Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries

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Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001, standards@api.org.

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Introduction

It is necessary that users of this standard be aware that further or differing requirements can be needed for individual applications. This standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, it is necessary that the vendor identify any variations from this standard and provide details.

A bullet (•) at the beginning of a section or subsection indicates that either a decision is required or the purchaser is required to provide further information. It is necessary that this information be indicated on data sheets or stated in the inquiry or purchase order (see examples in Annex N).

This standard shows U.S. customary (USC) units with other units in parentheses for information.

Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries

1 Scope

This standard specifies requirements for centrifugal pumps, including pumps running in reverse as hydraulic power recovery turbines (HPRTs), for use in petroleum, petrochemical, and gas industry process services.

This standard is applicable to overhung pumps, between-bearings pumps, and vertically suspended pumps (see Table 1). Section 9 provides requirements applicable to specific types of pumps. All other sections of this standard are applicable to all pump types. Illustrations are provided of the various specific pump types and the designations assigned to each specific type.

Relevant industry operating experience suggests pumps produced to this standard are suitable for pumping liquids at conditions exceeding any one of the following:

— discharge pressure (gauge): 275 psi; 19.0 bar (1900 kPa);

— suction pressure (gauge): 75 psi; 5.0 bar (500 kPa);

— pumping temperature: 300 °F (150 °C);

— rotational speed: 3600 r/min;

— rated total head: 400 ft (120 m);

— impeller diameter, overhung pumps 13 in. (330 mm).

NOTE For sealless pumps, reference can be made to API 685.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) at the time of quotation applies.

API Standard 5L, *Line Pipe*

API Standard 541, *Form-wound Squirrel Cage Induction Motors—375 kW (500 Horsepower) and Larger*

API Standard 547, *General Purpose Form-wound Squirrel Cage Induction Motors—185 kW (250 hp) through 2240 kW (3000 hp)*

API Standard 611, *General-purpose Steam Turbines for Petroleum, Chemical, and Gas Industry Services*

ANSI [1]/API Standard 614, *Lubrication, Shaft-sealing and Oil-control Systems and Auxiliaries*

API Standard 670, *Machinery Protection Systems*

API Standard 671, *Special-purpose Couplings for Petroleum, Chemical, and Gas Industry Services*

API Standard 677, *General-purpose Gear Units for Petroleum, Chemical and Gas Industry Services*

[1] American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York 10036, www.ansi.org.

API Standard 682, *Pumps—Shaft Sealing Systems for Centrifugal and Rotary Pumps*

ANSI B11.19-2010, *Performance Criteria for Safeguarding*

ANSI/ABMA 7 [2], *Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearings) Conforming to Basic Boundary Plan*

ANSI/AGMA 9000 [3], *Flexible Couplings—Potential Unbalance Classification*

ANSI/AGMA 9002, *Bores and Keyways for Flexible Couplings (Inch Series)*

ANSI/ASME B1.1 [4], *Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms)*

ANSI/AWS D1.1, *Structural Welding Code—Steel*

ANSI/HI 14.6 [5], *Rotodynamic Pumps for Hydraulic Performance Acceptance Tests*

ASME B1.13M, *Metric Screw Threads: M Profile*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard*

ASME B16.11, *Forged Fittings, Socket-Welding and Threaded*

ASME B16.47, *Larger Diameter Steel Flanges NPS 26 Through NPS 60 Metric/Inch Standard*

ASME B18.18.2M, *Inspection and Quality Assurance for High-Volume Machine Assembly Fasteners*

ASME B31.3, *Process Piping*

ASME *Boiler and Pressure Vessel Code (BPVC)*, *Section V, Nondestructive Examination*

ASME *Boiler and Pressure Vessel Code (BPVC)*, *Section VIII, Rules for Construction of Pressure Vessels*

ASME *Boiler and Pressure Vessel Code (BPVC)*, *Section IX, Welding, Brazing and Fusing Qualifications*

DIN 910 [6], *Hexagon head screw plugs with collar—Cylindrical thread*

EN 287 [7], *Qualification test of welders—Fusion welding—Steels*

EN 953 , *Safety of machinery—Guards—General requirements for the design and construction of fixed and movable guards*

EN 1092-1, *Flanges and their joints—Circular flanges for pipes, valves, fittings and accessories, PN designated—Steel flanges*

EN 13445 (all parts), *Unfired pressure vessels*

EN 13445-4, *Unfired pressure vessels—Fabrication*

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[2] American Bearing Manufacturers Association, 1001 N. Fairfax Street, Suite 500, Alexandria, VA 22314, www.americanbearings.org.

[3] American Gear Manufacturers Association, 1001 N. Fairfax Street, Suite 500, Alexandria, VA 22314-1587, www.agma.org.

[4] ASM International, 9639 Kinsman Road, Materials Park, Ohio 44073, www.asminternational.org.

[5] Hydraulic Institute, 6 Campus Drive, First Floor North, Parsippany, New Jersey 07054-4406, www.pumps.org.

[6] DIN Deutsches Institut für Normung e. V., Saatwinkler Damm 42/43, 13627 Berlin, Germany, www.din.de.

[7] European Committee for Standardization (CEN-CENELEC), Avenue Marnix 17, B-1000 Brussels, Belgium, www.cen.eu.

EN 13463-1, *Non-electrical equipment for use in potentially explosive atmospheres—Part 1: Basic method and requirements*

IEC 60034-1 [8], *Rotating electrical machines—Part 1: Rating and performance*

IEC 60034-2-1, *Rotating electrical machines—Part 2-1: Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)*

IEC 60079 (all parts), *Explosive atmospheres*

IEEE 841 [9], *Petroleum and Chemical Industry—Premium-Efficiency, Severe Duty, Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 370 kW (500 hp)*

ISO 228-1[10], *Pipe threads where pressure-tight joints are not made on the threads—Part 1: Dimensions, tolerances and designation*

ISO 261, *ISO general purpose metric screw threads—General plan*

ISO 262, *ISO general purpose metric screw threads—Selected sizes for screws, bolts and nuts*

ISO 281:2007, *Rolling bearings—Dynamic load ratings and rating life*

ISO 286 (all parts), *System of limits and fits*

ISO 3117, *Tangential keys and keyways*

ISO 3183, *Petroleum and natural gas industries—Steel pipe for pipeline transportation systems*

ISO 4200, *Plain end steel tubes, welded and seamless—General tables of dimensions and masses per unit length*

ISO 5753 (all parts), *Rolling bearings—Internal clearance*

ISO 7005-1, *Pipe flanges—Part 1: Steel flanges for industrial and general service piping systems*

ISO 8501 (all parts), *Preparation of steel substrates before application of paints and related products—Visual assessment of surface cleanliness*

ISO 9606 (all parts), *Qualification testing of welders—Fusion welding*

ISO 9906, *Rotodynamic pumps—Hydraulic performance acceptance tests—Grades 1, 2 and 3*

ISO 10441, *Flexible couplings for mechanical power transmission—Special-purpose applications*

ISO 10721-2, *Steel structures—Part 2: Fabrication and erection*

ISO 11342, *Mechanical vibration—Methods and criteria for the mechanical balancing of flexible rotors*

ISO 14120, *Safety of machinery—Guards—General requirements for the design and construction of fixed and movable guards*

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[8] International Electrotechnical Commission, 3 rue de Varembé, 1st Floor, PO Box 131, CH-1211 Geneva 20, Switzerland, www.iec.ch.

[9] Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, New Jersey 08854, www.ieee.org.

[10] International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland, www.iso.org.