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**Mechanical vibration—
Susceptibility and sensitivity
of machines to unbalance**

ICS 21.120.40

Descriptors : vibration, mechanical measurement, rotational motion, rotating electric machines, vibration measurement, vibration testing, balancing

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from the Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Clause 1, Article 12 of the Industrial Standardization Law.

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Mechanical vibration— Susceptibility and sensitivity of machines to unbalance

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 10814** *Mechanical vibration—Susceptibility and sensitivity of machines to unbalance* published in 1996 without modifying the technical contents.

Portions underlined with dots are the matters not stated in the original International Standard.

Rotor balancing during manufacture (as described in **ISO 1940-1** and **ISO 11342**, for example) is normally sufficient to attain acceptable vibration levels in service if other sources of vibration are absent. There are exceptions, however, where additional balancing during commissioning becomes necessary. Furthermore, after commissioning, some machines may require occasional or even frequent field rebalancing.

If the vibration levels are unsatisfactory during commissioning, the reason may be inadequate balancing or assembly errors. Another important cause may be that an assembled machine is especially sensitive to relatively small residual unbalances which are well within normal balance tolerances.

If vibration magnitudes are unsatisfactory, the first step often is an attempt to reduce the vibration by field balancing. If high vibration can be reduced by relatively small correction masses, high sensitivity to unbalance is indicated. This can arise, for example, if a resonant speed is close to the normal service speed and the damping in the system is low.

A sensitive machine which is also highly susceptible to its unbalance changing, may require frequent rebalancing *in situ*. This may be caused, for example, by changes in wear, temperature, mass, stiffness and damping during operation.

If the unbalance and other conditions of the machine are essentially constant, occasional trim balancing may be sufficient. Otherwise it may be necessary to modify the machine to change the resonant speed, damping or other parameters. Therefore, there is a need to consider permissible sensitivity values of the machine.

The repeatability of the sensitivity of a machine is influenced by several factors and may change during operation. Some thermal machines, especially those with sleeve bearings, have modal vibration characteristics which vary with certain operational parameters such as steam pressure and temperature, partial steam admission or oil temperature. For electrical machines, other parameters such as the excitation current may influence the vibration behaviour. In general, the machine vibration characteristics are influenced by the design features of the machine, including coupling of the rotor and the support conditions including the foundation. It should be noted that the latter may vary with time, for example owing to wear and tear.

This Standard is only concerned with once-per-revolution vibration caused by unbalance; however it should be recognized that unbalance is not the only cause of once-per-revolution vibration.