SLOVENSKI STANDARD
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Vodilo za nabavljanje opreme elektrarn - 2-9. del: Elektriļna oprema - Sistemi polaganja kablov

Guide for procurement of power station equipment - Part 2-9: Electrical equipment - Cabling systems

Leitfaden für die Beschaffung von Ausrüstungen für Kraftwerke - Teil 2-9: Elektrische Ausrüstung - Kabelsysteme

Guide pour l'acquisition d'équipements destinés aux centrales de production d'électricité - Équipements électriques - Partie 2-9: Systèmes de câblage

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ICS:

27.100	Elektrarne na splošno	Power stations in general
29.060.20	Kabli	Cables

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Guide for procurement of power station equipment - Part 2-9: Electrical equipment - Cabling systems

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Foreword

This European Standard takes the form of a recommendation and is therefore entitled a 'Guide'.

This Guide for procurement has been prepared by the CEN/CENELEC TC 2 "CEN/CENELEC Joint Technical Group Power Engineering".

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 45510-2-9 on 2008-04-01.

The following dates were fixed:

– *latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement*	*(dop)*	*2009-04-01*
– *latest date by which the national standards conflicting with the EN have to be withdrawn*	*(dow)*	*2011-04-01*

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 [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_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-SO_x) plant

Part 5-1: Steam turbines
Part 5-2: Gas turbines
Part 5-3: Wind turbines
Part 5-4: Hydraulic turbines, storage pumps and pump-turbines

[1] Under consideration.

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 45510-1:1997 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, or part of a paragraph/sentence, of 'common clauses' are omitted this is indicated by the symbol ***** at the end of the clause.

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

In this Guide, sentences not in italics indicate the additional recommendations to be found in Guides specific to particular **equipment**.

Contents

1 Scope

*This standard gives guidance on writing the technical **specification** for the procurement of **equipment** 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 on **cabling systems** deals with a wide range of activities and may be used for any or all of these activities by selection of the relevant parts e.g.:

- provision of support for cable;
- laying of cable;
- completion of cable ends;

The Guide covers the installation of power cable up to and including 20,8/36 (42) kV and the supply and installation of control and instrumentation cable. The supply of power cable is covered by EN 45510-2-8.

The Guide includes the installation of protective conductor cable for earthing and equipotential bonding up to the **main earthing busbar(s)**, but not the below ground earth-electrode network.

*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

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 (including any amendments) applies.

EN 54	Fire detection and fire alarm systems
EN 45510-2-8	Guide for procurement of power station equipment - Part 2-8: Electrical equipment - Power cables
EN 50085 Series	Cable trunking systems and cable ducting systems for electrical installations
EN 50086-2-4	Conduit systems for cable management - Part 2-4: Particular requirements for conduit systems buried underground
EN 50146	Cable ties for electrical Installations
EN 50262	Cable glands for electrical installations
EN 50266 Series	Common test methods for cables under fire conditions - Test for vertical flame spread of vertically-mounted bunched wires or cables
EN 50386	Bushings up to 1 kV and from 250 A to 5 kA, for liquid filled transformers

EN 60079-14	Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines) (IEC 60079-14)
EN 60228	Conductors of insulated cables (IEC 60228)
EN 60529	Degrees of protection provided by enclosures (IP Code) (IEC 60529)
EN 60584-3	Thermocouples - Part 3: Extension and compensating cables - Tolerances and identification system (IEC 60584-3)
EN 60702-1	Mineral insulated cables and their terminations with a rated voltage not exceeding 750 V - Part 1: Cables (IEC 60702-1)
EN 60794 Series	Optical fibre cables (IEC 60794 Series)
EN 61196-3	Radio frequency cables - Part 3: Sectional specification for coaxial cables for local area networks (IEC 61196-3)
EN 61238-1	Compression and mechanical connectors for power cables for rated voltages up to 36 kV (U_m = 42 kV) - Part 1: Test methods and requirements (IEC 61238-1, mod.)
EN 61386 Series	Cable systems for cable management (IEC 61386 Series)
EN 61537	Cable management - Cable tray systems and cable ladder systems (IEC 61537)
EN ISO 9001	Quality management systems - Requirements (ISO 9001)
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002)
HD 21.3	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 3: Non-sheathed cables for fixed wiring
HD 22.3	Cables of rated voltages up to and including 450/750 V and having cross-linked insulation - Part 3: Heat resistant silicone rubber insulated cables
HD 22.9	Cables of rated voltages up to and including 450/750 V and having cross-linked insulation - Part 9: Single core halogen-free non-sheathed cables for fixed wiring having low emission of smoke
HD 22.15	Cables of rated voltages up to and including 450/750 V and having cross-linked insulation - Part 15: Multicore cables insulated and sheathed with heat resistant silicone rubber
HD 60364-4-41	Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41, mod.)
HD 60364-5-54	Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors (IEC 60364-5-54, mod.)
HD 604	0,6/1 kV and 1,9/3,3 kV power cables with special fire performance for use in power stations
HD 622	Power cables having rated voltages from 3,6/6(7,2) kV up to and including 20,8/36(42) kV with special fire performance for use in power stations
HD 627	Multicore and multipair cable for installation above and below ground
HD 629	Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV
IEC 60050-191	International electrotechnical vocabulary - Chapter 191: Dependability and quality of services
IEC 60050-195	International electrotechnical vocabulary - Chapter 195: Earthing and protection against electric shock
IEC 60050-461	International electrotechnical vocabulary - Chapter 461: Electric cables
IEC 60331 Series	Tests for electric cables under fire conditions - Circuit integrity
IEC 60332-3 Series	Tests on electric cables under fire conditions - Part 3: Test for vertical flame spread of vertically-mounted bunched wires or cables
IEC 61156 Series	Multicore and symmetrical pair/quad cables for digital communications
ISO 834 Series	Fire-resistance tests - Elements of building construction

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 IS0 9000 (see Bibliography).

3.2 Technical terms

3.2.1
cabling system (**equipment** where typed in bold)
assembly of cables, cable accessories, fittings and associated items installed as a single entity

NOTE 1 This is a fixed installation.

NOTE 2 This includes wiring systems provided with additional mechanical protection.

3.2.2
schedule
list, drawing, diagram, plan, sheet or other means of presentation

3.2.3
identification of cable
cable manufacturers' description of cable

NOTE 1 This defines the cable type - rated voltage, materials (using recognised abbreviations), construction, relevant standard, fire test performance (if applicable) and cable size - number of cores and nominal cross-sectional area of conductor.

NOTE 2 This may be the same as the external marking on the cable sheath.

3.2.4
end item (termination point)
electrical equipment, equipment circuit or compartment, cubicle, cabinet, device, enclosure and frames etc, where the ends of scheduled cable are completed

NOTE 1 In this Guide the word equipment, where not printed in bold, refers to electrical equipment being provided under separate contracts or to existing electrical equipment.

NOTE 2 Examples of **end items** are switchboards, rotating electrical machines, electrically operated devices, control equipment, instruments, junction boxes etc.

3.2.5
identification of end item
title or the identifier with an **end item** identification system, of the **end item**

NOTE The identification may be shown on drawings or affixed to the **end item**.

3.2.6
cable identifier
numeric or alphanumeric identification allocated to each scheduled cable

NOTE The identification may be shown on drawings or affixed to the cable.

3.2.7
cable schedule
schedule containing the data that collectively defines each individual cable

NOTE Typically, this may contain the **cable identifier**, cable length, **identification of cable**, **identification of end item** (for both cable ends) and cable manufacturer.

3.2.8
cable scheduling
process of defining the data for each individual cable on the **cable schedule** in accordance with specified design criteria, if any

NOTE Once defined this becomes scheduled cable.

3.2.9
cable route
pathway for cable between **end items**

NOTE This is the space for cable along a **cable management system**.

3.2.10
cable route network
assembly of **cable routes** located in accordance with specified design criteria, if any

3.2.11
cable route identifier
identification allocated to each section, junction or node point in a **cable route network**

NOTE 1 The identification may be shown on drawings or affixed to the **cable management system** or its immediate surroundings.

NOTE 2 The **cable route identifier** may be the **cable identifier** on drawings.

3.2.12
cable route schedule
schedule containing a series of **cable route identifiers** that collectively define the **cable route** for scheduled cable

3.2.13
cable routing
process of defining the data on the **cable route schedule** for scheduled cable in accordance with specified design criteria, if any

NOTE 1 Once defined this becomes routed cable.

NOTE 2 This can provide an estimate of cable length.

3.2.14
cable system
different types and sizes of scheduled cable

3.2.15
cable support
provision of adequate load bearing surface for cable that is free from sharp edges

3.2.16
cable management system
assembly of cable accessories and fittings, building materials, structural steelwork, cable ducts and pipes, ground materials such as sand etc, for **cable support** in accordance with specified design criteria, if any

NOTE 1 **Cable management system** may either support or surround and support cable.

NOTE 2 **Cable support** may be provided in conjunction with a cable retaining devices.

NOTE 3 **Cable management systems** that surround and support also provide mechanical protection.

3.3.17
cable management system schedule
schedule defining the basic types of **cable management system** in the **cable route network**

3.2.18
cable fixing
securing or retaining of cable permanently in position, possibly in a set formation

3.2.19
cable fixing system
assembly of cable, cable accessories and fittings for **cable fixing** to the **cable management system** in accordance with specified design criteria, if any

NOTE This may not apply to **cable management systems** that surround the cable.

3.2.20
cable fixing system schedule
schedule defining the basic types of **cable fixing system** for the **cabling system**

3.2.21
cable entry
entry of cable into **end items** for **cable connection**

3.2.22
cable entry system
assembly of cable, cable accessories, fittings and where applicable protective conductor, for **cable entry** in accordance with specified design criteria, if any

NOTE 1 This may be combined with 3.2.25 as a cable ends system.

NOTE 2 This may not apply to frames, outdoor cable sealing ends, etc.

3.2.23
cable entry system schedule
schedule defining the basic types of **cable entry system** for the **cabling system**

NOTE This may be combined with 3.2.26 as a cable ends system schedule.

3.2.24
cable connection
terminating or jointing of cable core for the purposes of circuit continuity

3.2.25
cable connection system
assembly of cable, cable accessories and fittings for **cable connection** at **end items** in accordance with specified design criteria, if any

NOTE This may be combined with 3.2.22 as a cable ends system.

3.2.26
cable connection system schedule
schedule defining the basic types of **cable connection system** for the **cabling system**

NOTE This may be combined with 3.2.23 as a cable ends system **schedule**.

3.2.27
identification of core
cable manufacturers' identification of cable core

NOTE This is as defined in the standard for the cable.

3.2.28
core identifier
numeric or alphanumeric identification allocated to individual cable cores during circuit design

NOTE The identification may be shown on drawings or affixed to the core.

3.2.29
terminal identifier
identification given to each individual terminal provided for the terminating or jointing of cable core

NOTE The identification may be shown on drawings or affixed to the terminal or its immediate surroundings.

3.2.30
core allocation schedule
schedule defining the positions at **end items** where each individual cable core is terminated or jointed

NOTE 1 Typically, for each **cable identifier** at an **end item**, this relates the **identification of core** to the **terminal identifier** and **core identifier**, if required.
NOTE 2 This may not apply (a) where this information is contained within the **end item** (b) to power cable.

3.2.31
core allocating
process of defining the data on **core allocation schedules** to establish functional circuits through scheduled cable in accordance with specified design criteria, if any

3.2.32
cable junctioning
connection of non-power cable core to the core of other non-power cable or cables

3.2.33
cable junctioning system
enclosures and frames for **cable junctioning** in accordance with specified design criteria, if any

3.2.34
cable junctioning system schedule
schedule defining the basic types and sizes of enclosures and frames for **cable junction** for the **cabling system**

3.2.35
cable jointing
connection of power cable to other power cable or cables

3.2.36
cable jointing system
cable joints and fittings or enclosures for **cable jointing** in accordance with specified design criteria, if any

3.2.37
cable jointing system schedule
schedule defining the basic types and sizes of **cable jointing system** for the **cabling system**

3.2.38
supply factors
factors such as manufacturers' standard lengths, packaging quantities, minimum order quantities, etc.

3.2.39
installation factors
factors such as wastage, measurement uncertainty, accidental damage/breakage, lost items, etc.

3.2.40
supply quantity
quantity delivered to the **supplier** that may include allowance for **supply factors** and **installation factors**

3.2.41
installed quantity
quantity installed by the **supplier**

NOTE This may be a measured or an estimated quantity.

3.2.42
estimate of installed quantity
quantity estimated to be the **installed quantity** made before installation

NOTE This may be determined by either the **purchaser** or the **supplier**.

3.2.43
cable quantities schedule
schedule quantifying the total length of the **cable system** for every routed cable

NOTE 1 This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

NOTE 2 This should include the cable within **end items**.

3.2.44
cable management system quantities schedule
schedule quantifying the total content of the **cable management system schedule** for the **cable route network**

NOTE This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

3.2.45
cable laying quantities schedule
schedule quantifying cable length as a sum of lengths sectionalised according to the **cable management system schedule** for each routed cable

NOTE 1 This may be an **estimate of installed quantity** or an **installed quantity**.

NOTE 2 This may be combined with 3.2.45 as a cable installation quantities schedule.

3.2.46
cable fixing system quantities schedule
schedule quantifying the total content of the **cable fixing schedule** for every routed cable

NOTE 1 This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

NOTE 2 This may be combined with 3.2.44 as a cable installation quantities schedule.

3.2.47
cable entry system quantities schedule
schedule quantifying the total content of the **cable entry system schedule** for every scheduled cable

NOTE 1 This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

NOTE 2 This may be combined with 3.2.47 as a cable ends quantities schedule.

3.2.48
cable connection system quantities schedule
schedule quantifying the total content of the **cable connection system schedule** for every scheduled cable

NOTE 1 This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

NOTE 2 This may be combined with 3.2.46 as a cable ends quantities schedule.

3.2.49
cable junctioning system quantities schedule
schedule quantifying total numbers for the **cable junction schedule** for the **cabling system**

NOTE This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

3.2.50
cable jointing system quantities schedule
schedule quantifying the total content of the **cable jointing system schedule** for the **cabling system**

NOTE This may be a **supply quantity**, **estimate of installed quantity** or an **installed quantity**.

3.2.51
location drawing
drawing, diagram, plan or other means of presentation defining installed position

NOTE 1 Information on type and size may be included, as applicable.

NOTE 2 Location may be shown on general arrangement and layout drawings.

3.2.52
design data
information defining matters relevant to the design of the **cabling system** such as the **cable schedule**

3.2.53
supply data
technical and other information defining matters relevant to supply such as relevant standard, type, size and features, etc.

3.2.54
installation data
information defining matters relevant to installation such as the method of mounting, installation techniques, minor cable accessories, minimum distances, etc.

3.2.55
main earthing busbar
terminal or busbar which is part of the earthing arrangement of an installation and enabling the electric connection of a number of conductors for earthing purposes

[IEC 60050-195-02-33]