SPECIFICATIONS FOR THE

NF ELECTRICITE PEFORMANCE MARK

N° LCIE 103-13 / F

DIRECT-ACTING ROOM

HEATERS

Table of Contents

Introduction

This document sets out the minimum compliance criteria for direct-acting room heaters in order for them to be awarded the French NF ELECTRICITE PERFORMANCE standard mark.

Liste des normes à appliquer

EN 60335-2-30 (NF EN 60335-2-30)	Household and similar electrical appliances. Safety. Part 2: Particular requirem for room heaters.
EN 60335-2-43 (NF EN 60335-2-43)	Household and similar electrical appliances. Safety. Part 2: Particular requirem for room heaters. Clothes dryers and towel rails
EN 61032 (NF EN 61032)	Protection of persons and equipment by enclosures.
EN 60675 (NF EN 60675)	Household electric direct-acting domestic room heaters: methods for meas performance
EN 50564 (NF EN 50564)	Electrical and electronic household and office equipment. Measurement of low power comsumption

Dates

Date of Application of Specification LCIE 103-13/F	01/05/2018
Date of Withdrawal of LCIE 103-13/D Specifications	31/12/2018
Latest Manufacturing Date for Products Certified under Specification 103-13/D.	31/12/2020

1 Scope

These specifications relate to direct-acting room heaters, as defined in this document.

The term “direct-acting room heater” refers, under French standard NF EN 60675, to a device which transforms electrical energy into heat after the manifestation of the requirement for heat in the area to be heated, with heat being immediately transferred to this area.

Such devices are fitted with a room thermostat as defined under § 2.1.2 and with power between 300 and 2000 W inclusive.

These heaters should be within Electrical Insulation Class II in accordance with the relevant safety standards.

These specifications define the general as well as specific stipulations relating to the category to which the relevant room heater belongs.

NB: The term “**heater**” shall be understood to mean “**direct-acting room heater**”.

2 General Requirements for the awarding of the NF ELECTRICITE PERFORMANCE Mark

Qualification for the NF ELECTRICITE PERFORMANCE standard mark requires compliance with the relevant standards for the awarding of the NF ELECTRICITE (EN 60 335-2-30, EN 60 335-2-43) mark, and compliance with the requisite aspects of the EN 60675 standard, the general and specific requirements for which are set out below.

2.1 Integral Heater Components

2.1.1 Heat cut-off device

This control unit is mandatory.

Control of this unit should not affect the temperature controls. Where other functions can be controlled through this control unit, the heater must feature a separate indicator, giving a visual and/or audible signal to indicate the temperature level. It must be tested to 10,000 movements.

2.1.2 Room Thermostat

The thermostat shall be sensitive to room temperature and adjustable by the user and at least one or more parts of it must necessarily be integral to the heater and not detachable. It must provide the functions stipulated in paragraph 2.2 as appropriate to the product category.

Its maximum programmed temperature may not exceed 30°C.

2.1.3 Heating Element and Heat Unit

The heat unit comprises the heating element (the active part emitting heat) as well as an integral heat emitter (e.g. element + flanges…).

2.1.4 Power Cable

The heater shall be equipped with a power cable comprising a phase conductor, a neutral conductor and a pilot wire. Only the pilot wire may be black in colour.

2.2 Definition of User-Accessible Functions

Control of the functions stipulated below may be provided by different devices (pilot wire, infrared, powerline communication, radio, etc.) ; The device must have a pilot wire in accordance with the specifications set out in Appendix 4.

The testing sequence is set out in Appendix 5.

2.2.1 “Comfort” Function

“Comfort” controls are characterised by drift and amplitude requirements defined by performance category.

Article 11.1 of EN 60675 defines the utilisation rate used to define the drift value. In order to reduce the deviations, a linear regression should be calculated from the measured values, reduced to 20, (30% for powers below 500 W), 50 and 80% walking rate.

If the measured value of the average ambient temperature at the energy ratio of (50 ± 5)%; Called t_C; Is not between the values t_A and t_B, the drift D is determined as follows:

1- calculate the values t_{20} and t_{50} by linear regression, where:

T_{20} is the average ambient temperature calculated from t_B and t_C for the energy ratio equal to 20%;

T_{50} is the average ambient temperature calculated from t_B and t_C for the energy ratio equal to 50%.

2- calculate the values t'_{50} and t_{80} by linear regression, where:

T'_{50} is the average ambient temperature calculated from t_C and t_A for the energy ratio equal to 50%;

T_{80} is the average ambient temperature calculated from t_C and t_A for the energy ratio equal to 80%.

3- calculate the drift D as:

$D = \max\{| t_{20} - t_{50}| ; | t'_{50} - t_{80}|\}$

NOTE: In the case where the tests are carried out at an energy ratio of (30 ± 5)%, this paragraph should be replaced by 20 by 30.

The ambient temperature of the test cell shall be 19 ± 2 ° C. The difference between the ground temperature and the ambient temperature must not exceed 2 ° C. It will be measured directly above the cell probe using a thermocouple. The heater must be set to a temperature of 19℃. The manufacturer shall provide the method for adjusting this temperature.

When testing for utilisation rates of over 30%, after each stabilisation of external temperature variation, heater regulation should stabilise in less than 12 hours. Stabilisation within a ± 0.1°C range must be obtained in the last hour of testing. Stabilisation is defined in Appendix 9.

2.2.2 “Set-back” Functions

These functions must be tested based on utilisation rates of between 70% and 90% of energy ratio.

During testing, after each stabilisation of external temperature variation, heater regulation should stabilise within less than 12 hours.

2.2.2.1 Set-back of -1K

The set-back value must be -1K ± 0.5 K, at a stabilised rate; the set-back command must be made through the pilot wire.

2.2.2.2 Set-back of -2K

The set-back value must be -2K ± 0.5 K, at a stabilised rate; the set-back command must be made through the pilot wire.

2.2.2.3 Set-back of -3.5K

The set-back value must be 3.5K -±0.5 K, at a stabilised rate; the set-back command must be made through the pilot wire. The -3.5K -±0.5 K, set-back position must be set or pre-set.

2.2.3 Frost Protection Function

This function must be tested by applying an external temperature such as to get an energy ratio in Frost Protection mode of between 50% and 90% 5%.

At a stable setting, the Frost Protection function should maintain a temperature of 7℃ ± 3℃.

When testing, after stabilisation of the external temperature, the heater regulation should stabilise within 12 hours without ever falling below 4°C.

2.2.4 Maximum Setpoint

This test applies only to equipment rated equal or more than 750W.

The heater is set to the maximum setpoint. The thermostat must cycle before the room temperature reaches 35℃. Testing is carried out in a dual climate chamber, with no air exchange and regardless of the cold temperature setting. The operation of the cooling unit can be stopped.

From the maximum setpoint, the set-back is set at -3.5K. For this, the temperature of the cold climate is that of the test "comfort" to 80%; The air exchange is in operation.

The temperature attained should always be lower than 19° C (on the “comfort” setting) + 1° C. The value shall be verified based on the maximum setpoint in “comfort” mode.

2.2.5 Heating “Shut-off” Function

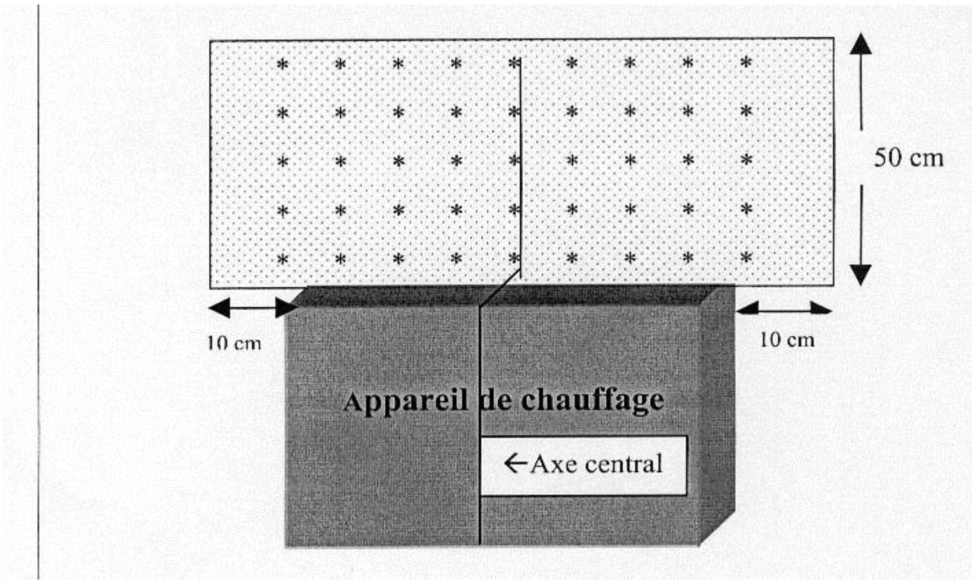
This function should be independent of the room temperature control unit. The "Pilot heating off" function is checked at the end of the frost protection test for 2 hours: the appliance must no longer heat up.

2.3 Damage Risk Prevention

Under normal installation conditions, the heater is fixed to a plywood panel painted with matt black paint and with thermocouples placed at 10 cm intervals (in accordance with the test corner model as defined under the relevant safety standards). The measurement surface of the panel is vertically limited to 50cm above the heater and laterally to 10 cm either side of it (see diagram below).

The first row of thermocouples will be placed 5 cm above the heater as shown in the diagram below.

Power is supplied to the heater at nominal capacity at steady state. During this period, heating in the area described above must not exceed 20K.



Appareil de chauffage = heater
Axe central = Central axis

2.4 Reliability - Safety

2.4.1 Prevention of Electric and Thermal Shock

Protection from hazards arising from accessing the heater cover as installed according to the manufacturer's instructions, is ensured by the following:

- non accessibility of live parts with the probe known as the "Canadian probe" (d = 6.4 mm, l = 102 mm), to be applied without appreciable force. This probe is described in Figure 4, Appendix 3.
- non accessibility of heating parts through the "rigid finger" test probe (d = 12mm) to be applied without appreciable force. This probe is described in Figure 3, Appendix 3.

2.4.2 Temperature Rises of Air Outlets

Based on the test described in Article 8 of Appendix 1, heated air outlet values must be tested to ensure they do not exceed the values stipulated in Paragraph 3 for each heater type.

2.4.3 Temperature Rises of External Surfaces

Based on the test described in Article 8 of Appendix 1, external surface temperature values must be tested to ensure they remain below the values stipulated in Paragraph 3 for each heater type.

2.4.4 Heating Element Endurance

Endurance is tested on the most powerful heating element in the heater range in accordance with testing methods set out below, for 2500 cycles.

Cycles are regulated such that heating elements below 400V function between two temperature levels referred to as T1 and T2, expressed in °C and such that T2 = 0.75 x T1.

The value of T1 is determined in advance by placing a probe at the hottest part of the heating element (or heat unit), the device being supplied below 244V up to thermal stabilisation. Should it prove impossible to take a measurement in the aforementioned manner, a thermal image shall be taken to indicate the temperature of the heating element.

Should it not be possible to apply the aforementioned method, (immersion heater elements, for example), the following test shall be conducted: the heating element shall be run for 1500 x 30 minute cycles at 1.27 rated output, followed by a 30 minute rest period.

Requisite results:

- compliance is required with Article 13 on heat units (leakage current and electric strength at operating temperature) of the relevant safety standards.
- power at the end of testing may not differ by ± 5% of the power measured prior to testing.

2.5 Control Display Precision at 19°C

Adequate regulation of the controls shall, at a utilisation rate of 50% ± 5%, correspond to a temperature of 19°C ±1°C.

2.6 Display of Control Temperatures in °C

This display must enable the user to see the value of the setting selected by a maximum of no less than 1°C. The presence of this display on the heater shall be verified.

2.7 Automatic System Reset

A function accessible to the user in the heater's control panel enabling, *a minima*, a return to the "19°C comfort" setting and as part of the adjustable set-back function to a set-back of -3.5K ± 0.5K.

2.8 Behavioural Indicator

This indicator shall, *a minima*, inform users when manually setting temperature to the “comfort” function, of the risk of energy overconsumption.

This warning when setting the temperature to the “comfort” function shall, *a minima*, be represented by means of a 3 colour system, with green denoting T≤ 19℃ and red denoting T> 24℃.

Yellow/orange shall indicate the 19℃ - 24℃ range.

2.9 Window open/closed Detection

2.9.1 Open Window Detection

The mandatory integral, independent and activated when the equipment is delivered inclusion of this feature in the heater is designed to prevent wasted energy due to open windows or doors letting in cold air whilst the heater is set to comfort mode.

It automatically detects a fall in room temperature in the room in which the device is installed and switches it into shut-off or frost protection mode.

The duration for which the heater stops working after an open window is detected may not be timer-controlled.

Verification of detection of an open window is carried out in accordance with the testing protocol stipulations in Appendix 7.

Installation conditions (heater positioning within the room, in relation to furniture, etc.) which would enable the detection of an open window or door to be genuinely detected should be clearly indicated in the heater instructions.

2.9.2 Closed Window Detection

Where this feature exists, it must mandatorily be integral to the appliance, independently controlled and activated when the equipment is delivered. It is designed to come out of Shut-off or Frost Protection mode when a window or door is opened letting in cold air.

It enables the automatic detection of a rise in room temperature in the room where the heater is installed following the closure of a door or window, returning it to the function mode which was running prior to the detection of an open door or window.

Closed window or door detection verification shall be carried out in accordance with the testing protocol stipulations in Appendix 7.

Installation conditions (heater positioning within the room, in relation to furniture, etc.) which would enable the detection of an open/closed window or door to be genuinely detected should be clearly indicated in the heater instructions.

2.10 Presence/absence Detection

The obligatory integral, independent and activated when the equipment is delivered inclusion of this feature in the heater is designed to prevent wasted energy during prolonged user absence, when the heater is set or programmed to comfort mode.

Closed window or door detection verification shall be carried out in accordance with the testing protocol stipulations in Appendix 8.

Installation conditions (heater positioning within the room, in relation to furniture, etc.) which would enable the detection of presence or absence to be genuinely detected should be clearly indicated in the heater instructions.

3 Specific stipulations for each product family

3.1 Heater Type

Heaters fall into the following categories:

- ✓ convection heaters
- ✓ panel heaters
- ✓ radiators

A so-called secondary function may be related to these devices: towel warmers. There may be additional functions related to this secondary function.

Note: The primary and secondary functions are regulated. In the event that a heater has one or more additional functions, if the function or functions are not regulated, they must be timer-controlled.

The "Where declared" category in the tables below indicates mandatory inclusion in the instruction documentation and requires the appropriate testing. When it is indicated on the packaging, it must also be included in the instructions.

The categories are as follows:

★	1 star
★★	2 stars
★★★	3 stars
★★★ 👁	3 stars – eye

It shall be confirmed that the amplitude at the end of each stage (20% or 30%, 50% and 80% of utilisation rates) is lower or equal to the stipulated value. The value used to calculate the AC is that measured at 50%± 5% of the utilisation rate.

3.2 Technical Requirements for Convection Heaters

3.2.1 Terminology

Heaters in which the temperature rise of at least one non-visible part in contact with the air in the room exceeds 75K in normal use. Air is evacuated by natural convection through one or more air outlets.

Note: "Non-visible part" means that this part cannot be seen from a distance of 2m away from the front of the heater and 1.2 m from ground level when the heater is installed.

3.2.2 Specific Requirements

	Performance Category			
Additional Stipulations	★	★★	★★★	★★★ 👁
Inclusion of bare element	**no**	**no**	**no**	**no**
Minimum protection level of enclosures	**IP 24**	**IP 24**	**IP 24**	**IP 24**
Maximum drift	**2.5K**	**1.5K**	**1K**	**1K**
Maximum amplitude	**1K**	**0.5K**	**0.3K**	**0.3K**
Comfort function	**P**	**P**	**P**	**P**
Set-back function(s)[1)]	**P**	**P**	**P**	**P**
Frost protection function	**NA**	**P**	**P**	**P**
Heating "cut-off" function	**NA**	**P**	**P**	**P**
Damage risk prevention	**NA**	**A**	**A**	**A**
Electric and thermal shock	**A**	**A**	**A**	**A**
Temperature rises of air outlets, when they occur max. 100 K - average 70	**A**	**A**	**A**	**A**
Temperature rises of external surfaces	**A**	**A**	**A**	**A**

max. 70 K at rated output				
Warm air outlet	**Frontal**	**Frontal**	**Frontal**	**Frontal**
Minimum average heating of active surface at a utilisation rate of 30% [2)]	**NA**	**NA**	**12K**	**12K**
Heat unit endurance	**NA**	**A**	**A**	**A**
Display of control temperatures in °C	**NA**	**NA**	**A**	**A**
Function indicator	**NA**	**NA**	**A**	**A**
Open window detection	**Where declared**	**Where declared**	**A**	**A**
Closed window detection	**Where declared**	**Where declared**	**Where declared**	**Where declared**
Absence/presence detection	**Where declared**	**Where declared**	**Where declared**	**A**
Automatic system reset	**Where declared**	**Where declared**	**A**	**A**
Comfort setting limited to 30°C	**NA**	**NA**	**A**	**A**
Eco setting limited to 19°C	**NA**	**NA**	**A**	**A**
Control display precision at 19°C	**NA**	**NA**	**A**	**A**

P = Mandatory programmed functions
A = Applicable requirements
NA = Non-applicable requirements

Set back Function [1)]

For the Category ★ verification of -3.5K set-back

For category ★★ ★★★ , ★★★ verification of -1K, -2K and -3.5K set-back.

Minimum average heating of active surface at utilisation rate of 30% [2)]

For measurements of the minimum average heating of active surface, the surface considered is the rectangle encompassing all the heating surfaces of the front face of the appliance (excluding air outlets, see Annex 6).

A mesh to define the measurement zones is made by "dividing" into 1 / 16th the maximum height and width of this surface. Nine measurement zones are defined (see Annex 6). In each of these nine zones and in all points accessible to the conical gauge shown in Figure 2 Annex 3, the thermocouple is placed in the center of each zone.

In the case where the center of a zone is not facing material, or is facing a non-heating surface, the measurement is made in projection towards the closest measuring point corresponding to a heating surface. In the case where 2 points correspond to this projection, the coldest point is taken into consideration (determination using an infrared camera).

For any point located at the edge of an active or non-active surface, the measurement is made at 20mm from the edge of the latter.

The measurements shall be made in a dual climate chamber, at utilisation rates of between 30% and 35% and 75% and 85%, during performance measurement tests (paragraph 2.2.1). These utilisation rates are representative of the products’ real usage rates.

The average heating is calculated from the average of the 9 measurement points mentioned above.

3.3 Technical Requirements for Panel Heaters

3.3.1 Terminology

Heaters in which the temperature rise of at least 80% of the visible surface of the heat unit exceeds 75K in normal use and for which the ratio of the visible surface of the heat unit to that of the total surface area of the front face is higher or equal to 40%.

A metal grille with a perforation rate of at least 50% shall be considered as transparent to radiant heat.

Note: The surface of the heat unit seen without the grille shall be considered the visible surface. The visible surface may be seen through a solid material which is transparent to heat radiation. Materials such as quartz are considered to be transparent to this radiation, but not ordinary glass.NB: “Non-visible part” means that a part which cannot be seen from 2m away from the front of the heater and 1.2 m above ground level when the heater is installed.

3.3.2 Specific Requirements

	Performance Category			
Additional Stipulations	★	★★	★★★	★★★ 👁
Inclusion of bare element	**no**	**no**	**no**	**no**
Minimum protection level of enclosures	**IP 24**	**IP 24**	**IP 24**	**IP 24**
Maximum drift	**2.5K**	**1.5K**	**1K**	**1K**
Maximum amplitude	**1K**	**0.5K**	**0.3K**	**0.3K**
Comfort function	**P**	**P**	**P**	**P**
Set-back function(s)[1)]	**P**	**P**	**P**	**P**
Frost protection function	**NA**	**P**	**P**	**P**
Heating “cut-off” function	**NA**	**P**	**P**	**P**
Damage risk prevention	**NA**	**A**	**A**	**A**
Electric and thermal shock	**A**	**A**	**A**	**A**
Temperature rises of air outlets, when they occur max. 100 K - average 70	**A**	**A**	**A**	**A**
Temperature rises of external surfaces max. 85 K at 1.15 rated output	**A**	**A**	**A**	**A**
Heat unit endurance	**NA**	**A**	**A**	**A**
Display of control temperatures in °C	**NA**	**NA**	**A**	**A**
Behavioural Indicator	**NA**	**NA**	**A**	**A**
Open window detection	**Where declared**	**Where declared**	**A**	**A**
Closed window detection	**Where declared**	**Where declared**	**Where declared**	**Where declared**
Absence/presence detection	**Where declared**	**Where declared**	**Where declared**	**A**
Automatic system reset	**Where declared**	**Where declared**	**A**	**A**
Comfort function limited to 30°C	**NA**	**NA**	**A**	**A**
Eco function limited to 19°C	**NA**	**NA**	**A**	**A**
Control isplay Precision at 19°C	**NA**	**NA**	**A**	**A**

P = Mandatory programmed functions
A = Applicable requirements
NA = Non-applicable requirements

Set back Function [1)]

For the Category ★ verification of -3.5K set-back

For category ★★ ★★★ , ★★★ 👁 verification of -1K, -2K and -3.5K set-back.

3.4 Technical Requirements for Radiators

3.4.1 Terminology

Heaters in which temperature dispersal is controlled and which comply with the stipulations given in the table below:

3.4.2 Exigences particulières

Additional Stipulations	Performance Category			
	★☐☐	★★☐	★★★	★★★ 👁
Inclusion of bare element	**no**	**no**	**no**	**no**
Level of protective cover	**IP 24**	**IP 24**	**IP 24**	**IP 24**
Maximum drift	**2.5K**	**1.5K**	**1K**	**1K**
Maximum amplitude	**1K**	**0.5K**	**0.3K**	**0.3K**
Comfort function	**P**	**P**	**P**	**P**
Set-back functions[1)]	**P**	**P**	**P**	**P**
Frost protection function	**NA**	Pall	**P**	**P**
Heating “cut-off” function	**NA**	**P**	**P**	**P**
Damage risk prevention	**NA**	**A**	**A**	**A**
Electric and thermal shock	**A**	**A**	**A**	**A**
Temperature rises of air outlets: 100K average 70K where air outlets occur	**A**	**A**	**A**	**A**
Maximum temperature rises of external surfaces 70K at rated output	**A**	**A**	**A**	**A**
Heater endurance	**NA**	**A**	**A**	**A**
Maximum surface temperature dispersal [2)]	**35K**	**30K**	**25K**	**25K**
Temperature stability (maximum values) [2)]	**20K**	**15K**	**10K**	**10K**
Minimum average heating of active surface at 30% utilisation rate[2)]	**NA**	**NA**	**12K**	**12K**
Minimum percentage of active area [3)]	**60**	**70**	**75**	**75**
Display of control temperatures in °C	**NA**	**NA**	**A**	**A**
Automatic System Reset	**Where declared**	**Where declared**	**A**	**A**
Behavioural Indicator	**NA**	**NA**	**A**	**A**
Open window detection	**Where declared**	**Where declared**	**A**	**A**
Closed window detection	**Where declared**	**Where declared**	**Where declared**	**Where declared**
Absence/presence detection	**Where declared**	**Where declared**	**Where declared**	**A**
Comfort setting limited to 30°C	**NA**	**NA**	**A**	**A**
Eco setting limited to 19°C	**NA**	**NA**	**A**	**A**
Control display precision at 19°C	**NA**	**NA**	**A**	**A**

P = Mandatory programmed functions
A = Applicable requirements
NA = Non-applicable requirements

Set back Function [1)]

For the Category ★☐☐ verification of -3.5K set-back

For category ★★☐ ★★★ , ★★★ 👁 verification of -1K, -2K and -3.5K set-back.

Maximum surface temperature dispersal [2)]

When measuring surface dispersal, the temperature stability and the minimum average heating of the active surface, the area considered is the rectangle encompassing all the heating surfaces of the front face of the appliance (excluding air outlets see Annex 6).

A mesh to define the measurement zones is made by "dividing" into 1 / 16th the maximum height and width of this surface. Nine measurement zones are defined (see Annex 6). In each of these nine zones and in all points accessible to the conical gauge shown in Figure 2 Annex 3, the thermocouple is placed in the center of each zone.

In the case where the center of a zone is not opposite material, or would be opposite a non-active surface, the measurement is made in projection towards the nearest measurement point corresponding to an active surface. In the case where 2 points correspond to this projection, the coldest point is taken into consideration (determination using an infrared camera).

For any point located at the edge of an active or non-active surface, the measurement is made at 20mm from the edge of the latter.

For tubular devices with a diameter of less than 40mm, the measuring point is the center of the tube.

The measurements are made in a dual climate chamber, at utilisation rates of between 30% and 35% and 75% and 85%, during performance measurement tests (paragraph 2.2.1). These utilisation rates are representative of the products’ real usage rates.

The surface dispersion, the temperature stability and the average temperature heating are calculated from the average of the 9 measurement points mentioned above.

Minimum percentage of active area [3)]

This percentage is the ratio between the active surface (projected from the front panel) and the sum of all the active and non-active surfaces (projected from the front panel).

The manufacturer declares the different surfaces (active and non-active) in a diagram of the front panel and for each device. For ratio calculation, the air outlets are not taken into consideration.

Non-active surfaces whose surface is less than 625cm² or whose smaller side is less than 25cm are considered as non-active without verification.

For each non-active surface whose surface is greater than 625cm² and whose smallest side is greater than 25cm, the average temperature rise, at the 100% running rate, is calculated as follows:

- ✓ The area taken into consideration is the rectangle encompassing the non-active surface considered.
- ✓ A mesh to define the measurement zones is made by "dividing" into 1 / 16th the maximum height and width of this surface. Nine measurement zones are defined (see Annex 6). In each of these nine zones and in all points accessible to the conical gauge shown in Figure 2 Annex 3, a probe for measuring the surface temperature is applied successively in the center of each zone. This leads to measuring the temperature rise in nine points of the non-active zone.
- ✓ In the case where the center of a zone is not facing material, or is facing an active surface, the measurement is made in projection towards the closest measurement point corresponding to this non active surface. In the case where 2 points correspond to this projection, the hottest point is taken into consideration (determination using an infrared camera).
- ✓ For any point on the edge of an active or non-active surface, the measurement is made at 20mm from the edge of the surface.
- ✓ For tubular design devices with a diameter of less than 40mm, the measuring point corresponds to the center of the tube.

In order for the surface to be considered as inactive, it is necessary that its average heating calculated by considering the heating of the nine points is <25K. In the opposite case, the surface is classified as active surface.

The measurement may be carried out in a test cell during the tests of § 2.4.3.

The minimum active area percentage values in Table 3.4.2 are the average values of all products in a range declared and defined by the applicant.

3.5 Technical Requirements Relating to the Secondary “Towel Rail” Function

3.5.1 Designation

Heaters with this function are called “towel rail heaters” (e.g. towel rail radiator).

3.5.2 Specific Requirements

The specific requirements relating to the towel rail function are set out in the safety testing stipulations.

There is the possibility of one or more additional functions, e.g. “blower”. If the additional function(s) are not regulated they must be timer-controlled as indicated in the table below.

	Performance Category		
Additional stipulations	★□□	★★□	★★★ **et** ★★★
Maximum drift	**Maximum amplitude**	**Maximum amplitude**	**Maximum amplitude**
Amplitude maximale	**1 K**	**0.5 K**	**0.3 K**
Temperature rises of air outlets max. 100 K Av. 70 K	**A**	**A**	**A**
Temperature rises of exterior surfaces max. 70 K at rated output excepting panel radiators	**A**	**A**	**A**
Temperature rises of exterior surfaces max. 85 K at 1.15 of rated output for panel radiators	**A**	**A**	**A**
Timer duration (if function is not regulated)	**2 hours max.**	**2 hours max.**	**2 hours max.** Within the limit of the manufacturer’s maximum specified duration, the timer periods “15 mins, 30 mins, 1 hour and 2 hours” must be set or pre-set Timer settings must be able to be interrupted at any time.
Résistance à fil nu autorisée uniquement pour fonction soufflante	**yes**[1)]	**yes**[1)]	**yes**[1)]

P = Mandatory programmed functions
A = Applicable requirements
NA = Non-applicable requirements

✓ Where there is a bare wire element, additional protection from thermal and electric shock shall be provided by a Test Probe D, as covered by the European standard EN 61032, “Protection of persons and equipment by enclosures. Probes for verification” This probe is a rigid metallic test wire 1mm in diameter and 100mm in length.

3.6 Determining the Aptitude Coefficient (AC) usable within the Framework of Heater Regulation

This value is determined according to the formula:

AC = (AD/2 + AA) / 2

where

AD = average drift values calculated on the basis of individual results obtained through certification testing for all products in the range declared and defined by the applicant.

AA = average amplitude values calculated on the basis of individual results obtained through certification testing for all products in the range declared and defined by the applicant.

This can only be defined within the framework of certification for NF ELECTRICITE Performance Categories ,  and .

The AC values for each power must be given to only 2 decimal points (where the second figure is a 0 it must still be shown). AC values for each power are rounded to the nearest number and CA calculation shall be done on this basis.

The AC value shall be rounded to the nearest 0.01 (e.g. 0.263 => 0.26 / 0.228 => 0.23). The certified value of the aptitude coefficient AC shall be shown on the licence for the range.

This certified value is representative of the value represented by temperature variation over time whilst in the "$\delta\Theta_{vtch}$" setting, as used in the energy performance calculation method stipulated under French regulations.

Using this method, the equivalence between the variation over time for certified integrated-thermostat direct heaters ($\delta\Theta_{vtch}$) and the Aptitude Coefficient as defined in these technical specifications is as follows:

$$\delta\Theta_{vtch} = 1.44 \text{ x Aptitude Coefficient}$$

Annexe 1 Measurement methods

The measurement methods are outlined in standard EN 60675 which is applicable, with the following changes:

Article 6: Terms and Conditions for Testing

The temperature of the test environment shall be 20℃ ± 2℃.

Article 7: Dimensions, Masse and Means of Connecting to the Supply

Testing shall be conducted in accordance with the stipulations of Article 7 of the EN 60675 standard.

Article 8: Temperature Rises of Air-outlet Grilles and External Surfaces

Replace article 8 of standard EN 60675 with:

Temperature rises of air outlet grilles for convection heaters and blower heaters are determined in an enclosure of the type described in Appendix 2.

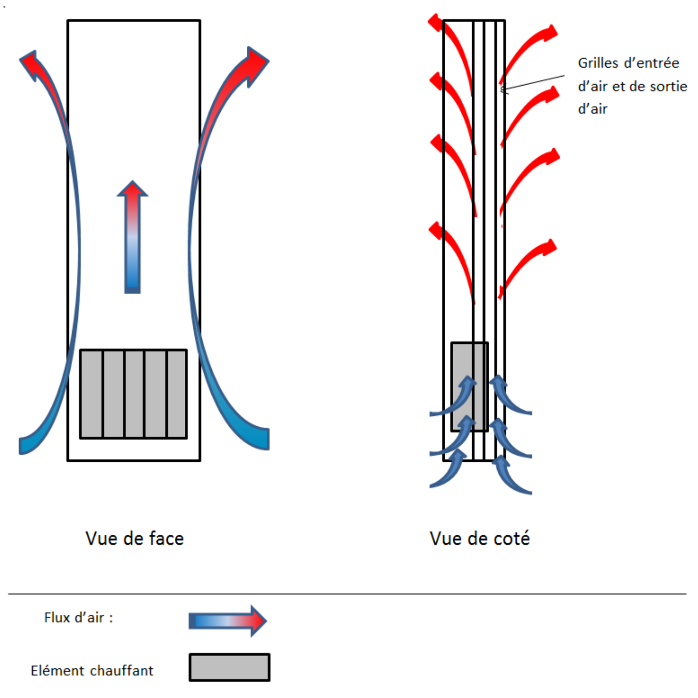
Temperature rises of external surfaces shall be determined, with the exception of:

- ✓ devices for mounting at a height above 1.8 m;
- ✓ the rear face inaccessible to the conical probe shown in Figure 2 of Appendix 3;
- ✓ radiant units with light-emitting components.

Note 1: If the air outlet grille cannot be identified and if air is emitted through a substantial part of the enclosure, a heat rise limit of 85K measured at 1.15 rated output shall apply.

Note 2: The surface of radiant units through which the heating element is visible shall be considered an external surface, except where the air outlet grille is clearly identifiable.

Note 3: If the air outlet grille is in continuity with the air intake grille, and the limit between the two cannot be identified, then the measurement of the average heating is not performed.



Vue de face = front view
Vue de côté = side view
Elément chauffant = heating element

Flux d'air = air flox
Grille d'entrée d'air et de sortie d'air = inlet and outlet air grille

The probe is applied to the surface with a force of 4N ± 1N so as to ensure the best possible contact.

As the temperature of the air outlet grille is the same as the surrounding air temperature, an air temperature measurement shall be taken.

Temperature shall be measured as per Appendix 2.

The 25mm area around the edges of the air outlet grille is considered part of this.

Article 9: Temperature Rises of Surfaces Surrounding the Heater.

Testing shall be conducted in accordance with the stipulations of Article 9 of the EN 60675 standard.

Article 10: Warming-up Time of the Heater

Testing shall be conducted in accordance with the stipulations of Article 10 of the EN 60675 standard.

Article 11: Stability of Room Temperature

Disregard section 11.2.

Section 11.1: in the 4th line, replace 150W with 100W.

Article 12: Set-back

Testing shall be conducted in accordance with the stipulations of Article 2.2.2 of these specifications.

Article 13: Frost Protection Temperature

Testing shall be conducted in accordance with the stipulations of Article 2.2.3 of these specifications.

Article 14: Inrush current

Testing shall be conducted in accordance with the stipulations of Article 14 of the EN 60675 standard.

Article 15: Effect of Radiant Heat

Testing shall be conducted in accordance with the stipulations of Article 15 of the EN 60675 standard only for "panels heaters" as defined in these specifications.

Article 16: Measurement of the Usable Power

Testing shall be conducted in accordance with the stipulations of Article 16 of the EN 60675 standard. Also including: "Measurement must be taken after the heater has been on for 1 hour. At the end of this test, the power delivered by the heater must correspond to its rated output."

Appendix A: Climatic Chamber

In order to adapt the heat loss in the climatic chamber to the power of the heater to be tested, Appendix A “Climatic Chamber” shall be amended as follows:

Replace the 3rd line with:

In the exterior wall there is a window measuring at least 3 m x 1.5 m with a thermal transmission coefficient not exceeding 6 W/m².K (a simple window with a thickness of 8 mm is considered satisfactory). The wall below the window shall be at least 0.8 m high with a thermal transmission coefficient no greater than 0.7 W/m².K. The remainder of the external wall has a thermal transmission coefficient not exceeding 1 W/m².K. The other walls and the ceiling have a thermal transmission coefficient not exceeding 0.6 W/m².K.

The concrete slab floor shall have a minimum thickness of 40 cm and be laid such that the entire structure is quasi-adiabatic.

Replace the first sentence of the 4th line with:

Cold air from the refrigeration system is supplied to the testing chamber via at least two air inlets placed symmetrically above the window.

Replace the 5th line with:

The air exchange between the refrigeration chamber and the testing chamber shall be:

1 test-chamber volume per hour for heaters with a rated power equal to or lower than 1000 W.

4 test-chamber volumes per hour for heaters with a rated power of above 1000 W.

Annexe 2 Air Temperature Measurement

1 Test Chamber

Testing shall be conducted in a chamber with 5 closed sides (front face open) placed in a room of sufficient size.

The specifications for this chamber are as follows:

- it shall be made from 20 mm thick insulated panels;
- the 3 vertical walls and ceiling shall be painted matt black;
- the floor shall be covered with thin plastic sheeting;
- its dimensions shall be as follows:
    - length at least equal to whichever of the following values is largest: 150 cm, or the width of the heater plus 100 cm (50 cm on each side of the heater);
    - depth: 200 cm;
    - height: 230 cm.
- it shall be raised 30 cm above the ground, situated 10 cm below the ceiling, and 20 cm from all other walls.

The heater to be tested shall be placed in the centre of the back wall and in accordance with the manufacturer's instructions.

The temperature of the chamber, measured in front of the heater, 1.50 m from the wall supporting the heater, at the mid-point of the heater and 1.5 m from the ground, must be maintained at 20℃ ± 2℃ and shall be recorded.

This temperature shall be considered the benchmark room temperature. Room temperature must be measured to the nearest 0.5 K.

2 Temperature Measurement Devices

The temperature rise of the air around the air outlet grille shall be measured and recorded.

The temperature shall be measured using a temperature recording device placed 2 - 3 mm from the grille and moving at a speed of 07 mm/s ± 5 % along a longitudinal axis before the longest side of the heater.

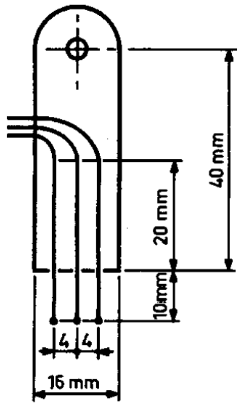
The measurement device moves along the length of the grille, at a distance of 12 mm.

In order to compare the diagrams obtained, movement along the grille is always from left to right, always in the same direction, following vertical grilles from bottom to top and horizontal grilles from front to back.

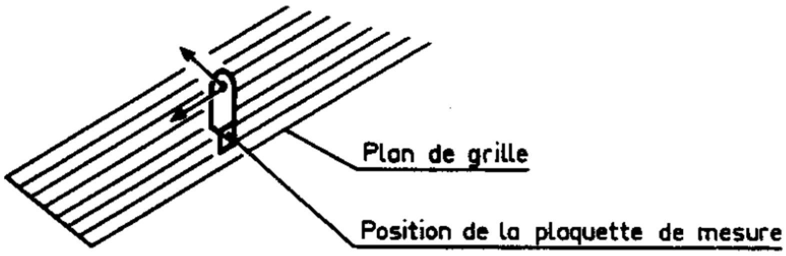
The temperature recording device shall comprise:

3 shielded thermocouples measuring 0.2mm in diameter, with each couple soldered to a stainless steel sheath 1 mm in diameter and placed 4 mm apart and affixed to an insulated mount receptacle. The mount is affixed to the transport mechanism leaving a 100mm length free.

The immediate temperature recorded is the average of the immediate temperature values taken by the thermocouples.



When recording temperatures, the support mount should be perpendicular to the grille surface.



Plan de grille = grid surface
Position de la plaquette de mesure = position of the measurement support plate

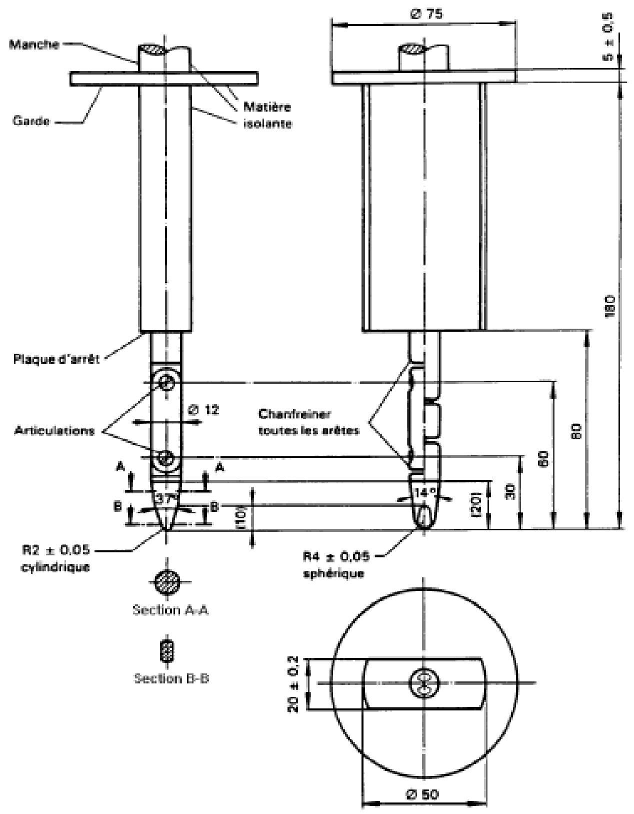
3 Equipment

The movement of the temperature measuring device must be made continuously and automatically.

The temperature measuring device must be held in place and moved using separate mobile device-holding apparatus. The equipment and mounting must not disturb the flow of air, and no part of this apparatus should enter the enclosure volume.

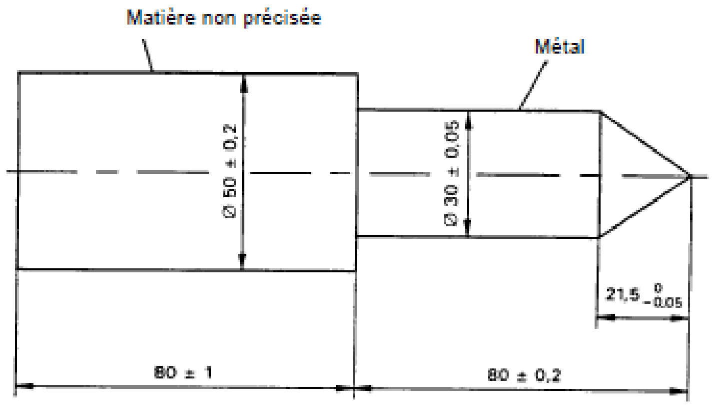
Annexe 3 Test Probes

Figure n°1 : Test Probe B (jointed finger probe)



Dimensions en millimètres

Figure n°2 : Access probe for hot or glowing parts.



Dimensions en millimètres

Figure n°3 : Test Probe for Active or Dangerous Mechanical Parts

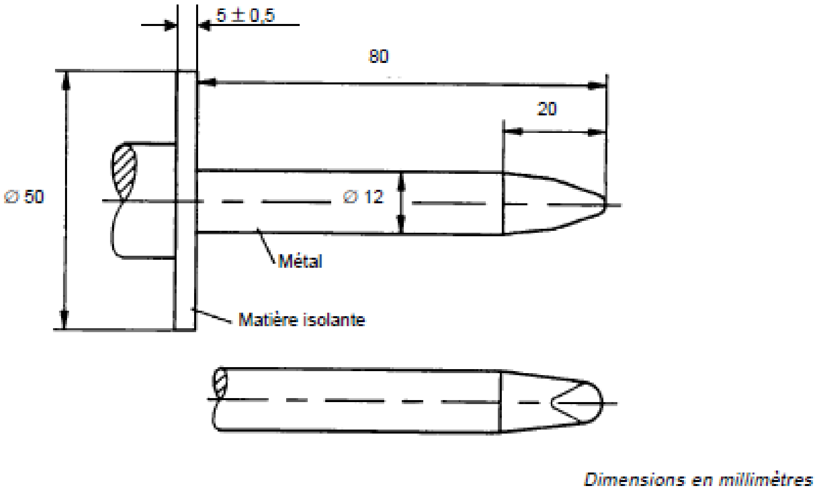
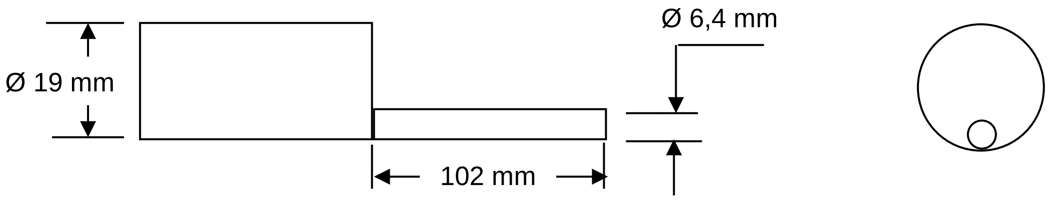


Figure n°4 :



RECOMMANDATION PROFESSIONNELLE :

SURETE DE FONCTIONNEMENT DES SYSTEMES A FIL PILOTE

Cette recommandation professionnelle précise les principales caractéristiques des systèmes à fil pilote largement utilisés dans le secteur résidentiel pour la conduite de chauffage électrique.

Son objectif est d'assurer l'interopérabilité des différents composants du système : convecteurs ou panneaux rayonnants à thermostat électronique, programmateurs, délesteurs, ...

La présente recommandation a été élaborée d'un commun accord par les acteurs du chauffage électrique, fabricants de convecteurs, de thermostats, de programmateurs et distributeur d'énergie, tous soucieux de garantir le bon fonctionnement des produits à fil pilote.

SPECIFICATION DES EMETTEURS ET DES RECEPTEURS COMMANDES PAR FIL PILOTE

SOMMAIRE

1 Préambule

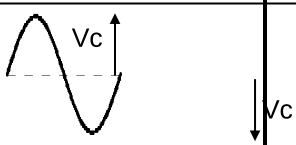
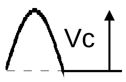
Ce document a pour objectif de caractériser les signaux fil pilote reçus par les récepteurs à régulations électroniques et émis par les émetteurs.

2 Définition du fil pilote

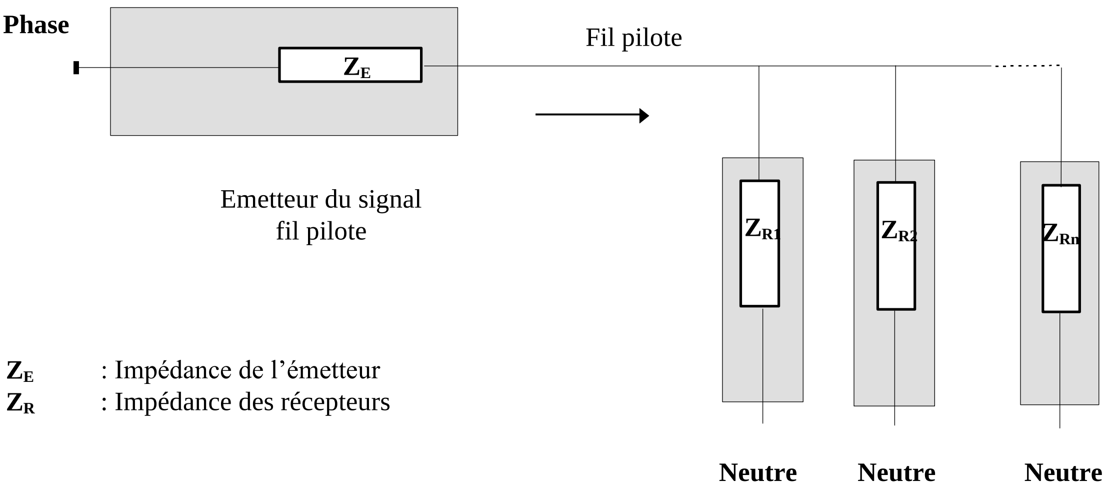
Le fil pilote est un dispositif de commande unidirectionnel sans adressage permettant de véhiculer un nombre limité d'informations entre des appareils appelés émetteurs et des appareils appelés récepteurs. Ces informations permettent, par exemple, la commande des appareils de chauffage. Pour cette dernière application, le fil pilote est dédié.

3 Nature des signaux véhiculés

Les signaux émis sont issus de la tension secteur 50 Hz et référencés au neutre. Ils sont construits à partir des quatre signaux élémentaires suivants :

Numéro du signal	nature des signaux présents sur le fil pilote	commentaires
1	aucun signal	
2		Valeur crête : Vc > 250 V
3		Valeur crête : Vc > 250 V
4		Valeur crête : Vc > 250 V

4 Schéma de principe du fil pilote



5. Émetteurs du signal fil pilote

5.1 Seuils de tension

Les émetteurs doivent produire des signaux en forme d'onde et en valeur compatibles avec ceux reconnus par les récepteurs. Les seuils de tension correspondant aux différents signaux figurent en annexe 1.

5.2 Impédance

L'impédance de l'émetteur du fil pilote est fonction du nombre de récepteurs raccordés et de la limite basse de la fourniture de la tension du réseau.

Si on considère, à titre d'exemple, le cas extrême où la tension du secteur est minimum (soit 276 V crête) et une valeur d'impédance des récepteurs défavorable (10 récepteurs en parallèle d'impédance 100 kΩ, soit 10 kΩ). L'impédance de l'émetteur forme un pont diviseur avec l'impédance des récepteurs. Pour obtenir 250 V crête aux bornes du récepteur, l'impédance de l'émetteur doit être inférieure à 1 kΩ.

5.3 Caractéristiques spécifiées

Les caractéristiques suivantes devront être précisées dans la documentation technique du constructeur, dans la notice ou sur le produit :

- courant maximal disponible par sortie de l'émetteur,

- nombre maximal de récepteurs fil pilote pouvant être raccordés à une sortie de l'émetteur, déterminé sur la base d'une impédance de récepteur de 100 kΩ.

6 Récepteurs

6.1 Seuils de détection des signaux à 50 Hz

La courbe, figurant en annexe 1, définit les zones à l'intérieur desquelles les signaux doivent être détectés.

Les signaux fil pilote de valeur crête supérieure à 250 V (zone ② de la courbe) doivent être correctement détectés et décodés (voir chapitre 7)

Tout signal de valeur crête, inférieure aux valeurs maximales définies par la zone ① de la courbe, doit être interprété comme une absence de signal.

6.2 Impédance d'entrée

L'impédance d'entrée, aux bornes du récepteur à 50 Hz entre fil pilote et neutre, doit être comprise entre 100 kΩ et 500 kΩ avec un cos $\varphi \geq 0,9$.

7 Principe de codage du fil pilote

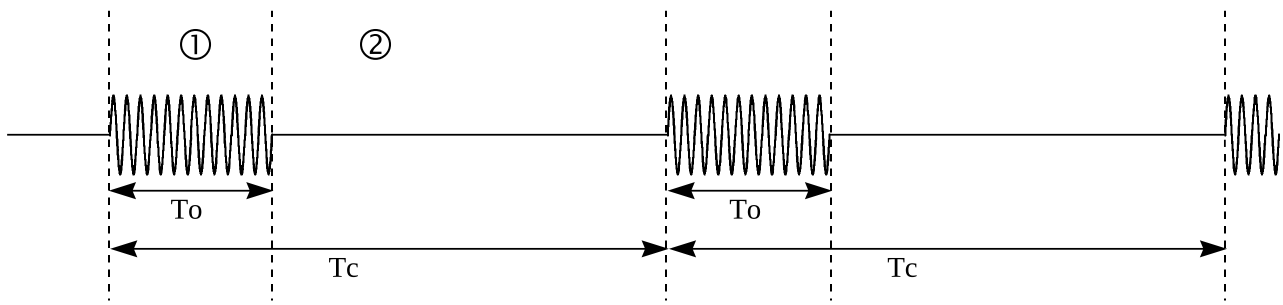
7.1 Définition des six ordres

Six ordres sont définis. Deux ordres supplémentaires viennent s'ajouter aux quatre ordres spécifiés dans le document DOMERGIE, EDF, GIFAM "Sûreté de fonctionnement des systèmes à fil pilote" du 07/07/97.

Ordres	Codage	Remarques
Confort	émission permanente du signal 1	voir chapitre 3
Abaissement (réduit, éco)	émission permanente du signal 2	
hors gel	émission permanente du signal 3	
Arrêt (veille)	émission permanente du signal 4	la prise en compte de cet ordre au niveau du récepteur doit s'effectuer dans un temps de 0,5s maximum
Abaissement de 1 K	émission cyclique du signal 2	abaissement par rapport à la consigne Confort réglée sur l'appareil de chauffage
Abaissement de 2 K	émission cyclique du signal 2	idem ci-dessus

7.2 Codage des ordres Abaissement de 1 K et Abaissement de 2 K

Les deux ordres supplémentaires (abaissement de 1 K et 2 K) sont codés sur le principe suivant :



Le codage est défini par un temps de cycle (Tc) et un temps associé à chaque nouvel ordre (To).

Pendant la phase ① de durée To, le signal émis sur le fil pilote est conforme à la description de l'ordre Abaissement. Pendant la phase ② de durée (Tc-To), le signal émis est conforme à la description de l'ordre Confort.

Ordres	Durée Tc	Durée To
Abaissement de 1 K	Tc = 300 s	$To_1 = 3$ s
Abaissement de 2 K	Tc = 300 s	$To_2 = 7$ s

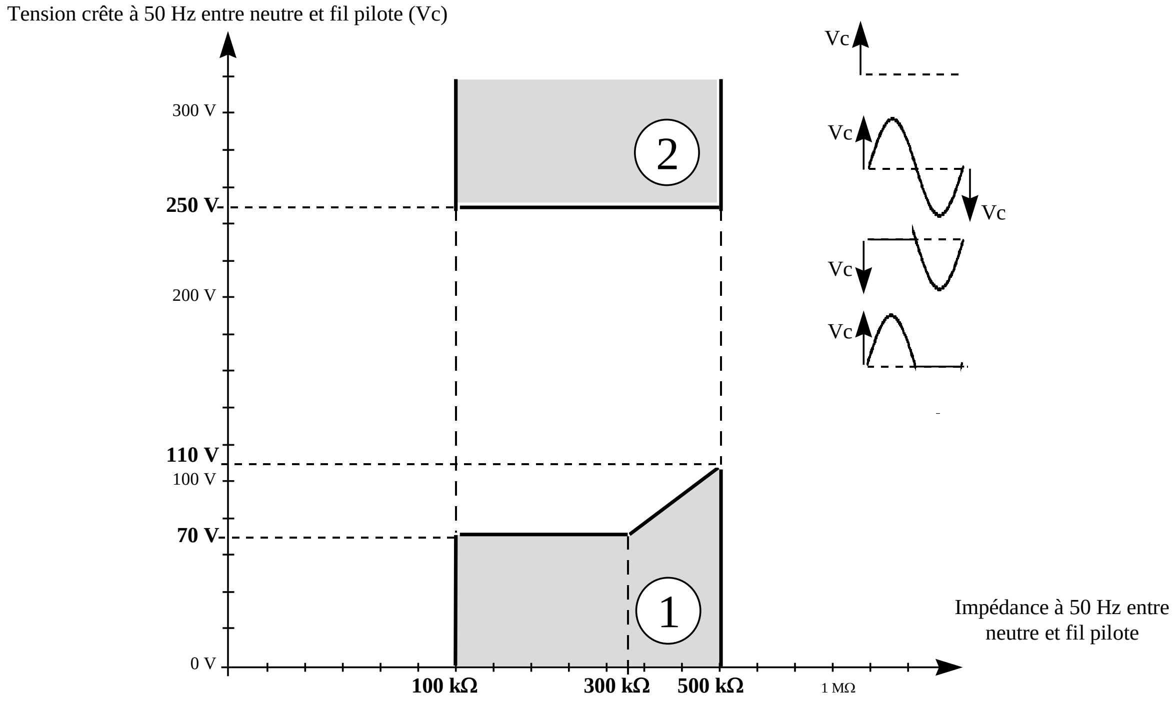
Pour l'émission des ordres, une tolérance de 20 % est admise pour les durées Tc et To (détail en annexe 2).

Un récepteur doit décoder tout signal tel que 2,4 s < To < 3,6 s et 240 s < Tc < 360 s comme un ordre Abaissement de 1 K, et tout signal tel que 5,6 s < To < 8,4 s et 240 s < Tc < 360 s comme un ordre Abaissement de 2 K.

Des exemples de transitions d'un ordre Abaissement de 1K ou 2K vers un autre ordre, ou le contraire sont présentés en annexe 3.

Annexe 1

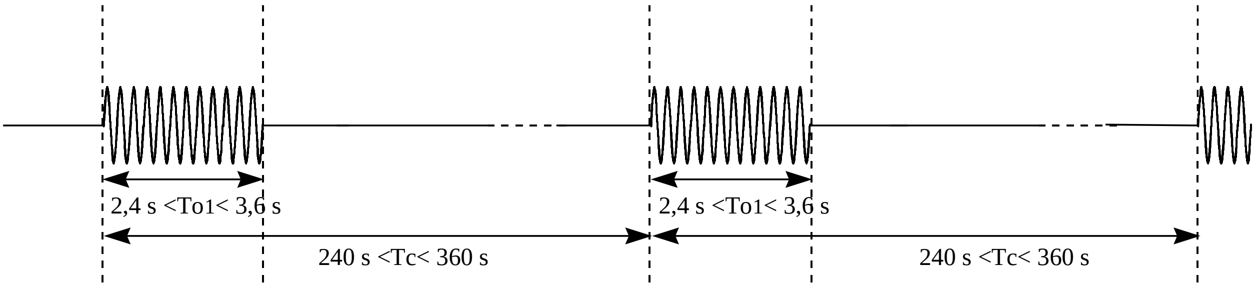
Courbe caractérisant les niveaux de tension des signaux fils pilotes et les impédances des récepteurs :



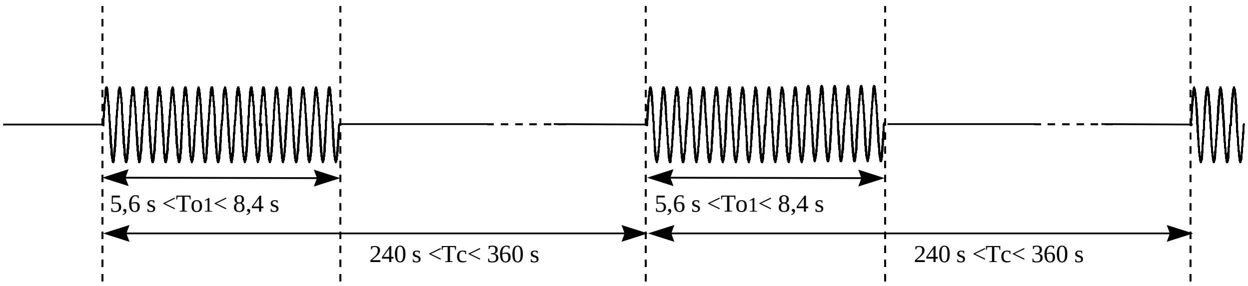
(1) Zone où il est considéré une absence de signal (2) Zone de prise en compte d'une présence de signal

Annexe 2

- Émission de l'ordre Abaissement 1 K :



- Émission de l'ordre Abaissement 2 K :



- Exemple des temps à prendre en compte au niveau d'un récepteur :

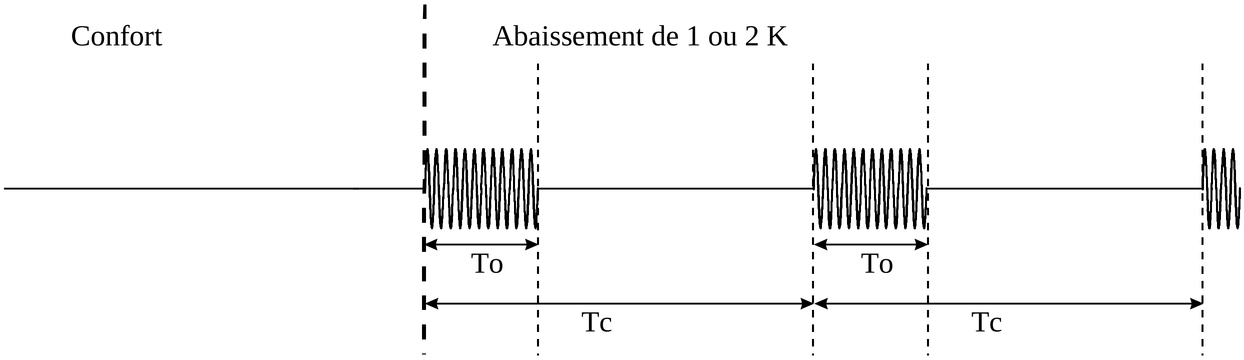
Si l'on considère une tolérance de 20 % de la base de temps au niveau du récepteur, la prise en compte de l'ordre abaissement de 1 K par le récepteur est réalisée si $2{,}4*0{,}8 < To < 3{,}6*1{,}2$ et $240*0{,}8 < Tc < 360*1{,}2$ soit :

1,92 s < To < 4,32 s et 192 s < Tc < 432 s.

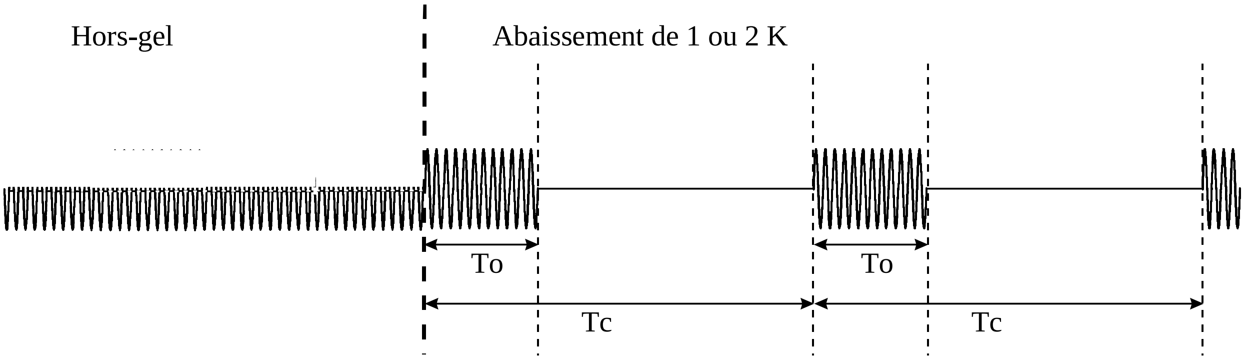
Pour l'ordre Abaissement de 2 K, on obtient : 4,48 s < To < 10,08 s et 192 s < Tc < 432 s

Annexe 3

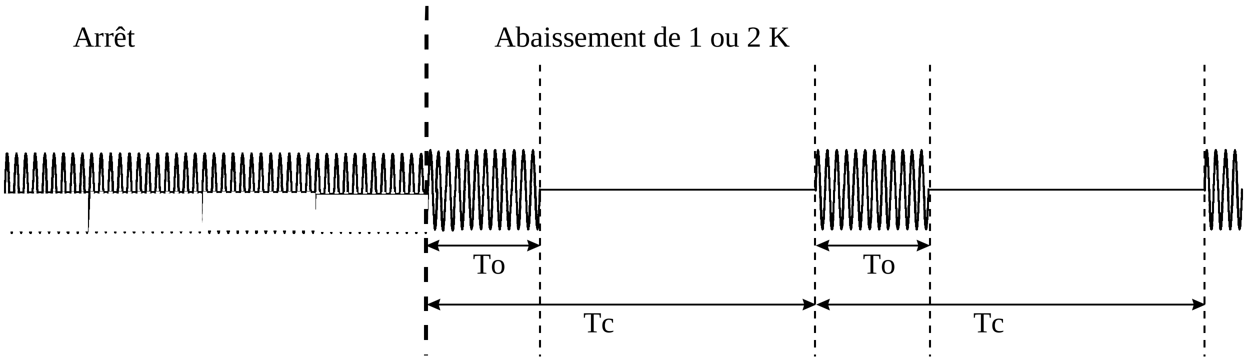
- Transition d'un ordre Confort vers un ordre Abaissement 1 K ou 2 K :



- Transition d'un ordre Hors gel vers un ordre Abaissement 1 K ou 2 K :



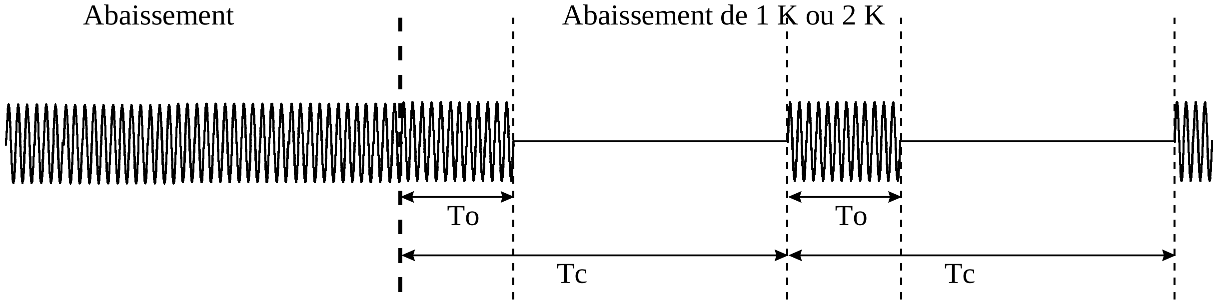
- Transition d'un ordre Arrêt vers un ordre Abaissement 1 K ou 2 K :



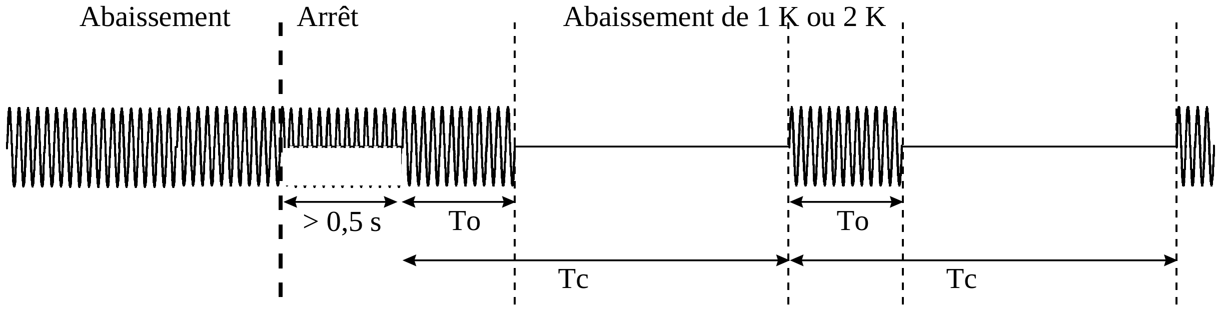
Pour les trois exemples ci-dessus, la prise en compte du changement d'ordre au niveau d'un récepteur peut être réalisée après un temps de durée To.

- Transition d'un ordre Abaissement vers un ordre Abaissement 1 K ou 2 K :

- 1



- 2



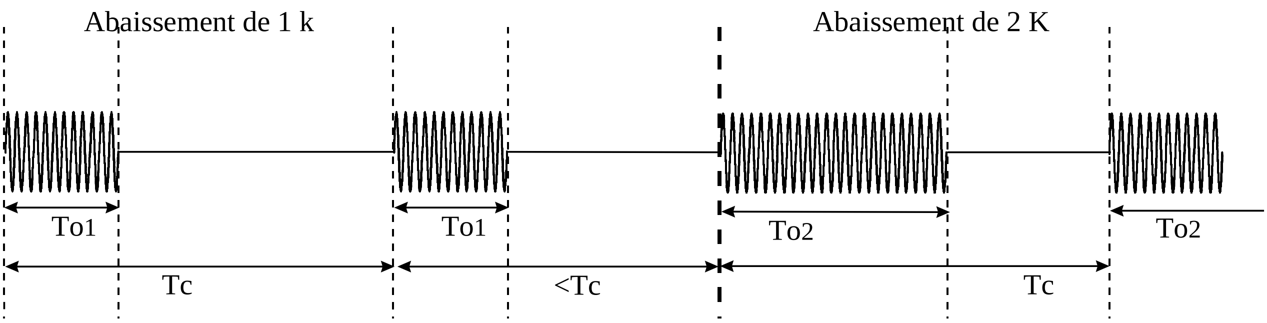
Dans le cas n°1, le changement d'état ne sera effectif au niveau d'un récepteur qu'après un temps supérieur à Tc + To.

Dans le cas n°2, le fait d'émettre l'ordre Arrêt lors d'une transition peut permettre de réduire ce temps à la durée To + 0,5 s.

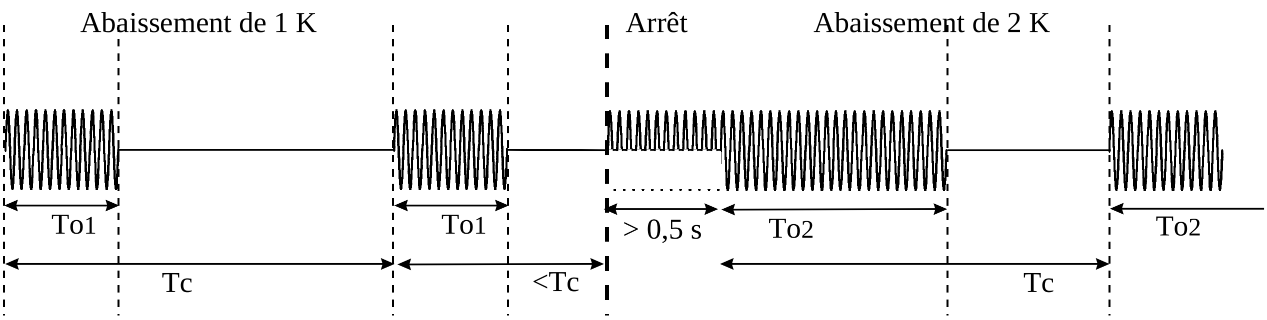
Le choix pour l'émission entre le cas n°1 ou n°2 est libre.

- Transition d'un ordre Abaissement de 1 K ou 2 K vers un ordre Abaissement 2 K ou 1 K :

- 1

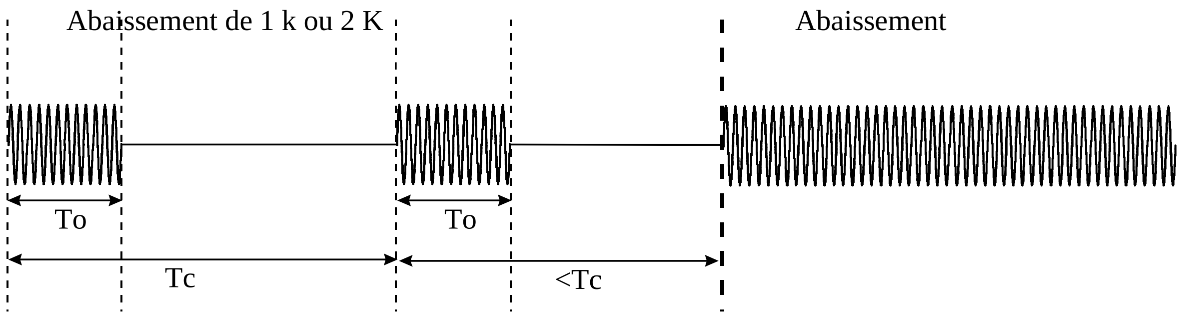


- 2

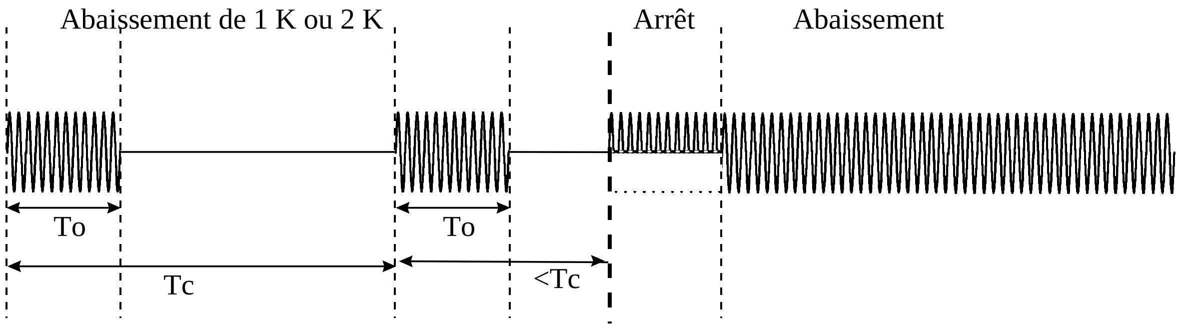


- Transition d'un ordre Abaissement de 1 K ou 2 K vers un ordre Abaissement :

- 1

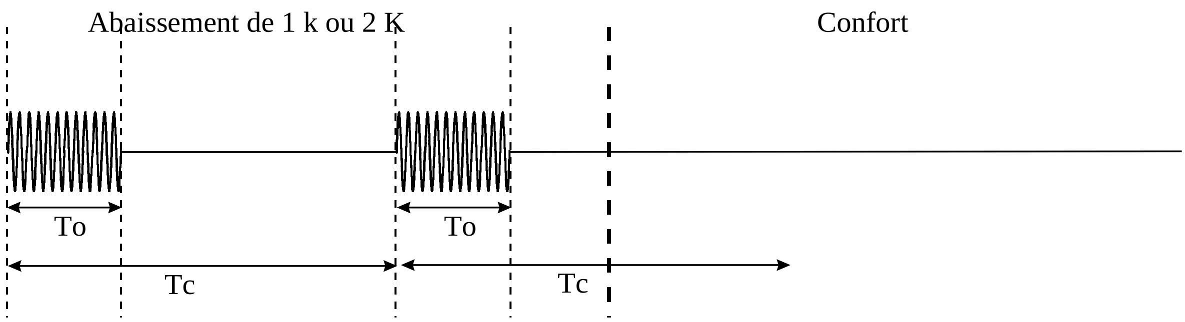


- 2

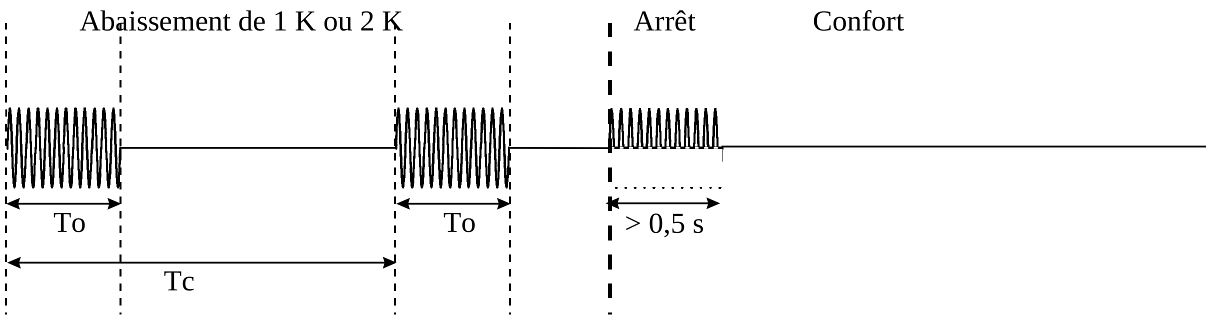


- Transition d'un ordre Abaissement de 1 K ou 2 K vers un ordre Confort :

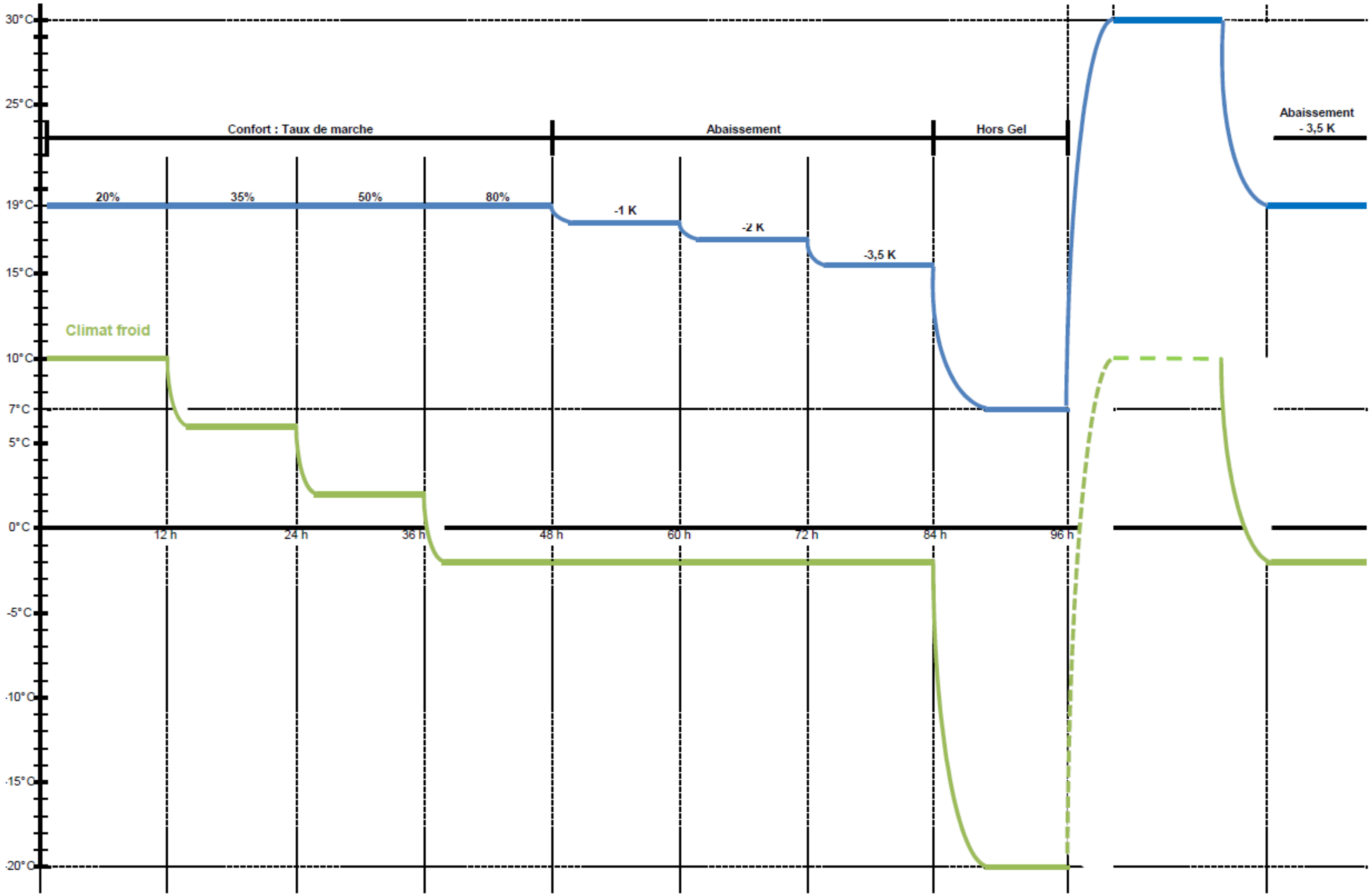
- 1



- 2



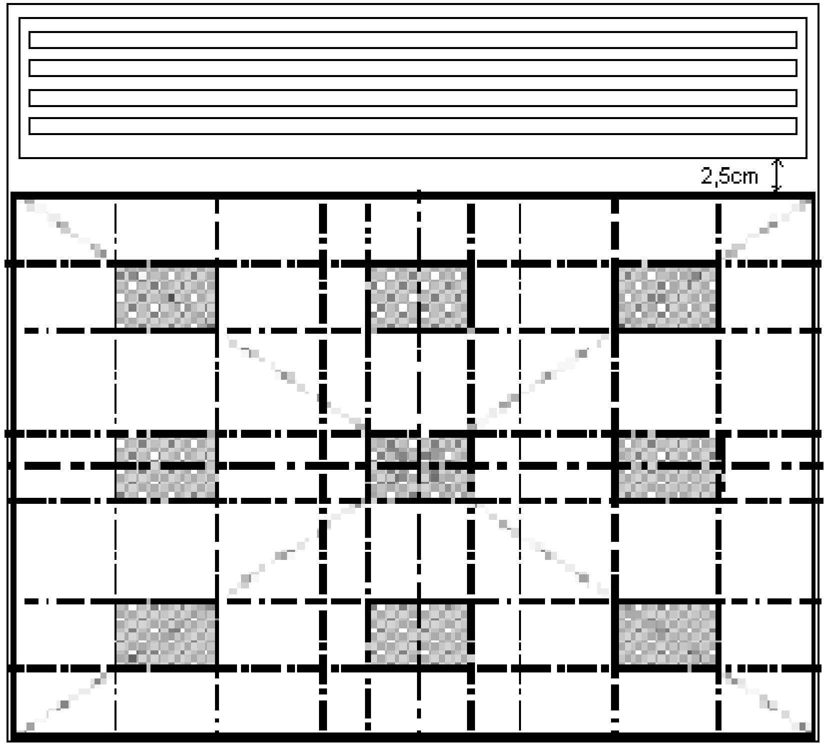
ANNEXE 5 Testing Order and sequences



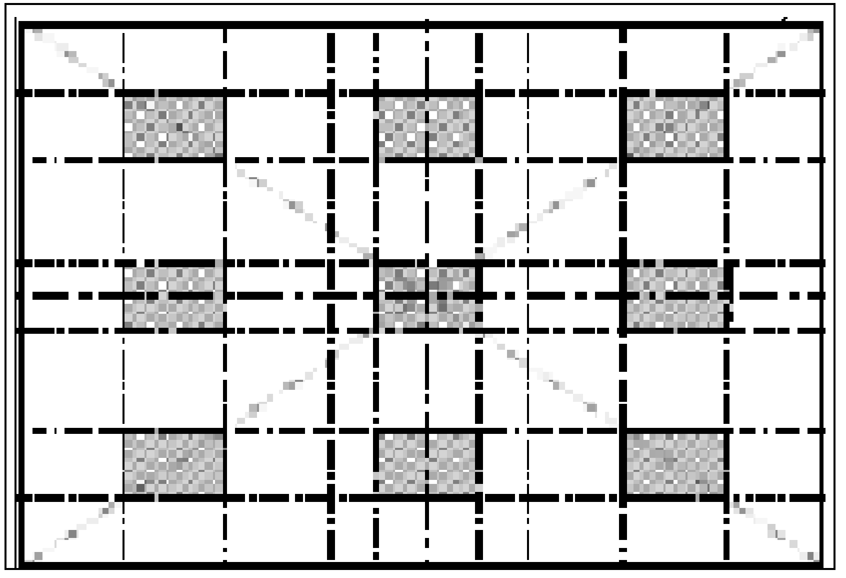
ANNEXE 6 Measurement zones

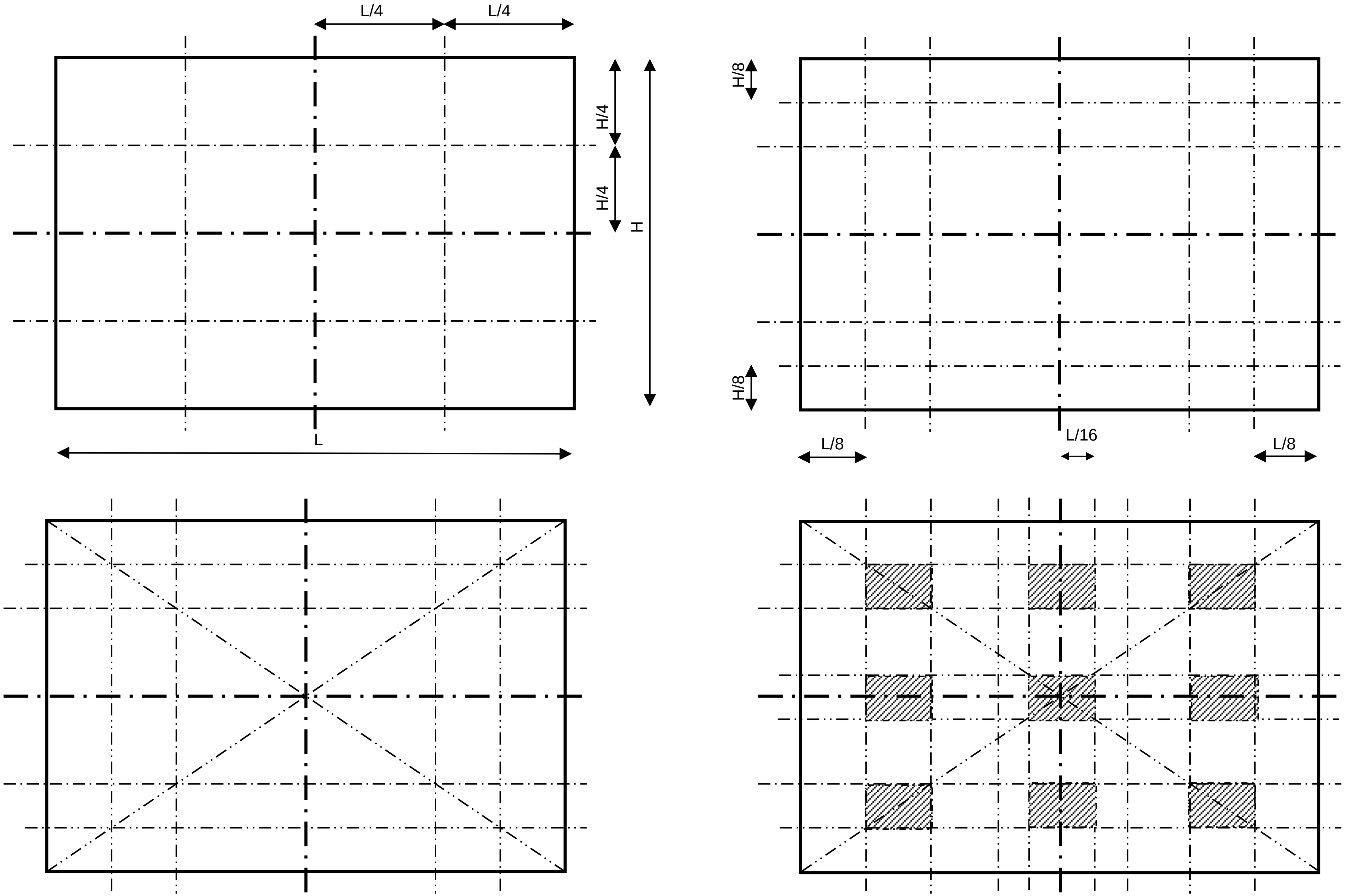
Detail of § 3.4 measurement zones

For a blower type radiator



For a traditional style radiator




L/4
L/4
H/4
H/4
H
L
H/8
H/8
L/8
L/16
L/8

ANNEXE 7 Test Protocol: Open/Closed Window Detection

Open window: detection verification with integrated system

Test Conditions:

Testing shall be conducted in a dual-climate chamber.

The 2 ventilation outlets in the centre above the window shall be sealed off.

The 2 ventilation outlets situated at each end shall be replaced with rectangular ventilation ducts 55mm x 220mm extending from the window to the window infill panel.

The cold air temperature TF shall be 5℃ ± 0.5℃.

The heater default setting temperature shall be 19°C.

At the start of testing, the air renewal rate shall be 0 volume/hour. The heater shall be set to Comfort mode. The heater shall be sited in accordance with the heater manufacturer's installation instructions (horizontal heaters below the window, vertical heaters on the adjacent wall) until the room temperature becomes stable.

The window opening shall be simulated by means of changing the air renewal rate from 0 – 4 volumes/hour.

In order to ensure repeatability of the tests, the test at 0 volume of air is carried out by the ventilation openings closed by valves.

Open window detection shall be deemed effective in less than 15 minutes when the system switches to shut-off or frost-protection mode.

Verification is carried out by measuring power, transmitting the passage through the various modes via a cable connected to a recording station or by image analysis.

Closed window: detection verification with integrated system

The window closing test shall be conducted immediately after the 15 minutes open-window testing.

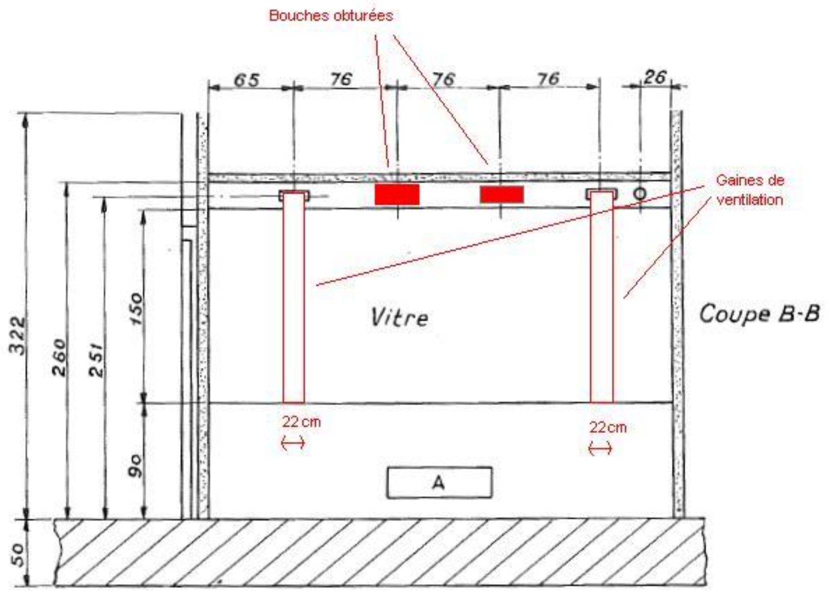
The window closing shall be simulated by changing the air renewal rate from 4 – 0 volumes/hour.

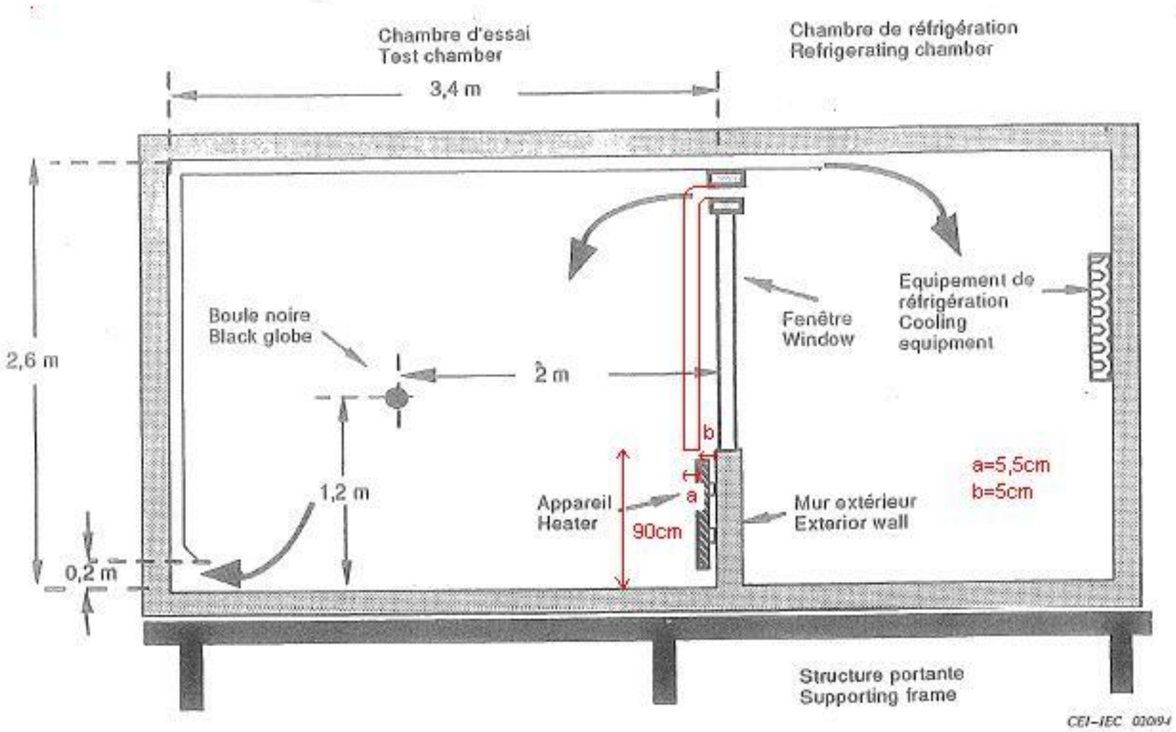
In order to ensure repeatability of the tests, the test at 0 volume of air is carried out by the ventilation openings closed by valves.

Closed window detection shall be deemed effective in less than 15 minutes when the system switches to the setting it was on prior to open-window detection (comfort or set—back).

Verification is carried out by measuring power, transmitting the passage through the various modes via a cable connected to a recording station or by image analysis.

Testing diagram





ANNEXE 8 Test Protocol: Presence/Absence Detection

During testing, the use of one (or more) targets made of heating foil stuck to sheet metal painted in matt black and heated to an even surface temperature of 35℃. Target dimensions are: height 30cm; Width: 30cm.

Nine measurement zones are defined on each target (see Appendix 6).

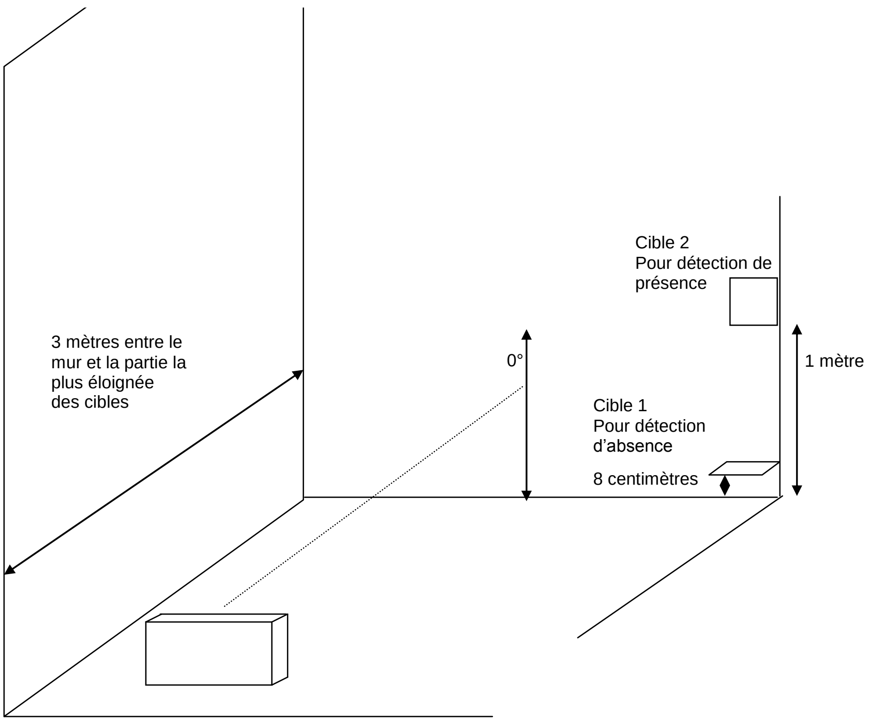
A thermocouple is placed in the centre of each of these nine zones. The dispersal rate is set at ± 2,5K.

1- Absence detection: Initial setting shall be Comfort mode. The heater should reduce its speed to set-back -1, -2 or Eco depending on the manufacturer's instructions, following non-detection for an extended period of no more than 4 hours.
   The target is placed in a horizontal position with the matt black painted surface facing upwards. The inner side of the target shall be 8cm from the ground. The target shall move at 0.3 m/s ± 0.1 m/s from 28° ± 1% to -28° ± 1% in relation to the heater axis. The heater speed shall not change.
2- Presence detection: The initial setting is that switched to during absence detection. A target is placed vertically 1m from the ground and moved at 0.3m/s± 0.1 m/s. The heater must switch to Comfort mode each time the target moves, within two cycles of the settings switching.
   This mode must be maintained for a minimum of two setting switch cycles.

Horizontal and vertical heaters are placed beneath the window infill panel.

This test can be conducted in a test room other than a dual climate chamber. Where the heater is very tall, it does not have to be placed beneath the window infill panel.

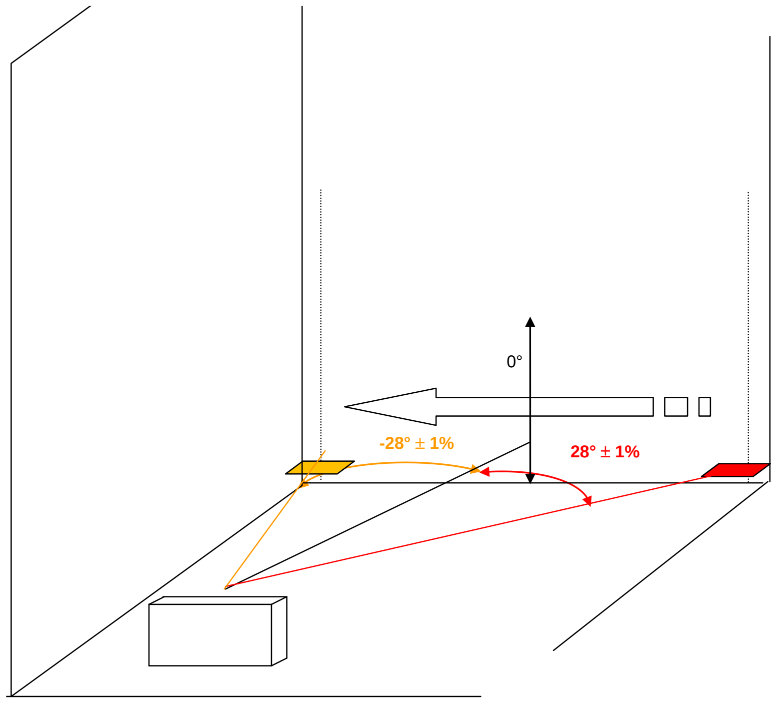
<u>Setting up the detection device</u>



NOTE: In the case where the laboratory has only one target, we will first place the target 8cm from the ground and then 1m from the ground in order to respect the order of the test steps described below.

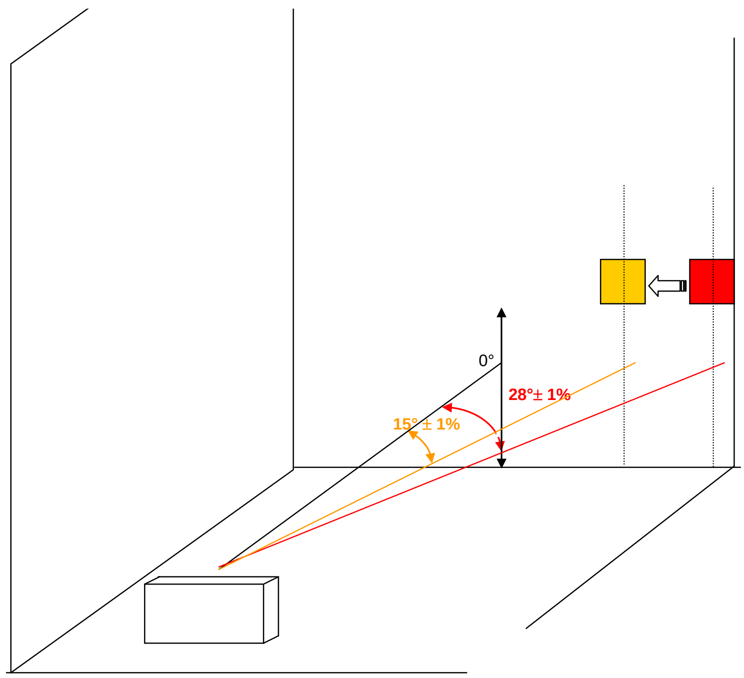
Stage 1: Moving Target 1 from 28° ± 1% to -28° ± 1% at a speed of 0,3 m/s ± 0,1 m/s

No detection in lower section



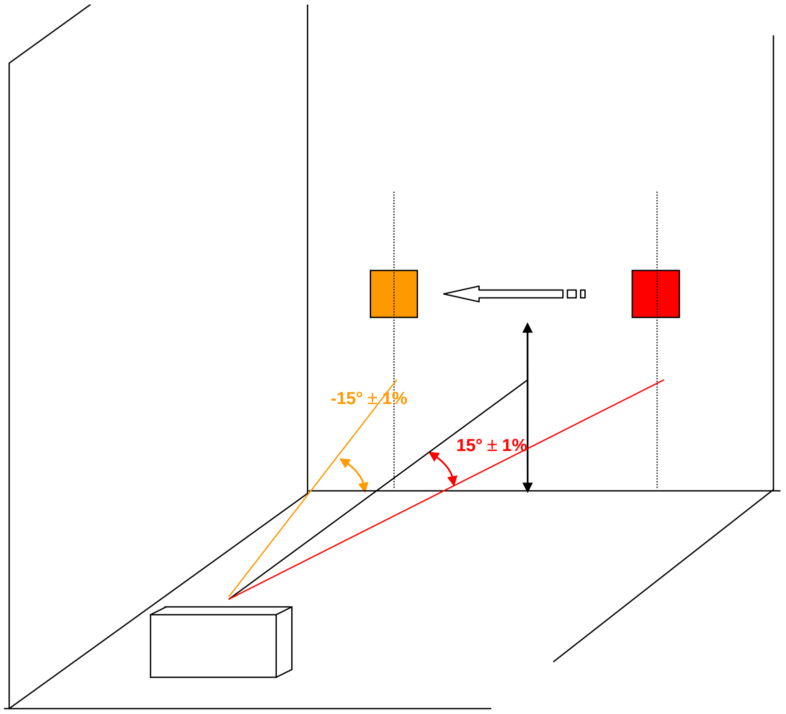
Stage 2: Moving Target 2 from 28° □1% to -15° □1% at a speed of 0,3 m/s □0,1 m/s

Verification of presence detection



Stage 3: Moving Target from 15° ± 1% to -15° ±1% at a speed of 0,3 m/s ±0,1 m/s

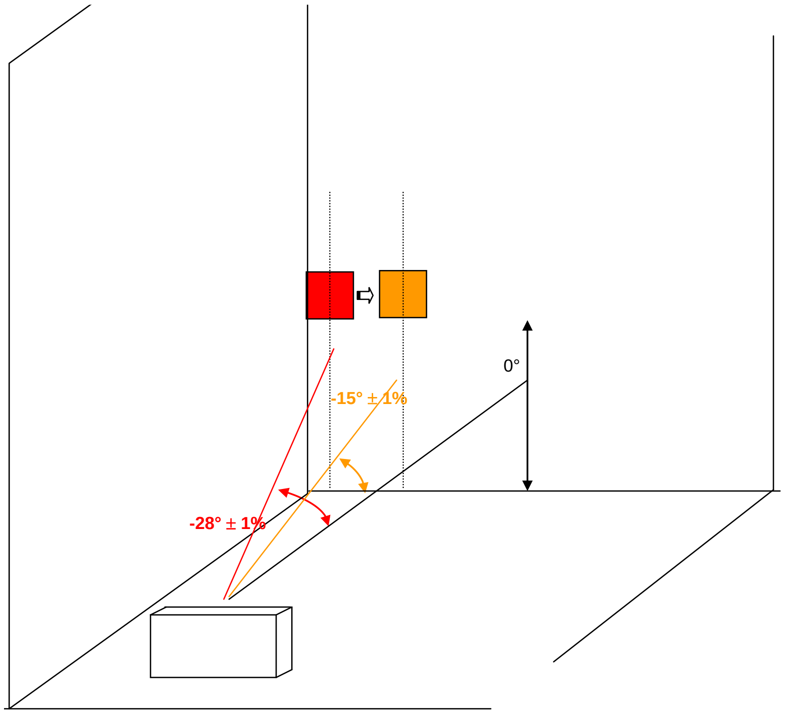
Verification of presence detection



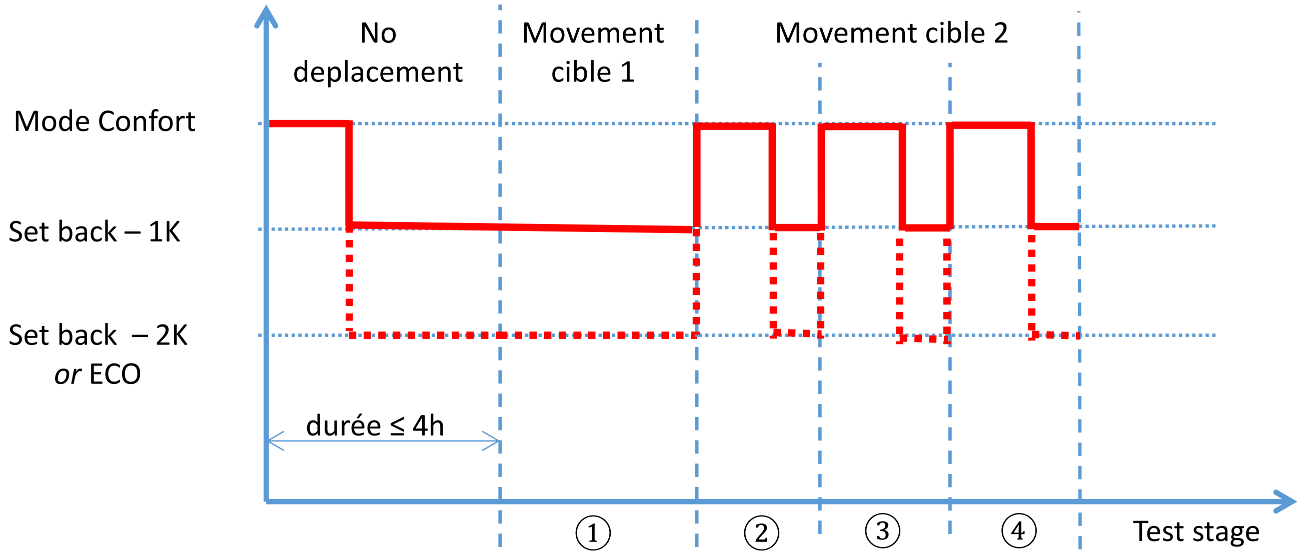
Having determined that the heater has cycled to Comfort mode, prepare stage 4 by moving the target to position -28°.

Stage 4: Moving Target from 28° ± 1% to -15° ± 1% at a speed of 0,3 m/s ± 0,1 m/s

Verification of presence detection

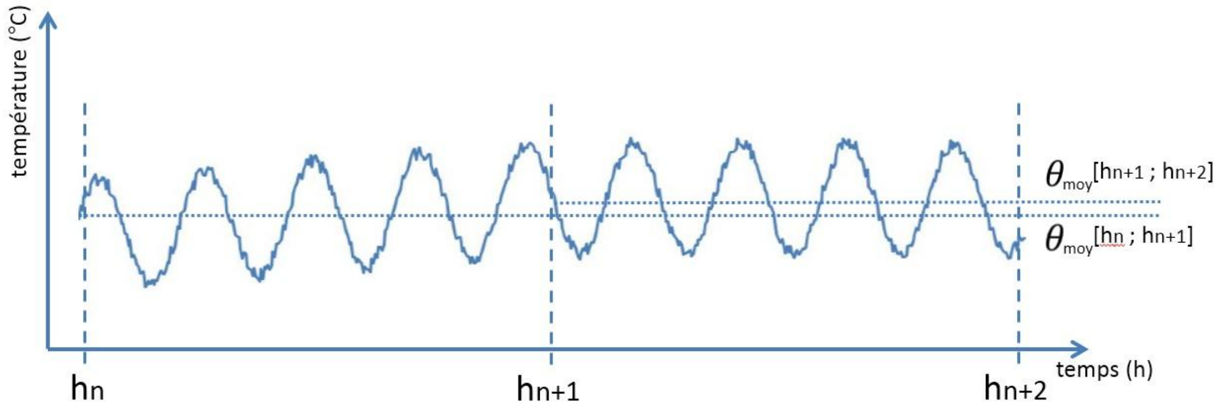


Examples of testing heater set-back modes during stages of absence/presence verification.



ANNEXE 9 Determining Stabilisation

Stabilisation is determined in comparison with the measurements taken between the last hour of testing (h_{n+1} à h_{n+2}, hereafter referred to as [hn+1 - hn+2]) and the previous hour (h_n à h_{n+1}, hereafter referred to as [hn - hn+1]).



The periodic acquisition of the temperature values must not exceed 1 minute.
Stabilization shall be deemed to be reached if:

$\theta_{moy}[h_{n+1}; h_{n+2}] - \theta_{moy}[h_n; h_{n+1}] \leq \pm 0{,}1°C$.

With :

$\theta_{moy}[h_{n+1}; h_{n+2}]$ is the average of the values obtained over the time range h_{n+1} to h_{n+2};
$\theta_{moy}[h_n; h_{n+1}]$ is the average of the values obtained over the time range h_n to h_{n+1}.