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ANSI/AHRI Standard 400 (I-P)

2015 Standard for Performance Rating of Liquid to Liquid Heat Exchangers



Approved by ANSI on November 6, 2015



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IMPORTANT

SAFETY DISCLAIMER

AHRI does not set safety standards and does not certify or guarantee the safety of any products, components or systems designed, tested, rated, installed or operated in accordance with this standard/guideline. It is strongly recommended that products be designed, constructed, assembled, installed and operated in accordance with nationally recognized safety standards and code requirements appropriate for products covered by this standard/guideline.

AHRI uses its best efforts to develop standards/guidelines employing state-of-the-art and accepted industry practices. AHRI does not certify or guarantee that any tests conducted under the standards/guidelines will not be non-hazardous or free from risk.

Note:

This standard supersedes AHRI Standard 400–2001 with Addenda 1 and 2.
For the SI ratings, see ANSI/AHRI Standard 401 (SI)–2015.

AHRI CERTIFICATION PROGRAM PROVISIONS

The scope of the Liquid to Liquid Heat Exchangers (LLHE) & Liquid to Liquid Brazed & Fusion Bonded Plate Heat Exchangers (LLBF) certification programs are defined below. These scopes are current as of the publication date of the standard. Revisions to the scope of these certification programs can be found on the AHRI website www.ahrinet.org. The scope of these certification programs should not be confused with the scope of the standard as the standard covers products that are not covered by a certification program.

LLHE Certification Program Scope

This program applies to production models of gasketed plate-type heat exchangers that utilize water or sea water on one (1) or both loops, for HVAC applications only.

This certification program excludes all of the following:

- Heat exchangers used for phase-change heat transfer
- Heat exchangers used for non-liquid heat transfer
- Heat exchangers used for food-based processes
- Heat exchangers with a capacity greater than 240,000,000 Btu/h
- Heat exchangers with a flow rate greater than 20,000 GPM
- Heat exchangers with pass arrangements above 3 passes per side
- Heat exchangers with an unequal number of passes per side

LLBF Certification Program Scope

This program applies to production models of brazed & fusion bonded plate-type heat exchangers, that utilize water or sea water on one or both loops for HVAC applications only.

This certification program excludes all of the following:

- Heat exchangers used for phase-change heat transfer
- Heat exchangers used for non-liquid heat transfer
- Heat exchangers used for food-based processes
- Heat exchangers with a capacity greater than 16,000,000 Btu/h
- Heat exchangers with a flow rate greater than 1,200 GPM

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PERFORMANCE RATING OF LIQUID TO LIQUID HEAT EXCHANGERS

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to establish for Liquid to Liquid Heat Exchangers: definitions; test requirements; rating requirements; minimum data requirements for Published Ratings; marking and nameplate data; and conformance conditions.

1.1.1 *Intent.* This standard is intended for the guidance of the industry, including manufacturers, engineers, installers, contractors and users.

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as technology advances.

Section 2. Scope

2.1 *Scope.* This standard applies to Liquid to Liquid Heat Exchangers as defined in Section 3, which includes the following types of heat exchangers:

- 2.1.1** Plate heat exchangers
- 2.1.2** Shell-and-tube heat exchangers
- 2.1.3** Shell-and-coil heat exchangers
- 2.1.4** Shell-and-U-Tube heat exchangers

2.2 *Exclusions.* This standard does not apply to heat exchangers used for change of phase or non-liquid heat transfer applications.

Section 3. Definitions

All terms in this document will follow the standard industry definitions in the *ASHRAE Terminology* website (<https://www.ashrae.org/resources--publications/free-resources/ashrae-terminology>) unless otherwise defined in this section.

3.1 *Cold Stream.* The liquid stream with the lower inlet temperature.

3.2 *Field Fouling Allowance.* Provision for anticipated fouling during use.

3.2.1 *Fouling Factor.* The thermal resistance due to fouling accumulated on the heat transfer surface.

3.3 *Hot Stream.* The liquid stream with the higher inlet temperature.

3.4 *Liquid to Liquid Heat Exchanger.* A heat transfer device used to exchange heat between two liquid streams that are single phase fluids.

3.5 *Number of Transfer Units (NTU).* A dimensionless coefficient representing the magnitude of thermal performance. The equation for NTU is given in Appendix C.

3.6 *Plate Heat Exchanger.* Heat transfer device that typically utilizes corrugated metal plates in a bolted frame. An alternate technique is for the plates to have elastomeric gaskets that seal the unit and direct the heat transfer stream in countercurrent flow. The corrugated plates can also be brazed together using a sacrificial alloy thus avoiding the need for a bolted frame.