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REV.	DESCRIÇÃO	DATA	PROJ.	EXEC.	VERIF.	APROV.
1	Para aplicação	29/04/19	RRS	RRS	GKT	MIS
0	Para aprovação	15/03/19	RRS	RRS	GKT	MIS

ENEVA

PARNAIBA V – BOTTOMING CYCLE

CLIENTE Nº 12-5-00-PRO-GG-0000-001

TECHINT ENGENHARIA E CONSTRUÇÃO S.A.

GENERAL

KKS APPLICATION

TECHNICAL PROCEDURE

6950-TBRA-G-PR-100-001

ESC.: N/A | JOB: N/A

1 REVISÃO

1. PURPOSE

The purpose of this technical specification is to define the coding methodology for the identification of systems, equipment, components, instruments and signals, according to their task, type and location in the plant. The coding methodology to be used in the project "Parnaíba V" will be the Identification System for Power Plants KKS (Kraftwerk-Kennzeichen-System), based on the VGB standards.

2. REFERENCES

The following document and standards were used to develop this technical specification:

- VGB-S-811-01-2018-01-EN – KKS – Identification system for Power Stations – Guideline for Application and Key Part – 8th Edition 2018.
- VGB-B106E – KKS Identification System for Power Plants – Application Explanations Part A and Part B – Edition 2004.
- 12-0-00-PGL-GG-0000-005-3 – Project procedures – KKS Aplication.

3. FORMAT OF IDENTIFICATION CODE

3.1 Type of Code and Breakdown Levels

The KKS identification system has three different types of code:

- **Process – related code:** identification of systems and items of equipment according to their functions in mechanical, civil, electrical and control and instrumentation engineering.
- **Point of installation code:** identification of point of installation of electrical and control and instrumentation devices in installation units (e.g. cabinets, panels, consoles, etc)
- **Location code:** identification of locations in structures, on floors and in rooms and also of fire areas and topographical stipulations (surface area grid)

These three types of code use the same identification scheme, which is subdivided into four breakdown levels. Each breakdown level will have a different meaning according to the type of code in use.

3.2 Identification Code - Format of Breakdown Levels

The format of the four breakdown levels is shown in the Table 3.2-1.

Serial n° of breakdown level	0	1			2			3	
Process related identification	Total Plant	System Code			Equipment Unit			Component Code	
Point of installation identification	Total Plant	Installation Unit code			Installation space Code				
Location identification	Total Plant	Structure Code			Room Code				
Designation of data character	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
Type of data character	A or N	N	AAA	NN	AA	NNN	A	AA	NN (N)

Table 3.2-1: Format of breakdown levels

Where:

A= Alpha characters (Roman letters except I and O, and special symbols). These alpha characters have a classifying function according the breakdown level that they belong (systems, equipment and components).

N= Numerical characters (Arabic numerals). These numerical characters have a numbering function according the breakdown level that they belong. In order to define them, the following principles apply:

- As a rule numbering starts a new when one of the preceding code elements changes.
- Numbering may be consecutive or grouping.
- Numbering need not to be continuous.
- Numbering conventions, once established, may not be altered, not even in the event of changes made in the progress of planning.
- Leading zeros must be written.
- An application –specific scheme of numbering- may be established. However, such schemes may not have the effect of reserving numbers in other applications, not even within the same engineering discipline.

In following sections a description of each breakdown level will be made for each type of code mentioned previously.

3.3 Identification Code - Representation

Code can be written in one, two or three lines, as it is presented below. If KKS is shown in one line, empty field(s) shall not be left. E.g.: **21LAB10AA001**

When the KKS-code is written in more than one line, KKS code must be written as shown below:

Breakdown levels 0 and 1	**21LAB10**
Breakdown level 2	**AA001**

Breakdown levels 0 and 1	**21LBA10**
Breakdown levels 2	**AA001**
Breakdown level 3	**XB01**

3.4 Coordinates, countable directions and priorities

The coordinates are defined as follow. The coordinate origin of the block 1 is in the center of the gas turbine chimney of the GT12. The Gauss-Krueger coordinates for the zero point are:

- Right value: 1138.500 (East)
- Left value: 1452.075 (North)

The coordinate system of the block 1 is rotated with respect to the GC-system by 63°.

The orientations have:

- Positive general direction: from north to south.
- Positive side direction: from east to west.
- Positive geodetic direction: from bottom to top.

The following applies to the priority in the census:

In process engineering the identification is counted in the flow direction.

Systems arranged in parallel and in civil areas the identification follows the order:

- general direction
- side direction
- geodetic direction.

4. PROCESS – RELATED CODE

4.1 Breakdown level 0 – Total Plant

For “Parnaíba V” power plant, character G will be defined as follow:

- 0 = Used to identify subsystems, equipment, components, instruments and signals (located in common areas of Parnaíba Complex) that are common for all systems and several blocks. E.g.: Clarified Water Treatment Plant.
- 2 = Used to identify subsystems, equipment, components, instruments and signals located in the power block #2 (GT21 and GT22).
- 3 = Used to identify subsystems, equipment, components, instruments and signals located in the power block #3 (GT31 and GT32).

For additional information see Annex 1.

Note: An exception of this classification criteria will be made for the cooling tower equipment, due to this equipment is located both in power blocks 2 and 3. This exception is made in order to use a unique "Total Plant Character (G)" for this whole equipment.

4.2 Breakdown level 1 – System Code

F_0 – Prefix number for system code: Numbering of similar systems and plants in the parts of a power station identified on breakdown level 0. This character could take the following values according the plant part which it represents.

For “Parnaíba V” power plant, character F_0 will be defined as it is shown in Table 4.2-1.

Systems, Subsystems, equipment.	F_0
Common system in the same Block	0
Common system for Block installed outside of Block area	0
GT1, HRSG1 and auxiliaries of each Block	1
GT2, HRSG2 and auxiliaries of each Block	2
ST and auxiliaries of each Block	8

Table 4.2-1: Prefix number for system code

For additional information see Annex 1.

F_1, F_2, F_3 – System classification: Classification of systems and plants as per KKS key. Coding letters and designations of the main groups F1 as given in the Function Key:

A – Grid and distribution system
B – Power transmission and auxiliary power supply
C – Instrumentation and control equipment
D – Instrumentation and control equipment (for use only when the function keys CM to CT are insufficient for the identification)
E – Conventional fuel supply and residues disposal
G – Water supply and disposal
H – Conventional heat generation
L – Water, steam, gas cycle
M – Main machine set
P – Cooling water system
Q – Auxiliary system
U – Structure
X – Heavy machinery
Z – Workshop and office equipment

The subdivisions in F2 and F3 are given in the applicable Function Key. For further information see document VGB-S-811-01-2018-01-EN – KKS Identification System for power Stations – Guideline for Application and Key Part.

F_N – System numbering: Numbering subdivision of systems and plants into subsystems and sections of plants. The number sequences in the system code shall preferable be established in decade jumps (beginning with 10), to have an expansion margin if necessary.

4.3 Breakdown level 2 – Equipment Code

A_1A_2 – Equipment Unit Classification: Classification of mechanical equipment, electrical and control and instrumentation equipment as per KKS Key.

Coding letters and designations of the main groups A1, as given in the Equipment Unit Key:

A – Mechanical equipment
B – Mechanical equipment
C – Direct measuring circuit
D – Closed-loop control circuit

E – Analog and binary signal conditioning
F – Indirect measuring circuit
G – Electrical equipment
H – Subassembly of main and heavy machinery
The subdivisions in A2 are given in the applicable Equipment Unit Key. For further information see document VGB-S-811-01-2018-01-EN – KKS Identification System for power Stations – Guideline for Application and Key Part.

A_N – Equipment Unit Numbering: Numbering of mechanical equipment, electrical and control and instrumentation equipment.

The counting of units who are in serie is in the flow direction. The counting in the equipment unit classification should preferably start with 001.

See Annex 3, for the equipment code counting range.

A_3 – Additional Code (Optional): Additional code letter for unambiguous coding.

Use of A3 character in electrical and instrumentation and control in multi speed drives: Drive control function for reversible or multi-speed drives, each having two drive control functions or require two slots in the substation, shall be differed in the breakdown level 2 in the data character A_3.

Direction of rotation	*the data character A_3*
Right	R
Left	L
Speed of rotation	*the data character A_3*
n_1 (slow)	S
n_2 (fast)	F

4.4 Breakdown level 3 – Component Code

Level 3 is used mainly in I&C engineering to define signals origins or applications which interface with DCS and in mechanical engineering to subdivide equipment units into separate components.

B_1B_2 – Component classification: Classification of components, signals or signal application as per KKS key.

Coding letters and designations of main groups B1:

K – Mechanical components
M – Mechanical components
Q – Control and instrumentation components (non-electrical)
X – Signal origins
Y – Signal applications
Z – Gated signals

The coding letters and the associated designations for subgroup B2 are given in the applicable Component Key, see Annex 2.

B_N – Component numbering: Numbering of components, signals or signal application.

5. LOCATION IDENTIFICATION

5.1 Breakdown level 0 – Total Plant:

G definition idem as described for Process – related code.

5.2 Breakdown level 1 – Structure Code:

F_0 – Prefix number for structure code: idem described in process – related code.

F_1, F_2, F_3 – Structure classification: Classifying subdivision of structures as per KKS key. Main group F_1=U. The subdivisions in F2 and F3 are given in the applicable Function Key. For further information see document VGB-S-811-01-2018-01-EN – KKS Identification System for power Stations – Guideline for Application and Key Part.

F_N – Floor numbering: Numbering subdivision of structures into floors, storeys, platforms, elevations, etc. Numbering maust be made according information shown in Table 5.2-1.

F_N	Level	
Floor	from (m)	to (m)
00	-10,00	-9,01
01	-9,00	-8,01
...	...	...
09	-1,00	-0,01
10	0,00	0,99
11	1,00	1,99
12	2,00	2,99
...		
20	10,00	10,99
21	11,00	11,99
...	...	...
30	20,00	20,99
31	21,00	21,99
...	...	...
91	81,00	81,99
92	82,00	83,99
93	84,00	85,99
94	86,00	89,99
95	90,00	91,99
96	92,00	93,99
97	94,00	95,99
98	96,00	98,99
99	>=99,00	

Table 5.2-1: Prefix number for system code

5.3 Breakdown level 2 – Room Code

The room code serves to identify physically separate and fictitious rooms in structures and in the outdoor area.

A_1A_2 – Room Classification: identification of room and fire areas.

A_1: R (for room)

A_2: remain “blank”

A_N – Room Numbering: Physically separate rooms in structures are usually identified by numbering, whereas grid squares in the outdoor area by coordinates. Fictitious rooms in structures may be identified by numbering or coordinate systems.

Room numbering follows the order:

- general direction: from North to South
- side direction: from East to West
- geodetic direction: from bottom to top

A_3 – Additional Code: Additional features for field grid (if necessary).

6. CODING RULES FOR ELECTRICAL EQUIPMENT

6.1 Identification of the main equipment in the power island

The identification of the main electrical equipment is carried out using process-related code. In general, the "Function keys" (breakdown level 2) - in addition to breakdown level 1 - are enough for an unambiguous identification.

The "Function keys" for the main electrical devices are shown below.

6.1.1 IPB – Isolated Phase Bus

- F1F2F3 = BBA
- FN = 10.. 20.. (used to identify different sections of it)

6.1.2 GSU - Generator Step-Up transformer

- F1F2F3 = BAT
- FN = 10 (unique value)

6.1.3 UAT – Unit Auxiliary Transformer

- F1F2F3 = BBT
- FN = 10 (unique value)

6.1.4 Other (LV) power transformers

In this case, the "Function key" depends on the "Type of system" and what is the transformer is feeding. The table below shows the "Function key" assigned in each case.

Type of power system / Feeding a	Normal & general purpose		Emergency & UPS & DC	
	F1 F2 F3	FN	F1 F2 F3	FN
LV SWG	BFT	10.. 20..	N/A	N/A
LV MCC	N/A	N/A	N/A	N/A
LV Panelboard	BLT	10.. 20..	BNT	10.. 20..

6.1.5 CTs & VTs

CTs & VTs require the use of “Equipment Units Keys” and “Component Keys” (breakdown levels 2 & 3) for their identification. Complete process-related code is shown below.

- F1F2F3 & FN = Associated equipment “Function key”
- A1A2 = CE
- AN = 001.. 002.. (for each group of 3 CTs); project-specific basis
- AN = 101.. 102.. (for each group of 3 VTs); project-specific basis
- A3 = Optional if it’s necessary to identify *measuring circuits sharing one sensor*
- B1B2 = -T
- BN = 10 for phase R; 20 for phase S; 30 for phase T; project-specific basis

Note: For multi-core CTs & VTs, the second digit of BN may be used to identify each core.

6.1.6 GCB – Generator Circuit Breaker (52G)

- F1F2F3 = BAC
- FN = 10 (unique value)

6.1.7 Control & Protection (C&P) Panels

6.1.7.1 C&P Panels for GSU (Generator Step-Up) & MKA (Generator itself)

- F1F2F3 = BAY
- FN = 10.. 20..

6.1.7.2 C&P Panels for UAT (Unit Auxiliary Transformer)

- F1F2F3 = BBY
- FN = 10.. 20..

6.1.8 Distribution Boards

In this case, the “Function key” depends on the “Type of system” and the “Board type”. The table below shows the “Function key” assigned in each case.

Type of power system / Board type	Normal & general purpose		Emergency		UPS		DC	
	F1 F2 F3	FN	F1 F2 F3	FN	F1 F2 F3	FN	F1 F2 F3	FN
MV SWG	BBA..	*	Not used	*	Not used	*	Not used	*
LV SWG	BFA..	*	BMC	*	Not used	*	Not used	*
LV MCC	BJA..	*	BMB BMD	*	Not used	*	Not used	*
LV Panelboard	BLA..	*	BNA	*	BRA..	*	BUA..	*

* In all type of distribution boards, FN is used to identify different boards from each other. The number sequences is established in decade jumps (beginning with 10).

6.1.9 MV VFDs

- F1F2F3 = BPA / BPB; *project-specific basis*
- FN = 10.. 20..

6.1.10 LV VFDs

- F1F2F3 = BPC / BPD; *project-specific basis*
- FN = 10.. 20..

6.1.11 UPS & DC systems

6.1.11.1 Inverter

- F1F2F3 = BRU
- FN = 10.. 20..

6.1.11.2 Battery

- F1F2F3 = BTA
- FN = 10.. 20..

6.1.11.3 Rectifier/Battery Charger

- F1F2F3 = BTL
- FN = 10.. 20..

6.2 Identification of the main equipment in the 500kV Switchyard

See title 7.3.9

6.3 Identification of power and control cables

Identification of power and I&C cables is carried out using the following scheme:

Cable TAG = "Function key" (mandatory) + "Equipment unit key" (optional) + "Component key" (optional) + Numbering element

The numbering element to be used in each case is indicated in the table below:

Numbering element	To be used for
0001 to 0999	MV power cables (>1kV)
1001 to 1999	LV power cables
2001 to 2999	Control cables for interlocks (>60V)
3001 to 3999	Control cables for CTs & VTs (secondary)
4001 to 4999	RTDs
5001 to 5999	Thermocouples
6001 to 6999	Analog signals
7001 to 7999	Digital signals
8001 to 8999	Communication
9001 to 9999	FO

6.4 Identification of junction boxes

Identification of power and control (other than I&C) junction boxes is carried out using "Function keys" and "Equipment Units Keys" (breakdown levels 1 & 2) for their identification.

Complete process-related code is shown below:

Function Key	Function numbering	Equipment Unit Key	Equipment Unit numbering
F1F2F3	FN	A1A2	AN
Associated equipment "Function key"	Associated equipment "Function numbering"	*GA> used by I&C* GC> for 'control' Junction boxes (other than I&C) *GD> used by I&C* GE> for power junction boxes *GF> used by I&C* GH> for functional units on SWG/MCC (any type) GP> for lighting junction boxes GQ> for receptables/sockets junction boxes	001 to 999 used for numbering

6.5 Identification of "Components"

Identification of components belonging to the main electrical equipment is carried out using "Equipment unit keys" and "Component keys" (breakdown level 2 & 3).

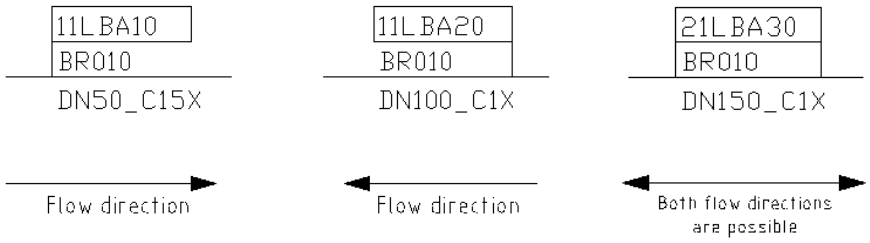
See "Component *Key for Electrical Equipment*" in Annex 2.

7. CODING RULES FOR PIPING & INSTRUMENTATION DIAGRAMS

7.1 Identification of piping systems

7.1.1 Symbol Use

Identification of the piping systems is carried out using “flags”. The direction of the “flag” shows the flow direction inside the pipe. The flag shall contain the Breakdown level 0 and 1 in the top line and the Breakdown Level 2 in the bottom line. Beneath the flag and in the opposite side of the line which represents the pipe, the nominal diameter, piping specification and insulation type will be shown.



Picture 7.1-1: Identification of piping systems

The letter X represents the type of insulation, which could be:

- P: Personnel protection
- H: Heat conservation

7.1.2 Delimitation of KKS Sections

Delimitation of a system identification in the breakdown level 1 is represented by a pin with empty pinhead. On the other hand delimitation of a system identification in the breakdown level 2 is represented with a pin with full pinhead.

Delimitation of breakdown level 1 Delimitation of breakdown level 2

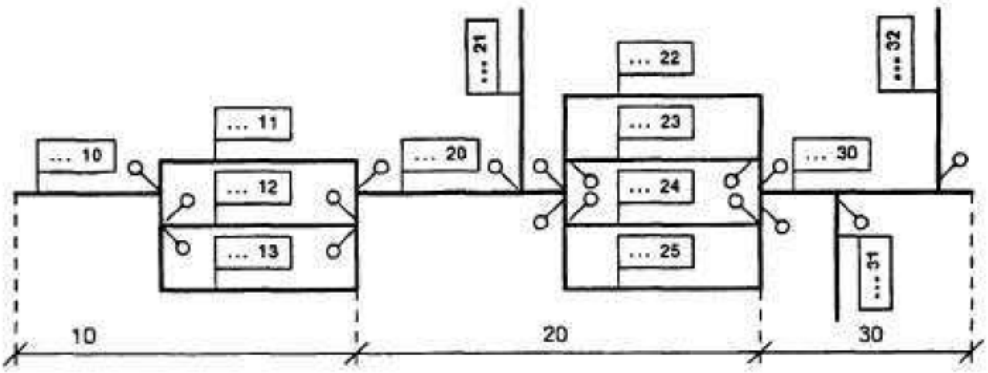
Picture 7.1-2: Delimitation of KKS sections

For clear representation of the coding sections it has to be ensured that the pins are not situated directly at the branching or junction point but close to it at the concerned line. For additional information of when to use each kind of delimiter see section “piping numbering”.

7.1.3 Piping numbering

Main lines should be numbered on level 1 in position FN by multiple of ten, beginning at 10, next 20, 30 and so on (decadic numbering).

If a main line is divided into several lines in a parallel pattern, these are classified starting with the unit of ten of the main line, e.g. if main line is 20, its branches will be marked 21, 22, 23, etc. It is recommended not to apply all succeeding numbers but to leave several free for a future use, e.g. 21, 23, 25, etc, as can be seen in Picture 7.1-3.



Picture 7.1-3: Decadic numbering example.

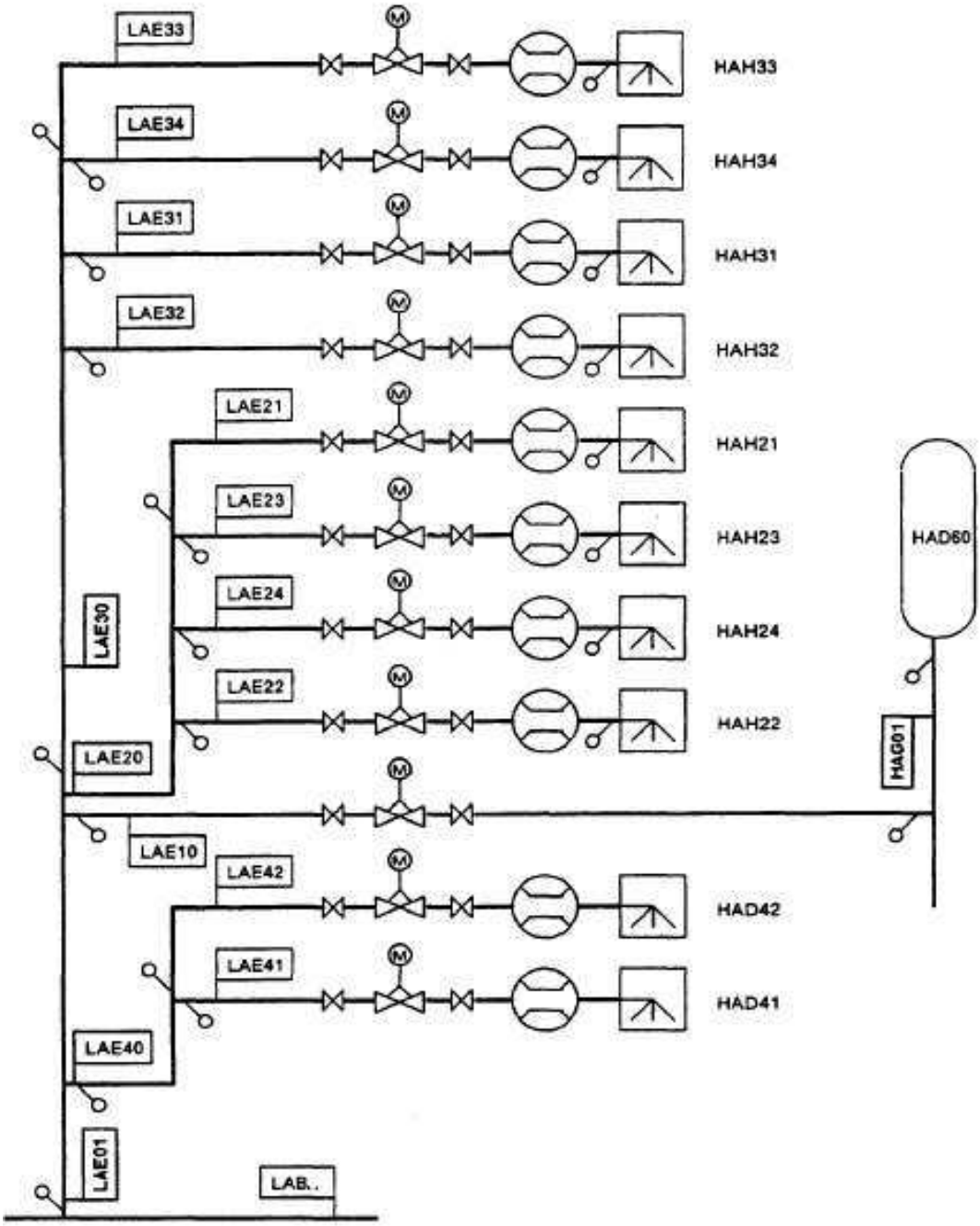
For parallel lines, codification ending with zero has to be avoided, so that the existence of another parallel line with the same function can be indicated. If two parallel lines are connecting, the numbering should be changed to the immediate next unit of ten.

The numbering of different main pipe branches is connected with position FN, which value is increasing by tens or if there are not enough possibilities, by fives or by twos. It is recommended to start using the unit of ten of the main line as a start point, and continue numbering following the flow direction, as it is shown in Picture 7.1-4.

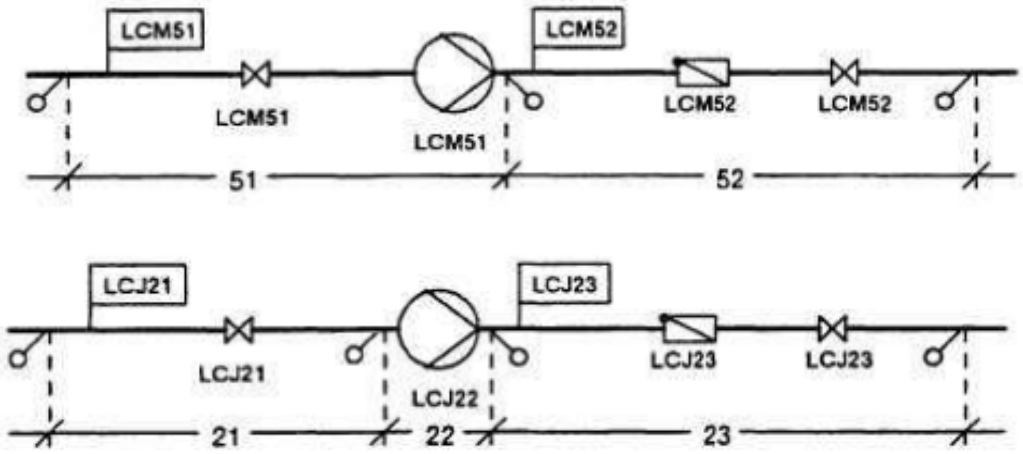
If significant changes of parameters are occurring in flow, e.g. pumping, compression, heating or cooling, the line shall be numbered (F_N) in ascending order with the direction of flow. As an example Picture 7.1-5 shows two numbering alternatives for a pumping system.

The numbering of different secondary pipe branches, valve bypass arrangements, piping

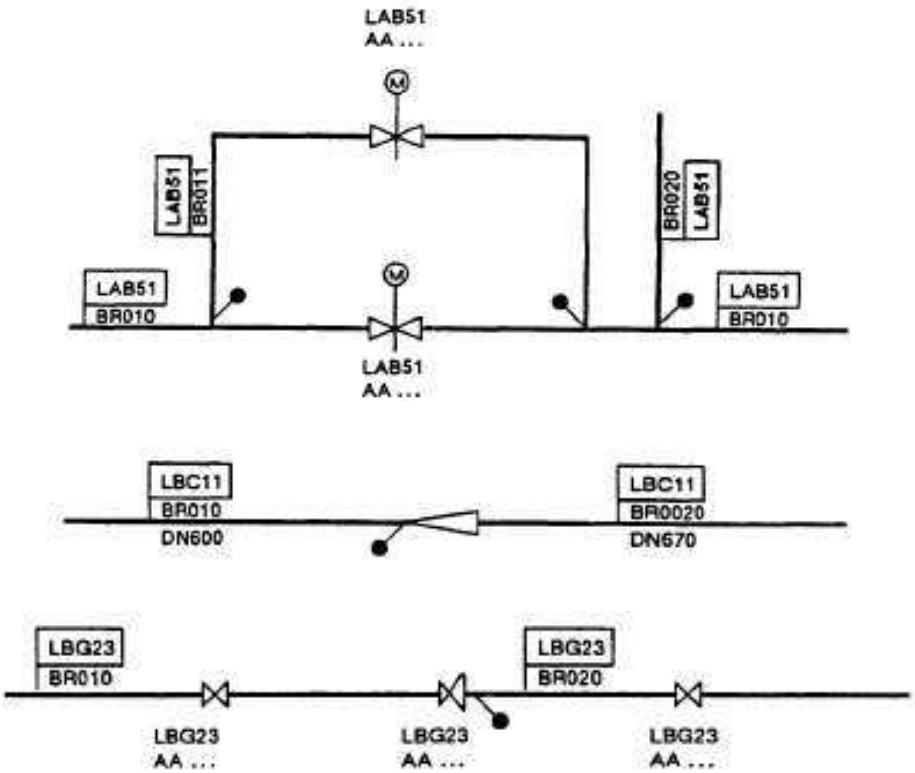
after a reduction or an expansion, piping after reducing valves (if and when there are no changes in design conditions) is connected with position A_N, which value is increasing according to table shown in Annex 3.



Picture 7.1-4: Main pipe branches numbering example.



Picture 7.1-5: Numbering of pumping system.



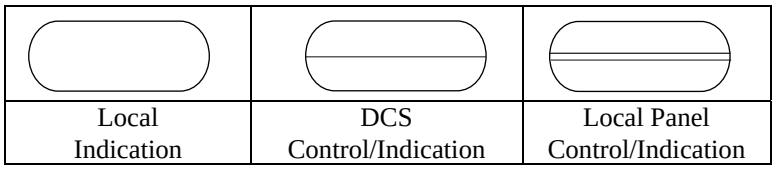
Picture 7.1-6: Numbering of pumping subsystem.

For additional references see Part B1 of standard VGB-B106E – KKS Identification System for Power Plants – Application Explanations Part A and Part B – Edition 2004.

7.2 Identification of Instrumentation and control

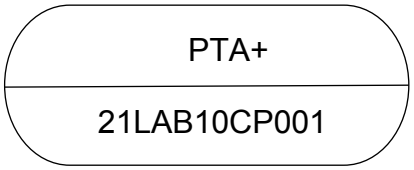
7.2.1 Presentation of measuring points in P&ID diagrams

The measurement points are represented by an extended oval thereinafter called measurement circuit, which gives information about the type of control of the instrument: indication, DCS or local panel, as can be seen in Picture 7.2-1.



Picture 7.2-1: Different kind of measurement circuits

In the top line, the instrument identification according to ISA 5.1 standard and the alarm levels are entered. In the bottom line the complete KKS code of the measurement point is shown.



Picture 7.2-2: Information shown in the measurement circuit

Complete KKS code for instrument and control is defined based on the process – related identification, using the appropriate Equipment Unit Code characters. Character A_1 will adopt letter C for measurement points and letter D for control loops. Character A_2 will indicate the type of measured variable (see Annex 2) whereas A_N the corresponding Equipment Unit numbering (see Annex 3).

Alarms indication in the upper part of the measurement circuit will be indicated with a letter A followed by “+” or “-“ for High or Low alarms respectively. In case of several alarm levels they will be indicated as follow:

- High values: + (High), ++ (High High), 3+ (High High High) and so on.
- Low Values: - (Low), - - (Low Low), 3- (Low Low Low) and so on.

Example:

A±A±±A3+ = (High), (High High), (High High High), (Low) and (Low Low)

For additional references see Part B4 of standard VGB-B106E – KKS Identification System for Power Plants – Application Explanations Part A and Part B – Edition 2004.

7.3 Additional miscellaneous coding rules

7.3.1 KKS for pump sump

For pump sumps which are usually not involved in the process engineering the function depends on the room code.

Example: Pump of a pump sump: UHA01 AP001

Associated binary measurement: UHA01 CL201

7.3.2 Protection boxes for measuring equipment

The KKS of boxes for protection of measurements depends on the KKS of the measurement, in the equipment unit code “C-” is replaced by “GH”.

Example: Measurement: LCP10 CP010

Protection box: LCP10 GH010

7.3.3 Emergency stop pushbutton

Example: …GS701

↑ = System code of the location (e.g. control desk) or the unit

7.3.4 Position measurement for valves

Position measurements only get a separate KKS label if they are external and therefore not integrated in the drive.

The KKS of an analogue position measurement is therefore generated by the system code of the valve with “CG” for the data characters A1 and A2 and the AN data character of the valve.

Example: KKS for the valve: …AA007

KKS of the analog position measurement: …CG007

The KKS of limit switches is made up of the system code of the valve, “CG” for the data

characters A1 und A2, the data character AN of the valve and “A”, “C”, “E” for end position OPEN and “B”, “D”, “F” for the end position CLOSED for the data characters A3.

Example: KKS for the valve: …AA007

KKS of the limit switch OPEN: …CG007A/C/E XG11

KKS of the limit switch CLOSED: …CG007B/D/F XG11

7.3.5 Pilot valves

The KKS of pilot valves made up of the system- and equipment unit code of the valve and “A”, “C”, “E” for valves in the “OPEN” direction and “B”, “D”, “F” for valves in the “CLOSED” direction for the data characters A3.

Example: valve: …AANNN

Pilot solenoid valve: …AANNNA

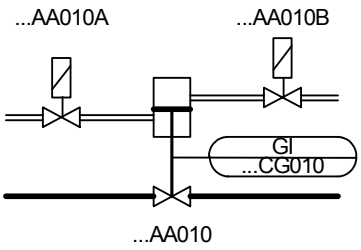


Abb. 2.11: KKS of Pilot valves

7.3.6 Pneumatics equipment, control air supply

Pneumatics equipment and control air supply systems are characterized by an X in the data character F3 of the system code (e.g. 10HSX10). The system code is analogous to the hydraulic systems.

7.3.7 Hydraulic equipment

Hydraulic equipment is characterized by an Y in the data character F3 of the system code (e.g. 10LBY01).

Example:

Valve Hydraulic equipment

LBA01 AA001 LBY01

LBB10 AA001 LBY10

LBC20 AA001 LBY20

7.3.8 Plaintext

As a modification and supplement to the VGB B108 “Rules for the formation of terms and their application in the field of power engineering” it is valid the following:

Plaintext consists of a maximum of 24 characters. In general numbers and upper and lower letters have to be used without umlauts.

Names in plaintext are abbreviated according to the abbreviation list VGB-B107.

Plaintext has to be phrased in a way that its content and the name of the state – regardless of the KKS – fully describe the designated unit or the designated measurement.

The plaintext is in the format of the KKS – starting with the “Total plant”, about the “System code” to the “Equipment unit code” – build. Locations and functions are not use duplicated.

Example:

Wrong: Gypsum silo pump sump sump pump 1

Right: Gypsum silo sump pump 1

State designations “UP” “CLOSE” “ON” “OFF” etc. are not taken in the short text description.

Hyphens are not used.

Arrangement items such as “before” or “behind” should be avoided and better use the terms “suction-side” or “pressure-side”.

Compound words are written without spaces. Individual words are separated by a blank.

7.3.9 Switchyard Equipment Codification – 500kV

According to “KKS APPLICATION" doc. N° 12-0-00-PGL-GG-0000-005:

TRAFO TG22	----	22BAT01	EXISTENT
7TPEZ	----	22ABP01	EXISTENT
7PR	----	22ABW01	PARA-RAIOS TRAFO 22BAT01
789EZ-3	----	22ABB01	EXISTENT
789EZ-3T	----	22ABT01	EXISTENT
789EX-1	----	05ABB11	BOTTOMING
752EX	----	05ABA10	BOTTOMING
7TCEX	----	05ABC10	BOTTOMING
789EX-2	----	05ABB12	BOTTOMING
789EY-1	----	05ABB21	EXISTENT
7TCEY	----	05ABC20	EXISTENT
752EY	----	05ABA20	EXISTENT
789EY-2	----	05ABB22	EXISTENT
789EZ-2	----	05ABB31	EXISTENT
7TCEZ	----	05ABC30	EXISTENT
752EZ	----	05ABA30	EXISTENT
789EZ-1	----	05ABB32	EXISTENT
789EX-3	----	28ABB01	BOTTOMING
789EX-3T	----	28ABT01	BOTTOMING
7PR	----	28ABW01	BOTTOMING
7TPEX	----	28ABP01	BOTTOMING
TRAFO TV 28	----	28BAT01	BOTTOMING
QPC-7EY	----	05ASR20	EXISTENT
QPC1-7EZ	----	05ASR30	EXISTENT

TRAFO TV38	------	38BAT01	BOTTOMING
7TPGZ	------	38ABP01	BOTTOMING
7PR	------	38ABW01	BOTTOMING
789GZ-3	------	38ABB01	BOTTOMING
789GZ-3T	------	38ABT01	BOTTOMING
789GY-1	------	07ABB11	BOTTOMING
7TCGY	------	07ABC10	BOTTOMING
752GY	------	07ABA10	BOTTOMING
789GY-2	------	07ABB12	BOTTOMING
789GZ-2	------	07ABB21	BOTTOMING
7TCGZ	------	07ABC20	BOTTOMING
752GZ	------	07ABA20	BOTTOMING
789GZ-1	------	07ABB22	BOTTOMING

Table 7.3-1: Switchyard equipment codification – 500 kV

7.3.10 Items to be identified according to KKS code in skids/modules

- Module
- Equipment/component (mechanical)
- Drivers (Power, auxiliary and RTD junction boxes if applicable)
- Electrical junction boxes
- Cables
- Instruments
- Instrument junction boxes
- Control panel
- Signals (including control loops and alarms)
- Control valves
- Safety valves
- Piping
- Manual valves
- Drains and vents
- Tie-ins

7.3.11 Items to be identified according to KKS code in Metallic Structure

- Platforms.
- Piping Supports.
- Cable Tray Supports.
- Piperacks Modules.
- Main Buildings.
- (KKS tags shall be by global items (not for parts) and shall be in agree with PIP, ELE and INS discipline)

8. CODING RULES FOR INSTRUMENTS AND CONTROLS

8.1 Instruments and Controls tagging

As is explained in section 7.2, the measurement points shall be represented using a KKS code based on the process – related identification, using the appropriate Equipment Unit Code characters.

Total Plant		System Code						Equipment unit code			
G		F_0	F_1	F_2	F_3	F_N		A_1	A_2	A_N	A_3

Character A_1 = “C” for measurement points or “D” for control loops. Character A_2 will indicate the type of measured variable (see Table below) whereas A_N the corresponding Equipment Unit numbering (see Annex 3).

A_2	Measurement variable
C	Conductivity
D	Density
E	Electrical Variable (Current, Voltage, Power)
F	Flow
G	Distance, lenght, position
K	Time
L	Level
M	Humidity
P	Pressure, vacuum
Q	Quality, Analisys, Chemical Variables
S	Speed, Frequency
T	Temperature
U	Combined Variables
V	Viscosity
W	Weight, Mass
Y	Vibration, Expantion

Example:

Total Plant	System Code					Equipment unit code			
G	F_0	F_1	F_2	F_3	F_N	A_1	A_2	A_N	A_3
2	1	L	B	A	20	C	P	501	

KKS 21LBA20CP501 shall be use for a Pressure Gauge located in System LBA20

8.2 Cables

Cables are defined in Electrical section.

Identification of power and I&C cables is carried out using the following scheme:

Cable TAG = "System code" (mandatory) + "Equipment unit code" (optional) + "Component code" (optional) + Numbering element

Process-related code it will be related to origin of cable (from field to DCS)

Total Plant	System Code					Equipment unit code				Component Code			Numbering Element	
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	NNN	A/N

The numbering element to be used in each case is indicated in the table below:

Numbering element	To be used for
0001 to 0999	MV power cables (>1kV)
1001 to 1999	LV power cables
2001 to 2999	Control cables for interlocks (>60V)
3001 to 3999	Control cables for CTs & VTs (secondary)
4001 to 4999	RTDs
5001 to 5999	Thermocouples
6001 to 6999	Analog signals
7001 to 7999	Digital signals
8001 to 8999	Communication
9001 to 9999	FO

Example:

Cable for instrument 21LBA10CP001 shall be called 21LBA10CP001 6001

Cable for Junction Box 32HNA50GD024 shall be called 32HNA50GA024 7001

8.3 Instrument Junction Boxes

On breakdown level 1, junction boxes receive the code of process – related identification. Exceptions are junction boxes for main machine sets and heavy machinery, and junction boxes in electrical and control and instrumentation cubicles and cabinets; these are identified on breakdown level 1 according to the associated main machine or heavy machine and cubicle or cabinet respectively. On breakdown level 2 junction boxes are identified by means of A1 = G (electrical equipment)

Total Plant		System Code						Equipment unit code			
G		F_0	F_1	F_2	F_3	F_N		A_1	A_2	A_N	A_3

A_1 A_2 (Equipment Classification):

GA - Junction boxes for Analog Signals (AI / AO)

GD - Junction boxes for Discrete Signals (DI / DO)

GF - Junction boxes for Instrumentation Buses (Profibus, Fieldbus,if any)

A_N (correlative numbering)

Power JBs are defined in Electrical section.

8.4 I&C Cabinets

Cabinets for instruments shall be defined in the System Code as follows:

System Code				
F_0	F_1	F_2	F_3	F_N

F_1 F_2 F_3 (System Classification):

CM or CT - General Cabinets for I&C or Electrical Equipment

CRA – DCS Controllers Cabinets

CRB – DCS Remote I/O Cabinets

CRS – DCS Communication Cabinets

CRM – DCS Operator Stations

F_N (correlative numbering)

8.5 Signals

Signals shall be defined by the component code,

Total Plant		System Code						Equipment unit code					Component Code		
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

Equipment unit code will define the equipment from which the signal comes (for instance: “21LAB70CP023” for a pressure transmitter.

Component Code will define the signal type according the following table:

B_1	Definition
X	Signals Origins
Y	Signals Applications
Z	Gated Signals

B_2	Definition	Binary / Analog
A	Automatic Control (group control)	B
B	Individual Control (control interface)	B
C	Closed-loop Control	B
D	** free to use**	
E	** free to use**	
F	** free to use**	
G	Conditioning of Signals from Contacts	B
H	Conditioning of Signals by Limit Value Monitors	B
J	Deriver analog Values	A
K	** free to use**	
L	Control Room and Control Stations	

M	Alarms	
N	Operation and Monitoring	B
P	Operation and Monitoring	A
Q	Analog Signal Conditioning	A
R	** free to use**	
S	Steps for Open Loop Controls (Sequences)	B
T	** free to use**	
U	Gated Signals	A/B
V	Gated Signals	A/B
W	Gated Signals	A/B

For instance, for the on/off valve 32HAC50AA181 the signals involved in this element will be:

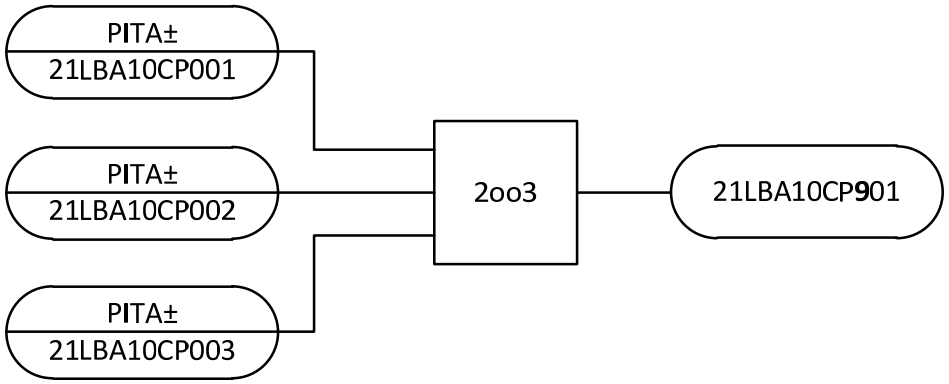
- 32HAC50AA181**XG01** Valve Closed (Status)
- 32HAC50AA181**XG02** Valve Open (Status)
- 32HAC50AA181**YB40** Open Valve (Command)
- 32HAC50AA181**YB50** Close Valve (Command)

More detailed information will be included in the I/O List.

Gated Analog Signals

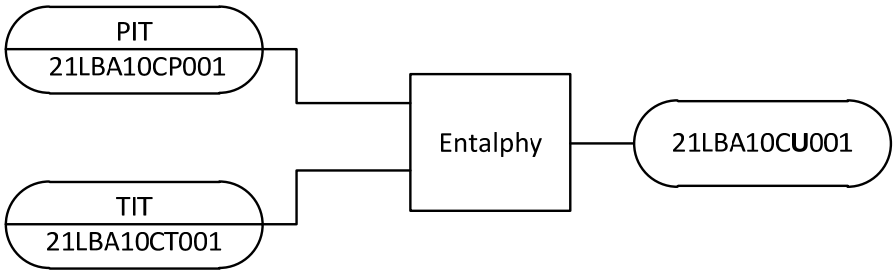
Gated analog signals representing physically similar direct measured variables are identified by means of a set number, e.g. “9”, in the first data character of A_N and retain the code of the physical variable in data character A_2.

For instance, a 2oo3 voting:

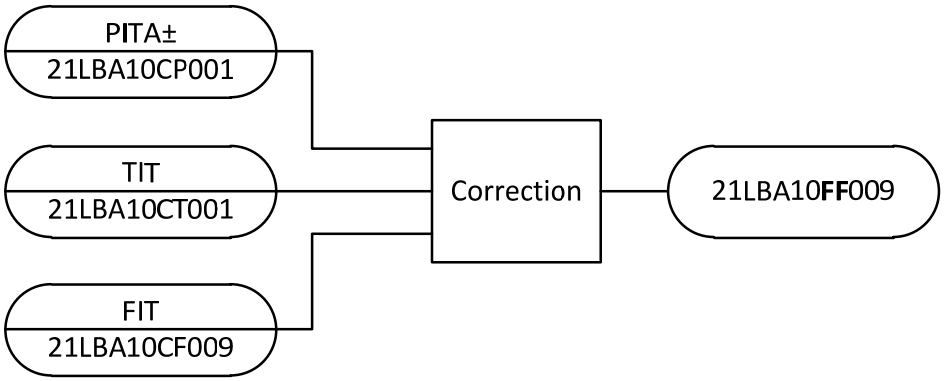


Gated analog signals representing physically dissimilar indirect measured variables are

identified by means of A_2 = U (combined variables) provided the output variable is dimensionless.



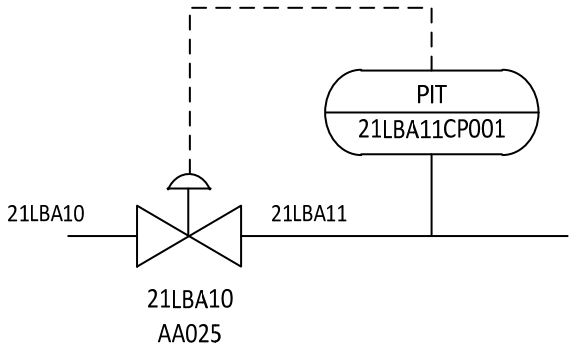
Where measured data are corrected (e.g. flow measurement corrected for pressure and temperature) and if only the corrected measured data are further processed, the codes stay the same as those of the origin measured data in spite of the gating of dissimilar measured data. Where a distinction is to be made between calculated analog data after analog data gating functions and the original measured data, the indirect (calculated) measured variables are identified by means of A_1 = F (indirect measuring circuits). Identification in data character A_2 is governed by the physical variable



8.6 Control Loops

Control loops will be represented in P&ID using a dash line between the final element, which manipulates the manipulated variable and the Process Value element (for instance valve – transmitter). They will be name with character “D” in field A1. A2 will maintain the character for process variable of the loop.

For example:



The following close loop will be name 21LBA11 DP001 because process variable is pressure and comes from the transmitter in system 21LBA11.

Controller SetPoint shall maintain the close loop name: 21LBA11DP001

Valve position (setpoint and feedback) are related to valve, that is way their signal will have the equipment unit code for the valve:

- Valve Position Feedback Signal: 21LBA10AA025**XB21**,
- Valve Position Setpoint: 21LBA10AA025**YB21**

8.7 Interlocks

Interlocks has two main components, the activating element and the resulting element, for instance a pressure switch is the activating element and a pump is the resulting element. Interlocks then, will be represented by the ISA symbol, next to both elements (activating and resulting) with the following identification rule:

I	-	Total Plant	P&ID #	Interlock #

Total Plant is refered to Area, as is used in other KKS tags, P&ID # is Eneva document number of P&ID in which the interlock is showed, and Interlock # is a sequential number used in case more than one interlock is presented in the same P&ID.

8.8 Connections

Connections shall be identified in accordance with DIN 40719 Part 2 by means of a dedicated code unit which is preceded by the prefix symbol ":" (colon). This code unit can be combined with any breakdown level as necessary for identification. Any combination of alpha and

numerical symbols appropriate to the requirements is acceptable for the identification of connections

Connection to Equipment:

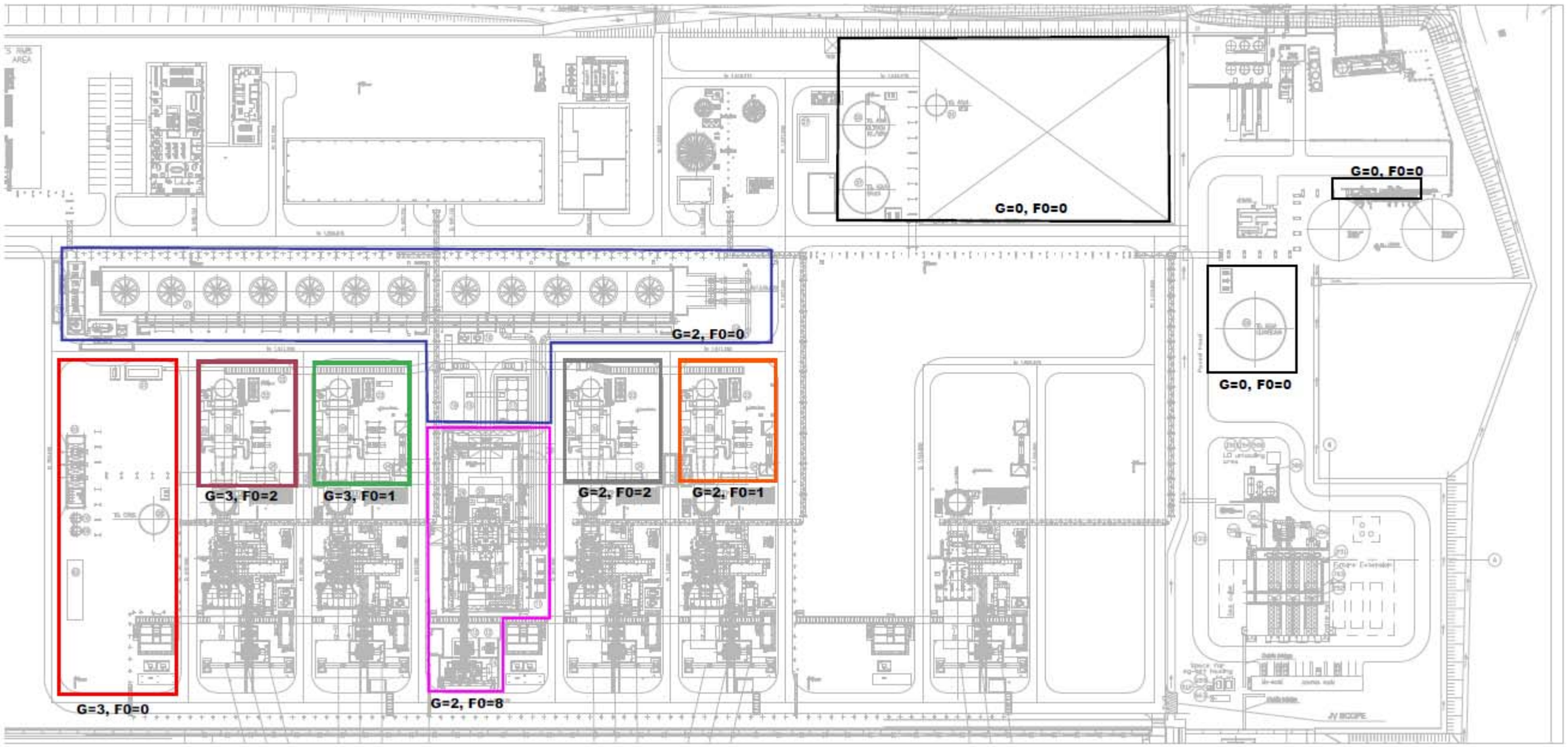
Total Plant	System Code						Equipment unit code						Component Code				:	Connection
G	F_0	F_1	F_2	F_3	F_N		A_1	A_2	A_N			A_3	B_1	B_2	B_N			
A / N	(N)	A	A	A	N	N	A	A	N	N	N	(A)	A	A	N	N	:	A……N

(Component Code is optional)

Connection to JBs:

Total Plant	System Code						Equipment unit code						:	Connection
G	F_0	F_1	F_2	F_3	F_N		A_1	A_2	A_N			A_3		
A / N	(N)	A	A	A	N	N	A	A	N	N	N	(A)	:	A……N

9. Annex 1


G=0, F0=0
G=0, F0=0
G=2, F0=0
G=3, F0=2
G=3, F0=1
G=2, F0=2
G=2, F0=1
G=3, F0=0
G=2, F0=8
JV SCOPE

10. Annex 2

Level 3: B_1 B_2 Component Key for I&C

B_1

X: signal identification to the signal source.
Y: signal identification to the signal destination

B_2

A: Automatic (no automatic operation)
B: Drive control, automatic operation
C: Control (actuator)
G: Binary signal management
H: Limit signals from the analog signal management
J: Control (analog signals)
K: Protection (signals from the protection of the boiler and the turbine)
M: Alarms
Q: Analog data management
R: Control (manual / automatic changeover)
S: Step name in the process control
U: Linked signals, operating automatics

Level 3: B_1 B_2 Component Key for Mechanical Equipments

KP: Pumps
MG: Gearboxes
MK: Clutches, couplings
-M: Motors

Level 3: B_1 B_2 Component Key for Electrical Equipment

-A: Assemblies and subassemblies
-B: Transducers for non-electrical to electrical variables and vice-versa
-C: Capacitors
-D: Binary elements, delay devices, memory devices
-E: Special components
-F: Protective devices
-G: Generators, power supplies
-H: Signaling devices
-K: Relays, contactors
-L: Inductors

-M: Motors
-N: Amplifiers, controllers
-P: Measuring instruments, testing equipment
-Q: Power switchgear
-R: Resistors
-S: Switches, selectors
-T: Transformers
-U: Modulators, convertors from electrical to other electrical variables
-V: Tubes, semiconductors
-W: Transmission paths, waveguides, aerials
-X: Terminals, plugs, sockets
-Y: Electrical positioners, e.g. solenoids (not motors)
-Z: Terminations, balancing equipment, filters, limiters, cable terminations

11. Annex 3

A_N for equipment (pumps, heat exchanges, tanks, etc) identified with
G≠0 → 001 – 099
G=0 → 051 – 099

Valves (KKS Code: AA)	A_N for plant systems with character G≠0	A_N for plant systems with character G=0
Manual valves (main valves)	001 – 099	051 – 099
Control valves (pne./hydr.)	101 – 199	151 – 199
Pneu./hydr. valves (on/off)	201 – 299	251 – 299
Motorized valves (on/off)	301 – 399	351 – 399
Sampling/chem. injection valves (manual)	401 – 499	451 – 499
Control valves (self regul.)	501 – 599	551 – 599
Solenoid valves (on/off)	601 – 699	651 – 699
Safety valves	701 – 799	751 – 799
Instrument isolating valves	801 – 899	851 – 899
Drain and vent valves	901 – 999	951 – 999

Measurement Points	A_N for plant systems with character G≠0	A_N for plant systems with character G=0
Transmitters	001 - 099	051 – 099
Transmitters for equipment supervision	101 - 199	151 – 199
Binary (switches)	201 – 299	251 – 299
Test Purpose	401 – 499	451 – 499
Local Instruments	501 – 599	551 – 599
Calculated values	901 – 999	951 – 999

Piping (KKS Code: BR)	A_N for plant systems with character G≠0	A_N for plant systems with character G=0
Main fluid piping	001/002/003/ – /099	051 - 099
Secondary piping	101/102/103 – /199	151 – 199
Auxiliary piping	201/202/203/ – /399	301 – 399
Sampling/chem. dosing piping	401 – 499	451 – 499
Test piping	501 – 599	551 – 599

Safety piping	701 – 799	751 – 799
Instrument piping as long piping run	801 – 899	851 – 899
Drain and vent piping	901 – 999	951 – 999