

MATERIAL AND EQUIPMENT STANDARD
FOR
SPECIAL PURPOSE GEAR UNITS

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0. INTRODUCTION

This Specification gives amendment and supplement to API Standard 613, Third Edition April 1988: "Special-Purpose Gear Units for Refinery Services".

It shall be used in conjunction with data/requisition sheets for Special-Purpose Gear Unit.

For ease of reference, the clause or section numbering of API Std. 613 has been used throughout this specification.

Clauses in API Std. 613 not mentioned remain unaltered.

For the purpose of this Specification, the following definitions shall hold:

- Sub. (Substitution) : The API Std. clause is deleted and replaced by a new clause.
- Del. (Deletion) : The API Std. clause is deleted without any replacement.
- Add. (Addition) : A new clause with a new number is added.
- Mod. (Modification) : Part of the API Std. clause is modified, and/or a new description and/or condition is added to that clause.

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

Equivalent SI Unit System dimensions and ratings shall be substituted. (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.)

1.4 Definition of Terms

1.4.20 The international nomenclature-diameter nominal- written as DN 15, 25, 32, 40, etc., has been used for pipe size in accordance with ISO 6708 (1980) and Appendix H in this Standard Specification. (Add.)

1.4.21 The international nomenclature-pressure nominal-written as PN 20, 50, 68, 100, etc., has been used for flange ratings in accordance with ANSI-ASME B16.5 (1981), ISO 7268 (1983) and Appendix I in this Standard Specification. (Add.)

1.5 Referenced Publications

1.5.1 The latest editions of the following standards, codes, and specifications shall, to the extent specified herein, form part of this Standard.

IPS (IRANIAN PETROLEUM STANDARDS)

- | | |
|----------|---|
| M-PM-320 | "Lubrication, Shaft Sealing and Control Oil Systems for Special Purpose Applications" |
| E-SF-900 | "Noise and Vibration Control" |

ISO (INTERNATIONAL ORGANIZATION FOR STANDARDIZATION)

- 6708 "Pipe Components-Definition of Nominal Size"
- 7268 "Pipe Components-Definition of Nominal Pressure" (Mod.)

2. BASIC DESIGN

2.1 General

2.1.3 Equipment trains shall comply with the requirement of IPS-E-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 μ Pa	
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.)

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

2.1.21 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

2.3.1.5 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.)

2.3.5 Assembly and disassembly

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

2.4 Casing Connections

2.4.2 Flanged connections

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

2.5 Gear Elements

2.5.1 General

2.5.1.17 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 speed

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

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

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.)

2.10 Nameplates and Rotation Arrows

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

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 baseplates, supplied by the main driven equipment vendor. (Mod.)

3.4 Controls and Instrumentation

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

4. INSPECTION, TESTING AND PREPARATION FOR SHIPMENT

4.3 Testing

4.3.1 General

4.3.1.1 All tests specified shall be witnessed by the purchaser's representative. (Mod.)

4.3.1.2 Replace 5 working days with 15 working days. (Mod.)

4.3.2 Mechanical running tests

4.3.2.5 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 Noise level test shall be performed with the requirements of IPS-E-SF-900.

4.4 Preparation for Shipment

4.4.3.9 Separate shipment of material is not allowed.

5. VENDOR'S DATA

5.1 Proposals

Vendor shall include following additional data with proposal:

- P. A list of previously manufactured units most similar to proposed gear, indicating installation location, model, ratings, center distance, and other pertinent comparative data.
- q. Maximum rating capability of proposed gear casing.
- r. Sump clearance under gear wheel.
- s. Method of protection of spare parts from corrosion during shipment and subsequent storage.
- t. Type of rust preventive to be applied to the units interior and bearing surfaces. (Mod.)

5.2 Contract Data

5.2.3 Drawing

5.2.3.3 The following additional drawings shall be submitted by the Vendor:

- k. Cross sectional drawings with all radial and axial internal clearances.
- L. Dimensioned general arrangement drawing.
- M. Dimensioned thrust bearing drawing.
- N. Dimensioned radial bearing drawing. (Mod.)

5.2.4 Data

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

- h) Completed final equipment data sheets.
- i) Input and results of critical speed and rotor unbalance response study including bearing and support stiffnesses and damping as a function of percent torque load and speed.
- j) Input and results of torsional critical speed analysis, and transient torsional if required.
- k) Weld detail and weld procedure for fabrication of gear wheel, if applicable. (Mod.)

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.)

APPENDICES**APPENDIX A
SPECIAL PURPOSE GEAR UNIT DATA SHEETS**

A.1 SI Units data sheets shall be used.

**APPENDIX H
PIPE COMPONENTS NOMINAL SIZE**

The purpose of this Appendix is to establish an equivalent identity for the piping components nominal sizes in Imperial system and SI system.

TABLE H1

Nominal Size		Nominal Size		Nominal Size		Nominal Size	
DN (1)	NPS (2)	DN	NPS	DN	NPS	DN	NPS
15	½	100	4	500	20	1000	40
20	¾	125	5	600	24	1050	42
25	1	150	6	650	26	1100	44
32	1¼	200	8	700	28	1150	40
40	1½	250	10	750	30	1200	48
50	2	300	12	800	32	1300	52
65	2½	350	14	850	34	1400	56
80	3	400	16	900	36	1500	60
90	3½	450	18	950	38	1800	72

1) Diameter nominal,mm

2) Nominal pipe size, inch

**APPENDIX I
PIPE FLANGES PRESSURE TEMPERATURE RATING**

The purpose of this Appendix is to establish an equivalent identity for the pipe flange nominal pressure temperature ratings in Imperial system and SI system.

TABLE I 1

PN (1)	PSIG (2)
20	150
50	300
68	400
100	600
250	1500
420	2500

1) Pressure Nominal, bar

2) Pounds per square inch, gage