



**OM-10-2017**

Published February 2017

**OPERATIONAL MANUAL  
for the  
CERTIFICATION  
of  
AIR TO AIR REGENERATIVE HEAT  
EXCHANGERS**

# OM-10-2017

Published February 2017  
Supersedes OM-10-2016

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<b>Checking (date):</b>	Jean FOURCROY	8 December 2016
<b>Approval (date):</b>	Compliance Committee for AARE	15 December 2016
<b>Approval (date):</b>	CPPC	16 January 2017
<b>Comes into effect from:</b>		03 February 2017

## Modifications as against last version:

No.	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 (city, country) are displayed on ECP website</i>	V.1	7
3	<i>OACF and EATR are published at 2.0 m/s (instead of 2.5 m/s before)</i>	V.1	7
4	<i>It shall be clearly stated if the airflows are given under standard or actual conditions</i>	APPENDIX B	10
5	<i>Performances of <i>tf</i> rotors are now to be declared at 1.0, 2.0 and 3.0 m/s (instead of 1.5, 2.5 and 4.0 m/s before)</i>	APPENDIX D	14
6	<i>Editorial revisions</i>	VARIOUS	

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## I. PURPOSE

The purpose of this Operational Manual is to prescribe procedures for the operation of the Certification Programme for Air-to-Air Regenerative Heat Exchangers (RHE) of Eurovent Certita Certification, in accordance with the Certification Manual.

## II. SCOPE OF THE PROGRAMME

This certification programme applies to all ranges of Air-to-Air Regenerative Heat Exchangers (including sealing systems) which are included in the certified public selection software of the Applicant/Participant. Units sold without casing and sealing systems are also included in the scope. The certify-all principle applies not only to Europe but to all markets.

Participants shall certify all models in the ranges, including:

- all classes: condensation RHE = non hygroscopic RHE = non enthalpy RHE  
hygroscopic RHE = enthalpy hygroscopic RHE  
sorption RHE = enthalpy sorption RHE
- all RHE geometry (wave height, foil thickness)
- all sizes (rotor diameters and rotor depths and surface areas of alternating storage matrices - ASM)
- all materials
- all airflow rates
- all different types of sealing (if available)

The class “sorption RHE” has to fulfil specific requirements on the humidity efficiency (see Rating Standard RS 8/C/0002, chapter “Certified performance items”)

## 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/002: software name and version, the software itself, declaration list and relevant literature.

### III.2 Qualifying procedure

For each class of Regenerative Heat Exchanger, one unit 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 complaint procedure may be carried out, as described in the Certification Manual of Eurovent Certita Certification.

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

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

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.

In case there is an infinity of sizes to declare, the Participant/Applicant shall declare, as a minimum, the following sizes (if existing): 1000, 2000, 4000 (or maximum).

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 AARE-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, one unit per class of Regenerative Heat Exchangers shall be selected by Eurovent Certita Certification and tested in the Independent laboratory selected by Eurovent Certita Certification.

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 corresponding invoice shall be sent by Eurovent Certita Certification to the Applicant/Participant.

**IV.3 Software**

See APPENDIX B.

**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. 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 a 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 AARE-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 in the Eurovent Certified Performance website. After verification (“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.

In case of failure on efficiency for sorption unit, Eurovent Certita Certification shall reconsider the unit’s classification given by the manufacturer and update the website with the new classification according to test 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).

In a repetition procedure, if the failure on regular measuring points is confirmed and accepted by the Applicant/Participant for a test of campaign *n*, a penalty test will be required on a unit from the same factory in test campaign *n+1*. The penalty test will be performed on another unit of different type but the same class (if available) selected by Eurovent Certita Certification.

## 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](http://www.eurovent-certification.com) for regenerative heat exchangers:

- Name of Company
- Trade or brand name of model
- *Production site (city, country)*
- Model designation(s)
- Basic Material

- Velocity [m/s]
- Geometric data : diameter [m], depth [m], thickness [mm], wave height [mm]
- Rotor speed (for rotary heat exchangers) [rpm]
- Alternating period (for alternating storage systems) [s]
- Purge angle
- Nominal air flow [m<sup>3</sup>/h]
- Pressure drop [Pa]
- Temperature and humidity efficiency for summer and winter conditions
- Outdoor Air Correction Factor (OACF) and Exhaust Air Transfer Ratio (EATR), both with and without purge at the following conditions:
  - OACF @250 Pa at 2.0 m/s for RHE and 1.5m/s for ASM
  - EATR @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM
- Designation of the sealing systems
- Web address of the documentation on the sealing systems

## **V.2 By Participants**

See dedicated chapter in Certification Manual.

Additionally each sealing system shall be documented and specified (type key or designation) and with pictures in the participant documentation. This information shall be made public (e.g. product catalogue).



## APPENDIX A. CERTIFICATION SCHEDULE

	AARE
Eurovent Certita Certification asks for update of list and software from the Participant	30/11/n-1
Eurovent Certita Certification sends selection list for test (regular tests + penalty tests from the previous test campaign)	31/12/n-1
Selection list is confirmed	31/01/n
Delivery + Technical data sheet + payment are completed	31/03/n
Eurovent Certita Certification sends the diploma if all elements are received	30/06/n
Diploma validity	30/06/n+1
All first tests finished by the laboratory	31/05/n
Eurovent Certita Certification forwards the test report to the Participant	2 working days after reception
Eurovent Certita Certification sends test results (software checking)	30/06/n
Eurovent Certita Certification sends selection list for second test	31/07/n
Delivery + Technical data sheet + payment are completed for second tests	15/09/n
Second tests are finished by the laboratory	15/10/n
Eurovent Certita Certification forwards the test report to the Participant	2 working days after reception
Correction of the software after failure	1 month
Report on failure	Compliance Com. meeting

## APPENDIX B. SPECIFIC SOFTWARE REQUIREMENTS

General software (selection tool) requirements are described in the dedicated appendix of the 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 and in APPENDIX E.
- It is mandatory for the Applicant/Participant to provide, as inputs of the software:
  - the mass flows (as a mandatory option) on the building side (exhaust inlet and supply outlet);
  - the temperature on the entry sides (extract and supply inlet);
  - the humidity on the entry sides (extract and supply inlet).
- It is mandatory for the Applicants/Participants to display the following items on the printouts:
  - the temperature efficiency (also called temperature ratio);
  - the pressure drop under standard conditions. It is allowed to display any other pressure drop values if accompanied by the underlying air density;
  - the actual extract and supply outlet mass flows (at least).
- *It shall be clearly stated if the airflows are given under standard or actual conditions*
- Wave lengths and heights do not have to be displayed in printouts.
- 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.
- If a unit is selected without a casing and sealing system no leakage data shall be presented on the printouts.
- If a wheel is selected with a casing and sealing system:
  - Airflows on the building side shall be provided in the printouts (supply outlet and extract)
  - If the static pressure difference is not specified during the selection then leakage data (OACF, EATR) at 250 Pa pressure difference, purge configuration and sealing system shall be provided:
    - If the purge is selected by the customer: with the purge configuration selected by the customer
  - If the pressure difference is specified during the selection:
    - The sealing system shall be specified (key code or designation) in the printouts
    - Leakage data (OACF, EATR) shall be specified in the software printouts for the given pressure difference at standard conditions and the given purge sector configuration
- 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.
- If a Regenerative Heat Exchanger is selected without casing, its performances cannot be higher than the Eurovent Certified Performances values.<sup>1</sup>

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<sup>1</sup> See Minutes of the Compliance Committee meeting held on 1<sup>st</sup> October 2015

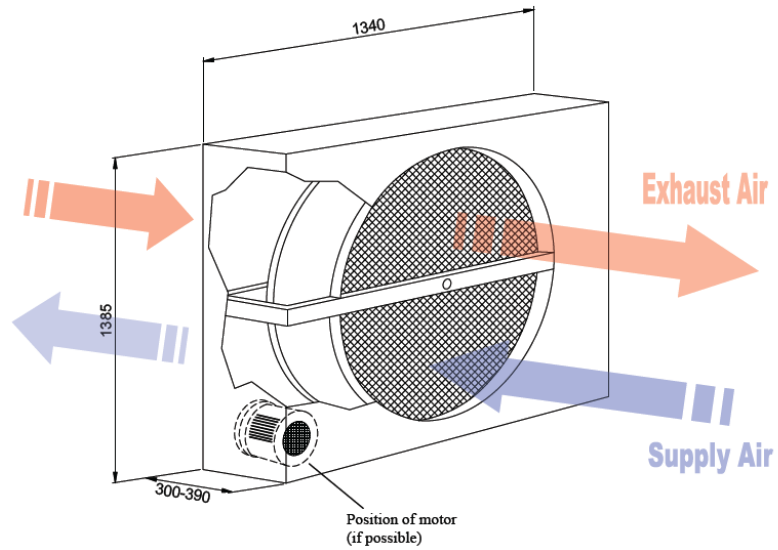
**Table 1: Information to be found as outputs and on the printouts**

SYMBOL	RECOMMENDED NAME	Output	Printout
	Type key		Mandatory
	Basic material		Mandatory <sup>(1)</sup>
	Diameter (rotary) in mm		Mandatory <sup>(1)</sup>
	Internal length in mm		Mandatory <sup>(1)</sup>
	Purge angle in deg		Mandatory <sup>(1)</sup>
<b>n</b>	Rotating speed (rotary)		Mandatory
	Thickness		Mandatory <sup>(1)</sup>
	Wave height in mm		Mandatory <sup>(1)</sup>
	Unit type (condensation/hygroscopic/sorption)		Mandatory <sup>(1)</sup>
	Face air velocity in m/s	Mandatory	Mandatory
<b>q<sub>m</sub> q<sub>v</sub> q<sub>vn</sub></b>	air mass flow rate or Standard air volume flow rate (1.2 kg/m <sup>3</sup> )	Mandatory	Mandatory
<b>p<sub>a</sub></b>	Atmospheric pressure		Mandatory
<b>...11</b>	Extract air [if Exhaust air is used] Exhaust air inlet <sup>(1)</sup> [if Exhaust air outlet is used]		Mandatory
<b>t<sub>11</sub></b>	Extract air temperature		Mandatory
<b>φ<sub>11</sub></b>	Extract air relative or absolute humidity		Mandatory
<b>q<sub>11</sub></b>	Extract air airflow		Mandatory
<b>...21</b>	Supply air inlet <sup>(1)</sup>		Mandatory
<b>t<sub>21</sub></b>	Supply air inlet temperature		Mandatory
<b>φ<sub>21</sub></b>	Supply air relative or absolute humidity		Mandatory
<b>q<sub>21</sub></b>	Supply air inlet airflow		Mandatory
<b>...12</b>	Exhaust air [if Extract air is used] Exhaust air outlet <sup>(1)</sup> [if Exhaust air inlet is used]	Mandatory	Mandatory
<b>t<sub>12</sub></b>	Exhaust air temperature	Mandatory	Mandatory
<b>φ<sub>12</sub></b>	Exhaust air relative or absolute humidity	Mandatory	Mandatory
<b>q<sub>12</sub></b>	Exhaust air airflow	Mandatory	Mandatory
<b>...22</b>	Supply air outlet <sup>(1)</sup>	Mandatory	Mandatory
<b>t<sub>22</sub></b>	Supply air temperature	Mandatory	Mandatory
<b>q<sub>22</sub></b>	Supply air airflow	Mandatory	Mandatory
<b>Δp<sub>1</sub></b>	Pressure drop on exhaust air side at standard condition (1.2 kg/m <sup>3</sup> )	Mandatory	Mandatory
<b>Δp<sub>2</sub></b>	Pressure drop on supply air side at standard condition (1.2 kg/m <sup>3</sup> )	Mandatory	Mandatory
<b>η<sub>t</sub></b>	Temperature efficiency dry [for plates] Temperature efficiency wet [for plates without humidity transfer] Temperature efficiency [for regeneratives]	Mandatory	Mandatory
<b>η<sub>x</sub></b>	Humidity efficiency (plates with humidity transfer) Humidity efficiency (regenerative)	Mandatory	Mandatory
<b>EATR</b>	Exhaust air transfer ratio in %	Mandatory	Mandatory
<b>OACF</b>	Outdoor air correction factor (-)	Mandatory	Mandatory
<b>Δp<sub>22-11</sub></b>	Static pressure difference	Mandatory	Mandatory

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

## APPENDIX C. LABORATORY LIMITS

Minimum air flow rate: 1500 m<sup>3</sup>/h  
Maximum air flow rate: 7000 m<sup>3</sup>/h  
Dimensions casing: length x height x width: 1340 x 1385 x max. 390 mm (+0 mm, -5 mm)  
Maximum diameter Rotary: 1000 mm



## APPENDIX D. FORMS

### D.I. Form aaRe-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 1		
		Name of range 2		
		...		
Software	Name	Software name		
	Version	Software version		
	Release date	Date of release		
Generic	Product number	Unique Eur. Cert. nb. This will be created during first import and will not change anymore		
	Master product nb	See form AARE-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		
	Range name	Name of the range		
BMG	Basic Model Group: for products with similar properties			
Performances		For each performance item, value of the declared data (see below)		
Characteristics		For each characteristic, value of the declared data (see below)		
Published performance	General	Air leakage	%	
		Pressure drop at standard conditions	Pa	
	1.0 m/s (for rotors and ASM)	Winter temperature efficiency	%	
		Winter humidity efficiency	%	
		Summer temperature efficiency	%	
		Summer humidity efficiency	%	
		Pressure drop at standard conditions	Pa	
		Nominal airflow at standard condition	m <sup>3</sup> /h	
	1.5 m/s (for ASM only)	Pressure drop at standard conditions	Pa	
		Winter temperature efficiency	%	
		Winter humidity efficiency	%	
		Summer temperature efficiency	%	
		Summer humidity efficiency	%	
		Nominal airflow at standard condition	m <sup>3</sup> /h	
	2.0 m/s (for rotors only)	Outdoor Air Correction Factor @ 250 Pa (for ASM only)	-	
		Exhaust Air Transfer Ratio @ 250 Pa (for ASM only)	%	
		Pressure drop at standard conditions	Pa	
		Winter temperature efficiency	%	
		Winter humidity efficiency	%	
		Summer temperature efficiency	%	
	2.5 m/s (for ASM only)	Summer humidity efficiency	%	
		Nominal airflow at standard condition	m <sup>3</sup> /h	
		Pressure drop at standard conditions	Pa	
		Winter temperature efficiency	%	
		Winter humidity efficiency	%	
		Summer temperature efficiency	%	
	3.0 m/s (for rotors only)	Summer humidity efficiency	%	
		Nominal airflow at standard condition	m <sup>3</sup> /h	
Pressure drop at standard conditions		Pa		
Winter temperature efficiency		%		
Winter humidity efficiency		%		
Summer temperature efficiency		%		
Published characteristics	Basic material			
	Purge angle (for rotary heat exchangers)			
	Diameter (for rotary heat exchangers)	mm		
	Height (for alternating storage systems)			
	Width (for alternating storage systems)			
	Internal length	mm		
	Rotor speed (for rotary heat exchangers)	rpm		
Alternating period (for alternating storage systems)	s			

	Thickness	mm	
	Wave height	mm	
	Wave length	mm	
	List of City(ies) and Country(ies) of Manufacturing place(s)		
Sealing system 1	Sealing system name		
	OACF @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	-	
	EATR @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	%	
Sealing system 2	Sealing system name		
	OACF @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	-	
	EATR @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	%	
Sealing system 3	Sealing system name		
	OACF @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	-	
	EATR @250 Pa at 2.0 m/s for rotors and 1.5m/s for ASM	%	

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

Generic	Participant name	Name of the holder of the contract
List of ranges	Ranges	Name of range 1
		Name of range 2
		...
		Name of range n
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 AARE-3: Technical datasheet

ECP Certification AIR TO AIR ROTARY HEAT EXCHANGERS TECHNICAL DATA SHEET						
Commercial Range						0
Manufacturer						0
Address of the factory						
Code Eurovent						0
Model						0
Product type						0
Software version						
Tested model serial number						
Sealing system	Number	Designation	Web address to the documentation			
	Sealing 1	0				0
Basic Material						0.00
Purge Angle						0.00 Deg°
Free diameter						0.00 mm
Height						0.00 mm
Width						0.00 mm
Internal Length						0.00 mm
Rotor speed						0.00 rot/mn
Alternating Period						0.00 s
Material Thickness						0.00 mm
Wave Height						0.00 mm
Wave Length						0.00 mm
Max. pressure diff. in software						Pa
OACF w/ purge	0.00		OACF w/o purge	0.00		
EATR w/ purge	0.00		EATR w/o purge	0.00		
Velocity	1 m/s (1)	1.5 m/s (1.5)	2 m/s (2)	2.5 m/s (2.5)	3 m/s (3)	m/s
Nominal Airflow	0	0	0	0	0	m <sup>3</sup> /h
Pressure Drop	0	0	0	0	0	Pa
Winter temperature Effic.	0	0	0	0	0	%
Winter humidity Effic.	0	0	0	0	0	%
Summer temperature Effic.	0	0	0	0	0	%
Summer humidity Effic.	0	0	0	0	0	%
<b>NB: PLEASE NOTE THAT THE PURGE SYSTEM HAS TO BE REMOVABLE. PLEASE PROVIDE INSTRUCTIONS TO THE LABORATORY IF NECESSARY.</b>						
NAME :						
TITLE :						
DATE :						
SIGNATURE :						

### D.IV. Form AARE-4: Test result form

Software	Participant name	Name of the holder of the contract				
	Name	Software name				
	Version	Software version				
Generic	Release date	Date of release				
	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 performance				As in Technical data sheet		
Test conclusion				Passed of Failed	Number of penalty tests	



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

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

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

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