International

ISO 13332

Reciprocating internal combustion engines — Test code for the measurement of structure-borne noise emitted from high-speed and medium-speed reciprocating internal combustion engines measured at the engine feet

Moteurs alternatifs à combustion interne — Code d'essai pour le mesurage du bruit solidien émis par les moteurs alternatifs à combustion interne à vitesse élevée et à vitesse moyenne, mesuré aux pieds du moteur

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This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

This second edition cancels and replaces the first edition (ISO 13332:2000), which has been technically revised.

The main changes are as follows:

— revised Clause 3;

— "Symbols" in Clause 4 of the previous edition has been deleted and the requirements for "measuring environment" has been added (see Clause 4);

— "Technical Background" in Clause 5 of the previous edition has been deleted and provisions for "measuring instruments" has been added (see Clause 5);

— content related to the installation and operating conditions of the measured object has been moved to Clause 6 of this document (see Clause 6);

— content related to "acceleration measurement" has been moved to Clause 7 of this document, requirements of measurement uncertainty have been supplemented; measurements of angular velocity and angular acceleration have be added (see Clause 7);

— "calculation" has been added (see Clause 8);

— added provisions on "record information" (see Clause 9);

— requirements related to "Test report" has been added (see Clause 10);

— requirements related to "connections between engine and test environment" has been added (see Annex A);

— content on “sensor contact plane height correction” has been added (see Annex B);

— relevant content of "Frequency range" in the previous edition Clause 7 has been moved to Annex C;

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Noise in buildings, structures, ships, aircraft and land vehicles often arises from the use of internal combustion engines, particularly reciprocating engines, and there can be situations where these are the dominant noise source. Even where it is not dominant, it can form an unwelcome background noise. These noises, arising within the building, etc., can be transmitted in at least two ways as given below.

a) Directly into the surrounding air. This is called airborne sound and the ISO 6798 series specifies methods for determining the airborne noise output of internal combustion engines.

b) Through excitation or vibration in the supporting structure, pipes and shafts. These vibrations then pass through the structure as structural vibration, exciting in turn the walls and panels of the structure, resulting in the radiation of so-called secondary sound or structure-borne noise.

The ability of the source of vibration (the engine) to generate vibration in the structure in which it is mounted depends on the amount of motion of the engine at its mounting points, the properties of the engine mounting system and the mobility of the receiving structure. Vibration from the engine feet can be in the vertical orientation, which is the one most easily visualised, but can also be longitudinal or transverse with respect to the crankshaft axis. The vibration source can also cause rotational input, resolved about each of the three orthogonal axes.

The passage through the structure of any vibration which has been caused in it can be very difficult to control, particularly at low frequencies. There are many possible modes of vibration of the structure that can be responsible for the transmission (compression, torsional or flexural modes). Only breaks in the continuity of the structure are likely to be completely effective, and this is not usually possible. Damping of the structure may be effective for some propagation modes, particularly at high frequencies/short wavelengths, but will not be sufficiently effective at low frequencies.

In spite of the difficulties in controlling the propagation of vibration within the structure, there are obvious benefits in knowing the characteristics of the engine as a potential vibration source so that a choice can be made amongst various competing mounting engines, or the structure and engine mounts can be designed to conform with the properties of the engine selected.