Sealless Centrifugal Pumps for Petroleum, Petrochemical, and Gas Industry Process Service

API STANDARD 685
THIRD EDITION, JULY 2022

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Introduction

Users of this standard should be aware that further or differing requirements may 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 may be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this standard and provide details.

Annex A discusses calculations for specific speed and suction-specific speed.

Annex B contains schematic drawings of cooling water and circulation systems.

Annex C illustrates typical nomenclature for sealless pumps.

Annex D provides information on magnetic materials for magnetic couplings.

Annex E provides an inspector's checklist that may be used.

Annex F provides informative criteria for piping design.

Annex G gives guidance on material class selection.

Annex H specifies requirements and gives guidance on materials selection.

Annex I specifies requirements for lateral analysis.

Annex J specifies requirements for determining residual unbalance.

Annex K provides information and examples for pressure temperature profiles in the recirculation circuit.

Annex L contains information and forms that may be used to indicate vendor drawing and data.

Annex M contains forms that may be used to record test data.

Annex N contains a data sheet format that is available for purchasers to use.

Annex O contains application-specific information and cautions.

Annex P contains hazard-based criteria for secondary containment/control specification.

Annex Q provides considerations for application for multistage sealless pumps.

Annex R defines options for instrumentation and protective systems.

This standard requires the purchaser to specify certain details and features.

A bullet (●) at the beginning of a section or paragraph indicates that either a decision by, or further information from, the purchaser is required. Further information should be shown on the data sheets or stated in the quotation request and purchase order.

In this standard, US customary units are included in parentheses for information.

API does not give guidelines on when a sealless pump should be considered. Sealless technology is well suited for the following applications:

— lethal;

— toxic;

— flammable fluids;

— expensive fluids;

— fluids with dissolved solids (i.e. caustic);

— carcinogenic;

— heat transfer fluids (hot and cold);

— emissions are regulated;

— clean fluids (typically);

— low specific gravity;

— fluids that are difficult to seal.

Increasingly stringent environmental requirements surrounding volatile organic compounds have led to the increased use of sealless technology. A thorough, unbiased evaluation and application of the appropriate sealless technology results from carefully evaluating both technologies (canned motor pump and magnetic drive pump). There are many refinery applications ideally suited to sealless technology. The following are a few examples of where sealless technology is being applied in refineries currently:

— hydrofluoric acid (HF acid);

— anhydrous hydrofluoric acid;

— naphtha;

— sulfuric acid;

— butane;

— isobutane;

— methanol;

— caustic;

— propylene;

— alkylate;

— methyl mercaptan;

— aromatics (benzene, xylene, toluene);

— sour water (water containing H_2S);

— olefins.

Process units that would pump the above fluids (pure or as a mixture) are varied and could include:

— alkylation (HF acid or sulfuric acid);

— sulfur plant;

— aromatics recovery unit;

— hydrotreaters;

— boiler house;

— hydrocracker;

— fluidized catalytic cracker;

— reformer;

— crude.

Sealless Centrifugal Pumps for Petroleum, Petrochemical, and Gas Industry Process Service

1 Scope

1.1 This standard covers the minimum requirements for sealless centrifugal pumps for use in petroleum, heavy-duty petrochemical, and gas industry services. Refer to Annex O for application information. Notes following a clause are informative.

1.2 This standard is applicable to single-stage overhung pumps of two classifications, magnetic drive pumps (MDPs) and canned motor pumps (CMPs). Sections 2 through 8 and Section 10 cover requirements applicable to both classifications. Section 9 is divided into two subsections and covers requirements unique to each classification.

NOTE Extension of applicability to other designs such as multistage will need additional input and agreement between the purchaser and the supplier. Considerations for multistage sealless pumps are given in Annex Q.

1.3 If application of sealless pumps is indicated, relevant industry operating experience suggests that sealless pumps produced to this standard should be considered for pumping liquids at conditions exceeding any of the following:

— discharge pressure	1900 kPa	(275 psig);
— suction pressure	500 kPa	(75 psig);
— pumping temperature	150 °C	(300 °F);
— rated total head	120 m	(400 ft).

NOTE For sealed pumps, refer to API 610.

2 Normative References

2.1 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) applies.

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

API Standard 610, *Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries*

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

API Standard 614, *Lubrication, Shaft-sealing, and Oil-control Systems and Auxiliaries*

API Standard 670, *Machinery Protection Systems*

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

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

API Recommended Practice 686, *Recommended Practice for Machinery Installation and Installation Design*