JIS

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JIS B 8301 : 2000

Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1 and 2

ICS 23.080

Descriptors : centrifugal pumps, rotary pumps, axial-flow pumps, performance testing, flow measurement

Reference number : **JIS B 8301 : 2000 (E)**

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 8301**: 1990 is replaced with JIS **B 8301**: 2000. **JIS B 8303**: 1990 *Testing methods for boiler feed pumps*, **JIS B 8304**: 1990 *Testing methods for condensate pumps*, and **JIS B 8305**: 1990 *Testing methods for self-priming centrifugal pumps* are included in this Standard and therefore have been withdrawn and replaced with this Standard. This revision is made based on the International Standards for conformity of the Japanese Industrial Standard with the International Standard.

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In the event of any doubts arising as to the contents, the original JIS is to be the final authority.

Contents

Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1 and 2

Introduction This Japanese Industrial Standard has been prepared based on **ISO 9906** *Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1 and 2*, published in 1999 without modifying its technical contents. However, regarding clause **7** *Measurement of flow rate*, the methods which have been specified in the former Japanese Industrial Standard are added. Some items not specified in the corresponding International Standard have been additionally contained as Japanese Industrial Standard. Concerning insertion of an independent sub-clause, a capital alphabetical letter is added to the clause number immediately before the position of insertion to form its clause number.

The portions underlined with dots in this Standard show the matters not specified in the original International Standard.

1 Scope This Standard specifies hydraulic performance tests for acceptance of rotodynamic pumps (centrifugal pumps, mixed flow pumps and axial flow pumps, hereafter referred to as "pumps"). It is applicable to pumps of any size, and to any pumped liquids behaving as clean cold water (such as defined in **5.4.5.1**). It is neither concerned with the structural details of the pumps nor with the mechanical properties of their components.

This Standard contains two grades of accuracy of measurement: Grade 2 in normal test and Grade 1 for higher accuracy. For the pumps produced in series with selection made from typical performance curves and for pumps with a driver power input less than 10 kW, see Annex A for higher tolerance factors.

This Standard is applicable both to a pump itself without any fittings and to a combination of a pump associated with all or part of its upstream and/or downstream fittings.

Remarks: The international standard corresponding to this Standard is as follows.

ISO 9906 : 1999 *Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1 and 2*

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of publication is given to these referred standards, only the edition of indicated year constitutes the provisions of this Standard but the revision and amendment made thereafter are not applied. The normative references without the indication of the year of coming into effect apply limiting only to the most recent edition (including the amendment).

JIS B 7505 *Bourdon tube pressure gauges*

JIS B 7554 *Electromagnetic flowmeters*

Remarks: Cited matters from **ISO 9104**: 1991 *Measurement of fluid flow in closed conduits — Methods of evaluating the performance of electromagnetic flow-meters for liquids* are equivalent to the corresponding matters in the said standard.

JIS B 8302 *Measurement methods of pump discharge*

Remarks: Clause **3** *Measurement by means of weirs* of this Standard is equivalent to the corresponding parts of **ISO 1438-1** Amendment 1: 1998 *Water flow measurement in open channels using weirs and venturi flumes — Part 1: Thin-plate weirs.*

JIS B 8327 *Testing methods for performance of pump, using model pump*

JIS C 1102-1 to 9 *Direct acting indicating analogue electrical measuring instruments and their accessories*

Remarks: These standards are identical with **IEC 60051-1** to **9** : 1984 *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 1 to 9.*

JIS C 4207 *Calculating methods of three-phase induction motor characteristics*

Remarks: Cited matters from **IEC 60034-2** : 1972 *Rotating electrical machines — Part 2: Methods for determining losses and efficiency of rotating electrical machinery from tests (excluding machines for traction vehicles)* are equivalent to the corresponding matters of the said standard.

JIS Z 8762 *Measurement of fluid flow by means of orifice plates, nozzles and venturi tubes inserted in circular cross-section conduits running full*

Remarks: Cited matters from **ISO 5167-1**: 1991 *Measurement of fluid flow by means of pressure differential devices — Part 1: Orifice plates, nozzles and venturi tubes inserted in circular cross-section conduits running full* are equivalent to the corresponding matters in the said standard.

ISO 2186: 1973 *Fluid flow in closed conduits — Connections for pressure signal transmissions between primary and secondary elements*

ISO 3354: 1988 *Measurement of clean water flow in closed conduits — Velocity-area method using current-meters in full conduits and under regular flow conditions*

ISO 3966: 1977 *Measurement of fluid flow in closed conduits — Velocity area method using Pitot static tubes*

ISO 4373: 1995 *Measurement of liquid flow in open channels — Water level measuring devices*

ISO 5198: 1987 *Centrifugal, mixed flow and axial pumps — Code for hydraulic performance tests — Precision grade*

ISO 7194: 1983 *Measurement of fluid flow in closed conduits — Velocity-area methods of flow measurement in swirling or asymmetric flow conditions in circular ducts by means of current-meters or Pitot-static tubes*

ISO 8316: 1987 *Measurement of liquid flow in closed conduits — Method by collection of the liquid in a volumetric tank*

3 Terms, definitions and symbols For the purposes of this Standard, the following terms, definitions and symbols apply.

Table 1 shows the definitions of terms used in this Standard based on **JIS Z 8202**, and the related symbols allotted thereto. Table 2 shows the alphabetical list of symbols used, and Table 3 shows the list of subscripts. In this Standard, coherent SI units shall be used. For conversion of other units to SI units, see Annex D.

3.1 Terms, definitions, symbols and units The terms and their definitions shall follow Table 1.

Table 1 Terms, definitions, symbols and units

	Terms	Definitions	Symbols	Dimensions	Units
3.1.1	angular velocity	number of radians of a shaft per unit time. $\omega = 2\pi n$	ω	T^{-1}	rad/s
3.1.2	acceleration due to gravity	(1)	g	LT^{-2}	m/s^2
3.1.3	speed of rotation	number of rotations per unit time	n	T^{-1}	s^{-1}
3.1.4	density	mass per unit volume	ρ	ML^{-3}	kg/m^3
3.1.5	pressure	force per unit area. In this Standard all pressures are gauge pressures, i.e. measured with respect to the atmospheric pressure, except for atmospheric pressure and the vapour pressure which are absolute pressures.	p	$ML^{-1}T^{-2}$	Pa
3.1.6	power	energy transferred per unit time	P	ML^2T^{-3}	W
3.1.7	Reynolds number	Reynolds number shall be obtained by the following formula in this Standard. $R_e = \frac{UD}{v}$	R_e	dimensionless	
3.1.8	mass flow rate	mass passing per unit time which is discharged into the pipe from the outlet branch of the pump	q (2)	MT^{-1}	kg/s
3.1.9	volume flow rate	The volume flow rate shall be obtained by the following formula. $Q = \frac{q}{\rho}$ However, if the compressibility of the pumped liquid is significant, the density ρ shall be replaced by the mean value: $\rho_m = \frac{\rho_1 + \rho_2}{2}$. The volume flow rate (4) at the designated section shall be designated by subscript. The volume flow rate is the value of the mass flow rate passing the section divided by the density at the section. Remarks 1 The following losses or abstractions are inherent to the pump and are not to be reckoned in the rate of flow: a) discharge necessary for hydraulic balancing of axial thrust b) cooling of bearings of the pump itself c) liquid seal to the packing 2 Leakage from the fittings, internal leakage, etc., are not to be reckoned in the rate of flow. On the contrary, all derived flows for other purposes, such as those shown below, may be reckoned in the rate of flow if abstractions are inherent to the upstream side of the section for measurement of the volume flow rate. – cooling of the motor bearings – cooling of a gear box (bearings, oil cooler), etc.	Q (3)	L^3T^{-1}	m^3/s