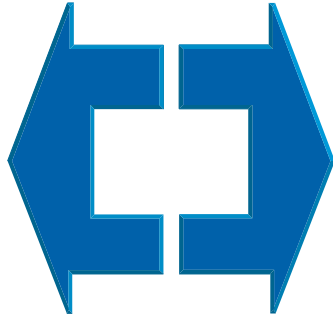




American National Standard for

Direct-acting (Steam) Pumps

for Nomenclature, Definitions,
Application, and Operation

ANSI/HI 8.1-8.5-2015



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Parsippany, New Jersey
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Approved December 22, 2014
American National Standards Institute, Inc.

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 Institute are to promote the continued growth and well-being of pump manufacturers and 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 the content of an Institute Standard 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; corresponding US customary units appear in parentheses. 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 centrifugal 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
Kemet Inc.

LVVWD - Las Vegas Valley Water District
Weir Floway, Inc.

Standard reviewers

The following individuals helped to review this standard in preparation for balloting and to address the comments and suggestions received with the ballots.

Scott Baker, Pentair - Berkeley
Rick Hammond, ClydeUnion Pumps, an SPX Brand

Tom Newman, ClydeUnion Pumps, an SPX Brand
Herb Tackett, Hydro, Inc.

8 Direct-acting (steam) pumps

8.0 Scope

This standard applies to direct-acting (steam) pumps. It includes types and nomenclature; definitions; design and application; and installation, operation, and maintenance.

8.1 Types and nomenclature

8.1.1 Introduction

A direct-acting (steam) pump is a reciprocating (steam) engine and a liquid end built integrally together as a unit. Although steam is implied as the driving medium, compressed gases such as air or natural gas can be used.

8.1.2 Types

Figure 8.1.2 shows the relationship between the following pump types.

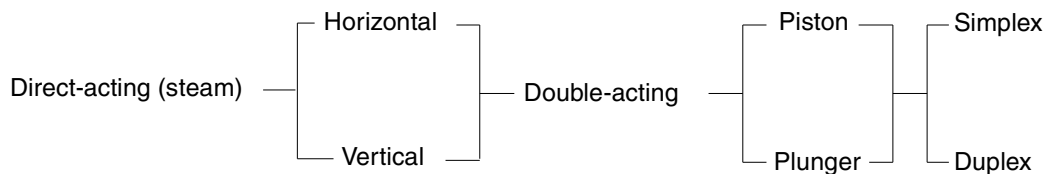


Figure 8.1.2— Types of direct-acting (steam) pumps

8.1.2.1 Horizontal pump

The axial centerline of the cylinder is horizontal.

8.1.2.2 Vertical pump

The axial centerline of the cylinder is vertical.

8.1.2.3 Double-acting pump

Liquid is discharged during both the forward and return strokes of the piston or pair of opposed plungers. That is, discharge takes place during the entire cycle (see Figures 8.1.2.3a and 8.1.2.3b).

8.1.2.4 Piston pump

The liquid end contains pistons (see Figure 8.1.2.3a).

8.1.2.5 Plunger pump

The liquid end contains plungers (see Figure 8.1.2.3b).

8.1.2.6 Simplex pump

Contains one piston or one pair of opposed plungers driven by one steam cylinder (see Figure 8.1.2.6).

8.1.2.7 Duplex pump

Contains two pistons or two pairs of opposed plungers driven by two (steam) cylinders (see Figure 8.1.2.7).

8.1.3 Nomenclature

8.1.3.1 Purpose

The nomenclature and definitions in these standards were prepared to provide a means for identifying the various pump components covered by these standards and to serve as a common language for all who deal with this type of equipment.

The following definitions and drawings illustrate typical construction of direct-acting (steam) pump components but do not necessarily represent recommended designs. Variations in design may exist without violating the intent of these standards.

8.1.3.2 Right- and left-hand designs

To determine the relative positions of components or hand of pump, proceed as follows:

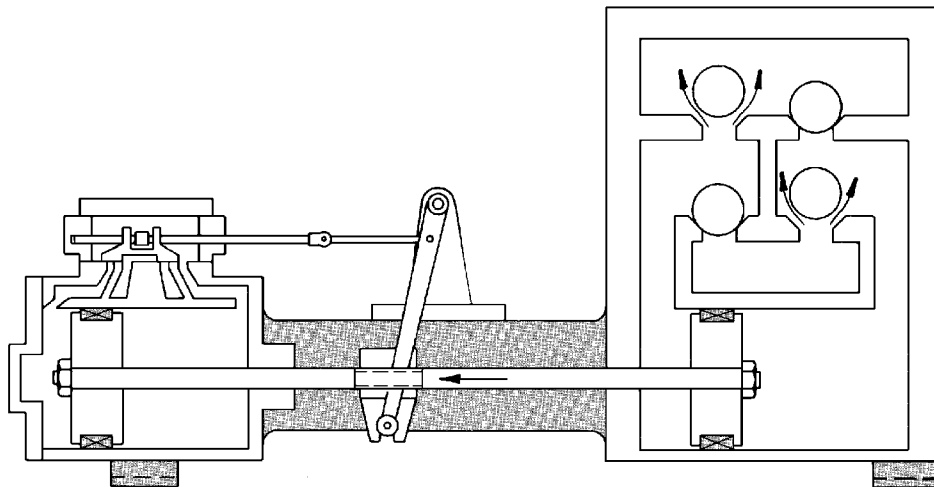


**Figure 8.1.2.3a — Direct-acting, horizontal, double piston (steam) pump
(Drive [steam] end is on left and liquid end is on right.)**

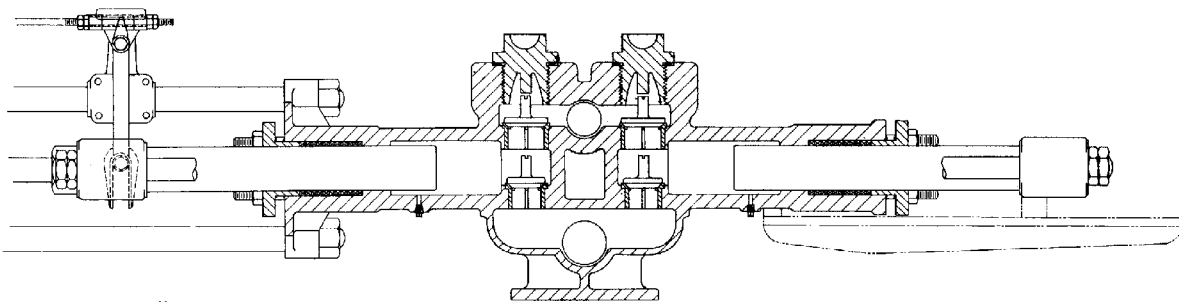


**Figure 8.1.2.3b — Double-acting plunger
type liquid end**

For horizontal pumps, stand at the drive (steam) end and face the liquid end. For vertical pumps, stand facing the driver (steam) valve chest.

When standing as indicated above, the side on the left is the left hand (LH), and the side on the right is the right-hand (RH) side.

8.1.3.3 Liquid end

The liquid end of a direct-acting (steam) pump is the same as the liquid end of a simplex or duplex double-acting power pump. Therefore, the table of liquid end parts, the drawings of the piston pump liquid ends, and the discussion of valve seat area are also applicable to direct-acting (steam) pumps.

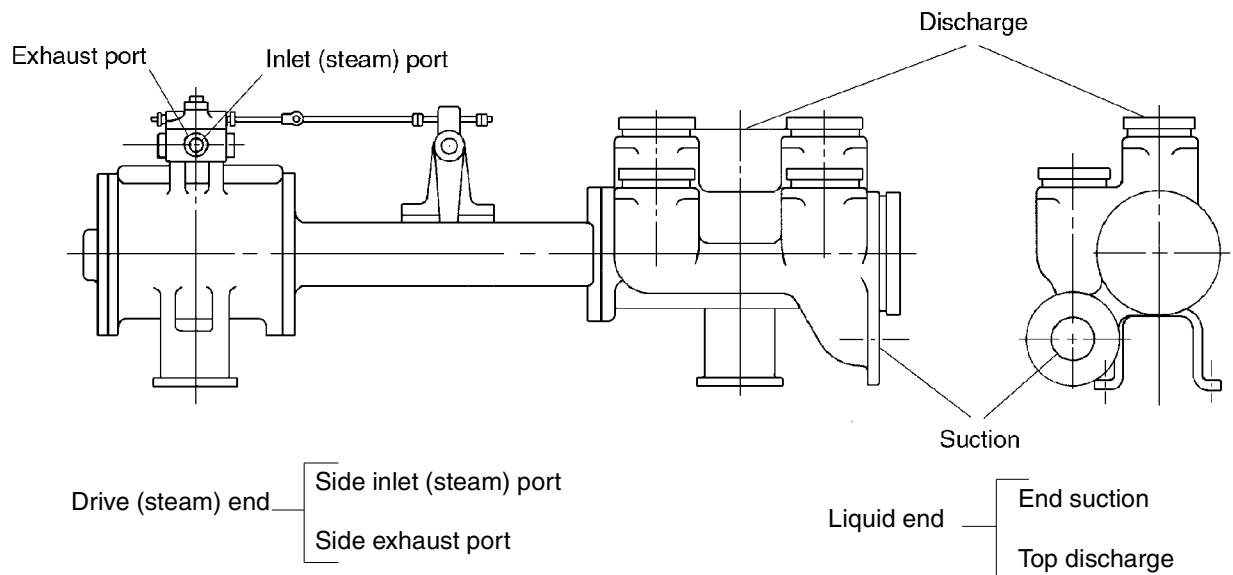


Figure 8.1.2.6 — Horizontal simplex direct-acting (steam) pump

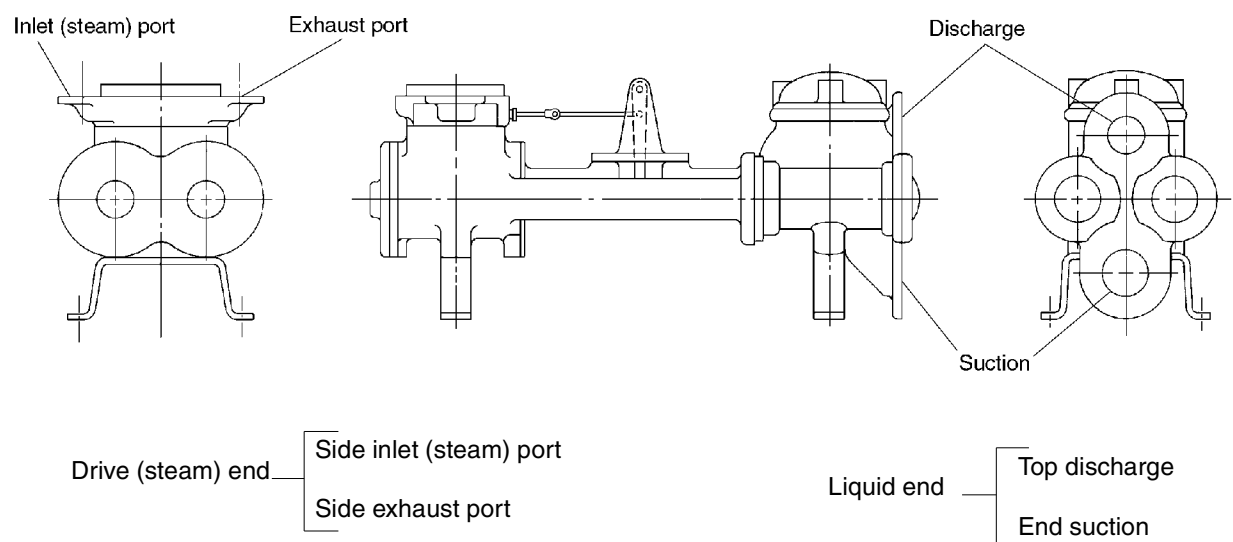


Figure 8.1.2.7 — Horizontal duplex direct-acting (steam) pump

The following liquid ends are used on both direct-acting (steam) and reciprocating power pumps:

8.1.3.3.1 Piston type

The liquid end contains pistons as shown in Figure 8.1.2.3a.

8.1.3.3.2 Plunger type

The liquid end contains plungers as shown in Figure 8.1.2.3b. Since most direct-acting (steam) pumps are double-acting, and since the conventional plunger is single-acting, two plungers and two individual pumping chambers are required for a simplex plunger pump (four of each for a duplex), arranged on a common axis as shown in Figure 8.1.2.3b.

8.1.3.3.3 Valve plate type

Has removable suction and/or discharge valve deck(s) (valve plates). The drawing shows a valve plate pump with a removable discharge valve deck (see Figure 8.1.3.3.3).

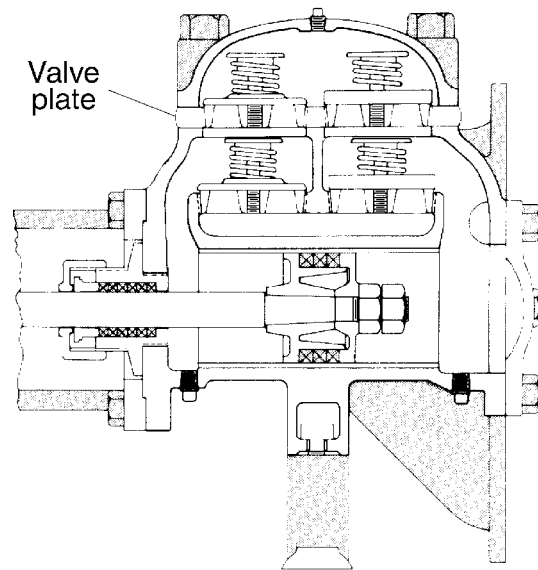


Figure 8.1.3.3.3 — Valve plate type liquid end

8.1.3.3.4 Valve pot type

Has a separate cover over each valve chamber. A side valve pot type has the suction valve pots at the side of the pump (see Figure 8.1.3.3.4).

8.1.4 Drive (steam) end

The drive (steam) end is that portion of a direct-acting (steam) pump that distinguishes it from a reciprocating power pump. It provides the force to drive the piston or plungers in the liquid end. The drive end includes the drive cylinder, drive piston(s), rods, valves, valve-actuating mechanism (valve gear), and various additional parts required to supplement the functions of the above.

Figure 8.1.4 shows a cross section and an exploded view of a typical horizontal duplex drive (steam) end.

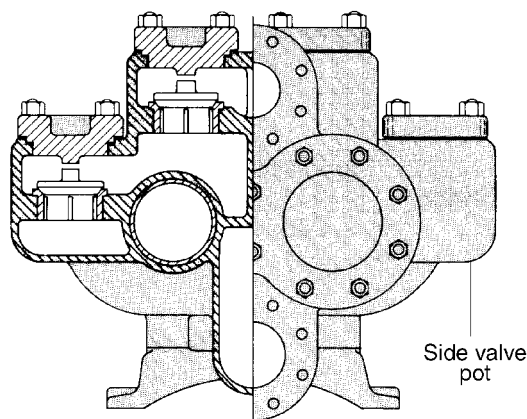
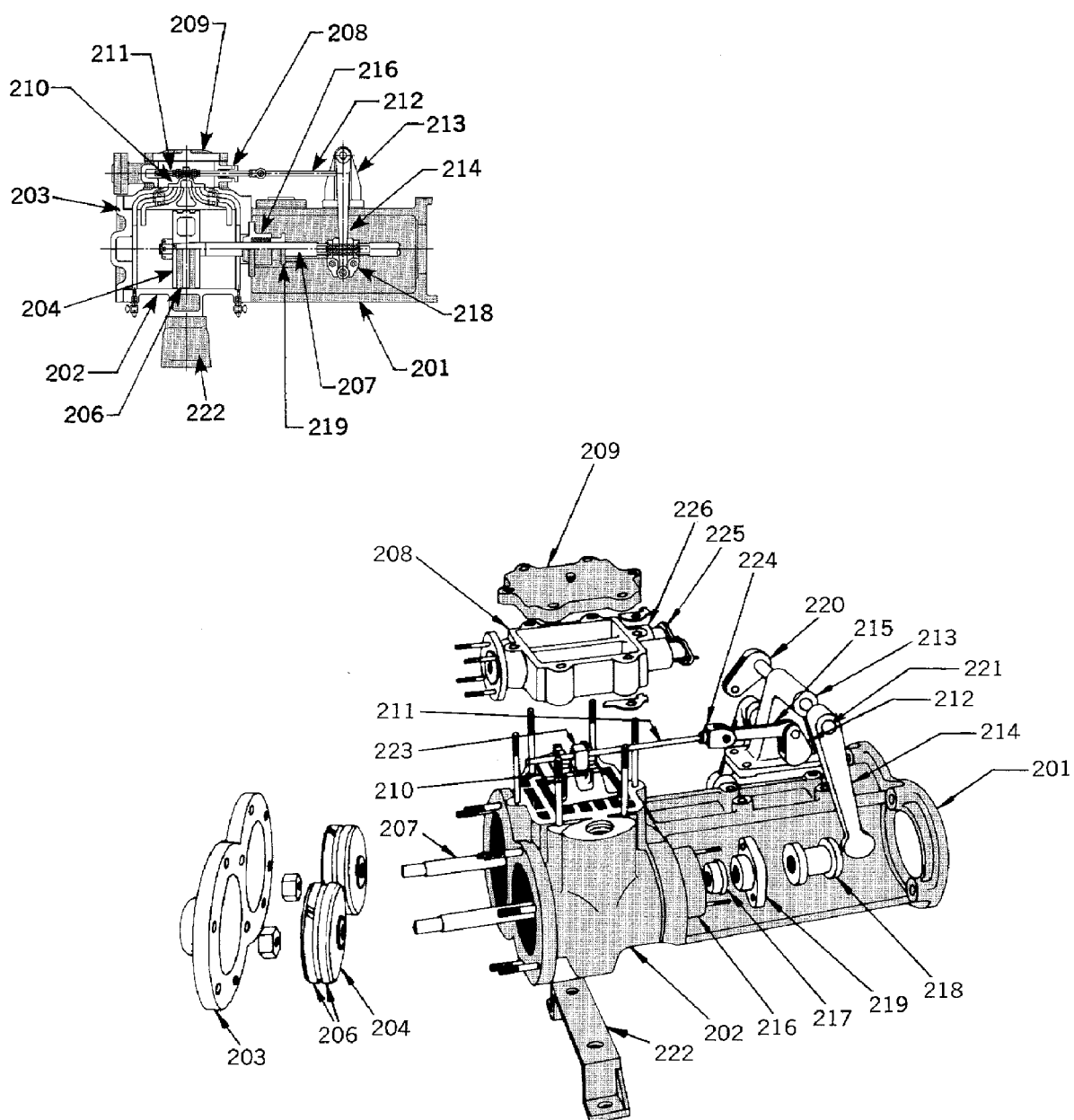


Figure 8.1.3.3.4 — Side valve pot type liquid end (end view, duplex pump)



201	Cradle or yoke	211	Rod, valve	220	Rockershaft, long
202	Cylinder, drive	212	Link, valve rod	221	Rockershaft, short
203	Head, drive cylinder	213	Bracket, rockershaft	222	Foot, drive cylinder
204	Piston, drive	214	Arm, rocker, long	223	Nut, rod adjusting
206	Ring, piston drive	215	Arm, rocker, short	224	Fork, valve rod
207	Rod, drive piston	216	Box, stuffing, drive rod	225	Gland, stuffing box, valve rod
208	Chest, drive	217	Bushing, throat	226	Box, stuffing valve rod
209	Cover, valve chest, drive	218	Crosshead, drive		
210	Valve, main drive	219	Gland, stuffing box, drive end		

Figure 8.1.4 — Drive (steam) end – horizontal duplex pump