
Guide for procurement of power station equipment - Part 5-2: Gas turbines

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Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 5-2: Gasturbinen

Guides pour l'acquisition d'équipements destinés aux centrales de production d'électricité -- Partie 5-2: Turbines à combustion

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centrales de production d'électricité - Partie 5-2: Turbines à
combustion

Leitfaden für die Beschaffung von Ausrüstungen für
Kraftwerke - Teil 5-2: Gasturbinen

This European Standard was approved by CEN/CENELEC on 11 December 1997.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN/CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This standard takes the form of a recommendation and is therefore entitled a "Guide".

This Guide for procurement has been prepared by the CEN/CENELEC Joint Task Force Power Engineering (JTFPE) of which the secretariat is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

This Guide for procurement has been prepared under mandates given to CEN and CENELEC by the European Commission and the European Free Trade Association.

This Guide for procurement is a part of a series of Guides mandated to cover the procurement of power station plant and equipment in conformity with European Procurement Directives. The Guides are:

EN 45510: Guide for procurement of power station equipment

Part 1: Common clauses

Part 2-1: Electrical equipment - Power transformers

Part 2-2: Electrical equipment - Uninterruptible power supplies

Part 2-3: Electrical equipment - Stationary batteries and chargers

Part 2-4: Electrical equipment - High power static convertors

Part 2-5: Electrical equipment - Motors

Part 2-6: Electrical equipment - Generators

Part 2-7: Electrical equipment - Switchgear and controlgear

Part 2-8: Electrical equipment - Power cables

Part 2-9: Electrical equipment - Cabling systems

Part 3-1: Boilers - Water tube boilers

Part 3-2: Boilers - Shell boilers

Part 3-3: Boilers - Boilers with fluidized bed firing

Part 4-1: Boiler auxiliaries - Equipment for reduction of dust emissions

Part 4-2: Boiler auxiliaries - Gas-air, steam-air and gas-gas heaters

Part 4-3: Boiler auxiliaries - Draught plant

Part 4-4: Boiler auxiliaries - Fuel preparation equipment

Part 4-5: Boiler auxiliaries - Coal handling and bulk storage plant

Part 4-6: Boiler auxiliaries - Flue gas desulphurization (De-SO_x) plant

Part 4-7: Boiler auxiliaries - Ash handling plant

Part 4-8: Boiler auxiliaries - Dust handling plant

Part 4-9: Boiler auxiliaries - Sootblowers

Part 4-10: Boiler auxiliaries - Flue gas denitrification (De-NO_x) plant

Part 5-1: Turbines - Steam turbines

Part 5-2: Turbines - Gas turbines

Part 5-3: Turbines - Wind turbines

Part 5-4: Turbines - Hydraulic turbines, storage pumps and pump-turbines

Part 6-1: Turbine auxiliaries - Deaerators
Part 6-2: Turbine auxiliaries - Feedwater heaters
Part 6-3: Turbine auxiliaries - Condenser plant
Part 6-4: Turbine auxiliaries - Pumps
Part 6-5: Turbine auxiliaries - Dry cooling systems
Part 6-6: Turbine auxiliaries - Wet and wet/dry cooling towers
Part 6-7: Turbine auxiliaries - Moisture separator reheaters
Part 6-8: Turbine auxiliaries - Cranes
Part 6-9: Turbine auxiliaries - Cooling water systems

Part 7-1: Pipework and valves - High pressure piping systems
Part 7-2: Pipework and valves - Boiler and high pressure piping valves

Part 8-1: Control and instrumentation

*EN 45510 Part 1 contains those clauses common to all the above Guides giving the provisions of a non **equipment** specific nature for use in the procurement of power station plant. EN 45510 is the responsibility of JTFPE. The so called "common clauses", as appropriate, also appear in italics in the documents specific to particular **equipment**.*

Where paragraphs of "common clauses" are omitted, each paragraph omitted is indicated by the symbol *****.

In this Guide, words in bold type indicate that they have the meaning given in the definitions, clause 3.

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In this Guide, words and sentences not in italics are specific to this Guide and refer to the particular **equipment** covered (standards.iteh.ai)

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of gas turbines, including gas turbines for combined-cycle systems, and their auxiliaries for use in electricity generating stations (power stations). This Guide for procurement is not applicable to **equipment** for use in the nuclear reactor plant area of nuclear power stations. Other possible applications of such **equipment** have not been considered in the preparation of this Guide.*

This Guide is applicable to open-cycle gas turbines using normal combustion systems, generally greater than 20 MW electrical output, and also includes closed-cycle, semi closed-cycle and combined-cycle gas turbine power plants and combined heat and power plants. In cases of turbines using free piston gas generators or special heat sources (for example, chemical process, nuclear reactors, furnace for a super-charged boiler), this Guide may be used as a basis but will need to be suitably modified.

This Guide excludes gas turbines for marine propulsion and those used to propel aircraft, locomotives, military vehicles, road construction and earth-moving machines, agricultural and industrial types of tractors and road vehicles.

This Guide for Procurement of Gas Turbines has been prepared to be used with the existing International Standard ISO 3977. It should, therefore, be read in addition and complementary to the International Standard.

*The **equipment** covered by this Guide is defined by its function rather than design type. Therefore, the guidance to the **specification** is stated in performance terms rather than being specified by a detailed description of the **equipment** to be supplied.*

*This Guide indicates to potential **purchasers** how their **specification** should be prepared so that:*

- the **equipment** type and capacity interfaces correctly with other elements of the systems;
- predicted performance is achieved;
- ancillary **equipment** is properly sized;
- **reliability, availability** and safety requirements are achieved;
- proper consideration is given to the evaluation process and the quality measures to be applied.

*This Guide does not determine the type of **specification** (e.g. detailed, performance, functional) or the extent of supply for any given contract which is normally decided on the basis of the **purchaser's** project strategy. It does not cover:*

- any commercial, contractual or legal issues which are normally in separate parts of an **enquiry**;
- any allocation of responsibilities which are determined by the contract.

*This Guide does not prescribe the arrangement of the documents in the **enquiry**.*

NOTE: As a comprehensive European environmental policy is still under preparation, this Guide does not address the environmental implications of the **equipment**.

2 Normative references

This Guide for Procurement incorporates by dated or undated reference, provisions from other publications. These normative references are cited in the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Guide only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

EN ISO 9001	Quality systems - Model for quality assurance in design, development, production, installation and servicing (ISO 9001:1994)
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002:1994)
IEC 50(191)	International electrotechnical vocabulary, Chapter 191: Dependability and quality of service
ISO 1999	Acoustics - Determination of occupational noise exposure and estimation of noise-induced hearing impairment
ISO 6190	Acoustics - Measurement of sound pressure levels of gas turbine installations for evaluating environmental noise - Survey method.
ISO 10494	Gas turbines and gas turbine sets - Measurement of emitted airborne noise - Engineering/survey method
ISO 2314	Gas turbines - Acceptance tests
ISO/DIS 3977-1	Gas turbines - Procurement - Part 1: General and definitions ¹⁾
ISO/DIS 3977-11	Gas Turbines - Procurement - Part 11: Reliability, availability, maintainability and safety ¹⁾

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3 Definitions

For the purposes of this Guide, the following definitions apply:

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3.1 Organisational terms

3.1.1 **purchaser**: Recipient of a product and/or a service provided by a **supplier**.

3.1.2 **supplier**: Person or organisation that provides a product and/or a service to the **purchaser**.

3.1.3 **specification**: Document stating technical requirements of the **purchaser**. It may form part of an **enquiry** issued by a **purchaser**.

3.1.4 **enquiry**: Invitation to **tender** issued by a **purchaser**. It will normally include a **specification** together with the necessary contractual and commercial conditions.

3.1.5 **tender**: Offer made by a **tenderer** in response to an **enquiry**.

3.1.6 **tenderer**: Person or organisation submitting a **tender** for the **equipment** in response to the **enquiry**.

¹⁾ This standard is under preparation by ISO/TC 192.

3.1.7 site: Place to which the **equipment** is to be delivered or where work is to be done by the **supplier**, together with so much of the area surrounding as the **supplier** may, with the consent of the **purchaser**, use for the purposes of the contract.

NOTE: Further definitions of useful organisational terms may be found in EN ISO 8402 (see Annex A).

3.2 Technical terms

Technical terms applicable to gas turbines are defined in ISO 3977. The following additions are specific for power generation:

3.2.1 combined cycle : As defined in ISO/DIS 3977-1.

NOTE: The combined cycle most commonly employed in power generation comprises one or more gas turbines exhausting through heat recovery steam generators (HRSG) which supply steam to a steam turbine. Each gas turbine is connected to a HRSG with or without a gas bypass facility. Other arrangements are possible.

3.2.2 combined heat and power : A system, based on a gas turbine, which drives an electrical generator and also produces heat energy.

3.2.3 heat rate : As defined in ISO/DIS 3977-1.

NOTE: In electrical power generation, heat rate is normally expressed in kilojoules per kilowatt hour (kJ/kWh).

3.2.4 reference turbine inlet temperature : As defined in ISO 2314.

NOTE: The turbine inlet temperature calculated in accordance with ISO 2314 is a representative, theoretical temperature which cannot be measured and is referred to as ISO TIT. Alternatively, the temperature can be defined as the flow weighted mean total temperature of the working fluid, at a plane immediately upstream of the first stage rotor blades; this temperature is referred to as the turbine rotor inlet temperature, TRIT.

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3.2.5 equivalent operating hours: As defined in ISO/DIS 3977-11.

3.3 General terms

3.3.1 equipment: Plant, component, system and/or associated service to be provided in response to the enquiry.

3.3.2 conformity: Fulfilment of specified requirements by a product, process or service.

3.3.3 performance: Obligations verified by specified tests.

3.3.4 operating period: Time between planned outages or maintenance periods during which the **equipment** is in operation and/or does not restrict operational requirements of the power station.

3.3.5 life expectancy: Time period over which the **equipment** might be expected to operate with planned maintenance but without replacement of a significant component. For example a gas turbine rotor is a significant component

3.3.6 design life: Operating hours of the **equipment** on which design calculations are based.

3.3.7 acceptability: Compliance with criteria defined by the **purchaser** for assessing the suitability of **equipment**.

3.3.8 equipment margins: Allowance for design, fabrication or operating contingency defined in the **specification**. These are separate to those normally included by the **supplier** for his own purposes.

3.3.9 proven equipment: Equipment which may be demonstrated to be similar to that offered and has operated for a sufficient time to have demonstrated performance and availability.

3.3.10 availability: As defined in IEC 50 (191).

3.3.11 reliability: As defined in IEC 50 (191).

3.3.12 maintainability: As defined in IEC 50 (191).

4 Brief overall project description

4.1 Role and organisation of purchaser

The **enquiry** should define the **purchaser's** role in the project, including whether the **purchaser** will assume responsibility for the planning and technical coordination of the project, or whether other organisations will be appointed to carry out all or part of this function. The **enquiry** should define all organisational interfaces and the procedures to be employed for managing the contract and the **site**.

4.2 Site location

The **specification** should describe the geographical location of the **site** which may include surveying points, the previous use of the **site** and any local features such as impact of industrial or military activities and planning restrictions.

Where applicable, the **specification** should indicate **site datum** on **specification** drawings and specify **site** and drawing orientation and define co-ordinate axes (x,y,z) and numbering order to ensure consistency between suppliers of connected equipment.

Where appropriate, the **specification** should define the permitted ground loading, dimensional and time restrictions on access routes up to but not including public roads or railways.

The **specification** should identify, where appropriate, the environment of the **site** in which the **equipment** will operate. The following factors may normally be included if appropriate:

- climatic e.g. atmospheric pressure, annual variation of air and cooling water temperature, relative humidity, rain fall, icing, snow, wind velocity (normal and maximum), lightning;
- geological e.g. seismic conditions and characteristics of subsoil (e.g. caverns, gliding stratifications, load bearing capability of subsoils);
- geographic e.g. elevation, influence of local topography and structures;
- hydrological e.g. flooding and tides.

4.3 Equipment task

The **specification** should describe in general terms the function, task or role of the **equipment** to be purchased. e.g. whether it is part of a new power generating plant, a modification to an existing power generating plant or replacement **equipment**.

Where appropriate, the **specification** should define the function and the known limitations, if any, in the **equipment** connected to that which is being supplied so that the **equipment** may avoid imposing adverse conditions or the **supplier** may suggest modifications to connected equipment which would ensure satisfactory operation.

4.4 Equipment to be purchased

The **specification** may define the **equipment** type or arrangement to be purchased. For example the **purchaser** may specify the presence of a bypass stack, single or multi shaft arrangement.

The **specification** may also define preferences for **equipment** types (or give information) regarding compatibility with existing equipment, if required.

The **specification** should define the intended methods or local practice for maintenance, inspection and operation.

The **specification** should define requirements with regard to the general appearance of the **equipment** (e.g. dimensions, shape or colour) to meet local planning requirements or specific criteria, where such requirements exist.

NOTE: Attention is drawn to European, national and/or local legislation which may place restrictions in this area.

4.5 Control and instrumentation

The **specification** should define the general requirements for the control and instrumentation system, the level of operator intervention allowed or required, integration with other control systems, localised control loops, commonality and redundancy.

NOTE: Guidance on the procurement of control and instrumentation systems for power stations, including advice on interfaces, can be found in EN 45510-8-1.

4.6 Electrical supplies and other services

The **specification** should define the electrical supplies available for the operation of the **equipment**, their voltages and frequencies, with their range of variation, phases available and, where appropriate, the acceptable values of maximum load (kW) and short circuit level at each voltage level and the harmonic content. Requirements for terminals and terminal boxes should be stated; these should be to a recognised European or international standard.

The **specification** should define the type and capacity of other services for the operation of the **equipment** such as compressed air and cooling water.

4.7 Other interfaces

The **specification** should define the interfaces with existing ancillary or new ancillary equipment to be supplied under separate contracts which interact directly with the **equipment**. For example: civil works, cranes or temporary systems

4.8 Project programme

The **specification** should describe the overall programme and timescale in which the project is to be carried out. This may include the principal dates associated with tendering, placement of orders, access to site, start and completion of installation, commissioning, trial run, take-over and final acceptance.