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PROCEDURE FOR SOUND TESTING
of
AIR CONDITIONERS

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FOREWORD

The present document describes procedures for sound testing of Air Conditioners. Specifications concerning temperature conditions and installation of units have been defined. The document is used by Independent Laboratories under contract with Eurovent Certita Certification for testing for certification.

I. PRINCIPLES

From the sound testing standpoint, four types of Air Conditioners have been defined:

- 1) Split systems;
- 2) Packaged air-cooled air conditioners;
- 3) Packaged water-cooled air conditioners.

All tests are made in cooling mode, in the same conditions as for the measurement of the EER in standard rating conditions (fan speeds, compressor speeds, etc).

Tests are normally performed in a reverberation room (EN 12102 and EN ISO 3741) except for very large units which are tested in a free field (Eurovent 8/1). For AC1 units, test shall be performed using the precision method in reverberant room (EN 12012 + EN ISO 3741).

For the purpose of this document, the minimum working time under the nominal working conditions as indicated in Table 1 and with the permissible deviations given in Table 2 is 20 minutes. Same deviations must be kept during testing.

Table 1: Operating conditions for standard rating

| | INDOOR UNIT or SIDE | | OUTDOOR UNIT or SIDE | | | |
|--|---------------------|-------|----------------------|-------|----------|-----|
| | Air entering | | Air entering | | Water °C | |
| | Dry bulb °C | H.R.% | Dry bulb °C | H.R.% | In | Out |
| Comfort Air Conditioners | 27 | 47 | 35 | 40* | 30 | 35 |
| Comfort Air Conditioners II (Packaged water-cooled units) | 27 | 47 | - | - | 30 | 35 |
| Comfort Air Conditioners III (Packaged ducted units) | 30 | 47 | - | - | 30 | 35 |
| Close control Air Conditioners | 24 | 50 | 35 | 40* | 30 | 35 |

* The relative humidity condition is not required when testing units which do not evaporate condensate.

To determine the available pressure at the unit outlet for ducted units, it is possible to determine the External Static Pressure (ESP) as the pressure difference between the reverberation room (if available) and the air inlet of the unit.

For units to be connected with ducts, it is recommended to use straight ducts, without any bend. The length of the ducts will depend on the dimensions of the unit, but should be as short as possible.

If bends can not be avoided, only one soft right angle bend without guide vanes is allowed in each duct.

The ducts shall not radiate noise liable to disturb the measurements. In some cases (e.g. discharge noise), the use of standard metal duct or wooden duct with a surface density over 10 kg/m² is enough to avoid parasite radiation.

But, in case of measurements of radiated noise of the casing for a ducted unit (e.g. in reverberation room), the radiation of duct should be as low as possible to avoid perturbation of the sound pressure under measurement. In that case, the ducts may be made of materials ensuring a good insulation against airborne transmission and having an acoustically reflecting outer layer.

But in case of measurements of radiated noise of the casing for a ducted unit (e.g. in reverberation a room), the radiation of duct should be as low as possible to avoid perturbation of the sound pressure level under measurement. In that case, the ducts may be made of materials ensuring a good insulation against airborne transmission and having an acoustically reflecting outer layer.

Table 2: Permissible deviations from set values for individual measured values

| | | |
|---------|------------------------------|-------------|
| Liquid | inlet temperature | ± 1.5 K |
| | ΔT | ± 1 K |
| | volume flow | 10% |
| Air | inlet temperature (dry bulb) | ± 2 K |
| | inlet temperature (wet bulb) | - |
| | HR | ± 10 % |
| | rpm of fan | ± 10 % |
| Airflow | Static pressure difference | ± 5 Pa |
| | Airflow | ± 10 % |
| Voltage | | ± 4 % |

II. SPLIT SYSTEM AIR CONDITIONERS

Four combinations may exist:

| | 1 | 2 | 3 | 4 |
|----------------|------------|------------|------------|--------|
| Outdoor | Non Ducted | Non Ducted | Ducted | Ducted |
| Indoor | Non Ducted | Ducted | Non Ducted | Ducted |

In all cases, except for the packaged water-cooled non ducted units, two sound power levels have to be measured, one for indoor and one for outdoor side.

When there is no ducting the measurement is performed with the corresponding unit in the reverberation room. When there is ducting, the unit is installed outside of the reverberation room and a duct is installed between its outlet and the reverberation room. A pressure difference corresponding to the claimed available pressure is adjusted with a tolerance of 10% or 5 Pa, whichever is higher.

When tested for sound, split system Air Conditioners should operate at temperature conditions as close as possible to standard values for capacity test. However, the influence of air temperature on sound power is much lower than its influence on cooling capacity. Therefore, a larger tolerance on conditions is acceptable in most cases.

It should be noted that when testing an indoor unit, the inlet air temperature should be maintained within the given limits but at the same time the inlet air temperature of the outdoor unit should be such that the unit as a whole operates normally. The same principle is valid for outdoor units testing.

Floormounted units are installed on the floor following normal installation instructions provided by the Participant.

Cassettes are installed in the normal operating condition (not upside down) on a support 1.8 m above the floor.

Louvers are kept at the opening position for the maximum air flow.

For specific unit working conditions please refer to Table 1 and 2*.

Note: For outdoor units with condensing control system or Inverter units, which can change fan speed and or compressor working frequency, care should be taken to avoid increasing the measurement uncertainty.

III. PACKAGED AIR-COOLED AIR CONDITIONERS

Two cases exist:

- outdoor non-ducted, indoor ducted;
- both outdoor and indoor ducted.

In both cases the temperature around the unit (i.e. inlet temperature for indoor and outdoor sides) is maintained at $30 \pm 5^{\circ}\text{C}$, according to Table 1 (Packaged ducted units).

IV. PACKAGED WATER-COOLED AIR CONDITIONERS

Two cases exist:

- indoor ducted;
- indoor non-ducted.

In both cases the inlet air temperature is maintained at $27 \pm 3^{\circ}\text{C}$ and the relative humidity at $47 \pm 5\%$. For non ducted units only, only the sound power level radiated by the unit is measured.