



# IRANIAN PETROLEUM STANDARD

# IPS

**MATERIAL AND EQUIPMENT STANDARD**

**FOR**

**SPECIAL PURPOSE GEAR UNITS**

**FIRST EDITION**

**DECEMBER 2003**

**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 specification gives the amendments and supplements to API Standard 613, Fourth Edition, June 1995, "Special Purpose Gear Units for Petroleum, Chemical, and Gas Industry Services". It shall be used in conjunction with data/requisition sheets for Special Purpose Gear Units.

**Note:** This is a revised version of the standard specification for special purpose Gear Units for process services, which is issued as edition(1) . Edition(0) of the said standard specification is withdrawn.

### Guidance for Use of this Standard

The amendments/supplement to API Standard 613 given in this Standard are directly related to the equivalent sections or clauses in API Standard 613. For clarity, the section and paragraph numbering of API Standard 613 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 is deleted and replaced by the new clause in this Standard.

**Del. (Deletion) :** The clause in API is deleted without any replacement.

**Add. (Addition) :** The new clause with the new number is added to the relevant section of API.

**Mod. (Modification):** Part of the clause or paragraph in API is modified and/or the new description and/or statement is added to that clause or paragraph as given in this Standard

## SECTION 1 - GENERAL

### 1.1 Scope

**1.1.1** This Standard Specification contains the minimum general requirements, for special purpose gear units for refinery services, chemical plants, petrochemical plants, gas plants and where applicable in production, exploration and new ventures. **(Mod.)**

**1.1.3** Compliance by the gear manufacturer with the provisions of this Standard Specification does not relieve him of the responsibility of furnishing gear and accessories of proper design, mechanically suited to meet guarantees at the specified service conditions. **(Add.)**

**1.1.4** Unless specific exception accompanied by a description of the proposed substitute is recorded under the heading "Exception" in Manufacturer's Proposal, it shall be mutually understood that the proposal is based on equipment, which complies strictly with the requirements of this Standard. **(Add.)**

### 1.2 Alternative Design

The International System (SI) of Units , dimension and rating 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 documents (whichever more stringent realized by Company) shall apply:

- First priority : purchase order and variations thereto
- Second priority : data sheets and drawings
- Third priority : this Standard Specification

All conflicting requirements shall be referred to the Purchaser in writing. The Purchaser will issue conforming documentation if needed for clarification. **(Sub.)**

### 1.5 Referenced Publications

**1.5.1** 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)

<a href="#">M-PM-320</a>	"Lubrication, Shaft Sealing and Control Oil Systems for Special Purpose Applications"	
<a href="#">G-SF-900</a>	"Noise and Vibration Control"	
<a href="#">E-GN-100</a>	"Units"	<b>(Mod.)</b>

#### ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

6708	"Pipe Components-Definition of Nominal Size"
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**SECTION 2 - DESIGN**

**2.1 General**

2.1.4 Equipment trains shall comply with the requirement of [IPS-G-SF-900](#) "Noise and Vibration Control".

Unless otherwise specified, the following limits shall be met at any measuring location 1 m from the equipment surface:

Sound pressure limit in dB re 20 µPa	
gear	87 dB (A)
Gear + drive system	90 dB (A)

If the equipment produces impulsive and/or narrow band noise, the above limits shall be taken 5 dB(A) lower, thus 82 dB(A) for the gear and 85 dB(A) for the gear + drive system.

Noise levels shall have an upper tolerance of +0dB.

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.

Noise control measures shall cause no hindrance to operations nor any obstruction to routine maintenance activities. **(Sub.)**

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

2.1.18 The main gear for any drive system shall be a separate coupled unit. A gear unit integral with prime mover is unacceptable. **(Add.)**

2.1.19 Spare rotors shall be furnished for and delivered with each gear unit. If the rotors of two or more units are duplicates, a single spare set will suffice. **(Add.)**

**2.2 Rating**

2.2.1 For electric motor drivers the gear shall also be rated to withstand momentary high torque overloads equal to or exceeding four times gear power rating to provide for peak torque resulting from reapplication of voltage after a power interruption. The suitability of this rating shall be confirmed by purchaser after final system characteristics are defined.

In addition, for synchronous motor drives, the gear shall also be rated to withstand the peak oscillatory torque values predicted by system transient torsional analysis of the motor starting. **(Mod.)**

**2.3 Casing**

**2.3.1 Design parameters**

2.3.1.7 External threaded connections on steel casings shall be seal welded, and threaded connections on cast iron casings shall be sealed by brazing. Threaded openings not connected to piping shall be plugged with solid, round shank plugs furnished in accordance with ANSI B16.11 and in material of comparable quality to the casing material. **(Mod.)**

### 2.3.4 Assembly and Disassembly

2.3.4.1 It shall be possible to lift the upper half without disturbing the alignment. **(Mod.)**

2.3.5 Gear box shall be equipped with magnetic plug fitted at the bottom of the casing to collect any possible metallic particles that may be present. **(Add.)**

### 2.4 Casing Connections

2.4.6. Socket welded fittings are not permitted in oil supply piping. **(Mod.)**

### 2.5 Gear Elements

#### 2.5.1 General

2.5.1.8 Double reduction gearing for reciprocating compressor drives shall use the nested arrangement. i.e. having a conventional double helical low speed set and the high speed gearing placed so that half the high speed gearing is on each side of the low speed set. **(Add.)**

#### 2.5.4 Shafts

2.5.4.2 Surface finish of the shafting at the radial proximity probe locations shall be equivalent to the finish on journals. Repair of shaft surface under probes by plating is not permitted. **(Mod.)**

### 2.6 Dynamics

#### 2.6.1 Critical speeds

2.6.1.6 The vendor's report shall also include both input data and results of critical speed analysis including a graphic display of critical speed versus support stiffness, and support stiffness versus percent torque load and speed. **(Mod.)**

2.6.1.10 The gear vendor shall also perform an independent torsional analysis using basic equipment dimension and stiffness data. For synchronous motor drivers, the gear vendor shall also perform a system transient torsional analysis of the motor starting. **(Add.)**

### 2.8 Lubrication

2.8.3 The common lube oil systems shall be furnished by the main driven equipment vendor, when the main equipment requires forced feed lubrication. However, the gear vendor shall furnish lube oil supply and drain headers with flanged connections. When the oil systems will be required only for the gear unit, the oil system shall be provided by the gear vendor. **(Sub.)**

2.8.5 Unless otherwise specified, oil systems furnished by the vendor shall be in accordance with [IPS-M-PM-320](#). **(Sub.)**

### 2.10 Nameplates and Rotation Arrows

Nameplate data shall be in SI Units. **(Mod.)**

## SECTION 3 - ACCESSORIES

### 3.2 Coupling and Guards

3.2.1 The driven equipment manufacturer will coordinate the shipment and mounting of the coupling prior to shipment. **(Mod.)**



### 3.3 Mounting Plates

#### 3.3.1 General

3.3.1.1 Gear units, main driven equipment and driver shall be mounted on steel fabricated, rigid common base plates, supplied by the main driven equipment vendor. **(Mod.)**

### 3.4 Controls and Instrumentation

#### 3.4.1 General

3.4.1.1 When no detailed specification are furnished, instrumentation and installation shall conform to the requirements of API Standard 614 as amended and supplemented by [IPS-M-PM-320](#). **(Mod.)**

### 3.5 Piping and Appurtenances

Lube oil piping and appurtenances shall conform to the requirements of API Standard 614 as amended and supplemented by [IPS-M-PM-320](#). **(Mod.)**

## SECTION 4 - INSPECTION, TESTING AND PREPARATION FOR SHIPMENT

### 4.3 Testing

#### 4.3.1 General

4.3.1.3 Replace 5 working days with 15 working days. **(Mod.)**

#### 4.3.2 Mechanical running tests

4.3.2.2.15 During the mechanical running tests the vibration amplitude/frequency sweep shall also be recorded at minimum specified and maximum continuous speeds for vibration of the shafts adjacent to one bearing on each shaft. **(Mod.)**

#### 4.3.3 Optional tests

4.3.3.5 The sound level test shall be performed in accordance with [IPS-G-SF-900](#). **(Mod.)**

### 4.4 Preparation for Shipment

4.4.3.9 Separate shipment of material is not allowed.

## SECTION 5 - VENDOR'S DATA

### 5.2 Proposals

#### 5.2.3 Technical Data

Vendor shall include following additional data with proposal:

- n. Maximum rating capability of proposed gear casing.
- o. Sump clearance under gear wheel.
- p. Method of protection of spare parts from corrosion during shipment and subsequent

storage

- q. Type of rust preventive to be applied to the units interior and bearing surfaces. **(Mod.)**

### 5.3 Contract Data

#### 5.3.2 Drawing

(Appendix F) The following additional drawings shall be submitted by the Vendor:

1. Cross sectional drawings with all radial and axial internal clearances.
2. Dimensioned general arrangement drawing.
3. Dimensioned thrust bearing drawing.
4. Dimensioned radial bearing drawing. **(Mod.)**

#### 5.3.3 Technical Data

5.3.3.1 The following additional data shall also be provided by the Vendor:

- a) Input and results of critical speed and rotor unbalance response study including bearing and support stiffness and damping as a function of percent torque load and speed.
- b) Input and results of torsional critical speed analysis, and transient torsional if required.
- c) Weld detail and weld procedure for fabrication of gear wheel, if applicable. **(Mod.)**

## SECTION 6 - GUARANTEE AND WARRANTY

Unless exception is recorded by the Vendor in his proposal, it shall be understood that the Vendor agrees to the following guarantees and warranties:

During a period of 12 months after the date of commissioning, the Vendor shall, with all possible speed and without cost to the purchaser, replace or repair the goods or any part thereof found to be defective due to faulty material, workmanship or to any act or omission of the Vendor, in particular the Vendor shall reimburse any transportation and other charges incurred by the Purchaser in effecting such replacement or repair at the point of use. **(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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