

Gas Turbine

Specification

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

"This Standard is exclusive property of Petróleo Brasileiro S. A. - PETROBRAS, internal application and PETROBRAS Subsidiaries and shall be used by its suppliers of goods and services under contracts or similar under the conditions established in Bidding, Contract, Agreement or similar.

The use of this Standard by other companies / organizations / government agencies and individuals is the sole responsibility of the users."

CONTEC

Comissão de Normalização
Técnica

SC - 11

Machines

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard [N-1](#). For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 11/2014) of PETROBRAS N-2922 12/2014. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used. This Standard is based on API [STD 616:2011](#) (Fifth Edition).

1 Scope

1.1 This Standard establishes the minimum conditions required for gas turbine and their auxiliary systems for refinery services, power generation plants, oil & gas production plants, compression and pumping stations and the like, to be supplied in accordance with API [STD 616:2011](#), Fifth Edition.

1.2 Gas turbine shall be in accordance with API [STD 616:2011](#), Fifth Edition, plus the following changes, as noted in parenthesis for each clause, according to the definitions stated below. The information of each clause shall be read as follows, whenever starting with:

- a) addition - continuation of that particular API [STD 616:2011](#) paragraph;
- b) modification - replacement of part of that affected API [STD 616:2011](#) paragraph;
- c) substitution - replacement of that API [STD 616:2011](#) paragraph in its entirety;
- d) new - insertion of a requirement not found in API [STD 616:2011](#);
- e) exclusion - removal of that particular API [STD 616:2011](#) paragraph.

1.3 Except for new items, item numbers referred in parentheses in this Standard are the same API [STD 616:2011](#), Fifth Edition paragraph ones.

1.4 PETROBRAS considers all items of API [STD 616:2011](#), other than those mentioned herein, as valid to this PETROBRAS Standard.

1.5 This Standard applies to design starting from its issue date.

1.6 This Standard contains only Technical Requirements.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

CONAMA [436/2011](#) - Estabelece os limites máximos de emissão de poluentes atmosféricos para fontes fixas instaladas ou com pedido de licença de instalação anteriores a 02 de janeiro de 2007;

[NR-15](#) - Atividades e Operações Insalubres.

IEC [60034-1](#) - Rotating Electrical Machines – Part 1: Rating and Performance;

IEC [60079-29-1](#) - Explosive Atmospheres – Part 29-1: Gas Detectors – Performance Requirements of Detectors for Flammable Gases;

IEC [60079-29-2](#) - Explosive Atmospheres – Part 29-2: Gas Detectors – Selection, Installation, Use and Maintenance of Detectors for Flammable Gases and Oxygen;

IEC [61892-3](#) – Mobile and Fixed Offshore Units - Electrical Installations Part 3: Equipment;

ISO 7-1 - Pipe Threads Where Pressure-Tight Joints Are Made on the Threads - Part 1: Dimensions, Tolerances and Designation;

ISO 6183 - Fire Protection Equipment - Carbon Dioxide Extinguishing Systems for Use on Premises - Design and Installation;

ISO 7919-4 - Mechanical Vibration - Evaluation of Machine Vibration by Measurements on Rotating Shafts - Part 4: Gas Turbine Sets With Fluid-Film Bearings;

ISO 10438 - Petroleum, Petrochemical and Natural Gas Industries - Lubrication, Shaft-Sealing and Control-Oil Systems and Auxiliaries - Parts 1, 2, 3 and 4;

ISO 10441 - Petroleum, Petrochemical and Natural Gas Industries - Flexible Couplings for Mechanical Power Transmission - Special-Purpose Applications;

ISO 10816-4 - Mechanical Vibration - Evaluation of Machine Vibration by Measurements on Non-Rotating Parts - Part 4: Gas Turbine Sets With Fluid-Film Bearings;

ISO 11342 - Mechanical Vibration - Methods and Criteria for the Mechanical Balancing of Flexible Rotors;

ISO TR 13387-7 - Fire Safety Engineering - Part 7: Detection, Activation and Suppression;

ISO 14520 - Gaseous Fire-Extinguishing Systems - Physical Properties and System Design;

API STD 541 - Form-Wound Squirrel-Cage Induction Motors - 500 Horsepower and Larger;

API STD 546 - Brushless Synchronous Machines - 500 kVA and Larger;

API STD 613 - Special Purpose Gear Units for Petroleum, Chemical, and Gas Industry Services;

API STD 614 - Lubrication, Shaft-sealing and Oil-Control Systems and Auxiliaries;

API STD 616:2011 - Gas Turbines for the Petroleum, Chemical, and Gas Industry Services;

API STD 670 - Machinery Protection Systems;

API STD 671 - Special-Purpose Couplings for Petroleum, Chemical, and Gas Industry Services;

ASTM B841 – Standard Specification for Electrodeposited Coatings of Zinc Nickel Alloy Deposits;

ASTM B849 – Standard Specification for Pre-Treatments of Iron or Steel for Reducing Risk of Hydrogen Embrittlement;

ASTM B850 – Standard Guide for Post-Coating Treatments of Steel for Reducing Risk of Hydrogen Embrittlement;

ASTM D1655 - Standard Specification for Aviation Turbine Fuels;

ASTM D2880 - Standard Specification for Gas Turbine Fuel Oils;

BSI BS EN 779 – Particulate Air Filters for General Ventilation - Determination of the Filtration Performance;

BSI BS EN 13779 – Ventilation for Non-Residential Buildings - Performance Requirements for Ventilation and Room-Conditioning Systems;

NFPA 12 - Standard on Carbon Dioxide Extinguishing Systems;

NFPA [72](#) - National Fire Alarm and Signaling Code;

NFPA [750](#) - Standard on Water Mist Fire Protection Systems;

NFPA [2001](#) – Standard on Clean Agent Fire Extinguishing Systems;

NRC NEC CHANGES - National Energy Code of Canada for Building.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Terms and Definitions (Section 3 of API [STD 616:2011](#))

For the purposes of this document, the following terms and definitions apply.

3.1 New (3.66 of API [STD 616:2011](#))

FPU

Floating Production Unit

3.2 New (3.67 of API [STD 616:2011](#))

certified point

point specified by purchaser at which the vendor certifies that the power and heat rate are within the tolerances stated in this standard. (see 4.2 of this Standard)

3.3 New (3.68 of API [STD 616:2011](#))

string test

complete unit test combined with the performance test

4 Basic Design

4.1 Modification (4.1.3 of API [STD 616:2011](#))

The purchaser shall specify the equipment's operating points on the datasheet (see 3.31 of API [STD 616:2011](#) and Annex A of this standard).

4.2 Modification (4.1.3.1 of API [STD 616:2011](#))

The gas turbine vendor shall guarantee turbine power (with no negative tolerance) at certified point condition as shown on the datasheet with a 3 % tolerance on the heat rate (lower heating value).

4.3 Modification (4.1.7 of API [STD 616:2011](#))

The gas turbine design shall accommodate transient thermal gradients following trip-outs and shall permit immediate restarting subject to the driven equipment restrictions. Gas turbine cold-start and hot-start restrictions shall be defined in the proposal. Any hot-start restriction shall be avoided through the use of an automatic turning gear device as described in item 4.17 (5.1.3.1 of API [STD 616:2011](#)) of this standard.

4.4 Addition (4.1.21 of API STD 616:2011)

If the site rated conditions (see 3.52 of API STD 616:2011) are not specified by contractor, vendor shall consider site maximum temperature, site minimum barometric pressure and site minimum relative humidity.

4.5 Modification (4.5.3.4 of API STD 616:2011)

Vendor shall include with the proposal the Campbell and Goodman diagrams for the blading backed demonstrating their adequacy to the project. The vendor shall indicate on the Goodman diagrams the standard acceptance margins.

4.6 Addition (4.6.1 of API STD 616:2011)

NOTE Vendor shall include with tender documents a complete sealing system description and material specifications for purchaser review.

4.7 Addition (4.7.2.3 of API STD 616:2011)

NOTE Vendor shall include with tender documents the Critical speed-support stiffness map.

4.8 Substitution (4.7.2.6 of API STD 616:2011)

In case of machine trains with rigid couplings, the vendor shall submit a train lateral analysis as per contract. This document shall be approved by the purchaser before the functional tests.

4.9 Acceptance Criteria - Substitution (4.7.5.2.1 of API STD 616:2011)

Acceptance criteria, for both new and overhauled machines, are based on shaft vibration, bearing housing vibration and on casing vibration. These criteria shall be applied during all the factory acceptance tests (e.g.: mechanical running test, performance test, complete unit test). During steady state operation, operating at its maximum continuous speed or at any other speed within the specified operating speed range (see 4.1.5 of API STD 616:2011), the vibration shall not exceed the following values:

a) shaft relative vibration is as follows: $A_{(\rho - \rho)}$ for Zone A in ISO 7919-4:

— in SI units: $A_{(\rho - \rho)} = 4800 / \sqrt{N} \mu m$ (10a)

— in USC units: $A_{(\rho - \rho)} = 190 / \sqrt{N} mils$ (10b)

— or 50 % of the manufacturer's published alarm set point value, whichever is lower, where:

$A_{(\rho - \rho)}$ is the magnitude of unfiltered vibration, μm (mils) peak-to-peak;

N is the maximum continuous operating speed, in revolutions per minute.

b) bearing housing or casing vibration for Zone A in ISO 10816-4 is 4,5 mm/s (0,18 in/s) RMS, broadband, or 50% of the manufacturer's published alarm set point value, whichever is lower;

c) during all the factory acceptance tests (e.g.: mechanical running test, performance test, complete unit test) for aircraft derivative gas generator/gas turbine, at any steady state speed within the operational range, the amplitude of vibration (measured at the manufacturer's standard sensor locations) shall not exceed 50 % of the manufacturer's published alarm set point value. This limit shall be based on filtered or unfiltered vibration data as per published in the project and shall be verified during the factory tests.

4.10 Modification (4.7.5.2.2 of API STD 616:2011)

At any speed greater than the maximum continuous speed, up to and including the trip speed of the driver, the vibration magnitude shall not increase more than 12,7 μm (0,5 mil) for shaft relative vibration and 1,5 mm/s (0,06 in/s) for bearing housing or casing vibration above the maximum value recorded at the maximum continuous speed.

NOTE These limits must not to be confused with the limits specified in 4.7.2.15 of API STD 616:2011 for shop verification of unbalanced response.

4.11 New (4.7.5.2.6 of API STD 616:2011)

At any speed, nonsynchronous filtered vibration shall not exceed 20 % of the synchronous vibration magnitude.

4.12 Acceptance Limits During Commissioning - Modification (4.7.5.3.1 of API STD 616:2011)

Acceptance criteria are based on shaft relative vibration, bearing housing vibration and on casing vibration as specified by the vendor. The limits shall apply to vibration measurements under steady-state operating conditions at operational speeds.

a) shaft relative vibration:

$$\text{— in SI units: } A_{(\rho - \rho)} = 7000 / \sqrt{N} \mu\text{m} \quad (11a)$$

$$\text{— in USC units: } A_{(\rho - \rho)} = 275 / \sqrt{N} \text{mils} \quad (11b)$$

— or 70 % of the manufacturer's published alarm set point value, whichever is lower, Where:

$A_{(\rho - \rho)}$ is the magnitude of unfiltered vibration, μm peak-to-peak;

N is the maximum continuous speed in revolutions per minute.

- b) bearing housing or casing vibration: 6,5 mm/s (0,25 in/s) RMS, broadband or 70 % of the manufacturer's published alarm set point value, whichever is lower. The RMS measurement is broadband vibration over a frequency range from 10 Hz to at least 500 Hz or six times the maximum normal operating speed, whichever is greater.
- c) during field acceptance tests for aircraft derivative gas generator/gas turbine, at any steady state speed within the specified operating range, the amplitude of vibration (measured at the manufacturer's standard sensor locations) shall not exceed 70 % of the manufacturer's published alarm set point value.

4.13 New (4.7.5.4 of API STD 616:2011)

The vibration limits at factory and commissioning test during transient operation (start up or coast down), measured on shaft, bearing housing or casing, shall not exceed two times the limits for steady state operation, as specified in items 4.9 and 4.12 of this Standard.

4.14 Modification (4.10.1.2 of API STD 616:2011)

The materials of construction of all major components shall be clearly stated in the vendor's proposal. Materials shall be identified by reference to applicable international standards, including the material grade. When no such designation is available, the vendor's material specification, giving material properties, chemical composition, and test requirements, shall be included in the proposal. Any component and coating material which does not have at least 16 000 hours total experience (of which 8 000 hours shall be continuous in one machine) at the same component shall be identified in the proposal, including a reference list.

4.15 Addition (4.10.1.5 of API STD 616:2011)

For saline environments, bolts, nuts and other minor non painted carbon steel components shall be coated with Zinc-Nickel according to ASTM B841, class 1, type B/E, grade 5 to 8, with stress and hydrogen relief treatment, according to ASTM B849 and ASTM B850. Alternatives may be offered and shall be agreed between purchaser and vendor.

4.16 Modification (4.10.2.3.3 of API STD 616:2011)

All repairs shall be approved by the purchaser.

4.17 Modification (5.1.3.1 of API STD 616:2011)

A turning gear device shall be furnished, if required to avoid rotor deformation after a trip-out. The turning gear operation shall be with automatic engagement/disengagement.

The gas turbine shall be able to restart at any time after an indeterminate period of time without external AC power supply. Purchaser will not guarantee any facility during time without AC power.

4.18 Modification (5.3.1.2.9 of API STD 616:2011)

Anchor bolts shall be furnished by the vendor, unless otherwise specified.

4.19 Modification (5.4.1.1 of API STD 616:2011)

Instrumentation and installation shall conform to the requirements of purchaser's specifications, API STD 614 and ISO 10438.

4.20 Modification (5.4.1.8 of API STD 616:2011)

The control system shall be microprocessor based. The degree of redundancy shall be indicated in the data sheet.

4.21 Modification (5.4.4.7 of API STD 616:2011)

Instrumentation, control devices, and annunciation display units shall be furnished, mounted and configured by the vendor.

4.22 Substitution (5.6.1.1 of API STD 616:2011)

The gas turbine air intake system shall have at least the following components:

- inlet air filters;
- inlet silencer section;
- inlet plenum chamber;
- expansion joints;
- inlet ducting and interconnections;
- inlet instrumentation and related connection facilities;
- inlet electrical equipment and related connection facilities;
- access facilities including internal and external platforms, doors, walkways and ladders.

The gas turbine exhaust system shall have at least the following components:

- exhaust silencer section;
- exhaust plenum chamber;
- expansion joints;
- exhaust supports and steel work;
- insulation;
- instrumentation and related connection facilities;
- duct work and exhaust stack.

4.23 Substitution (5.6.1.9 of API STD 616:2011)

The purchaser shall specify the air quality as required by 5.6.1.9.1 and 5.6.1.9.2 of API STD 616:2011. In the absence of any required information, both vendor and purchaser shall mutually agree on the presence of the respective contaminants in the gas turbine and gas turbine package design in order to comply with the specified parameters of: performance, operability, reliability, availability, overhaul intervals, maintenance costs, and emissions.

4.24 Modification (5.6.1.10 of API STD 616:2011)

The complete air filtration system, including the filter house, shall be supplied in unpainted 316L stainless steel. All welds and stiffeners shall be continuous to avoid crevice corrosion.

NOTA 1 Where there would be contact of stainless steel and hot dip galvanized steel or carbon steel, shall be provided protection to avoid galvanic corrosion.

NOTA 2 The house for mounting to the FPU structure shall be furnished with supporting points.

NOTA 3 All fixing elements (such as bolts, nuts, washers etc) shall be designed such that they not be loosen and fall into the inlet of the gas generator.

4.25 Modification (5.6.1.14 of API STD 616:2011)

A reinforced coarse-mesh 6,4 mm to 12,7 mm (1/4 in. to 1/2 in.) stainless steel screen shall be provided immediately ahead of the gas turbine air inlet. The actual location shall be mutually agreed upon by the vendor and the purchaser, both of whom must consider cleaning systems, access plates, viewing windows, vaned elbows, and aerodynamic disturbance of the bell mouth entrance.

4.26 Addition (5.6.2.1.3 of API STD 616:2011)

A drain system shall be provided to ensure that any water caught within the air intake (upstream and downstream of all filter stages) is immediately removed, preventing the risk of re-entrainment into the airstream. Drains shall be fabricated with flange termination. The drain trap shall not allow unfiltered air ingress, water or another contaminant in any air filter degradation condition.

4.27 Addition (5.6.2.1.4 of API STD 616:2011)

The filter house shall be supplied with relevant instrumentation for proper alarm and shutdown monitoring of differential pressure. Instrumentation and wiring shall be installed per the required codes and specifications, and wired to terminal strips located in junction boxes mounted on the outside of the filter structure. Local differential pressure indicators and transmitters shall be furnished for each filter stage and for the total filter unit. Differential pressure signals shall be indicated at the Gas Turbine control panel.

4.28 Substitution (5.6.2.1.8 of API STD 616:2011)

Implosion door device shall not be used.

4.29 Modification (5.6.2.1.9 of API STD 616:2011)

Unless otherwise specified, the filter house shall be elevated with a minimum 4,6 m (15 ft) elevation from grade to the lowest part of the filter air entrance, but shall be below top of the turbine exhaust stack. If the filter house is elevated, the vendor shall provide lugs for mounting the house to supporting steelwork. The purchaser shall specify if supporting steel work is to be provided by the vendor.

4.30 New (5.6.2.1.12 of API STD 616:2011)

The filter house roof shall be sloped to shed rainwater. Internal lighting shall comply with the area classification.

4.31 Substitution (5.6.2.3 of API STD 616:2011)

High-velocity filter systems shall not be used.

4.32 Substitution (5.6.2.4.1 of API STD 616:2011)

The low-velocity inlet filter system recommended configuration shall consist of four filter stages. The rain protection with the trash screen is considered as zero stage. The four stages consist of inertial separator, coalescer pre-filter, inertial separator and high efficiency filter. Pre-filter and high efficiency filter shall be separated, nested assembling is not acceptable.

4.33 Substitution (5.6.2.4.2 of API STD 616:2011)

The first filter stage consists of inertial separator with horizontal vanes. For saline environments it shall be fabricated in AISI 316L stainless steel.

4.34 Substitution (5.6.2.4.3 of API STD 616:2011)

The second filter stage consist of coalescing pocket type pre-filter, class F5 according to BS EN 779. A holding frame concept made of AISI 316L stainless steel shall be designed to support the coalescing filter elements and shall be equipped with the fixing pieces and the anti-leaks gasket.

4.35 Substitution (5.6.2.4.4 of API STD 616:2011)

The third filter stage consists of inertial separator with vertical vanes - mist eliminator / droplets eliminator / inertial separator, made of AISI 316L stainless steel to remove the potential salt particles and droplet that has been coalesced from the last filter stage. This separator will assure that no humidity (water with salt) go into the last filter stage.

4.36 New (5.6.2.4.5 of API STD 616:2011)

The fourth filter stage consists of a high efficiency filter, class F9 according to BSI BS EN 779/ BSI BS EN 13779, based on pleated media in a rigid plastic molded type V-CELL. Filter media shall be made of micro fiber glass, moisture resistance up to 100% RH. A holding frame shall be made of AISI 316L stainless steel, each frame shall be equipped with the fixing pieces and the anti-leaks gasket.

4.37 New (5.6.2.4.6 of API STD 616:2011)

The minimum distance between the first stage (inertial separator with horizontal vanes) and the second filter stage (coalescing pocket type pre-filter) shall be at least 700 mm.

4.38 New (5.6.2.4.7 of API STD 616:2011)

With the four stages air filter configuration shall have two the inspection doors. One door between the first and the second filter stage and the second door between the third and fourth filter stage. The doors shall be made of AISI 316L stainless steel and equipped with specific locks and hinges for Gas Turbine Filter Units.

4.39 Modification (5.7.1.1 of API STD 616:2011)

Insulation for personnel protection shall be provided by the vendor. Turbine casings normally accessible during operation shall be insulated and jacketed or provided with suitable lagging or guards so that no exposed surface in a personnel access area exceeds a temperature of 60 °C (140 °F). Jackets and insulation shall be designed so that routine maintenance may take place without damage being done to the insulation.

4.40 New (5.7.5.7 of API STD 616:2011)

Guard rails shall be provided for routine maintenance and inspection on the upper part of the enclosure roof.

4.41 Modification (5.8.1.3.2 of API STD 616:2011)

Gas distribution piping shall be 316L stainless steel, full penetration butt welded and hydrotested.

4.42 Modification [5.8.4.2 b) of API STD 616:2011]

b) For those cases in which deviation in manufacturer's fuel specification can not be avoided, the manufacturer shall advise the consequences with regards to turbine life and performance degradation.

4.43 Exclusion (6.1.5.3 of API STD 616:2011)

Removed from API STD 616:2011.

4.44 Modification (6.1.7 of API STD 616:2011)

The purchaser's representative shall have access to the vendor's quality program for information. The inspection and test plan shall be submitted for approval by the purchaser.

4.45 New (6.1.8 of API STD 616:2011)

The purchaser's representative shall have access to the manufacturer's applicable procedures during the inspection activities.

4.46 Exclusion (6.3.1.2 of API STD 616:2011)

Removed from API STD 616:2011.

4.47 Exclusion (6.3.1.3 of API STD 616:2011)

Removed from API STD 616:2011.

4.48 Modification (6.3.4.1 of API STD 616:2011)

This test may be run at a no-load condition, especially in case of a single shaft turbine. The purpose of the test is to confirm the mechanical integrity and verify that the vibration acceptance criteria of the equipment are met. The requirements of 6.3.4.1.1 through 6.3.4.1.12 of API STD 616:2011 shall be met before the mechanical running test is performed.

NOTE 1 This test can be combined with the performance test (see 6.3.5.1 of API STD 616:2011) for a full load mechanical running test.

NOTE 2 In case of industrial power turbine integrated with aeroderivative gas generator, the power turbine may be submitted to sole spin test.

4.49 Modification (6.3.4.1.2 of API STD 616:2011)

All oil pressures, viscosities, and temperatures shall be within the range of operating values recommended in the manufacturer's operating instructions for the specific unit being tested. During the test, the gas turbine shall run during the time required to evaluate the dynamic response in the following lube oil system conditions: minimum pressure / minimum temperature, maximum pressure / minimum temperature, minimum pressure / maximum temperature and maximum pressure / maximum temperature. For pressure lubricating systems, oil flow rates for each bearing housing through the entire operational speed range of gas turbine train shall be measured.

4.50 Modification (6.3.4.1.6 of API STD 616:2011)

If specified, auxiliary systems mounted on the gas turbine main base shall be tested with the gas turbine during the mechanical run. These auxiliary systems may include but are not limited to the job oil system(s), fuel system(s), starting and cool-down drive systems, and auxiliary gear box. The purchaser shall specify which systems shall be included in the test.

NOTE Job fuel nozzles (gas and liquid) shall be tested with the gas turbine during the mechanical run.

4.51 Modification (6.3.4.3.4 of API STD 616:2011)

Synchronous vibration amplitude and phase angle vs speed for deceleration measured before and after the 4-hour run shall be presented. Both the filtered (one per revolution) and the unfiltered vibration magnitudes trends shall be presented. These data shall also be presented in polar form. The speed range covered by these plots shall be 400 revolutions per minute to the specified driver trip speed. All vibration data shall be included in the test report.

4.52 Addition (6.3.4.3.6 of API STD 616:2011)

When the vendor does not have a compatible software with the systems used by PETROBRAS, shall provide a software to read the vibration data provided.

4.53 Substitution (6.3.5.2 of API STD 616:2011)

The basic scope of the Unit String Test shall include the following requirements:

- to verify the power output and heat rate at certified point;
- to demonstrate the mechanical integrity of the package;
- to demonstrate the suitability and operation of the auxiliary systems: lube oil, starting and fuel;
- to demonstrate the ability of the Unit Control Panel to perform start sequence, monitoring and fuel control function;
- to demonstrate the capability of loading and unloading the electric generator, protection, controls etc.

- voltage and frequency regulation test at steady-state and by loading and unloading the generator with the highest allowable step of the rated load (IEC 61892-3);
- complete borescopic inspection of the gas turbine after the test.

The following contract equipment shall be used in the String Test:

- gas generator and power turbine;
- gas fuel and/or liquid fuel skid;
- starting system;
- unit Control Panel including Generator excitation and protection;
- gearbox;
- electric generator;
- Inlet filter;
- exhaust system.

NOTE 1 The String Test shall be preferably performed at factory, unless otherwise specified by the purchaser.

NOTE 2 The test shall be performed by using natural gas or liquid fuel. In the proposal, the vendor shall inform the proposed fuel.

NOTE 3 Contract electric generator, inlet filter and exhaust systems shall be used, unless otherwise specified.

NOTE 4 The test may combine the mechanical running test and performance test and may substitute those separate tests, if agreed by purchaser.

4.54 Modification (6.3.5.5 of API STD 616:2011)

The vendor shall perform an overspeed test of the rotor at 120 % of rated speed for 2 minutes to demonstrate the mechanical integrity and vibration behavior of the rotor.

4.55 Addition (6.3.5.9 of API STD 616:2011)

NOTE This paragraph is mandatory and not a bullet.

4.56 Modification (6.4.1 of API STD 616:2011)

The gas turbine units shall be suitably prepared for the type of shipment specified, including blocking of the rotors when necessary. Blocked rotors shall be identified by corrosion resistant tags externally attached with stainless steel wire. The preparation shall make the equipment suitable for twelve months of outdoor storage (under the conditions specified in 4.1.19 of API STD 616:2011) from the time of shipment, with no disassembly required before operation except for inspection of bearings and seals. If storage for a longer period is contemplated, the purchaser shall consult with the vendor regarding the recommended procedures to be followed. Any gas turbine component accessory, or instrument not suitable for the extremes of temperature that can be expected during shipment or storage, shall be identified by the vendor in the proposal.

4.57 Modification [7.2.3 l) and o) of API STD 616:2011]

l) Description of special requirements, as outlined in the purchaser's documentation and in 4.1.4, 4.1.6, 4.1.11, 4.3.2, 4.3.4, 4.5.3.1, 4.9.2, 4.9.5, 4.10.1.1, 4.10.1.3, 5.6.1.4, 5.6.1.16, 5.6.2.1.6, 5.6.2.5.6, 5.6.2.6.2.2, 5.6.2.6.2.4, 5.7.5.3, 5.8.7.4.2, 5.8.6, 6.1.3, 6.3.2 of API STD 616:2011, beside the itens 4.1, 4.14, 4.56 of this standard and any other paragraph in the purchaser's documentation.


o) Vibration limits per 4.9 and 4.12 of this standard.

5 Annex


Annex A - Data Sheet of Gas Turbine.

[illegible]

<div><div><div>BR</div><div>PETROBRAS</div></div></div>		DATA SHEET		No.	REV.
TITLE: <div>GAS TURBINE</div>				SHEET of	
<div><div>1</div><div>APPLICABLE TO:</div><div><div><input type="radio"/> PROPOSAL</div><div><input type="radio"/> PURCHASE</div><div><input type="radio"/> AS-BUILT</div></div></div>					
<div><div>2</div><div>FOR</div><div></div><div>UNIT</div><div></div></div>					
<div><div>3</div><div>SITE</div><div></div><div>SERIAL NUMBER</div><div></div></div>					
<div><div>4</div><div>SERVICE</div><div></div><div>NUMBER REQUIRED</div><div></div></div>					
<div><div>5</div><div><div><input type="radio"/> CONTINUOUS</div><div><input type="radio"/> INTERMITTENT</div><div><input type="radio"/> STANDBY</div></div><div>DRIVEN EQUIPMENT</div><div></div></div>					
<div><div>6</div><div>MANUFACTURER</div><div></div><div>MODEL</div><div></div><div>ISO RATING (3.21 API 6E)</div><div></div><div>kW @</div><div></div><div>r/min</div></div>					
<div><div>7</div><div>NOTE: INFORMATION TO BE COMPLETED:</div><div><div><input type="radio"/> BY PURCHASER</div><div><input type="checkbox"/> BY MANUFACTURER</div><div><input checked="" type="checkbox"/> BY MFR IF NOT BY PURCHASER</div></div></div>					
GENERAL					
<div><div>9</div><div>CYCLE:</div><div><div><input type="radio"/> REGEN</div><div><input type="radio"/> SIMPLE</div><div><input type="radio"/> EXHAUST HEAT RECOVERY TYPE:</div><div></div><div><input checked="" type="checkbox"/> SINGLE SHAFT</div><div><input type="checkbox"/> MULTISHAFT</div></div></div>					
<div><div>10</div><div>DRIVEN EQUIPMENT POWER: NORMAL SHAFT</div><div></div><div>kW</div><div>@</div><div></div><div>r/min</div><div>RATED SHAFT</div><div></div><div>kW</div><div>@</div><div></div><div>r/min</div></div>					
<div><div>11</div><div>GAS TURBINE DRIVER OUTPUT SHAFT SPEED RANGE (4.15 API 6E)</div><div><div><input type="radio"/> MIN</div><div></div><div>r/min</div><div><input type="radio"/> MAX</div><div></div><div>r/min</div></div></div>					
<div><div>12</div><div><input type="radio"/> DESIRED MINIMUM SITE POWER</div><div></div><div>kW</div><div>r/min</div><div><input type="radio"/></div></div>					
<div><div>13</div><div>OPERATION</div><div><div><input type="radio"/> ATTENDED</div><div><input type="radio"/> UNATTENDED</div></div><div><input type="checkbox"/> POTENTIAL MAXIMUM POWER (3.41 API 6E)</div><div></div><div>kW</div></div>					
<div><div>14</div><div>NOTE:</div><div>All Datasheets References to GT = Gas Turbine, GG = Gas Generator, SS = Single Shaft, and PT = Power Turbine</div></div>					
PERFORMANCE			LOCATION (4.19 API 6E)		
GAS TURBINE INCLUDING ALL LOSSES			<div><div><input type="radio"/> INDOOR</div><div><input type="radio"/> OUTDOOR</div><div><input type="radio"/> GRADE</div><div><input type="radio"/> WHITOUT ROOF</div></div>		
<div><div>17</div><div><input type="radio"/> INLET LOSS</div><div></div><div>mm H₂O</div><div>EXHAUST LOSS</div><div></div><div>mm H₂O</div></div>			<div><div><input type="radio"/> HEATED</div><div><input type="radio"/> UNDER ROOF</div><div><input type="radio"/> MEZZANINE</div></div>		
<div><div>18</div><div><input type="radio"/> INLET AIR CHILLER DESIGN RATING</div></div>			<div><div><input type="radio"/> UNHEATED</div><div><input type="radio"/> PARTIAL SIDES</div><div><input type="radio"/> OTHER</div><div></div></div>		
<div><div>19</div><div></div><div>SITE</div><div>NORMAL</div><div>SITE</div><div>SITE</div></div>			<div><div><input type="radio"/> AMBIENT TEMPERATURE RANGE (°C) (5.12.1 API 6E)</div></div>		
<div><div>20</div><div></div><div>RATED</div><div>DUTY</div><div>MAX</div><div>MIN</div></div>			<div><div>MINIMUM</div><div></div><div>NORMAL</div><div></div><div>MAXIMUM</div><div></div></div>		
<div><div>21</div><div></div><div>(3.52 API 6E)</div><div>(3.31 API 6E)</div><div>TEMP</div><div>TEMP</div></div>			<div><div><input type="radio"/> EXTREME AMBIENT TEMPERATURES (°C) (5.12.1 API 6E)</div></div>		
<div><div>22</div><div><input type="radio"/> DRY BULB TEMP (AMB)</div><div></div><div>°C</div><div></div><div></div><div></div></div>			<div><div>MINIMUM</div><div></div><div>MAXIMUM</div><div></div></div>		
<div><div>23</div><div><input type="radio"/> TURBINE INLET AIR CHILLED (Y/N)</div><div></div><div></div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> SEISMIC DESIGN ZONE</div><div></div><div></div></div>		
<div><div>24</div><div><input type="radio"/> TURBINE INLET TEMP</div><div></div><div>°C</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> WIND DESIGN VELOCITY m/s</div><div></div><div></div></div>		
<div><div>25</div><div><input type="radio"/> RELATIVE HUMIDITY (AMB)</div><div></div><div>%</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> ELEVATION</div><div></div><div>m</div><div><input type="radio"/> PRECIPITATION</div><div></div><div></div></div>		
<div><div>26</div><div><input type="radio"/> BAROMETRIC PRESS</div><div></div><div>kPa</div><div></div><div></div><div></div></div>			ELECTRICAL AREA CLASSIFICATION (4.14 API 6E)		
<div><div>27</div><div><input type="checkbox"/> GT OUTPUT SHAFT POWER</div><div></div><div>kW</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> UNCLASSIFIED</div><div><input type="radio"/> HAZARDOUS</div></div>		
<div><div>28</div><div><input type="checkbox"/> GG OUTPUT SHAFT SPEED</div><div></div><div>r/min</div><div></div><div></div><div></div></div>			APPLICABLE CODE: (5.4.15.3 API 6E) <div><div><input type="radio"/> NEC ART. 500</div><div><input type="radio"/> NEC ART. 505</div><div><input type="radio"/> IEC</div></div>		
<div><div>29</div><div><input type="checkbox"/> PT OUTPUT SHAFT SPEED</div><div></div><div>r/min</div><div></div><div></div><div></div></div>			ZONE <div></div> GROUP: <div></div> TEMP. CODE: <div></div>		
<div><div>30</div><div><input type="checkbox"/> LHV HEAT RATE</div><div></div><div>kJ/kW-hr</div><div></div><div></div><div></div></div>			AREA CLASSIFICATION <div><input type="radio"/></div>		
<div><div>31</div><div><input type="checkbox"/> LHV EFFICIENCY</div><div></div><div>%</div><div></div><div></div><div></div></div>			AREA CLASSIFICATION ENCLOSURE INTERIOR <div><input type="radio"/></div>		
<div><div>32</div><div><input type="checkbox"/> FIRING TEMPERATURE</div><div></div><div>°C</div><div></div><div></div><div></div></div>			<div><input type="radio"/> THIRD-PARTY CERTIFICATION REQUIRED</div>		
<div><div>33</div><div><input type="checkbox"/> AIR FLOW</div><div></div><div>kg/s</div><div></div><div></div><div></div></div>			<div><input type="radio"/> WINTERIZATION REQD <div><input type="radio"/></div> TROPICALIZATION REQD (5.4.6.6 API 6E)</div>		
<div><div>34</div><div><input type="checkbox"/> GG EXHAUST TEMP</div><div></div><div>°C</div><div></div><div></div><div></div></div>			UNUSUAL CONDITIONS:		
<div><div>35</div><div><input type="checkbox"/> PT EXHAUST FLOW</div><div></div><div>kg/s</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> DUST</div><div><input type="radio"/> FUMES</div><div><input type="radio"/> MARINE ENVIRONMENT</div></div>		
<div><div>36</div><div><input type="checkbox"/> PT EXHAUST TEMP</div><div></div><div>°C</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> NORMAL / MAX DUST LOADING kg/Nm³/hr</div><div></div><div></div></div>		
<div><div>37</div><div><input type="checkbox"/> FUEL FLOW RATE</div><div></div><div>kg/hr</div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> SNOW LOAD kg/m²</div><div></div><div></div></div>		
<div><div>38</div><div><input type="radio"/> CERTIFIED POINT (3.2 PETROBRAS N-2922)</div><div></div><div></div><div></div><div></div><div></div></div>			NOISE LIMIT REQUIREMENTS: (4.10 API 6E and 4.4 PETROBRAS N-2922)		
<div><div>39</div><div>INCLUDING:</div><div><div><input type="radio"/> STEAM</div><div><input type="radio"/> WATER EFFECTS FOR</div></div></div>			<div><div><input type="radio"/> GAS TURBINE ENCLOSURE</div><div></div><div>dB A</div><div><input type="radio"/> PRESSURE</div><div><input type="radio"/> POWER</div></div>		
<div><div>40</div><div><input checked="" type="checkbox"/> EMISSION CONTROL</div><div><input checked="" type="checkbox"/> AUGMENTATION (4.19 API 6E)</div></div>			<div><div><input type="radio"/> INLET SYSTEM</div><div></div><div>dB A</div><div><input type="radio"/> PRESSURE</div><div><input type="radio"/> POWER</div></div>		
<div><div>41</div><div><input type="checkbox"/> STEAM FLOW, kg/hr</div><div></div><div></div><div></div><div></div><div></div></div>			<div><div><input type="radio"/> EXHAUST SYSTEM</div><div></div><div>dB A</div><div><input type="radio"/> PRESSURE</div><div><input type="radio"/> POWER</div></div>		
<div><div>42</div><div><input type="checkbox"/> WATER FLOW, m³/hr</div><div></div><div></div><div></div><div></div><div></div></div>					
APPLICABLE SPECIFICATIONS:					
<div><div>44</div><div><input type="radio"/> API 6E GT FOR THE PETROLEUM, CHEMICAL, & GAS INDUSTRY SERVICES</div></div>					
<div><div>45</div><div><input type="radio"/> GOVERNING SPECIFICATION (IF DIFFERENT)</div><div></div><div></div></div>					
<div><div>46</div><div></div><div></div><div></div><div></div><div></div></div>					
<div><div>47</div><div><input type="radio"/> VENDOR HAVING UNIT RESPONSIBILITY (4.12 API 6E)</div><div></div><div></div></div>					
<div><div>48</div><div><input type="radio"/> OTHER</div><div></div><div></div></div> </					

DATA SHEET		No.	REV.
		SHEET _____ of _____	
		TITLE: GAS TURBINE	
1 FUEL SYSTEM (5.8 API 66)			
2 TYPE <input type="radio"/> GAS (5.8.2 API 66) <input type="radio"/> LIQUID (5.8.3 API 66) <input type="radio"/> DUAL (5.8.5.1 API 66)			
3 DUAL SYSTEM REQMTS (5.8.5.1 API 66) <input type="radio"/> GAS/GAS <input type="radio"/> LIQUID/GAS <input type="radio"/> LIQUID/LIQUID			
4 <input type="radio"/> FUEL GAS COMPRESSION SYSTEM REQ'D [5.8.12.13 c) API 66] <input type="radio"/> MAXIMUM TIME ALLOWED TO COMPLETE TRANSFER _____ seconds			
5			
GAS FUELS (5.8.2 API 66)		GAS FUEL SYSTEM AND COMPONENTS	
7 <input type="radio"/> FUEL ANALYSIS - MOL % (5.8.2.1 API 66)		8 <input type="radio"/> FUEL GAS BYPASS & VENT [5.8.12.13 d) API 66]	
8 COMPOSITION: M.W. NORMAL START-UP ALTERNATE		9 <input type="checkbox"/> MANUAL ISOLATION VALVE MFR (5.8.12.2 API 66) _____	
9 AIR 29 _____		10 <input type="radio"/> SECONDARY VENT VALVE _____	
10 OXYGEN 32 _____		11 <input type="checkbox"/> PRIMARY FAST SHUT OFF MFR (5.8.12.4 API 66) _____	
11 NITROGEN 38 _____		12 <input type="checkbox"/> LEAK TIGHT SHUT OFF MFR (5.8.12.4 API 66) _____	
12 WATER VAPOR 18 _____		13 <input type="checkbox"/> EXTERNAL SHUT OFF VALVE MFR (5.8.12.5 API 66) _____	
13 CARBON MONOXIDE 28 _____		14 <input type="radio"/> DUAL Y-TYPE STRAINERS REQ'D (5.8.12.6.2 API 66)	
14 CARBON DIOXIDE 44 _____		HEATER REQ'D (5.8.2.7 API 66) <input type="checkbox"/> YES <input type="checkbox"/> NO	
15 HYDROGEN 2 _____		<input type="checkbox"/> MANUFACTURER _____	
16 METHANE 16 _____		<input type="checkbox"/> REQ'D FUEL TEMP ABOVE DEWPOINT _____	
17 ETHYLENE 26 _____		<input type="radio"/> COALESCING FILTER (5.8.2.3 API 66)	
18 ETHANE 30 _____		<input type="checkbox"/> MANUFACTURER _____	
19 PROPYLENE 42 _____		<input type="radio"/> RATE OF CHANGE OF LHV (5.8.2.4.2 API 66) _____	
20 PROPANE 44 _____		FUEL ANALYZER EQUIPMENT:	
21 I-BUTANE 58 _____		<input type="radio"/> CALORIMETER	
22 N-BUTANE 58 _____		<input type="radio"/> GAS CHROMATOGRAPH	
23 I-PENTANE 72 _____		<input type="radio"/> WOBBE METER	
24 N-PENTANE 72 _____		<input type="radio"/> SUPPLY FILTRATION (5.8.12.6 API 66) _____	
25 HEXANE PLUS _____		_____	
26 _____		_____	
27 TOTAL % 100.00 100.00 100.00		_____	
28		_____	
29 AVG. MOL. WT. _____		_____	
30 HC DEWPT °C @ kPa _____		PIPING, TUBING & DESIGN DETAILS	
31 <input type="radio"/> LHV (5.8.2.4.1) BTU/SCF _____		<input type="radio"/> PRESENCE OF HYDROGEN SULFIDE _____	
32 <input type="checkbox"/> REQ'D FUEL TEMP °C _____		<input type="radio"/> NACE MATERIAL STANDARDS (4.10.19 API 66) _____	
33 <input type="checkbox"/> WOBBE INDEX REQ'D Kcal/Nm³ _____		<input type="radio"/> ANSI FLANGE RATING _____	
34 <input type="checkbox"/> FUEL PRESSURE REQ'D kPag _____		<input type="radio"/> PIPING / TUBING GRADE _____	
35		<input type="radio"/> TUBE FITTING MANUFACTURER _____	
36		<input type="radio"/> MAXIMUM VENT BACKPRESSURE (5.8.12.8 API 66) _____ kPag	
37 CONTAMINANTS (5.8.2.2.1 API 66)		_____	
38 <input type="radio"/> TAR PPM _____		_____	
39 <input type="radio"/> CARBON BLACK PPM _____		_____	
40 <input type="radio"/> COKE PPM _____		"SHIP LOOSE" FUEL GAS SYSTEM COMPONENTS	
41 <input type="radio"/> SOLIDS PPM _____		<input type="checkbox"/> Y-TYPE STRAINERS _____	
42 <input type="radio"/> NAPHTHALENE PPM _____		<input type="checkbox"/> DUPLEX FUEL GAS FILTERS _____	
43 <input type="radio"/> GAS HYDRATES PPM _____		<input type="checkbox"/> PIPING _____	
44 <input type="radio"/> _____ PPM _____		<input type="checkbox"/> HEATERS _____	
45 CORROSIVE AGENTS (5.8.2.3.1 API 66)		<input type="checkbox"/> GAS ANALYSIS EQUIPMENT _____	
46 <input type="radio"/> HYD. SULPHIDE PPM _____		REMARKS: _____	
47 <input type="radio"/> SULPHUR DIOXIDE PPM _____		_____	
48 <input type="radio"/> SULPHUR TRIOXIDE PPM _____		_____	
49 <input type="radio"/> TOTAL SULPHUR PPM _____		_____	
50 <input type="radio"/> ALKALI METALS PPM _____		_____	
51 <input type="radio"/> CHLORIDES PPM _____		_____	
52 <input type="radio"/> _____ PPM _____		_____	
53		_____	
NOTES: _____			

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DATA SHEET		No.	REV.
		SHEET of	
TITLE			
GAS TURBINE			
1 FUEL SYSTEM (5.8 API66)			
2 TYPE <input type="radio"/> GAS (5.8.2 API66) <input type="radio"/> LIQUID (5.8.3 API66) <input type="radio"/> DUAL (5.8.5.1 API66)			
3 DUAL SYSTEM REQMTS (5.8.5.1 API66) <input type="radio"/> GAS/GAS <input type="radio"/> GAS/LIQUID <input type="radio"/> LIQUID/LIQUID			
4 <input type="radio"/> MAXIMUM TIME ALLOWED TO COMPLETE TRANSFER _____ seconds			
5			
LIQUID FUEL SYSTEM (5.8.3 API66)		LIQUID FUELS (5.8.4 API66)	
7 FUEL GRADES (5.8.4.3 API66):		LIQUID FUEL TREATMENT REQUIRED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
8 <input type="radio"/> ASTM D2880 GRADE (5.8.4.3.1 API66)		TREATMENT SYSTEM BY <input type="radio"/> VENDOR <input type="radio"/> OTHER _____	
9 <input type="radio"/> GRADE 0-GT _____		HEATER REQUIRED (5.8.3.14 API66) <input type="checkbox"/> YES <input type="checkbox"/> NO	
10 <input type="radio"/> GRADE 1-GT _____		<input type="checkbox"/> LIQUID FUEL PRESS REQUIRED, MAX/MIN, kPag _____	
11 <input type="radio"/> GRADE 2-GT _____		<input type="checkbox"/> FUEL ANALYSIS DATA (5.8.4.3 API66):	
12 <input type="radio"/> GRADE 3-GT _____		PROPERTY ASTH METHOD <input type="radio"/> MEASURED VALUE	
13 <input type="radio"/> GRADE 4-GT _____		VISCOSITY, cSt @ 38°C D-445 <input type="radio"/> _____	
14 <input type="radio"/> ASTM D1555 (5.8.4.3.2 API66) _____		DISTILLATION DATA D-86 _____	
15 <input type="radio"/> JET A OR JET A-1 _____		10% / 50% / 90% RECOVERY, °C MAX <input type="radio"/> _____	
16 <input type="radio"/> JET B _____		END POINT, °C MAX <input type="radio"/> _____	
17 <input type="radio"/> OTHER, INDICATE ANALYSIS (5.8.4.3.3 API66) _____		SULFUR CONTENT %WEIGHT, MAX. (SELECT APPL. METHOD)	
18 _____		BOMB METHOD D-29 <input type="radio"/> _____	
19 _____		LAMP METHOD D-1266 <input type="radio"/> _____	
20 <input type="checkbox"/> ISOLATION VALVE LOCATION (5.8.3.2 API66) _____		HIGH-TEMP METHOD D-1552 <input type="radio"/> _____	
21 _____		CARBON RESIDUE (ON 10% BOTTOMS) %WT. MAX. <input type="radio"/> _____	
22 <input type="checkbox"/> FLOW CONTROL DEVICE (5.8.3.3 API66) _____		CONRADSON D-169 <input type="radio"/> _____	
23 _____		RAMSBOTTOM D-524 <input type="radio"/> _____	
24 <input type="checkbox"/> SHUT-OFF VALVE (5.8.3.4 API66) _____		COPPER STRIP CORROSION PLATE D-180 _____	
25 <input type="checkbox"/> SPILL VALVE (5.8.3.4 API66) _____		3 HOURS AT 100°C MAXIMUM <input type="radio"/> _____	
26 <input type="checkbox"/> DRAIN VALVE (5.8.3.6 API66) _____		AROMATIC CONTENT %WT D-5186 <input type="radio"/> _____	
27 <input type="checkbox"/> FILTER / STRAINER (5.8.3.7 API66) _____		ASH CONTENT D-482 <input type="radio"/> _____	
28 _____		SPECIFIC GRAVITY, kg/m³ @ 15°C D-4052 <input type="radio"/> _____	
29 <input type="checkbox"/> VALVE PROVING & POSITION MONITORING (5.8.3.8 API66) _____		FLASH POINT, °C D-56 <input type="radio"/> _____	
30 <input type="checkbox"/> THERMAL RELIEF VALVES (5.8.3.9 API66) _____		CLOUD POINT, °C D-2500 <input type="radio"/> _____	
31 <input type="checkbox"/> MULTIFUEL SYSTEMS (5.8.3.10 API66) _____		POUR POINT, °C D-97 <input type="radio"/> _____	
32 <input type="checkbox"/> FUEL PURGING (5.8.3.11 API66) _____		WATER D-95 <input type="radio"/> _____	
33 _____		PARTICULATES, MG/100ML D-2276 <input type="radio"/> _____	
34 <input type="checkbox"/> FUEL DRAINAGE (5.8.3.12 API66) _____		TRACE METALS (ATOMIC ABSORPTION	
35 <input type="checkbox"/> OTHER SYSTEM COMPONENTS (5.8.3.13 API66) _____		PREFERRED) D-3605 <input type="radio"/> _____	
36 _____		SODIUM <input type="radio"/> _____	
37 _____		POTASSIUM <input type="radio"/> _____	
38 _____		VANADIUM <input type="radio"/> _____	
39 <input type="radio"/> FUEL TRANSFER EQUIP REQUIRED (5.8.3.15 API66) _____		CALCIUM <input type="radio"/> _____	
40 _____		LEAD <input type="radio"/> _____	
41 FUEL PUMP SYSTEM DETAILS		OTHER METALS <input type="radio"/> _____	
42 <input type="radio"/> FUEL PUMP REQUIRED _____		LOWER HEATING VALUE, MJ/kg D-2382 <input type="radio"/> _____	
43 <input type="radio"/> RV AT PUMP DISCHARGE (YES/NO) _____		RED VAPOR PRESSURE, Bar D-323 <input type="radio"/> _____	
44 <input type="radio"/> RV SET POINT _____ Bar		OLEFIN CONTENT, %VOL D-1319 <input type="radio"/> _____	
45 <input type="radio"/> PUMP RATED CAPACITY _____ l/min			
46 _____			
47 PIPING, TUBING & DESIGN DETAILS		REMARKS: _____	
48 <input type="radio"/> PRESENCE OF HYDROGEN SULFIDE _____		_____	
49 <input type="radio"/> NACE MATERIAL STANDARDS (4.10.19 API66) _____		_____	
50 <input type="radio"/> ANSI FLANGE RATING _____		_____	
51 <input type="radio"/> PIPING / TUBING GRADE _____		_____	
52 <input type="radio"/> TUBE FITTING MANUFACTURER _____		_____	
53 _____		_____	
NOTES: _____			

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<div><div><div><div><div></div><div>BR</div></div></div><div><div></div><div>PETROBRAS</div></div></div></div>		DATA SHEET		No.		REV.					
		TITLE				SHEET		of			
GAS TURBINE											
GAS GENERATOR - CONSTRUCTION FEATURES											
BEARINGS AND BEARING HOUSINGS (4.8 API616)											
RADIAL BEARINGS		DE BRG No.		NDE BRG No.		RADIAL / THRUST		RADIAL BRG No.		THRUST BRG No.	
<input type="checkbox"/> TYPE						<input type="checkbox"/> TYPE					
<input type="checkbox"/> MANUFACTURER						<input type="checkbox"/> MANUFACTURER					
<input type="checkbox"/> SIZE mm						<input type="checkbox"/> SIZE mm					
<input type="checkbox"/> RATED SHAFT SPEED r/min						<input type="checkbox"/> RATED SHAFT SPEED r/min					
<input type="checkbox"/> RADIAL LOAD N						<input type="checkbox"/> RADIAL/THRUST LOAD N					
<input type="checkbox"/> BEARING 'C' RATING N						<input type="checkbox"/> BEARING 'C' RATING N					
<input type="checkbox"/> L-10 BEARING LIFE hr						<input type="checkbox"/> L-10 BEARING LIFE hr					
<input type="checkbox"/> INNER / OUTER RACE MAT'L						<input type="checkbox"/> INNER / OUTER RACE MAT'L					
<input type="checkbox"/> ROLLING ELEMENT MAT'L						<input type="checkbox"/> ROLLING ELEMENT MAT'L					
<input type="checkbox"/> CAGE MATERIAL						<input type="checkbox"/> CAGE MATERIAL					
<input type="checkbox"/> SHAFT DIAMETER mm						<input type="checkbox"/> SHAFT DIAMETER mm					
<input type="checkbox"/> BEARING LENGTH mm						<input type="checkbox"/> BEARING SIZE mm					
<input type="checkbox"/> AREA mm²						<input type="checkbox"/> AREA mm²					
<input type="checkbox"/> UNIT LOAD (ACT/ALLOW) N/mm²						<input type="checkbox"/> UNIT LOAD (ACT/ALLOW) N/mm²					
<input type="checkbox"/> BASE MATERIAL						<input type="checkbox"/> BASE MATERIAL					
<input type="checkbox"/> BABBITT THICKNESS mm						<input type="checkbox"/> BABBITT THICKNESS mm					
<input type="checkbox"/> NUMBER OF PADS						<input type="checkbox"/> NUMBER OF PADS					
<input type="checkbox"/> LOAD: BETWEEN/ON PAD						<input type="checkbox"/> PIVOT: CENTER/OFFSET %					
<input type="checkbox"/> PIVOT: CENTER/OFFSET %						LUBRICATION: <input type="checkbox"/> FLOODED <input type="checkbox"/> DIRECTED					
<input type="checkbox"/> BEARING SPAN (BETWEEN BRG No X and No.Y) mm						THRUST COLLAR: <input type="checkbox"/> INTEGRAL <input type="checkbox"/> REPLACEABLE					
<input type="checkbox"/> DAMPER BEARING						PROXIMITY PROBES (4.8.5.3 API616)					
<input type="checkbox"/> OTHER						RADIAL SHAFT VIBRATION PROBES					
BEARING TEMPERATURE SENSORS (4.8.5.5 API616)				SEE ATTACHED API670 DATASHEETS							
<input type="radio"/> SEE ATTACHED API670 DATA SHEETS				<input type="radio"/> TYPE _____ <input type="radio"/> MODEL _____							
<input type="radio"/> THERMOCOUPLES				<input type="radio"/> MFR _____							
<input type="radio"/> SELECTOR SWITCH & IND. BY: _____ PURCH _____ MFR _____				<input type="radio"/> NO. AT EACH SHAFT BRG _____ TOTAL NO. _____							
<input type="radio"/> RESISTANCE TEMPERATURE DETECTORS				<input type="radio"/> OSCILLATOR-DEMODULATOR SUPPLIED BY _____							
<input type="radio"/> RESISTANCE MAT'L _____ <input type="radio"/> OHMS _____				<input type="radio"/> MFR _____ <input type="radio"/> MODEL _____							
<input type="radio"/> SELECTOR SWITCH & IND. BY: _____ PURCH _____ MFR _____				<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.2 API616) _____							
<input type="radio"/> LOCATION-JOURNAL BEARING:				<input type="radio"/> LOCATION _____ ENCLOSURE _____							
NUMBER _____ EA PD _____ EVERY OTH PAD _____ PER BRG				<input type="radio"/> MFR _____ MODEL _____							
OTHER _____				<input type="checkbox"/> SCALE RGE _____ <input type="checkbox"/> ALARM SET @ _____ µm							
<input type="radio"/> LOCATION-THRUST BEARING				<input type="radio"/> SHUTDOWN <input type="checkbox"/> SET @ _____ microns <input type="checkbox"/> TIME DELAY _____ seconds							
NO. (ACT) _____ EA PD _____ EVERY OTH PAD _____ PER BRG				AXIAL POSITION PROBES (4.8.5.3 API616)							
OTHER _____				<input type="radio"/> SEE ATTACHED API670 DATASHEETS							
NO. (INACT) _____ EA PD _____ EVERY OTH PAD _____ PER BRG				<input type="radio"/> TYPE _____ <input type="radio"/> MODEL _____							
OTHER _____				<input type="radio"/> MFR _____ <input type="radio"/> NO. REQUIRED _____							
<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.5 API616) _____				<input type="radio"/> OSCILLATOR-DEMODULATOR SUPPLIED BY _____							
<input type="radio"/> LOCATION _____ ENCLOSURE _____				<input type="radio"/> MFR _____ <input type="radio"/> MODEL _____							
<input type="radio"/> MFR _____ <input type="radio"/> MODEL _____				<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.2 API616) _____							
<input type="checkbox"/> SCALE RANGE _____ <input type="checkbox"/> ALARM SET @ _____ °C				<input type="radio"/> LOCATION _____ ENCLOSURE _____							
<input type="radio"/> SHUTDOWN <input type="checkbox"/> SET @ _____ °C <input type="checkbox"/> TIME DELAY _____ seconds				<input type="radio"/> MFR _____ <input type="checkbox"/> MODEL _____							
				<input type="checkbox"/> SCALE RGE _____ <input type="checkbox"/> ALARM SET @ _____ µm							
				<input type="radio"/> SHUTDOWN <input type="checkbox"/> SET @ _____ microns <input type="checkbox"/> TIME DELAY _____ seconds							
CASING AND / OR ROLLING ELEMENT VIBRATION TRANSDUCERS (5.4.7.8 API616)											
<input type="radio"/> SEE ATTACHED API670 DATASHEETS				<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.8 API616) _____							
<input type="radio"/> CASING VIBRATION (5.4.7.8.3 API616) <input type="radio"/> ROLLING ELEMENT VIB. (5.4.7.8.5 API616)				<input type="radio"/> LOCATION _____ ENCLOSURE _____							
<input type="radio"/> MFR _____ <input type="radio"/> MODEL _____				<input type="radio"/> MFR _____ <input type="radio"/> MODEL _____							
<input type="radio"/> LOCATION _____ <input type="radio"/> NUMBER _____				<input type="checkbox"/> SCALE RGE _____ <input type="checkbox"/> ALARM SET @ _____ mm/s							
<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.4 API616) _____				<input type="radio"/> SHUTDOWN <input type="checkbox"/> SET @ _____ microns <input type="checkbox"/> TIME DELAY _____ seconds							
NOTES:											
BASED ON THE ANNEX A API STD 616 FIFTH EDITION											
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DATA SHEET		No.	REV.
TITLE GAS TURBINE		SHEET of	
POWER TURBINE - CONSTRUCTION FEATURES			
BEARINGS AND BEARING HOUSINGS (4.8 API616)			
RADIAL		DE BRG No.	NDE BRG No.
<input type="checkbox"/> TYPE			
<input type="checkbox"/> MANUFACTURER			
<input type="checkbox"/> SHAFT DIAMETER mm			
<input type="checkbox"/> BEARING LENGTH mm			
<input type="checkbox"/> AREA mm ²			
<input type="checkbox"/> UNIT LOAD (ACT/ALLOW) N/mm ²			
<input type="checkbox"/> BASE MATERIAL			
<input type="checkbox"/> BABBITT THICKNESS mm			
<input type="checkbox"/> NO. PADS			
<input type="checkbox"/> LOAD: BETWEEN/ON PAD			
<input type="checkbox"/> PIVOT: CENTER/OFFSET %			
<input type="checkbox"/> RATED SHAFT SPEED r/min			
<input type="checkbox"/> RADIAL LOAD N			
<input type="checkbox"/> BEARING 'C' RATING N			
<input type="checkbox"/> L-10 BEARING LIFE hr			
<input type="checkbox"/> INNER / OUTER RACE MAT'L			
<input type="checkbox"/> ROLLING ELEMENT MAT'L			
<input type="checkbox"/> CAGE MATERIAL			
<input type="checkbox"/> BEARING SPAN (BETWEEN BRG No X and No. Y) mm			
<input type="checkbox"/> DAMPER BEARING			
<input type="checkbox"/> OTHER			
THRUST		ACTIVE DE/NDE	INACTIVE DE/NDE
<input type="checkbox"/> TYPE			
<input type="checkbox"/> MANUFACTURER			
<input type="checkbox"/> SHAFT DIAMETER mm			
<input type="checkbox"/> BEARING SIZE mm			
<input type="checkbox"/> AREA mm ²			
<input type="checkbox"/> UNIT LOAD (ACT/ALLOW) N/mm ²			
<input type="checkbox"/> BASE MATERIAL			
<input type="checkbox"/> BABBITT THICKNESS mm			
<input type="checkbox"/> NO. PADS			
<input type="checkbox"/> PIVOT: CENTER/OFFSET %			
<input type="checkbox"/> SIZE mm			
<input type="checkbox"/> RATED SHAFT SPEED r/min			
<input type="checkbox"/> RADIAL/THRUST LOAD N			
<input type="checkbox"/> BEARING 'C' RATING N			
<input type="checkbox"/> L-10 BEARING LIFE hr			
<input type="checkbox"/> INNER / OUTER RACE MAT'L			
<input type="checkbox"/> ROLLING ELEMENT MAT'L			
<input type="checkbox"/> CAGE MATERIAL			
LUBRICATION: <input type="checkbox"/> FLOODED <input type="checkbox"/> DIRECTED			
THRUST COLLAR: <input type="checkbox"/> INTEGRAL <input type="checkbox"/> REPLACEABLE			
PROXIMITY PROBES (4.8.5.3 API616)			
RADIAL SHAFT VIBRATION PROBES			
BEARING TEMPERATURE SENSORS (4.8.5.5 API616)			
<input type="radio"/> SEE ATTACHED API670 DATASHEETS			
<input type="radio"/> THERMOCOUPLES			
<input type="radio"/> SELECTOR SWITCH & IND. BY: PURCH MFR			
<input type="radio"/> RESISTANCE TEMPERATURE DETECTORS			
<input type="radio"/> RESISTANCE MAT'L OHMS			
<input type="radio"/> SELECTOR SWITCH & IND. BY: PURCH MFR			
<input type="radio"/> LOCATION-JOURNAL BEARING:			
NUMBER EA PD EVERY OTH PAD PER BRG			
OTHER			
<input type="radio"/> LOCATION-THRUST BEARING			
NO. (ACT) EA PD EVERY OTH PAD PER BRG			
OTHER			
NO. (INACT) EA PD EVERY OTH PAD PER BRG			
OTHER			
<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.5 API616)			
<input type="radio"/> LOCATION ENCLOSURE			
<input type="radio"/> MFR MODEL			
<input type="checkbox"/> SCALE RANGE ALARM SET @ °C			
<input type="radio"/> SHUTDOWN SET @ °C TIME DELAY seconds			
AXIAL POSITION PROBES (4.8.5.3 API616)			
<input type="radio"/> SEE ATTACHED API670 DATASHEETS			
<input type="radio"/> TYPE MODEL			
<input type="radio"/> MFR NO. REQUIRED			
<input type="radio"/> OSCILLATOR-DEMOMULATOR SUPPLIED BY			
<input type="radio"/> MFR MODEL			
<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.2 API616)			
<input type="radio"/> LOCATION ENCLOSURE			
<input type="radio"/> MFR MODEL			
<input type="checkbox"/> SCALE RANGE ALARM SET @ μm			
<input type="radio"/> SHUTDOWN SET @ microns TIME DELAY seconds			
CASING AND / OR ROLLING ELEMENT VIBRATION TRANSDUCERS (5.4.7.8 API616)			
<input type="radio"/> SEE ATTACHED API670 DATA SHEETS			
<input type="radio"/> CASING VIBRATION (5.4.7.8.3 API616) ROLLING ELEMENT VIB. (5.4.7.8.5 API616)			
<input type="radio"/> MFR MODEL			
<input type="radio"/> LOCATION NUMBER			
<input type="radio"/> MONITOR SUPPLIED BY (5.4.7.8.4 API616)			
<input type="radio"/> LOCATION ENCLOSURE			
<input type="radio"/> MFR MODEL			
<input type="checkbox"/> SCALE RGE ALARM SET @ mm/s			
<input type="radio"/> SHUTDOWN SET @ mm/s TIME DELAY seconds			
NOTES:			
BASED ON THE ANNEX A API STD 616 FIFTH EDITION			
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[illegible]

<div><div></div><div><div>BR</div></div><div>PETROBRAS</div></div>		DATA SHEET		No.	REV.			
				SHEET		of		
TITLE								
GAS TURBINE								
1	INSTRUMENTS							
2	INSTRUMENTATION & INSTALLATION : (4.9 AND 4.21PETROBRAS N-2922)			INSTRUMENT TYPE		INSTRUMENT LOCATION		
3	<div><div><input type="radio"/> API6W/ISO 10438</div><div><input type="radio"/></div></div>							
4	<div><input type="radio"/> INSTRUMENTATION MOUNTING (4.21PETROBRAS N-2922)</div>							
5	<div><input type="radio"/> OPTIONAL ALARM & SHUTDOWN POINT (4.21PETROBRAS N-2922)</div>							
6	DESCRIPTION			INDICATING	RECORDING	LOCAL	LOCAL PANEL	CONTROL ROOM
7	GAS GENERATOR OR SINGLE SHAFT GAS TURBINE							
8	TACHOMETER(S)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	ΔP AIR INLET SYSTEM			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	COMPRESSOR DISCHARGE PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	FUEL FILTER ΔP			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	FUEL SUPPLY PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	STARTING GAS SUPPLY PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	STARTING GAS EXHAUST PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	TEMP COMBUSTOR MEASUREMENT (6PTS MIN) (4.3.2 API6®)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	TEMP GAS TURB CONTROL PLANE (6 PTS MIN)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	INLET AIR TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	TEMPERATURE, GG COMPRESSOR DISCHARGE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	TEMPERATURE, THRUST BEARING OIL DRAIN			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	TEMPERATURE, EACH BEARING SUMP-ROLLING ELEMENT TYPE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	TEMPERATURE, FUEL MANIFOLD			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	TEMPERATURE, LUBE OIL RESERVOIR			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	FIRED HOUR METER			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	A) NUMBER STARTS COUNTER			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	B) START SEQUENCE TIMER			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
26	LUBE OIL RESERVOIR LEVEL			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
27	LUBE OIL PUMP PRESSURE INDICATORS (NO.)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
28	LUBE OIL COOLER OIL INLET TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
29	LUBE OIL COOLER OIL OUTLET TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30	LUBE OIL COOLER COOLANT INLET TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
31	LUBE OIL COOLER COOLANT OUTLET TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
32	LUBE OIL FILTER ΔP			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
33	LUBE OIL PRESSURE EACH LEVEL (NO.)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
34	CONTROL OIL PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
35	SITE FLOW INDICATOR EACH DRAIN (NO.)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
36	INLET GUIDE VANE POSITION INDICATOR			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
37	EXHAUST DUCT DIFFERENTIAL PRESSURE INDICATOR			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
38	ENCLOSURE COOLING AIR EXHAUST TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
39	POWER TURBINE							
40	TACHOMETER(S) (NO.)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
41	EXHAUST TEMPERATURE (2 POINTS MIN)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
42	JOURNAL BEARING TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
43	THRUST BEARING TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
44	BEARING DRAIN TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
45	SITE FLOW INDICATOR EACH DRAIN (NO.)			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
46	LUBE OIL INLET PRESSURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
47	LUBE OIL INLET TEMPERATURE			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
48	NOTE: ALL TRANSMITTERS AND SENSING DEVICES SHALL BE FURNISHED BY VENDORS (4.21PETROBRAS N-2922)							
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	DATA SHEET		No.		REV.	
	GAS TURBINE				SHEET	of
ALARMS AND SHUTDOWNS (5.4.4 API 66)						
	DESCRIPTION	APPLIES TO:		FIRST OUT ANNUNCIATED POINT IN VENDOR FURNISHED CONTROL PANEL (5.4.8.5 API 66)		
		SS OR GG	SEP PT	ALARM	SHUT-DOWN	
1		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
2		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
3		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
4		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
5		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
6		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
7		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
8		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
9		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
10		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
11		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
12		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
13		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
14		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
15		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
16		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
17		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
18		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
19		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
20		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
21		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
22		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
23		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
24		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
25		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
26		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
27		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
28		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
29		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
30		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
31		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
32		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
33		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
34		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
35		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
36		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
37		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
38		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
39		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
40		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
41		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
42		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
43		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
44		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
45		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
46		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
47	NOTES: 1) ALL TRANSMITTERS AND SENSING DEVICES SHALL BE FURNISHED BY VENDORS (4.21 PETROBRAS N-2922)			GAUGE BOARD:		
48	2) VENDOR TO ADVISE METHOD OF ANNUNCIATION			<input type="checkbox"/> LOCATION		
49	3) "VISUAL DISPLAY UNIT" MAY USE MESSAGE INDICATOR					
50	4) GG = GAS GENERATOR, SS = SINGLE SHAFT, AND PT = POWER TURBINE					
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BASED ON THE ANNEX A API STD 616 FIFTH EDITION						
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		No.	REV.
<div><div><div><div><div><div></div></div><div><div>BR</div></div></div><div>PETROBRAS</div></div></div></div>	<div>DATA SHEET</div>		
TITLE:	GAS TURBINE	SHEET	of
ACCESSORIES SUPPLIED BY GAS TURBINE MANUFACTURER			
<div>STARTING AND HELPER DRIVERS (5.11API6%)</div> <div><div><div><div><div><input type="radio"/> STARTER ONLY</div><div><input type="radio"/> STARTER/HELPER (5.11API6%)</div></div></div><div><div><div><div><input type="radio"/> TYPE (5.114 API6%)</div><div><input type="radio"/> MOTOR: <input type="radio"/> API541 <input type="radio"/> API546 <input type="radio"/> IEC 60034-1</div></div><div><div><input type="radio"/> GAS EXPANDER</div><div><input type="radio"/> IC ENGINE <input type="radio"/> HYDRAULIC</div></div><div><div><input type="radio"/> GAS TURBINE</div><div><input type="radio"/> STARTER IS CLUTCHED (5.117 API6%)</div></div><div><div><input type="radio"/> HELPER RATING (5.12.2 API6%) _____ kW</div><div><input type="checkbox"/> STARTER RATING (5.12.1API6%) _____ kW</div><div><input type="checkbox"/> SHAFT TURNING DEVICE REQUIRED (4.17 PETROBRAS N-2922)</div></div></div></div><div><div><input type="checkbox"/> MOTOR (STARTER ONLY); TYPE _____ RATING _____ kW MFR _____ MODEL _____ <input type="radio"/> REDUCED VOLTAGE STARTING (%) (5.115 API6%)</div></div></div><div><div><input type="checkbox"/> MOTOR (STARTER / HELPER); TYPE _____ RATING _____ kW MFR _____ MODEL _____ <input type="radio"/> REDUCED VOLTAGE STARTING (%) (5.115 API6%)</div></div></div> <div><div><input type="checkbox"/> GAS EXPANDER APPLICABLE SPEC. (5.116 API6%) _____ MFR _____ MODEL _____ kW _____ MAX. GAS FLOW _____ kg/hr TOTAL/START _____ kg <input type="radio"/> GAS FOR EXPANSION TURBINE: MIN MAX NORMAL INLET PRESSURE barA _____ EXHAUST PRESS barA _____ GAS TEMPERATURE, °C INLET _____ GAS TEMPERATURE, °C EXHAUST _____ MOLECULAR WEIGHT _____ SPEED CONTROL: <input type="radio"/> GOVERNOR <input type="radio"/> PRESSURE REGULATOR DESIGN DETAILS: YES NO INLET CONTROL VALVE FURNISHED _____ STAINLESS STEEL PIPING MANIFOLD _____ CARBON STEEL FLANGES _____ Y-STRAINER W/BREAKOUT FLANGES _____ LOW SPEED CAPABILITY _____ (FOR COMPRESSOR CLEANING) _____ RELIEF VALVE PRESSURE SET POINT _____ barG CASING MATERIAL _____ SEAL TYPE _____</div></div> <div><div><input type="checkbox"/> INTERNAL COMBUSTION ENGINE TYPE <input type="radio"/> SPARK IGNITED <input type="radio"/> DIESEL APPLICABLE SPECIFICATION (5.116 API6%) _____ MANUFACTURER _____ MODEL _____ SPEED _____ r/min POWER _____ kW</div></div> <div><div><input type="checkbox"/> STEAM TURBINE (REFERENCE API DATASHEETS) MFR _____ M ODEL _____ kW _____ MAX. STEAM FLOW _____ kg/hr TOTAL FLOW/ START _____ kg</div></div> <div><div><input type="radio"/> GEARS: SEE SEPARATE API 613 GEAR DATASHEETS (5.2.11API6%) <input type="radio"/> DRIVEN EQUIPMENT,SEE SEPARATE API DATASHEETS</div></div> <div><div>FIRE PROTECTION EQUIPMENT (5.7.3.1API6%) TYPE: <input type="radio"/> WATER MIST <input type="radio"/> CO₂ TYPE OF SENSOR: NUMBER OF DETECTORS: <input type="radio"/> ULTRA VIOLET NUMBER _____ <input type="radio"/> INFRA RED NUMBER _____ <input type="radio"/> HEAT RISE NUMBER _____ <input type="radio"/> ADDITIONAL LEVELS OF DETECTION (5.7.3.3 API6%)</div></div> <div><div>MOUNTING PLATES (5.3 API6%) TYPE (5.3.11API6%): <input type="radio"/> SOLEPLATE <input type="radio"/> BASEPLATE BASEPLATE (5.3.2 API6%) <input type="radio"/> EQUIPMENT MOUNTED ON BASEPLATE _____ (5.3.2.1API6%) <input type="radio"/> GAS TURBINE,COMPRESSOR SKID(S),ACCESSORY SKID <input type="radio"/> SOLEPLATES REQUIRED (5.3.3.1API6%) <input type="radio"/> DRIP RIM REQUIRED <input type="radio"/> SUB-SOLEPLATES REQUIRED (5.3.3.1API6%) <input type="radio"/> LEVELING PADS (5.3.2.3 API6%) <input type="radio"/> COLUMN MOUNTING (5.3.2.4 API6%) (3-POINT) <input type="radio"/> GROUTE <input type="radio"/> EPOXY <input type="radio"/> CONCRETE <input type="radio"/> OTHERS <input type="radio"/> DECKING TYPE <input type="radio"/> ANCHOR-BOLT (4.8 PETROBRAS N-2922)</div></div> <div><div>ENCLOSURES (5.7.5 API6%) <input type="radio"/> ENCLOSURE REQUIRED <input type="radio"/> MATERIAL _____ <input type="radio"/> ACOUSTICAL <input type="radio"/> WEATHERPROOF <input type="radio"/> SAFETY <input type="radio"/> FIRE PROTECTION <input type="radio"/> ADDITIONAL VENTILATION DUCTING (5.7.5.6.3 API6%) _____</div></div> <div><div>COUPLINGS AND GUARDS (5.2.2 API6%) <input type="radio"/> SEE ATTACHED API 671COUPLING DATA SHEETS <input type="radio"/> COUPLINGS PER ISO 10441(5.2.2.4 API6%) <input type="checkbox"/> MFR _____ <input type="checkbox"/> MODEL _____ COUPLING TYPE: <input type="radio"/> FLEXIBLE DIAPHRAGM <input type="radio"/> DISK PACK <input type="checkbox"/> MAXIMUM OUTSIDE DIAMETER _____ mm <input type="checkbox"/> HUB WEIGHT _____ kg <input type="checkbox"/> SPACER REQ'D <input type="checkbox"/> SPACER LENGTH _____ mm <input type="checkbox"/> SPACER WEIGHT _____ kg <input type="checkbox"/> MAXIMUM NUMBER OF SHIMS PER SIDE _____ <input type="radio"/> IDLING ADAPTER REQUIRED <input type="radio"/> SOLE PLATE REQUIRED <input type="checkbox"/> KEYED & SHRUNK <input type="checkbox"/> HYDRAULIC FIT CPLG. FRICT. COEFF.: _____ CPLG. GEAR PITCH DIA,mm _____ TURBINE SHAFT: <input type="checkbox"/> TAPER <input type="checkbox"/> CYL. DRIVEN EQUIP. SHAFT: <input type="checkbox"/> TAPER <input type="checkbox"/> CYL. <input type="checkbox"/> GUARD SUPPLIED BY _____ TYPE: <input type="radio"/> FULLY-ENCLOSED <input type="radio"/> SEMI-OPENED <input type="radio"/> OTHER _____</div></div> <div>REMARKS:</div> <div>NOTES:</div> <div>BASED ON THE ANNEX A API STD 616 FIFTH EDITION</div> <div>THIS DOCUMENT IS PROPERTY OF PETROBRAS, BEING PROHIBITED OUTSIDE OF THEIR PURPOSE.</div> <div>FORM OWNED TO PETROBRAS N-2922 ANNEX A - SHEET11/15.</div>			

DATA SHEET		No.	REV.
 PETROBRAS		SHEET _____ of _____	
TITLE: GAS TURBINE			
1 ACCESSORIES SUPPLIED BY GAS TURBINE MANUFACTURER			
2 INLET CONDITIONS (5.6.1 API 6B)		INLET SYSTEM (5.6.2 API 6B AND 4.22 PETROBRAS N-2922)	
3 INLET METEOROLOGICAL CONDITIONS (5.6.18 API 6B):		<input type="radio"/> ANTI-ICING (5.6.17 API 6B) <input type="radio"/> SINGLE STAGE WITH PROVISION FOR FUTURE EXTRA STAGES (5.6.2.12 API 6B): <input type="radio"/> YES <input type="radio"/> NO <input type="radio"/> INLET SYST. SUPPORT STEEL REQ'D. (4.29 N-2922) MIN. HEIGHT (m) _____ <input type="radio"/> SEISMIC ZONE _____ <input type="radio"/> SELF CLEANING (PULSE TYPE) (5.6.2.2 API 6B) <input type="radio"/> RELATIVE HUMIDITY SENSOR (5.6.2.2.2 API 6B) <input type="checkbox"/> FILTRATION EFFICIENCY _____ <input type="checkbox"/> FILTER MFR. _____ MODEL _____ <input type="checkbox"/> MAINTENANCE INTERVAL _____ MONTHS <input type="checkbox"/> CLEANING FREQUENCY _____ DAYS <input type="checkbox"/> MANOMETER MFR. _____ MODEL _____ RANGE _____ mm H ₂ O <input type="checkbox"/> SYSTEM SITE RATED PRESSURE DROP _____ mm H ₂ O @ 10% RATED AIR FLOW AND CLEAN FILTERS @ 10% RATED AIR FLOW AND DIRTY FILTERS, ALARM @ _____ mm H ₂ O <input type="checkbox"/> DUCTING GAUGE / MATERIAL _____ / _____ <input type="checkbox"/> EXPANSION JOINT MFR _____ TYPE _____	
4 <input type="radio"/> WIND SPEED (km/hr) & DIRECTION _____			
5 <input type="radio"/> WIND SPEED (km/hr) & DIRECTION FOR CONTAMINANTS _____			
6 <input type="radio"/> DRY BULB TEMP (°C): MIN _____ MAX _____			
7 <input type="radio"/> BAROMETRIC PRESSURE (kPa) _____			
8 <input type="radio"/> RAINFALL (MAX. RATE) (mm/hr) _____			
9 <input type="radio"/> SNOWFALL (MAX. RATE) (mm/hr) _____			
10 <input type="radio"/> RELATIVE HUMIDITY WITH VARIATIONS _____			
11 <input type="radio"/> FOG OR MIST CONDITIONS _____			
12 <input type="radio"/> ICING CONDITIONS _____			
13 CHEMICAL CONTAMINANTS IN THE AIR (4.23 N-2922):		INLET SILENCERS (5.6.2.5 API 6B):	
14 <input type="radio"/> SODIUM (Na)		<input type="radio"/> ALTERNATE SILENCER PLATE MATERIAL (5.6.2.5.4 API 6B) _____	
15 <input type="radio"/> POTASSIUM (K)		<input type="checkbox"/> SILENCER MFR _____ Δ P _____ mm H ₂ O	
16 <input type="radio"/> CALCIUM (Ca)		<input type="checkbox"/> SILENCER MATERIALS _____	
17 <input type="radio"/> CHLORIDE (Cl)			
18 <input type="radio"/> SULPHATE (SO ₄)		INLET COOLERS (5.6.2.6 API 6B):	
19 <input type="radio"/> NITRATE (NO ₃)		<input type="radio"/> EVAPORATIVE TYPE (5.6.2.6.1 API 6B)	
20 <input type="radio"/> TRACE METALS (V, Pb, Ni, Zn)		<input type="radio"/> LIQUID-TO-AIR TYPE (5.6.2.6.2 API 6B)	
21 <input type="radio"/> SULPHUR DIOXIDE (SO ₂)		COOLANT-SIDE CONDITIONS (5.6.2.6.3 API 6B):	
22 <input type="radio"/> AMMONIA (NH ₃)		<input type="radio"/> MAX. AVAILABLE FLOW (L/MIN) _____	
23 <input type="radio"/> NITROUS OXIDES (NO _x)		<input type="radio"/> MAX. TEMP (°C) _____ MIN TEMP (°C) _____	
24 <input type="radio"/> HYDROCARBONS (VOC)		<input type="radio"/> MAX. PRESS. (kPa) _____ MIN. PRESS. (kPa) _____	
25 <input type="radio"/> HYDROGEN SULPHIDE (H ₂ S)		<input type="radio"/> COOLANT COMPOSITION OR ANALYSIS _____	
26 <input type="radio"/> CHLORINE GAS (Cl ₂)		<input type="checkbox"/> EXCHANGER MFR _____	
27 <input type="radio"/> HYDROCHLORIC ACID (HCL)		<input type="checkbox"/> MODEL _____ Δ P _____ mm H ₂ O	
28 <input type="radio"/> NEON (Ne)			
29 <input type="radio"/> OZONE (O ₃)			
30 <input type="radio"/> HELIUM (He)			
31 <input type="radio"/> METHANE (CH ₄)			
32 <input type="radio"/> KRYPTON (Kr)			
33 <input type="radio"/> HYDROGEN (H ₂)			
34 <input type="radio"/> NITROUS OXIDE (N ₂ O)			
35 <input type="radio"/> CARBON MONOXIDE (CO)			
36 <input type="radio"/> XENON (Xe)			
37 <input type="radio"/> NITROGEN DIOXIDE (NO ₂)			
38 PARTICULATE CONTAMINANTS IN AIR (4.22 PETROBRAS N-2922):		REMARKS:	
39 <input type="radio"/> SEA WATER			
40 <input type="radio"/> COASTAL WATER			
41 <input type="radio"/> SAND			
42 <input type="radio"/> ROADS WITH HEAVY TRAFFIC			
43 <input type="radio"/> DRY LAKE BED			
44 <input type="radio"/> NEARBY COOLING TOWER			
45 <input type="radio"/> PETROCHEMICAL INDUSTRY			
46 <input type="radio"/> FOSSIL FIRED POWER PLANT			
47 <input type="radio"/> GENERAL CHEMICAL INDUSTRY			
48 <input type="radio"/> PAPER AND PULP INDUSTRY			
49 <input type="radio"/> CEMENT PRODUCTION			
50 <input type="radio"/> QUARRIES			
51 <input type="radio"/> AGRICULTURAL ACTIVITIES			
52 <input type="radio"/> PRODUCTION OF FERTILIZERS			
53 <input type="radio"/> MINING AND METALLURGICAL ACTIVITIES			
54 NOTES:			
55			
56			
57			
58			
59			
BASED ON THE ANNEX A API STD 616 FIFTH EDITION			
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FORM OWNED TO PETROBRAS N-2922 ANNEX A - SHEET 12/15.			

[illegible]

<div><div><div>BR</div><div>PETROBRAS</div></div></div>		DATA SHEET			No.	REV.
		SHEET of				
		TITLE: GAS TURBINE				
1	INSPECTION AND TESTING: CONTROLS AND INSTRUMENTATION					
2	SHOP INSPECTION AND TESTS: (6.11API6E)	REQ	WIT	OBS	MATERIALS INSPECTION REQUIREMENTS: (6.2.13 API6E)	
3	SHOP INSPECTION (6.12 API6E)	<input type="checkbox"/>			<input type="checkbox"/> ALTERNATE INSPECTION PROCEDURES (6.22.11API6E) SPECIFY	
4	CLEANLINESS (6.2.3.1API6E)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/> SPECIAL CHARPY TESTING (4.10.5.3 API6E) _____	
5	HYDROSTATIC (6.3.2 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> RADIOGRAPHY REQUIRED FOR _____	
6	PNEUMATIC (6.3.3 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> MAGNETIC PARTICLE REQUIRED FOR _____	
7	MECHANICAL RUNNING TEST (6.3.4 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> LIQUID PENETRANT REQUIRED FOR _____	
8	AUXILIARY SYSTEMS (4.50 PETROBRAS N-2922) SPECIFY	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> ULTRASONIC REQUIRED FOR _____	
9	<input checked="" type="checkbox"/> CONTRACT CPLG <input type="checkbox"/> IDLING ADAPTOR(S)				<input type="checkbox"/> QUALITY CONTROL OF INACCESSIBLE WELDS (4.10.4.6.2 API6E)	
10	VIB. PROBES <input type="checkbox"/> CONTRACT <input type="checkbox"/> SHOP				<input type="checkbox"/> 100 % INSPECTION OF WELDS (4.10.4.7.1API6E)	
11	VIBRATION PLOTS (4.51PETROBRAS N-2922)	<input type="checkbox"/>			<input type="checkbox"/> INSPECTION PRIOR TO CLOSING OPENINGS (6.2.3.3 API6E)	
12	DIGITAL RECORD VIB DATA (4.52 PETROBRAS N-2922)	<input type="checkbox"/>			<input type="checkbox"/> WELDING HARDNESS TESTING (6.2.3.4 API6E)	
13	SPARE ROTOR (6.3.4.4.2 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> POSITIVE MATERIAL IDENTIFICATION (4.10.14.1API6E) ATTACH LIST	
14	PERFORMANCE TEST (6.3.5.1 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> ADDITIONAL COMPONENTS FOR PMI (4.10.14.2 API6E) ATTACH LIST	
15	COMPLETE UNIT TEST (4.53 PETROBRAS N-2922)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____	
16	PACKAGE TEST (6.3.5.2.1API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
17	TORSIONAL VIBRATION (6.3.5.2.2 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MISCELLANEOUS INSPECTION AND TESTING:	
18	LOAD GEAR TEST (6.3.5.3 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> SITE TEST OF GT AND DRIVEN EQUIPMENT (4.17 API6E)	
19	SOUND LEVEL TEST (6.3.5.4 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> VENDOR'S REVIEW & COMMENTS ON PURCHASER'S PIPING & FOUNDATION [4.18 a) API6E]	
20	ROTOR OVERSPEED (4.54 PETROBRAS N-2922)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> OBSERVE PARTING OF FLANGES (4.18 b) API6E]	
21	AUXILIARY EQUIPMENT (6.3.5.6 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> CHECK ALIGNMENT AT OPERATING TEM PERATURE [4.18 c) API6E]	
22	VENTILATION SYSTEM VALIDATION (6.3.5.7 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> WITNESS INITIAL ALIGNMENT CHECK [4.18 d) API6E]	
23	ENCLOSURE LEAK TEST (6.3.5.8 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> FINAL ASSEMBLY CLEARANCES [6.2.11d) API6E] AT GT VENDOR SHOP	
24	POST TEST INSPECTION (4.55 PETROBRAS N-2922)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
25	HYDRAULIC COUPLING INSP (6.3.5.10 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SPECIALIZED INSTRUMENTS AND CONTROLS	
26	GOVERNOR RESPONSE TEST (6.3.5.11API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TACHOMETERS / SPEED SENSORS: (5.4.7.2.2 API6E)	
27	SPARE PARTS (6.3.5.12 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TYPE: <input type="checkbox"/> ELE ELECTRICAL <input type="checkbox"/> ELECTRONIC	
28	FIRE PROTECTION (6.3.5.8 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> ANALOG <input type="checkbox"/> DIGITAL	
29	UNIT CONTROL PANEL (FAT)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> MANUFACTURER _____	
30	OTHER (6.3.5.14 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> GLYCERIN-FILLED PRESSURE GAUGES (5.4.7.6 API6E)	
31	GT FIELD PERFORMANCE TEST (6.3.6 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CONTROL WIRING (5.4.5.3.2 API6E): <input type="checkbox"/> ARMORED <input type="checkbox"/> METAL CONDUIT	
32	FIT UP & ASSEMBLY OF COMPONENTS (6.4.9 API6E)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	SWITCHES: (5.4.4.8.2 API6E) CIRCUIT SHALL:	
33					<input type="checkbox"/> ENERGIZE <input type="checkbox"/> DEENERGIZE TO ALARM	
34					<input type="checkbox"/> ENERGIZE <input type="checkbox"/> DEENERGIZE TO SHUTDOWN	
35					INSTRUMENT / ELECTRICAL ENCLOSURES:	
36	CONTROL SYSTEMS				<input type="checkbox"/> EXPLOSION PROOF <input type="checkbox"/> WEATHER PROOF	
37	TYPE: (4.20 PETROBRAS N-2922):				CONTROL / INSTRUMENT WIRING (5.4.5.3.2 API6E): <input checked="" type="checkbox"/> ARMORED CABLE <input type="checkbox"/> METAL CONDUIT	
38	<input type="checkbox"/> DEGREE OF REDUNDANCE _____				CONTROL SYSTEM DETAILS:	
39	<input type="checkbox"/> MICROPROCESSOR BASED				<input type="checkbox"/> ALARM & SHUTDOWN ARRANGEMENTS (5.4.4.8 API6E)	
40	<input type="checkbox"/> MONITORS PER API670: <input type="checkbox"/> 5.4.7.5 <input type="checkbox"/> 5.4.7.8.2 <input type="checkbox"/> 5.4.7.8.4 (API6E)				<input type="checkbox"/> ALARM & SHUTDOWN SWITCHES (5.4.4.8.1API6E)	
41	<input type="checkbox"/> SIGNAL SOURCE _____				<input type="checkbox"/> FIRST-OUT ANNUNCIATOR REQ'D (5.4.4.8.5 API6E)	
42	<input type="checkbox"/> SENSITIVITY _____ <input type="checkbox"/> RANGE _____ TO _____				<input type="checkbox"/> PURGE FIRST-OUT ANNUNCIATOR REQ'D [5.4.4.8.5 b) API6E]	
43	<input type="checkbox"/> TIME OF AC OUTAGE PROTECTION (5.4.19) _____ MINUTES				<input type="checkbox"/> SHUT OFF VALVES FOR SHUT DOWN SENSORS (5.4.4.9 API6E)	
44					<input type="checkbox"/> SHUTDOWN DEVICE ISOLATION LOCKOUT (5.4.4.10 API6E)	
45	CONTROL CONSOLES: (5.4.5.11API6E)				LOAD CONTROL - GOVERNOR (5.4.3 API6E)	
46	<input type="checkbox"/> ON-SKID <input type="checkbox"/> OFF SKID LOCAL <input type="checkbox"/> OFF SKID REMOTE				<input type="checkbox"/> MFR'S STD. <input type="checkbox"/> OTHER <input type="checkbox"/> MAKE _____ <input type="checkbox"/> MODEL _____	
47	WEATHER PROTECTION REQUIRED <input type="checkbox"/> YES <input type="checkbox"/> NO				<input type="checkbox"/> CONSTANT SPEED <input type="checkbox"/> VARIABLE SPEED	
48					<input type="checkbox"/> ISOCRONOUS <input type="checkbox"/> DROOP	
49	<input checked="" type="checkbox"/> HUMAN MACHINE INTERFACE <input type="checkbox"/> KEYBOARD				REMOTE SHUTDOWN SIGNAL, SPECIFY TYPE: _____	
50	STARTING SYSTEM (5.4.2.1API6E)				<input type="checkbox"/> CONTROL SIGNAL RANGE (5.4.3.3 API6E) _____	
51	<input type="checkbox"/> SEMI-AUTOMATIC <input type="checkbox"/> AUTOMATIC				MANUAL SPEED CHANGER, r/min _____ MAX. _____ MIN.	
52	<input type="checkbox"/> PURGE (5.4.2.2 API6E) _____ MINUTES				<input type="checkbox"/> MAINTAIN TURBINE SPEED UPON FAILURE OF CONTROL	
53	<input type="checkbox"/> SEPARATE SHUTDOWN VALVE TEST DURING OPERATION				SIGNAL OR ACTUATOR	
54	NOTES 1) FAT=FACT					

DATA SHEET		No.	REV.
	SHEET		of
	TITLE		
	GAS TURBINE		
LUBRICATION, WEIGHTS & VENDOR DATA			
1			
2	<input type="checkbox"/> WEIGHTS	DRY INSTALLED	SHIPPING
3		(kg)	(kg)
4	GAS GENERATOR	_____	_____
5	POWER TURBINE	_____	_____
6	GT ENCLOSURE	_____	_____
7	INLET FILTER HOUSE	_____	_____
8	INLET AIR DUCTING	_____	_____
9	VENT DUCTING	_____	_____
10	EXHAUST DUCTING	_____	_____
11	EXHAUST STACK	_____	_____
12	MIN OIL CONSOLE	_____	_____
13	SYN OIL CONSOLE	_____	_____
14	MIN OIL SEPARATOR	_____	_____
15	SYN OIL SEPARATOR	_____	_____
16	MIN OIL AIR COOLER	_____	_____
17	SYN OIL AIR COOLER	_____	_____
18	HYD START SKID	_____	_____
19	EXHT START SILENCER	_____	_____
20	CO ₂ CYLINDER SKID	_____	_____
21	WATER WASH SKID	_____	_____
22	TOTAL PACKAGE WT	_____	_____
23	MAX ERECTION WT	_____	ITEM _____
24	MAX MAINT WT	_____	ITEM _____
25			
26	LUBRICATION SYSTEMS: (4.9 API66)		
27	<input type="checkbox"/> API64 DATA SHEETS		
28	<input type="checkbox"/> MINERAL LUBE SYSTEM: (4.9.5 API66) <input type="checkbox"/> OIL VISCOSITY _____		
29	COMMON TO <input type="checkbox"/> GAS GENERATOR or SINGLE SHAFT GT <input type="checkbox"/> LOAD GEAR		
30	<input type="checkbox"/> FREE POWER TURBINE <input type="checkbox"/> PNEUMATIC STARTER		
31	<input type="checkbox"/> DRIVEN EQUIPMENT <input type="checkbox"/> AUXILIARIES _____		
32	<input type="checkbox"/> SYNTHETIC LUBE OIL SYSTEM: (4.9.2 API66)		
33	<input type="checkbox"/> LUBE SPECIFICATION _____		
34	COMMON TO <input type="checkbox"/> GAS GENERATOR <input type="checkbox"/> POWER TURBINE		
35	<input type="checkbox"/> LOAD GEAR <input type="checkbox"/> DRIVEN EQUIPMENT		
36	<input type="checkbox"/> PNEUMATIC STARTER		
37	<input type="checkbox"/> AUXILIARIES _____		
38	<input type="checkbox"/> OIL DEBRIS MONITORING _____		
39	<input type="checkbox"/> OIL REQUIREMENTS FLOW (m ³ /hr) PRESSURE (barG) HEAT LOAD (kW)		
40	GAS GENERATOR _____		
41	POWER TURBINE _____		
42	HYD START SYSTEM _____		
43	MINERAL OIL RESERVOIR CAPACITY _____ liters		
44	SYNTHETIC OIL RESERVOIR CAPACITY _____ liters		
45	HYDRAULIC OIL RESERVOIR CAPACITY _____ liters		
46	HYDRAULIC OIL SPECIFICATION _____		
47	MOUNTING ARRANGEMENT: <input type="checkbox"/> CONSOLE <input type="checkbox"/> COLUMN <input type="checkbox"/> BASEPLATE		
48	REMARKS: _____		
49	_____		
50	_____		
51	_____		
52	_____		
53	_____		
54	_____		
55	_____		
56	_____		
57	_____		
58	_____		
59	_____		
VENDOR'S DATA:			
27	<input type="checkbox"/> COORDINATION MEETING SITE (7.13 API66) _____		
28	<input type="checkbox"/> SPARE PARTS OPTIMIZATION ANALYSIS [(7.2.3 v) API66]		
29	<input type="checkbox"/> FAILURE MODES AND EFFECTS ANALYSIS [7.2.3 w) API66]		
30	<input type="checkbox"/> LIFE CYCLE COST ANALYSIS [7.2.3 x) API66]		
31	<input type="checkbox"/> VENDOR'S REVIEW & COMMENTS ON PURCH. PIPING & FOUNDATION		
32	<input type="checkbox"/> FINAL ASSEMBLY CLEARANCES		
33	<input type="checkbox"/> PURCHASER REVIEW OF CAMPBELL / GOODMAN DIAGRAMS (4.5 PETROBRAS N-2922)		
34	<input type="checkbox"/> VENDOR WITNESS ALIGNMENT		
35	<input type="checkbox"/> INSULATION FOR HEAT CONSERV. AND PERSONNEL PROTECTION		
36	<input type="checkbox"/> CERTIFIED COPIES OF TEST DATA		
37	<input type="checkbox"/> SPARE ROTOR		
38	<input type="checkbox"/> FIELD BALANCING		
39	PERFORMANCE CURVES: (7.2.4 API66)		
40	<input type="checkbox"/> SPEED-TORQUE CURVE OF OUTPUT SHAFT [7.2.4 a) API66]		
41	<input type="checkbox"/> INCREMENTAL POWER FOR STEAM/WATER [7.2.4 b) API66]		
42	<input type="checkbox"/> EFFECTS OF AMB. COND. ON EXHAUST FLOW [7.2.4 c) API66]		
43	<input type="checkbox"/> RUN DOWN CURVES [7.2.4 d) API66]		
44	<input type="checkbox"/> NO _x AND CO ₂ EMISSIONS [7.2.4 e) API66]		
45	<input type="checkbox"/> IMPACT OF ANTI-ICING SYSTEM [7.2.4 f) API66]		
46	<input type="checkbox"/> PROGRESS REPORTS (7.3.4 API66)		
47	<input type="checkbox"/> TECHNICAL DATA MANUAL (7.3.6.4 API66)		
48	NOTES: _____		
49	_____		
50	_____		
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BASED ON THE ANNEX A API STD 616 FIFTH EDITION			
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