



RS 7/C/005 - 2016

Issued July 2016

**RATING STANDARD
for the certification of
FORCED CIRCULATION AIR COOLING
AND HEATING COILS**

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Modifications as against last version:

No.	Modifications	Section	Page
1	Update of purpose	I	4
2	Update of scope	II	4
3	Update of definitions	III	4
4	Reference to Certification Manual for general definitions	III	4
5	Introduction of Basic Model Groups and reference fin spacing to simplify selection.	III.6	5
6	Update of standard reference	III.1 and IV.1	4 and 5
7	Update of paragraph "test conditions" renamed "testing requirements"	IV	5
8	Update of maximum allowable deviations	VII	7
9	Deletion of paragraph "test standard" to merge all testing requirements into the IV section	deleted	deleted
10	Deletion of paragraph "certification procedures" already treated in OM-9	deleted	deleted
11	Deletion of paragraph "selection of coils for testing" already treated in OM-9	deleted	deleted
12	Deletion of appendixes that are available in OM-9	deleted	deleted

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TABLE OF CONTENTS

I. PURPOSE	4
II. SCOPE	4
III. DEFINITIONS	4
III.1 Forced Circulation Air Cooling and Heating Coils	4
III.2 Applications	4
III.3 Range	4
III.4 Range Certification	5
III.5 Row	5
III.6 Basic Model Group	5
IV. TESTING REQUIREMENTS	5
IV.1 Test standard	5
IV.2 Particular specifications for testing	5
a. Dimensional check	5
b. Heat exchange fluid	6
c. Standard conditions for qualifying tests	6
d. Repetition Tests	6
V. RATING REQUIREMENTS	7
V.1 Test check	7
V.2 Air density	7
VI. CERTIFIED PERFORMANCE ITEMS	7
VII. TOLERANCES	7

I. PURPOSE

The purpose of this rating standard is to establish definitions and specifications *for testing and rating of Forced Circulation Air Cooling and Heating Coils (COIL) for the related Eurovent Certified Performance (ECP) certification programme in accordance with Operational Manual OM-9.*

II. SCOPE

This rating standard applies to *Forced Circulation Air Cooling and Heating Coils as defined in standard EN 1216:1998+A1:2002 that is coils operating:*

- *with water, +0-50% ethylene-glycol or propylene-glycol mix, acting as cooling or heating fluid*
- *without fans.*

This certification programme does not cover the heat recovery applications.

This rating standard does not cover technical safety aspects.

This certification programme consists in range certification as defined in paragraph III.4.

III. DEFINITIONS

For definitions regarding the certification scheme refer to Certification Manual.

III.1 Forced Circulation Air Cooling and Heating Coils

The definition displayed in EN 1216:1998+A1:2002 applies. In the following the term “coil” will be used.

III.2 Applications

The following possible applications are covered by this programme:

- *Air cooling with water or water+glycol mix as heat exchange fluid*
- *Air heating with water or water+glycol mix as heat exchange fluid*

III.3 Range

Coils designed for one or more applications and having the following identical features:

- fin designation
- tube *outside* diameter
- tube arrangement :
 - *pitch height* : tube spacing (*i.e perpendicular to the air flow*)
 - *pitch depth* : row spacing (*i.e in direction of the air flow*)
 - *tube alignment* (*in-line or staggered*)
- arrangement of coil in relationship to the direction of the airflow
- *minimum and maximum number of rows*
- *minimum and maximum number of tubes per row*
- *minimum and maximum finned length*

III.4 Range Certification

Certification of a *range* (see definition in III.3), based on *product performance testing in independent laboratories, verification of operating software/calculation model and factory audits.*

III.5 Row

A bank of tubes that are located in a plane at right angle to the direction of the air flow.

III.6 Basic Model Group

Within a range, models which are essentially the same or comparable in terms of basic components and/or configurations combinations are grouped into basic model groups (BMG).

The following variations *distinguish one BMG from another.*

- tube type (plain or *inner-grooved*)
- tube material category
 - *standard* : Copper (Cu); Aluminium (Al); Copper alloys (Cu-X); Aluminium alloys (Al-X);
 - *special* : *other materials than the above list* ;
- fin type (flat, corrugated, *louvered*, wavy)
- fin material for a given fin type
- reference fin spacing (RFS) for a given fin thickness

A reference fin spacing (RFS) is considered representative of a range of fin spacings from 0.7 to 1.3 times its value.

Example: The applicant range covers fin spacings (FS) from 2.0 to 20 mm in the following steps: 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0 mm. Considering the aforementioned rule there are four (4) reference fin spacings (RFS):

- **2.5** covers the range [1.8; 3.3] so it is considered representative of 2.0, 2.5, 3.0
- **5.0** covers the range [3.5; 6.5] so it is considered representative of 4.0, 5.0, 6.0
- **10.0** covers the range [7.0; 13.0] so it is considered representative of 8.0, 10.0 and 12.0
- **18.0** covers the range [12.6; 23.4] so it is considered representative of 14.0, 16.0 18.0 and 20.0

IV. TESTING REQUIREMENTS

IV.1 Test standard

Test shall be conducted in accordance with EN 1216:1998+A1:2002, "Heat exchangers. Forced circulation air-cooling and air-heating coils. Test procedures for establishing the performance".

IV.2 Particular specifications for testing

a. Dimensional check

Before testing, the laboratory shall check dimensions to ensure that the unit correspond to the selection. The following tolerances are acceptable:

- *Finned length* $\pm 0,5 \%$, with at least ± 5 mm
- *Finned height of the coil* ± 5 mm

- *Finned depth (width) of the coil* $\pm 5 \text{ mm}$
- *Total number of fins* $\pm 4 \%$, with at least ± 2 fins
- *Diameter of (expanded) tube outside the coil* $\pm 1 \text{ mm}$

If one of the dimensions is not compliant, the laboratory shall not perform the test and contact Eurovent Certita Certification who shall ask the applicant/participant to send a new unit for testing (see also Operational Manual).

b. Heat exchange fluid

The tests shall be performed with water+25% ethylene-glycol mix. It is considered that testing with the water+25% ethylene-glycol mix is representative of a coil using a water + 0-50% ethylene-glycol or propylene-glycol mix. To ensure the comparability of test results the CLARIANT product “Antifrogen® N” shall be used.

c. Standard conditions for qualifying tests

Qualifying tests consist in measuring the certified performances for the eight (8) standard conditions defined in Table 1.

Table 1: Test Standard Conditions (SC) according to the application

Application	SC	t_{db}	t_{wb}	t_L	Δt_L	V_L	V_A
Cooling	1	27	24	7	>5	Avg ⁽¹⁾	Avg ⁽¹⁾
	2	27	19	7	>5	Avg ⁽¹⁾	Avg ⁽¹⁾
	3	20	10	7	>5	Avg ⁽¹⁾	Avg ⁽¹⁾
	4	20	10	7	>5	Min ⁽¹⁾	Min ⁽¹⁾
	5	20	10	7	>5	Max ⁽¹⁾	Max ⁽¹⁾
Heating	6	20		50	>5	Avg ⁽¹⁾	Avg ⁽¹⁾
	7	20		50	>5	Min ⁽¹⁾	Min ⁽¹⁾
	8	20		50	>5	Max ⁽¹⁾	Max ⁽¹⁾

(1) Target values for the velocities are specified by Eurovent Certita Certification for each selected unit. The design must be performed so that the effective velocity values do not differ from specified target values by more than 5%.

The abbreviations used in Table 1 are detailed in Table 2.

Table 2: Abbreviations used in Table 1

t_{db}	Dry bulb air inlet temperature	°C
t_{wb}	Wet bulb air inlet temperature	°C
t_L	Fluid temperature entering coil	°C
Δt_L	Fluid temperature difference	K
V_A	Air velocity at coil inlet	m.s ⁻¹
V_L	Fluid velocity	m.s ⁻¹

d. Repetition Tests

The selected coil(s) shall be tested at three (3) conditions in the cooling mode and three (3) conditions in the heating mode which are to be selected by Eurovent Certita Certification.

V. RATING REQUIREMENTS

V.1 Test check

Eurovent Certita Certification shall conduct a “test check”, i.e. the performances will be recalculated at the test operating conditions using the selection software.

A performance item fails when the difference between the recalculated value recalculated and the test results differs by more than the allowable tolerance (see VII).

A test fails when one or more performance items fail.

V.2 Air density

Standard air density is set at 1.20 kg/m³. It is mandatory to display the certified performances items under the standard conditions in the software outputs. It is allowed to display any other values if accompanied by the underlying air density.

VI. CERTIFIED PERFORMANCE ITEMS

The following performance characteristics, as defined in EN 1216:1998+A1:2002, declared by the applicant/participant shall be verified by tests:

- Total cooling or heating capacity [W]
- Air side pressure drop at standard air density [Pa]
- Fluid (water or brine) side pressure drop [kPa]

VII. TOLERANCES

When tested in the laboratory the obtained performance data shall not differ from the recalculated values (“test-check”) by more than the following tolerance values:

Table 3 : Maximum allowable deviations (In 2016-2017)

CHARACTERISTICS	Individual relative deviation threshold (any single test)	Mean relative deviation threshold (average of tests)
Capacity	-7%	-5%
Air side pressure drop	+20 % or +5 Pa whichever is greater	+10 % or +5 Pa whichever is greater
Fluid side pressure drop	+20 %	+10 %

Table 4 : Maximum allowable deviations (From 01.01.2018)

CHARACTERISTICS	Individual relative deviation threshold (any single test)	Mean relative deviation threshold (average of tests)
Capacity	-3%	-2%
Air side pressure drop	+20 % or +5 Pa whichever is greater	+10 % or +5 Pa whichever is greater
Fluid side pressure drop	+20 %	+10 %

The relative deviation (in %) between the measured value X_{meas} and the recalculated value X_{recal} is calculated as follows:

$$\Delta_{rel} = (X_{meas} - X_{recal}) / X_{recal}$$