MANUFACTURER'S INSTRUCTION

- Installation
- Usage
- Cleaning
- Maintenance

Le refroidissement rapide, la surgélation

ACFRI TRAINING

Control rapid chilling, flash freezing, stiffening and crusting of your products

This document is a training plan and in no way replaces the various manuals published by ACFRI.

Contents

As the cooling cells are stainless steel appliances, by their very nature made up of thin sheet metal parts, it is strongly recommended that safety practices and appropriate PPE be observed on a daily basis and during cleaning operations (protective gloves, protective goggles, respiratory protection mask, safety shoes, etc.) ***54***

I. Installation and assembly

1. Installation

Compact and Standard trolley cell

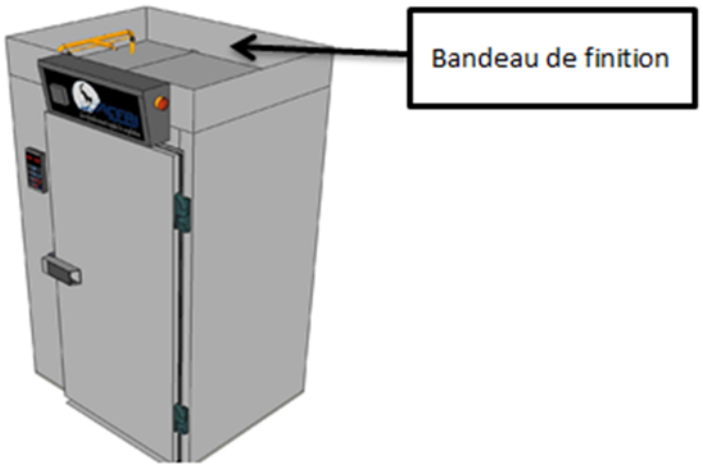
✓ Tilting can cause:

- a risk of buckling of bodywork components
- a change in the alignment of the bodywork components in relation to each other
- a fall of the evaporation/ventilation block
- damage to the locking system (strike plate, hinges, handle)

If it is not possible to place the equipment upright on its pallet, it is recommended that the components be dismantled and handled individually.
Particular care must be taken during assembly operations (see section B).

✓ When removing equipment from its pallet, it is advisable to:

- accompany several people as equipment is removed from its pallet
- avoid releasing the cell suddenly
- avoid holding the appliance by the trim strips.



I. Installation and assembly

XL trolley cell (modular panel body)

- ✓ Carry and handle evaporation/ventilation units with care:

  The evaporation/ventilation units are handled under the fan frame. It is forbidden to lift the block under the evaporators. This is because damage could be caused to the brackets under the evaporators.

- ✓ Installation of an XL cell directly in a recess (only for cells delivered assembled with an insulated floor):

  It is not advisable to slide the mounted cell into the recess:
  - handling difficulties that could damage the box
  - staggered battens, which could limit the insulation effect of the crawl space through poor air circulation
  - difficulties in centring the disbursed material

It is advisable to plan for the dismantling/reassembly of the elements in the recess

2. Assembly and connection

Compact and Standard trolley cell

✓ Checking alignment:

- Check that the door is correctly aligned
Finishing band
- Special case for plasma cells: check the height alignment between the entrance to the machine and the rolling base of the carriage.

✓ Checking tightness

✓ Make sure that all the mechanical parts on the cell are tight.

✓ No climbing on ceilings without reinforcement.
If these instructions are not followed, there is a risk of the panels buckling.

➢ **Special case: reinstalling an air unit housed on the ceiling of a trolley cell**

The cell assembly is delivered disassembled for transport reasons.
To reinstall the air unit housed on the cell ceiling, make sure to:

- Pull out the electrical panel
- Position the unit on the cell ceiling
- Rewire the unit components (regulation LP, safety HP/BP, crankcase resistor, unit power)
- Reposition the electrical panel - Rewire the cubicle components on the cubicle's electrical panel
(fans, insertion sensor, room sensor, door element, etc.)

I. Installation and assembly

XL trolley cell

✓ Checking the clamping elements:

All the body panels are cam-lock type. The hooks used to assemble the panels are eccentric (they are tightened in 2 stages). When hanging, therefore, the hooks must first be tightened to
then a second time so that the off-centre part of the hook is fully tightened.

If a hook is forgotten or not fully tightened, assembly problems will arise.

✓ Leak test:

- Connecting cables must be watertight, routed through IRO tubes and sealed with non-flammable silicone sealant.

- For the interior of the cell containing a junction box, care should be taken when making the electrical connections to the fans, for example, to make a loop or at least an anti-drip tape before entering the junction boxes, in order to prevent water from entering the boxes by running along the cables.

- Where pipes pass through the ceiling, they must be sealed with expanding foam.

Montage incorrect

Montage correct

I. Installation and assembly

✓ Attaching the evaporation/ventilation units:

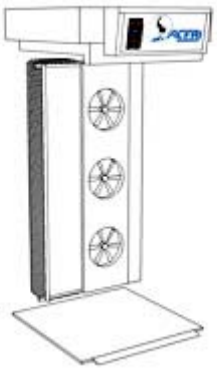
To attach the evaporator block, open the ventilation plate of the evaporator/ventilator blocks and fix them to the isothermal partition (hole + pop rivet). **PLEASE NOTE**: At this stage, the evaporator/ventilator blocks are not yet attached, so make sure they are wedged in place to prevent them tipping over before opening the ventilation panel.

✓ Check that inlet and outlet valves of pressure relief valves are working properly
(present on XL range cells).

✓ Tube outlets (diagram below)
- Extension of tube outlets above the cell ceiling
- Brazing of regulators (liquid line)
- Installation of manifolds above ceilings (see photo below)
- It is essential to balance the H-connection on the liquid and suction lines to ensure that the supply is evenly distributed

I. Installation and assembly

Refrigeration connection



The cell/tunnel has one lane with an evaporation unit, which is supplied by a refrigeration unit/cooling plant. An evaporator/ventilator unit consists of a coil positioned on the side of a central ventilation column (see schematic diagram opposite).

The following connections therefore need to be made:
- Supply and installation of suction and liquid lines between the refrigeration unit and the cell/tunnel.
- Supply and installation of the fault reporting + Solenoid valve control cables (4 x 0.75 cable) between the refrigeration unit and the cell/tunnel electrical cabinet.

The tubes are routed as follows:
- Connection of the lines to the cooling unit.
- Connected to the liquid flow and suction side of the cooling unit.

1- REFRIGERATION LINES

They must be carried out after the evaporator/ventilator unit has been integrated into the body.

Note: The information provided concerns the diameters of the outlets and inlets of the suction and liquid connection lines. These diameters must be calculated and checked by you according to the configuration of the lines on site (calculation of head losses).
The diameter of the pipes must take account of the following factors:
- compressor mass flow
- the connection distance
- lifts, elbows..

A- Liquid line between the unit and the cell:

Each battery is supplied by a pressure reducer (pressure reducers may or may not be supplied, depending on the order, which you will need to fit to the liquid tube outlets on the batteries above the cell).

1- The first step is to connect the pressure regulators to the liquid tubes of the batteries, which protrude above the cell/tunnel.

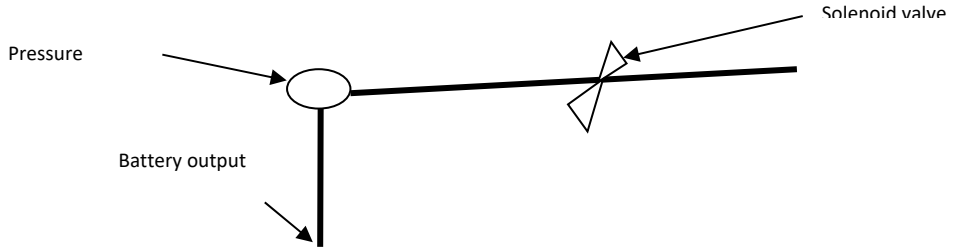
2- Fit a solenoid valve at the outlet of the liquid line tube (solenoid valve + coil supplied or not depending on order, to be connected by yourself).

3- Then pull the liquid line towards the refrigeration unit and connect.

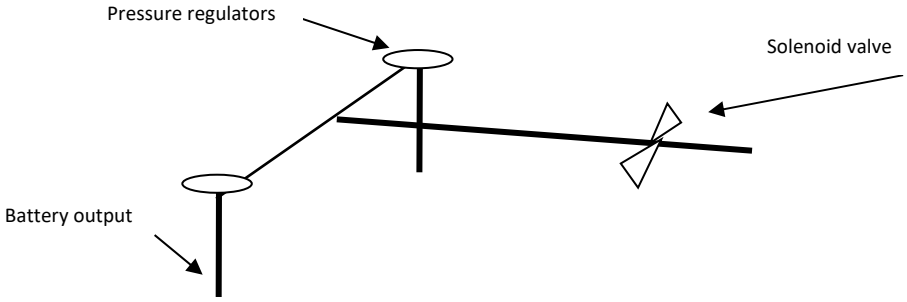
Indication for single-stage units:
The liquid is not under-cooled, so there is no need to isolate the liquid line

I. Installation and assembly

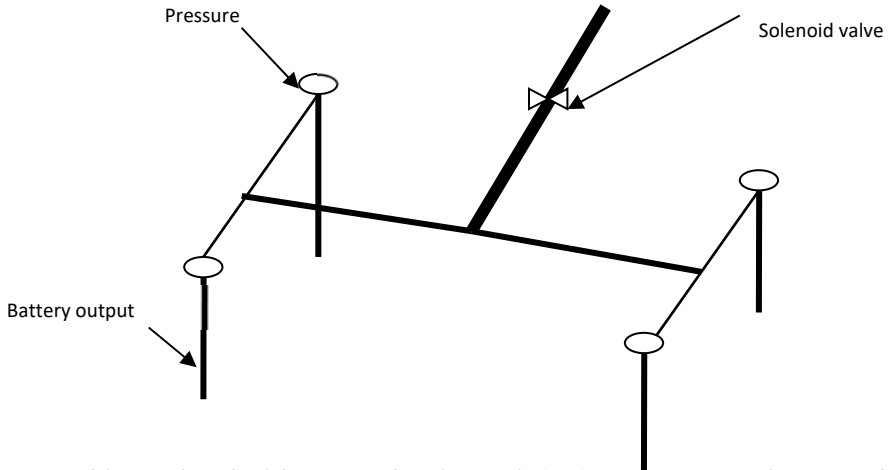
Below is a schematic diagram of the liquid line with collectors, for a single cell with 1 evaporator:



Below is a schematic diagram of the liquid line with collectors, for a single cell with 2 evaporators:



Below is a schematic diagram of the liquid line with collectors, for a double cell with 4 evaporators:



- Machine ordered without condensing unit (SG), pressure regulators and suction and liquid manifolds to be supplied and made by you.
- Machine ordered with X range ACFRI unit, R452A expansion valve(s) and suction and liquid manifolds will be supplied and manufactured in our factory
- Machine ordered with N Range ACFRI unit, R448A, R449A regulator(s) and suction and liquid manifolds will be supplied and manufactured in our factory.
- solenoid valve + coil and pressure switches supplied or not, depending on the option selected when ordering
-

B- Suction line between the group and the cell:

I. Installation and assembly

1- First of all, connect the suction tubes together by means of a manifold protruding above the cell/tunnel (if there are several batteries on the evaporation/ventilation unit)

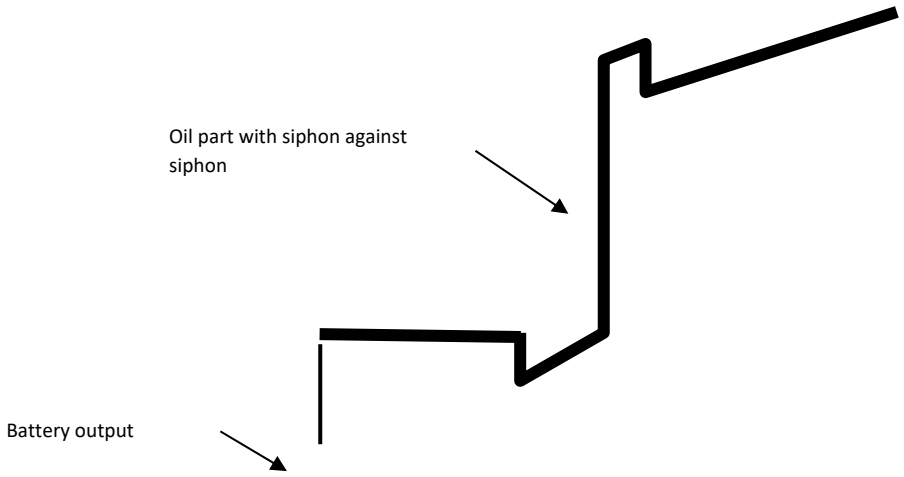
2- At the outlet of the collector, above the cell/tunnel, make an oil trap with siphon against siphon.

3- Then build the suction line to the refrigeration unit.

4- Once you have reached the refrigeration unit, connect the vibration eliminator (supplied or not, depending on the option, control or type of unit) to the suction line.

5- Make a reduction at the vibration eliminator outlet and connect to the suction inlet of the refrigeration unit.

Below is a schematic drawing (given as an example) of the suction line manifold for the evaporator/ventilator unit of a single chamber cell



The suction line should be insulated with Armaflex of sufficient thickness (evaporation rate between -20°C and -30°C for rapid cooling).

To avoid any preferential feed, all tee manifolds must be perfectly centred in relation to the batteries they connect together.

To encourage oil return, the following rules should be observed:
The suction line must slope towards the cooling unit. Slope of 1 cm / metre.
For all ascents equal to or greater than 3 metres, the diameter of the tube should be reduced by one section within the ascent.
An oil trap with siphon against siphon will be installed every 3 metres of ascent.
Beyond 5 to 6 metres of rise, this system will no longer be used, but a double riser will be used, with the suction reduced accordingly.

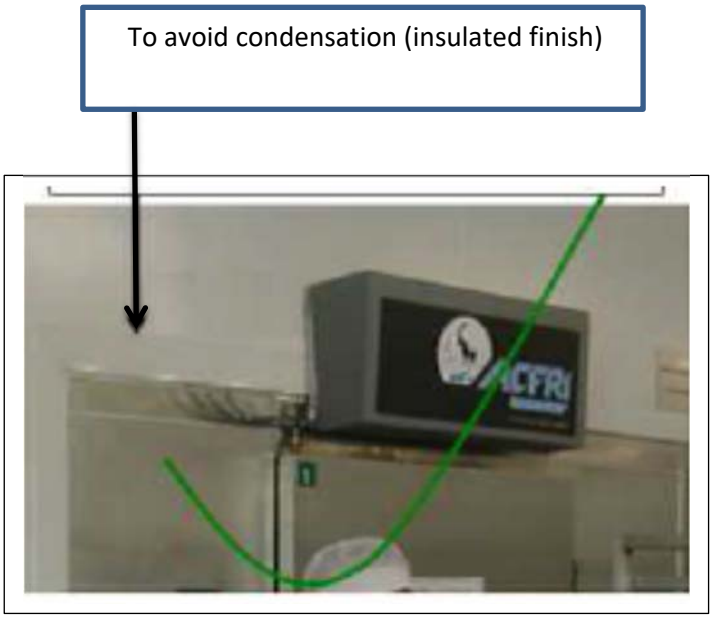
3. Cold room integration

The precautions for walk-through cells with an exit into the positive cold room are as follows:

- The sealing of the positive cold room is in direct contact with the cell ceiling.

- Note that the opening above the finishing strips causes condensation.

- It is forbidden to carry out an outing in a negative cold room.



4. Floor and location

4.1. Floor recommendations

✓ Checking flatness:

The entire length and width of the floor must be level (whether it is an original factory floor or a recessed floor...).

✓ Checking regularity:

The floor must be smooth with no bumps or hollows, otherwise difficulties may arise (aligning doors, mounting the body, etc.).

✓ Checking the thermal inertia of the factory floor:

The rapid alternation between negative temperatures (-20/-25°C for cooling and -40°C for flash freezing) and positive temperatures (+15/+20°C for a defrost cycle) can lead to problems such as ice build-up, body deformation, damage to the original factory floor, etc

4.2. Precautions for a standard laid floor

✓ Daily use:

The semi-insulated floor of the cell is recommended for daily use of 8 to 10 hours, interspersed with defrost cycles. If the recommended time is exceeded, problems may arise with ice setting, deformation, deterioration of the original factory floor, etc.

✓ The cell can be fixed to the floor:

Corner brackets fixed to the floor and to the cell prevent the unit from being moved.

The cell is held together in this way to prevent refrigeration connections from becoming brittle or breaking..

Warning :

Under no circumstances should a standard laid floor be integrated into a recess in the resin or tiles.

Such integration would create a "retention tank" for cleaning and condensation water, and therefore a significant short-term risk of bacteriological development.

The standard floor must be laid in accordance with the aforementioned preliminary checks and installation advice.

The standard floor is delivered in one piece

The floor of the blast chiller never has to be wedged (put elements under the floor of the blast chiller to level the equipment).

Before using the blast chiller, it is necessary to make sure that there is a gutter or a drain nearby. The finishing will be done with skirting boards to avoid any water infiltration under the blast chiller floor.

4.3. Precautions for an insulated floor on battens

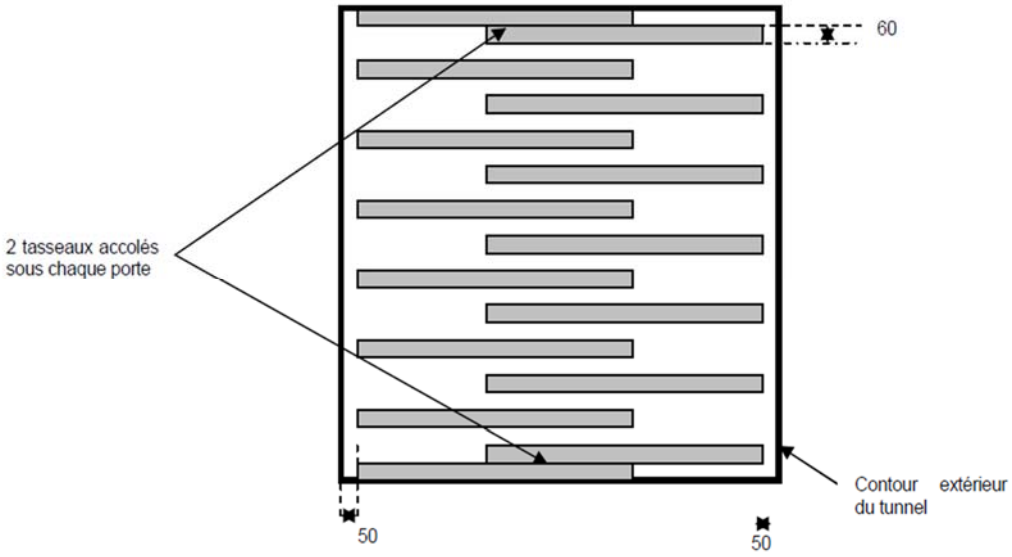
✓ Daily use:

The insulated floor is recommended for daily use of more than 10 hours (defrost cycles are still necessary), to avoid floor problems (detailed above).

✓ Laying the floor on cleats:

This creates natural ventilation in the form of a crawl space.

The battens are staggered, allowing air to circulate freely in the recess (see diagram below).



5. Doors and settings

✓ Aligning doors and closures:

It is necessary to check:

- the correct tightening of strike plates
- doors close properly

A door that is badly aligned and therefore badly closed generates:

- malfunction of a rapid cooling cycle
- rapid icing
- deformation of the door
- play in the hinges

You can use shims on the door hinges to help with adjustments and to compensate for any offset

II. Cooling

1. The regulations

1.1. The text

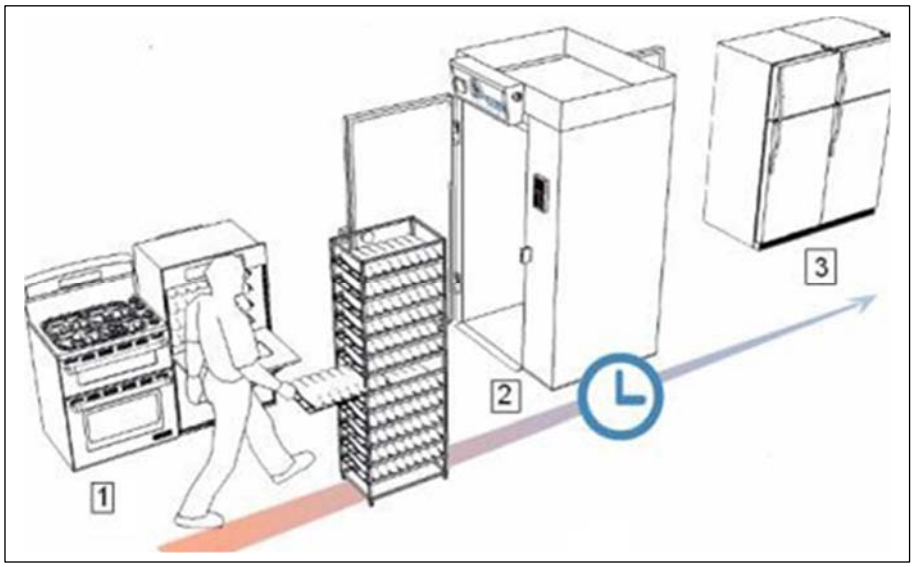
According to article 21 - decree of 19/09/97:

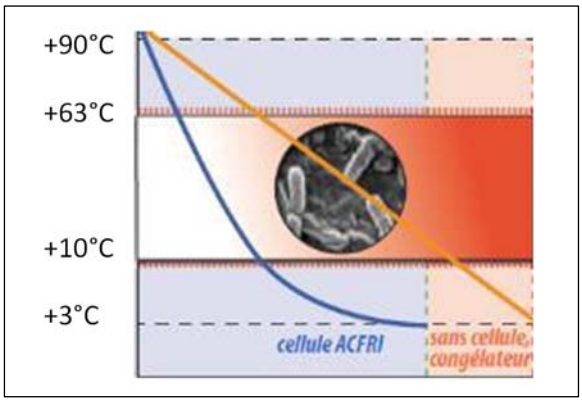
Rapid cooling of foodstuffs is carried out in such a way that their core temperature does not remain between **+63°C and +10°C for more than 2 hours**.

Unless the risk analysis provided for in Article 5 has shown that a lower temperature poses no risk to consumer health. These culinary preparations must be consumed on the day they are first heated

II. Cooling

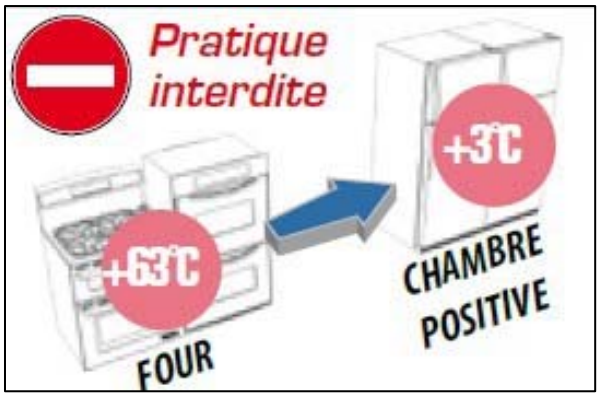
1.2. The principle





- Rapid cooling at the end of cooking is essential to prevent bacterial proliferation

The principle can be summed up in three stages:



1/ The product is placed on the trolley after cooking (max temperature: 75°C).

2/ Introduction of the trolley into the cell for a cooling cycle with blowing at very low temperature (-20/-25°C) down to +10°C at the core of the products.

3/ The product will be stored in a positive cold room

2. Temperature and airflow mode

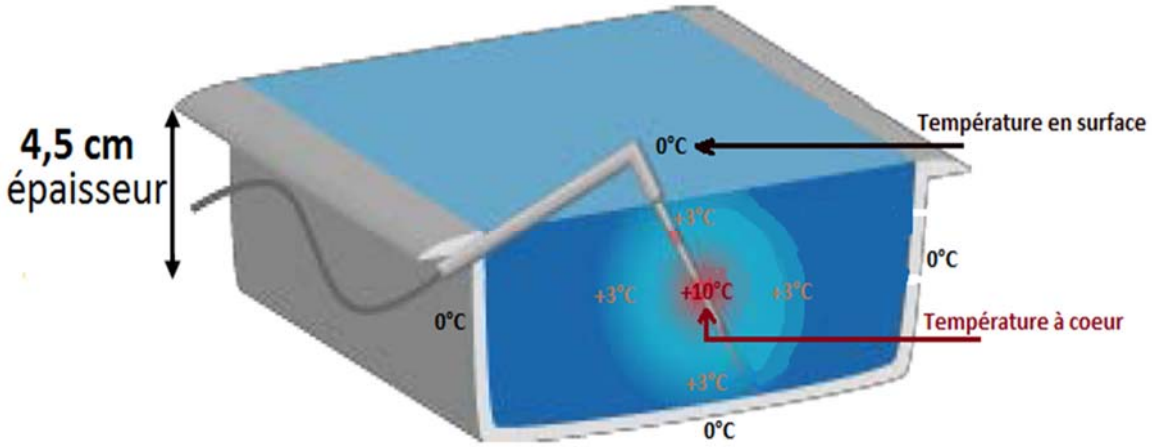
2.1. Single-temperature cycles (mode accessible directly by pressing the + and - keys on start-up)

2.1.1. Product characteristics and temperatures (Type 1 product diagram)

Cooling is different for each product. The length of the cycle varies according to **a number of criteria**:

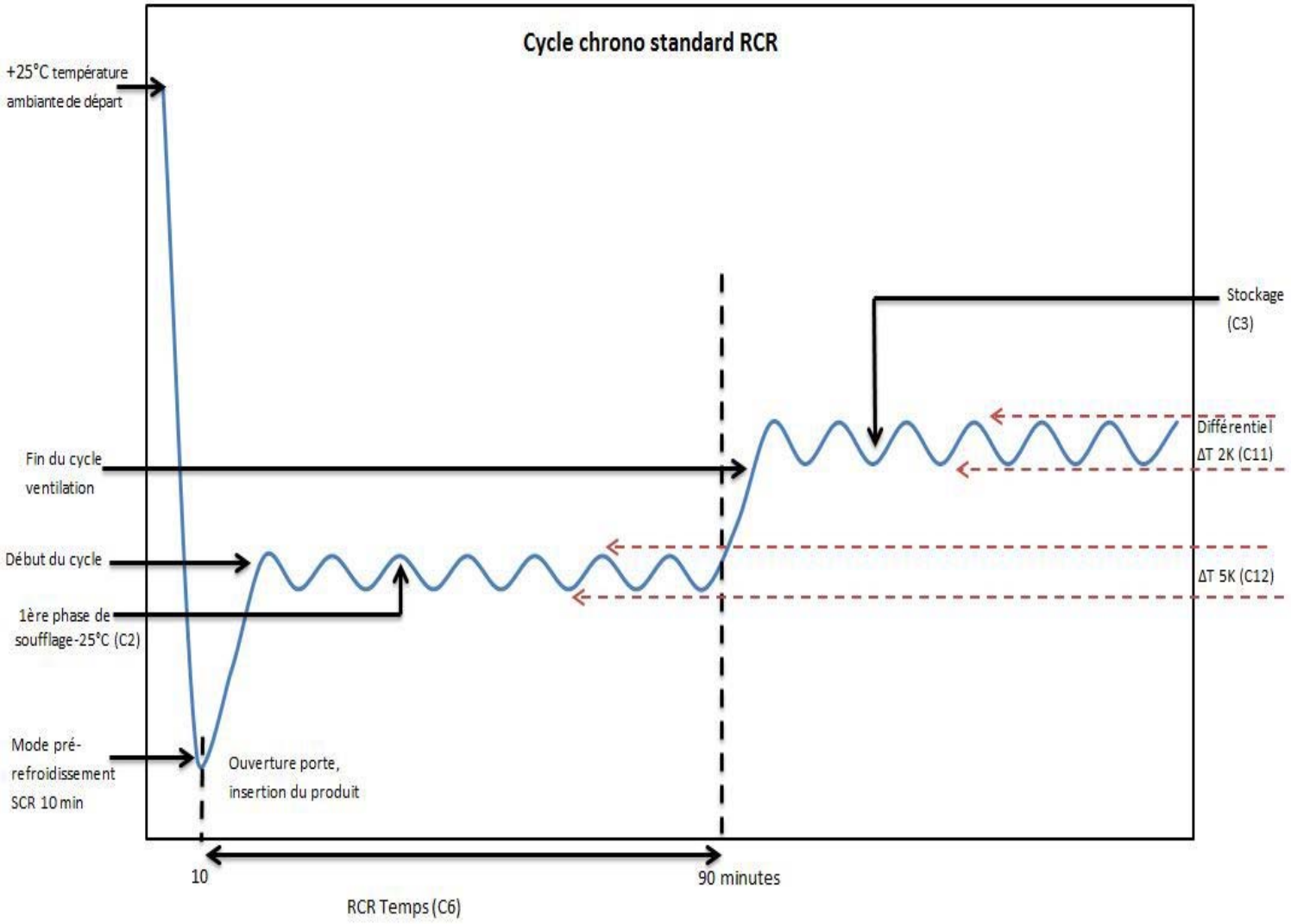
- Thickness
- Temperature
- Packaging
- Type of product

- The surface of the product will cool faster than the core.
- For a 4.5 cm thick product, a **core**temperature **of 10°C and 0°C in the core** are obtained **surface.**
- **Maintain a core temperature of +10°C.**
- **If set at +3°C > Flash freezing**



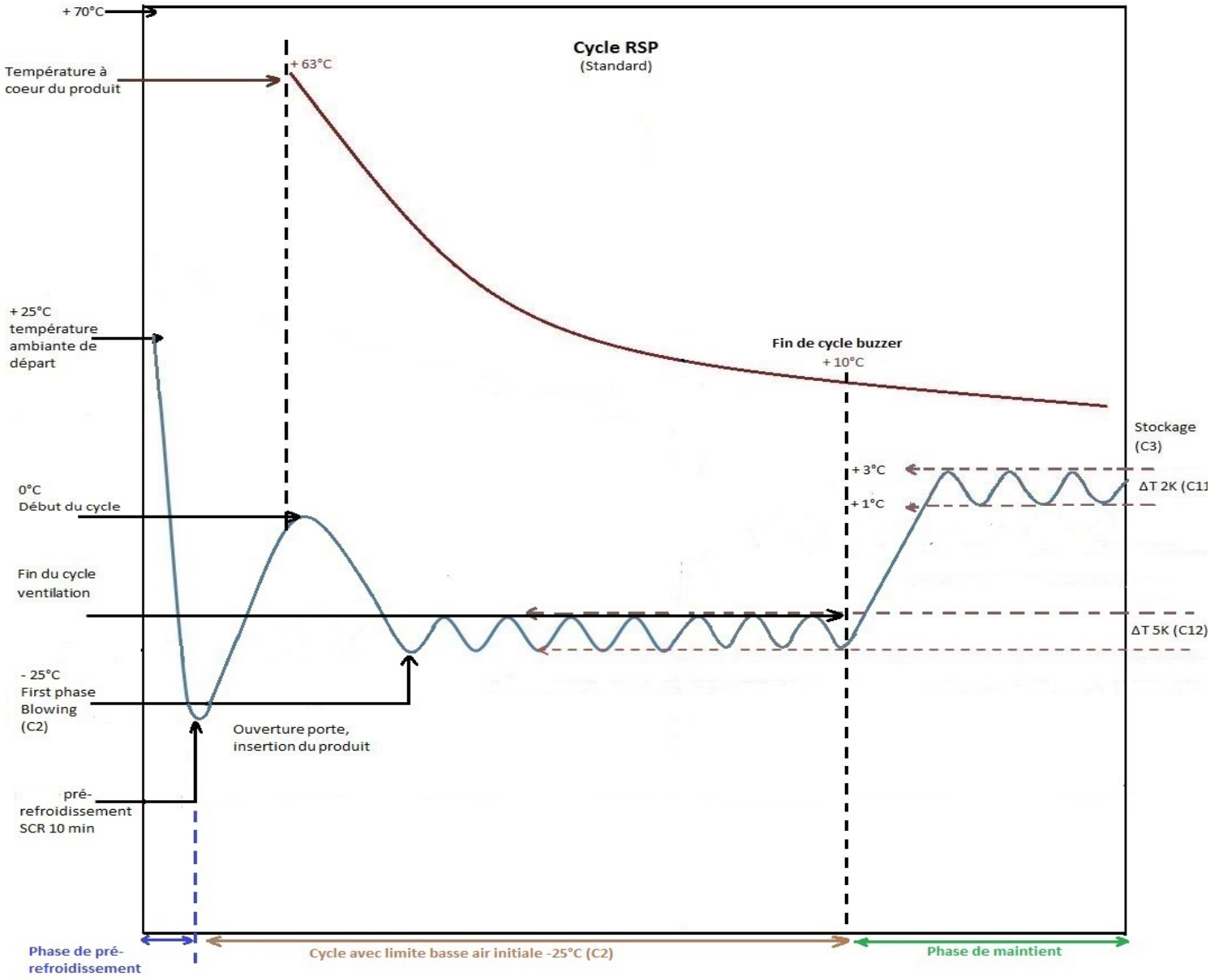
II. Cooling

2.1.2. Timed cooling cycle (RCR)



II. Cooling

2.1.3. Cooling cycle insertion probe (RSP)



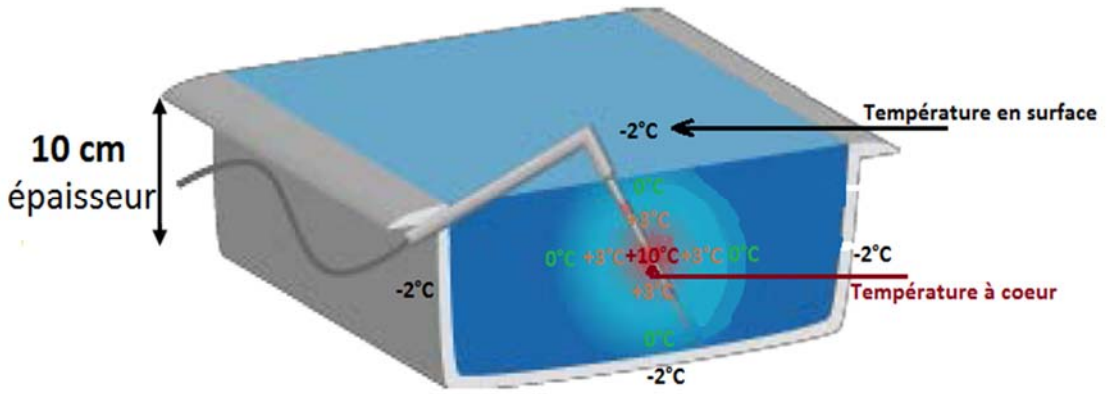
2.2. Sequenced cycles (typical diagram, use and setting via parameters, see manual)

2.2.1. Product characteristics and temperatures (Type 2 product diagram)

Cooling is different for each product. The length of the cycle varies according to **a number of criteria**:

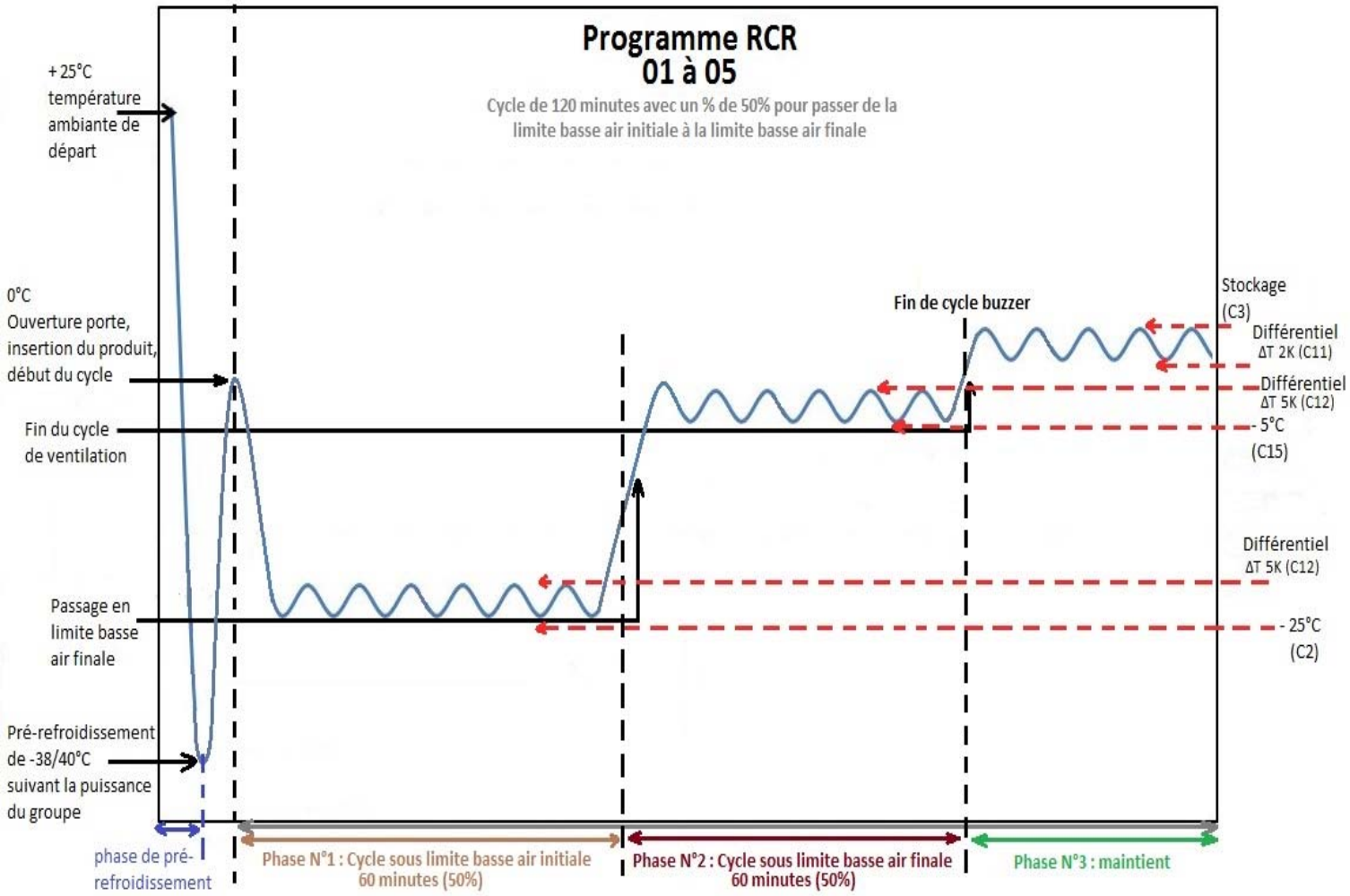
- Thickness
- Temperature
- Packaging
- Type of product

- The surface of the product will cool faster than the core.
- For a 10 cm thick product, a **core**temperature **of 10°C and -2°C in the core** are obtained **surface.**
- **Maintain a core temperature of +10°C.**
- **If set at +3°C > flash freezing.**



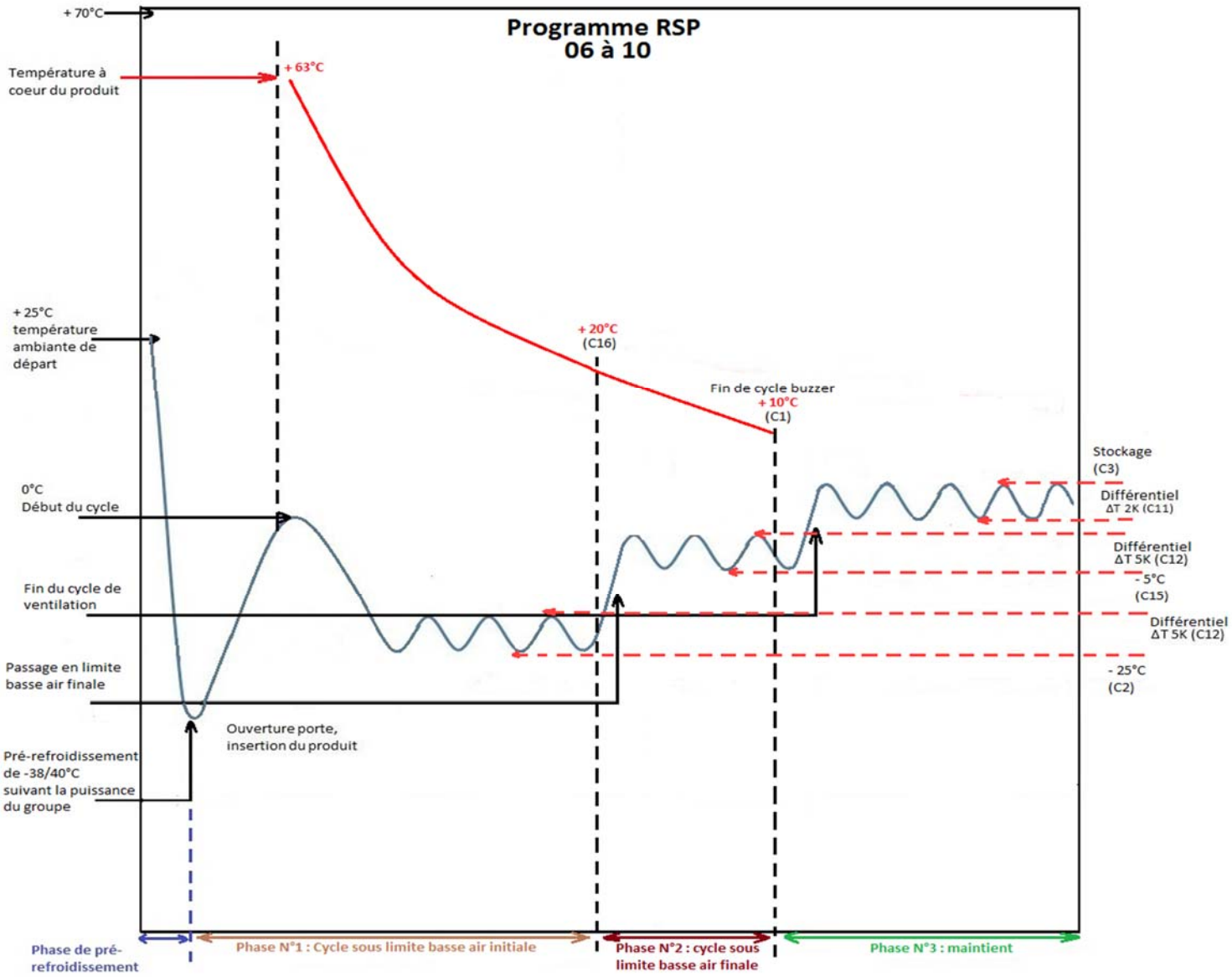
II. Cooling

2.2.2. Timed cooling programme (01 to 05)



II. Cooling

2.2.3. Insertion probe cooling programme (06 to 10)



III. Flash freezing

1. Regulations

1.1. The text

- Ready meals are flash frozen in such a way that their core temperature does not remain between **+65°C and -18°C for more than 4h30**.

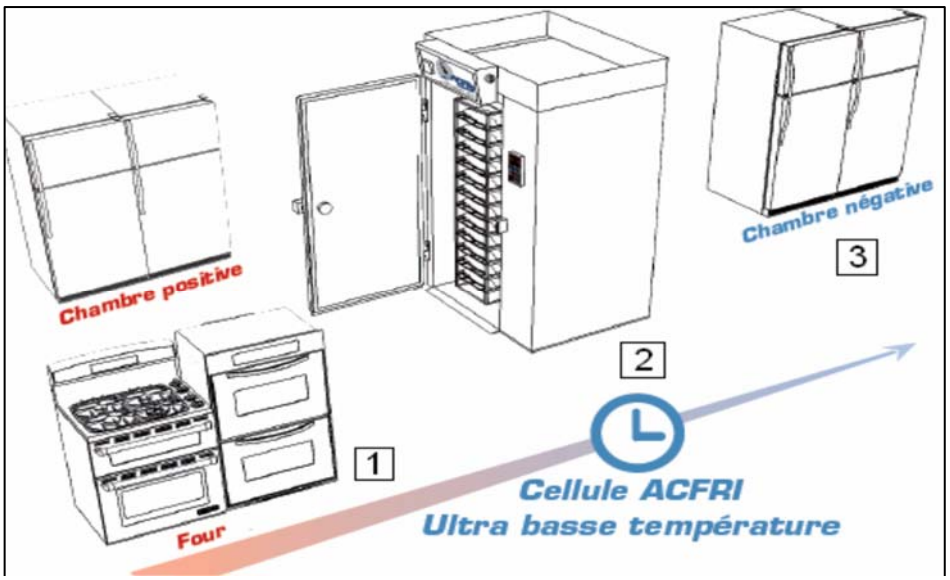
1.2. The principle

The principle can be summed up in three stages:

1/ Products can be taken directly from an oven or a positive chamber.

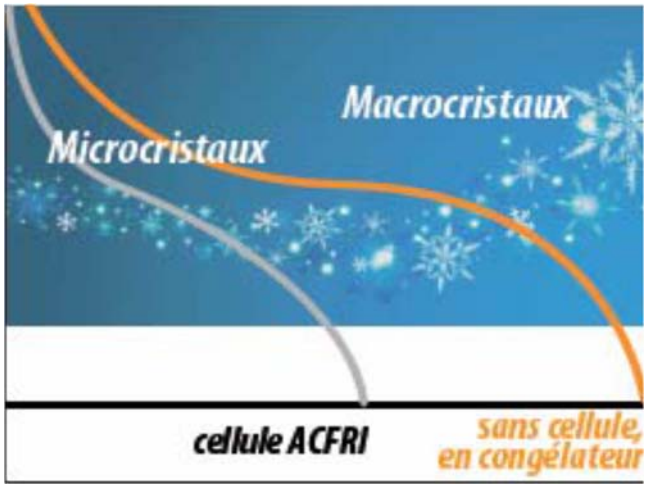
2/ Positioning the trolley in the cell at very low temperature for a flash freezing cycle.

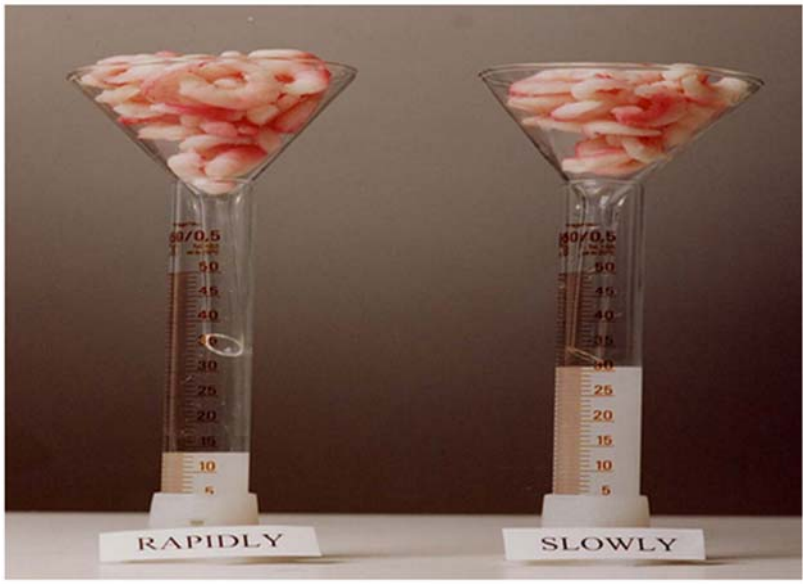
3/ The product will be stored in a cold room.



III. Flash freezing

Ready meals are flash frozen in such a way that their core temperature does not remain between **+65°C and -18°C** for more than 4h30.
Flash freezing is a rapid freezing process that prevents the product from deteriorating as a result of macro-crystallisation, i.e. the formation of large crystals from the water contained in the product's cells after the cell envelope has burst.





2. Product characteristics and temperatures

Flash freezing is different for each product. The length of the cycle varies according to a number of criteria:

- Thickness

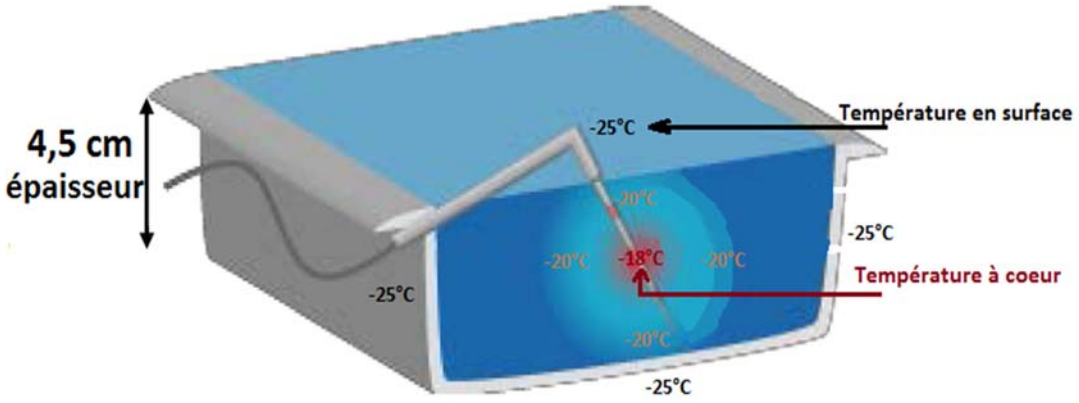
- Temperature

- Packaging

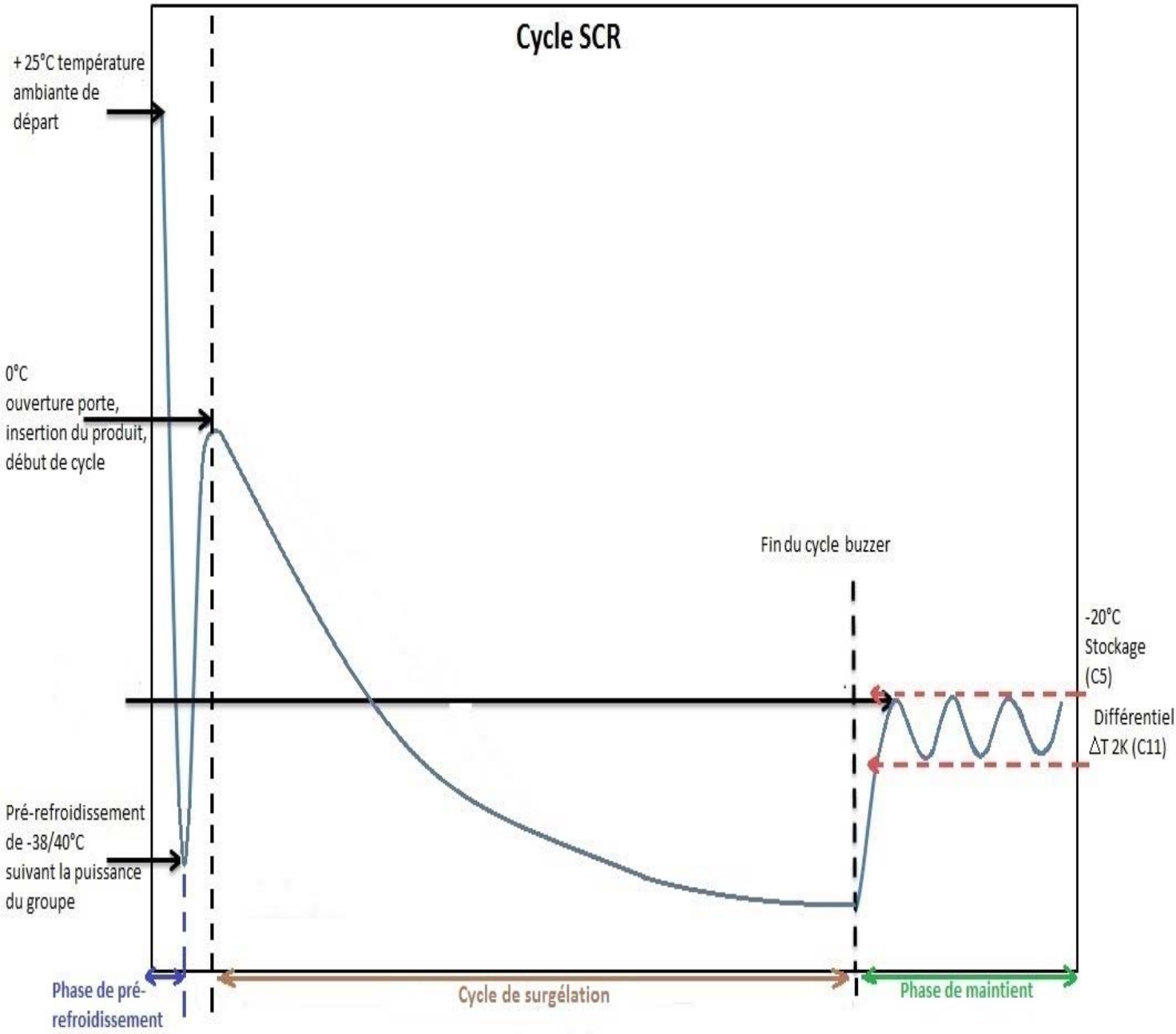
- Type of product

The surface of the product will cool faster than the core.

On a 4.5cm-thick product, we obtain a core temperature of -18°C and a surface temperature of -25°C.



3. Flash freezing cycle



IV. Stiffening

1. Regulations

1.1. The text

Order of 23 July 2010 laying down the requirements and recommendations for the conformity of a charcuterie product:

Stiffening techniques are authorised when it is shown to be necessary and/or beneficial to the product (e.g. mincing for sausages). However, the product must not be kept for more than 24 hours in the stiffened state (72 hours maximum at weekends and public holidays) and the temperature obtained must be:

- Between - 5 °C and - 3 °C for lean.

- Between - 7 °C and - 3 °C for fat

IV. Stiffening

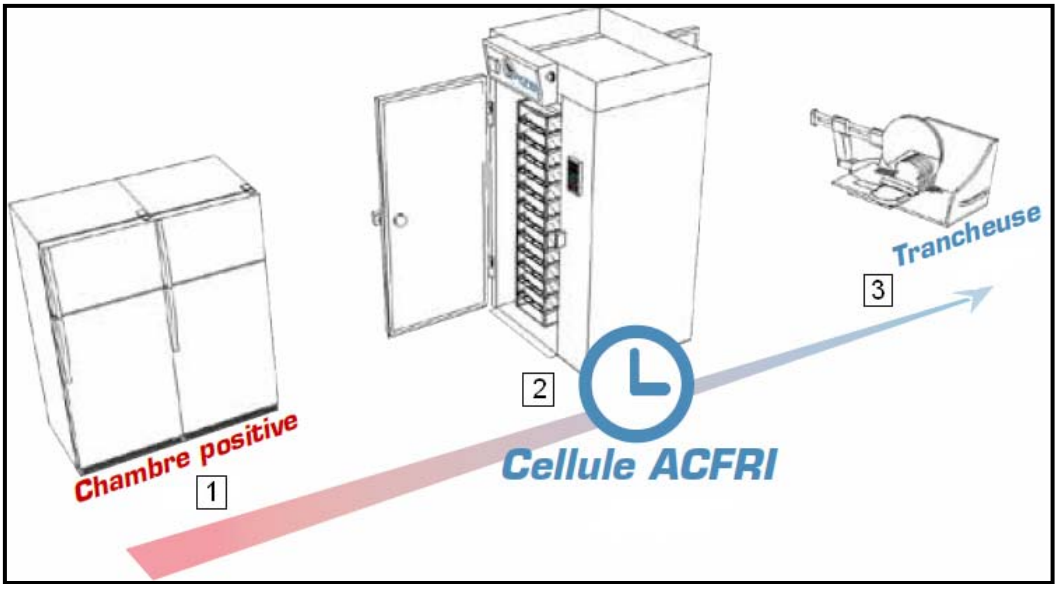
1.2. The principle

The principle can be summed up in three stages:

1/ Storage in a positive chamber.

2/ Placing trolleys in an ACFRI cell.

3/ Cutting with the slicer.



Exceptional slicing quality after stiffening at low temperature:

- ❖ Surface stiffening in 30 minutes.
- ❖ Reduction in material losses.
- ❖ Core/surface homogeneity in progressive mode temp.

2. Product characteristics and temperatures

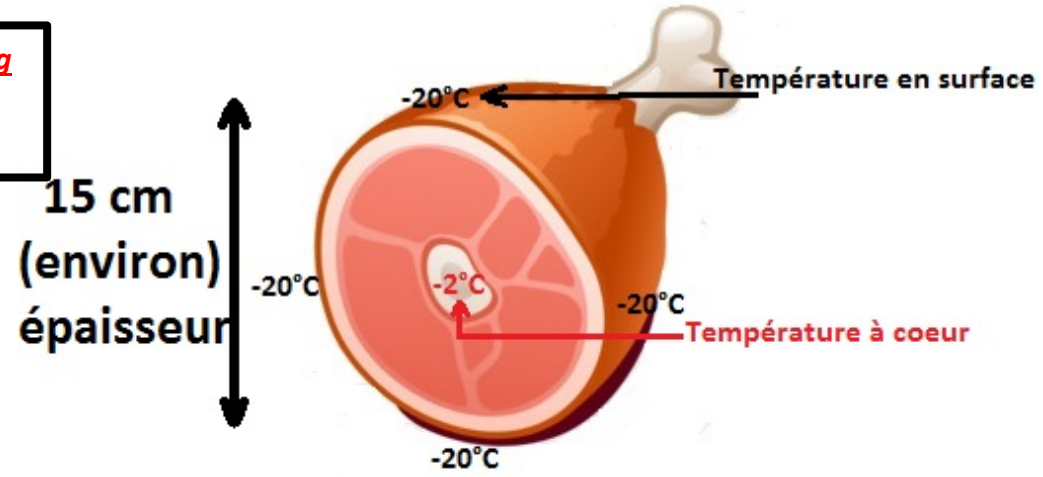
The stiffening is different for each product. The length of the cycle varies according to **a number of criteria**:

- Thickness
- Temperature
- Packaging
- Type of product

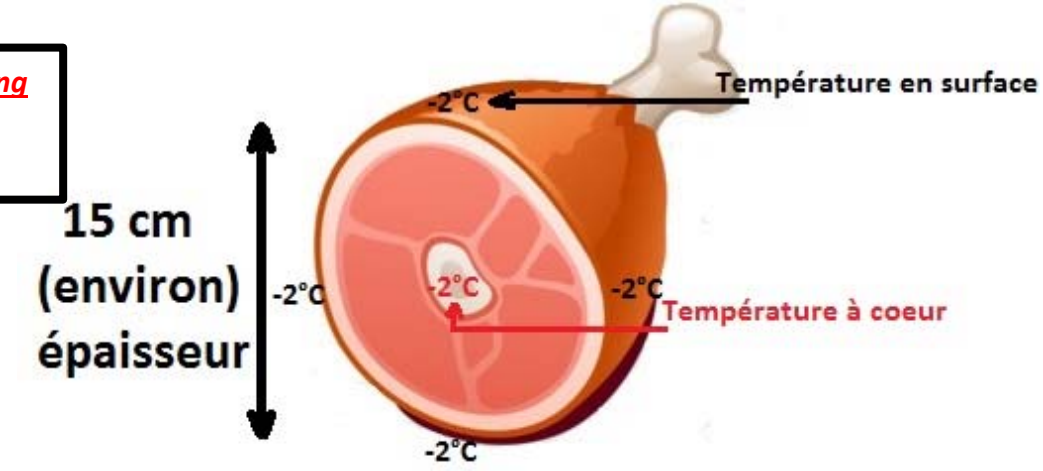
❖ The surface of the product will cool faster than the core.
❖ On a 15cm-thick product, we obtain a **core**temperature **of -2°C and a surface temperature of -20°C**.
❖ **Maintain a core temperature of -2°C.**

❖ Example of the temperature at the end of the stiffening cycle on a typical 15cm thick product.

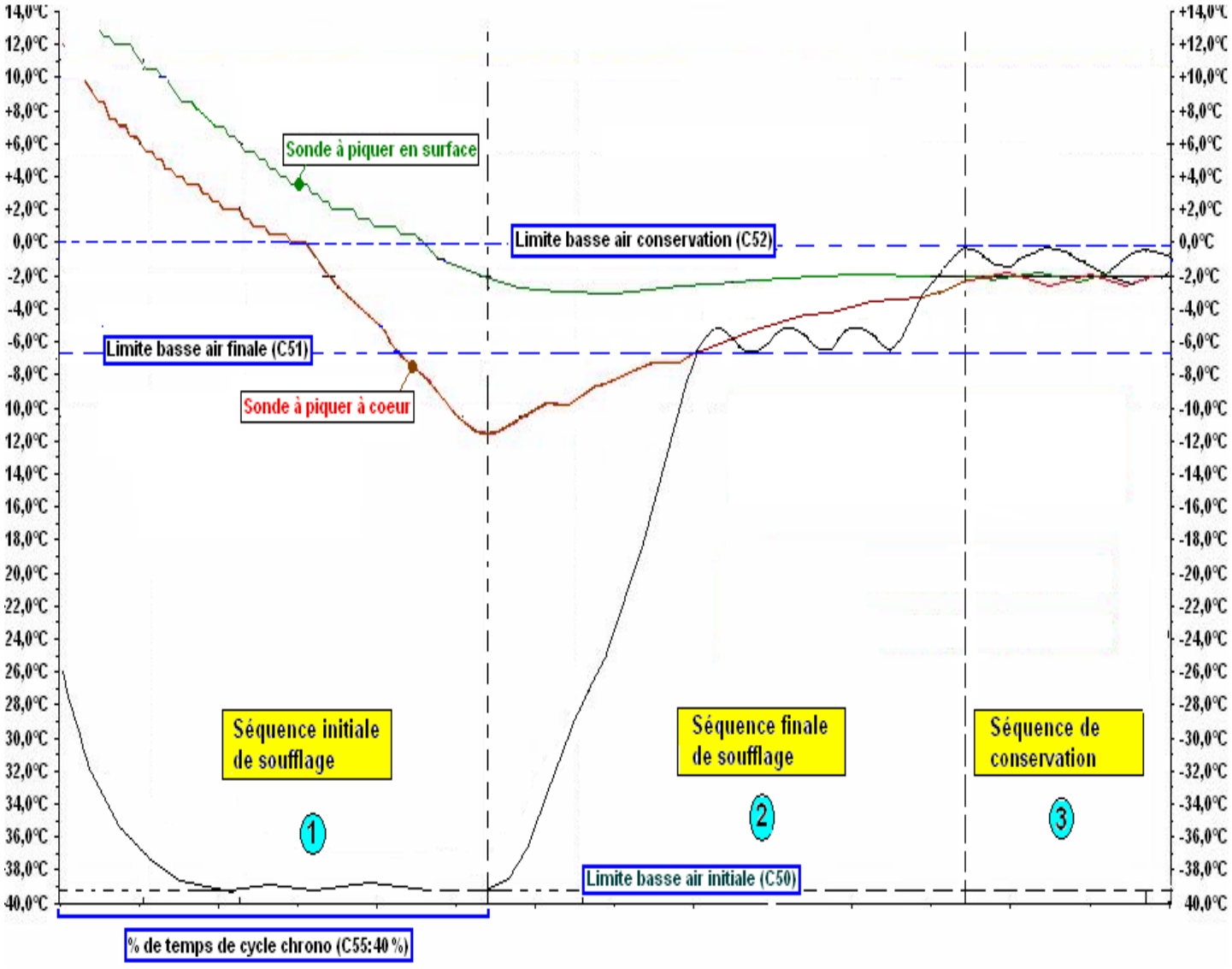
After a stiffening cycle without sequencing



After a stiffening cycle with sequencing



3. Stiffening cycle



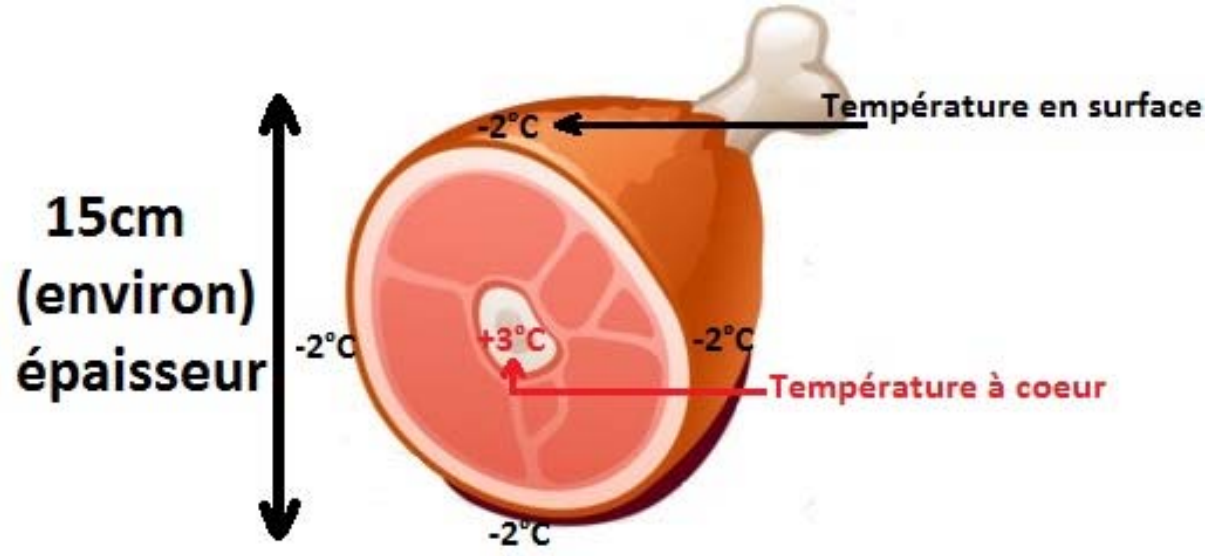
V. Crusting

1. Product characteristics and temperatures

The crusting process is different for each product. The length of the cycle varies according to **a number of criteria**:

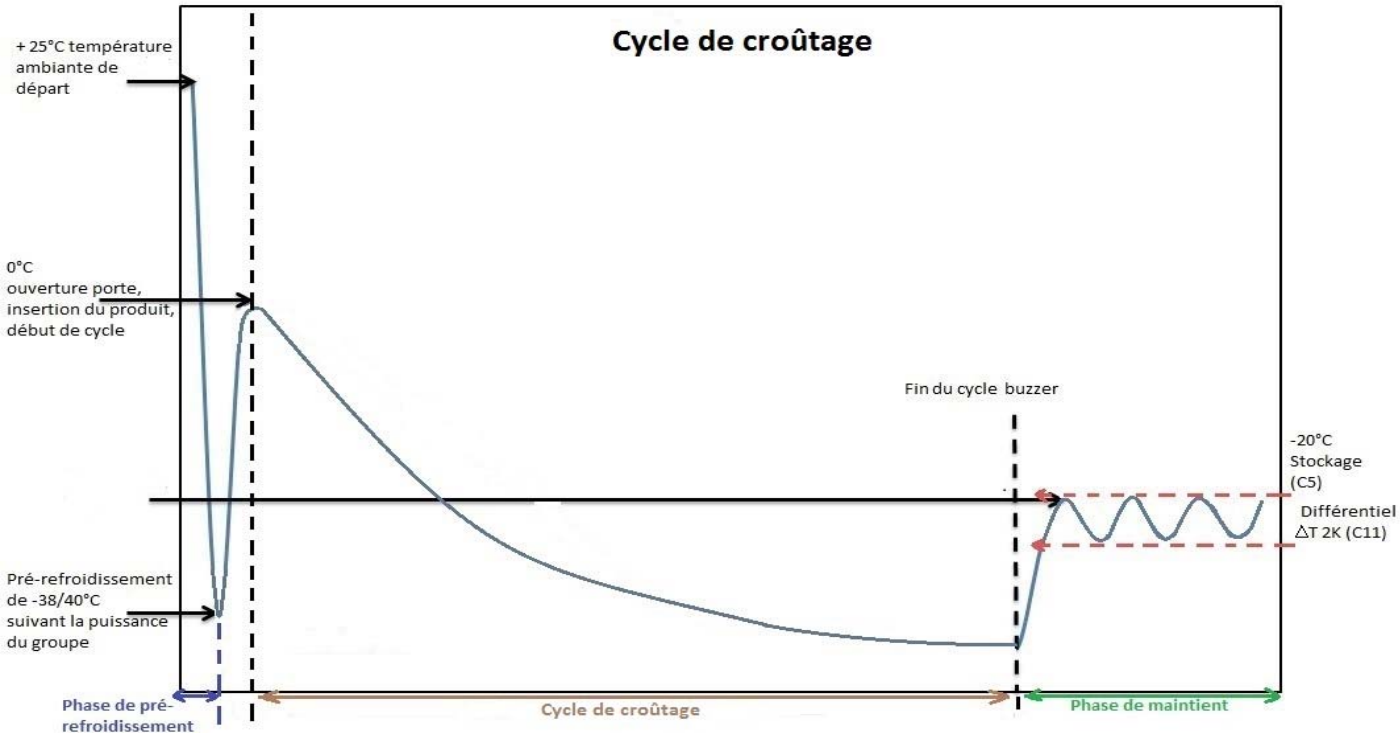
- Thickness
- Temperature
- Packaging
- Type of product

- ❖ The surface of the product will cool faster than the core.
- ❖ On a 15cm-thick product, we obtain a **core**temperature **of +3°C and a surface temperature of -2°C**.
- ❖ **Maintain a core temperature of +3°C.**



2. Crusting cycle (identical to the SCR cycle)

- Crusting is carried out on all sides of the product:
  - **1 cm / hour**.



VI. Ventilation

1. The principle

1/ Hot air is drawn in

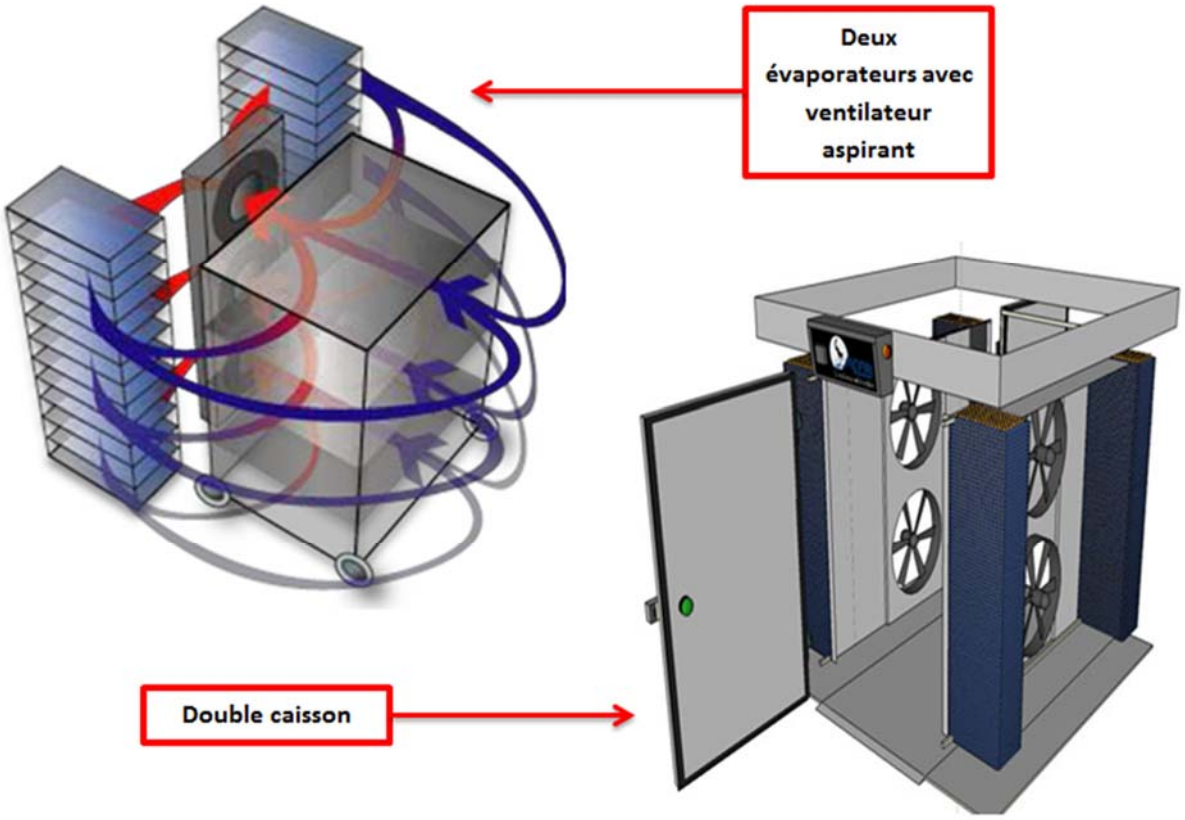
2/ Passing through the evaporators lowers its temperature

There are different types of evaporation/ventilation units:

1/ Two evaporators with suction fan

2/ An evaporator with a suction fan

3/ Double housing with 4 evaporators



2. Product and packaging constraints

❑ Thickness:

- Up to 5 cm product thickness in the tray > single-temperature cycle.
- Over 5 cm thick > sequenced cycle > increased cooling time.

❑ Packaging:

- Make sure there is sufficient air circulation between the products
- Beware of the difficulty of ventilating the product due to its packaging.
- Example below: crates with little or no perforation.

❑ Multi-product cooling:

- Preferably launch cycles with similar products in terms of:
  - thickness
  - weight
  - packaging
  - by product type
  - cooling time
- Remove the products that have cooled the quickest first,
- Multi-product cooling involves single-temperature cycles.

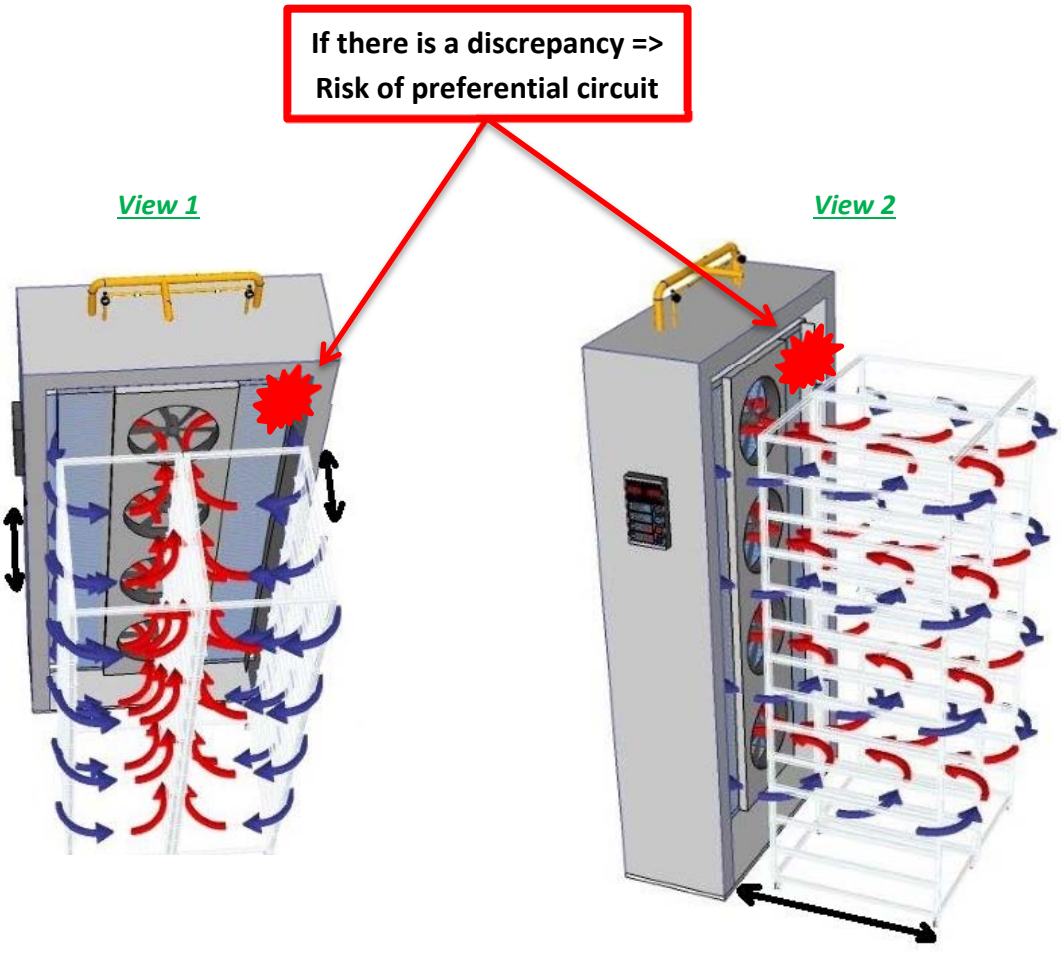
3. Trolley positioning

For trolley positioning:

- Keep the **distance** between the trolley and the ventilation system to a **minimum** .

- Place the trolley in front of the fan, in the **air flow**.

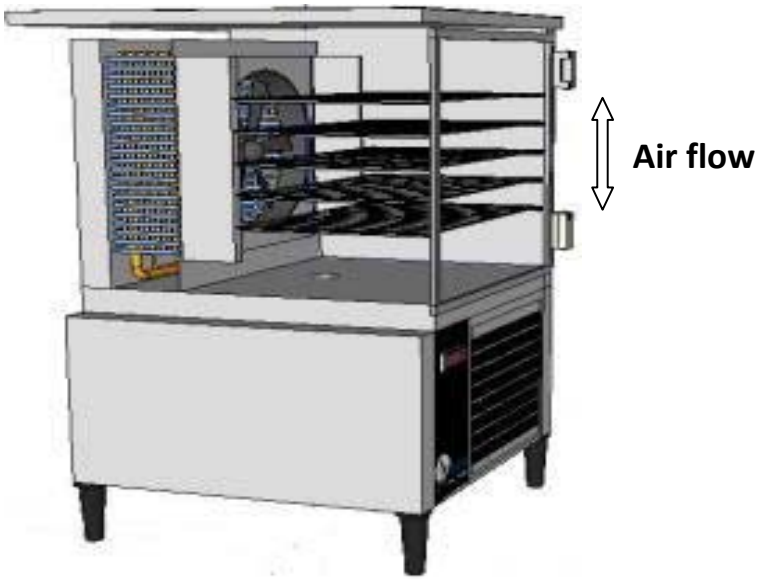
- This will avoid temperature disparities and ensure a **uniform temperature** across the products.



4. positioning the grids

On grid cells:

- The grilles should be spaced two storeys apart and placed in the **air flow**.
- Care should also be taken not to place too many products on each grid.
- Weight on grids: 5kg maximum.



VII. Switching the cell on and off

1. Precautions before starting up

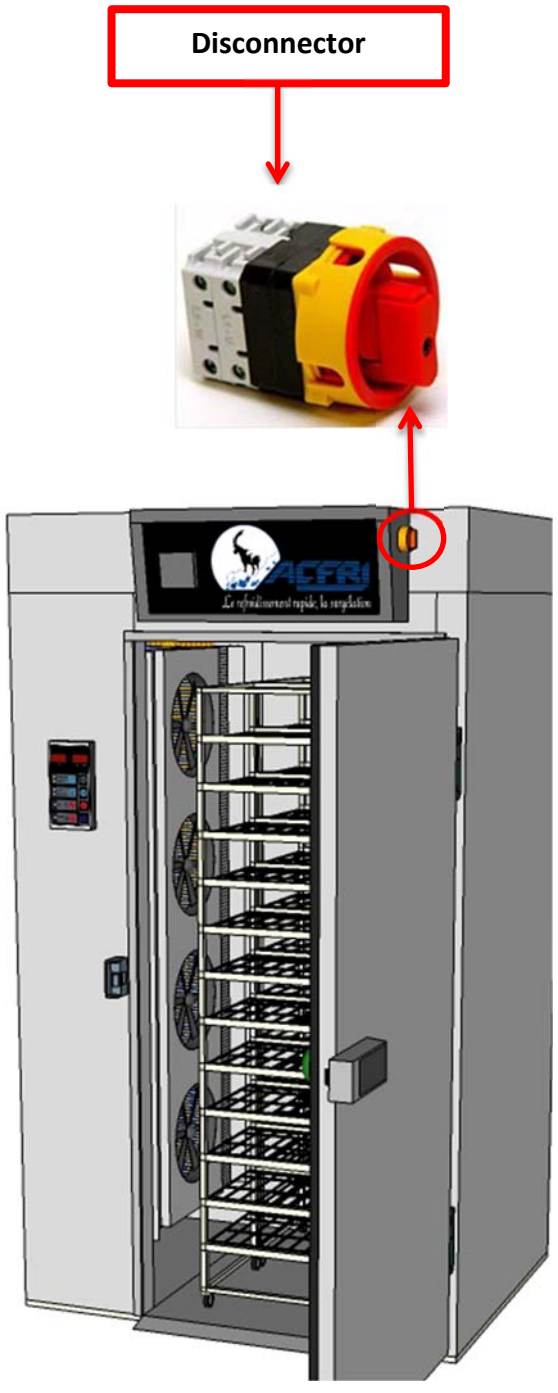
Before operating the isolating switch, make sure that:

- The ventilation door is closed correctly.
- Presence of fan protection grille

2. Precautions before cutting off

Before switching off the isolating switch, make sure that:

- No product remained in the cell.
- No cycle in progress
- The PLC is in standby mode (OFF or LEDs off)

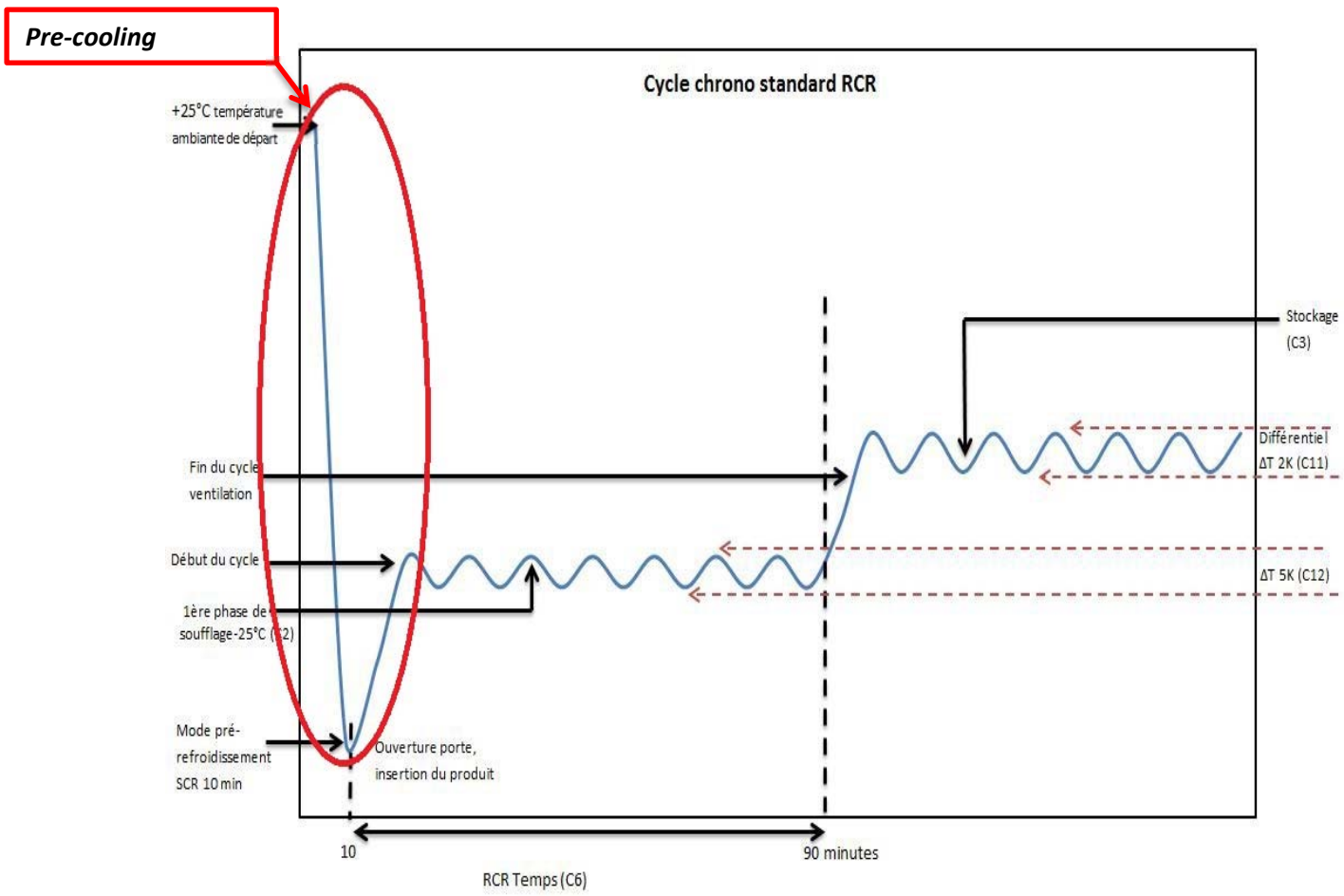


➢ **The machine must not be switched on without supervision.**

3. Pre-cooling

Before inserting products in the cell:

- Pre-cool for 10 minutes in Timed flash freezing mode (SCR)
  - If the cell is operated "continuously", it will only need to be pre-cooled once at the start of the working day.
  - The higher the temperature of the incoming product, the more pre-cooling is required.
  - Saves cooling time - Reduces energy consumption.
  - Reduced risk of frost build-up.



VIII. SIMPLY III controller

1. Switching on and displaying menus

- Press ON/OFF if the PLC is switched off.
- Displays the last mode used.
- Scroll through the menus by pressing the + and - keys.
- Confirm a menu by pressing the Enter key.

List of basic modes:

- RCR - Timed cooling.
- RSP - Insertion probe cooling.
- SCR - Timed flash freezing.
- SSP - Insertion probe flash freezing.
- DEG - Defrosting.
- TST - Self-test.
- PAR - Settings.
- PGR - Programming.

List of optional modes:

- DCR - Timed Defrost.
- DSP - Insertion probe Defrosting.
- CFG - Configuration.
- LST - List.

➢ **For more information on the menus, see "ACFRI SIMPLY III PLC manual"**

2. Parameter management

❖ A wide range of settings can be accessed and modified to suit your preferences.

Example:

- Storage temperature after a cooling/storage cycle.
- Supply temperature.
- Defrost temperature.
- Setting the internal clock.
- Probe calibration.

3. Changing parameters

- Press ON/OFF if the PLC is off

- Scroll through the modes using the + and - keys until you reach the "PAR" mode and press "enter".

- Parameter C10 appears ("password" parameter)

- Set this parameter to 12 using the + and - keys, then "enter".

- You then enter the settings for the various parameters/Press "enter" to scroll through the parameters.

- When a parameter is displayed, use + and - to change its value, then press enter to confirm.

➢ **To access the list of modifiable parameters, see "ACFRI SIMPLY III controller manual"**

4. Fault and alarm management (DF1 to DF6)

- **DF1: Room sensor in circuit off**

- In RCR / SCR / RSP / SSP / Conservation mode > Fault display + buzzer > Cycle stopped
- Accessible modes: DEG / PAR / TST

- ***DF2: Insertion probe in circuit disconnected***

- In RCR / SCR and conservation mode > Fault display + buzzer > Undisturbed cycle.
- In RSP and SSP mode > Fault display + buzzer > Cycle stop

- ***DF3: Group fault***

- In RCR / SCR / RSP / SSP mode and in conservation > Fault display + buzzer > Cycle stopped
- Accessible modes: DEG / PAR / TST

- ***DF4: Short-circuited insertion probe***

-In SCR and RCR mode > Fault display (light on ENTER LED) + buzzer > Undisturbed cycle
In RSP and SSP mode > Fault display + buzzer > Cycle stopped.

- ***DF5: Room sensor short-circuited / or temperature value detected above maximum room range (+60°C).***

- In RCR and SCR mode > Fault display + buzzer > Cycle stopped
- In conservation > Fault display + Buzzer > Cycle stopped

- ***DF6: Short-circuited insertion probe / or temperature value detected above maximum probe range (91°C).***

- In RCR / SCR and conservation mode > Fault display + buzzer > Undisturbed cycle

- In RSP and SSP mode > Fault display + buzzer > Cycle stopped

- To acknowledge the buzzer (operation and/or fault) > press + and - simultaneously for 5 seconds.
- At the end of RSP/RCR/SSP/SCR mode, acknowledgement of the buzzer does not change the switchover to conservation mode.
- Once the fault has been corrected, the display is acknowledged > press + and - simultaneously for 5 seconds.

For more information on faults and alarms, see "ACFRI SIMPY III PLC manual"

IX. Temperature sensors and precautions for use

1. Room sensor

➢ Range of use:

- Maximum permitted temperature: +60°C. (see DF5)
- Minimum permitted temperature: - 55°C. (see DF1)

➢ Presentation of successive displays in RCR or RCR cycles:

- RCR or SCR
- Time remaining in decrements (display flashing)
- Ambient temperature in the cell (fixed display)

➢ Special function:

- C21>Inversion Room Sensor/Insertion Probe Parameter setting (SAV)

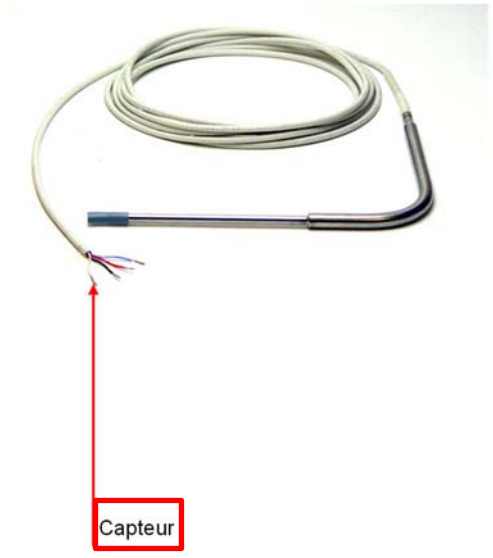
- Alternating display: C21

2. Insertion probe

➢ Range of use:
- Maximum permitted temperature: +91°C. (see DF6)
- Minimum permitted temperature: - 38°C. (see DF2)
-

➢ Presentation of successive displays in RSP or SSP cycles:
- RSP or SSP
- Total time elapsed since start of cycle (display flashing)
- Product core temperature (fixed display)

➢ Special function:
- C19 > Possibility of cancelling RSP/SSP probe modes
- C20 > Time delay before sensor temperature is taken into account
- C21 > Room sensor/insertion probe changeover parameter setting (SAV) - Alternating display: C21
- C51 > Display of the time between 2 selected temperatures. (Default: +63°C. : +10°C.)



Precautions:

❖ Do not violently remove the probe from products
❖ Clean with a disinfectant wipe before each use.

X. Icing and defrosting

1. Origin of icing

At the end of a product cooling cycle, frost forms naturally. But this icing is **exacerbated by the following phenomena:**

- Door opening
- Product evaporation
- Air humidity

2. Observation of a frosted socket

Icing is considered to have set when:

- Evaporator saturated with frost
- Air circuit impossible

3. Risk

- Risk of compressor failure (liquid hammering)
- Risk of moisture in fans (icing up of motors)
- Risk of saturation of decompression vents
- Risk of panel sheets tearing off due to the weight of the evaporation-ventilation unit or the spread of frost in the panel

4. Trigger

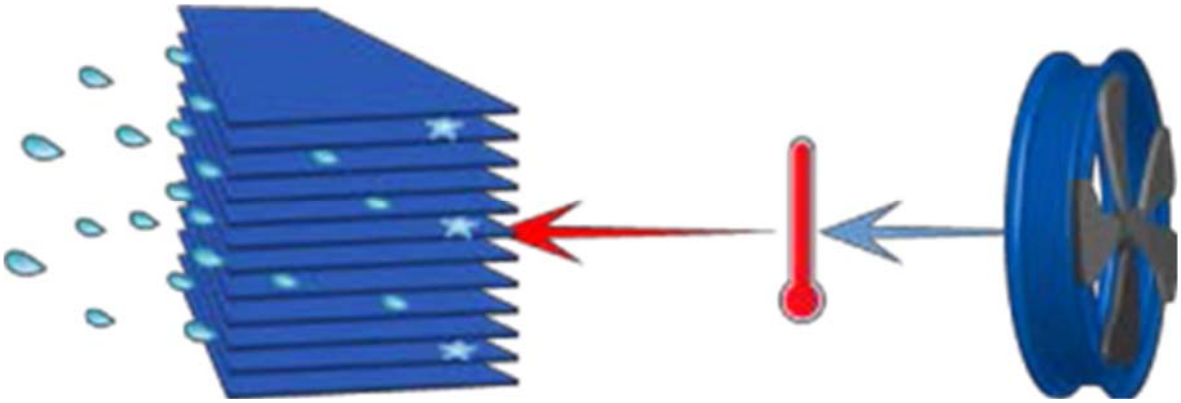
After a phase of use, if you notice frosting, you should:

- Empty the cell
- Start defrosting until "DEG" mode stops
    - Select "DEG" mode using the + or - keys, then press ENTER

The defrost cycle should be started once a day or as soon as excessive frost build-up is detected.

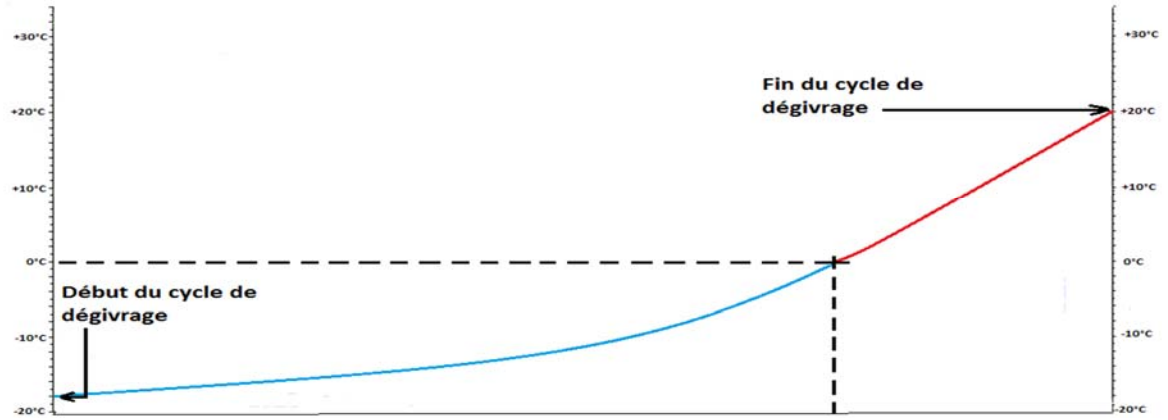
5. Operating principle

- Forced ventilation
- Defrosting element
- Temperature measurement on room sensor
- End of defrost phase when end-of-cycle temperature is reached (Parameter C8)



6. Defrost cycle

- ❑ The default defrost temperature is +20°C (C8)
- ❑ The temperature settings can be modified to suit the application. The selected temperature must not be lower than +20°C and must not exceed +40°C. **(see manual for setpoint adjustment)**



7. Insufficient defrosting

- Frost forming on evaporators
- Risk of damage to the unit (compressor fluid leak)
- Faster frost recovery on evaporators
- Defrost setpoint too low

What not to do:

- ➢ Static defrosting: switch off the cell's power supply and leave the door open.
  - o Consequence:
    - ▪ No water drainage during static defrosting
- ➢ Consequence of static defrosting after cell restart:

- Drainage and accumulation of water on the ground
- During cycles: risk of slippery floor and stuck castors
- Faster frost recovery

8. Actions after a defrost

Once the defrost cycle is complete:

- Water drainage:
  - Condensate water from the cell is drained to the drainage point using a scraper.
  - A low drainage point for cleaning water is required. It is recommended that there is a drainage channel near the door**(see example below**).

  - Drip tray: a drip tray for condensate is possible but not recommended. If the tank is not cleaned every day, the risk of bacterial growth increases.
  - Frost build-up due to cell operating temperatures (-20/-40°C) may prevent the condensate from being drained off, even if the drip trays are connected to a drain.

- Cleaning **(see "Cleaning and cleaning products" leaflet)**
- Rinsing, **CAUTION**: no high pressure; no water on motor
- Blower => Condition: defrost end setpoint temperature > room temperature.
- Final evacuation.

X. Icing and defrosting

- At the end of the cleaning operation, run a general defrost to remove the water from the evaporators. **CAUTION**: a residue of water may form on the outside of the evaporator.

Recommendations:

- Check the condition of the evaporators inside => behind the fans.

XI. Food storage in cells

In all cases, the storage phases must be carried out under the control of a recording and alarm system.

1. The principle

The SIMPLY controller automatically switches to storage mode at the end of the cycle.

Default:

- + 3°C at the end of the cooling cycle
- -18°C at the end of the flash freezing cycle

2. Precaution

- A cell is not intended to be used exclusively and indefinitely in storage mode.

- food storage can only be used occasionally.

- Defrosting must be carried out before using storage mode.

- Prolonged use of storage mode can lead to untimely interruptions in the operation of the refrigeration unit:

- Fault => Oil return
- Oil safety

XII. Cleaning

Machines must be cleaned as often as necessary, depending on the bacteriological samples taken. In all cases, it should be done at least once a day.

1. Cleanable area

- Inside the cell (remove any waste that may be present)

- Cleanable parts (see "Precautions" below):

    - Copper aluminium or galvanised steel battery (refrigerant on the sides of fans and ventilators).
- Outside the cell

For more information on this subject, please refer to the "Cleaning" leaflet (pages 3, 4, 5, 6)

2. Precautions

2.1. Cleaning products

- Do not use products that are not PH neutral (PH = 7) and must not contain chlorine or aggressive products.
- The water used to dose and rinse the products must also be PH neutral (PH = 7).
- Prefer pH-neutral quaternary ammonium products.
- Do not use hard brushes, steel wool or metal sponges that could scratch the metal. The use of abrasive products, even very fine ones, is prohibited.
- Use cleaning products in accordance with the manufacturer's instructions.

Our company accepts no liability for damage caused by the use of unsuitable products, or by the use of cleaning products on or near cells and tunnels without our approval or without due care.

For more information on this subject, please refer to the "Cleaning" leaflet (pages 1, 2, 4)

2.2. PPE

As the cooling cells are stainless steel appliances, by their very nature made up of thin sheet metal parts, it is strongly recommended that safety practices and appropriate PPE be observed on a daily basis and during cleaning operations (protective gloves, protective goggles, respiratory protection mask, safety shoes, etc.)

2.3. Cells and tunnels

- Cleaning must be carried out as often as necessary depending on the samples taken.

- Bacteriological tests carried out. In all cases, it should be done at least once a day.

- Never start cleaning when the tunnel is in a negative atmosphere, otherwise the equipment may be damaged and staff may be at risk.

- Never direct a high-pressure jet towards the evaporator fins, as this could damage them.
- Do not use products that are incompatible with evaporators.

- Never direct a high-pressure jet and/or water at the motorised fans, as this could cause irreversible damage.

- Never touch the defrosting elements when they are still hot.

- Beware of the risk of falling, as tunnel floors can be slippery due to residual ice and/or puddles of wash water.

2.4. Elements to be protected

Do not wash electrical components, and never direct a pressurised jet and/or water jet at electrical components (remote control pontoon, main electrical cabinet, fans, mushroom switch etc). These elements should be protected with an appropriate cover such as a tarpaulin.

In-depth cleaning of certain components requires special precautions, either because it involves dismantling protective casings, or because it concerns sensitive tunnel components, in particular:

- Electrical cabinet:
  - They must be switched off (power indicator light off) and closed when cleaning.
  - Only the outside of the cabinets will be cleaned. The outside of the cabinets must be dried after cleaning.
  - They are not watertight, given the holes drilled to accommodate the control buttons, indicators etc.
  - Never use products that are incompatible with the enclosure or with the indicators and plastic parts on the front of the cabinet.

- Copper aluminium or galvanised glacier battery:
  - Do not use any cleaning products on fan coils (in most cases, simply rinsing them with lukewarm, non-pressurised water and a pH-neutral solution will suffice).
  - Clean the evaporators with pure lukewarm water or a mild soap solution (PH neutral water).
  - If, and only if, bacteriological tests require the use of a product on cold bacteria, always use a product specially adapted for copper aluminium or galvanised steel evaporators.

For more information on this subject, please refer to the "Cleaning" leaflet

3. Action after cleaning

- Squeegees are used to remove water from the floor.

XII. Cleaning

- At the end of the cleaning operation, run a general defrost to dry out the evaporators. The evaporators must be thoroughly rinsed and dried after cleaning.
- After washing and rinsing, allow the tunnel to dry before cooling. Drying can be enhanced by defrosting.

For more information on this subject, please refer to the "Cleaning" leaflet

XIII. Maintenance

1. Information common to groups and trolley cells

1.1. Electrical checks

✓ Neutral system validation:

The neutral system on our equipment is TN-S (Earth Neutral Separated).

✓ Checking the tightness of electrical connections:

Electrical connections may become loose during transport. These checks must therefore be carried out on the cubicle electrical cabinet and the unit electrical cabinet.

✓ Checking head protection:

Protection at the top by earth leakage circuit breaker with a curve (D curve, for example) adapted to the overcurrents associated with motor starting.

✓ Check that all electrical safety devices are working properly:

In particular, check the faulty connections by switching on the components one by one. For example, for a semi-hermetic unit, test the fault report from the HP safety pressure switch, the isolating switch, etc

✓ Heat gun test of high temperature safety on:

- PLC parameter
- heat safety thermostat setting

✓ One-by-one testing of all electrical components:

To do this, run a self-test (see PLC manual): start the unit, start the fans, etc

1.2. Checking ventilation

- ✓ Check that the propellers and ferrules on the condenser and evaporator fans are properly tightened.
- ✓ Check that the cable glands are tight.
- ✓ Check that the propellers of all fans are not touching their protective grids.
- ✓ Check that the evaporator and condenser fans rotate in the correct direction (to do this, switch them on one at a time). The fans on the cell must be suction fans. A sheet placed over the ventilation grille should stick. The condenser fans should rotate in the direction of the arrow on the condenser casing, close to the fan slots.
- ✓ Checking the evaporators:
    - o Opening ventilation ramps
    - o Tightening internal screws

2. Refrigeration unit

The purpose of the cooling unit is to provide the refrigeration needed to bring the products up to temperature.

The main maintenance rules are as follows:

- Regulatory leak test.
- Oil acidity test.
- Check for any traces of oil on the compressor and condenser, which may be linked to a refrigerant leak.
- Check that there are no abnormal vibrations.
- Pressure and temperature readings.
- Moisture in the circuits (via the sight glass).

Recommendations:

- A certain amount of time must elapse between switching the generator on and off.
- In the event of prolonged stoppage, run the fan motors.

Comment:

- Additional adjustment of magnetothermics after commissioning:

  - During operation, take an amperometric reading.
  These electrical protections are located in the cell's electrical panel. They need to be adjusted.

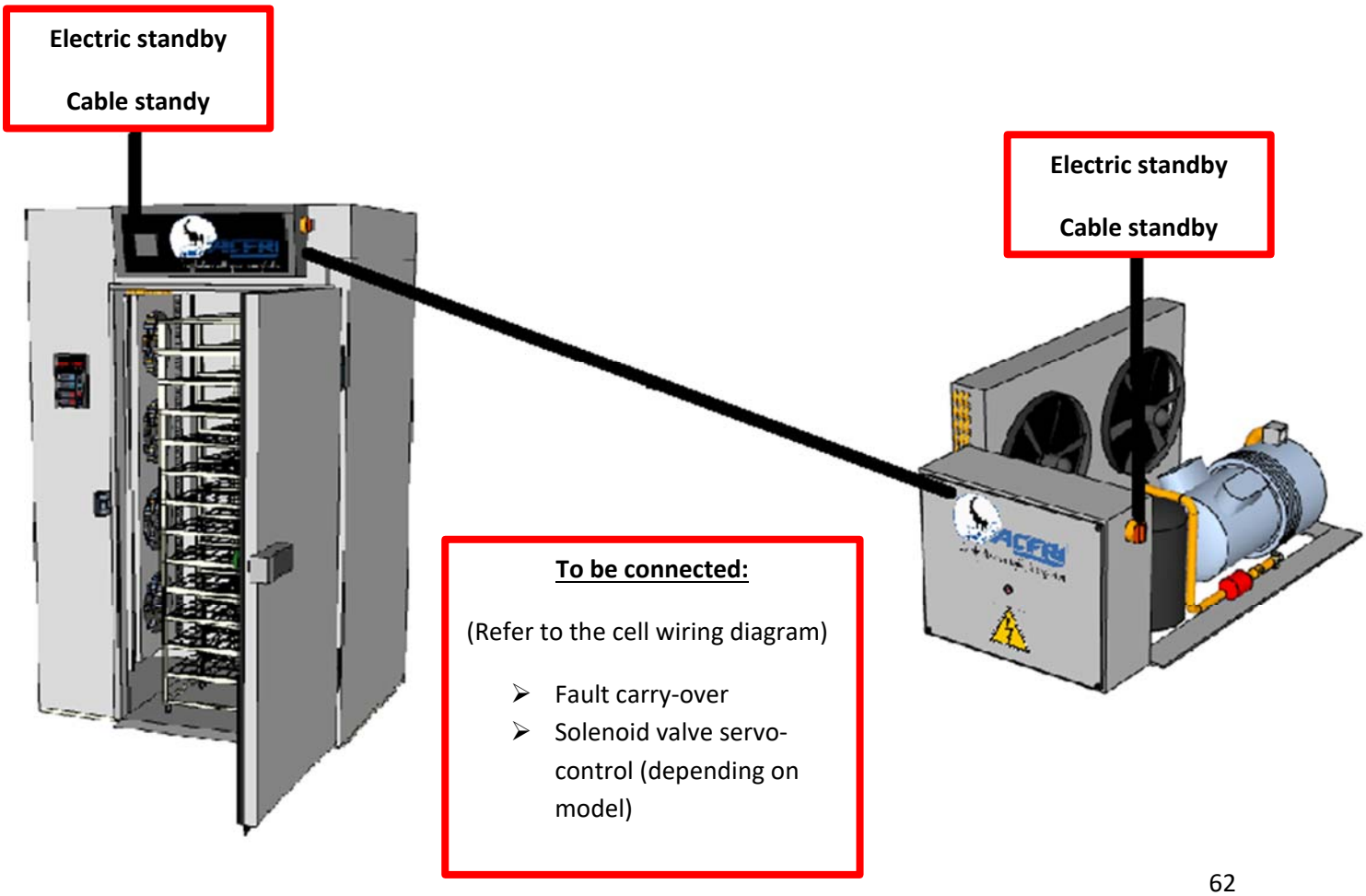
- The unit's electrical protection is not integrated into the panel (the units sold by Acfri are fitted with a dedicated electrical cabinet).

- If the hermetic unit is not sold by Acfri, it is essential to select a unit fitted with its own electrical cabinet.

- Group fault report :
  - Make sure that the defect report contact between the generator control panel and the cubicle control panel is correctly made, as well as the electrovalve control connexion.
    To do this, use a 4 x 0.75 cable.
    If this reports are not made, group faults will not be signalled on the PLC. The user, if not
    aware of these errors, there is a risk of serious damage to the refrigeration unit and the airframe.

The electrical connection diagram below is based on the type of generating set:

- Change the filter after commissioning with the new filter supplied (semi-hermetic unit only)

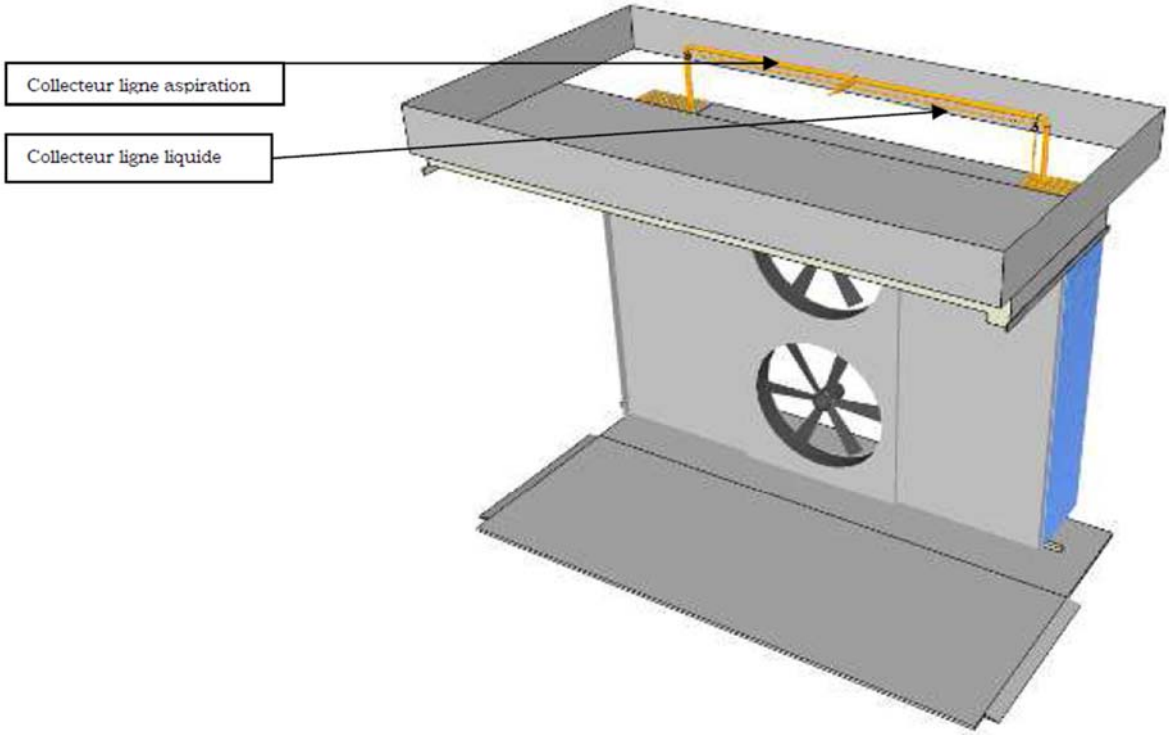


3. Refrigeration circuit

- ✓ Check that all unit connections are tight:
  - Poor connections lead to operating problems.
- ✓ Refrigerant tubes:
  - It is necessary to ensure that the tubes of the unit are not in contact with vibrating parts that could damage them over time.
- ✓ Setting HP safety pressure switches
- ✓ Supply of solenoid valve:
  - If this option is ordered with the cell and unit from our company.
  - Element not connected at the factory.
- ✓ Check that all mechanical components on the cell/tunnel and the refrigeration unit/cooling unit are tight (tighten valves, hoses, etc., refer to the refrigeration unit/cooling unit manual in the electrical cabinet).
- ✓ Check that the "pump down" principle is respected when installing a remote unit cell.
- ✓ Presence of a control BP pressure switch and a solenoid valve:
  - This device ensures that the installation is evacuated after the cell has stopped operating.
- ✓ Checking the crankcase element power supply
- ✓ The oil temperature must be maintained before the unit is started up to prevent lubrication failure.
- ✓ Check that the collector is correctly centred between the batteries (see diagram below):
  - The tee manifold on each line must be perfectly centred in relation to the 2 evaporators, to avoid any supply imbalance.

XIII. Maintenance

- ✓ You need to calculate the diameters of the refrigeration lines yourself, based on the distance and configuration of the lines on the installation site, and in compliance with good practice.



4. Periodic inspection obligations

Reminder of periodic leak testing obligations for regulators of equipment containing refrigerants:

Equipment owners must have their installations checked for leaks by an authorised company, in accordance with the **Fgas/Environmental Code regulations**, which require refrigeration installations to be checked for leaks, with the aim of reducing the use of gases with a high global warming potential (GWP).

The frequency of leak checks is determined by the tonne of CO2 equivalent content of the equipment, which depends on the type of gas and the gas load in the installation, and whether or not the installation has an automatic leak detection system (sold as an option by ACFRI)

The calculation method is:
Tonne of CO2 Equivalent of an installation = quantity of gas in the installation (gas load) × Global Warming Potential (GWP) of the gas used /1000.

TeqC02 = Charge en kg x(GWP/1000)

Mandatory inspection thresholds and frequencies:

In the absence of an automatic leak detection system (available as an option on our equipment):

- Less than 5 TeqC02, no legal obligation.
- Once a year for a load equal to or greater than 5 TeqC02 and less than 50 TeqCO2
- Every 6 months for a load greater than or equal to 50 TeqC02 and less than 500 TeqCO2less than 500 t Eq. CO2.
- Every 3 months thereafter.

Reminder: In addition to the above legal obligations, it may be necessary to carry out checks as part of the preventive maintenance of equipment, the frequency of which depends on the manufacturer's recommendations.

By installing an automatic leak detection system on the installation (sold as an option), you can double the time between the following checks

The above results in the following inspection frequencies for the gases R452A, R449A and R448A:

Installation containing R452A gas:

Installation contenant du Gaz R452A (PRC/GWP = 2140) :			
Charge en Gaz R452A dans l'installation :	Tonne équivalent C02 (Teq C02) de l'installation :	Fréquence des controles d'étanchéité obligatoire :	
		sans système de detection de fuite automatique sur l'installation :	Avec système de détection de fuite automatique sur l'installation :
charge ≤ 2,33 Kg	inférieure à 5 Teq C02	Pas d'obligation légale	Pas d'obligation légale
2,33 Kg < charge ≤ 23,36 Kg	supérieure à 5 TeqC02 et inférieure à 50 Teq C02	contrôle obligatoire tous les 12 mois	contrôle obligatoire tous les 24 mois
23,36 Kg <charge ≤ 233,64 Kg	Supérieure à 50 TeqC02 et inférieure à 500 Teq C02	contrôle obligatoire tous les 6 mois	contrôle obligatoire tous les 12 mois
233, 64 Kg < charge	Supérieure à 500 Teq C02	contrôle obligatoire tous les 3 mois	contrôle obligatoire tous les 6 mois

XIII. Maintenance

Installation containing R449A gas:

Installation contenant du Gaz R449A (PRC/GWP = 1397) :			
Charge en Gaz R452A dans l'installation :	Tonne équivalent C02 (Teq C02) de l'installation :	Fréquence des controles d'étanchéité obligatoire :	
		sans système de detection de fuite automatique sur l'installation :	Avec système de détection de fuite automatique sur l'installation :
charge ≤ 3,57 Kg	inférieure à 5 Teq C02	Pas d'obligation légale	Pas d'obligation légale
3,57 Kg < charge ≤ 35,79 Kg	supérieure à 5 TeqC02 et inférieure à 50 Teq C02	contrôle obligatoire tous les 12 mois	contrôle obligatoire tous les 24 mois
35,79 Kg <charge ≤ 357,90 Kg	Supérieure à 50 TeqC02 et inférieure à 500 Teq C02	contrôle obligatoire tous les 6 mois	contrôle obligatoire tous les 12 mois
357,91 Kg < charge	Supérieure à 500 Teq C02	contrôle obligatoire tous les 3 mois	contrôle obligatoire tous les 6 mois

Reminder: In addition to the above legal obligations, it may be necessary to carry out checks as part of the preventive maintenance of equipment, the frequency of which depends on the manufacturer's recommendations.

Installation containing R448A gas:

Installation contenant du Gaz R448A (PRC/GWP = 1387) :			
Charge en Gaz R452A dans l'installation :	Tonne équivalent C02 (Teq C02) de l'installation :	Fréquence des controles d'étanchéité obligatoire :	
		sans système de detection de fuite automatique sur l'installation :	Avec système de détection de fuite automatique sur l'installation :
charge ≤ 3,60 Kg	inférieure à 5 Teq C02	Pas d'obligation légale	Pas d'obligation légale
3,60 Kg < charge ≤ 36,04 Kg	supérieure à 5 TeqC02 et inférieure à 50 Teq C02	contrôle obligatoire tous les 12 mois	contrôle obligatoire tous les 24 mois
36,04 Kg <charge ≤ 360,49 Kg	Supérieure à 50 TeqC02 et inférieure à 500 Teq C02	contrôle obligatoire tous les 6 mois	contrôle obligatoire tous les 12 mois
360,49 Kg < charge	Supérieure à 500 Teq C02	contrôle obligatoire tous les 3 mois	contrôle obligatoire tous les 6 mois

Reminder: In addition to the above legal obligations, it may be necessary to carry out checks as part of the preventive maintenance of equipment, the frequency of which depends on the manufacturer's recommendations.