

Plain bearings — Testing under conditions of hydrodynamic and mixed lubrication in test rigs

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National foreword

This British Standard is the UK implementation of ISO 6281:2007.

The UK participation in its preparation was entrusted to Technical Committee MCE/12, Plain bearings.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Plain bearings — Testing under conditions of hydrodynamic and mixed lubrication in test rigs

*Paliers lisses — Essai des paliers lisses dans les conditions de
lubrification hydrodynamique et mixte dans des machines d'essai pour
paliers*



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Foreword

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Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6281 was prepared by Technical Committee ISO/TC 123, *Plain bearings*, Subcommittee SC 2, *Materials and lubricants, their properties, characteristics, test methods and testing conditions*.

This first edition of ISO 6281 cancels and replaces ISO/TR 6281:1990, of which it constitutes a technical revision.

Plain bearings — Testing under conditions of hydrodynamic and mixed lubrication in test rigs

1 Scope

This International Standard establishes guidelines for the testing of lubricated plain journal bearings in test rigs, running under conditions of hydrodynamic or mixed lubrication, during bearing and/or material development. It deals with both static and dynamic loading in solid and multi-layer journal bearings. It is not applicable to the testing of dynamic characteristics of lubricant film in journal bearings applied in calculation of vibration and stability of turbo-rotors. Further details of test procedures will need to be established when carrying out testing based on these guidelines.

2 Symbols

See Table 1.

Table 1 — Symbols

Symbol	Description	Unit
a	Length of period	s
B	Bearing width	mm
F	Bearing load	N
F^*	Bearing load per unit bearing width	N/mm
f	Coefficient of friction of journal bearing	—
t	Time	s
U	Sliding velocity	m/s
β	Direction of bearing load	°
ω	Angular velocity	rad/s
η	Dynamic viscosity of lubricant	N·s/m ²

3 Test objectives for bearing properties

The test objectives for plain journal bearing test rigs operating under conditions of hydrodynamic or mixed lubrication are to obtain information, among others, on the following bearing properties, which can serve as critical variables when designing and applying the bearing (see ISO 4378):

- a) running-in ability;
- b) wear resistance;
- c) compatibility between bearing and journal materials (resistance to adhesion);
- d) embeddability (foreign particles absorption);
- e) resistance to journal scoring and abrasion;
- f) conformability;
- g) deformability (compressive strength);
- h) resistance to erosion (cavitation erosion, fluid erosion, particle erosion);
- i) static load carrying capacity;
- j) dynamic load carrying capacity (fatigue strength);
- k) friction characteristics;
- l) lubricant flow rate characteristics;
- m) temperature increase characteristics.

Of these bearing properties, the first group, a) to h), depends primarily on the mechanical and tribological properties of sliding materials under specified conditions. The second group, i) to m), depends primarily on hydrodynamic variables, and therefore also on

- viscosity as a function of temperature, pressure and shear rate,
- energy dissipation in the lubricant film (shear heating and heat dissipation), and
- elastic and thermal deformation of the bearing and journal, and hence change of lubricant film thickness (thermo-elastohydrodynamic lubrication).

The determination of these bearing properties, or test objectives, requires lubrication conditions that can involve boundary, mixed or hydrodynamic lubrication — the three modes of lubrication regime. In certain cases, a repeated, time-dependent change between mixed and hydrodynamic lubrication can be required.

NOTE Specific test methods may not yet exist for all of the above-mentioned bearing properties.

Figure 1 depicts the typical relation between the dimensionless number, $\eta U/F^*$, and the coefficient, f , of friction of the journal bearing, where η , U and F^* denote dynamic viscosity of the lubricant, sliding velocity and bearing load per unit bearing width ($F^* = F/B$), respectively. It shows the three regimes of boundary, mixed and hydrodynamic lubrication and qualitatively indicates the dependence between these important parameters.