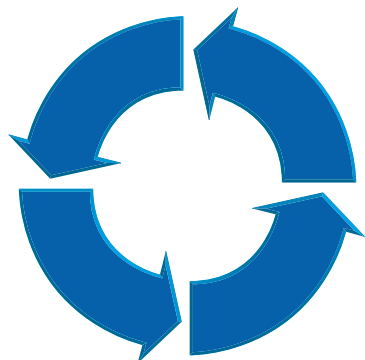




American National Standard for

Sealless, Magnetically Driven Rotary Pumps

for Nomenclature, Definitions,
Application, Operation, and Test

ANSI/HI 4.1–4.6-2010



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Approved June 24, 2010
American National Standards Institute, Inc.

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Foreword (Not part of Standard)

Scope

The purpose and aims of the Institute are to promote the continued growth of pump knowledge for the interest of pump users and manufacturers and to further the interests of the public in such matters as are involved in manufacturing, engineering, distribution, safety, transportation and other problems of the industry, and to this end, among other things:

- a) To develop and publish standards for pumps;
- b) To collect and disseminate information of value to its members and to the public;
- c) To appear for its members before governmental departments and agencies and other bodies in regard to matters affecting the industry;
- d) To increase the amount and to improve the quality of pump service to the public;
- e) To support educational and research activities;
- f) To promote the business interests of its members but not to engage in business of the kind ordinarily carried on for profit or to perform particular services for its members or individual persons as distinguished from activities to improve the business conditions and lawful interests of all of its members.

Purpose of Standards

- 1) Hydraulic Institute Standards 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.
- 2) Use of Hydraulic Institute Standards 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."

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 sent to the Technical Director of the Hydraulic Institute. The inquiry will then be directed to the appropriate technical committee for provision of a suitable answer.

If a dispute arises regarding contents of an Institute publication or an answer provided by the Institute to a question such as indicated above, the point in question shall be sent in writing to the Technical Director of the Hydraulic Institute who shall initiate the Appeals Process.

Revisions

The 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.

Units of measurement

Metric units of measurement are used; and corresponding US customary units appear in brackets. Charts, graphs, and sample calculations are also shown in both metric and US customary units. Since 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 for this standard was achieved by use of the Canvass Method

The following organizations, recognized as having an interest in the standardization of vertical 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.

A.W. Chesterton Company
Baldor Electric Company
Bechtel Power Corporation
Brown and Caldwell
ekwestrel corp
GIW Industries, Inc.
Healy Engineering, Inc.

Kemet Inc.
Las Vegas Valley Water District
Leistriz Corporation
Malcolm Pirnie, Inc.
Pentair Water - Engineered Flow GBU
Weir Floway, Inc.

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 the standard was approved, the committee had the following members:

Chair – John W. Owen, IMO Pump
Alan G. Wild, Consultant – Moyno, Inc.

Committee Members

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formerly of Tuthill Pump Group
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4 Sealless, magnetically driven rotary pumps

4.0 Scope

This standard covers the unique features of sealless, magnetically driven rotary pumps and includes sections on types and nomenclature; definitions; design and applications; installation, operation, and maintenance; and test. Because of the variety of rotary pump configurations available and the broad range of applications, familiarization with Hydraulic Institute Standards ANSI/HI 3.1–3.5 *Rotary Pumps for Nomenclature, Definitions, Application and Operation* and ANSI/HI 3.6 *Rotary Pump Tests* is recommended. This standard does not apply to the flexible member/peristaltic rotary pump type.

4.1 Types and nomenclature

4.1.1 Objective

To clearly outline information necessary to define, apply, operate, and maintain sealless rotary pumps.

4.1.2 Introduction

This standard covers magnetically coupled rotary pumps (sometimes called *magnetic drives* or *magnetic couplings*), which eliminate the shaft seal. These pumps use permanent magnets to drive an internal rotating assembly through a magnetically permeable containment shell (canister). There are no openings or leak paths through the shell, and the rotor and bearings are completely submerged in the fluid. There are static seals in the pump.

The coupling referred to is the radial synchronous magnetic type. Other means of eliminating the shaft seal are axial magnetic couplings, eddy current (slip) drives, and canned motors. Although concepts within this standard apply, these devices have not been included because they are considered to be currently in limited distribution and focused information on the synchronous magnetic coupling is of greater importance.

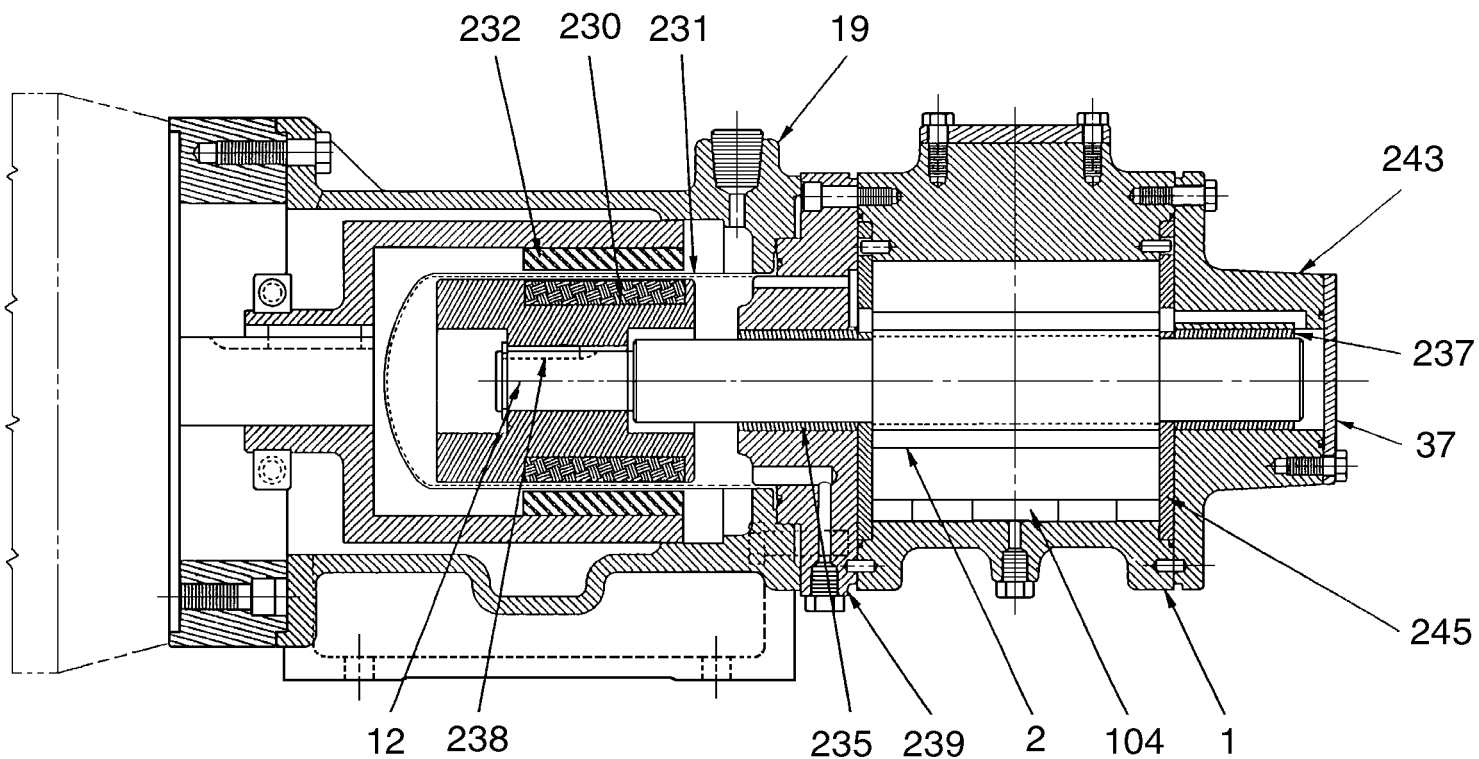
4.1.3 Types of magnetic drive configurations

ANSI/HI 3.1–3.5 *Rotary Pumps for Nomenclature, Definitions, Application and Operation*, Figure 3.1, provides a diagrammatic breakdown of types of rotary pumps. Because this family of products is so broad, this standard does not attempt to provide guidance or figures with each type in a sealless configuration.

The figures included in this standard are to illustrate the fundamental magnetic drive configurations and those components that are typically applicable to various types of rotary pumps:

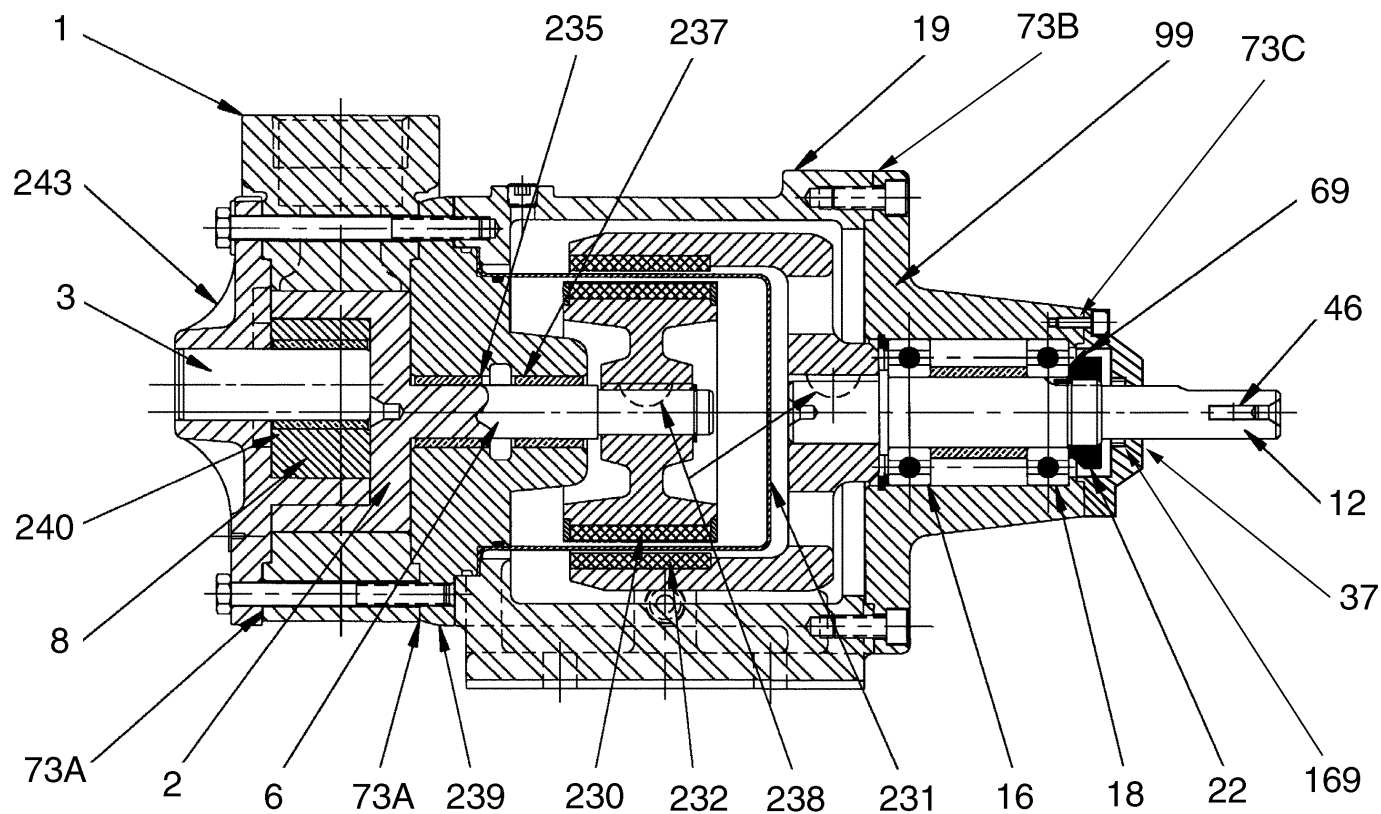
- Figure 4.1.3a Close-coupled, vane-type, magnetic drive pump
- Figure 4.1.3b Separately coupled, internal gear, magnetic drive pump with secondary control
- Figure 4.1.3c Separately coupled, screw-type, magnetic drive pump

The definitions of component parts are included in Table 4.1.3 — Nomenclature.



- | | | | | | |
|----|--------------------------|-----|---------------------------|-----|----------------------------|
| 1 | Casing | 104 | Vane | 237 | Bushing, bearing, outboard |
| 2 | Rotor | 230 | Magnet assembly, inner | 238 | Key, shaft |
| 12 | Shaft, drive | 231 | Shell, containment | 239 | Cover, casing, inboard |
| 19 | Frame | 232 | Magnet assembly, outer | 243 | Cover, casing, outboard |
| 37 | Cover, bearing, outboard | 235 | Bushing, bearing, inboard | 245 | Disc |

Figure 4.1.3a — Close-coupled, vane-type, magnetic drive pump



1	Casing	22	Locknut, bearing	230	Magnet assembly, inner
2	Rotor	37	Cover, bearing, outboard	231	Shell, containment
3	Idler pin	46	Key, coupling	232	Magnet assembly, outer
6	Shaft, pump	69	Lockwasher	235	Bushing, bearing, inboard
8	Idler gear	73A	Gasket, casing	237	Bushing, bearing, outboard
12	Shaft, drive	73B	Gasket, adapter	238	Key, shaft
16	Bearing, inboard	73C	Gasket, bearing cover	239	Cover, casing, inboard
18	Bearing, outboard	99	Housing, bearing	240	Bushing, idler
19	Frame	169	Seal, bearing housing	243	Cover, casing, outboard

Figure 4.1.3b — Separately coupled, internal gear, magnetic drive pump with secondary control

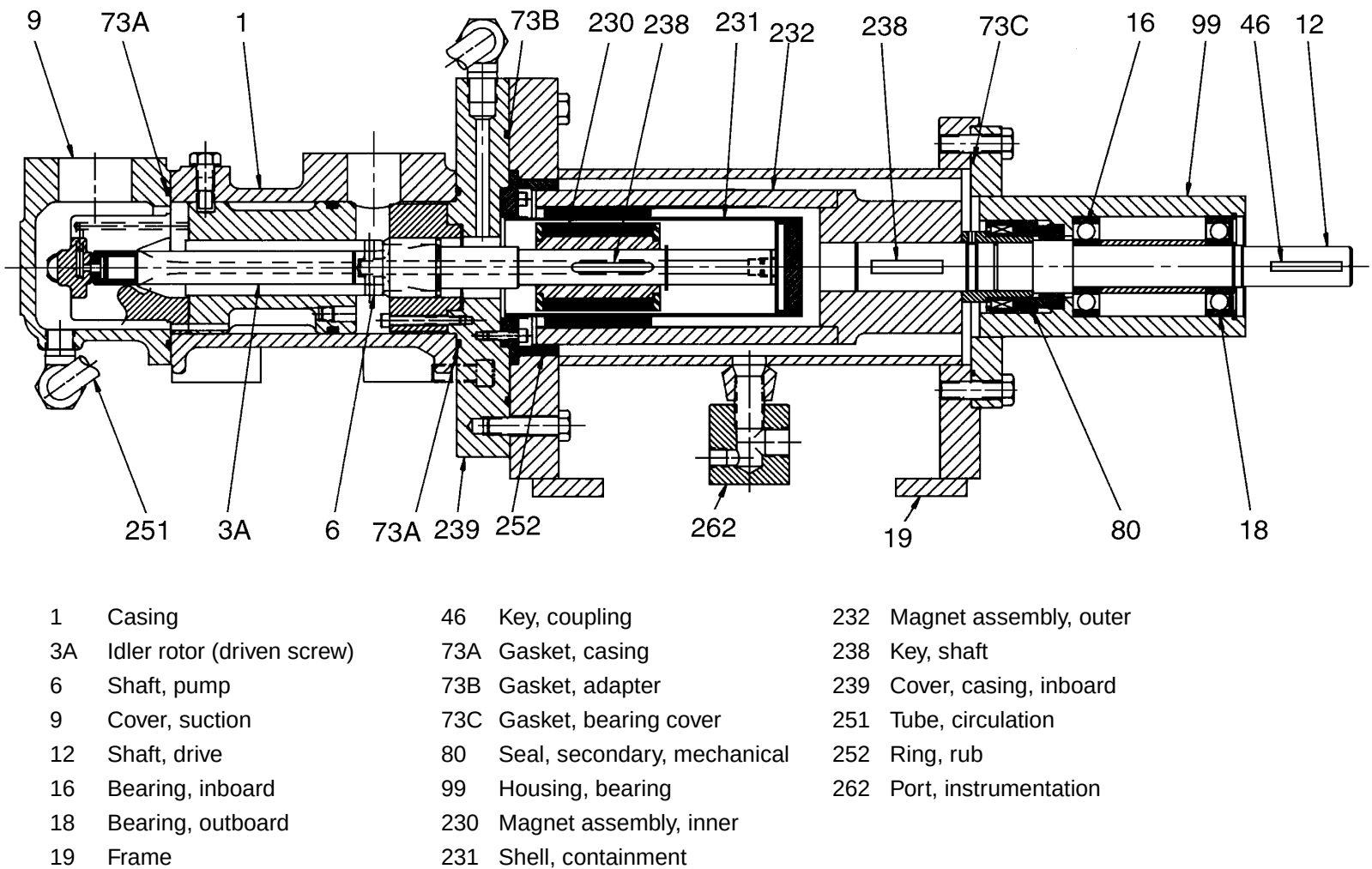


Figure 4.1.3c — Separately coupled, screw-type, magnetic drive pump

Table 4.1.3 — Nomenclature

Part name	Number	Definition
Bearing, inboard	16	Rolling element bearing in the frame nearest the pump.
Bearing, outboard	18	Rolling element bearing in the frame closest to the motor.
Bushing, bearing, inboard	235	Sleeve-type bearing in the drive section, closest to the liquid chamber, which is lubricated by the pumpage.
Bushing, bearing, outboard	237	Sleeve-type bearing in the drive section, closest to the magnets, which is lubricated by the pumpage.
Bushing, idler	240	Sleeve-type bearing in the idler, closest to the magnets, which is lubricated by the pumpage. The bushing rides on the idler pin.
Casing	1	The external part that surrounds the periphery of the pumping chamber. In some designs, the casing and liner (housing) are integral and form part of the pumping chamber.
Cover, bearing, outboard	37	An enclosing plate for the outboard end of the bearing housing.
Cover, casing, inboard	239	The end portion of the magnetic drive assembly that houses the driven magnet assembly, shaft, and containment shell.
Cover, casing, outboard	243	A body in which the outboard bushing is mounted.
Cover, suction	9	A removable piece that allows the inlet nozzle to be used to enclose the suction side of the casing.
Disc	245	Replaceable element to maintain close clearance along the rotor sideface.
Frame	19	A member of a pump to which is assembled the rotating outer magnet assembly and the drive motor or bearing housing.
Gasket	73A, B and C	Resilient material of proper shape and characteristics for use in joints to prevent leakage.
Housing, bearing	99	A body in which the bearing is mounted.
Idler gear	8	The driven element in internal gear rotary positive displacement pumps.
Idler pin	3	Part on which the idler gear rotates. Unique to internal gear rotary positive displacement pump configurations.
Idler rotor	3A	The driven element in three-screw rotary positive displacement pumps.
Key, coupling	46	A parallel-sided piece used to prevent the shaft from turning in a coupling half.
Key, shaft	238	A parallel-sided piece used to prevent the shaft from turning in the magnet assembly.
Locknut, bearing	22	Locking device used to fix a bearing position on a shaft.
Lockwasher	69	A device to prevent loosening of a nut.
Magnet assembly, inner	230	The permanent magnet or induction device assembly attached to the pump shaft, located within the containment shell, and driven by outer magnet assembly.