



**SLOVENSKI STANDARD**  
**SIST EN 1397:1999**

**01-december-1999**

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

Wärmeaustauscher - Wasser-Luft-Ventilator-konvektoren - Prüfverfahren zur Leistungsfeststellung

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Echangeurs thermiques - Ventilconvecteurs a eau - Procédures d'essai pour la détermination des performances

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**Ta slovenski standard je istoveten z: EN 1397:1998**

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**ICS:**

27.060.30      Grelniki vode in prenosniki toplote      Boilers and heat exchangers

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EUROPEAN STANDARD

EN 1397

NORME EUROPÉENNE

EUROPÄISCHE NORM

December 1998

ICS 27.060.30

Supersedes ENV 1397:1994

Descriptors: heat exchangers, convectors, ducted fans, definitions, symbols, performance evaluation, measurements, tests, calorific power, sound power, condensation, installation, computation

English version

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

Echangeurs thermiques - Ventilconvecteurs à eau -  
Procédures d'essai pour la détermination des performances

Wärmeaustauscher - Wasser-Luft-Ventilatorconvektoren -  
Prüfverfahren zur Leistungsfeststellung

This European Standard was approved by CEN on 28 November 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**Contents**

	Page
Foreword	3
1 Scope	4
2 Normative references	4
3 Definitions	5
4 Symbols	7
5 Standard capacity	8
6 Manufacturer's data	9
7 Measurements	10
8 Testing methods and equipment	12
9 Test procedures	14
10 Capacity calculations	19
Annex A (informative) Bibliography	

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ALIMENTO 10 ANI 1998  
SISTEMA DI TRATTAMENTO  
CANTIERI DI TRATTAMENTO  
E TRATTAMENTO

1998  
CANTIERI DI TRATTAMENTO

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 110 "Heat exchangers", the secretariat of which is held by BSI.

This European Standard replaces ENV 1397:1994.

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 June 1999, and conflicting national standards shall be withdrawn at the latest by June 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This European Standard applies to room fan-coil units using hot or chilled water or water mixtures.

It applies to units designed for an air flow of not more than  $0,7 \text{ m}^3/\text{s}$  and an external static pressure due to duct resistance of 65 Pa max.

Air heating may be achieved by means of electrical resistance heaters.

This standard specifies uniform methods of testing under non frosting conditions, conducted on test samples to test and ascertain the following at the specified standard conditions:

- product identification;
- performance on condensation on the casing;
- capacity;
- performance on condensate disposal;
- liquid side pressure drop;
- air volume flow rate;
- sound power level.

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This standard does not cover technical safety aspects.

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

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 45001	General criteria for the operation of testing laboratories
EN 23741	Acoustics - Determination of sound power levels of noise sources - Precision methods for broad-band sources in reverberation room (ISO 3741:1988)
ISO 5801	Industrial fans - Performance testing using standardized airways
ISO 5221	Air distribution and air diffusion - Rules to methods of measuring air flow rate in an air handling duct

### 3 Definitions

For the purposes of this standard, the following definitions apply:

**3.1 room fan-coil unit:** A factory-made 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 cooling or heating. This device is normally designed for free intake of air from a room and delivery of air into the same room, but may be applied with minimal ductwork. This device may be designed for built in application, or with an enclosure for application within the conditioned space.

In the following, the term “fan coil unit” is used.

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The principal components are:

- one or more heat exchangers;
- one or more fans with drive mechanism;
- a common casing;
- an air filtering device.

NOTE: These parts may be complemented by:

- an air mixing device;
- safety devices;
- control devices;
- a condensate collecting device.

**3.2 capacity:** The total heat flow rejected by or supplied to the air flow passing through the fan coil unit. It includes the power absorbed by the integral fan(s) of the unit.

**3.2.1 air-heating fan coil units:** The heat flow rejected by the heating liquid flow between the connections of the unit including the power absorbed by the integral fan(s) of the unit.

### 3.2.2 air cooling fan coil units

**3.2.2.1 total air cooling capacity:** The heat flow absorbed by the cooling liquid flow between the connections of the unit including the power absorbed by the integral fan(s) of the unit and minus the heat flow removed by the condensed water, if any.

**3.2.2.2 sensible (dry) air-cooling capacity:** The heat flow which is rejected by the air by means of a dry-bulb temperature drop.

**3.2.2.3 latent air-cooling capacity:** The heat flow which is rejected by the air by condensation of water vapour on the cooling coil.

**3.2.3 electric power:** Electric power absorbed by the fans and electric heaters (where fitted).

### 3.3 temperatures

NOTE: Temperatures are average values ascertained during the measuring period.

**3.3.1 air inlet temperature:** Dry or wet bulb temperature of the air flowing back from the room to the fan coil unit and which is not influenced by recirculation of air from the fan coil unit air outlet to the inlet by the unit itself without having mixed with the room air.

### 3.3.2 liquid temperature

**3.3.2.1 liquid inlet temperature:** Temperature at the inlet connection of the fan coil unit.

**3.3.2.2 liquid outlet temperature:** Temperature at the outlet connection of the fan coil unit.



### 3.4 temperature differences

**3.4.1 inlet temperature difference:** Absolute value of the difference between air inlet temperature and liquid inlet temperature.

**3.4.2 liquid temperature difference:** Absolute value of the difference between the inlet and outlet liquid temperature.

**3.5 liquid side pressure drop:** Difference between the static pressures of the liquid at the inlet and outlet connections of the fan coil unit.

**3.6 sound power level:** Ten times the logarithm to the base 10 of the ratio of the sound power,  $w$ , radiated by the sound source under test to the reference sound power,  $W_0 (= 10^{-12} \text{W})$ .

## 4 Symbols

For the purpose of this standard the following apply:

$c_{pw}$	Specific heat capacity of water	$\text{kJ}(\text{kg.K})$
$c_{pL}$	Specific heat capacity of liquid	$\text{kJ}(\text{kg.K})$
$h_{L1}$	Specific enthalpy of liquid at inlet connection = $c_{pL1} \times t_{L1}$	$\text{kJ/kg}$
$h_{L2}$	Specific enthalpy of liquid at outlet connection = $c_{pL2} \times t_{L2}$	$\text{kJ/kg}$
$\Delta h_w$	Vaporization heat of water at $0^\circ\text{C} = 2500,4$	$\text{kJ/kg}$
$L_w$	Sound power level	$\text{dB}$
$n_1$	Number of revolutions of the fan at capacity test	$1/\text{s}$
$n_2$	Number of revolutions of the fan at airflow test	$1/\text{s}$
$n_3$	Number of revolutions of the fan at acoustic test	$1/\text{s}$
$P_{elec}$	Absorbed electrical power	$\text{kW}$
$P_{lat}$	Measured latent cooling capacity	$\text{kW}$
$P_{sens}$	Measured sensible cooling capacity	$\text{kW}$
$P_{tot}$	Measured total cooling or heating capacity	$\text{kW}$
$P_w$	Enthalpy flow of condensate (air side)	$\text{kW}$
$p_{atm}$	Atmospheric pressure	$\text{kPa}$
$p_A$	External static pressure	$\text{Pa}$
$q_{mA}$	Mass flow rate of air	$\text{kg/s}$
$q_{mL}$	Mass flow rate of liquid	$\text{kg/s}$
$q_{mW}$	Mass flow rate of condensate (air side)	$\text{kg/s}$
$t_{L1}$	Liquid inlet temperature	$^\circ\text{C}$
$t_{L2}$	Liquid outlet temperature	$^\circ\text{C}$
$t_{LO}$	Liquid temperature at the flow rate measuring device	$^\circ\text{C}$
$t_w$	Condensed water temperature	$^\circ\text{C}$
$t_{A1dp}$	Air inlet dewpoint temperature	$^\circ\text{C}$
$t_{A1wb}$	Air inlet wet bulb temperature	$^\circ\text{C}$

$t_{A1}$	Air inlet dry bulb temperature	°C
$\Delta p_L$	Liquid side pressure drop	kPa
$\Delta t_{ldb}$	Inlet temperature difference (dry bulb) = $ t_{A1} - t_{L1} $	K
$\Delta t_L$	Liquid temperature difference = $ t_{L2} - t_{L1} $	K

## 5 Standard capacity

### 5.1 Basis for standard-capacity data

The capacity of a fan coil unit depends on:

- the inlet temperature and the moisture content of the entering air;
- the mass flow of the air and of the cooling or heating liquid;
- the inlet conditions of the cooling or heating liquid.

Therefore the capacity of a fan coil unit shall be specified for specific operating conditions.

### 5.2 Standard conditions for capacity

The standard conditions for capacity are given in table 1.

**Table 1: Standard conditions for capacity**

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		Symbol	Cooling	Heating		Unit
Air side conditions	air inlet temperature					
	dry bulb	$t_{A1}$	27	20		°C
	wet bulb	$t_{A1wb}$	19			°C
Liquid side conditions	Liquid type = water					
	Inlet temperature	$t_{L1}$	7	50	70	°C
	Outlet temperature	$t_{L2}$	12	40	60	°C

The nominal voltage and frequency shall be 230 V, 50 Hz, unless otherwise specified by the manufacturer.

The fan speed setting shall be the maximum.

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

### 5.3 Standard conditions for sweat test and air side condensate disposal test

The standard conditions for the test and air side condensate disposal test are given in table 2.

**Table 2: Standard condition for sweat test and air side condensate disposal test**

		symbol	value	unit
Air side conditions	air inlet temperature			
	dry bulb	$t_{A1}$	27	°C
	wet bulb	$t_{A1wb}$	24	°C
Liquid side conditions	Liquid type = water			
	Inlet temperature	$t_{L1}$	6	°C
	Outlet temperature	$t_{L2}$	10	°C

Nominal voltage and frequency shall be used.

The fan speed settings shall be as follows:

- for condensate disposal test: minimum;

- for sweat test: minimum.

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

### 5.4 Standard conditions for air flow measurement

The air flow measurement shall be made in isothermal conditions with dry coil, at temperatures between 15 °C and 25 °C, and nominal voltage and frequency.

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

### 5.5 Standard conditions for sound power level determination

The sound power level measurement shall be made in isothermal conditions with dry coil, at temperatures between 15 °C and 25 °C, and nominal voltage and frequency.

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

## 6 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;