
Guide for procurement of power station equipment - Part 6-4: Turbine auxiliaries - Pumps

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Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke -- Teil 6-4: Turbinenhilfseinrichtungen - Pumpen

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité -- Partie 6-4: Auxiliaires de turbine - Pompes

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Guide for procurement of power station equipment - Part 6-4:
Turbine auxiliaries - Pumps

Guide pour l'acquisition d'équipements destinés aux
centrales de production d'électricité - Partie 6-4: Auxiliaires
de turbine - Pompes

Leitfaden für die Beschaffung von Ausrüstungen für
Kraftwerke - Teil 6-4: Turbinenhilfseinrichtungen - Pumpen

This European Standard was approved by CEN/CENELEC on 1 October 1999.

CEN/CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN/CENELEC member.

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 European Standard has been prepared by Technical Committee CEN/CLC JTFPE "Joint Task Force Power Engineering", the secretariat of which 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of an identical text or by endorsement, at the latest by April 2000, and conflicting national standards shall be withdrawn at the latest by April 2000.

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.

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

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 converters

Part 2-5: Electrical equipment - Motors

Part 2-6: Electrical equipment - Generators

Part 2-7: Electrical equipment - Switchgear and control gear

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 desulphurisation (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 plants. 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**.*

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

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

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1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of the pump units 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 covers:

- feedwater pumps (including the start-up and booster pumps);
- condensate pumps and condensate booster pumps;
- condenser cooling water pumps;
- boiler recirculation pumps;
- heater drains pumps;
- water recirculation pumps of the different systems: feedwater storage tank, exhaust gas coolers, etc.;
- auxiliary service water pumps;
- flue gas desulphurisation (DeSO_x) plant and ash pumps.

For small-sized pumps and/or those whose failure does not significantly effect electricity generation, the **purchaser** should only apply this guide with caution and limit its requirements. In this case, this guide notably allows the use of "standardised" pumps. The **purchaser** then benefits from the advantages of series production, reduced procurement times, wider ranging experience and lower costs. However the **purchaser's** attention is drawn to the necessity to check the adequacy of the chosen pump against the functional and installation requirements.

This Guide also covers:

- the gear box (speed increaser or speed reducer), the variable speed drive (hydraulic coupling but not the motor), the turning gear;
- monitoring devices;
- supports of the pump(s) and of the drive and ancillary systems (filters, coolers, lubrication system);
- maintenance tools;
- couplings;
- all the services which enable a complete installation of a pump unit.

This Guide does not cover the drive machine itself (turbine, electrical motor, combustion engine).

*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.
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing.
IEC 60050-191	International electrotechnical vocabulary - Chapter 191 : Dependability and quality of service.
ISO 2548	Centrifugal, mixed flow and axial pumps - Code for acceptance tests - Class C.
ISO 3555	Centrifugal, mixed flow and axial pumps - Code for acceptance tests - Class B.
ISO 1940	Mechanical vibration - Balance quality requirements of rigid rotors - Part 1: Determination of permissible residual unbalance.
ISO 3945	Mechanical vibration of large rotating machines with speed range from 10 to 200 rev/s - Measurement and evaluation of vibration severity in situ.
ISO 2954	Mechanical vibration of rotating and reciprocating machinery - Requirements for instruments for measuring vibration severity.
ISO 3740	Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards and for the preparation of noise test codes.

3 Definitions

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

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**.
- 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 Bibliography).

3.2 Technical terms

The technical terms for pumps are defined in "EUROPUMP TERMINOLOGY" (edited by the European Committee of Pump Manufacturers).

Any technical terms not defined there should be defined in the specification.

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.
- 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 60050 - 191.
- 3.3.11 reliability:** As defined in IEC 6050 - 191.
- 3.3.12 maintainability:** As defined in IEC 60050 - 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 pump type (either axial, mixed or centrifugal pump, horizontal or vertical shaft);
- the number of pumps (for any particular application);
- the type of drive.

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.

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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 or auxiliary service 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, crange, piping systems, driving equipment, or temporary systems. The **specification** should provide information on the piping and other systems linked to the **equipment**, in particular:

- suction and discharge lines;
- bedplates;
- control and monitoring 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, take-over and final acceptance.

4.9 Equipment identification systems

The **specification** may specify the equipment identification system for use during the operating life of the plant. If applicable to the **project**, a recognised European or international system should be used.

5 Extent of supply

The **specification** should define the extent of supply of all the **equipment**.

This may include:

- design phase:
 - model testing, definition of the protective measures for **equipment** on standby and/or during the on-site installation, studies and development of the procedure for conservation of the **equipment** when the plant is shut down, design studies for the connecting pipelines (inlet, outlet, minimum-flow recirculation, lubrication, cooling, etc.), static and dynamic studies of the support (verification of anchor strength, support block form work and reinforcement drawings for reinforced concrete; or working drawings for metal block construction; modal analysis of the block), thermal shock studies and/or tests, verification of the adequacy of the available NPSH on the suction side of each pump in the different steady state and/or transient operating conditions, the dynamic studies (start-ups, shut-downs, transient modes) and steady state analysis of acoustic or mechanical resonances of the piping systems, the studies (and any experimental validation) on the dynamic behaviour of the machine stators and rotors, the cooling water system surge analysis, the maintenance optimisation studies;
- main equipment:
 - main pump, booster pump, drive machine (turbine or motor), speed increaser, speed reducer, hydraulic coupling, etc.;
- auxiliary equipment:
 - structural steelwork supporting the drive machine, structural steelwork supporting the pumps, base plates, anchors, fixing bolts, couplings, block supporting the pump unit assembly, minimum-flow protection device, shaft sealing system, heating and/or temperature maintaining device, lubrication system, purification system;
- accessories:
 - monitoring and control sensors, instrumentation tappings for the tests (thermowells for temperature measurements, bosses and connections for pressure measurements, etc.), local instrument panels grouping the measuring instruments, connecting pipes (inlet, outlet, connection between booster pump and main pump, minimum-flow recirculation, cooling, lubrication, etc.), pipes and associated valves on the connecting nozzles (isolation, drain, vent, hydraulic balancing, etc.), filters, priming system, thermal insulation, safety covers, access walkways, painting, soundproofing devices, special tools for maintenance, handling rigs (used during initial installation and/or maintenance);
- spare parts:
 - impellers, mechanical seals, bearings, wear rings, gaskets, etc.;
- site activities:
 - transport, off-loading, storage, installation and commissioning;
- tests:
 - works tests, on-site plant and equipment functional/commissioning tests, plant and system **performance** tests;
- documentation:
 - equipment description, operation and maintenance manuals.