

**SLOVENSKI STANDARD**  
**SIST EN 45510-8-1:1999****01-april-1999**

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**Vodilo za nabavo opreme elektrarn –8-1. del: Krmiljenje in instrumentacija**

Guide for procurement of power station equipment - Part 8-1: Control and instrumentation

Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke - Teil 8-1: Leittechnische Einrichtungen

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Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité - Partie 8-1: Contrôle-commande et instrumentation

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25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
27.100	Elektrarne na splošno	Power stations in general

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EUROPEAN STANDARD  
 NORME EUROPÉENNE  
 EUROPÄISCHE NORM

**EN 45510-8-1**

March 1998

ICS 25.040.40; 27.100

Descriptors: electric power stations, inspection devices, control devices, measuring instruments, adjusting systems, purchase, user supplier relations, invitation of tenders, specifications, technical writing

English version

## Guide for procurement of power station equipment - Part 8-1: Control and instrumentation

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité - Partie 8-1: Contrôle-commande et instrumentation

Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke - Teil 8-1: Leittechnische Einrichtungen

This European Standard was approved by CEN/CENELEC on 2 March 1998.

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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 the BSI.*

*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 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<sub>x</sub>) 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<sub>x</sub>) 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*

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*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.*

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

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 September 1998, and conflicting national standards shall be withdrawn at the latest by September 1998.

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.

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## 1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of Control and Instrumentation (C&I) 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:*

- measurement;
- final controlling elements;
- signal transmission and conditioning;
- open loop control;
- closed loop control;
- control rooms;
- control desks and panels;
- alarm systems;
- data analysis and archiving.

*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)*

*EN 29000-3 Quality management and quality assurance standards - Part 3: Guidelines for the application of ISO 9001 to the development, supply and maintenance of software (ISO 9000-3:1991)*

IEC 50 (191) International electrotechnical vocabulary

### 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 Annex A).

#### 3.2 Technical terms

**3.2.1 plant to be controlled :** the complete power plant or power plant sector, machine or component on which the C&I **equipment** is installed for the purposes of providing closed loop control, sequential control, monitoring or other functions.

**3.2.2 individual drive control :** Control acting directly on the final controlling elements, where manual and automatic operation may be implemented. The control contains facilities for protection and release signals.

**3.2.3 operator interface :** General term for the control desks, controls, switches, VDU (visual display unit) screens, touch screens, keypads, light pens, tracker balls etc.

NOTE: Further definitions of technical terms may be found in IEC 50: Chapter 351: Automatic control

#### 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 control valve 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 project may concern:

- C&I for a complete power plant unit or a particular plant sector, machine or component;
- extension of existing C&I;
- replacement or upgrading of existing C&I.

The **specification** should outline in broad terms the extent of supply (see clause 5) and the C&I system architecture (see 10.1.1), e.g. the functions to be automated, the type of **operator interface**, the signal communication technology, etc.

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**

\*\*\*\*\*

This section is used in other Guides, but not in this Guide.

#### 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 provide information on availability of battery supplies and alternative supplies.

The **specification** should provide information on the quality of the electrical supplies to be made available. For AC supplies this should include the following:

- supply voltage variations;
- supply frequency variations;
- high energy transient over-voltage;
- voltage dips and short supply interruptions;
- harmonic and inter-harmonic voltages;
- voltage notches;
- voltage unbalance.

The **specification** should state whether the **supplier** is required to make available any form of electrical supply for uses outside the extent of the C&I system supply. Quality requirements for such supplies should be specified.

The **tender** should provide information on the load to be drawn from the electrical supplies provided. This should include both steady state loads and transient loads such as inrush currents.

The **specification** should define requirements for the operation of the **equipment** for a specified period when one or more of the electrical supplies to it are disturbed or lost. The level of C&I system operation for the different degrees of disturbance may be specified. **Reliability** requirements may be stated.

NOTE: To meet these requirements the **supplier** may have to provide facilities such as Uninterruptible Power Supplies or changeover switches to support supplies in cases of interruption, or filters to remove disturbances. A general requirement is for all equipment to be designed so that interruptions or disturbances which occur in electrical supplies, do not endanger personnel or damage plant.

The **specification** should define the type and capacity of other services for the operation of the **equipment** such as pneumatic and hydraulic supplies. The **specification** should define whether pneumatic or hydraulic supplies will be provided to power the C&I system, or whether any supplies needed should be generated by the **supplier**. The **specification** should provide details on any supplies available, (e.g. measures taken to ensure purity, the supply pressure and its control).

The **specification** should define requirements for the response when pneumatic or hydraulic supplies are interrupted (e.g. failure of compressors or pumps).

#### 4.7 Other interfaces

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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. This can include interfaces with:

- other C&I systems;
- boilers, turbines and other plant;
- high pressure pipework and valves;
- computer systems;
- communication systems;
- electrical equipment.

Signal interchange philosophy and protocols should be defined in detail. Where possible these should be in accordance with internationally accepted standards. The **specification** should also define responsibilities for ensuring compatibility of interface hardware or software, responsibilities for commissioning, etc.

The **specification** should identify information that will be required from the **supplier** on interfaces and identify requirements for cooperation with the **purchaser** or with other **suppliers**.

#### 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.

The **specification** may also define the extent to which the identification system will be applied on labels, in documentation, on operator displays and within computer software and databases.