



OM-8-2017

Published February 2017

OPERATIONAL MANUAL
for the
CERTIFICATION
of
**AIR TO AIR PLATE AND TUBE HEAT
EXCHANGERS**

OM-8-2017

Published February 2017
Supersedes OM-8-2016

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Checking (date):	Jean FOURCROY	8 December 2016
Approval (date):	Compliance Committee for AAHE	15 December 2016
Approval (date):	CPPC	17 January 2017
Comes into effect from:		03 February 2017

Modifications as against last version:

Nb	Modifications	Section	Page
1	<i>In case of failure, Participant/Applicant has 4 working weeks to ask for a second test or correct his software</i>	IV.6	7
2	<i>Production sites are displayed on ECP website</i>	V.1	7
3	<i>It shall be clearly stated in the printouts or any documents whether the airflows are given under standard or actual conditions.</i>	APPENDIX C	11
4	<i>The Temperature Efficiency "Wet" is mandatory only for AAHE without humidity transfer.</i>	APPENDIX C	11
5	<i>150 Pa is added as a new possibility for Nominal Pressure Drop</i>	APPENDIX D	13
6	<i>Editorial revisions</i>	VARIOUS	

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I. PURPOSE

The purpose of this manual is to prescribe procedures for the operation of the certification programme for Air-to-Air Plate and Tube Heat Exchangers of Eurovent Certita Certification, in accordance with its Certification Manual.

II. SCOPE OF THE PROGRAMME

This certification programme applies to all ranges of Air to Air Plate and Tube Heat Exchangers which are included in the certified public selection software of the Applicant/Participant. The certify-all principle applies not only to Europe but to all markets.

The Applicant/Participant shall certify all models in the ranges, including:

- cross flow, counter-flow and parallel flow units
- all sizes
- all materials
- all airflow rates
- all edge lengths
- plate heat exchangers with humidity transfer

Combination of units (twin exchangers) are also included in the scope of the programme (see RS-8/C/001 §IV.7).

Heat exchangers with accessories such as bypass and dampers shall not be included.

The programme does not cover other types of Air to air heat exchangers like Rotary heat exchangers or Heat pipes.

III. BASIC OUTLINE OF THE PROGRAMME

Participation in this programme consists of the following:

III.1 Application

The Applicant, after signing the Licence Agreement, shall send to Eurovent Certita Certification all information as required by Eurovent Certita Certification Rating Standard RS 8/C/001: software name and version, the software itself, declaration list and relevant literature.

III.2 Qualifying procedure

For each range to enter the certification programme, three units selected by Eurovent Certita Certification shall be tested in the independent laboratory. If the tests show conformity with the relevant Rating Standard, certification is granted.

III.3 Repetition procedure

Every year Eurovent Certita Certification checks whether the certified products still fulfil the requirements. One unit selected from regular production shall be tested in the independent laboratory. If the previous test campaign has been successfully completed and the unit of the current test campaign is ready for a new test, the certification is renewed for another campaign.

III.4 Failure treatment

When the test results fail to comply with the requirements of the relevant Rating Standard, the failure treatment shall be applied.

III.5 Challenge procedure

Under special conditions a challenge procedure may be carried out, as described in the Certification Manual.

IV. OPERATION OF THE PROGRAMME

IV.1 Declaration of data

All characteristics and performance items shall be expressed in SI units. Maximum of three significant figures shall be used for performance items.

Submittal of certification of models shall be sent to Eurovent Certita Certification as .xls or .xlsx declaration file. The following forms shall be fully completed:

- Declaration file AAHE-1 for manufacturing companies (Original Equipment Manufacturer – OEM).
- Declaration file AAHE-2 for companies selling a model produced by a certified manufacturer (Brand Name) to identify the corresponding model number.
- Technical data sheet AAHE-3 for units selected for test completing technical description of all components.

All units shall be declared with an effective depth of 1000 mm in the declaration form AAHE-1 (or AAHE-2 for Brand Name). The effective depth corresponds to the depth of the exchanger “naked”, i.e. without casing.

Confidentiality of certification data: All data submitted to Eurovent Certita Certification shall be held confidential except for information authorised to be published in the website.

The Participant shall inform Eurovent Certita Certification of any modification of models by updating declaration file and selection software by sending Software update record sheet AAHE-4. In the case of significant modifications Eurovent Certita Certification is entitled to request adequate tests to check the influence on performance data.

Copies of the forms are part of this manual.

IV.2 Selection, delivery and recovering of units

a. Selection of units to be tested

For the qualifying procedure, three units, if existing, of different sizes and if possible different spacing shall be selected from the range by Eurovent Certita Certification and tested.

For the repetition procedure, one unit for all certified ranges shall be selected by Eurovent Certita Certification every year and tested.

Eurovent Certita Certification can select the production sites from which the unit will be delivered if several production sites are declared by the participant.

In case for a repetition test campaign, a model selected was the same than in a previous test campaign, the Participant shall manufacture and provide a new physical unit.

b. Time limitation of acquisition of unit

Deadline for delivery of units to the laboratory, together with the technical data sheet completed and the payment shall be decided by Eurovent Certita Certification in accordance with the Compliance Committee.

If elements are not delivered within the time limitations (specified in the notification received from Eurovent Certita Certification), it is considered as non-application of procedures (see dedicated chapter in Certification Manual).

c. Recovering of units

Applicant/Participant shall recover its products four working weeks after receiving its test report and results. When the units are not recovered on time, the laboratory can destroy the units and the invoice shall be sent by Eurovent Certita Certification to the Applicant/Participant.

IV.3 Software

See APPENDIX C.

IV.4 Tests at the laboratory

Tests shall be performed at the Independent laboratory selected by Eurovent Certita Certification.

The laboratory shall be responsible for uncrating, handling, testing and recrating the unit for shipment. Only the independent laboratory personnel shall be permitted to handle test units.

The Applicant/Participant shall provide to the laboratory full information about the installation. Units shall be installed in test facility in accordance with the Applicant/Participant's published installation instructions.

No Applicant/Participant's personnel shall be present in the test facility during the measurements.

If any functional component is inoperative, or the unit is damaged and cannot be repaired at the Laboratory, then it is considered as a component failure. If internal air leakage is outside the allowed tolerance, the laboratory shall stop the test. In both cases, the laboratory shall inform Eurovent Certita Certification and the technical contact of the Applicant/Participant. The laboratory may make repairs to the test unit only in agreement with Eurovent Certita Certification and the Applicant/Participant.

The laboratory will send a short report to Eurovent Certita Certification, explaining why the unit could not be tested. A further unit shall then be delivered within one week for test.

During a second test (see IV.6) the Applicant/Participant may be present to witness, but not participate or interfere with the test.

IV.5 Report and conclusion of test

Upon completion of the test on each unit, the laboratory will render its complete report as pdf file to Eurovent Certita Certification, which will immediately forward it to the Participant.

For each performance item, deviation is calculated as the difference between claimed value (calculated using the selection software under the test conditions) and result of test in the independent laboratory. When completed, Eurovent Certita Certification shall transmit to the Participant the results of the checking and conclusions (Form AAHE-4).

If all deviations are inside the allowed tolerances, the test is considered as "Passed". If at least one deviation is out of allowed tolerance, the test is considered as "Failed" and the procedure for failure treatment shall be applied.

IV.6 Failure treatment

If a failure occurred, the Applicant/Participant has *four* working weeks from the notification of failure to choose one of the following alternatives:

- (1) Rerate the data, by adapting the selection software to the test results. The corrected software with its new version number shall be sent to Eurovent Certita Certification who will check the consistency of the modifications. If the software is in accordance with all the measurements, new selection documentation with a new reference and date of publication shall be put on the Eurovent Certified Performance website. After reverification (“test recheck”), if the software is still not in accordance with the test results manufacturer will have two additional weeks for final adjustment of the software. In case of new failure, the Participant shall be temporarily suspended until he updates his software in accordance with the tests results.
- (2) Ask for a second test on the same unit. If this second test is successful, no revision of selection software will be required. If the second test is unsuccessful, the Participant shall comply with point (1).

If the failure is confirmed and accepted by the Applicant/Participant for at least two of the seven measurements of a test of campaign *n*, a penalty test will be required on a unit from the same factory in test campaign *n+1* for plates without humidity transfer. Criteria is eight over twenty-four for plates with humidity transfer.

IV.7 Diploma

When all tests of a qualifying procedure are completed and validated, product range and associated selection software shall be certified. Eurovent Certita Certification shall grant the certification until validity date defined in APPENDIX A.

Regarding the repetition procedure, certification is renewed if previous test campaign has been completed and validated when all the delivery process is completed (units, forms and payments).

IV.8 Non-application of procedures

See dedicated chapter in Certification Manual.

V. PROMOTION OF THE PROGRAMME

V.1 By Eurovent Certita Certification

For each certified model, the following general information, and certified performance and characteristics shall be published on the Eurovent Certified Performance website: www.eurovent-certification.com for Air-to-air plate and tube heat exchangers:

- Name of Company
- Trade name or brand name of model
- *Production site(s) (city, country)*
- Model designation(s)
- Range
- Selection software name and version
- Air flow [m³/h]
- Pressure drop [Pa]
- Temperature efficiency dry in winter conditions [-]
- Temperature efficiency wet in winter conditions [-]

- Temperature efficiency dry in summer conditions for exchangers with humidity transfer [-]
- Temperature efficiency wet in summer conditions for exchangers with humidity transfer [-]
- Humidity efficiency for exchangers with humidity transfer [-]
- Plate length [mm]
- Plate height [mm]
- Plate thickness [mm]
- Plate spacing [mm]
- Casing outside length [mm]
- Casing outside height [mm]

V.2 By Participants

See dedicated chapter in Certification Manual.

APPENDIX A. CERTIFICATION SCHEDULE

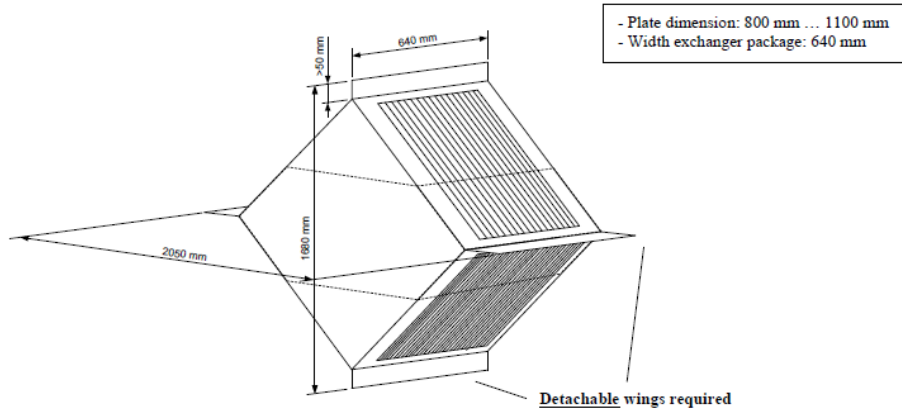
	AAHE
Eurovent Certita Certification asks for update of list and software from the Participant	31/01/n
Eurovent Certita Certification sends selection list for test (regular tests + penalty tests from the previous test campaign)	28/02/n
Selection list is confirmed	31/03/n
Delivery + Technical data sheet + payment from Participant are completed	31/05/n
Eurovent Certita Certification sends the diploma if all elements are received	30/06/n
Diploma validity	31/08/n+1
All first tests finished by the laboratory	31/07/n
Eurovent Certita Certification forwards the test report to the Applicant/Participant	2 working days after reception
Eurovent Certita Certification sends test results (software checking)	31/08/n
Eurovent Certita Certification sends selection list for second test	30/09/n
Delivery + Technical data sheet + payment from Participant are completed for second tests	31/10/n
Second tests are finished by the laboratory	30/11/n
Eurovent Certita Certification forwards the test report to the Applicant/Participant	2 working days after reception
Correction of the software after failure	1 month
Report on failure	Compliance com. meeting

APPENDIX B. LABORATORY LIMITS

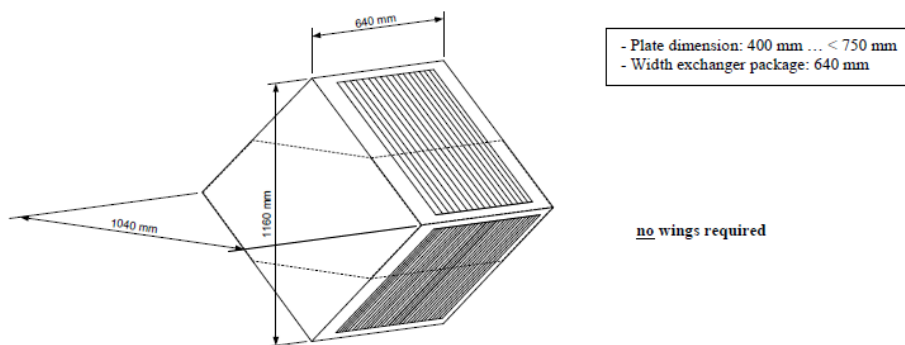
B.I. For “usual” units

Air flow rates: $1500 \text{ m}^3/\text{h} - 7000 \text{ m}^3/\text{h}$

Dimensions for large test units:



Dimensions for smaller test units:



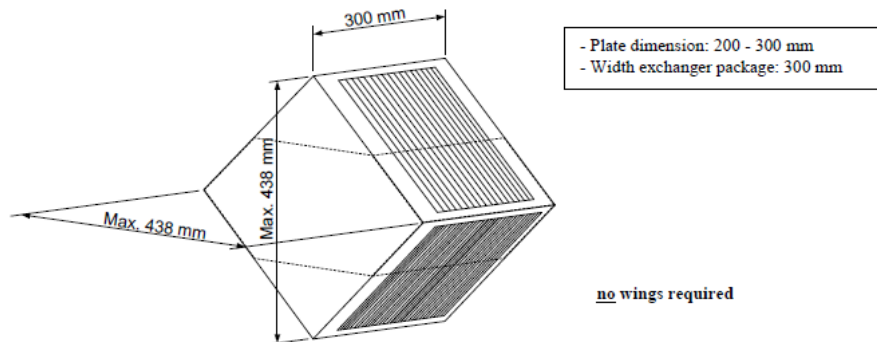
In both drawings the counter flow heat exchanger is shown in dashed lines. For the counter flow heat exchanger the same horizontal dimensions are possible as for the cross flow heat exchanger. The height of the counter flow heat exchanger is lower than of the cross flow heat exchanger anyway. For the large units the counter flow heat exchanger has to be equipped with two detachable wings.

B.II. For small units

Air flow rates:

up to 1'000 m³/h

Dimensions for test units:



The counter flow heat exchanger is shown in dashed lines. For the counter flow heat exchanger the same horizontal dimensions are possible as for the cross flow heat exchanger. The height of the counter flow heat exchanger is lower than of the cross flow heat exchanger anyway.

APPENDIX C. SPECIFIC SOFTWARE REQUIREMENTS

General software (selection tool) requirements are described in the dedicated appendix of Certification Manual. In addition:

- Each technical selection has to be reproducible without any protection by login and/or password.
- Vocabulary and symbols shall be in accordance with reference vocabulary available on the Eurovent Certified Performance website.
- Applicants/Participants are obliged to display in the outputs the pressure drop under the standard conditions. They are allowed to display any other pressure drop values if accompanied by the underlying air density.
- As inputs, the massflows shall be a mandatory option. Are also mandatory in the outputs (and printouts) actual exhaust and supply mass flows. It is allowed to use other air flows, but the massflows shall be present, at least. *It shall be clearly stated in the printouts or any documents whether the airflows are given under standard or actual conditions.*
- It is allowed to ask the location of the customer in the software, however all data provided by the software shall be the same whatever the location of the customer is.
- It is forbidden to display the Extract/Exhaust Air Temperature Efficiency and Humidity Efficiency in both outputs and printouts.
- All defined dimensional characteristics must be used explicitly in accordance to Rating Standard definitions and the mentioned wordings must not be used for other purposes.

Table 1: Information to be found as outputs and on the printouts

SYMBOL	RECOMMENDED NAME	Output	Printout
	Type key		Mandatory
	Basic material		Mandatory ⁽¹⁾
q_m q_v q_{vn}	air mass flow rate or Standard air volume flow rate (1.2 kg/m ³)	Mandatory	Mandatory
p_a	Atmospheric pressure		Mandatory
...11	Extract air [if Exhaust air is used]		Mandatory
	Exhaust air inlet ⁽¹⁾ [if Exhaust air outlet is used]		
t_{11}	Extract air temperature		Mandatory
φ_{11}	Extract air relative or absolute humidity		Mandatory
q_{11}	Extract air airflow		Mandatory
...21	Supply air inlet ⁽¹⁾		Mandatory
t_{21}	Supply air inlet temperature		Mandatory
φ_{21}	Supply air relative or absolute humidity		Mandatory
q_{21}	Supply air inlet airflow		Mandatory
...12	Exhaust air [if Extract air is used]		Mandatory
	Exhaust air outlet ⁽¹⁾ [if Exhaust air inlet is used]	Mandatory	Mandatory
t_{12}	Exhaust air temperature	Mandatory	Mandatory
φ_{12}	Exhaust air relative or absolute humidity	Mandatory	Mandatory
q_{12}	Exhaust air airflow	Mandatory	Mandatory
...22	Supply air outlet ⁽¹⁾	Mandatory	Mandatory
t_{22}	Supply air temperature	Mandatory	Mandatory
q_{22}	Supply air airflow	Mandatory	Mandatory
Δp_1	Pressure drop on exhaust air side at standard condition (1.2 kg/m ³)	Mandatory	Mandatory
Δp_2	Pressure drop on supply air side at standard condition (1.2 kg/m ³)	Mandatory	Mandatory
η_t	Temperature efficiency dry [for plates]		
	Temperature efficiency wet [for plates <i>without humidity transfer</i>]	Mandatory	Mandatory
	Temperature efficiency [for regeneratives]		
η_x	Humidity efficiency (plates with humidity transfer)	Mandatory	Mandatory
	Humidity efficiency (regenerative)	Mandatory	Mandatory

(1): the information can be found in the type key

APPENDIX D. FORMS

D.I. Form AAHE-1: Declaration file for Original Equipment Manufacturer (OEM)

Generic	Participant name	Name of the holder of the contract		
List of ranges	Ranges	Name of range n		
Software	Name	Software name		
	Version	Software version		
	Release date	Date of release		
Generic	Product number	Unique Eurovent Certita Certification number in its own database. This will be created during first import and will not change anymore		
	Master product number	See form AAHE-2		
	Tested on	Date of last test		
	Rerated on	Date of last rerate (degradation of data after test)		
	Created on	Date of creation of the product		
	Last update on	Date of last modification of the product		
	Status	Status of the product [New, DVP, Deleted, Certified, Obsolete]		
	Participant name	Name of the holder of the contract		
	Product name	Name of the product. This has to be unique		
	Trade name	Also called "Brand"		
	Type of product	Eurovent Certita Certification codification for types of products (ex: AAHE/P for plate heat exchanger)		
Range name	Name of the range			
BMG	If several products have similar properties, they can be grouped in the same Basic Model Group			
Performances		For each performance item, value of the declared data (see below)		
Characteristics		For each characteristic, value of the declared data (see below)		
Published performances		Influence of pressure difference on pressure drop	Pa	
	50 Pa	Airflow	m ³ /h	
		Standard pressure drop	Pa	
	50 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	50 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	100 Pa	Airflow	m ³ /h	
		Standard pressure drop	Pa	
	100 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	100 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	150 Pa	Airflow	m ³ /h	
		Standard pressure drop	Pa	
	150 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	150 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
Humidity efficiency		%		
200 Pa	Airflow	m ³ /h		
	Standard pressure drop	Pa		
200 Pa Winter conditions	Temperature efficiency dry	%		
	Temperature efficiency wet	%		
	Humidity efficiency	%		
200 Pa Summer conditions	Temperature efficiency dry	%		
	Temperature efficiency wet	%		
	Humidity efficiency	%		
Published characteristics		Plate material		
		Plate coating		
		Plate length	mm	
		Plate height	mm	
		Plate thickness	mm	
		Plate spacing	mm	
	Plate edge connection			

	Plate surface connection		
	Casing side wall material		
	Casing side wall coating		
	Casing elbow place material		
	Casing elbow place coating		
	Casing outside length	mm	
	Casing inside length	mm	
	Casing outside height	mm	
	Casing inside height	mm	
	Casing side wall width	mm	
	List of City(ies) and Country(ies) of Manufacturing place(s)		

D.II. Form AAHE-2: Declaration file for Brand Names (BN)

Generic	Participant Name	Name of the holder of the contract
List of ranges	Ranges	Name of range
Softwares	Name	Software name
	Version	Software version
	Release date	Date of release
Generic	Product number	Unique Eurovent Certita Certification number in its own database. This will be created during first import and will not change anymore
	Master product number	In case a Applicant/Participant presents, as Distributor (or Brand Name) a product which is manufactured and certified by another Participant, here should be inserted the Product number of the master product
	Tested on	Inherited from Master product
	Rerated on	Inherited from Master product
	Created on	Date of creation of the product
	Last update on	Date of last modification of the product
	Status	Status of the product [New, DVP, Deleted, Certified, Obsolete]
	Participant name	Name of the holder of the contract
	Product name	Name of the product. This has to be unique
	Trade name	Also called "Brand"
	Type of product	Eurovent Certita Certification codification for types of products (ex: CB/A for active chilled beam)
Range name	Name of the range	
BMG	Inherited from Master product	
Performances		Inherited from Master product
Characteristics		Inherited from Master product

D.III. Form AAHE-3: Technical data sheet (TDS)

Generic		Participant name	Name of the holder of the contract	
Software		Name	Software name	
		Version	Software version	
		Release date	Date of release	
Generic			As in declaration list	
		Serial number	Serial number	
Tested technical items	General	Influence of pressure difference on pressure drop	Pa	
		Air leakage	[%]	
	50 Pa	Airflow	kg/s	
		Standard pressure drop	Pa	
	50 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	50 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	100 Pa	Airflow	kg/s	
		Standard pressure drop	Pa	
	100 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	100 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	150 Pa	Airflow	kg/s	
		Standard pressure drop	Pa	
	150 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	150 Pa Summer conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
		Humidity efficiency	%	
	200 Pa	Airflow	kg/s	
		Standard pressure drop	Pa	
	200 Pa Winter conditions	Temperature efficiency dry	%	
		Temperature efficiency wet	%	
Humidity efficiency		%		
200 Pa Summer conditions	Temperature efficiency dry	%		
	Temperature efficiency wet	%		
	Humidity efficiency	%		
General	Plate thickness	mm		
	Plate spacing	mm		
	Casing outside length	mm		
	Casing outside height	mm		

D.IV. Form AAHE-4: Test result form

Generic		Participant name	Name of the holder of the contract	
Software		Name	Software name	
		Version	Software version	
		Release date	Date of release	
Generic		Test key		
		Created on		
		Last update on		
		Test status		
		Model key		
		Model name		
		Product type		
		Serial number		
		Unit received on		
		Report received on		
Unit tested on				
Tested technical items			As in Technical data sheet	
Test conclusion			Passed of Failed	Number of penalty tests



D.V. Form AAHE-5: Software update record sheet

Company Logo

XXXXX Software Name Software Update Record Sheet

Prepared By: _____

Software revision code	Date	Brief description of update

APPENDIX E. VOCABULARY

The use of recommended and accepted wordings may only take place in accordance with the symbols and equations listed in the Table below.

SYMBOL	FORMULA	RECOMMENDED	ACCEPTED	FORBIDDEN
t		Temperature ⁽¹⁾		
x		Absolute humidity ⁽¹⁾	Humidity Moisture contents ⁽¹⁾ Moisture ⁽²⁾	
h		Total enthalpy ⁽³⁾	Specific enthalpy ⁽³⁾ Enthalpy ⁽²⁾	
...11		Extract air [if Exhaust air is used] Exhaust air inlet ⁽¹⁾ [if Exhaust air outlet is used]	Exhaust air in [if Exhaust air out is used] Exhaust air entering ⁽²⁾	
...21		Supply air inlet ⁽¹⁾	Supply air in Supply air entering ⁽²⁾ Fresh air	
...12		Exhaust air [if Extract air is used] Exhaust air outlet ⁽¹⁾ [if Exhaust air inlet is used]	Exhaust air out [if Exhaust air in is used] Exhaust air leaving (2)	
...22		Supply air outlet ⁽¹⁾	Supply air out Supply air leaving ⁽²⁾ Supply air [if Fresh air is used]	
...w		Wet bulb ⁽¹⁾		
...d		Dry bulb ⁽²⁾		
Q_{HRS}		Capacity of the heat recovery system	Capacity of the HRS ⁽³⁾ HRS capacity Recuperation power	
P_{el}		Electric power consumption ⁽³⁾		
η_t^(*)	$\eta_t = \frac{t_{22} - t_{21}}{t_{11} - t_{21}}$	Temperature efficiency dry ^(*) [for plates]	Temperature ratio dry ^(*) [for plates]	Efficiency [without Temperature or Sensible or Latent in front]
		Temperature efficiency wet ^(*) [for plates]	Temperature ratio wet ^(*) [for plates]	
		Temperature efficiency ^(*) [for rotaries]	Temperature ratio ^(*) ⁽¹⁾ [for rotaries]	Ratio [without Temperature in front]

				Temperature efficiency [for plates, without dry or wet after]
				Temperature ratio [for plates, without dry or wet after]
			Sensible efficiency ^(*)	
			Latent efficiency ^(*)	
$\eta_x^{(*)}$	$\eta_x = \frac{x_{22} - x_{21}}{x_{11} - x_{21}}$	Humidity efficiency ^(*)		Humidity ratio ^{(*) (1)}
η_h	$\eta_h = \frac{h_{22} - h_{21}}{h_{11} - h_{21}}$	Total efficiency		Total ratio
				Enthalpy efficiency
				Enthalpy ratio
		Sensible effectiveness dry [for plates]		Temperature effectiveness dry [for plates]
		Sensible effectiveness wet [for plates]		Temperature effectiveness wet [for plates]
ϵ_t	$\epsilon_t = \frac{\dot{m}}{\dot{m}_{\min}} \cdot \frac{t_{22} - t_{21}}{t_{11} - t_{21}}$			Effectiveness [without Temperature or Sensible in front]
		Sensible effectiveness ⁽⁴⁾ [for rotaries]		Temperature effectiveness [for plates, without dry or wet after]
				Temperature effectiveness [for rotaries]
				Sensible effectiveness [for plates, without dry or wet after]
ϵ_x	$\epsilon_x = \frac{\dot{m}}{\dot{m}_{\min}} \cdot \frac{x_{22} - x_{21}}{x_{11} - x_{21}}$	Latent effectiveness ⁽⁴⁾		Humidity effectiveness
				Enthalpy effectiveness
ϵ_h	$\epsilon_h = \frac{\dot{m}}{\dot{m}_{\min}} \cdot \frac{h_{22} - h_{21}}{h_{11} - h_{21}}$	Total effectiveness ⁽⁴⁾		Total heat effectiveness
η_e	$\eta_e = \eta_t \cdot (1 - 1/\epsilon)$	Energy efficiency (always defined for balanced airflows.)		Efficiency ⁽³⁾ [without Energy or Energetic in front]
ϵ	$\epsilon = Q_{HRS}/P_{el}$	Coefficient of performance ⁽³⁾		

(*): The use of "Exhaust", "Extract", or any equivalent before the temperature and humidity efficiencies is strictly forbidden (See also APPENDIX C)

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1. CEN/TC 110. EN308:1997: Heat exchangers - Test procedures for establishing the performance of air to air flue gases heat recovery devices. 1997.
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4. ASHRAE/TC 5.5. ASHRAE/ANSI 84: Method of testing air-to-air heat exchangers. 1991.