ANSI/HI 11.6-2017

American National Standard for

Rotodynamic Submersible Pumps

for Hydraulic Performance, Hydrostatic Pressure, Mechanical, and Electrical Acceptance Tests

HYDRAULIC INSTITUTE

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American National Standard

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Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Hydraulic Institute are to promote the advancement of the pump manufacturing industry and further the interests of the public and to this end, among other things:

a) Develop and publish standards.

b) Address pump systems.

c) Expand knowledge and resources.

d) Educate the marketplace.

e) Advocate for the industry.

Purpose of Standards and Guidelines

a) Hydraulic Institute Standards and Guidelines are adopted in the public interest and are designed to help eliminate misunderstandings between the manufacturer, the purchaser, and/or the user and to assist the purchaser in selecting and obtaining the proper product for a particular need.

b) Use of Hydraulic Institute Standards and Guidelines is completely voluntary. Existence of Hydraulic Institute Standards does not in any respect preclude a member from manufacturing or selling products not conforming to the standards.

Definition of a Standard of the Hydraulic Institute

Quoting from Article XV, Standards, of the By-Laws of the Institute, Section B:

> "An Institute Standard defines the product, material, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, quality, rating, testing and service for which designed."

Definition of a Hydraulic Institute Guideline

A Hydraulic Institute Guideline is not normative. The guideline is tutorial in nature, to help the reader better understand the subject matter.

Comments from users

Comments from users of this standard will be appreciated, to help the Hydraulic Institute prepare even more useful future editions. Questions arising from the content of this standard may be directed to the Technical Director of the Hydraulic Institute. If appropriate, the inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

Revisions

American National Standards of the Hydraulic Institute are subject to constant review, and revisions are undertaken whenever it is found necessary because of new developments and progress in the art. If no revisions are made for five years, the standards are reaffirmed using the ANSI canvass procedure.

Disclaimer

This document was prepared by a committee of the Hydraulic Institute and approved by following ANSI essential requirements. Neither the Hydraulic Institute, Hydraulic Institute committees, nor any person acting on behalf of the Hydraulic Institute: 1) makes any warranty, expressed or implied, with respect to the use of any information, apparatus, method, or process disclosed in this document or guarantees that such may not infringe privately owned rights; 2) assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this guideline. The Hydraulic Institute is in no way responsible for any consequences to an owner, operator, user, or anyone else resulting from reference to the content of this document, its application, or use.

This document does not contain a complete statement of all requirements, analyses, and procedures necessary to ensure safe or appropriate selection, installation, testing, inspection, and operation of any pump or associated products. Each application, service, and selection is unique with process requirements that shall be determined by the owner, operator, or its designated representative.

Units of measurement

Metric units of measurement are used, and corresponding US customary units appear in parentheses. Charts, graphs, and sample calculations are also shown in both metric and US customary units. Because values given in metric units are not exact equivalents to values given in US customary units, it is important that the selected units of measure to be applied be stated in reference to this standard. If no such statement is provided, metric units shall govern.

Consensus

Consensus for this American National Standard was achieved by use of the canvass method. The following organizations, recognized as having an interest in the standardization of pumps, were contacted prior to the approval of this revision of the standard. Inclusion in this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

Brown and Caldwell
Deltares
DuPont
ekwestrel corp.
Flowserve Corporation
Fluid Sealing Association
Healy Engineering, Inc.
Hidrostal AG
John Anspach Consulting
Kemet Inc.
Las Vegas Valley Water District
Mechanical Solutions, Inc.
Patterson Pump Company
Pentair - Berkeley
Pentair - Fairbanks Nijhuis
PumpsPositive
Rotating Equipment Repair Inc.
Sulzer
Taco Comfort Solutions
WECTEC LLC
WEG Electric Corp.
Weir Minerals North America
Weir Specialty Pumps
Xylem AWS

Committee list

Although this standard was processed and approved for submittal to ANSI by the canvass method, a working committee met many times to facilitate its development. At the time it was developed, the committee had the following members:

Chair – Paul J. Ruzicka, Xylem Inc. - Applied Water Systems
Vice-chair – James E. McKee, Pentair - Berkeley

Committee members	**Company**
Timothy Albers	Nidec Motor Corporation
Frank Ennenbach	Sulzer Pumps Ltd.
Christopher Felix	Xylem Inc. - Applied Water Systems
Lane Larsen	Weir Specialty Pumps
James E. McKee	Pentair - Berkeley
Paul W. Moulton	AECOM
Craig S. Redmond	Gorman-Rupp, Mansfield Division
Jan Schyberg	Xylem Inc. - Water Solutions
Arnold R. Sdano	Pentair - Fairbanks Nijhuis
Ernest C. Sturtz	CDM Smith
Jerry J. Szofer	Yeomans Chicago Corporation
Jamie Watkins	Crane Pumps & Systems, Inc.
Alternate:	
Al Iseppon	Pentair

11.6 Submersible pump tests

11.6.1 Introduction

This revision of ANSI/HI 11.6 brings the standard into harmony with ANSI/HI 14.6 *Rotodynamic Pumps for Hydraulic Performance Acceptance Tests*, using the symbols and equations as contained in that standard.

Minor revisions were also made to the specification for the input power to the motor when testing the submersible pump that reflect good quality power as supplied by utilities. Additionally, new requirements of the electrical input power measurement devices are now specified in the document and are in alignment with the findings from the HI 40.6 committee for the Department of Energy (DOE).

11.6.1.1 Purpose

This standard is intended to provide uniform procedures for performance, hydrostatic, net positive suction head required (NPSHR), submersible motor integrity, and vibration testing of submersible pumps; and data recording and reporting of the test results. It is intended to define test procedures that may be invoked by contractual agreement between a purchaser and manufacturer. It is not intended to define a manufacturer's standard practice.

11.6.1.2 Scope

This standard applies to customer acceptance testing of submersible pumps driven by electric motors, unless otherwise agreed or specified. A *submersible pump* is defined as a close-coupled pump/motor unit designed to operate submerged in the pumped liquid. This definition includes submersible pumps operating in either a wet-pit or dry-pit environment. A standard test measures pump performance from pump inlet to pump outlet and electrical input power. It does not include accessory items, such as outlet elbows, inlet fittings, or valves, unless specified by a contractual agreement. This standard also includes the acceptance criteria for original equipment manufacturer (OEM) factory and permanently installed pump vibration testing.

ANSI/HI 11.6 is intended to be used for pump acceptance testing at pump test facilities, such as manufacturers' pump test facilities or laboratories only. Industry experience shows that it is very difficult to perform measurements accurate enough to satisfy the acceptance requirements in this standard when testing is performed in the field.

Information in the standard may be applied to pumps of any size and to any pumped liquids behaving as clean cold water. This standard does not deal with the structural details of the pump or with the mechanical properties of their components.

a) Submersible pump designs included are:

   1) Semipermanent/pull-up/wet-pit types.

   2) Dry-pit/dry-installed types.

   3) Portable/flexible outlet types.

   4) Chopper/cutter/grinder types.

   5) Close-coupled types.

   6) Integral electric motor types.

   7) Direct current or battery powered motors

   8) Fractional horsepower (hp)