

Third party certification for water-clear performances on an opaque market

A need for more transparency and reliability on the plate heat exchangers market

Suitable for a wide range of applications, single-phase (liquid-to-liquid) plate heat exchangers (PHE) are a compact and efficient heat transfer solution.

The area of a plate varies from a few square centimetres to several square meters. Besides, the number of plates in a single exchanger can range from ten to several hundreds, thus reaching heat exchange surface areas up to thousands of square meters. Thanks to this high level of modularity, plate heat exchangers (PHE) can be customized to the end customer's specific needs.

However, the race towards design optimisation, originally customer oriented, created a perverse effect. Indeed, the final choice between two providers being mainly driven by prices, the manufacturer can be tempted to manipulate calculations, thus minimizing costs and making his technical offer more attractive. Yet, these adjustments often imply a heat capacity loss.

This malpractice is all the stronger as two different plate heat exchangers can look physically identical. However, there are differences of prime importance for the heat transfer, for instance the plate corrugation pattern, that are not visible from outside. These technical features, treated as confidential "know-how" data, are impossible to check without dismantling the heat exchanger.

Anyone involved in recommending, selecting and using such heat exchangers – consultant, specifier and end customer – is therefore breaking out into a cold sweat when the commissioning time comes. Indeed, if the installed heat exchanger does not function as expected, filling the performance gap generates additional, and sometimes, substantial costs which come on top of the investment already made, not to mention the lost time.



MARIE-CLÉMENCE BRIFFAUD

Project Development Engineer
Eurovent Certita Certification, Paris,
France
mc.briffaud@eurovent-certification.com

In a spirit of fair competition, some manufacturers have been trying to communicate on this risk to raise the general awareness, but such individual initiatives have not been as successful as expected. So far, the choice remains driven by the costs, no matter the level of commitment provided by the manufacturer.

Joining forces for a European solution

To encourage manufacturers to communicate on engineering performances of their products and to create a level playing field, the first step is to provide them a single, common, baseline for the product evaluation rules. This is where voluntary third-party certification comes into play.

Eurovent Certified Performance (ECP), is one the most renowned certification mark in the European HVAC&R. It is estimated that 66% of HVAC&R products sold on the European market are ECP certified¹. That is the reason why a group of European manufacturers decided to join forces with Eurovent Certita Certification to establish a strong, reliable certification scheme guaranteeing that certified products will perform as advertised once set-up.

The committee thus formed worked between April 2017 and September 2018 on reference documents

[1,2] that provide a common, levelled playground to the market players. The resulting Liquid-to-liquid plate heat exchangers certification programme entered into force on October 15th, 2018.

A tailor-made certification programme...

The development of the programme also involved European laboratories consultation to elaborate an adequate test method based on, but amending, the EN 1148:1999+A.1:2005 standard [3] focused on water-to-water district heating applications. The test method detailed in the rating standard [2] is aligned with the certification scope i.e. plate heat exchangers operated for Heating, Ventilation and Air-conditioning (HVAC) single-phase applications.

To enhance comparability and fairness of the ratings the performance tests need to be fully reproducible. A great part of the work was therefore dedicated to bringing more details to the test protocol in order to leave no room for ambiguity. As a result, priority was given to measurement uncertainty requirements clarity and relevance.

Another aspect of the challenge was to select a number of standard temperature conditions representative of NTU-LMTD² pairings that can be actually found in the HVAC industry in order to properly map the product range operating area (see **Figure 1**). A final list of twelve conditions was adopted (see **Table 1** and **Table 2**).

Eurovent Certita Certification will vary the following parameters every time a selection is made to cover as many configurations as possible over the certification campaigns:

- temperature condition (see **Table 1**)
- heat exchange fluid nature on secondary side: aqueous solution - ethylene glycol, propylene glycol and ethanol – with a given mass fraction between 20 and 50% or clean water
- primary side heat exchange fluid³ inlet volume flow rate
- maximum allowed pressure drops on primary and secondary sides respectively

... for tailor-made products

Three main categories of plate heat exchangers, named after their respective sealing technology, are used in single-phase HVAC applications. Gasketed PHE on the one hand, are appreciated for their easy dismantling for cleaning and maintenance operations. Brazed⁴ and fusion-bonded⁵ technologies, on the other hand, can

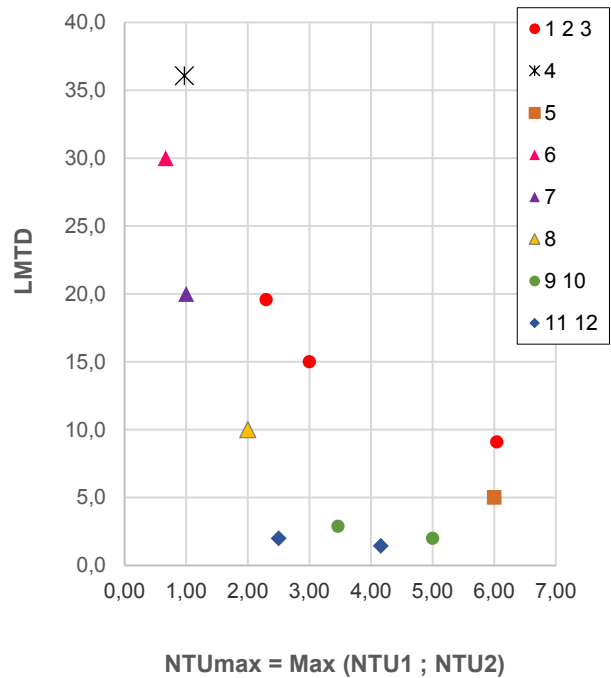


Figure 1. LMTD and NTU_{max} values corresponding to the 12 testing conditions adopted for the LPHE programme.

Table 1. Standard temperature conditions for testing. [2]

Temperature condition	t ₁₁	t ₁₂	t ₂₁	t ₂₂	
1	70	15	10	55	
2		25			
3		35		20	
4		40		35	65
5		40	35	20	40
6		50	30	50	
7		50	40	60	
8		22	12	10	20
9	14				
10	16		15		
11	17				
12					

Table 2. Abbreviations used in Table 1.

t ₁₁	Primary fluid inlet temperature (in °C)
t ₁₂	Primary fluid outlet temperature (in °C)
t ₂₁	Secondary fluid inlet temperature (in °C)
t ₂₂	Secondary fluid outlet temperature (in °C)

sustain higher temperatures/pressures and are even more compact.

Playing with the plate size and number enable determining the most appropriate heat exchanger design for a given project specification. As a result, each and every plate heat exchanger sold to a customer is tailor-made.

Manufacturers generally use a software to compute the calculations. Hence, the software ability to provide accurate performance data is critical.

The certification requirements defined for the LPHE programme involve product performance testing to check the software outputs accuracy, but also production sites auditing and selection tool checking as complementary guarantees.

Indeed, the production site audit is an opportunity for Eurovent Certita Certification to verify that the software version used in situ – sometimes made available to the project owner - is the same as that declared for the certi-

fication. Besides, Eurovent Certita Certification verifies that essential manufacturing checks⁶ are included in the standard operating procedure, conducted and registered. Eventually, the auditor checks that the products selected for testing are consistent with products sold to customers.

Towards increasing levels of transparency

Third-party certification purpose is to provide common rules for the product performance evaluation as a solution towards a fair competition between manufacturers.

Certification is not a single pass process (see **Figure 2**). Once a range is certified, an annual surveillance procedure, comprising tests and audits, is initiated to verify that the requirements continue to be fulfilled throughout the years. This surveillance procedure is mandatory for the manufacturer to see renewed his authorization to use the ECP mark on documentation and products.

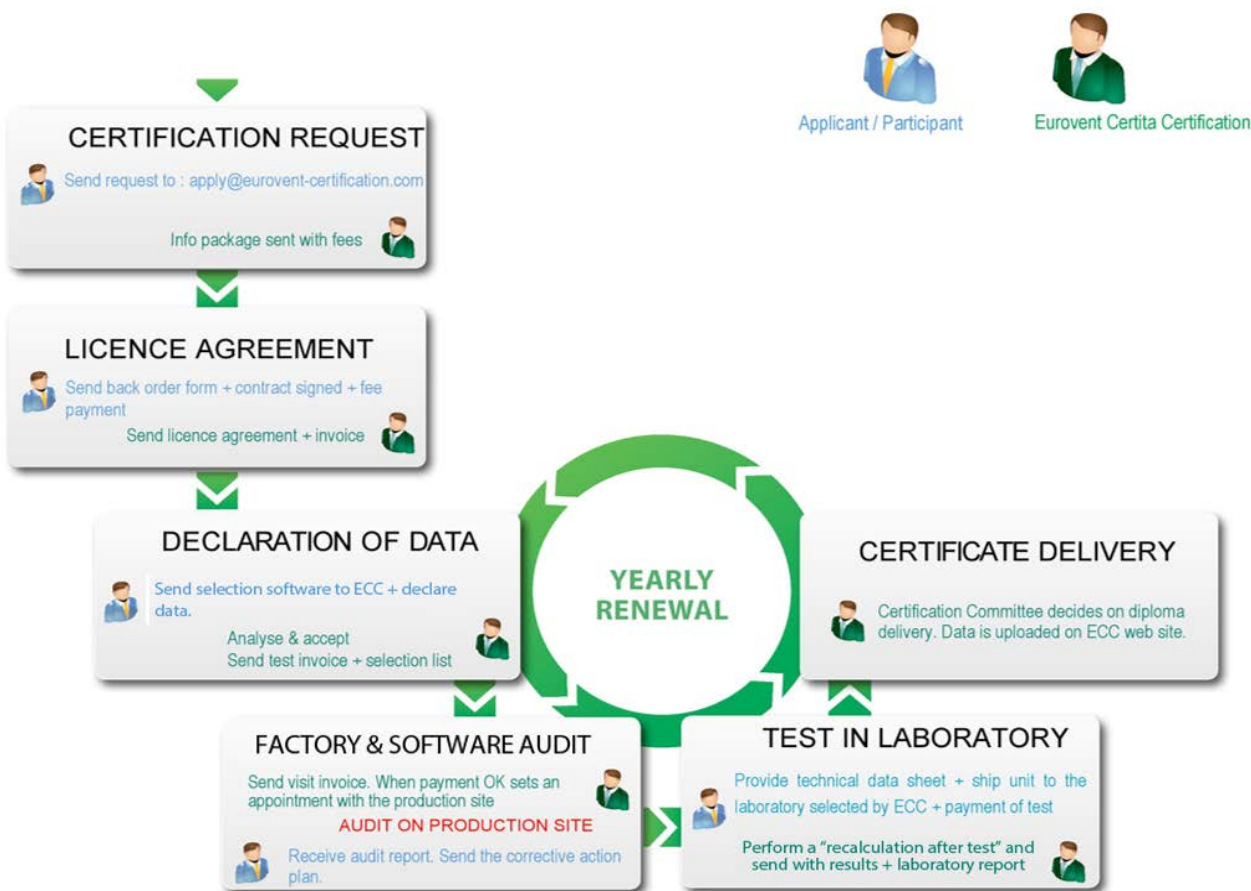


Figure 2. LPHE programme process overview.

The LPHE programme will constantly evolve throughout the years to capitalize on the certification campaigns feedback. Besides, it is already planned to re-evaluate in 2023 the possibility to switch from a range certification to a “certify-all” policy to enhance full transparency on the market. Every year, a dedicated committee composed of participating manufacturers will gather to suggest or validate updates managed by Eurovent Certita Certification.

In the meantime, any end-user will be able to ask Eurovent Certita Certification to check the software printout provided by a participating manufacturer free of charge.

With this brand new LPHE certification programme, Eurovent Certita Certification and plate heat

exchangers manufacturers expect to raise the standard for transparency and reliability of the products data, thus restoring confidence in the plate heat exchangers industry over time.

How to get further information?

Anyone willing to get further information about the LPHE certification can visit the dedicated webpage where the applicable reference documents are available in English⁷.

For specific questions or to apply for the certification scheme please contact apply@eurovent-certification.com specifying “LPHE” in the e-mail object. There is no deadline as this is a voluntary registration. ■

Endnotes

- 1 2014 data valid for Chillers, Heat Pumps, Fan Coil Units, Heat Exchangers and Filters within the certified scope
- 2 NTU (Number of heat transfer units) and LMTD (Logarithmic Mean Temperature Difference) definitions can be found in standard [4]
- 3 The primary side fluid is always clean water for simplicity
- 4 Using copper as brazing material
- 5 Using stainless steel as fusion material for hygiene and corrosion resistance
- 6 See Operational Manual OM-25 [1] for further details
- 7 <http://www.eurovent-certification.com>

References

- [1] OM-25 Operational Manual for the certification of Liquid-to-liquid plate heat exchangers, Eurovent Certita Certification, 2018.
- [2] RS 7/C/010 Rating Standard for the certification of Liquid-to-liquid plate heat exchangers, Eurovent Certita Certification, 2018.
- [3] European Standard EN 1148:1999+A.1:2005 - Heat Exchangers - Water To Water Heat Exchangers For District Heating - Test Procedures For Establishing The Performance Data.
- [4] European Standard EN 305:1997 - Heat exchangers - Definitions of performance of heat exchangers and the general test procedure for establishing performance of all heat exchangers.