

LCIE

**SPECIFICATIONS FOR THE
NF ELECTRICITE PERFORMANCE MARK**

N° LCIE 103-15 / D

***AUTONOMOUS STORAGE
WATER HEATER
WITH
ELECTRICALLY
DRIVEN COMPRESSOR***

Version	Description of changes
D	<ul style="list-style-type: none">- Introduction of smart control- Editorial improvements

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Introduction

These specifications:

- define the minimal criteria the autonomous storage water heaters with electrically driven compressors has to comply with for obtaining the NF ELECTRICITE *Performance Mark*
- cover various thermodynamics sources
- apply to the storage water heaters with electrically driven compressors with a volume greater or equal than 75 liters and less than 400 liters
- take into account the requirements of the standard EN 16147 (2017)

List of relevant standards

EN 60335-1	General requirements for the safety of household and similar electrical appliances
EN 60335-2-21	Particular requirements for storage water heaters
EN 60335-2-40	Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers
EN 62233	Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure
EN 16147	Heat pumps with electrically driven compressors – Testing and requirements for marking of domestic hot water unit

Dates

Date of implementation of the specifications LCIE 103-15 / D	01/04/2022
Date of withdrawal of the specifications LCIE 103-15 / C	01/04/2022 *
Deadline for manufacturing certified products according to the specifications LCIE 103-15 / C	N/A *

* The specification version D, apart from editorial improvements, only consists of the introduction of smart control, which remains an option for certified equipment. Thereby:

- Specifications 103-15 version D comes into force as soon as it is published.
- Equipment certified according to specifications 103-15 version C remain certified and can continue to be manufactured under the NF mark.
- All licenses from 01/04/2022 will be issued indicating the specifications 103-15 version D.

1 Scope

These specifications apply to storage water heaters with electrically driven compressors hereafter named "units", using an electric heat pump regardless of any additional energy.

These units are equipped with at least one control thermostat and the storage volume is greater than or equal to 50 liters and less than 400 liters.

This specification defines the applicable test methods as well as the general and specific requirements for different types of units.

2 General requirements for obtaining the NF ELECTRICITE PERFORMANCE mark

Obtaining the NF ELECTRICITE PERFORMANCE mark requires compliance with the required standards in force for the attribution of the NF ELECTRICITE mark, to which must be added the general and specific requirements described below and defined on the basis of the EN 16147 standard (performance).

3 Définitions

The unit is an autonomous hot water system. Thanks to thermodynamic technology, it makes it possible to heat water using mainly renewable energy. The apparatus comprises all the elements of a heat pump associated with a hot water storage tank.

3.1 Types of heat source

Exhaust Air:

The heat pump uses only the calories of the air extracted from the housing from a single flow controlled mechanical ventilation (VMC).

This system also provides general and permanent ventilation of the dwelling in accordance with the French regulations of March 24th, 1982 and October 28th, 1983, or according to a technical notice

Outside Air:

The heat pump uses the calories from the outside air.

Mixed Exhaust Air¹:

The heat pump uses the calories of the extracted air mixed with the outside air.

This system also provides general and permanent ventilation of the dwelling in accordance with the French regulations of March 24th, 1982 and October 28th, 1983, or according to a technical notice. It must be equipped with a control system for extract air / outdoor air mixture.

Multisource Exhaust Air² :

The heat pump uses the calories of the extracted air and at least another source of air located outside the heated volume, from non-upgraded energies, with a temperature above 20 ° C. These systems are equipped with a system for controlling this combination of air, in the apparatus or in a remote manner.

This system also provides general and permanent ventilation of the dwelling in accordance with the French regulations of March 24th, 1982 and October 28th, 1983, or according to a technical notice.

Ambient air (indoor air or air from an unheated space):

The heat pump uses the calories from the ambient air where the appliance is placed.

Geothermal sensor with water and glycol water:

The heat pump uses the calories of a network of buried sensors containing glycol water. In a system with water on ribbon, the evaporator shall be provided with a safety minimum flow.

¹ Since the source type "Mixed Exhaust Air" is not currently automatically taken into account in IdCET and Th-BCE, it may be necessary to use a "titre V" to value the COP and Pes certified values.

² Since the source type "Multisource Exhaust Air" is not currently automatically taken into account in IdCET and Th-BCE, it may be necessary to use a "titre V" to value the COP and Pes certified values.

Geothermal sensor with direct expansion (evaporation):

The heat pump uses the calories of the ground through a buried sensor with direct expansion which plays the role of the evaporator.

Return of the heating circuit and regulated water loop³:

The heat pump uses the calories from the return of the heating circuit. This allows you to recover, during a period of non-heating, the calories that are generated by the sunshine of the rooms and by the equipment present on the premises.

3.2 Installation of the water heater

The units must be installed according to the manufacturer's instructions and in accordance with § 5 of EN 16147.

3.3 Symbols and abbreviations

The symbols and abbreviations are those listed in § 4 of EN 16147.

Additional abbreviations:

θ_A :	Maximum value of the temperature of the hot water withdrawn observed during the first two withdrawals of step E
θ_E :	Water temperature at the end of step E.
θ_{sc} :	Rated temperature of the heat source (Rated value)
θ_{as} :	Rated ambient temperature of the storage tank (Rated value)
V_n	Nominal volume declared by the manufacturer (see §6)
V_m	Measured storage volume (l)

Throughout the document the COPDHW is noted COP.

4 General requirements and test methodology

4.1 Test conditions :

The settings and test conditions are those described in § 6 of EN 16147.
For outdoor air, the test is performed according to average climate conditions.

4.2 Additional test conditions:

Type of heat source	Heat source Air temperature (°C) (a)	Heat source Inlet / outlet temperatures or bath temperature (°C)	Ambient temperature range of the heat pump (°C)	Ambient temperature of the storage tank (°C)
<u>Return of the heating circuit and regulated water loop</u>	/	25/22	Between 15 and 30	20
<u>Mixed Exhaust Air</u>	7 (6)	/	Between 15 and 30	20
<u>Multisource Exhaust Air</u>	20 (12)		Between 15 and 30	20

(a) All air temperatures are dry, wet temperatures are in brackets

³ Since the source type "Return of the heating circuit ..." is not currently automatically taken into account in IdCET and Th-BCE, it may be necessary to use a "titre V" to value the COP and Pes certified values.

A unit operating in "ambient air" is compulsorily tested in "indoor air at 20 ° C" and "air unheated space at 15 ° C" condition. The information necessary for the adjustment of the product to carry out the tests must be indicated (whether on the instructions or via the control interface or any other available means accompanying the device).

For appliances on extract air, annex I is applicable. The absorbed power correction (WEI-Corr) applies as soon as the heat pump is in operation (compressor and/or fan, etc.).
For other ducted appliances on outside air, figure I of appendix I is applicable.

4.3 Additional test conditions for units using exhaust air or mixed exhaust air or multisource exhaust air as a source of heat:

4.3.1 Determination of test rates and associated performance

The manufacturer declares the scope of use covered by the unit for the production of Hot Water (DE_{ECS}). This field of use must be included in the ventilation application area (DE_{VENT}).

DE_{ECS} is tested at least twice:

- for the average flow of its minimal configuration
- for the average flow of the maximum configuration

Note: the field of use of DE_{ECS} can be different for the same product in humidity-controlled and self-regulating ventilation.

The average flow rates for the tests are determined as follows:

Minimum usage domain configuration: average flow = MIN (Q_{ventmoy} X C_{dep} ; Q_{varepspec} X C_{dep})

Maximum usage domain configuration: average flow = MAX (Q_{ventmoy} X C_{dep} ; Q_{varepspec} X C_{dep})

In self-regulating ventilation, average flow = Q_{ventmoy} X C_{dep}

With: Q_{ventmoy} = [(D_{ugd} X Q_{vpointe} + (168 - D_{ugd}) X Q_{vbase}] / 168

D_{ugd}: duration of use in high flow kitchen in h per week

Q_{vpointe}: high flow

Q_{vbase}: basic flow

C_{dep} = 1,1 (fixed value to be used in this document)

In humidity-controlled ventilation, average flow = Q_{varepspec} X C_{dep}

With: Q_{varepspec} = defrosting flow of the humidity-controlled ventilation system, according to technical opinion

C_{dep} = 1,1 (fixed value to be used in this document)

For "individual" units, including a fan:

- the average flow test of the minimum configuration of DE_{ECS} is carried out with a pressure difference of at least 50 Pa
- the average flow test of the maximum configuration of DE_{ECS} is carried out with a minimum pressure difference of 70 Pa

A COP, a stabilized power absorbed P_{es}, a warm-up time t_h and an energetic efficiency are determined for each of the tests carried out.

The certified COP and energetic efficiency value for these devices is calculated by linear interpolation from the test values for the average ventilation rate corresponding to the F4 housing configuration (1 Bath + 1 WC + 1 Shower room) and this for each ventilation systems. However, for water heaters that do not cover this configuration, the housing configuration F2 (1Bain + 1WC) is retained covered by the product (self-regulating and/or humidity-controlled VMC type A and B).

This certified COP and energetic efficiency values will be displayed for each system:

COP air exhaust on self-regulating ventilation

COP air exhaust on humidity-controlled VMC type A and B

The setting parameters for the testing of the product submitted for admission must be clearly identified to allow reproducibility of these tests during the checks.

4.3.2 Determination of the Performance for "collective" appliances that do not incorporate a fan but are evaluated from a model incorporating a fan

It is necessary to determine the power of the fan (P_{vent}) to exclude for the calculation of the performances of the model of use "collective" not integrating fan. Only the consumption of the fan is to be excluded. Consumptions of other auxiliaries (regulator, display, etc.) must not be removed.

Note: Absorbed power corrections defined by the formula (2) of § 7.4.1 of EN 16147 apply.

Pvent definition:

This is the power consumed by the fans built into the water heater. It is calculated by difference between the consumption of the water heater with fan in operation ($P_{vent} + aux$) and the consumption of the water heater with fan disengaged (P_{aux_mes}), the compressor and the electrical backup being stopped in both case.

$$P_{vent} = P_{vent} + aux - P_{aux_mes}$$

Determination method of Pvent and Paux_mes

The manufacturer must provide the method to disengage the fan during the measurement of P_{aux_mes} . This software or mechanical method, installed permanently or temporarily for the test, must be able to be implemented from outside the thermodynamic water heater without generating malfunction.

4.3.3 Determining IdCET Performance

For exclusive use in RT2012/RE2020 calculations, performance is also defined (COP, P_{es} and also SCFP) that does not integrate the auxiliary powers already taken into account in the ventilation unit.

Note: COP IdCET, P_{es} IdCET P_{es} IdCET and also SCF IdCET values are not calculated if the electrical back-up is activated during one of the stages C, D, E or F (§7 figure 2 of standard EN 16147).

Note 2: all variables with the mention "IdCET" are intended for appliances using extract air or mixed extract air or multisource extract air as a heat source.

4.3.3.1 Cases of "individual" use, incorporating a fan

For the calculation of the IdCET COP, P_{es} IdCET and also SCF IdCET and its guardrail (see Appendix AIII.1, the power $P_{vent} + aux$ is subtracted from the electrical consumptions on the respective durations t_{TTC} and t_{es} , as well as during the reference period and the smart period.. The corrections in formula (3) of §7.4.1 of EN 16147 do not apply.

4.3.3.2 Cases of "collective" units

The power consumed by the outdoor fan (s) is not taken into account.

For appliances with "collective" use that do not incorporate a fan but are evaluated using a model incorporating a fan, the methods of 5.3.2 apply. Consumptions of other auxiliaries (regulator, display, etc. ...) should not be removed. In any case, the corrections of formula (2) of §7.4.1 of EN 16147 do not apply.

5 Step and order of the tests

If the unit is declared to be operating entirely in off-peak hours (§ 7.3 of EN 16147), the laboratory must perform the tests taking into account this type of operation. All the tests are carried out according to the modalities of § 7.2 of the standard EN 16147.

5.1 Measurement of the storage volume V_m (l)

The test is performed according to §7.6 of EN16147..

Result

Storage capacity: $V_m = ###, \# l$

NOTE : adding a " , #" because the standard requires a 1 / 10th indication.

5.2 Warm-up period t_h (h.min)

Test is performed according to §7.7 of standard EN 16147.

5.3 Absorbed power in steady state P_{es} (kW)

Test is performed according to § 7.8 of standard EN 16147.

5.4 Coefficient of Performance (COP) and Energetic Efficiency

The draw profile is the profile declared by the manufacturer. It corresponds to the one with the highest reference energy that a water heater can supply by filling the temperature and flow conditions of the said withdrawal profile, or the immediately lower withdrawal profile, the latter being at a minimum of type M. The test is carried out in accordance with § 7.9 and §7.13 of EN 16147.

The water temperature θ_E at the end of stage E (§ 7.2 figure 1 of standard EN 16147) must be greater than or equal to $\theta_A - 1^\circ\text{C}$.

During the withdrawal phases, the acquisition step is less than or equal to 3 seconds.

During the other phases of this step, the acquisition step is less than or equal to 60 seconds.

The calculated COP (classical or smart) is rounded to the nearest 0.01 (example 3.564 => 3.56 / 3.565 => 3.57)

The calculated energetic efficiency is rounded to the nearest unit (example 94.4 => 94 / 94.5 => 95)

5.5 Reference hot water temperature and mixed water volume at 40 ° C V_{40} (l)

Test is performed according to §7.10 of standard EN 16147.

5.6 Equipment with intelligent control – smart control

If the equipment is declared as equipped with a smart control, the test is carried out according to the procedures of article 7.11 of the EN16147 standard and appendix III "Active management of the smart control type - smart control".

The manufacturer shall provide a method to enable smart control. This method (manual, software installed permanently or temporarily for the test, etc.) must be able to be implemented at the latest at the start of step 3 in figure 3 of standard EN 16147, without generating operating faults.

5.7 Anti-corrosion system

The unit must be equipped with an anti-corrosion system.

5.7.1 Permanent system

System that protects the tank against maintenance free corrosion throughout the life of the unit. This system allows the joint use of a permanent anti-corrosion system and one or more sacrificial anodes.

Control: Manufacturer's declaration on the presence of a 24-hour protection system, regardless of the type of power supply used.

5.7.2 Temporary system

System using one or more sacrificial anodes.

Control: declaration of the manufacturer on the presence of one or more sacrificial anodes.

5.7.3 Other system

Control: declaration of the manufacturer justifying the effectiveness of the technology used.

5.8 Thermal load of the electric back-up

The thermal load of the electrical back-up is defined as the power of the resistance (in W) divided by the surface of the body of the appliance in contact with the water contained in the tank (in cm²).

Calculation as appropriate:

- Resistance placed in a sleeve: Heating power (in W) / surface (in cm²), submerged neutral zone of the tube of the heating body including.

- Immersed resistance (shielded): Heating power (in W) / actual heating area (in cm²), neutral zone included.

Verification of the manufacturer's declaration, by calculation made according to the plans provided, when the electric back-up turns on.

5.9 Tank Warranty

Control of documents accompanying the unit to ensure that the manufacturer guarantees, at least for 5 years, the tightness of the tank.

5.10 Installation and Operating Instructions

5.10.1 Unit operating on ambient air

The manufacturer must include in the instruction manual information specifying that the equipment must be installed in a sufficient volume.

5.10.2 Unit operating on return of the heating circuit and on regulated water loop

The manufacturer must state in the installation instructions of the unit that the heat pump uses the calories of a controlled temperature water loop and that this water loop must be heated mainly by a source of renewable energy.

5.11 Switching on the electric booster

Check that the electric back-up is switched on or off during steps C, D, E and F and smart control.

5.12 Auxiliary power

Under the thermal regulation applicable to new buildings, the power of the auxiliaries P_{aux} is conventionally set to zero because the consumption of the auxiliaries are already integrated in the consumptions used to determine the performances of the apparatus (COP, energetic efficiency, P_{es} and SCF). This also applies to devices for which a non-zero P_{aux_mes} has been measured according to §4.3.2.

6 Définitions et critères d'obtention des catégories

Measured value	Abreviation	Unit	Categorie ★★	Categorie ★★★
Storage capacity	V_m	l	$\geq V_n$	$\geq V_n$
Reference hot water temperature	θ'_{WH}	°C	$\geq 52,5$	$\geq 52,5$
Absorbed power in steady state	P_{es}	kW	$\leq 0,0001 \times V_n + 0,029 + (20 - \theta_{as})/1000$	$\leq 0,0001 \times V_n + 0,024 + (20 - \theta_{as})/1000$
Thermal load of the electric auxiliary		W/cm ²	≤ 12	≤ 12
Volume of mixed water at 40 °C	V_{40}	l	$\geq (\theta_A - 10)/30 / 1,33 \times V_m$	$\geq (\theta_A - 10)/30 / 1,22 \times V_m$
Energetic Efficiency	η_{WH}	%	$\geq Q_{ref} / (Q_{ref} + 2,44) + \theta_{sc} / 100$	$\geq Q_{ref} / (Q_{ref} + 1,95) + \theta_{sc} / 100$
Duration of temperature: Exhaust air, mixed exhaust air, multisource exhaust air others technologies	t_h	<i>h.min</i>	$\leq 18,00$ $\leq 14,00$	$\leq 18,00$ $\leq 14,00$
Switching on the electric auxiliary (if existing) ⁴			Switching on the electrical back-up authorized in the appliance during steps C to F	Switching on the electrical back-up not allowed in the appliance during steps C to F

⁴ When the back-up is activated, the certified COP and P_{es} values can not be valued in IdCET and Th-BCE

7 Criteria to be Included in the License

7.1 Outdoor air

Power (W).
Voltage (V) / Frequency (Hz)
Class
IP degree
Category
Capacity (l)
Switching on the electric back-up YES / NO
Equipment with intelligent control YES / NO.
Smart Control Factor : SCF_{certified}.
COP at 7°C
COP_{smart} at 7°C.
Energetic Efficiency
Volume of mixed water at 40°C : V₄₀ (l)
Reference hot water temperature (°C)
Absorbed power in steady state: P_{es} (kW)
Racking cycle
Duration of temperature setting: th
Heat load of the electrical back-up (W / cm²)
Auxiliary power (RT 2012): P_{aux} = 0 W

7.2 Ambient air

Power (W).
Voltage (V) / Frequency (Hz)
Class
IP degree
Category
Capacity (l)
Racking cycle
Heat load of the electrical back-up (W / cm²)
Switching on the electric back-up at 15°C or 20°C YES / NO
Equipment with intelligent control YES / NO.
Smart Control Factor : SCF_{certified}.
COP at 15°C
COP_{smart} at 15°C.
Energetic Efficiency at 15°C
Volume of mixed water at 40 ° C usable at 15°C: V₄₀ (l) :
Hot water temperature of reference at 15°C (°C)
Absorbed power in steady state at 15°C : P_{es} (kW)
Duration of temperature setting at 15°C : th (h.min)
Auxiliary power at 15°C (RT 2012) : P_{aux} = 0 W
COP at 20°C
COP_{smart} at 20°C.
Efficiency at 20°C
Volume of mixed water at 40 ° C usable at 20°C: V₄₀ (l) :
Hot water temperature of reference at 20°C (°C)
Absorbed power in steady state at 20°C : P_{es} (kW)
Duration of temperature setting at 20°C : th (h.min)
Auxiliary power at 20°C (RT 2012): P_{aux}= 0 W

7.3 Exhaust air or mixed exhaust air or multisource exhaust air

Power (W).
Voltage (V) / Frequency (Hz)
Class
IP degree
Category
Capacity (l)
Switching on the electric back-up YES / NO
Racking cycle
Heat load of the electrical back-up (W / cm²)
Auxiliary power (RT 2012): P_{aux} = 0 W
Equipment with intelligent control YES / NO.
Airflow for smart control test:
Smart Control Factor : SCF_{certified}.
Smart Control Factor IdCET : SCF IdCET_{certified}.

Flow min Q1 et max Q2 of the field of use, as well as any intermediate flows
Air flow Q_i (m³/h)
Volume of water mixed at 40 ° C usable at air flow Q_i : V_{max} (l)
Reference hot water temperature at air flow Q_i (° C)
COP at 20 ° C with air flow Q_i: COP_i
Energetic Efficiency
Power absorbed in stabilized regime with air flow Q_i : P_{es} (kW)
Duration of temperature with air flow Q_i : t_h
COP_{IdCET} with air flow Q_i
COP_{IdCET_{smart}} with air flow Q_i
P_{es}IdCET with air flow Q_i
Air flow in Hygro A mode for F4 type housing (F2 if applicable): Q_{ventmoy} (m³ / h)
COP certified at 20°C Hygro A
COP_{smart} at 20°C Hygro A.
Energetic Efficiency at 20°C Hygro A
COP_{IdCET} at 20°C Hygro A
COP_{IdCET_{smart}} at 20°C Hygro A.
Air flow in Hygro B mode for F4 type housing (F2 if applicable): Q_{ventmoy} (m³ / h)
COP certified at 20°C Hygro B
COP_{smart} at 20°C Hygro B
Energetic Efficiency at 20°C Hygro B
COP_{IdCET} at 20°C Hygro B
COP_{IdCET_{smart}} at 20°C Hygro B.
Air flow in auto-adjustable mode for F4 type housing (F2 if applicable): Q_{ventmoy} (m³ / h)
COP certified at 20°C Auto-adjustable
COP_{smart} at 20°C Auto-adjustable.
Energetic Efficiency at 20°C Auto-adjustable
COP_{IdCET} at 20°C Auto-adjustable
COP_{IdCET_{smart}} at 20°C Auto-adjustable.

Annexe I Test protocol for equipment operating on exhaust air (air flow measurements)

The purpose of this instruction is to specify the protocol for aerodynamic tests for thermodynamic water heaters operating on exhaust air.

It refers to §4 of the CDC LCIE 103-15 / C - General prescription and test methodology.

Symbols

D: connection diameter

P_e : static pressure at the entrance

P_s : static pressure at the exit

Q1: average flow of the manufacturer's minimum configuration of the field of use

Q2: average flow of the manufacturer's maximum configuration of the field of use

Q_i ($i \geq 3$): additional flow (s) (optional)

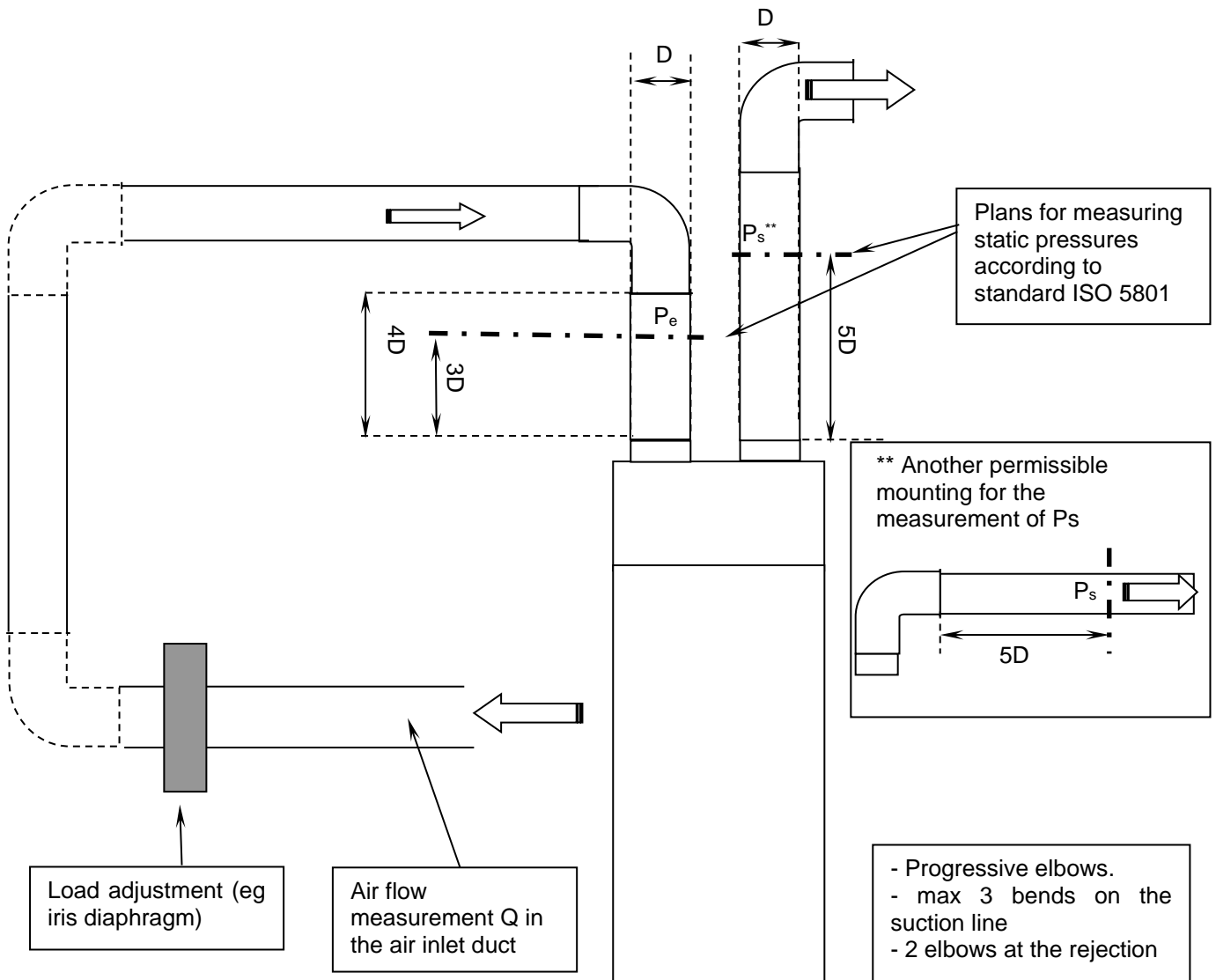


Figure n°1 : Example of aeration installation with pressure drop adjustment and air flow measurement in the inlet duct

Any aeraulic installation with pressure drop adjustment and air flow measurement in the outlet duct is also acceptable as long as it complies with the conditions of use of the equipment used.

At least two COPs called COP1 and COP2 are determined at the respective flow rates Q1 and Q2

The flow rate Q2 must be achievable with a minimum static pressure difference Ps-Pe of 70 Pa.

The flow rate Q1 must be achievable with a minimum static pressure difference Ps-Pe of 50 Pa.

Note: The flow rate setting of the device is either following the instructions provided by the manufacturer, or using an additional pressure drop.

Reference configuration:

The COP and energetic efficiency values certified for these devices are calculated for an average ventilation flow Q_{mref} corresponding to the F4 housing configuration: 1 Bath + 1 WC + 1 Shower room or, for appliances that do not cover this area. configuration, for an average ventilation flow Q_{mref} corresponding to configuration F2: 1 bath + 1 WC.

The COP and energetic efficiency values certified at Q_{mref} will be linearly interpolated using the test values (at least 2) and the reference values for each system will be displayed:

VMC auto
VMC hygro

Linear interpolation of reference values from 2 tests

Figure 2 shows an example of a linear interpolation between COP1 and COP2 to determine the reference value (s) COPcertifié at the average flow rate (s) of ventilation Q_{mref} *

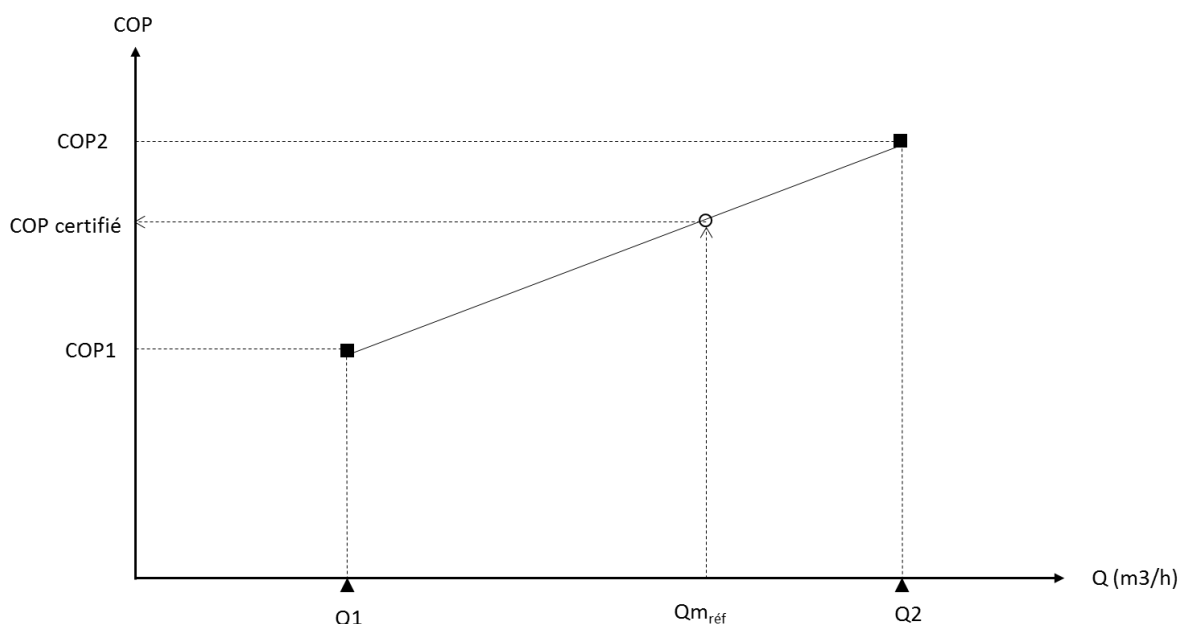


Figure n°2 : Determination of the certified COP from 2 tests

At the request of the manufacturer, the interpolation can be refined with one or more additional test points, without limiting the number of points. The static pressure rise generated by the Ps-Pe product shall be greater than 50 Pa for each additional test point.

Figure 3 shows an example of refined linear interpolation between COP1, COP3 and COP2 to determine the reference value (s) COP certified at the average flow rate (s) of ventilation Q_{mref} *

The principle is the same for the following certified values: energetic efficiency - warm up period t_h -

Absorbed power in steady state P_{es}

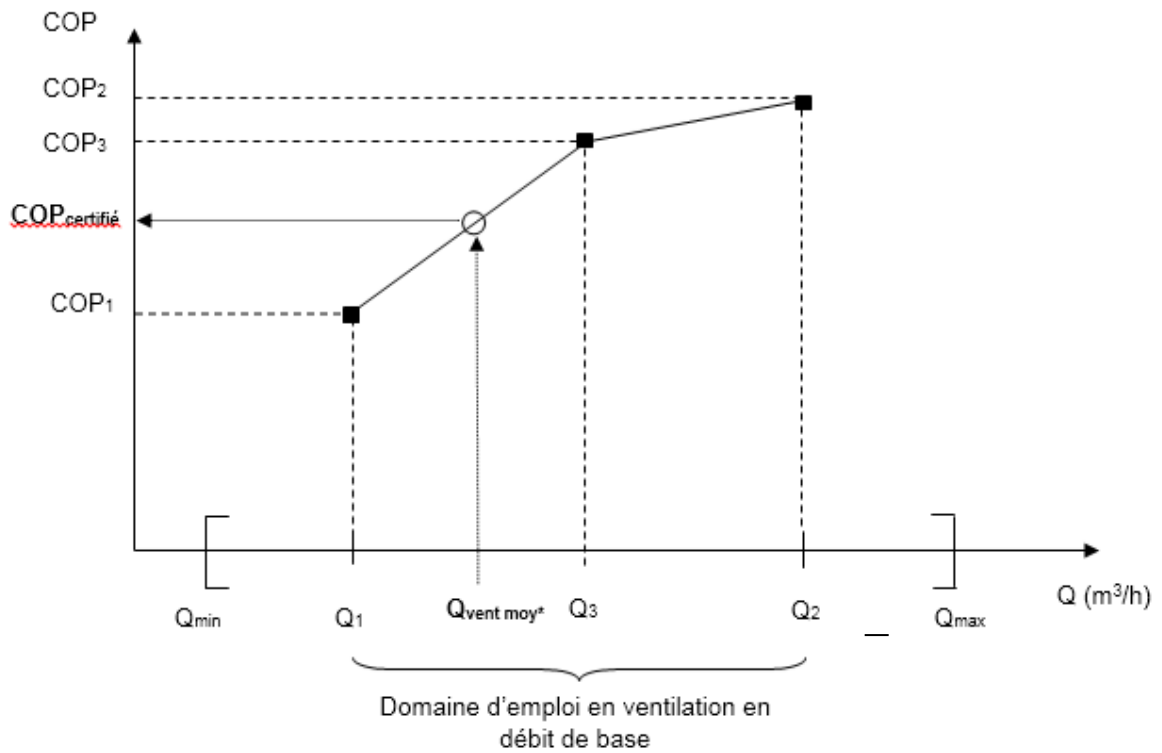


Figure n°3 : Détermination de la COP certifiée à partir de 3 tests

Determining the average flow rate Q_{mref}

- For a self-adjusting system: $Q_{mref} = 126 m^3/h$ (T4 1 Bath + 1 WC + 1 Shower room) or $Q_{mref} = 65 m^3/h$ (T2 1 Bath + 1 WC)
- For a humidity-sensitive system: Q_{mref} to be determined according to paragraph 4.3.1 and the technical advice issued by CSTB to the manufacturer

Annexe II Test protocol for thermodynamic water heaters with static external exchanger

This test protocol includes in all respects the EN16147: 2016 standard and the LCIE 103-15 / C specifications.

When solar gain is activated during the test, the following parameters are taken into account:
the solar flux is set at $170\text{W} / \text{m}^2$,
the daily sunshine duration is 12:50, it starts at 7:00 and ends at 19:50 (basic time of the test),
the sensor (s) is (are) installed vertically in the test cell facing a radiating panel placed at 1m distance.
This panel is 3 meters long and 2 meters high, regardless of the size of the sensor (s) of the thermodynamic water heater. Depending on the size of the sensor (s) of the thermodynamic water heater, the laboratory of the certification body will judge the feasibility of the test.

During the entire test the aero-solar collector (s) + radiating panel assembly is in an environment with a dry temperature of 7°C and a humid temperature of 6°C (in accordance with the EN16147 standard of 2016 and the booklet). loads LCIE 103-15 / C.

The test protocol as described in the standard EN16147: 2016 and in the specification LCIE 103-15 / C remains applicable with the following specific points:

The temperature rise phase starts at 7:00 am ("virtual" time). The rise in temperature therefore starts at the same time as sunshine. If the rise in temperature was to exceed 12:50, the rest of the phase would be carried out without sunshine (time of sunshine elapsed).

At the end of the rise in temperature, the operating phase in steady state begins. Stabilized power consumption will be determined in accordance with EN16147: 2016. No sunlight will be made during this phase of tests,

The COP determination step will be carried out in accordance with the EN16147: 2016 standard and the LCIE 103-15 / C specifications with sunshine from 7:00 am ("virtual" time) to 19:50 ("virtual" time). Only one sunshine sequence will be performed during this test, regardless of the total duration of the test.

The measurement phase of the maximum water temperature achievable in thermodynamic mode takes place in the same sunshine conditions as the temperature rise phase. It starts at 7:00 am (virtual time), at the same time as sunshine. If this phase was to exceed 12:50, the rest of the phase would be done without sunshine.

Explanatory note for "solar" flux values

In order to take into account the solar contributions in determining the performances of this type of system, the evaporator is subjected to conditions of outside temperature and sunshine representative of a French "average" climate.

Calculations from the RT2005 RT 2012 weather files make it possible to determine that the average annual outdoor dry temperature of 7°C (EN16147: 2016 condition) is obtained for the Nancy weather. The solar radiation at the sensor level (South / inclination 90°) and the average daily sunlight time for this geographical zone are respectively equal to $170\text{W} / \text{m}^2$ and 12h50min

Annex III Active management of the Smart Control type - Smart Control

The tests are carried out in accordance with article 7.11 of standard EN 16147 (2017), taking into account the additions to this appendix.

The CTF laboratories carrying out the tests themselves must obtain from the certifier the sequence of withdrawal profiles to be used during the smart cycle tests, a sequence comprising 3 times the nominal profile declared by the manufacturer and 2 times the immediately lower profile.

Smart control tests are carried out at a single ambient condition defined in paragraphs 4.1 or 4.2 to obtain the value of SCF certified, which can be used to deduce several COPs (depending on airflows or temperatures).

As part of the ambient air tests, a single smart control test at 15°C is carried out. The result obtained will be extended for an ambient condition of 20°C.

For appliances using extracted air, the test is carried out at an average flow rate Q_i described as one of the flow rates tested in appendix I and:

- Either less than or equal to $(Q_1+Q_2)/2$
- Or equal to the average flow Q_1 .

The value of SCF IdCET certified will be calculated by applying the corrections applied in articles 4.3.3.1 and 4.3.3.2 to the electricity consumption. The result values obtained will be extended for the other test flow rates determined in §4.3.1.

Details on the additional electric heating resistance:

The electricity consumption of the additional electric heating resistance described in article 7.9.1 in the case of drawing off with a peak temperature of 55°C and its calculation by equation 11 must be taken into consideration during the test smart control in electricity consumption for the Q_{elec}^{ref} and Q_{elec}^{smart} .

AIII.1. Safeguard on announcements

The manufacturer declares an "Intelligent Control" gain value, named $SCF_{declared}$, which takes into account manufacturing dispersions and variations in gain according to the scheduling of the profiles. This is included in its certification file; it corresponds to the one he plans to communicate publicly for the device concerned. It must be at least 7% to satisfy the Ecodesign regulations.⁵

The gain resulting from the tests in accordance with this appendix is called $SCF_{certified}$. The following scenarios then arise:

- The gain resulting from the tests is strictly less than 7%: the product therefore does not have a "smart control".
- The gain resulting from the tests is greater than or equal to 7% but strictly less than the $SCF_{declared}$: the product has an "smart Control", $SCF_{certified} = 7\%$.
- The gain resulting from the tests is greater than or equal to 7% and to $SCF_{declared}$: the product has an "smart Control", $SCF_{certified} = SCF_{declared}$. (the value declared by the manufacturer is certified).

⁵ If the applicant forget to declare SCF, $SCF = 7$.

AIII.2. Safeguard on reference power consumption

In order to avoid an abnormal value on the reference electricity consumption, the following parameters are defined

a) Raw daily COP COP_{raw}

The raw Daily COP COP_{raw} aims to define a COP independent of the static losses of the device and is defined according to Formula A.III.1

$$COP_{raw} = \frac{Q_{LP}}{W_{EL-LP} - 24 \times P_{es}}$$

Where Q_{LP} , W_{EL-LP} and P_{es} are the terms measured in article 5.4 when measuring performance, excluding smart control.

The raw daily COP COP_{raw} , based on electricity consumption and made independent of static losses, is considered to be not very dependent on the withdrawal profile.

b) Reference Maximum Power Consumption $Q_{elec}^{ref,max}$

Within the framework of the reference week, the maximum electricity consumption of reference $Q_{elec}^{ref,max}$ is based on the electrical consumption during the performance test, excluding smart control, carried out according to paragraph 5.4. This is defined by formula A.III.2:

$$Q_{elec}^{ref,max} = 1.05 \times (24 \times 7 \times n \times P_{es} + \frac{Q_{LP}^{ref}}{COP_{raw}^{ref}})$$

n=1 if the reference period lasts one week, n=2 if the reference period lasts two weeks

c) Verification of the reference electricity consumption Q_{elec}^{ref}

The electricity consumption measured during the reference period Q_{elec}^{ref} of article 7.11 of EN16147, must respect the following condition:

$$Q_{elec}^{ref} \leq Q_{elec}^{ref,max}$$

Failing this, Q_{elec}^{ref} will be taken equal to $Q_{elec}^{ref,max}$ for the determination of the $SCF_{certified}$ and, where applicable, for the determination of the $SCF_{IdCET_{certified}}$

AIII.3. Safeguard on the engagement of the electrical back-up present in the tank

If the latter was not used during the initial test to determine the COP (article 7.9 of EN16147), the entire learning period (step 1 to step 5 included) must be carried out without tripping the electrical back-up present in the water heater.

AIII.4. Safeguard on the maximum temperature at the top of the tank

During the learning period, the maximum temperature at the top of the tank must not exceed by more than 2 K, that observed during the initial test to determine the COP (article 7.11 of EN16147).

AIII.5. Results

- The result of the SCF smart control measurement is strictly less than 7%: the product therefore does not have a "Smart Control" (smart value = 0)
- The result of the SCF smart control measurement is greater than or equal to 7%: the product has "Smart Control" (smart value = 1). In these cases, we get:

The Coefficient of Performance with Smart Control (COP_{smart}) is calculated with the equation:

$$COP_{smart} = COP / (1 - smart \times SCF_{certifié})$$

The Coefficient of Performance IdCET with Smart Control (COPI_{IdCET}_{smart}) is calculated with the equation:

$$COPI_{IdCET_{smart}} = COPI_{IdCET} / (1 - smart \times SCF_{IdCET_{certifié}})$$