ANSI/HI 5.1-5.6-2021

Approved American National Standard

ANSI

American National Standard for

Sealless Rotodynamic Pumps

for Nomenclature, Definitions, Design, Application, Operation and Test

HYDRAULIC INSTITUTE™

ANSI/HI 5.1–5.6-2016 (R2021)

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Sealless Rotodynamic Pumps

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Reaffirmed 2021

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www.Pumps.org

Approved March 24, 2016. Reaffirmed July 16, 2021

American National Standards Institute, Inc.

American National Standard

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Published By

Hydraulic Institute
300 Interpace Parkway
Building A, 3rd Floor
Parsippany, NJ 07054-4406

www.Pumps.org

Printed in the United States of America

ISBN 978-1-935762-96-6

Recycled paper

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Foreword (Not part of Standard)

Purpose and aims of the Hydraulic Institute

The purpose and aims of the Hydraulic Institute (HI) 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) HI 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 HI Standards and Guidelines is completely voluntary. Existence of HI 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 HI 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 are appreciated, to help HI prepare even more useful future editions. Questions arising from the content of this standard may be directed to the HI 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 HI 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 an HI committee and approved by following ANSI essential requirements. Neither the HI, HI committees, nor any person acting on behalf of the HI: 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 HI 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 appear 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.

Leistritz
TACO INC
Patterson Pump Company
Summit Pump Inc
Earth & Daughter
Tarrant Regional Water District
Pentair
Irving Oil
Brown and Caldwell

Special Acknowledgement

William Taylor, PeopleFlo Manufacturing, Inc., for providing a thorough review of the standard in preparation for publication.

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 the development of the 2015 standard. At the time it was developed, the committee had the following members:

Chair – Jared Wageman, Sundyne LLC
Vice-chair – John Maloney, Chempump, a Division of Teikoku USA Inc.

Committee members	Company
Ravindra Birajdar	Kirloskar Brothers Ltd.
Kenneth Deddo (Alternate)	HERMETIC-Pumps Inc.
Lucian Dobrot	ITT - Industrial Process
Robert Fleming (Alternate)	Hayward Tyler, Inc.
Benjamin Hardy	Hayward Tyler, Inc.
Scott Judge	Flowserve Corporation
Peter Koegl	HERMETIC-Pumps Inc.
Suzanne Smyth	Exponent Inc.
Peter Timpanelli	LEWA-Nikkiso America, Inc.
Kees van der Sluijs (Alternate)	Flowserve Corporation

Although the reaffirmation of this standard was processed and approved for submittal to ANSI by the Canvass Method, a working committee met to facilitate the reaffirmation process. The committee had the following members:

Chair – Gregory Case, TACO, Inc.
Vice-chair – James Dawley, ITT - Industrial Process

Committee Members	Company
Camden DiMicco	Hayward Tyler, Inc.
Peter Koegl	HERMETIC-Pumps Inc.
Jetro Pergentino	Iwaki America Inforporated

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5 Sealless rotodynamic pumps

5.0 Introduction

The sealless pump is used when there is a need to contain toxic, dangerous, high-suction pressure, and/or valuable fluids or where dynamic seals are undesirable due to utility (seal flush/buffer) requirements or due to high system reliability standards. Application may be dictated by space, noise, environment, or safety regulations. This section outlines types, nomenclatures, and components of sealless rotodynamic type pumps.

Sealless pump design is founded on eliminating the dynamic shaft seal between the liquid end of a rotodynamic pump and the atmosphere. The pressure vessel or primary containment is sealed by static seals, such as gaskets or O-rings. The inner rotor assembly is driven by a rotating magnetic or electromagnetic field that is transmitted through a containment barrier.

The two primary sealless pump designs are the canned motor pump (CMP) and magnetic drive pump (MDP). See Figure 5.0 for a diagrammatic breakdown of the types of sealless rotodynamic pumps.

5.0.1 Purpose

To clearly outline the information necessary to define and describe the construction and use of sealless pumps.

5.0.2 Scope

This standard covers types and nomenclature, definitions, design and application, installation, operation and maintenance, and test of sealless rotodynamic pumps driven by canned motors or magnetic couplings.

Not included are submersible wastewater pumps that do not have external shaft seals and are therefore not susceptible to external shaft leakage. Deep well submersible pumps and circulator pumps are also excluded.

5.0.3 Disclaimer

The term *sealless* is a generic, industrial word used for pumps not employing dynamic seals such as mechanical shaft seals, centrifugal seals, or packing as the primary method of sealing liquid or vapor from the atmosphere. *Liquid-tight* would accurately describe the construction of these types of pumps. Static seals may be used in pumps that are designated sealless.

Use of the term sealless herein should not be construed as any type of warranty or guarantee against pump leaks.

5.1 Types and nomenclature

5.1.1 Canned motor pump (CMP)

The CMP combines a rotodynamic pump and induction motor into one liquid-tight unit. The impeller is mounted directly on the rotor assembly, which is driven by the rotating electromagnetic field of the stator. The rotor is typically supported by hydrodynamic bearings at each end of the motor. The motor components are protected from the process liquid by a nonmagnetic stator liner that is placed between the stator and rotor.

During operation, the motor section and bearings are cooled and lubricated by the process liquid. This fluid is either a flush introduced from an external source or, more commonly, taken from the pump discharge.

Below are typical examples of canned motor pumps, but additional variations and circulation plans can be found in Appendix A.