

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

SPECIAL PURPOSE STEAM TURBINES (AMENDMENTS/SUPPLEMENTS TO ISO 10437)

PTS 31.29.60.31

DECEMBER 2010



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PTS Title:	Special Purpose Steam Turbines (Amendments/Supplements to ISO 10437)

This revision of PTS 31.29.60.31- Special Purpose Steam Turbines (Amendments/Supplements to ISO 10437) has been updated to incorporate PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards.

The previous version of this PTS 31.29.60.31 (December 1998) will be removed from PTS binder / e-repository from herein onwards.

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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/Divisions 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 standardization.

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.

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PART I INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations for the design, materials, fabrication, inspection, testing and preparation for shipment of steam turbines for special-purpose applications.

This PTS is based on ISO 10437. Part II and Part III of this PTS amend, supplement and delete various clauses of ISO 10437.

Part II of this PTS applies to special purpose steam turbines.

All clauses of ISO 10437 not modified by this PTS shall remain valid as written.

This is a revision of the PTS of the same number dated December 1998; a summary of the main changes is given in (1.5).

In this PTS, where practical, US Customary units have been added in brackets, for information.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of PETRONAS or managed by a Group company and, where necessary, to Contractors and Manufacturers nominated by them.

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

When PTSs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

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 of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this PTS 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 PTS as closely as possible.

1.3 DEFINITIONS

The **Contractor/Purchaser** 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/Vendor** 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 to other parts of this PTS are made, the referenced section number is shown in brackets. Other documents referenced by this PTS are listed in (Part III).

1.5 SUMMARY OF MAIN CHANGES SINCE PREVIOUS EDITION

This PTS is a revision of, the PTS of the same number dated December 1998, which was based on API Std 612. This edition of the PTS is now based on ISO 10437. Due to the restructuring of the clauses it is impractical to list the changes since the previous edition herein.

PART II AMENDMENTS / SUPPLEMENTS TO ISO 10437

2. NORMATIVE REFERENCES

Add to this clause:

Standards referred to in this PTS are listed in Part IV.

3. TERMS AND DEFINITIONS

3.51 Add new clause:

minimum pressurization temperature

lowest possible ambient temperature of the casing (or container, piping, etc.) at which the casing (or container, piping, etc.) may be pressurized to 25 % or more of its design pressure during warm up.

3.52 Add new clause:

local gauge board

gauge board located directly at the steam turbine

See (12.5.4).

3.53 Add new clause:

local panel

panel located near the steam turbine train, containing the instruments for routine checking of the steam turbine during normal operation, in addition to the alarm panel

See (12.5.4).

6. BASIC DESIGN

6.1. GENERAL

6.1.1 Add to this clause:

Steam turbine rated power and speed shall not exceed the limits of the Vendor's proven design and shall be well within the range of the Vendor's successful experience.

Steam turbine shall be designed for a minimum operating period of 12 years between required overhaul inspections.

6.1.3 Add to this clause:

The driven equipment vendor for mechanical drives has unit responsibility. The turbine vendor shall assist the vendor of the driven equipment in fulfilling his obligation as the party responsible for the entire train, including the driver and all power transmitting components. For power generation, the steam turbine manufacturer has unit responsibility.

6.1.6 g) Add to this clause:

The Vendor shall present NEMA swing certification for the turbine pressure retaining components. If the turbine is capable of operating levels greater than the NEMA swings, the vendor shall specify those limits for which the turbine can accept.

6.1.6 i) Add new clause:

The maximum continuous speed of the turbine shall be not less than the maximum continuous speed of the driven equipment.

6.1.9 Add to this clause:

When requested by the purchaser, the vendor shall review and comment on the purchaser's piping and foundation drawings.

The vendor shall provide a list of field installation activities that should be witnessed by the vendor's representative. Factory representatives shall be present to assist the Contractor during initial installation (including the piping checks specified below) and initial start-up. An outline of initial start-up procedures shall be prepared by the vendor and shall be agreed upon by all parties involved prior to operation commencing.

6.1.11 Add to this clause:

The following shall also apply:

- a) All left-handed threads shall be clearly marked.
- b) Any maintenance item with a mass more than 20 kg (44 lb) shall be provided with lifting lugs or similar dedicated fixed lifting point(s). Screw-in eyebolts are only acceptable for bearing housing covers and for internal components where other lifting arrangements are impractical. Holes for eyebolts shall be permanently marked with the correct bolt size to be used. If this marking is impractical, bolt size information should be clearly indicated in the instruction manual.

6.1.15 Add to this clause:

The following shall also apply:

- a) The Contractor shall comply with PTS 31.10.00.31 and thereby communicate to the vendor the specified equipment noise limitations by using data sheet PTS 31.10.00.94, which forms part of the requisition.
- b) The vendor shall assure this noise limits are specified to all sub-suppliers.
- c) The vendor shall submit expected sound power levels and sound pressure levels of the equipment, together with any other relevant information as requested in the data sheet, PTS 31.10.00.94 with the tender.
- d) The vendor shall indicate what special silencing measures, if any, are proposed in order to meet the specified levels. If noise enclosures are supplied, the full access to the

equipment for maintenance purposes shall be ensured by means of an appropriate design.

6.1.16 Add to this clause:

Motors, electrical components and electrical installations shall be in accordance with PTS 33.64.10.10.

6.1.20 Add new clause:

The vendor shall state in the proposal that the offered design details and materials have been used on new turbines for a minimum of 5 years or have acquired at least 16,000 h of successful operation. Any component not meeting these requirements shall be listed as an exception. Although continuous advancements and improvements by the manufacturer in his product line are recognized, these changes are subject to the Principal's approval. At the discretion of the Principal, alternative designs may be requested if the manufacturer fails to provide evidence of proven reliability.

The vendor shall also confirm that at least two units of similar rating and mechanical design have been produced at the vendor's proposed manufacturing plant.

6.1.21 Add new clause:

In the event of any design or manufacturing error, faulty material or damage relating to any turbine part, the component in question shall be replaced unless otherwise agreed by the Principal.

Any proposal to recover the component rather than replace it, and the method of repair, shall be submitted to the Principal to obtain approval. Additional tests or calculations may be required to prove (a) the effectiveness of the repair, and (b) that there will be no detrimental effect on the serviceability of the component.

At the discretion of the Principal a temporary repair or recovery may be accepted subject to a later replacement of the complete component or assembly by the vendor.

6.2 NAMEPLATES AND ROTATION ARROWS

6.2.4 Add to this clause:

m) Year of manufacture

6.2.6 Replace this clause with:

Nameplates shall be in the English language. Data units shall be same as shown on approved datasheets

7. CASINGS

7.1 PRESSURE CASING

7.1.3 Add to this clause:

The temperature corresponding to the maximum allowable working pressure of 0.7 bar (ga) (10 psig) shall be at least 150 °C (300 °F).

7.1.5 Add to this clause:

If possible, vertical joints in the turbine casing shall be discontinuous at the horizontal split to avoid a four-cornered joint.

7.1.6 Add to this clause:

The design details of the high-pressure joints shall be submitted for reviewed by the Principle for turbines with inlet pressures 40 bar (ga) (580 psig) or higher.

The vendor shall demonstrate by engineering calculation and by experience that the high-pressure joint design will not leak at the highest design steam pressures and temperatures. The calculations shall include, as a minimum, joint contact pressure and bolt tensions.

All high-pressure steam joints shall be hydraulic tensioned. The vendor shall provide the necessary tool for tensioning these joints. Designs requiring re-torquing joint bolting while hot are not acceptable as a means of achieving a tight joint.

7.1.10 Add to this clause:

Eyebolt to lift the upper casing shall not be used or provided.

7.1.13 Add to this clause:

There shall be no tapped openings in the pressure casing unless approved by the Principal.

7.1.15 f) Add to this clause:

The main casing joint and the main turbine nozzles shall be designed so the studs and nuts can be tensioned by an approved hydraulic tensioning method. There shall be sufficient access around the bolting to facilitate the use of the hydraulic tooling.

7.1.19 Add new clause:

The residual Gaussian magnetic flux density in fabricated steel casings and steel castings that have been weld repaired shall be not greater than 10 Gs.

7.1.20 Add new clause:

If casing expansion keys and slide surfaces are used, the vendor shall provide a suitable material combination which prevents sticking during transient and normal operating conditions.

7.2 CASING CONNECTIONS

7.2.3 Replace this clause with:

Casing openings for piping connections shall be at least DN 20 (NPS 3/4) and shall be flanged or machined and studded. There shall be no threaded openings in the casing unless approved by the Principal.

Piping connections to the casing DN 25 (NPS 1) and large shall be full penetration butt weld connections, not socket weld connections. Openings of less than DN 25 (NPS 1) may be reinforced boss connections of the "weldolet" type, using only full penetration butt welds

7.2.7 a) Replace this clause with:

Cast iron flanges shall not be used.