



IRANIAN PETROLEUM STANDARD

IPS

**MATERIAL AND EQUIPMENT STANDARD
FOR
POSITIVE DISPLACEMENT PUMPS - ROTARY**

**FIRST EDITION
JUNE 2002**

**DEPUTY MINISTER
FOR
ENGINEERING & TECHNOLOGY
RESEARCH AND STANDARDS**

FOREWORD

This Standard is intended to be used within and for Iranian Ministry of Petroleum (N.I.O.C, N.I.G.C, N.P.C., N.I.O.R.D.C. and other affiliate organizations and companies) and has been prepared on the basis of the recognized standards, scientific publications, technical documents, accumulated knowledge and experiences in petroleum industries at national and international levels.

Iranian Petroleum Standards are prepared by Iranian Petroleum Standards Organization reviewed and amended by the relevant technical standard committees to incorporate acceptable comments made by oil, gas and petrochemical experts.

Standards are finally approved by the "Standards High Council" of Iranian Ministry of Petroleum.

Iranian Petroleum Standards (IPS) are subject to amendment withdrawal, if required, thus the latest edition of IPS shall be applicable.

Any comment or recommendation submitted to the "Iranian Petroleum Standards Organization" will be evaluated in the relevant technical committee and will be considered in the next revision, upon approval.

GENERAL DEFINITIONS:

Throughout this Standard the following definitions shall apply.

"COMPANY" : Refers to one of the related and/or affiliated companies of the Iranian Ministry of Petroleum such as National Iranian Oil Company, National Iranian Gas Company, National Petrochemical Company etc.

"PURCHASER" : Means the "Company " Where this standard is part of direct purchaser order by the "Company", and the "Contractor" where this Standard is a part of contract documents.

"VENDOR" and **"SUPPLIER"** : Refers to firm or person who will supply and/or fabricate the equipment or material.

"WILL" : Is normally used in connection with the action by the "Company" rather than by a contractor, supplier or vendor.

"MAY" : Is used where a provision is completely discretionary.

"SHOULD" : Is used where a provision is advisory only.

"SHALL" : Is used where a provision is mandatory.

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0. INTRODUCTION

This Standard gives technical specifications and general requirements for the purchase of "Positive Displacement Pumps-Rotary" for use in oil, Gas and Petrochemical Industries and is based on API standard: 676, Second edition, Dec. 1994, and shall be read in conjunction with that document.

Note: This is a revised version of the standard specification for positive displacement pumps – rotary, which is issued as revision (1). Revision (0) of the said standard specification is withdrawn.

Guidance for Use of this Standard

The amendments/supplement to API Standard 676 given in this Standard are directly related to the equivalent sections or clauses in API Standard 676. For clarity, the section and paragraph numbering of API Standard 676 has been used as far as possible. Where clauses in API are referenced within this Standard, it shall mean those clauses are amended by this Standard. Clauses in API that are not amended by this Standard shall remain valid as written.

The following annotations, as specified hereunder, have been used at the bottom right hand side of each clause or paragraph to indicate the type of change made to the equivalent clause or paragraph of API.

- Sub. (Substitution)** : The clause in API shall be deleted and replaced by the new clause in this Standard.
- Del. (Deletion)** : The clause in API shall be deleted without any replacement.
- Add. (Addition)** : The new clause with the new number shall be added to the relevant section of API.
- Mod. (Modification)** : Part of the clause or paragraph in API shall be modified and/or the new description and/or statement shall be added to that clause or paragraph as given in this Standard.

1. GENERAL

1.1 Scope

This Standard Specification contains the minimum technical requirements for rotary positive displacement pumps for use in refinery services chemical plants, petrochemical plants, and where applicable in exploration, production and new ventures. Selected equipments shall be in all respect within the range of the manufacturer's proven experience and not involve the use or application of any prototype design or component.

Compliance with the provisions of this specification does not relieve the pump manufacturers of the responsibility of furnishing pump and accessories of proper design mechanically suited to meet operating guarantees at the specified service conditions.

No deviation or exception from this Standard shall be permitted without written approval of the Company. Intended deviations shall be separately listed by the Vendor and supported by reasons thereof for Purchaser's consideration. **(Sub.)**

1.2 Alternative Designs

International System of Units (SI) in accordance with [IPS-E-GN-100](#) shall be used, unless otherwise specified. **(Mod.)**

1.3 Conflicting Requirements

In the case of conflict between documents relating to the inquiry or order, the following priority of document shall apply :

- First priority : Purchase order and variations thereto
- Second priority : Data sheets and drawings
- Third priority : This specification **(Sub.)**

1.5 Referenced Publications

Throughout this Standard the following dated and undated standards/codes are referred to. These referenced documents shall, to the extent specified herein, form a part of this standard. For dated references, the edition cited applies. The applicability of changes in dated references that occur after the cited date shall be mutually agreed upon by the Company and the Vendor. For undated references, the latest edition of the referenced documents (including any supplements and amendments) applies.

IPS (IRANIAN PETROLEUM STANDARDS)

IPS-M-PM-240	"General Purpose Steam Turbine"
IPS-M-PM-250	"Special Purpose Steam Turbine"
IPS-M-EL-132	"Induction Motors"
IPS-M-PM-300	"Special Purpose Gear Units"
IPS-M-PM-320	"Lubrication, Shaft Sealing and Control Oil Systems for Systems for Special Purpose Application"
IPS-G-SF-900	"Noise and Vibration Control"

[IPS-E-EL-110](#) "Electrical Area Classification and Extent"

[IPS-E-GN-100](#) "Units"

2. BASIC DESIGN

2.1 General

2.1.4 Pumps shall be designed to minimize the generation of noise and shall not exceed the noise limits given in the supplementary clauses bellow.

All definitions, notations, measuring equipment, measuring procedures, test reporting, calculation methods and calculation procedures shall be in accordance with [IPS-G-SF-900](#). **(Sub.)**

2.1.4.1 Unless otherwise specified, the following limits shall be met at any measuring location not less than 1m from the equipment surface:

SOUND PRESSURE LIMIT IN db	
Pump	87
Pump + Driver	90

If the equipment produces impulsive and/or narrow band noise, the above limits shall be taken 5 dB lower, thus 82 dB for pump and 85 dB for pump + driver.

The above requirements apply in absence of reverberation and background noise from other sources, and for all operating conditions between minimum flow and rated flow. **(Add.)**

2.1.11 All equipment covered by this specification shall be designed for operation outdoors, unless otherwise specified on the individual pump data sheet. **(Mod.)**

2.1.13 pump speed shall not exceed 1500 rpm. Pump which do not require timing gears, may operate at higher speeds subject to purchaser's authorization. **(Mod.)**

2.2 Pressure Casings

2.2.9 Areas of the pump which are normally subjected to suction pressure shall be designed to withstand the maximum discharge pressure. **(Add.)**

2.2.10 Casing shall be provided with 3 mm minimum corrosion allowance. **(Add.)**

2.3 Casing Connections

2.3.1 Suction and discharge connections DN 40 and larger shall be furnished with flanged suction and discharge nozzles integral with the casing, and orientations shall be indicated on the proposal.

Flanged suction connections shall be suitable for the maximum discharge pressure and pumping temperature.

2.3.6.3 Flanges that are thicker or have a larger diameter than required by ANSI may be furnished, but they shall be faced and drilled as specified in ANSI Standard. **(Sub.)**

2.3.6.4 Connections other than those covered by ASME B16.5 require the purchase approval when specified, the mating parts shall be furnished. **(Mod.)**

2.3.9 Connections for drains, vents, seal cages, jackets and lubrication shall be DN 15 minimum. **(Add.)**

2.5 Rotating Element

2.5.1 All major rotating elements, and also assembled rotors shall be statically and dynamically balanced. **(Mod.)**

2.5.4 Dynamic shaft deflection under the maximum conditions of load shall not exceed 0.05 mm at the face of the stuffing box. **(Add.)**

2.6 Mechanical Seals and Conventional Packing

2.6.1.1 The pump vendor shall be responsible to obtain a full guarantee from the seal manufacturer for seals provided. **(Mod.)**

2.6.1.5-1 When seal gland plates are used, they shall be of the same material as the pump case except for carbon steel and cast iron casings which shall be 18 Cr 8 Ni. Gland plates retaining mechanical seals shall have at least four bolts. **(Add.)**

2.6.2 Stuffing boxes for conventional packing

2.6.2.7 Stuffing boxes shall preferably be integral with the pump casing. **(Add.)**

2.6.2.8 Packed stuffing boxes shall be flushed at the throat bushing if the liquid contains abrasive particles such as catalysts or coke in concentration of 11.98 Kg/m³ or more, or fails to provide the required lubrication for the packing. **(Add.)**

2.7 Bearings

2.7.6 Bearing housings preferably shall be arranged so that the bearings can be replaced without disturbing the pump drive or the pump mounting. In general internally lubricated type bearings are acceptable when the fluid pumped has no damaging effect on the bearings. In all other cases, pump shall be provided with oil lubricated bearings and timing gears in separate housings. **(Add.)**

2.8 Lubrication

2.8.3 In the case of a unit having oil lubricated bearings in separate housings, constant-level oilers shall be furnished. The oilers' volume shall be 120 cm³. **(Mod.)**

2.8.5 When pressure lubrication is required or specified for externally lubricated bearings, the pump vendor shall provide a self-contained lubrication system complete with oil pump reservoir, piping, filters, necessary controls and instrumentations, and water cooled or air cooled oil cooler as specified by the purchaser. **(Add.)**

2.9 Material

2.9.14 Steel casings are required for pumps located within process unit areas, handling a stream containing any flammable liquids or toxic materials. **(Add.)**

2.10 Nameplates and rotation arrows

2.10.3 Add to this clause:

Differential head and total weight. The serial number shall also be cast in or stamped on the pump casing. **(Mod.)**

3. ACCESSORIES

3.1 Drivers

3.1.5 All induction motors supplied by the pump vendor shall be in accordance with IPS Std. [M-EL-132](#). **(Mod.)**

3.1.7 All steam turbines supplied by the pump vendor shall be in accordance with IPS standard,s [M-PM-240](#) or [M-PM-250](#). **(Mod.)**

3.2 Couplings and Guards

3.2.1 The coupling shall be capable of transmitting the total torque through the whole range of the pump performance curve as well as accommodating both angular and lateral misalignments.

The spacer piece shall be positively restrained from flying out in the event of failure of the flexible element. **(Mod.)**

3.2.5 Removable metallic guards shall be supplied by the vendor. Guards shall be non-spark type and sufficiently heavy and rigid in design to avoid contact with coupling or shaft as a result of bodily contact. **(Mod.)**

3.2.6 The couplings shall be dynamically balanced when the coupling size-speed relationship is such that balancing is recommended by the coupling manufacturer. **(Add.)**

3.3 Mounting Plate

3.3.2 Base plates

3.3.1 The minimum size of base plate drain shall be 1". **(Mod.)**

For units having a gross weight of 50 Kg or more, the base plate shall be provided with lifting lugs for a four-point lift. **(Mod.)**

3.3.1.2.10 Anchor bolts shall be furnished by the vendor, unless otherwise specified in data/requisition sheet. **(Sub.)**

3.3.2.4 Bases shall have a grout hole not less than 100 millimeters in diameter where practical and located so the base can be grouted in place without removal of pump, driver, or any auxiliaries. The grout hole shall be arranged so that the pumped fluid will not accumulate over the open grout. Adequate vent holes shall be provided to insure a complete distribution or grout. **(Mod.)**

3.3.2.9 Base plates shall be provided with two welded on earthing studs positioned diagonally at opposite end complete with two nuts and two washers per earthing. **(Mod.)**

3.4 Relief Valves

3.4.1 Delete when specified from this clause. **(Mod.)**

3.5 Piping

3.5.1 Stainless steel tubing and piping shall be cleaned with a suitable solvent. Cleaning shall be performed at vendor's shop.

3.5.9 Copper tubing and brass fittings are not acceptable. **(Mod.)**

4. INSPECTION TESTING, AND PREPARATION FOR SHIPMENT**4.2 Inspection**

4.2.1.4 Shop inspection shall be carried out as follows prior to tests and performance testing.

For all pumps, shop inspection shall include a dimensional check against approved outline drawings combined with a visual check for good workmanship. Other types of inspection may be specified in purchase order or data sheet. **(Add.)**

4.3 Tests**4.3.1 Testing**

4.3.1.3 The vendor shall notify the purchaser or his authorized representative not less than 15 days prior to the date the equipment will be ready for test. **(Sub.)**

4.3.2 Hydrostatic test

4.3.2.1 The minimum test pressure for casing shall be 780 kPa. g. [7.8 bar (g)]. The water used for the test shall contain a suitable wetting agent. The liquids with chloride content are not permitted for hydrostatic test of austenitic stainless steel materials. After completion of shop tests, pumps are to be thoroughly cleaned. **(Mod.)**

4.3.2.5 Pressure casing shall be hydraulically tested for at least four hours. **(Mod.)**

4.3.4 Optional test

4.3.4.3 If the NPSH required by the pump differs from the specified available NPSH by 0.3m or less, an NPSH suppression test is required. **(Mod.)**

4.3.5.1 Certified performance data and curves shall be supplied. **(Mod.)**

4.4 Preparation for Shipment

4.4.3.2 Unless otherwise specified the rust preventive applied to unpainted exterior machined surfaces shall be of a type:

a) To provide protection during outdoor storage for a period of twelve months exposed to a normal industrial environment. and;

b) To be removable with mineral spirits or any standard solvent. **(Mod.)**

4.4.3.8 Each pump shall be identified as required by the purchase order. No material shall be shipped separately. Miscellaneous parts shall be properly tagged by securely affixed metal tags and

marked with the item number for which they are intended. All such parts shall be suitably boxed, firmly attached to the base plate and shipped with the unit. **(Sub.)**

5. VENDOR'S DATA**5.2 Proposals**

5.2.3 Technical data Add to item F of this clause:

F) Vendor's offer shall include recommended spare parts for two years of continuous operation with price list. **(Mod.)**

6. GUARANTEE AND WARRANTY**6.1 Performance**

6.1.1 The complete pumping assembly shall be guaranteed for pressure, capacity and power consumption at specified design and operating condition, and satisfactory application in all respects to the operating conditions specified on the individual pump specification sheet. Permissible variations from the specified performance are as follows:

Guarantee Point

Capacity: Minus Zero, plus 3% at the pump rated discharge pressure.

Brake Kilowatt : plus 4% (Add.)

Note to Users

The IPS Standards reflect the views of the Iranian Ministry of Petroleum and are intended for use in the oil and gas production facilities, oil refineries, chemical and petrochemical plants, gas handling and processing installations and other such facilities.

IPS publications are based on internationally acceptable standards and include selections from the options stipulated in the referenced standards. They are also supplemented by additional requirements and/or modifications based on the experience acquired by the Iranian Petroleum Industry and the local market availability. The options which are not specified in the text of the standards are itemized in data sheet/s, so that, the user can select his appropriate preferences therein.

The IPS standards are therefore expected to be sufficiently flexible so that the users can adapt these standards to their requirements. However, they may not cover every requirement or diversity of conditions of each project or work.

For such cases, an addendum to IPS Standard shall be prepared by the user which elaborates the particular requirements of the user. This addendum together with the relevant IPS shall form the job specification for the specific project or work.

The users of IPS publications are therefore requested to send their views and comments, including any addendum prepared for particular cases to the Ministry of Petroleum, Standards and Research Organization. These comments and recommendations will be reviewed by the relevant technical committee and will be incorporated in the formal revision of the relevant IPS. The IPS publications are reviewed and revised approximately every five years.

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