

Eskom Group Capital Medupi Power Station Project

Standard:

The Application of KKS Plant Coding

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MEDUPI POWER STATION PROJECT

The Application of KKS Plant Coding

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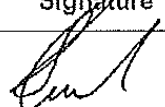
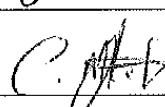
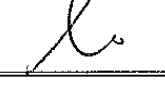
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Document Approval

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Author Approval	Renier Smal CM Consultant		2015/12/09
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Figure 1: Relationship between KKS Documents

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1. INTRODUCTION

1.1 Objectives

The purpose of this Standard is to define KKS coding rules for Eskom's new build Medupi project.

1.2 Scope

This standard is to use the latest KKS code as defined by the VGB, of which Eskom is a member. Thus no deviations from the VGB standards are permitted, and if the VGB codes are not fit for a specific plant type or configuration, Eskom will make application to the relevant VGB Technical Committee for a solution.

In line with the KKS Key Part definitions and the Guidelines as published by the VGB, specific user definable codes and numbering schemes for Eskom use are specified in this Standard.

2. REFERENCES

The latest approved revision of each document applies, unless otherwise specified

2.1 Basis Documents¹

Document Title	Document Number	Revision / Issue Date
[1] Execution Plan	200 5919	Rev 10
[2] Project Quality Plan	200 1679	Rev 6
[3] Development and Change of Medupi QMS Documents	PPZ 200 5665	Rev 7
[4] Document Management Procedure	PPZ 200 1680	Rev 5
[5] KKS Guidelines	VGB-B 105 E	2010
[6] Application Commentaries	VGB-B 106 E – KKS – Part A	2004
[7] Identification in Mechanical Engineering	VGB-B 106 B1 E – KKS – Part B1	2004
[8] Identification in Civil Engineering	VGB-B 106 B2 E – KKS – Part B2	2004
[9] Identification of Electrical and C&I Engineering	VGB-B 106 B3 E – KKS – Part B3	2004
[10] Identification of C&I in Process Systems	VGB-B 106 B4 E – KKS – Part B4	2004

¹Documents that form the basis of the compilation of this document, e.g. Codes, Standards, and Procedures etc.

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2.2 Applicable Documents²

Document Title	Document Number
[11] Medupi Power Station Project Standard Abbreviations	200-5343
[12] KKS Key Part – Fossil Power Station	200-18202
[13] KKS Coding and Labelling	200-3340
[14] Quality Management Systems.	ISO 9001
[15] Guidelines for Configuration Management	ISO 10007
[16] Issuing of KKS Certificate	200-94660

3. ABBREVIATIONS AND DEFINITIONS

3.1 Abbreviations or Acronyms

Abbreviation or Acronym	Description
DA	Design Authority
LDE	Lead Discipline Engineer
LPE	Lead Project Engineer
CM	Configuration Management
IE	Integration Engineer
KKS	Kraftwerk Kennzeichen System – German abbreviation for (Power Plant Classification system)
QMS	Quality Management System
Rev	Revision
QA	Quality Assurance
PSZ	Standard – Document Type
VGB	Technische Vereinigung Der Grosskraftwerks Betreiber E.V (Major Power Plant Users Association)
RACI	Responsible Accountable Consulted Informed
VDSS	Vendor Document Submittal Schedule
kV	Kilovolt
V	Volt
NOD	Notice of Defect
KPA	Key Performance Area
KPI	Key Performance Indicator
LRD	Document type – Document Register
PTZ	Document Type – Template
CE	Electrical quantities according to the KKS Key Part
SPF	Smart Plant Foundation

²Documents referred to in this document that must be read in conjunction with this document and/or providing background or additional information.

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3.2 Definitions

Term	Definition
Key Part	KKS KEY-PART is a Plant Classification system catalogue of KKS codes to be used to classify power plant structures, systems, equipment and components
Process-Related Coding	Process-related identification of systems and items of equipment according to their functions in mechanical, civil, electrical and control and instrumentation engineering
Point of Installation	Identification of points of installation of electrical and control and instrumentation equipment in installation units (e.g. in cabinets, panels, consoles)
Location Code	Identification of locations in structures, on floors and in rooms and also of fire areas
Breakdown Level 0	In Breakdown level 0 power station units, Non-unit-specific plant and extensions are marked within location of a power station
Breakdown Level 1	Classification of systems and plants as per the KKS key part
Breakdown Level 2	Classification of mechanical equipment, electrical, control and instrumentation equipment as per the KKS key part
Breakdown Level 3	Classification of component, signals or signal applications as per the KKS key part

MEDUPI POWER STATION PROJECT**The Application of KKS Plant Coding****4. PLANT CLASSIFICATION SYSTEM (KKS) RULES****4.1 Relationship between KKS Documents**

Figure 2 defines the relationship between the levels of KKS documents:

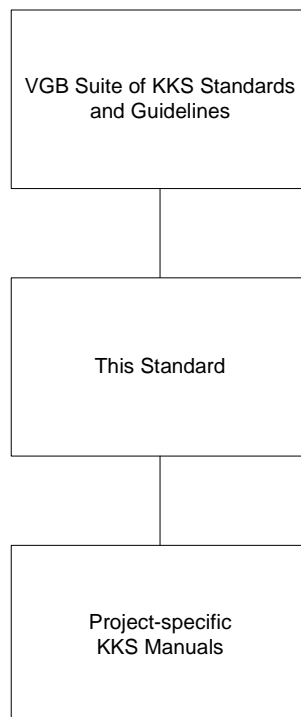


Figure 2: Relationship between KKS Documents

The project-specific KKS manuals shall define the actual allocated KKS schema and counting directions, in accordance with the rules as set out in this Standard for that specific project.

4.2 Coding Rules**4.2.1 Basis for KKS Coding**

Plant shall be coded according to the published KKS Identification System, as defined in VGB publications VGB-B 106 Edition 2004.

The Key Part particularly, shall be adhered to with respect to the alpha character codes for function, equipment and component codes. No deviation shall be permitted, and should the KKS codes as defined by the VGB not suit the particular technology or plant type, Eskom will formally approach the VGB for additions to the Key Part through its links as a member of the VGB.

In some areas, VGB allows the user to define project-specific codes (free for use). For consistency across its fleet, Eskom has defined these codes in Eskom document KKS Key Part – Fossil Power Station - 200-18202. If additional codes are required, these need to be agreed with Eskom.

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4.2.2 Scope of KKS Coding

Each project shall determine the scope of KKS coding upfront in the Definition Phase. As a minimum, all plant shall be coded as follows:

a. **Process-Related Coding**

All plant shall be coded to breakdown level 3.

b. **Point of Installation Code**

Electrical plant (switchgear) shall be coded to breakdown level 2.

c. **Point of Installation Code**

Cables shall be coded according to the format: source equipment KKS code to breakdown level 1, followed by a sequential four-digit number. Refer to paragraph 4.3.6 for an application guideline for cable number codes.

d. **Location Code**

Plant structures may be coded to KKS to level 2, as defined by the project engineering team and the relevant engineering discipline.

4.2.3 Changes to Allocated KKS Codes

KKS codes, once allocated and agreed to in baselines, shall not be reused if cancelled.

4.2.4 Structure of KKS Code

Plant KKS code structure shall be strictly according to the latest VGB standards, rules and guidelines. For reference in this document, the following code identifiers are used:

Breakdown Level	0	1			2			3	
Level Name	Plant Code	System Code			Equipment Unit Code			Component Code	
Code Identifier	G	(F ₀)	F ₁ F ₂ F ₃	F _N	A ₁ A ₂	A _N	A ₃	B ₁ B ₂	B _N
Code Format	A/N	N	A A A	N N	A A	N N N	A	A A	N N

The KKS codes are identified by a Prefix Symbol in front of the Level 0 codes as follows:

Process-related identification: symbol '='

Point of Installation identification: symbol '+'

Location identification: symbol '+'.

The KKS codes on documentation may be truncated only at full breakdown levels, to denote a whole system, an equipment unit or a component.

4.2.5 Coordinates

The coordinate zero point and plant coordinate system shall be determined specifically for each project by the Plant Lead/Integration Engineer.

4.2.6 Counting Direction Priorities

The order of priority in counting for code F_N for equipment within boiler and turbine islands is as follows:

1. Process flow direction of the medium (water, steam, oil, coal).

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2. Horizontal primary direction is Left to Right.
3. Horizontal secondary direction is Front to Rear.
4. Vertical direction is Bottom to Top.

Priority for counting code shall be F_N for auxiliary, LP services, water treatment plant and materials handling shall be:

1. Process flow direction of the medium (water, steam, oil, coal).
2. Horizontal primary direction is West to East.
3. Horizontal secondary direction is South to North.
4. Vertical direction is Bottom to Top.

4.2.7 Determining the Left and Right Side of Plant

In the Boiler Plant: face the boiler, with your back to the turbine.

In the Turbine Plant: stand at High Pressure turbine end, looking down the shaft.

4.3 Counting Rules

4.3.1 Breakdown Level 0

The position G defines common plant or unit numbers:

$G = 0$ for any common plant

$G = 1$ N indicating plant Unit Number (For power plant generating plant, a 'Unit' is defined as an entity that can be independently connected to the grid for purposes of power generation.)

Counting direction priority shall be determined individually for each power plant.

4.3.2 Breakdown Level 1

F_0 is only used if there more than one major plant sections within a unit, e.g. two turbines within one unit, or an east and west plant for common plant. Otherwise this position is coded as 0 (zero), thus Unit 1 will be coded 1 0 (corresponding to $G F_0$).

Code positions $F_1 F_2 F_3$ shall identify the plant system as per KKS Key Part.

Code F_N numbering shall generally follow a decade counting scheme, such as 10, 20, 30 for each major process segment in process flow direction (refer to paragraph 4.2.6).

Parallel streams per segment shall then be coded within the segment decade, e.g. 21, 22, 23

4.3.3 Breakdown Level 2

Code positions $A_1 A_2$ shall identify the plant equipment unit as per KKS Key Part.

Code A_N numbering shall in general start with 001, increasing in ones, tens or hundreds.

Code A_N numbering shall follow the rules for counting for the following specific equipment type groups:

Equipment Unit code where $A1 = AA$ (Valve, damper, etc.)

- 001-099 Analogue Control valve
- 101-199 Valve with electrical actuator (binary)

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201-299	Valve with pneumatic, hydraulic or solenoid actuator (binary)
301-399	First isolating valves for measuring devices at the tapping point
401-499	Drain and vent valve
501-599	Hand operated valve (except the valve referred to 301-399 and 401-499)
601-699	Mechanically operated valve (except the valve referred to 301-399 and 401-499)

Equipment Unit code where A1 = C* (Pressure, level, position, etc.)

001-099	Analogue remote measurement
301-399	Binary remote measurement
401-499	Test and adjustment measuring point
501-599	Local measurement
601-699	Temporary measuring circuit
901-999	Combined measuring circuit

Exception:

For electrical measurement 'CE', the following rule is valid:

101-199	Voltage measurement
201-299	Current measurement
301-399	Frequency measurement
401-499	Megawatt
501-599	Mega volt amp reactive
601-699	Kilowatt hour
701-799	Kilovolt amp reactive hour
801-899	Power factor

4.3.4 Rule for Code Position A₃

Code Position A₃ may be used for electrical and C&I equipment to denote additional information as per the VGB Guidelines. If not used, this position shall remain blank. Project-specific codes used shall be defined in the Project KKS Manual.

4.3.5 Rule for Code Position B₁B₂ and B_N

The alphabetic codes shall be applied as per the KKS Guidelines and Key Part

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4.3.6 Coding Rules for Cables

The VGB standard of numbering cables shall be used, where Level 1 is coded according to the source, followed by a four-digit counting number. For bidirectional cables, the KKS code of the source or destination which is the earlier in the alphabet of the two termination points, shall be used.

CABLE NUMBERS COUNTING RULES

0001 - 0999 = Power cables > 1 kV

1001 - 1999 = Power cables < or = 1 kV

2001 - 3999 = Process cables > 60 V

4001 - 9999 = Process cables < or = 60 V

To ensure that cable numbers are not duplicated, an additional classification is required. This consists of four alpha characters, the first two (BB) identifying the F₁ and F₂ functions of the destination of the cable, and the second two (CC) identifying the contractor responsible for the design of the cable.

For example: N NAAANNNN BB CC

4.4 Plant Descriptions

The Rules and guidelines to plant descriptions can be found in the KKS coding and labelling standard (200-3340).

5. QUALITY RECORDS

The following quality records are utilised to record necessary process data required to verify process conformity:

- Comments made during the design review workflow in SPF
- NOD Report
- KKS Certificate
- Medupi Punch List

The revision status of Medupi project Quality Record templates is defined in the Medupi QMS Index LRD 200 – 47329 maintained by Medupi Quality Dept.

Retention and storage of records generated as a result of this document shall follow the process defined in the Procedure 200-1681 “Control of Records”.

6. QUALITY ASSURANCE & GOVERNANCE PROVISIONS

6.1 Training Requirements

The responsible Design authority as stipulated in the contract per package, CM employees, LPE/LDE and IE must ensure competent staff allocates and integrate KKS coding through designs.

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6.2 Stakeholders

The following stakeholder personnel were consulted during development of this standard document.

Name	Position
Riem de Beer	Project Engineering Manager
Renier Smal	CM Consultant
Chuma Mketo	LPE