BS EN 1397:2015

BSI Standards Publication

Heat exchangers — Hydronic room fan coil units — Test procedures for establishing the performance

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National foreword

This British Standard is the UK implementation of EN 1397:2015. It supersedes BS EN 1397:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RHE/17, Testing of air conditioning units.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Heat exchangers - Hydronic room fan coil units - Test procedures for establishing the performance

Échangeurs thermiques - Ventilo-convecteurs à eau - Procédures d'essai pour la détermination des performances

Wärmeübertrager - Wasser-Luft-Ventilatorkonvektoren - Prüfverfahren zur Leistungsfeststellung

This European Standard was approved by CEN on 3 July 2015.

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European foreword

This document (EN 1397:2015) has been prepared by Technical Committee CEN/TC 113 “Heat pumps and air conditioning units”, the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2016 and conflicting national standards shall be withdrawn at the latest by February 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1397:1998.

The main modifications with regard to the previous edition include:

— modification of the scope, with the inclusion of ducted units < 120 Pa;

— revision of test conditions and technical requirements to be consistence with CEN/TC 113 standards;

— revision of test methods;

— addition of an informative annex for measurement of the inlet air flow rate for non-ducted units;

— deletion of the clause about sound power level measurement that will be dealt with in EN 16583.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard applies to hydronic fan coil units (FCU) as factory-made single assemblies which provide the functions of cooling and/or heating but do not include the source of cooling or heating.

This European Standard covers both air free delivery and air ducted units with a maximum external static pressure due to duct resistance of 120 Pa max.

This European Standard applies to all types of fan speed control of a fan coil unit (variable speed, multispeed).

This European Standard deals with the cooling and heating functions of the FCU considered as an emitter for cooling/heating of a room/space. It does not cover any ventilation function of the unit.

If the FCU can also provide fresh air, this function is not considered and the fresh air inlet closed during testing.

This European Standard provides a method for the determination of the thermal performance of fan coil units in standard conditions, for the use with hot or chilled water or water mixtures. The test procedures given in this standard may additionally be used for determining performance at other conditions.

It also provides the method for the determination of the air flow rate supplied by the fan coil unit.

This standard does not cover the rating of heating or cooling from direct expansion coils or heating from electric resistance elements.

The standard does not cover acoustic performance of fan coil units which is dealt with in EN 16583.

It is not the purpose of this standard to specify the tests used for production or field testing.

NOTE For the purpose of remaining clauses, the term “unit” is used to mean “fan coil unit” as defined in 3.1.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5801, *Industrial fans — Performance testing using standardized airways*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
hydronic fan-coil unit
factory-made single assembly which provides one or more of the functions of forced circulation of air, heating, cooling, dehumidification and filtering of air, but which does not include the source of heating or cooling

Note 1 to entry: This device includes at least a liquid-to-air heat exchanger and a fan, and may be designed for free or ducted intake air and/or for free or ducted delivery of supply air.

3.2
heating capacity
total heat added to the air by the unit

3.3
total cooling capacity
total heat removed from the air by the unit which is the sum of the sensible and latent cooling capacities

3.4
sensible cooling capacity
heat which is removed from the air by means of a dry-bulb temperature drop

3.5
latent cooling capacity
heat which is removed from the air by condensation of water vapour on the cooling coil

3.6
total electric power input
total electric power absorbed by the unit, including fan(s) and auxiliary devices but excluding any electrical resistance heater

3.7
2-pipe fan coil unit
fan coil unit having a single coil, one supply pipe, supplying either cold or hot water to the unit, and one return pipe

Note 1 to entry: The fan coil unit can include an electrical resistance for heating purpose.

3.8
4-pipe fan coil unit
fan coil unit having one coil with two independent water circuits for cooling and heating, or two independent cooling/heating coils

3.9
standard rating condition
mandatory condition that is used for comparison purposes

3.10
application rating condition
optional rating condition which provides additional information on the performance of the unit

3.11
standard fan speed
fan speed setting declared by the manufacturer and used for setting the air flow rate conditions of ducted units

Note 1 to entry: The fan speed setting can be declared by the manufacturer as a certain wiring, a switch position or a steering voltage.

3.12
external static pressure
positive pressure difference measured between the air outlet and inlet sections of the unit

3.13
liquid pressure drop
negative pressure difference measured between the outlet and inlet connections of the liquid circuit of the unit

4 Designation of fan coil units

Fan coil units can be ducted or non-ducted. They can be standing on the floor, hung on the wall, or fitted into the ceiling or floor, with the inlet and outlet air sections located either on the front, back, bottom or top of the unit.

Annex A provides a series of drawing schemes associated to designations to show typical existing configurations.

5 Symbols

For the purposes of this document, the symbols indicated in Table 1 apply.

Table 1 — Symbols

Symbol	Description	Unit
c_{pL}	Specific heat capacity of liquid	kJ/(kg K)
h_{L1}	Specific enthalpy of liquid at inlet connection (= $c_{pL1} \times t_{L1}$)	kJ/kg
h_{L2}	Specific enthalpy of liquid at outlet connection (= $c_{pL2} \times t_{L2}$)	kJ/kg
Δh_w	Vaporization heat of water (constant = 2460)	kJ/kg
n_1	Rotational speed of the fan at air flow test	min^{-1}
n_2	Rotational speed of the fan at capacity test	min^{-1}
P_{elec}	Total power input	W
P_{lat}	Latent cooling capacity	W
P_{sens}	Sensible cooling capacity	W
P_C	Total cooling capacity	W
P_H	Heating capacity	W
P_{atm}	Atmospheric pressure	kPa
p_A	External static pressure	Pa
q_{mA}	Mass flow rate of air	kg/s
q_{mL}	Mass flow rate of liquid	g/s
q_{mW}	Mass flow rate of condensate (air side)	g/s
t_{L1}	Liquid inlet temperature	°C
t_{L2}	Liquid outlet temperature	°C
t_A	Air inlet dry bulb temperature	°C
t_{Adp}	Air inlet dew point temperature	°C
t_{Aw}	Air inlet wet bulb temperature	°C
Δp_L	Liquid side pressure drop	kPa

6 Air flow rate test for ducted units

6.1 General conditions

The test is required to measure the outlet air flow rate of ducted units.

For non-ducted units or ducted units with a declared static pressure lower than 50 Pa at standard fan speed, the test is optional and is described in the informative Annex B.

For testing, the unit shall include an air filter but no any other accessory for air inlet or diffusion or others. Dampers for fresh air intake shall be closed.

NOTE 1 No modification such as sealing is made on the unit before testing.

If the unit includes flaps, they shall be adjusted in a fixed position according to the manufacturer instructions. If this information is not available, their position shall correspond to the maximum mechanical open position.

NOTE 2 This maximum mechanical open position might differ from the minimum airflow resistance.

6.2 Test installation

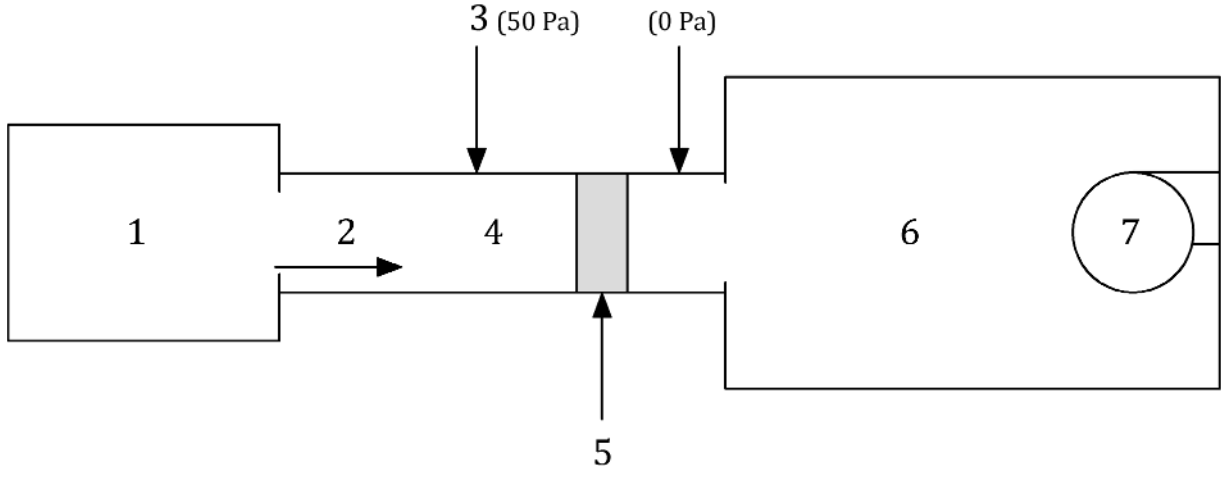
6.2.1 Outlet measurement method

The installation is described in Figure 1.

The air flow measurement equipment consists of a test chamber, an air flow measuring device and an auxiliary fan, all in accordance with ISO 5801, installation category “B”.

The discharge section of the fan coil unit shall be connected to the test chamber through a ductwork having an adjustable resistance, and made in compliance with ISO 5801. In case of several outlet sections, the ductwork shall contain all of them.

For units that can be ducted at the inlet, the tests are performed without inlet duct(s).



Key

1 object under test (with 0 Pa at the inlet)
2 measured air flow
3 external static pressure
4 ductwork
5 adjustable duct resistance (e.g. damper)
6 test chamber with airflow measuring apparatus
7 fan (may be inside or outside the discharge chamber)

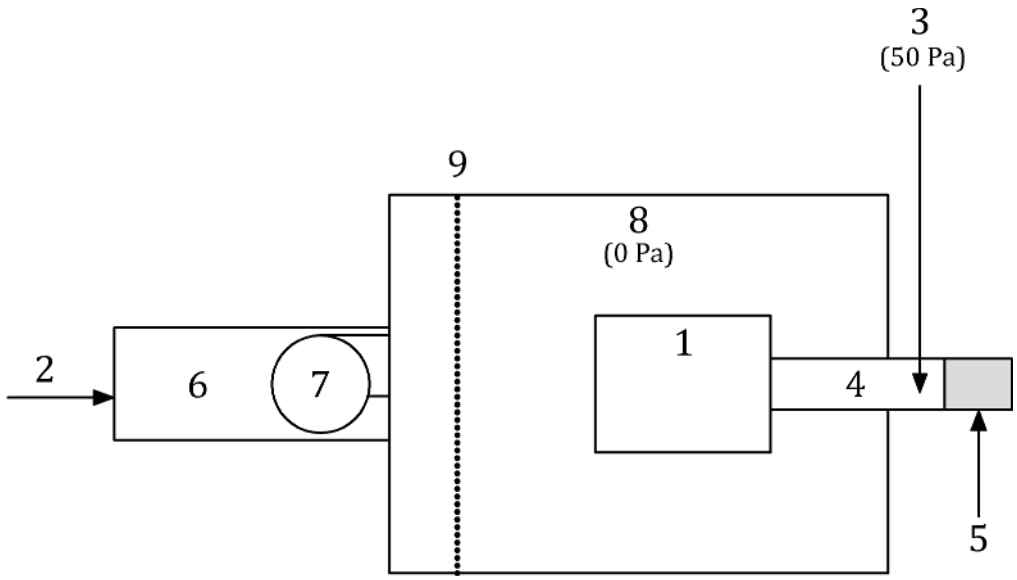
Figure 1 — Example of test installation (outlet measurement method)

6.2.2 Inlet measurement method

The installation is described in Figure 2.

The fan coil unit is placed in a chamber. The air flow measuring device is connected to the entrance of this chamber.

The outlet section of the unit is connected to a ductwork including a damper for adjusting the external static pressure. In case of several outlet sections, the ductwork shall contain all of them.



Key

1	object under test (with 0 Pa at the inlet)	6	airflow measuring apparatus
2	measured air flow	7	fan
3	external static pressure	8	test chamber
4	ductwork	9	flow straightener
5	adjustable duct resistance (e.g. damper)		

Figure 2 — Example of test installation (inlet measurement method)

6.3 Pressure settings

For the standard fan speed declared by the manufacturer, the following conditions shall be fulfilled:

— 0 Pa at the inlet of the unit;

— an external static pressure (ESP) of 50 Pa at the outlet of the unit;

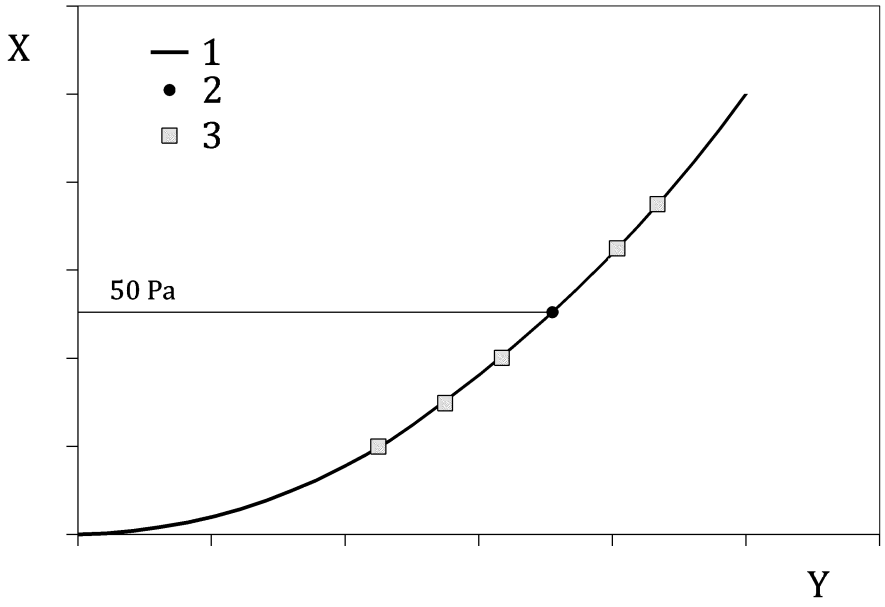
— inside the test chamber a static pressure equal to 0 Pa.

For air flow rate measurements at other fan speeds than the standard fan speed, the following apply:

— no change in the position of the adjustable outlet duct resistance;

— 0 Pa at the inlet of the unit;

— inside the test chamber a static pressure equal to 0 Pa, so that the same network curve resistance is used (see Figure 3).



Key

1 ductwork load curve
2 reference standard speed
3 other speeds
X external static pressure difference (Pa)
Y flow rate

Figure 3 — Setup external static pressure difference of ducted units other speeds

6.4 Standard rating conditions

The air flow rate measurement shall be made in isothermal conditions with dry coil, at an ambient temperature of 20 °C and at nominal voltage and frequency as specified by the manufacturer, for all fan speeds declared by the manufacturer, with the allowable deviations as specified in Table 2.

Table 2 — Permissible deviations for set values

Measured quantity	Permissible deviation of the arithmetic mean values from set values	Permissible deviations of time-individual measured values from set values
Ambient air: dry bulb temperature	± 5 K	± 5 K
Voltage	± 1 %	± 2 %
External static pressure	± 1 Pa	± 5 Pa

6.5 Test procedure

The fan coil shall be disconnected from the cooling or heating power supply or the liquid circulation shall be stopped.

Test shall be performed according to ISO 5801.

The fan motor shall run for at least half an hour before measuring the flow rate.

The air flow rate measurement shall be conducted under steady state conditions, which are assumed to be achieved when the rotational speed of the fan motor(s) does not change by more than 1 % but not less than 10 r/min within 15 min.

6.6 Data to be recorded

The data to be recorded for the air flow rate test are given in Table 3. The table identifies the general information required but is not intended to limit the data to be obtained.

Table 3 — Data to be recorded

	Symbol	Unit
Atmospheric pressure	P_{atm}	kPa
Voltage	-	V
Frequency	-	Hz
Speed control setting of the fan speed	-	-
Total power input	*Pelec*	W
Rotational speed of the fan	n_1	min^{-1}
Air inlet dry bulb temperature	t_{AI}	°C
Air inlet dew point temperature	t_{AIdp}	°C
Volume flow rate of air	q_{vA}	m^3/h
Mass flow rate of air	q_{mA}	kg/s
External static pressure	p_A	Pa

7 Capacity rating tests

7.1 General conditions

For testing the unit shall include an air filter but no any other accessory for air inlet or diffusion or others. Dampers for fresh air intake shall be closed.

NOTE No modification such as sealing is made on the unit before testing.

7.2 Test room

The test room shall be of sufficient volume and shall circulate air in such a manner that it does not change the normal return air circulating pattern of the unit.

To comply with this, the air velocities at a distance of 0,5 m from the air inlet section area of the unit under test shall not exceed 0,5 m/s when the unit is stopped.

For free delivery units, dimensions shall be such that the distance from any room surface to any surface of the unit from which air is discharged, is not less than 1,5 m, except for units mounted under ceiling or in false-ceiling for which the requirement in 7.3 applies.

The distance from any other room surface or any other surface of the unit shall not be less than 1 m, except for floor, ceiling or wall relationship required for normal installation according to manufacturer's instructions.

7.3 Installation of the test object

The fan coil unit shall be installed in the test room in accordance with the manufacturer's installation using recommended installation procedures. In all cases, the manufacturer's recommendations with respect to distance from adjacent walls, etc. shall be followed in accordance to the requirements given in 7.2.

Free delivery units to be mounted under ceiling or in false-ceiling shall be installed in the test room so that the air discharge section area of the unit is at a distance between 1,8 m and 2 m from the floor.

For 1-way and 2-way cassette type fan coil units, a vertical partition plate shall separate the inlet section from the outlet section(s) to minimize possible recirculation effect onto the air temperature measurements, according to the description given in Annex C.

For 4-way cassette type fan coil units, a separation cone shall be used to separate the inlet section from the outlet sections and to minimize possible recirculation effect onto the air temperature measurements, according to the description given in Annex C.

7.4 Standard rating conditions

7.4.1 Air flow conditions

The general conditions specified in 6.1 apply.

For ducted units, the air flow rate(s) is(are) the one(s) obtained with the settings specified in 6.3, for all declared fan speed(s).

For free delivery units, the fan speed(s) declared by the manufacturer shall be used.

7.4.2 Temperature conditions

The heating and/or cooling capacity shall be determined in accordance with the test conditions specified in Tables 4 to 6.

Table 4 — Temperature conditions in cooling mode

	Unit	Standard rating condition	Application rating condition
Air dry bulb temperature	°C	27	27
Air wet bulb temperature	°C	19	19
Liquid inlet temperature	°C	7	10
Liquid outlet temperature	°C	12	15

Table 5 — Temperature conditions in heating mode – 4-pipe units

	Unit	Standard rating condition	Application rating condition
Air dry bulb temperature	°C	20	20
Air wet bulb temperature	°C	15 max.	15 max.
Liquid inlet temperature	°C	65	70
Liquid outlet temperature	°C	55	60

Table 6 — Temperature conditions in heating mode – 2-pipe units

	Unit	Standard rating condition	Application rating condition
Air dry bulb temperature	°C	20	20
Air wet bulb temperature	°C	15 max.	15 max.
Liquid inlet temperature	°C	45	65
Liquid outlet temperature	°C	40	55

7.4.3 Electrical conditions

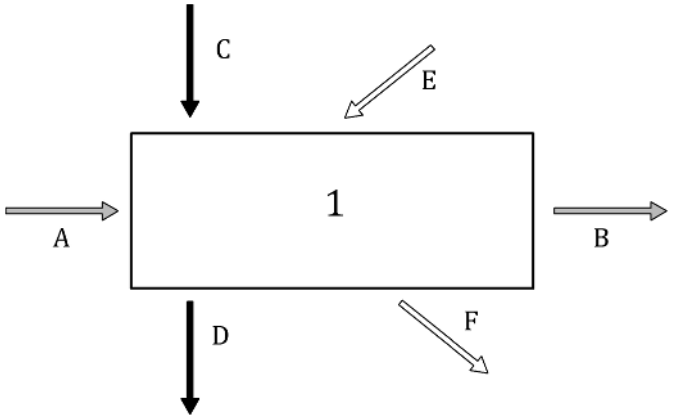
The nominal voltage and frequency shall be set as specified by the manufacturer.

7.5 Test method

7.5.1 General

The principle of the method is to consider the energy balance of the fan coil unit as shown in Figure 4.

The energy balance is obtained as follows: A +C + E = D + B + F.



Key

A	inlet air	D	outlet water
B	outlet air	E	total electric power input
C	inlet water	F	condensate rate
1	fan coil unit		

Figure 4 — Energy flows through the fan coil unit

7.5.2 Cooling capacity

The enthalpy of the condensate rate F is difficult to evaluate because the temperature cannot be accurately measured and it is very small compared to the other terms of the energy balance equation. Therefore, it is assumed that this term can be neglected.

With this assumption, the cooling capacity on the fan coil unit is determined as the cooling capacity measured on the water side minus the total electric power input.

$$P_C = q_{mL} \times \left(h_{L2} - h_{L1}\right) - P_{elec} \quad (1)$$

The latent cooling capacity is given by:

$$P_{lat} = q_{mW} \times \Delta h_W \quad (2)$$

The sensible cooling capacity is given by:

$$P_{sens} = P_C - P_{lat} \quad (3)$$

7.5.3 Heating capacity

The heating capacity of the fan coil unit is determined as the heating capacity measured on the water side plus the total electric power input.

$$P_C = q_{mL} \times \left(h_{L1} - h_{L2}\right) + P_{elec} \quad (4)$$

7.6 Measurements criteria

7.6.1 Air inlet dry bulb temperature

The air temperature sensing elements shall be shielded against thermal radiation.

The temperature measuring points shall be positioned such, that the measurement is not influenced directly by air discharged from the tested fan coil unit (direct recirculation of discharge air).

NOTE The recirculation zone can be verified, e.g. by visible tracer gases.

For free air inlet temperature measurements, it is required to have:

— either a minimum of one measuring point per 0,05 m^2 of air inlet section of the fan coil unit and at least two measuring points;

— or a sampling device. It shall be completed by 4 sensors for checking uniformity if the surface area is greater than 1 m².

All measuring points shall be equidistant from the air inlet and outside any recirculation zone.

The temperatures, measured at individual points, shall not differ by more than ±0,5 K from the mean value for each air inlet section.

For cassette type fan coil units the temperature sensors shall be placed at a distance of 15 cm to 20 cm from the air inlet section.

For units having several air intakes (e.g. front or back and bottom), temperature sensors shall be placed at both inlets with respect of the number of measuring points for each inlet section.

7.6.2 Moisture content

In the case of air-cooling fan coil units with dehumidification, the moisture content shall be measured and controlled accurately, because the latent air cooling capacity is very sensitive to its value. Therefore, dew point temperature measurement is recommended.

The measurement plane for moisture content shall be located as close as possible to the measurement plane for air dry bulb temperature.

7.6.3 Liquid temperature

The liquid temperatures shall be measured by a sensor immersed in the pipe. It shall be ensured that temperature stratification and flow patterns do not influence the accuracy of the measurements.

Liquid temperature shall be measured as close as possible to the fan coil unit's connection and in any case within twenty times the connection outside diameter.

7.6.4 Liquid pressures

The liquid pressure measuring points shall be located in the middle of a straight part of the connecting pipe of constant diameter, (equal to the fan coil unit connection) having a length of not less than ten diameters ensuring that there is no restriction involved. They shall be placed between the temperature measuring points and the connections of the fan coil unit.

7.6.5 Condensate flow rate

In the case of dehumidification of the air, the condensate shall be collected during the capacity test period, once a constant flow rate is obtained. If discharge cycles are observed due to a draining pump, the condensate shall be collected during a series of consecutive discharge cycles. The condensate flow shall be determined by dividing the mass of condensate collected by the test duration.

7.6.6 Steady state conditions

These conditions are obtained and maintained when all the measured quantities remain constant without having to alter the set values, for a minimum duration of 30 min, with respect to the tolerances given in Table 7.

Table 7 — Permissible deviations for set values

Measured quantity	Permissible deviation of the arithmetic mean values from set values	Permissible deviations of time-individual measured values from set values
Liquid		
— inlet temperature	± 0,2 K	± 0,5 K
— outlet temperature	± 0,3 K	± 0,6 K
Air		
— inlet temperature (dry bulb)	± 0,3 K	± 1 K
— inlet temperature (wet bulb)	± 0,4 K	± 1 K
— external static pressure	-	± 10 %
Voltage for unit supply	± 1 %	± 4 %
External control voltage for variable fan speed	± 0.5 %	-

7.7 Uncertainties of measurement from indicated values

The uncertainties of measurement shall not exceed the values specified in Table 8.

Table 8 — Uncertainties of measurement from indicated values

Measured quantity	Unit	Uncertainty of measurement
Liquid		
— temperature inlet/outlet	°C	± 0,15 K
— temperature difference	K	± 0,15 K
— volume flow	m^3/s	± 1 %
— static pressure difference	kPa	±1 kPa (Δp ≤ 20 kPa) - ± 5 %(Δp > 20 kPa)
Air		
— dry bulb temperature	°C	± 0,2 K
— dew point temperature	°C	± 0,3 K
— static pressure difference	Pa	± 3 Pa (Δp ≤ 100 Pa) ± 3 % (Δp > 100 Pa)
Others		
— brine concentration	%	± 2 %
— atmospheric pressure	kPa	± 0.5 kPa
— fan speed	min^{-1}	± 1 %
— mass	kg	± 0.5 %
Electrical quantities		
— electric power	W	± 1 % or at least 1 W
— voltage	V	± 0,5 %
— current	A	± 0,5 %
— electrical energy	Wh	± 1 %

The heating, the total cooling and latent capacities obtained from measurements on the liquid side shall be determined with a maximum uncertainty of measurement of 5 % independent of the individual uncertainties of measurement including uncertainties of the properties of fluids.

7.8 Test duration

It is necessary to record all the meaningful data continuously. In case of recording instruments which operate on a cyclic basis, the sequence shall be adjusted such that a complete recording is effectuated at least once every 30 s.

The data shall be measured in steady state operation. The duration of the measurement shall not be less than 30 min.

7.9 Data to be recorded

The data to be recorded for the air flow and capacity tests are given in Table 9. The table identifies the general information required but is not intended to limit the data to be obtained.

These data shall be the mean values taken over the data recording period.

Table 9 — Data to be recorded

	Symbol	Unit
Atmospheric pressure	P_{atm}	kPa
Voltage	-	V
Frequency	-	Hz
Speed control setting of the fan speed	-	-
Rotational speed of the fan	n_2	min^{-1}
Total electric power input	P_{elec}	W
Air inlet dry bulb temperature	t_A	°C
Air inlet wet bulb temperature	t_{Aw}	°C
Air inlet dew point temperature	t_{Adp}	°C
External static pressure, where applicable	p_A	Pa
Mass flow rate of condensate (air side)	q_{mW}	q/s
Inlet liquid temperature	t_{L1}	°C
Outlet liquid temperature	t_{L2}	°C
Liquid mass flow rate	q_{mL}	g/s
Brine concentration, where applicable	-	% vol
Specific heat capacity of liquid at t_{L1}	c_{pL1}	kJ/(kg·K)
Specific heat capacity of liquid at t_{L2}	c_{pL2}	kJ/(kg·K)
Specific enthalpy of liquid at at t_{L1}	h_{L1}	kJ/kg
Specific enthalpy of liquid at t_{L2}	h_{L2}	kJ/kg
Liquid side pressure drop	Δp_L	kPa
Total cooling capacity	P_C	W
Latent cooling capacity	P_{lat}	W
Sensible cooling capacity	P_{sens}	W
Heating capacity	P_H	W

8 Performance tests

8.1 General

The sweat test and the condensate disposal test may be executed simultaneously.

8.2 Test conditions

The standard conditions for the sweet test and air side condensate disposal test are given in Table 10.

Table 10 — Standard conditions for sweat test and air side condensate disposal test

		Unit	Value
Air side conditions	air inlet temperature		
	dry bulb	°C	27
	wet bulb	°C	24
Liquid side conditions	Inlet temperature	°C	6
	Outlet temperature	°C	10

Nominal voltage and frequency shall be used.

The fan speed settings shall be as follows:

— for condensate disposal test: minimum;

— for sweat test: minimum.

No external resistance shall be added at the air inlet and outlet of the unit.

8.3 Sweat test

Checks shall be made to ascertain whether there is any condensation of water on the casing and water dripping from or being blown off the fan coil unit.

For the sweat test, the grilles, dampers, etc., shall be set to allow for the maximum cooling power. The fan speed shall be at the minimum setting.

The specified standard temperature conditions shall be maintained within ± 1 K.

After reaching the specified temperature conditions, the unit shall be operated continuously for a period of four hours.

NOTE Visual check can be documented by suitable instruments (e.g. pictures).

8.4 Condensate disposal test

Checks shall be made to ascertain whether there is constant disposal of condensed water and no water is dripping from or being blown off the fan coil unit.

For the condensate disposal test, the grilles, dampers, etc., shall be set to allow for the maximum cooling power. The fan speed shall be at the minimum setting.

The specified standard temperature conditions shall be maintained within ± 1 K.

After reaching the specified temperature conditions, the unit shall be operated continuously for a period of four hours.

NOTE Visual check can be documented by suitable instruments (e.g. pictures).

9 Test report

9.1 General information

The test report shall at least contain:

a) date;

b) test institute;

c) test location;

d) test supervisor;

e) test object designation;

   1) type;

   2) serial number;

   3) name of the manufacturer;

f) reference to this European Standard.

9.2 Additional information

Additional information given on the rating plate shall be noted and any other information relevant to the tests.

9.3 Test results

Test results shall include:

— type of configuration of the unit, according to Annex A;

— settings of the unit : wiring or control signal for fan speed setting, position of dampers and flaps, etc.;

— standard and application rating conditions, and all relevant data according to Table 3 and Table 9;

— results from performance tests with visual remarks.

10 Manufacturer's data

The manufacturer or supplier shall supply the test house with the following minimum information for every fan coil unit to identify the fan coil unit and allow its traceability.

a) manufacturer's identification;

b) type, model and serial number designation;

c) mounting instructions, maximum water working pressure and temperature;

d) standard capacity;

e) the power input in W of the fan motors at standard conditions (including fan control if included within the unit);

f) voltage, nature and frequency of the current.

NOTE Further information can be provided in manufacturer's documentation with regard to performance in the range of application.

If the unit may be installed with accessories for air intake and/or air diffusion, the manufacturer shall specify the effect of these accessories on the performance of the fan coil unit, e.g. pressure drop, acoustics.

Annex A
(informative)

Drawings of the different types of configurations of fan coil units

A.1 General

This annex provides drawing schemes associated with designations to show typical existing configurations of fan coil units covered by the standard.

The list of described systems is not exhaustive.

The air flows at inlet and outlet sections are represented by the arrows.

A.2 Non ducted units

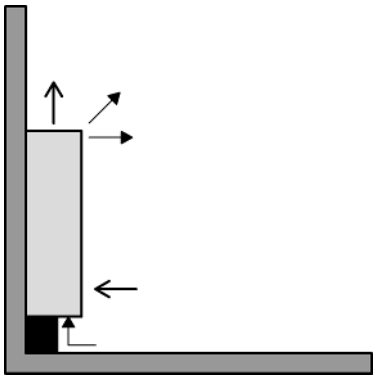


Figure A.1 — Floor mounted (with / without casing)

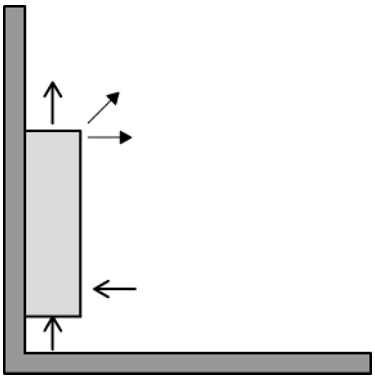


Figure A.2 — Wall mounted (with / without casing)

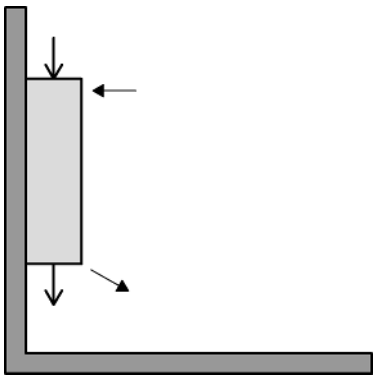
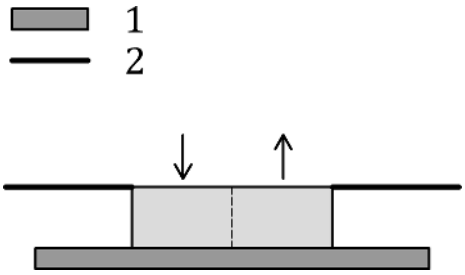


Figure A.3 — High wall mounted (with / without casing)



Key

1 floor

2 floating floor

Figure A.4 — Under floor mounted

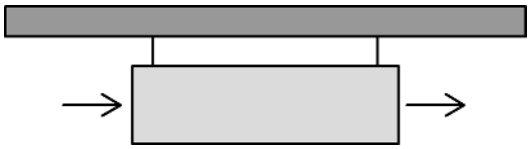


Figure A.5 — Under ceiling mounted I-Type (with / without casing/false ceiling)

Figure A.6 — Under ceiling mounted L-Type (with / without casing/false ceiling)

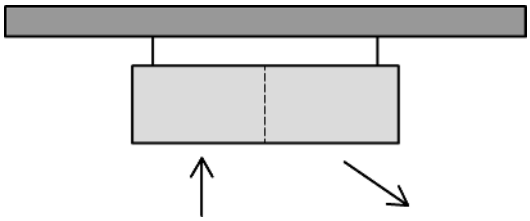


Figure A.7 — 1-way cassette

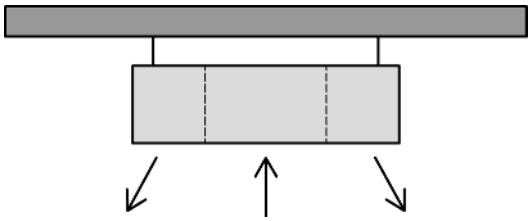


Figure A.8 — 2-way cassette

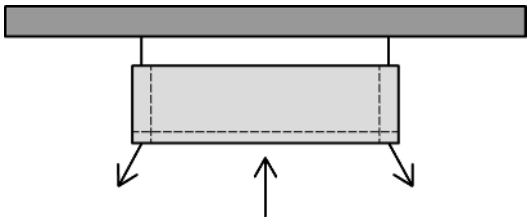


Figure A.9 — 4-way cassette

A.3 Ducted units

Examples of ducted units, on inlet and/or outlet sections, are given in Figures A.10 to A.13.

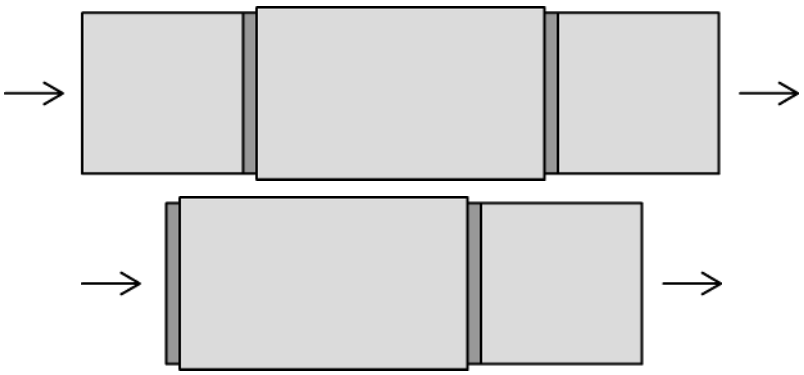


Figure A.10 — I-shape

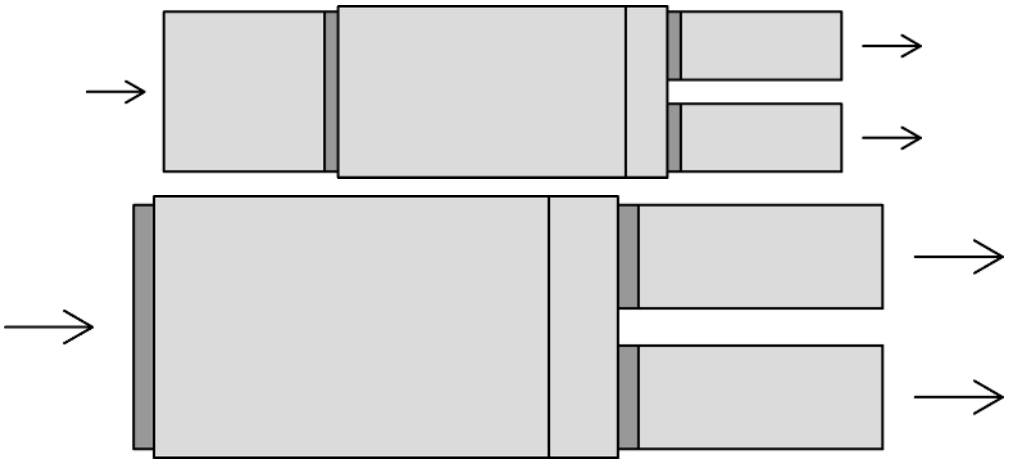


Figure A.11 — Y-shape

Figure A.12 — H-shape

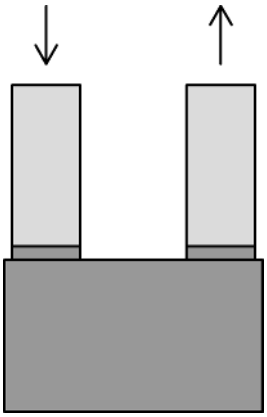


Figure A.13 — U-shape

Annex B
(informative)

Air flow rate test for non-ducted units

B.1 General conditions

The measurement of the outlet air flow rate is optional for free delivery units and for ducted units with a declared external static pressure lower than 50 Pa at standard fan speed.

For testing, the unit shall include an air filter but no any other accessory for air inlet or diffusion or others. Dampers for fresh air intake shall be closed.

NOTE 1 No modification such as sealing is made on the unit before testing.

NOTE 2 This maximum mechanical open position might differ from the minimum airflow resistance.

If the unit includes flaps, they shall be adjusted in a fixed position according to the manufacturer instructions. If this information is not available, their position shall correspond to the maximum mechanical open position,

B.2 Testing equipment

The air flow measurement equipment consists of a test chamber, an air flow measuring device and an auxiliary fan, all in accordance with ISO 5801.

An auxiliary fan shall be used to control the external static pressure at the fan coil outlet. It shall be designed to overcome pressure losses through the test setup, and equipped with adjustment means such as dampers, pitch control, or speed control to vary the capacity.

B.3 Test installation

The discharge section of the fan coil unit shall be connected to an air flow measuring device as described in ISO 5801, through a ductwork. In case of several outlet sections, they shall discharge in a common plenum.

The fan coil shall be disconnected from the cooling or heating power supply or the liquid circulation shall be stopped.

B.4 Standard rating conditions

The air flow rate measurement shall be made in isothermal conditions with dry coil, at temperatures between 15 °C and 25 °C, and at nominal voltage and frequency as specified by the manufacturer, for all fan speed(s) declared by the manufacturer and used for capacity ratings.

The external static pressure shall be set to zero Pa at the inlet and outlet of the unit.

B.5 Test procedure

Test shall be performed according to ISO 5801.

The motor shall run for at least half an hour before measuring the flow rate.

The air flow rate measurement shall be conducted under steady state conditions, which are assumed to be achieved when the rotational speed of the fan motor(s) does not change by more than 1 % but not less than 10 r/min within 15 min.

B.6 Data to be recorded

The data to be recorded for the air flow rate test are given in Table B.1. The table identifies the general information required but is not intended to limit the data to be obtained.

Table B.1 — Data to be recorded

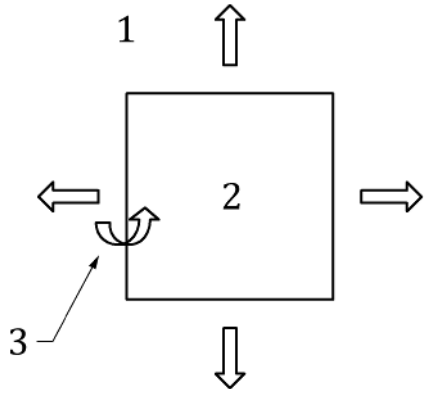
	Symbol	**Unit**
Atmospheric pressure	P_{atm}	kPa
Voltage	-	V
Frequency	-	Hz
Speed control setting of the fan speed	-	-
Total power input	*Pelec*	W
Rotational speed of the fan	n_1	min^{-1}
Air inlet dry bulb temperature	t_{AI}	°C
Air inlet dew point temperature	t_{AIdp}	°C
Mass flow rate of air	q_{mA}	kg/s
External static pressure	p_A	Pa

Annex C
(normative)

Design of separation partition for testing of cassette type fan coil units

C.1 General

Capacity rating tests of either 1-way, 2-way or 4-way cassette type fan coil units shall be performed using a separation partition between the air inlet section and the air discharge section(s) to limit the effect of possible recirculation of air, as shown in Figure C.1, on the temperature measurements.



Key

1 outlet
2 inlet
3 recirculation

Figure C.1 — Recirculation of outlet air on a 4-way cassette type unit

C.2 1-way and 2-way cassette type

For 1-way cassette type fan coil unit, a vertical cardboard partition plate shall be placed to separate the air inlet section from the air discharge section as represented in Figure C.2.

For 2-way cassette type fan coil unit, two vertical cardboard partition plates shall be placed to separate the air inlet section from the two sides of air discharge section as represented in Figure C.3.

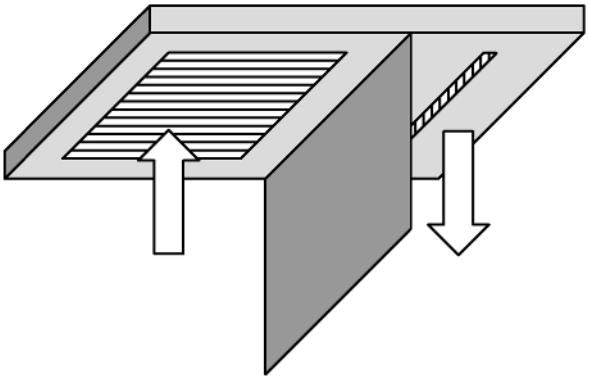


Figure C.2 — Position of the vertical separation plate for 1-way cassette type unit

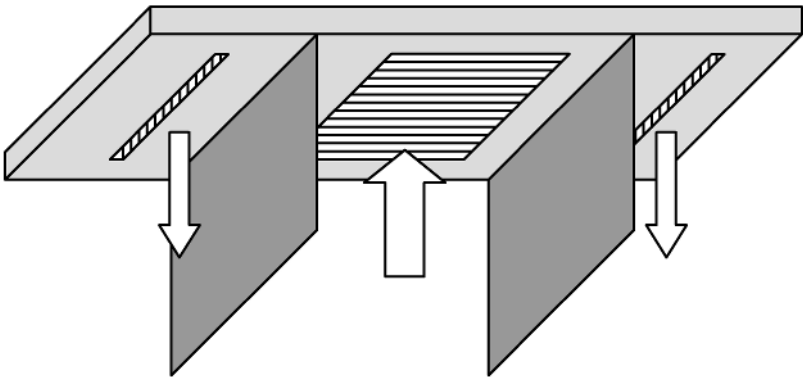


Figure C.3 — Position of the vertical separation plates for 2-way cassette type unit

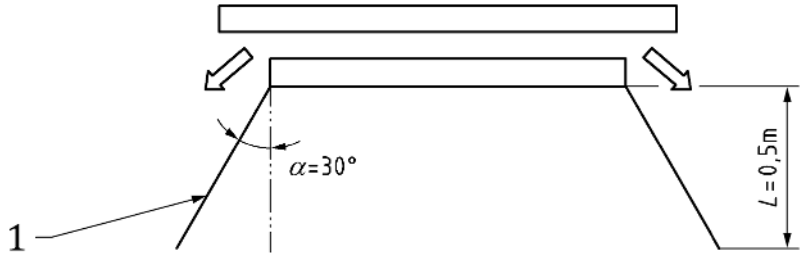
The partition plate shall have a height of 50 cm and a width equal to the width of the air inlet/outlet sections.

C.3 4-way cassette type

For 4-way cassette type fan coil units, the effect of recirculation can be minimized by placing a separating cone as represented in Figure C.4.

The technique consists of sticking a cardboard separating cone at the inlet to avoid outlet air to mix with inlet air. Even if turbulence can come from the installation, this technique simplifies the measurement.

The dimensions of the separating cone shall be as specified in Figure C.4.



Key

1 separating cone

Figure C.4 — Dimensions of the separating cone

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