

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

PETROLEUM AND NATURAL GAS INDUSTRIES - HIGH-SPEED SPECIAL-PURPOSE GEAR UNITS (AMENDMENTS/SUPPLEMENTS TO ISO 13691)

PTS 31.29.00.32

DECEMBER 2010



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PTS No:	31.29.00.32
PTS Title:	Petroleum and Natural Gas Industries – High-speed special-purpose gear units (Amendments/Supplements to ISO13691)

This revision of PTS 31.29.00.32– Petroleum and Natural Gas Industries – High-speed special-purpose gear units (Amendments/Supplements to ISO13691) has been updated incorporating PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. All updates in the document are highlighted in *italic* font.

The previous version of this PTS 31.29.00.32 (November 2003) will be removed from PTS binder/ e-repository from herein onwards.

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Document Approval

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PREFACE

PETRONAS Technical Standards (PTS) publications reflect the views, at the time of publication, of PETRONAS OPU/Divisions.

They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardisation.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use PTS they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, it is expected of them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the PTS. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the owner.

The right to use PTS rests with three categories of users:

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- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) and 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

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The copyright of PTS vests in PETRONAS. Users shall arrange for PTS to be held in safe custody and PETRONAS may at any time require information satisfactory to PETRONAS in order to ascertain how users implement this requirement.

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PART I INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations for special-purpose, high-speed gear units for petroleum, chemical and natural gas industries. This PTS is based on ISO 13691:2001- 1st edition. Part III of this specification amends, supplements and deletes various clauses of ISO 13691.

1.2 DISTRIBUTION, APPLICABILITY AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this document is confined to companies forming part of PETRONAS Group, and to Contractors nominated by them.

This PTS is intended for use in oil refineries, chemical plants, gas plants, supply/marketing installations and, where applicable, in onshore exploration and production facilities.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which combination of requirements will be acceptable as regards safety, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this document which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this document as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project, or operation or maintenance of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word "**shall**" indicates a requirement.

The word "**should**" indicates a recommendation.

1.4 CROSS-REFERENCES

Where cross-references are made, the number of the section or sub-section referred to is shown in brackets. For ease of reference, the clause (or paragraph) numbering of ISO 13691 has been used throughout (Part III) of this PTS.

All publications referred to in this PTS are listed in (Part IV).

1.5 SUMMARY OF CHANGES

This revision has been essentially only editorial, with no significant technical changes.

PART II GENERAL INFORMATION

Part III of this PTS gives amendments and supplements to ISO 13691:2001, 1st edition.

For ease of reference, the clause numbering of ISO 13691 has been used throughout Part III of this specification. Clauses in ISO 13691 which are not mentioned shall remain valid as written.

A bullet (•) in the margin of certain clauses in both this PTS and ISO 13691 indicates that a decision is required of the Contractor and/or the Principal. These decisions shall be indicated directly on the relevant data/requisition sheet where provisions are made for them. Otherwise, they shall be indicated on the data/requisition sheet(s) under the heading "Additional Requirements", or stated in the purchase order.

PART III AMENDMENTS/SUPPLEMENTS TO ISO 13691

1 SCOPE

Add the following new clauses:

- 1.1** Up to a gear ratio of 1:9, one-stage speed increasers or reducers shall be used. The use of higher gear ratios, which shall utilise two-stage speed or epicyclic gear increasers, is subject to the approval of the Principal.

- 1.2** The Contractor, Principal and the Main Manufacturer shall agree whether a single- or double-helical gear shall be applied in critical services. A double helical gear shall be the first choice in view of the balanced thrust, smaller "footprint" and lighter weight. If large cyclic torque variations are expected (such as with reciprocating compressors), gears shall be double helical.

The gear selection for a power recovery train, or for any other configuration where load reversals can occur for extended periods, is subject to the approval of the Principal.

Note: Gearboxes that experience load reversals for extended periods require special consideration with regard to, for example, tooth accuracy on the normally unloaded face, tooth profile modification on the normally unloaded face (may be different to that on the normally loaded face), lubrication points, and load direction changes in the bearings.

- 1.3** Unless otherwise specified, the Vendor shall supply the gear unit to the Main Manufacturer for mounting on a common base plate. The Vendor shall supply all relevant information, including dynamic analysis, performance, dimensions and noise emission to the Main Manufacturer so that a fully integrated unit results.

- 1.4** Special-purpose gear units shall be supplied by Vendors qualified by referenced experience in manufacturing gear units with closely similar duties and build specifications to those being proposed.

To qualify, the Vendor shall have manufactured at least two gear units of comparable power rating, selection factor, pinion speed, and pitch line velocity. Each of these gears shall have acquired at least 16,000 hours of trouble-free operation.

- 1.5** The Vendor and his sub-Suppliers shall have an implemented, effective, quality system. It should be in accordance with ISO 9001 requirements, or an equivalent internationally recognised quality system that is acceptable to the Principal.

1.6 Alternative designs

The Vendor's primary quotation shall be in accordance with this PTS. Alternative quotations may be submitted if they offer significant price, delivery, or technical advantage. Alternative proposals must be clearly defined as such.

1.7 Conflicting requirements

In the event of conflict between documents relating to the inquiry or purchase order, the following hierarchy of documents shall apply:

1st priority – the purchase order and variations thereto;

2nd priority – the data sheets, requisition sheets and drawings;

3rd priority – this PTS.