JB

MACHINERY INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 27.200

J 73

JB/T 4330-1999

Replacing JB 4330-86

Determination of Noise Emitted by Refrigerating and Air Conditioning Equipment

制冷和空调设备噪声的测定

Issued on: July 12, 1999 **Implemented on: Janaury1, 2000**

Issued by: State Machinery Industry Bureau

Table of Contents

Determination of Noise Emitted by Refrigerating and Air Conditioning Equipment

1 Scope

This standard specifies the determination methods for sound power level of noise on the reflection plane under the free-field conditions. Annex C (Normative Annex) presents the measuring methods for sound pressure level of noise. And Annex D (Normative Annex) presents the measuring methods for sound pressure level of noise emitted by air conditioners.

This standard is applicable to the refrigerating and air conditioning Equipment/parts (hereinafter referred to as "units") assembled by facilities.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

GB/T 3785-1983 *Electric, sonic properties and measuring methods for sound level meters*

JJG 176-1984 *Verification regulation of sound calibrators*

JJG 188-1984 *Verification regulation of sound level meter*

3 Measuring Environment

3.1 Reflection Plane

Reflection plane shall be the flat surface which is composed of concretes, asphalt, terrazzo or other similar solid materials; its dimension shall be larger than the projection of the measuring surface wheresoever.

3.2 Appropriate Measuring Environment

As for the unit, its noise test shall be carried out on half space of the reflection plane. The

be verified periodically according to those specified in JJG 188.

6 Unit Installation and Operation

6.1 Unit Installation

The stationary units shall be installed according to the relevant technical requirements, and the mobile units shall be directly installed on the reflection ground. All of the parts shall be completely installed. However, vibration isolation, sound isolation and sound absorption parts shall not be installed additionally.

6.2 Unit Operation

The units shall be able to function continuously in steady conditions. The following requirements are made for different units:

a) As for the refrigeration compressor, the condensing units shall be operated under nominal refrigerated conditions according to those specified in the relevant standards.

b) As for the room fan-coil air conditioners and air-cooled condensers, they may be measured only when the fan is running.

c) As for other units, their operation shall be in accordance with their test methods.

7 Datum Body and Measuring Surface

7.1 Datum Body

A datum body is the smallest rectangular hexahedron which can precisely envelop the measured unit and end at the reflection plane. In terms of determining the datum body, the small parts (such as the connecting pipes and handles) protruding on the unit may not be considered.

7.2 Measuring Surface

The measuring surfaces include hemisphere measuring surface and rectangular hexahedron measuring surface [see Figure B1 and Figure B2 shown in Annex B (Normative)].

7.2.1 Hemisphere Measuring Surface

a) As for the full-closed and semi-closed refrigeration compressors as well as other smaller-dimension units, the hemisphere measuring surface shall be adopted.

8.3.2 10 measuring points are totally arranged on the hemisphere measuring surface (see Figure B1 and Table B1).

8.3.3 The measuring points on the rectangular hexahedron measuring surface include 9 basic measuring points and 8 additional measuring points (see Figure B2 and Table B2).

8.3.4 Measuring points shall be added under the following conditions:

a) Any side of the datum body is larger than 2d (d is the measuring distance);

b) The measured difference between the maximum sound pressure level value and the minimum sound pressure level value on the basic measuring points is larger than the number of the measuring points;

c) If the measured unit is very large or smaller measuring distance is adopted, then the additional measuring points shall be kept on increasing to make the spacing of the measuring points on the measuring surface not exceeding 2d and distribute uniformly.

8.3.5 Decrease of Number of the Measuring Points

As for some kinds of units, if it is proved that the difference between their sound power level measured by decreasing several measuring points and that measured on the basic measuring points is within ±1dB, then the measuring points may be appropriately decreased.

8.4 Measurement

The microphone shall be over against the direction of the measured unit. As for the sound level meter, the "slow" time-weighed characteristic measurement shall be adopted. If the beat of the sound level meter pointer is not larger than ±3dB, then the mean value between the maximum and minimum sound pressure level shall be adopted. As for the A-weighting and octave whose center frequency is larger than 160Hz, the observation time shall be at least 10s; while for the octave whose center frequency is less than 160Hz, the observation time shall be at least 30s.

If the beat of the sound level meter pointer is larger than ±3dB, then:

a) Analog Equipment which have longer time constant or digital integration-type sound level meters shall be adopted for the measurement;

b) As for the non-steady noise with periodic changes, the "slow" time-weighed characteristic measurement of the sound level meter shall be adopted. Record the sound pressure level and duration in a complete alternation, and then calculate the energy mean value in this complete alternation.

S -- the measuring surface area, m^2;

S_0 -- the reference area is $1m^2$.

10 Measuring Records

The measuring records shall include the following contents. The recommended record list form is given in Annex E (Informative Annex).

10.1 Measured Units

a) The unit type, name, manufacturer and factory number as well as other relative parameters;

b) The measuring operating condition parameters of the unit.

10.2 Acoustic Environment

The reflection plane condition, test cabinet volume, total surface area and acoustic treatment condition shall be recorded. In addition, the sound source diagram also shall be drawn. As for the outdoor measurement, the wind speed and the distance of the measuring points from the nearest reflector and many other conditions shall be recorded.

10.3 Measuring Equipment

a) The equipment type, name, manufacturer and factory number;

b) The inspection dates and departments of the equipment.

10.4 Acoustic Data

a) The datum body dimension, dimension and surface area of the measuring surface;

b) The measuring point position as well as the measuring point position diagram;

c) A-weighted or octave sound pressure level at each measuring point;

d) The sound pressure level of the background noise and the corresponding corrected value, as well as the environmental corrected value K determined according to Annex A;

e) The average A-weighted or octave sound pressure level of the measuring surface and the calculated sound power level.

Annex A

(Normative)

Verification Methods for Measuring Environment

Al Summary

This annex specifies the absolute comparison method and reverberation time method shall be adopted to determine the environmental corrected value K.

A1.1 The environmental correction may not be carried out in the following conditions (namely, K=0):

a) The outdoor sites where there is no reflector within l0m away from any of the measuring points;

b) The semi-anechoic rooms certified according to the relevant standards.

NOTE: Acoustic reflectors mainly refer to buildings and some larger Equipment. As for impediments which are close to the sound sources and whose width (for instance, the diameter of piles and pillars) is larger than 1/10 of their distance apart from the sound sources, then it is deemed as acoustic reflectors.

A1.2 Environmental Corrected Value K

a) This standard requires that the environmental corrected value K shall not be larger than 2dB;

b) If the measured K value is larger than 2dB, then sound absorption measurement may be adopted, or the measuring distance shall be appropriately decreased to reduce the environmental corrected value. However, the measuring distance shall not be less than 0.5m;

c) If the K value is larger than 2dB and less than 7dB, then the A-weighted sound power level shall be measured according to this standard. If the A-weighted sound power level is used for comparison with the sound power level of the similar units in the same measuring environment, then their standard deviation shall not be larger than 3dB.

A2 Absolute Comparison Method

A2.1 Method

Annex C

(Normative)

Measurement for Sound Pressure Level of Noise Emitted by Refrigerating and Air Conditioning Equipment

C1 Application Scope

This annex specifies measuring methods for sound pressure level of noise emitted by refrigerating and air conditioning Equipment.

C2 Measuring environment

The measuring environment is a semi-free sound field of a reflection plane. The difference between the measured unit noise and the background noise shall be over 6dB. If this requirement cannot be met, then sound isolation measurement may be adopted to reduce the background noise. If the difference is less than 10dB, then the measuring environment shall be corrected according to 8.1.2.

C3 Measuring Equipment

The measuring Equipment shall meet the requirements of 5.1. In addition, they also shall be calibrated according to 5.2.

C4 Unit Installation and Operation

The unit installation shall meet the requirements of 6.1. In addition, the units shall be operated according to 6.2.

C5 Measuring Point Positions

The measuring points shall be placed according to 1-4 positions specified in 8.3.3. If the unit height is not more than lm, then its measuring points shall be placed at the altitude of 1m. If the unit height is larger than lm, then its measuring points shall be placed at the altitude of 1.5m. As for large-scale units, additional measuring points may be increased according to those specified in 8.3.4 and their measuring points shall be placed at the altitude of 1.5m. If the measuring points are placed at the air outlet or cooling fan position of the unit and the wind speed is larger than 4-level as well, then they may be measured at a place 45° off the air outlet.

Annex D

(Normative)

Measurement for Sound Pressure Level of Noise Emitted by Air Conditioners

D1 Application Scope

This annex specifies the measuring methods for the sound pressure level of noise emitted by air conditioners.

D2 Measuring Environment

The measuring environment shall be the semi-free sound field on the reflection plane. The difference between the measured unit noise and the background noise shall be over 6dB; if it is less than 10dB, then the measuring environment shall be corrected according to those specified in 8.1.2.

D3 Measuring Equipment

The measuring Equipment shall meet the requirements of 5.1. In addition, they also shall be calibrated according to 5.2.

D4 Operation Conditions

The Equipment shall be installed on the rack according to the relevant technical requirements. They can maintain stable operation under rated voltage and rated frequency. In addition, their operation conditions shall be close to those specified in the technical requirements. However, in the situation that the refrigerant circulating noise may be negligible, the unit noise in the determination room may also be adopted in the ventilation state for the split type units. As for those units with speeders, the noise of all the velocity stages shall be measured, respectively.

D5 Measuring Point Positions

D5.1 Indoor Measurement

The measuring points shall be in the positions shown in Figure D1～Figure D7. And the units shall be measured under the maximum noise condition.

a) Cabinet-type air conditioner (whose refrigerating output is less than or equal to

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------