

ICS 27.010
CCS F01



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB 19577-2024

Replacing GB 19577-2015

**Minimum allowable values of energy efficiency and energy
efficiency grades for heat pumps and water chillers**

热泵和冷水机组能效限定值及能效等级

Issued on: April 29, 2024

Implemented on: February 1, 2025

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

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1 Scope

China's mandatory energy efficiency standard for the large heat pumps and water chillers that air condition commercial buildings - the machines in the plant room of every office block, shopping centre, hospital and hotel, which between them account for a substantial share of the country's summer electricity peak. It specifies the technical requirements for the minimum allowable values of energy efficiency and the energy efficiency grades for heat pumps and water chillers, together with the test methods and inspection rules. The interesting part of a standard like this is which index it chooses to measure. A chiller spends almost none of its life at full load: it is sized for the hottest afternoon of the year and then runs at part load for everything else. Judging it on its full load coefficient of performance therefore rewards the wrong machine, and this standard, like its international counterparts, sets the grades on the integrated part load value as well as the full load COP - a weighted figure across the load points a machine actually sees, which is what determines the electricity bill. The grades are tabulated by machine type and by cooling capacity, since a small scroll unit and a large centrifugal machine are not comparable, and the requirements apply to the water chilling packages using the vapour compression cycle. The minimum allowable value is the compliance threshold, the energy conservation evaluation value the higher threshold for certification, and the grades what appears on the label. Issued on 29 April 2024 and in force since 1 February 2025, it replaces GB 19577-2015.

This document specifies the technical requirements for the minimum allowable values of the energy efficiency and energy efficiency grades for heat pumps and water chillers, describes the corresponding test methods, and clarifies the implementation of this document. The types of heat pumps and chillers to which this document applies include water chilling (heat pump) packages using the vapor compression, low ambient temperature air source heat pump (water chilling) packages, water-source (ground-source) heat pumps, lithium bromide absorption water chillers (heaters), water-source high temperature heat pumps using the

vapor compression cycle, indirect evaporative cooling water chillers, and integrated water chilling (heat pump) packages.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 10870 The methods of performance test for water chilling (heat pump) packages using the vapor compression cycle

GB/T 18362 Direct-fired lithium bromide absorption water chiller (heater)

GB/T 18430.1 Water chilling (heat pump) packages using the vapor compression cycle - Part

1. Water chilling (heat pump) packages for industrial & commercial and similar application

GB/T 18430.2 Water chilling (heat pump) packages using the vapor compression cycle - Part

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 18430.1, GB/T 18430.2, GB/T 18362, GB/T 18431, GB/T 10870, GB/T 19409, GB/T 25127.1, GB/T 25127.2, GB/T 25861, JB/T 14640, JB/T 14642 and JB/T 12839 and the following apply.

3.1 minimum allowable values of energy efficiency for water chilling (heat pump) packages using the vapor compression Under the specified standard operating conditions, the minimum allowable values of the coefficient of performance (COP_c), integrated part load value (IPLV), annual comprehensive cooling coefficient of performance (ACCOP) and (or) cooling seasonal performance factor (CSPF) of water chilling (heat pump) packages using the vapor compression.

20 Under the specified standard operating conditions, the minimum allowable values of the nominal heating coefficient of performance (COP_h), low temperature heating coefficient of performance (COP_{dh}), heating seasonal performance factor (HSPF) and (or) annual performance factor (APF) of low ambient temperature air source heat pump (water chilling) packages.

3.3 minimum allowable values of energy efficiency for water-source (ground-source) heat pumps Under the specified standard operating conditions, the minimum allowable values of the annual comprehensive coefficient of performance (ACOP) or heating coefficient of performance (COP) of water-source (ground-source) heat pumps. NOTE. For heat-pump units, the annual comprehensive coefficient of performance (ACOP) is assessed; for

single-heat units, the heating coefficient of performance (COP) is assessed.

3.4 minimum allowable values of energy efficiency for lithium bromide absorption water chillers (heaters) Under the specified standard operating conditions, the minimum allowable values of the coefficient of performance (COP) or the maximum values of the heating source consumption per unit cooling capacity of lithium bromide absorption water chillers (heaters). NOTE. For vapor units, the heating source consumption per unit cooling capacity is assessed; for direct-fired units, the coefficient of performance (COP) is assessed.

3.5 minimum allowable values of energy efficiency for water-source high temperature heat pumps using the vapor compression cycle Under the specified standard operating conditions, the minimum allowable values of the heating coefficient of performance of water-source high temperature heat pumps using the vapor compression cycle. NOTE. For water-source high temperature heat pumps, the heating coefficient of performance (COPH) is assessed; for periodical feeding heat pump high temperature hot water units, the heating coefficient of performance (COP) is assessed.

3.6 minimum allowable values of energy efficiency for indirect evaporative cooling water chillers Under specified standard operating conditions, the minimum allowable values of the annual energy efficiency ratio (AEER) or energy efficiency ratio (EER) of indirect evaporative cooling water chillers. NOTE. For high-leaving water temperature chillers base on dew point indirect evaporative cooling used in data centers and similar places, the annual energy efficiency ratio (AEER) is assessed; for composite indirect evaporative cooling water chillers used in computer and data processing rooms, the energy efficiency ratio (EER) is assessed.

3.7 minimum allowable values of energy efficiency for integrated water chilling (heat pump) package Under specified standard operating conditions, the minimum allowable values of the integrated part load value (IPLVI) and nominal operating coefficient of performance (COPI) of integrated water chilling (heat pump) packages. NOTE. For vapor-cooled, cooling-tower and air-cooled units, the integrated part load value (IPLVI) and nominal operating coefficient of performance (COPI) are assessed.

4 Energy efficiency grades

4.1 The energy efficiency grades for heat pumps and water chillers are divided into 3 grades, among which grade 1 has the highest energy efficiency.

4.2 The measured values and nominal values of the energy efficiency indicators of various types of heat pumps and water chillers shall not be less than the specified values corresponding to the energy efficiency grades in Tables 1 to

8. Among them, the indicators of energy efficiency grades for water chilling (heat pump) packages using the vapor compression adopt dual-channel evaluation indicators, i.e., select the energy efficiency value of one of the indicator systems in the comprehensive part load

value (IPLV) (see Table 1) or the coefficient of performance (COP_c) (see Table 2) to determine the energy efficiency grade.

5 Technical requirements

5.1 The minimum allowable values of energy efficiency for water chilling (heat pump) packages using the vapor compression, the minimum allowable values of energy efficiency for low ambient temperature air source heat pump (water chilling) packages, the minimum allowable values of energy efficiency for water-source (ground-source) heat pumps, the minimum allowable values of energy efficiency for lithium bromide absorption water chillers (heaters), the minimum allowable values of energy efficiency for water-source high temperature heat pumps using the vapor compression cycle, the minimum allowable values of energy efficiency for indirect evaporative cooling water chillers, and the minimum allowable values of energy efficiency for integrated water chilling (heat pump) packages are the indicator values corresponding to energy efficiency grade 3 in Tables 1 to 8.

5.2 For low ambient temperature air source heat pump (water chilling) packages with electric auxiliary heating, the electric auxiliary heating system shall be manually turned on and off, and its working status shall be expressed in an obvious position.

5.3 The marked values of energy efficiency for heat pumps and water chillers shall be within the range of values corresponding to their rated energy efficiency grades, and the measured values of energy efficiency shall not be less than the provisions in the corresponding product standards in Tables 1 to 8.

6 Tests and calculation methods

6.1 The energy efficiency test method for water chilling (heat pump) packages using the vapor compression shall be carried out in accordance with the relevant provisions of GB/T 18430.1 and GB/T 18430.2. The test and calculation of air-cooled comfort chillers with a nominal cooling capacity not exceeding 50 kW shall be carried out in accordance with the provisions of Annex A.

6.2 The energy efficiency test method for low ambient temperature air source heat pump (water chilling) packages shall be carried out in accordance with the relevant provisions of GB/T 25127.1 and GB/T 25127.2.

6.3 The energy efficiency test method for water-source (ground-source) heat pumps shall be carried out in accordance with the relevant provisions of GB/T 19409.

6.4 The energy efficiency test method of lithium bromide absorption water chillers (heaters) shall be carried out in accordance with the relevant provisions of GB/T 18431 and GB/T 18362.

6.5 The energy efficiency test method for water-source high temperature heat pumps using