LANDSNET

KKS HANDBOOK

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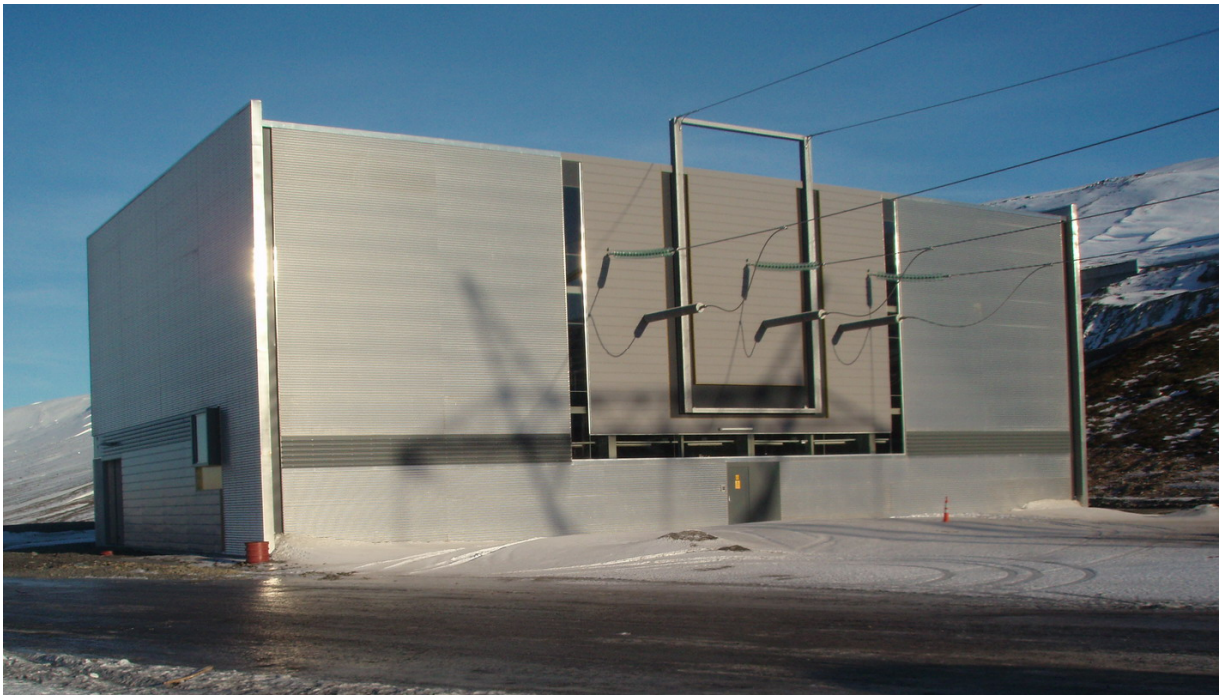

0. PREFACE

The main purpose of this handbook is to define the methods used by Landsnet hf (LN) for identification in mechanical-, civil-, electrical-, control and instrumentation engineering.

For this purpose Landsnet has chosen the identification system KKS (G: **K**raftwerk **K**ennzeichnen **S**ystem, E: Identification Systems for Power Plants).

The background of this system is, that in 1970 a committee was established in Germany which included representatives of designers, manufacturers, operators, regulators and authorities in the energy sector. The purpose of the committee was to draw up a system which could be used to record equipment in power plants, especially in nuclear, oil and coal power plants.

One of the main goals of the committee was to establish a uniform code to be used for listing/identifying structures, operations, maintenance, registration of data and spare parts.

The KKS system is the most widespread of all corresponding systems in Europe and beyond. Countries include: Germany, Denmark, Austria, Switzerland, Holland, Sweden, France, Italy, almost all Eastern European countries and South Africa.

The KKS key is based on the IEC and ISO standards, including DIN 40719 PART 2 (IEC750).

Landsnet has decided certain working rules to be used when coding. This is important, as KKS has a certain flexibility, witch is in the scope of the VGB rules.

This handbook contains part of the working rules used by Landsnet. Those not listed here are available in the Landsnet's KKS-Key.

The KKS Commission of Landsnet is responsible for the issuing and maintenance of the KKS handbook and the KKS key. The Commission consists of members from Operation and Maintenance, New Development Projects and System Planning as well as one independent person outside of Landsnet (consultant).

It shall be stressed, that this handbook is under constant refurbishment and it is the responsibility of the users to ensure that they have the latest edition at all times.

LN has certain guidelines which are within the limits given by VGB (Technische **V**ereinigung der **G**rosskraftwerks**b**etreiber E.V.). These guidelines apply on the different **B**reak **D**own **L**evels (BDL) in the identification system.

If there are any disputes between the Guidelines and the Handbook, the Handbook shall prevail.

In this KKS Handbook there are special rules which apply for LN and are not described in the Guidelines.

1. KKS

1.1 SCOPE OF KKS

The Identification System for Power Plants “KKS” serves to identify Power Plants, sections of plants and items of equipment in any kind of Power Plants according to task, type and location. It also serves to identify Substations and overhead lines in the same manner.

The KKS key is based on the IEC and ISO standards together with the DIN 40719 PART 2 (IEC 750).

These KKS guidelines **do not** contain rules on:

- Combination of the code with other identification systems.
- Methods of marking, e.g. in control rooms (partly), local control stations (partly), labelling off components and identification of documents.
- Open text abbreviations.
- Identification/numbering of drawings.

The following guidelines and explanations issued by VGB are valid, and where not in contradiction to the handbook, they do apply.

- KKS Guidelines (4th edition 1995)
- KKS-Application Commentaries, Part A General (1st edition 1988)
- KKS-Application Commentaries, Part B Engineering Discipline,

  Part B1, Identification in Mechanical Engineering (1st edition 1988)
- KKS-Application Commentaries, Part B Engineering Discipline,

  Part B2, Identification in Civil Engineering (1st edition 1988)
- KKS-Application Commentaries, Part B Engineering Discipline,

  Part B3, Identification in Electrical and Control and Instrumentation Engineering (1st edition 1988)
- KKS-Application Commentaries, Part B Engineering Discipline, Part B4, Identification in Electrical and Control and Instrumentation Engineering (1st edition 1993)

1.1.1 TYPE OF CODE

The KKS has three different types of codes, which can be used together or separately. These codes are:

- **The process-related code**
- **The point of installation code**
- **The location code**.

These codes are subdivided into 3 and 4 **B**reak **D**own **L**evels (BDL).

Process related Code

Process related identification of systems and items of equipment according to their function in mechanical, civil, electrical and control and instrumentation engineering. As example there are pipes, pumps, valves, motors, measurements, switches, transformers etc.

Point of installation Code

Identification of points of installation of electrical and control and instrumentation equipment in installation units e.g. in cabinets, panels, consoles etc.

Location Code

Identification of various structures, such as dams, tunnels, buildings, floors, rooms and fire areas.

This code is also used in connection with maintenance of buildings and structures.

Further more this code is used to identify the location of mechanical components in the same manner as the point of installation code is used in electrical- and control and instrumentation engineering.

These codes are explained further in the following chapters.

Each code is divided into **B**reak **D**own **L**evels, BDL i.e. BDL ÷1, BDL 0, BDL 1, BDL 2 and BDL 3 as needed.

The BDL ÷1 does not belong to the basic KKS code, but is use to define names of the areas and structures being coded.

1.1.2 BREAK DOWN LEVELS, PREFIX AND BREAKDOWN SYMBOLS

Definitions for prefixes and breakdown symbols for writing these codes are in DIN 40719, part 2.

The following fig. 1.1.1 shows the role of the codes on different BDL´s.

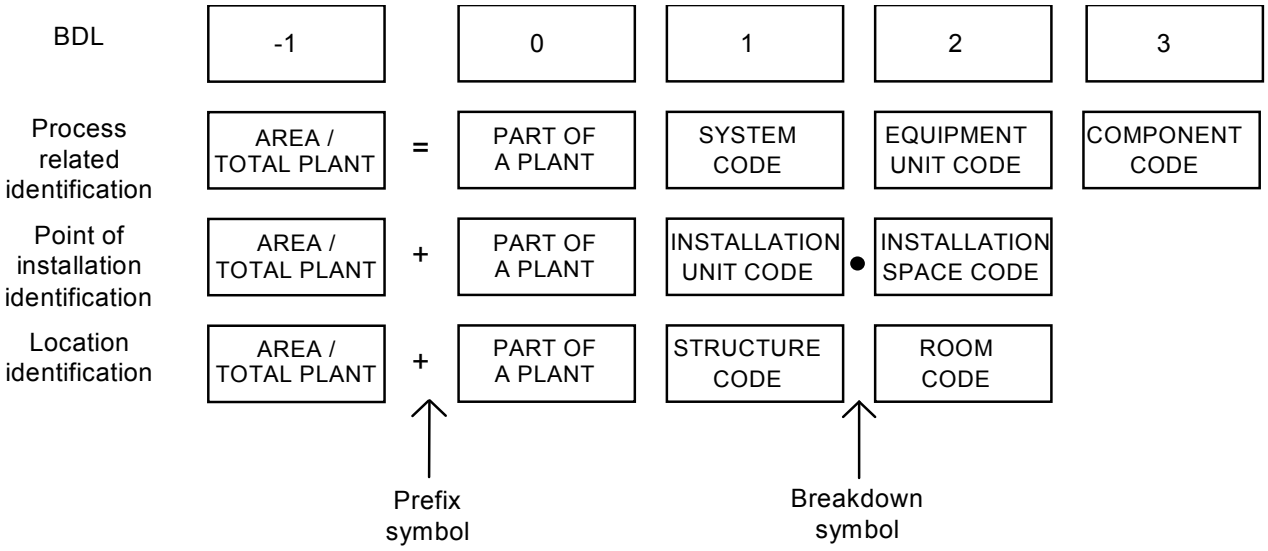

Fig. 1.1.1 Break Down Levels for various types of codes

The “full stop” breakdown symbol for point of installation identification must always be written. The prefix symbols may be omitted if the information content of the codes remains unambiguous.

In front of these codes there is a BDL ÷1 and this BDL is used for identification of Power Plants (P.P.) and Substations (S.S.). It does not belong to the KKS code issued by VGB, but has been decided upon by Landsnet, (see appendix 1).

As an example the following is mentioned:

BDL	Area	Example	KKS
÷1	Substation	Teigarhorn S.S.	TEH
0	Part of a S.S.	Line 132 kV to HOL	HO1
1	System	Line bay 132 kV	1AEL10
2	Equipment (part of system)	Circuit breaker	GS100
3	Component (part of equipment)	A fuse	-F01

Table 1.1.1 Example, use of Break Down Levels.

1.1.3 KKS CODE

The KKS code consists of alpha letters (A) and numbers (N). The code is divided in 4 (0-3) BDL´s in the process related code and in 3 (0-2) BDL´s in the point of installation code and the location code.

BDL	- 1	0	1	2	3
Definition	Area/ total plant	Part of a plant	System code	Equipment unit code	Component code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

Table 1.1.2 KKS codes.

1.2 CONTENTS OF DATA CHARACTERS

It shall be clearly stated that all explanations in this book are related to the process code unless otherwise specified.

In the KKS key the use of the alpha symbols (A) is defined in most cases. Still there are some codes that are available for free use, see ***chapters 4.11 and 4.12***. The definition of the use of numerical symbols (N) is defined in this book, according to the regulations valid by LN.

The letters I and O are not permitted on BDL 1, 2 and 3 in the KKS code, to avoid misunderstanding between I and 1 (one) on one hand and O and 0 (zero) on the other hand.

The Icelandic alphabetic characters Á, Đ, É, Í, Ó, Ú, Ý, Þ, Æ and Ö are not permitted and only capital letters are allowed.

1.2.1 BREAK DOWN LEVEL ÷1

The BDL ÷1 is used for definition of names of areas or constructions, which are to be coded. This BDL is free for use, so the short names of the Power Plants and Substations are used for identification. If more than one Power Plant is using the same water impounding works, they have the same name on this BDL.

BDL	÷ 1		
Definition	Area / Total plant		
Name	S_1	S_2	S_3
Type of key	A	A	A/N

Table 1.2.1 BDL ÷1

Normally alpha symbols are used on BDL ÷1 and they occupy 3 places.

Example:
BUR for P.P. Búrfell 1 and 2
HRA for P.P. Hrauneyjafoss
LAX for P.P. Laxá 1, 2 and 3
GEH for S.S. Geithals

See Landsnets definitions of BDL ÷1 in appendix 1.

1.2.2 BREAK DOWN LEVEL 0

BDL	- 1	0	1	2	3
Definition	Area/ total plant	Part of a plant	System code	Equipment unit code	Component code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

Table 1.2.4 BDL 0.

The KKS key allows the use of alpha- and numerical symbols on BDL 0. In case of one Power Plant with its own water impounding works, BDL 0 is defined as zero and written 000.

When more than one Power Plant shares the same water impounding works (W.I.W), the W.I.W. get a 000 (zero) on BDL 0 and each station is numbered, so that the oldest one gets the number 001 the next one 002 etc. Common equipment for two or more stations will always receive the number 000.

Example:

BDL ÷1	BDL 0	
LAX	000	All common equipment for Laxárstöðvar power plants Example: W:I:W. for Laxá 1, 2 og 3
LAX	001	All equipment for Laxárstöð1
LAX	002	All equipment for Laxárstöð 2

Fig. 1.2.1 Example of use of BDL 0.

Two Alfa and one Number are used to identify line bays in substations, AAN, e.g. BU1, BU2, HT1 etc.

In the same manner, transformers in substations are identified by SP1, SP2 etc.

Exceptionally, if there are more than 9 transformers, like in Hellisheiðarvirkjun, then the numbering/coding is SP10, SP11 etc.

The general rule is:

A_n Line bays

TTn Busbar bays

CQn Bays for capacitor batteries

Example:

LYK ÷1	LYK 0	LYK 1	
BRE	SP1		All equipment for SP1 in Brennimelur
BRE	SP1	1ADT10	All equipment for transformer bay SP1 in Brennimelur
BRE	VA1		All equipment for line VA1 in Brennimelur
BRE	VA1	2AEL10	All equipment for line bay VA1 in Brennimelur
VAT	VA1		All equipment for line VA1 in Vatnshamrar
VAT	VA1	1AEL10	All equipment for line bay VA1 in Vatnshamrar

Fig. 1.2.2 Example of use of BDL ÷1, BDL 0 and BDL 1.

1.2.3 BREAK DOWN LEVEL 1

BDL	- 1	0	1	2	3
Definition	Area/ total plant	Total plant	System code	Equipment unit code	Component code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

Table 1.2.5 BDL 1.

The first seat in this BDL (F_0) is used if there are two or more identical systems in the Power Plant (Substation) e.g. main machine sets, which have to be coded separately.

When one system is common for more than one main system or there is no system counting, the F_0 = 0 (zero), else the systems are numbered from 1 to 9.

On this BDL (F_1, F_2, F_3) the original KKS key applies.

Some keys (F_2, F_3) in this group are given free for use so that they can be used as it suits the purpose of coding. This also applies to some keys on BDL 2 (A_2) and on BDL 3 (B_2).

Some keys (F_3) in the group of ancillary systems are given free for use to separate systems in various buildings.

The use of these characters has been defined by Landsnet, and this is shown in chapter 3 and chapter 4.

It is not permitted to use keys that are “blocked” in the code. **They cannot be used under any circumstances. These keys are blocked for future use.**

The F_N numbers are used for coding within the same system. As an example the main code for a generator rotor is 1MKA20 and for a generator stator the main code is 1MKA40.

1.2.4 BREAK DOWN LEVEL 2

BDL	- 1	0	1	2	3
Definition	Area/ total plant	Total plant	System code	Equipment unit code	Component code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

Table 1.2.6 BDL 2.

In the KKS key equipment is coded/defined by A_1, A_2 e.g. valves, pumps, switches etc.. The A_N number is a consecutive number which is used to number identical equipment, which is identified by A_1, A_2, within the same system.

It has been decided by LN how these numbers shall be used in case of parallel- and serial connected systems in the mechanical engineering and also in the electrical part, where 3 phase systems are coded and A_3 is used to separate e.g. cores in measurement transformers see chapter 4.

When A_3 is not used, it is not written in the code.

1.2.5 BREAK DOWN LEVEL 3

BDL	- 1	0	1	2	3
Definition	Area/ total plant	Total plant	System code	Equipment unit code	Component code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

Table 1.2.7 BDL 3.

B_1 and B_2 are defined in the KKS key and B_N is used to number components inside the same system or equipment. Here a distinction is made between mechanical and electrical parts.

The coding of electrical components is according to DIN 40719, part 2.

2 NUMBERING

The KKS code allows a certain possibility of free/individual use of numbering code elements. This chapter shows the rules for using the F_N numbers, A_N numbers og B_N numbers. The rules defined here are compulsory for the KKS coding for Landsnet.

BDL	- 1	0	1	2	3
Definition	SVÆÐI	VIRKI	KERFI	BÚNAÐUR	TÆKI/HLUTUR
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3	B_1 B_2 B_N B_N
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)	A A N N

In some cases it is possible to use some other way of numbering, in those cases the Landsnet's KKS committee will set the standard for that numbering.

The source for this is the KKS Guidelines from VGB, together with Part A and Part B (booklets B_1, B_2, B_3 and B_4) also from VGB.

1. Numbering starts again when one of the preceding code elements changes.
2. Numbering may be done in units or decades. It depends on the system that's being used.
3. The numbering with F_N and A_N shall basicly be in the direction of a flow as often as possible. If however the flow has two directions, one direction shall be defined as "NORMAL OPERATION".
4. Numbering shall be from left to right or from top to bottom. It is permitted to use numbering that exists in old Power Plants though it isn't in the right direction.
5. It is preferred to use gaps in the numbering, to simplify later changes.

The "flag" symbol represents codes for pipes on drawings. A "flag" with one leg point in the direction of flow, while a "flag" with two legs, indicates that the flow can be in both directions, depending on the mode of operation.

The following 3 figures show the main possibilities allowed:

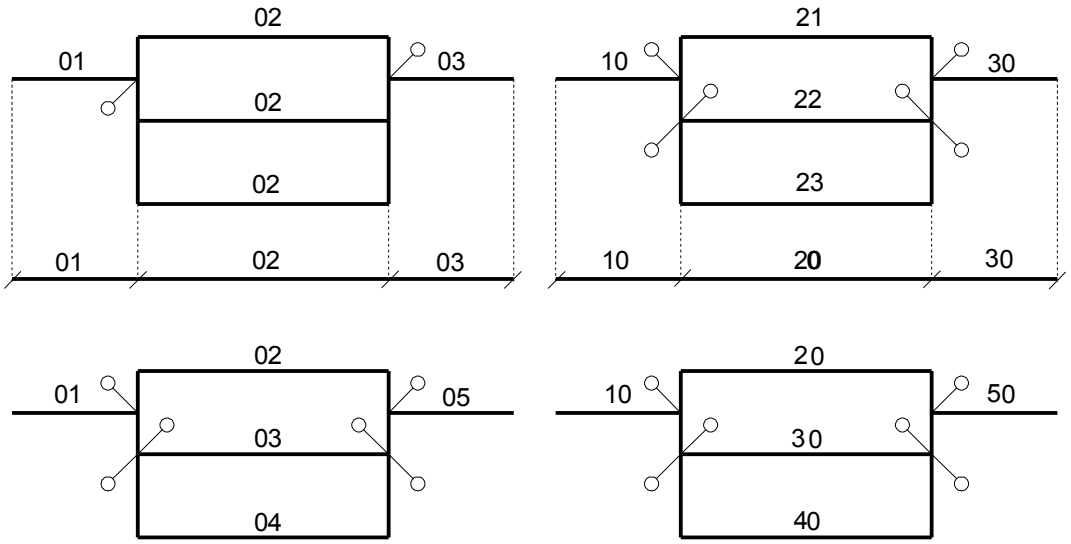

Fig. 2.1 Consecutive and decades numbering.

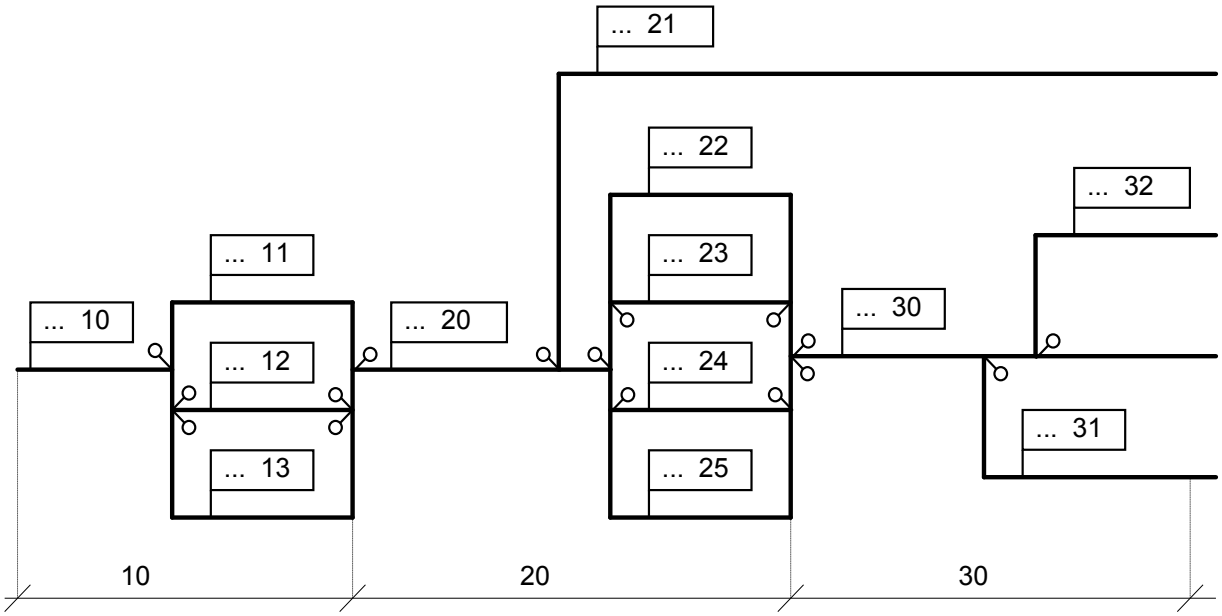

Fig. 2.2 Decades numbering, variant 1.

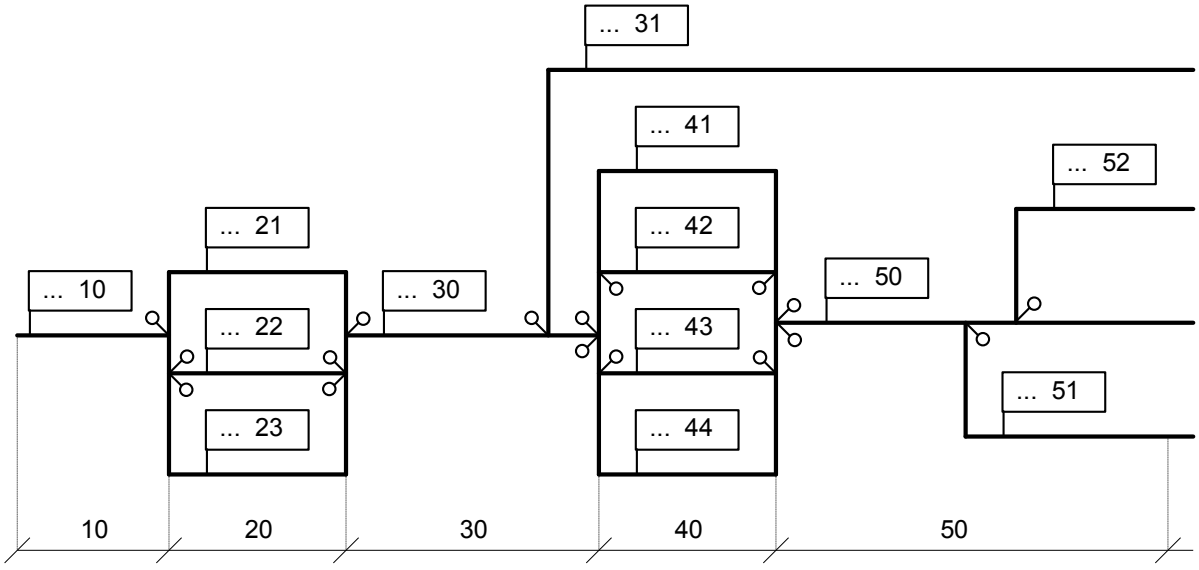

Fig. 2.3 Decades numbering, variant 2.

Numbering in decades is convenient for large systems. Each case shall be treated uniquely depending to how the system is built when decades numbering is used.

Decades numbering shall be used in main and extensive systems, but sub-systems shall be numbered using units.

Consecutive numbering shall only be used within the same system or within the same part of a system where components are in parallel connection.

2.1 F_N NUMBERING

F_N numbering is used to divide systems in parts or subsystems. F_N is done in decades (10,20,30....etc.) or consecutive (11,12,13,14.....etc)

F_N numbering should be minimised. If no further F_N numbering is needed then the decade 10 should be used in the F_N seat.

Numbering with F_N in large plumbing systems should be clearly divided, e.g. by areas, by levels, by machinery and by large parts of machinery with decade numbering but with consecutive numbering in parallel connected system.

2.2 A_N NUMBERING

A_N numbering is used to divide systems in single parts. A_N numbering shall be in decades (_10, _20, _30 ….) or in consecutive (_11, _12, _13 …..).

For numbering of electrical and pipe line systems separations shall be clear. E.g. use decade numbering for separation along main branches and use consecutive numbering for separation along parallel connected branches.

2.2.1 NUMBERING OF MEASUREMENT POINTS

Measurement points numbering is consecutive and shall be grouped by the hundreds in the following way:

1 _ _ for indicating local meters, sight-glasses, meters with no control or alarm purpose and meters which are not connected to remote control

2 _ _ for digital meters with control and alarm purposes

3 _ _ for analog meters with control and alarm purposes.

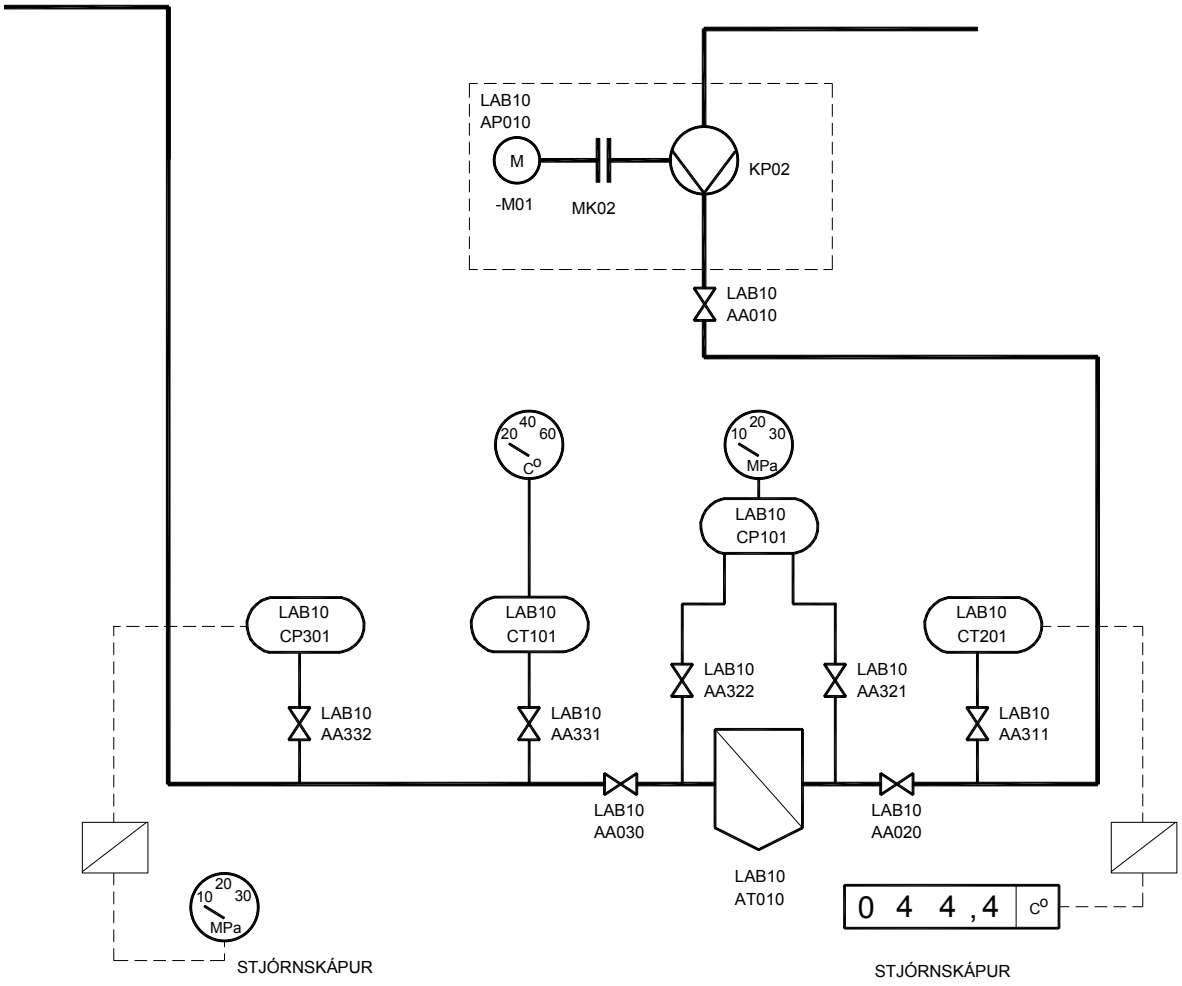

Fig. 2.2.1 Numbering of measurements, equipment and components, e.g. in a feed water system.

3. IDENTIFICATION IN MECHANICAL ENGINEERING

3.1 Coding of air-condition systems

Air condition system is coded as shown in table 3.1.1. The main parts of the system are identified on BDL 1 and numbering is done there.

F_1	F_2	F_3	F_N	F_N	Equipment
S	A	A	-	-	Stationary air condition system in substations
S	A	C	-	-	Stationary air condition in control houses
S	A	L	-	-	Stationary air condition system in intake constructions
S	A	M	-	-	Stationary air condition system in powerhouses
S	B	A	-	-	Stationary heating blowers in substations
S	B	C	-	-	Stationary heating blowers in control houses
S	B	L	-	-	Stationary heating blowers in intake constructions
S	B	M	-	-	Stationary heating blowers in powerhouses

Table 3.1.1 Coding of air-condition systems on BDL 1.

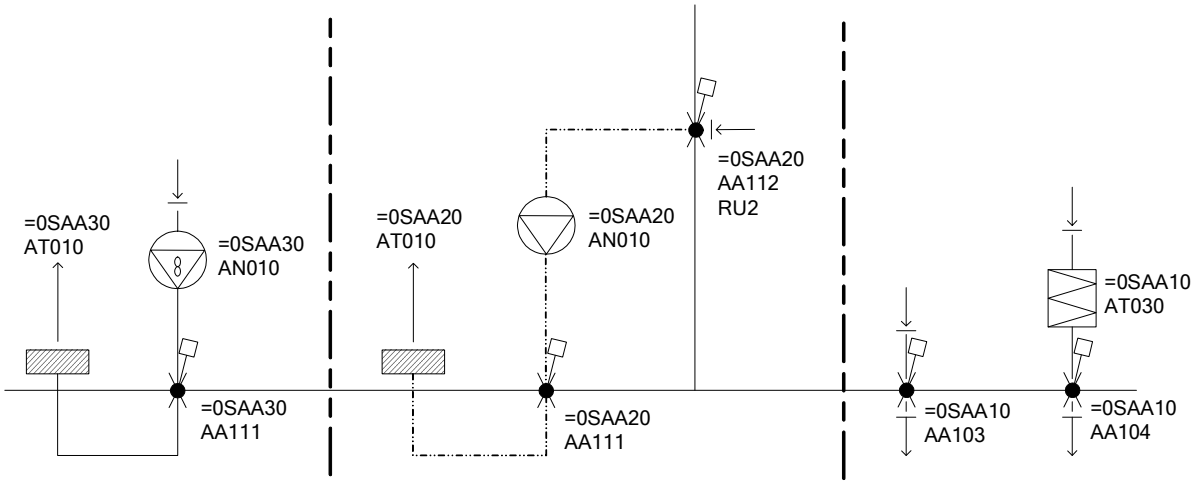

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Fig 3.1.1 Example on air outlets (air condition).

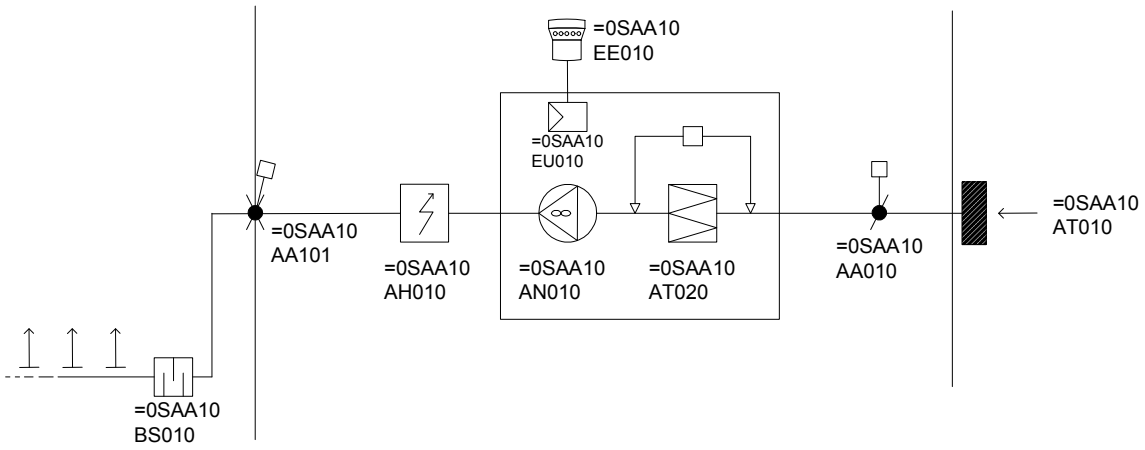


Fig 3.1.2 Example on air inlets (air condition).

Symbol	Examples	Sign	Explanation
	Motor valve, dual position		Fan
	Fire valve/ smoke valve Motor of/on		Fan with a regulation
	Control console		Air filter
	Control center		Sound trap
	Inlet		Electrical heater
	Outlet		Intak grill, Outlet grill

Table 3.1.2 Explanation of symbols.

4 IDENTIFICATION IN ELECTRICAL, CONTROL AND INSTRUMENTATION ENGINEERING

The following definition for F_1 on BDL 1, applies for coding of the electrical part of Power Plants and distribution systems. The main parts are coded on BDL 1 and there the counting is performed.

F_1	F_2	F_3	F_N	F_N	Equipment
A	-	-	-	-	Grid and distribution
B	-	-	-	-	Power production and, auxiliary power systems
C	-	-	-	-	Instrumentation and control equipment
D	-	-	-	-	Instrumentation and control equipment (for auxiliary equipment)

Table 4.1 Coding of the electrical part of Power Plants and distribution systems, BDL1.

4.1 CODING OF POWER SYSTEMS

Distribution systems inside of Power Plants shall be coded with B on F_1. Distribution, which is not coded under auxiliary supply (for own purpose) shall be coded under A on F_1 and shall be coded according to the voltage levels defined in the KKS key from VGB on BDL 1 on F_2 see table 4.1.1.

F_1	F_2	F_3	F_N	F_N	Voltage
A	A	-	-	-	➢ 420 kV, free use
A	B	-	-	-	➢ 420 kV, free use
A	C	-	-	-	380 (420) kV
A	D	-	-	-	220 (245) kV
A	E	-	-	-	110 (150) kV
A	F	-	-	-	60 (72) kV
A	H	-	-	-	30 (35) kV
A	J	-	-	-	20 (25) kV
A	K	-	-	-	10 (15) kV
A	L	-	-	-	6 (5) kV
A	M	-	-	-	1 (3) kV
A	N	-	-	-	<1 kV

Table 4.1.1 Coding of voltage levels in distribution systems on BDL 1.

Line bays and transformer bays in Power Plants and Substations shall be coded as shown in Appendix 2, and shall be coded with A on F_1.

Line bays in substations and in switchyards in power stations shall be coded as the switchyard on BDL ÷1 and as the line on BDL 0. Line and line bays shall always be coded L on BDL 1 on F_3. F_0 is 0 for the line itself, 1 for the switchyard where it starts in but 2 where it ends. Busbar connections always have T on BDL1 on F_0 and F_1 and it is counted on F_2.

Example: Búrfellslína 1 is connected from Búrfell to Írafoss. The line shall be coded BU1 BU1 0ADL, the line bay in Búrfell shall be coded BUR BU1 1ADL and the line bay in Írafoss shall be coded IRA BU1 2ADL.

4.2 CODING OF BUSBARS

Busbars are coded according to the process code. They are coded with 0 on F_0 on BDL 1 and under A or B on F_1 on BDL 1.

In group A, busbars that are connected to transmission lines and line bays which are outgoing lines from Power Plants and Substations.
On F_2 they shall be coded according to the voltage levels, defined in the KKS key, see table 4.1.1.

On F_3 they shall be coded A,B or V. A for main busbar A, B for main busbar B or V for spare busbar.

Numbering is on F_N.

In group B, busbars needed for the production, transmission and distribution of electrical energy.

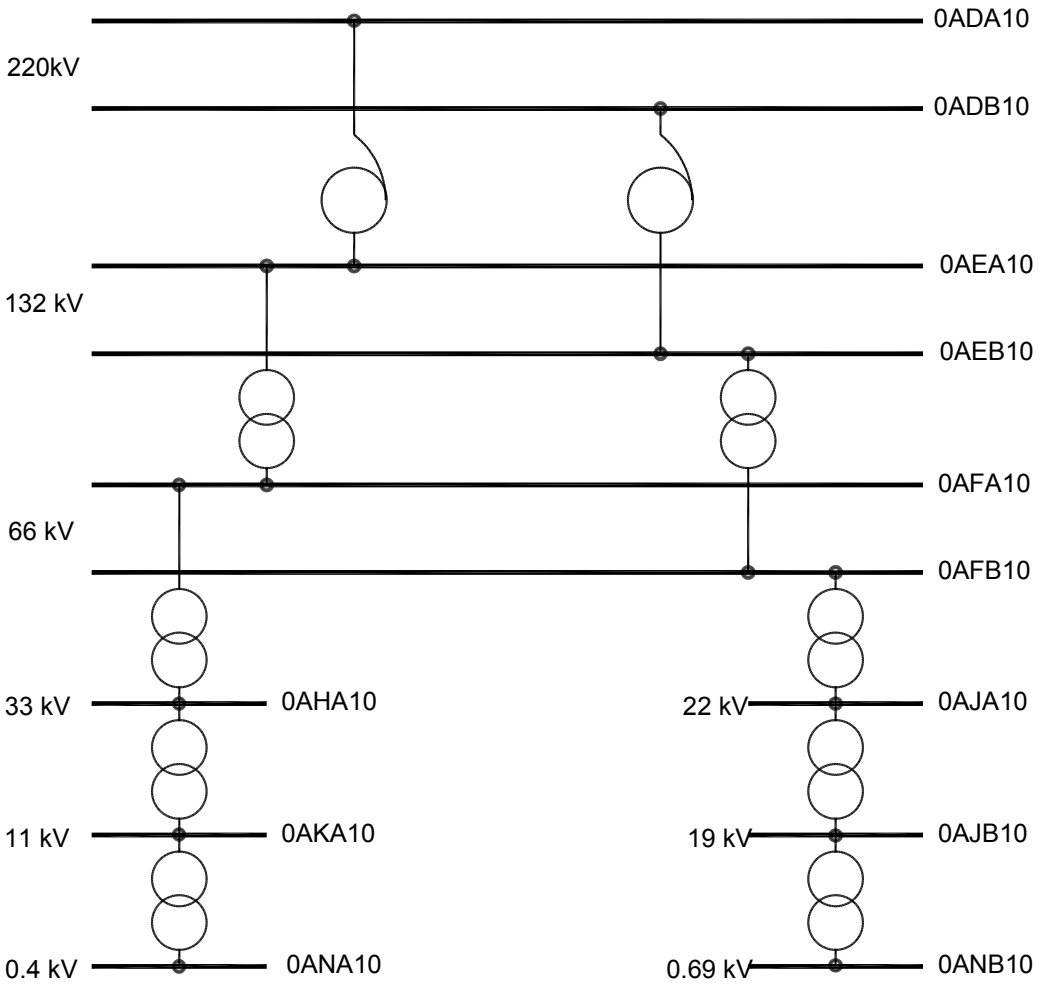


Fig. 4.2.1 Coding of busbars in distribution systems outside of Power Plants.

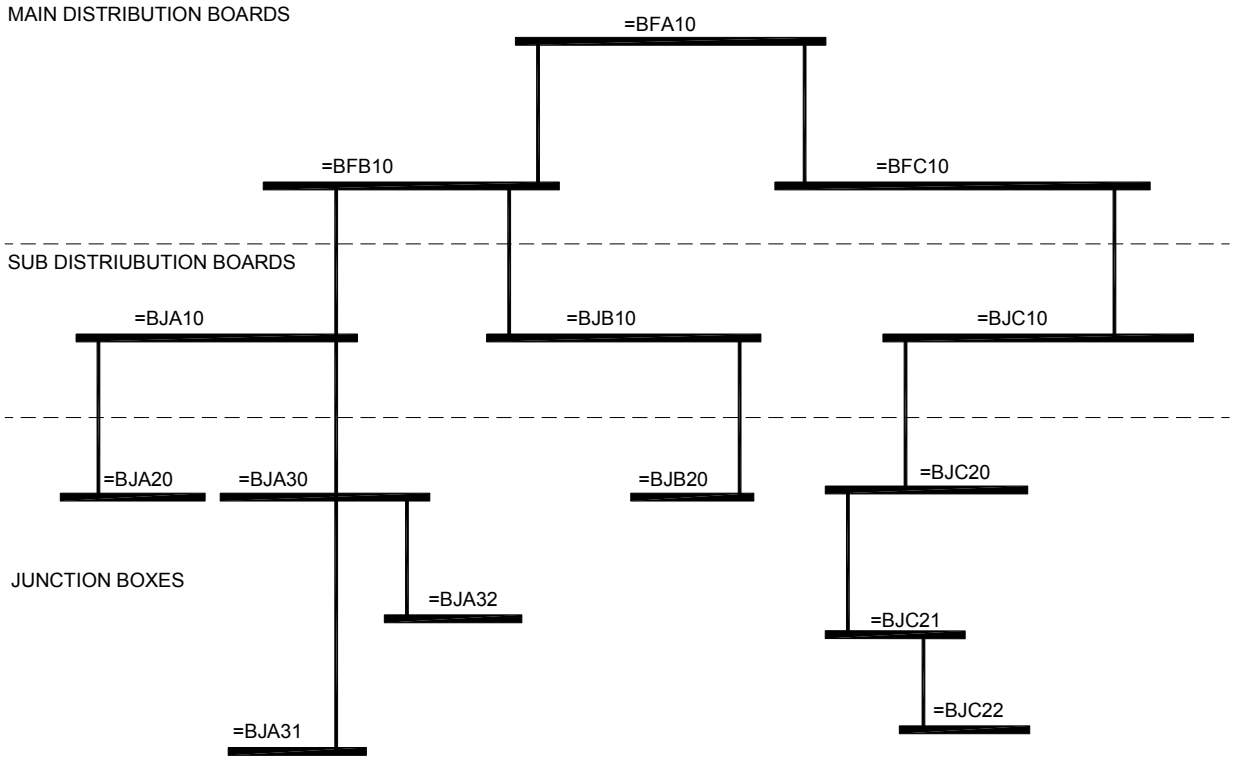


Fig. 4.2.2 Coding of busbars inside a Power Plant, normal system.

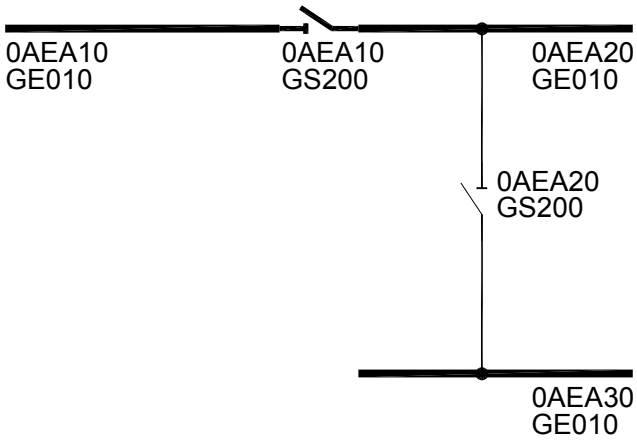


Fig. 4.2.3 Coding of busbars, more than one busbar.

4.3 CODING OF CIRCUIT BREAKERS, DISCONNECTORS AND EARTHING SWITCHES

Circuit breakers disconnectors and earthing switches are coded as shown in table 4.3.1, they are separated on BDL 2 where numbering is made.

Breakers are named GS_ _ _ and are counted in hundreds with the A_N numbers in such a way that the circuit breakers are in the group 100, disconnectors are in group 200 and earthing switches are in group 300.

A_1	A_2	A_N	A_N	A_N	A_3	Equipment
G	S	1	0	0	-	Circuit breakers
G	S	2	0	0	-	Disconnector on busbar
G	S	2	1	0	-	Disconnector connected to busbar A
G	S	2	2	0	-	Disconnector on line and transformer
G	S	2	3	0	-	Disconnector, bypass disconnector
G	S	2	4	0	-	Disconnector, direct connecting of lines
G	S	2	5	0	-	Disconnector connected to spare busbar V
G	S	2	7	0	-	Disconnector connected to busbar B
G	S	2	9	0	-	Disconnector on connection of A and B busbars
G	S	3	0	0	-	Earthing switch on line, transformer and busbar
G	S	3	1	0	-	Earthing switches on circuit breaker
G	S	3	2	0	-	Earthing switches on circuit breaker
G	S	3	3	0	-	Earthing switches on line, transformer

Table 4.3.1 Coding breakers on BDL 2.

For further information see fig. 4.2.3 and 4.3.1 to 4.3.7.

In special cases table 4.3.1 does not apply, those cases are in table 4.3.2. Two special cases are in Hamranes and Hrauneyjafossstöð. In Hamranes on the 11 kV there are two circuit breaker carriers for each circuit breaker, circuit breaker carrier one shall be coded GS100 but circuit breaker carrier two shall be coded GS105, see picture 4.3.8. In Hrauneyjafossstöð the line disconnector is coded GS200 because of special circumstances, see picture 4.3.9.

A_1	A_2	A_N	A_N	A_N	A_3	Equipment
G	S	1	0	5	-	For one of the two circuit breaker carrier that are equal, the other one shall be coded GS100
G	S	2	0	0	-	Disconnector on line in special circumstances as in Hrauneyjafossstöð
G	S	2	1	5	-	For one of the two disconnector carrier that are equal, the other one shall be coded GS210

Table 4.3.2 Special cases for coding breakers on BDL 2.

4.3.1 EXAMPLES OF CODING OF CIRCUIT BREAKERS, DISCONNECTORS AND EARTHING SWITCHES

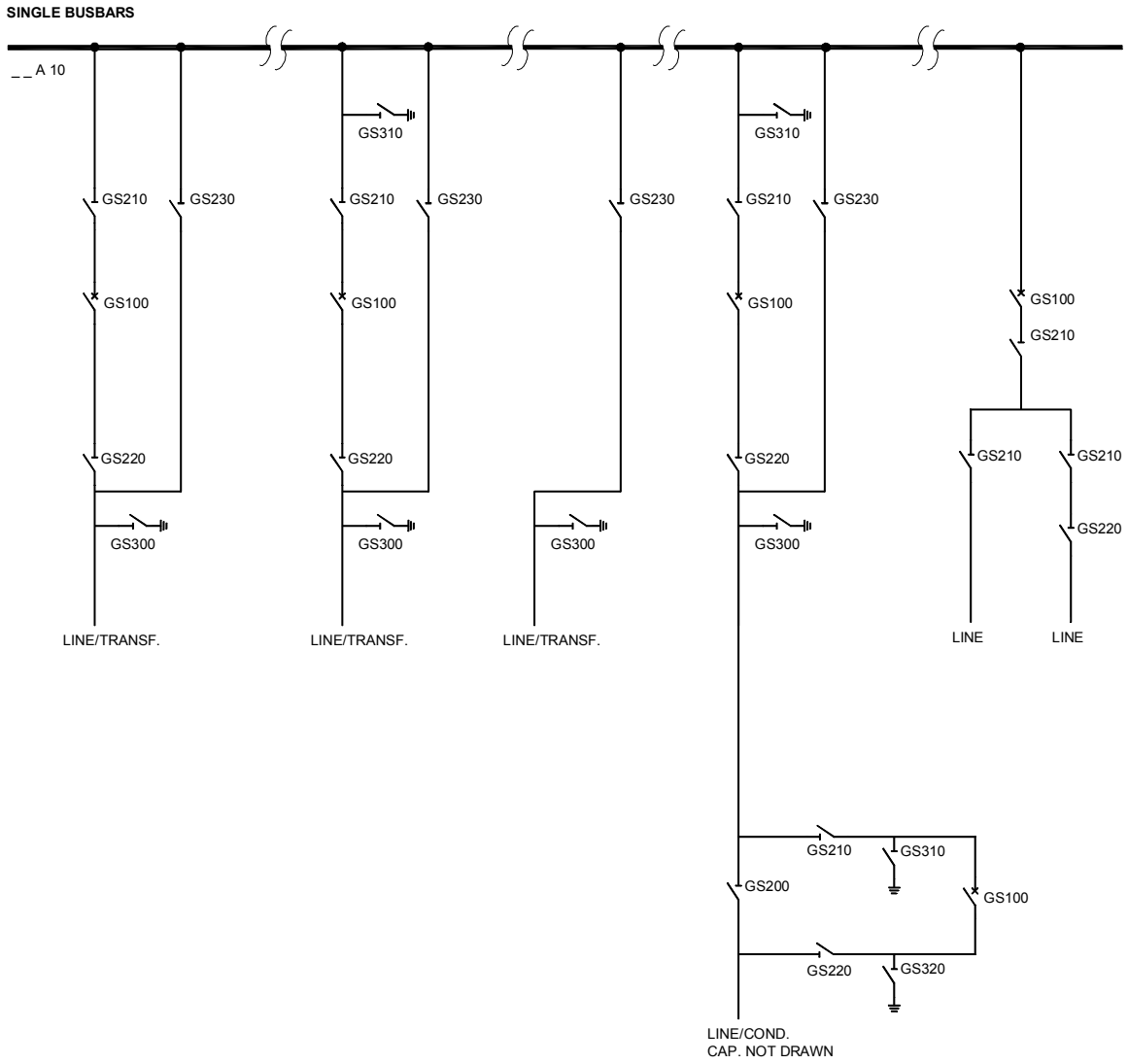


Fig. 4.3.1 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, single busbar.

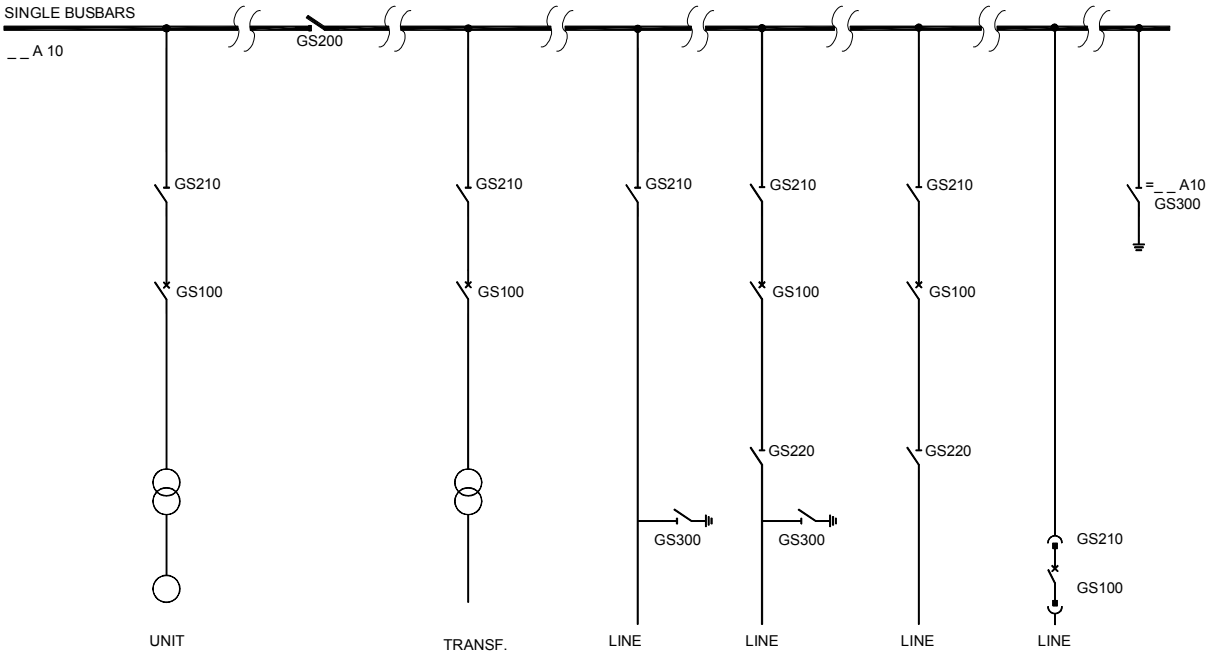


Fig. 4.3.2 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, single busbar.

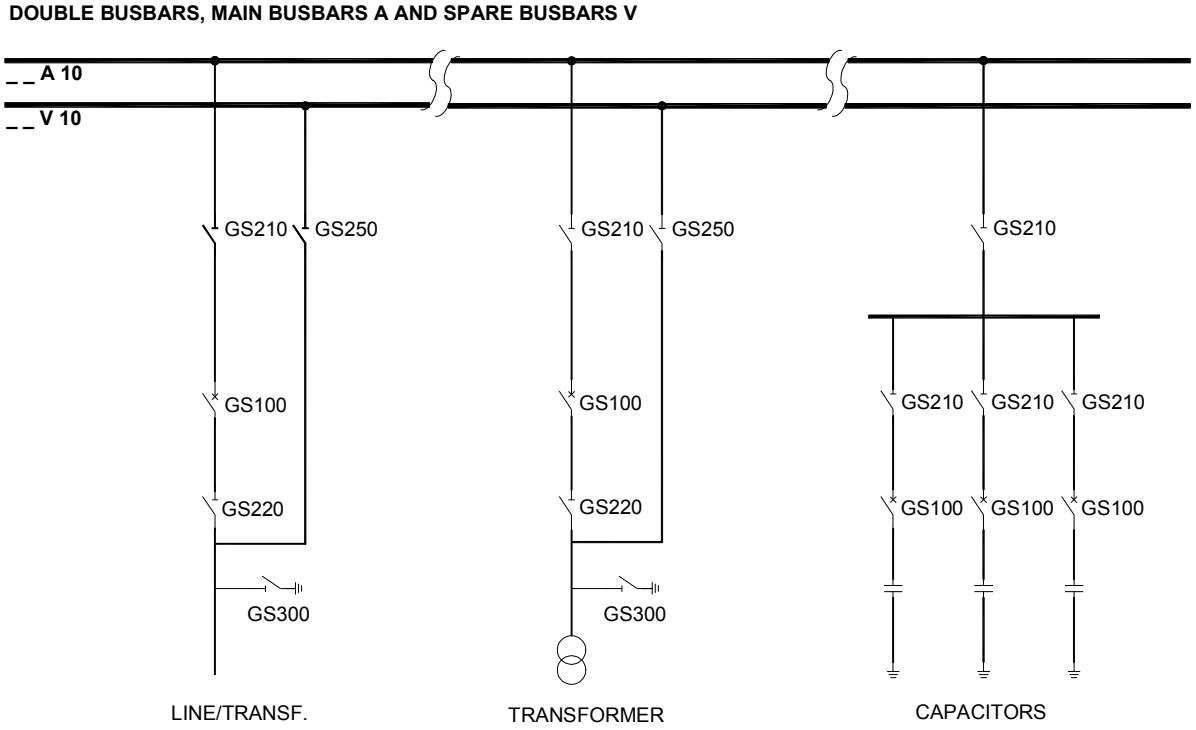


Fig. 4.3.3 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, main busbar and spare busbar.

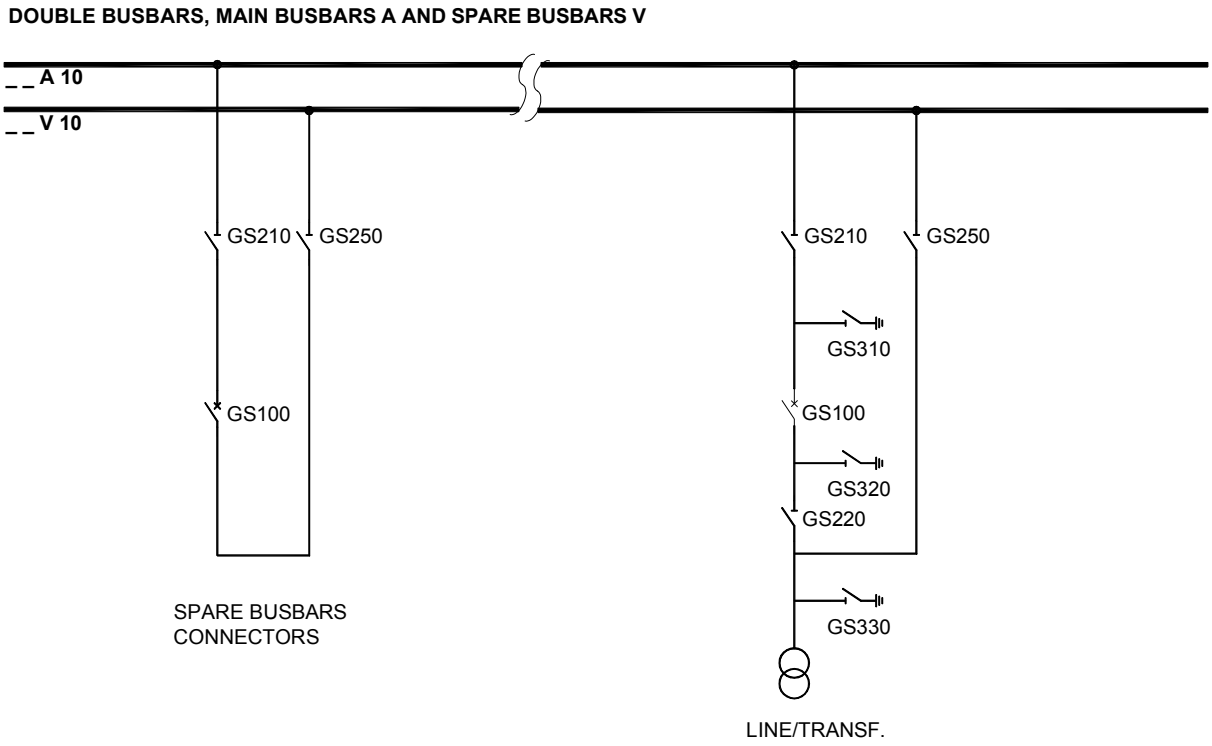


Fig. 4.3.4 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, main busbar and spare busbar.

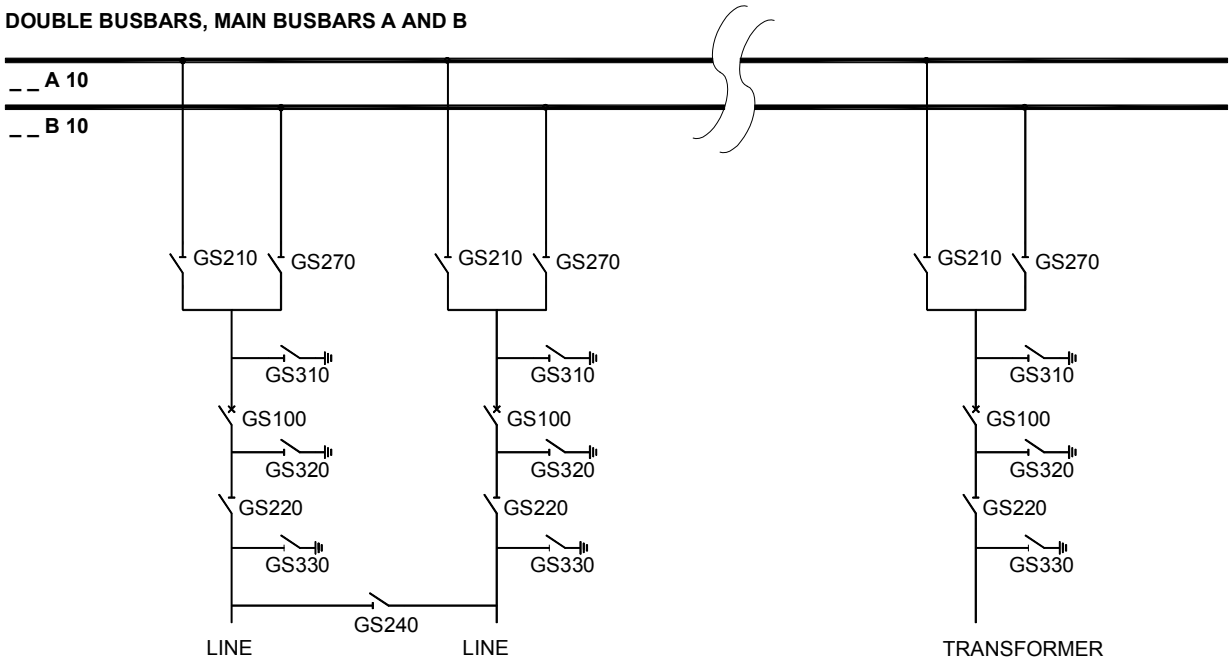


Fig. 4.3.5 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, double busbars.

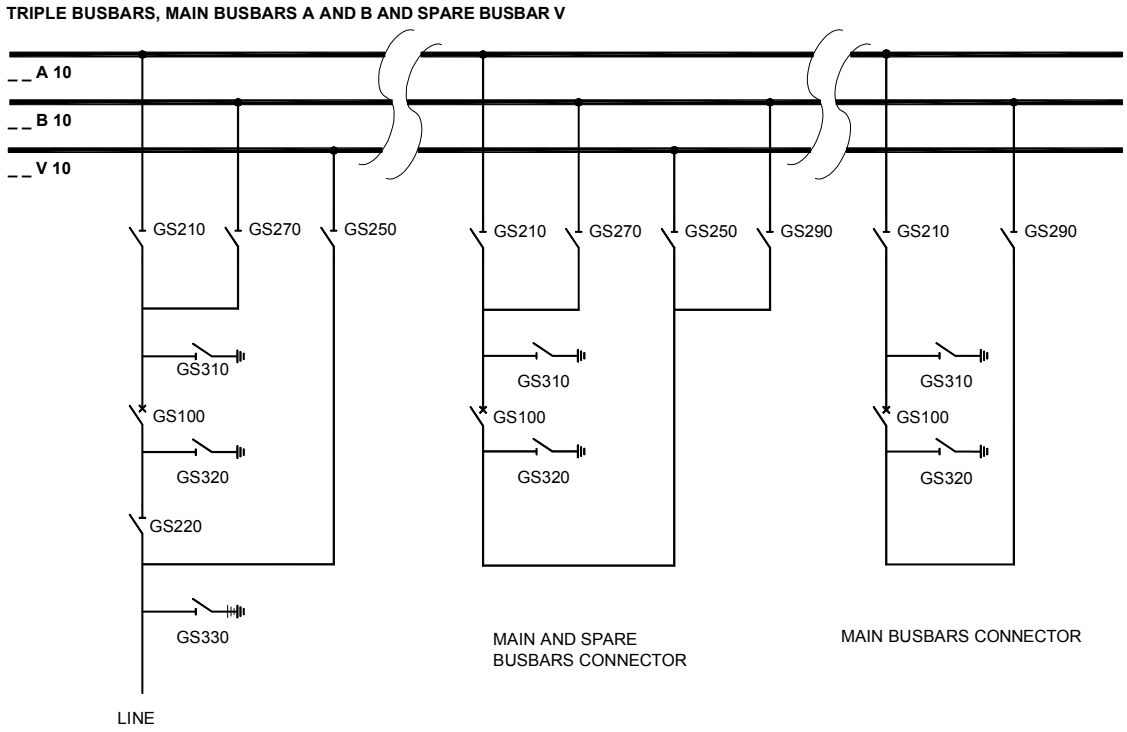


Fig. 4.3.6 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, triple busbars, main busbars A and B and spare busbar V. Case 1

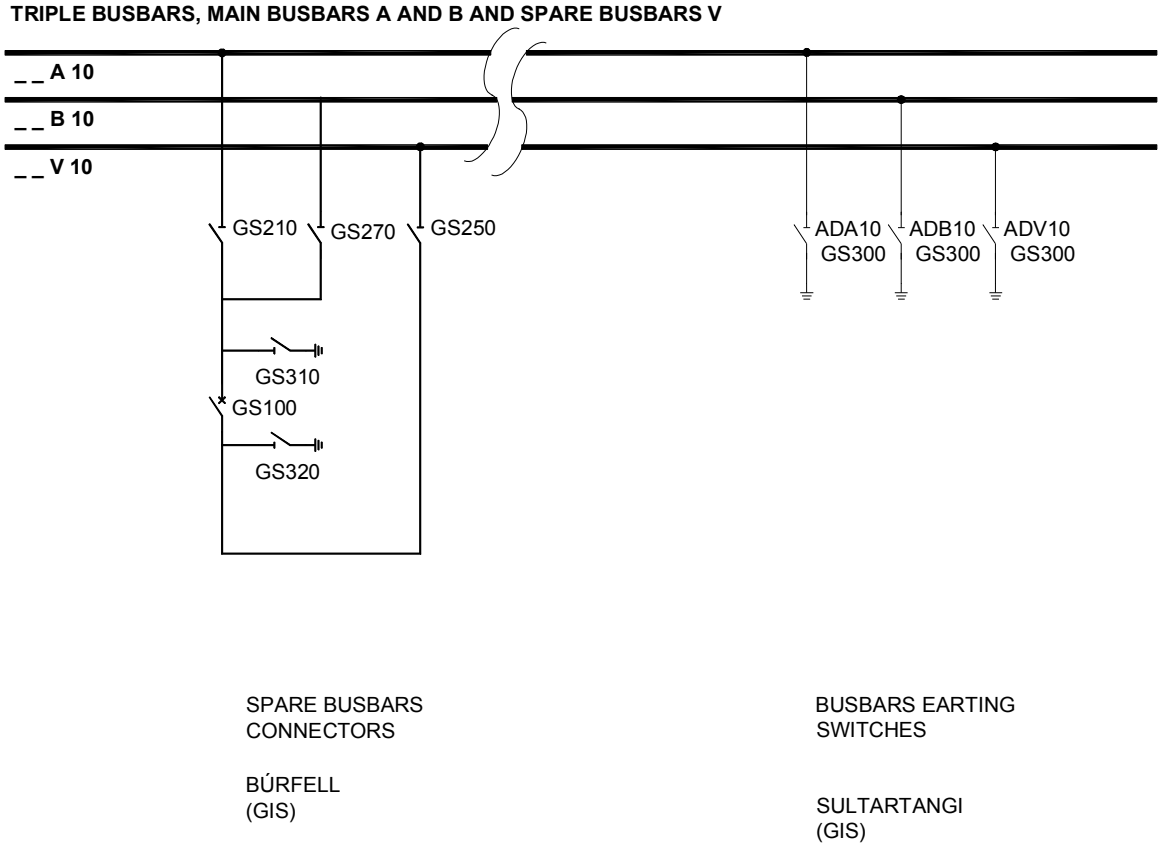


Fig. 4.3.7 Coding of circuit breakers, disconnectors and earthing switches on BDL 2, triple busbars, main busbars A and B and spare busbar V. Case 2

4.3.2 SPECIAL CASES OF BREAKER CODING

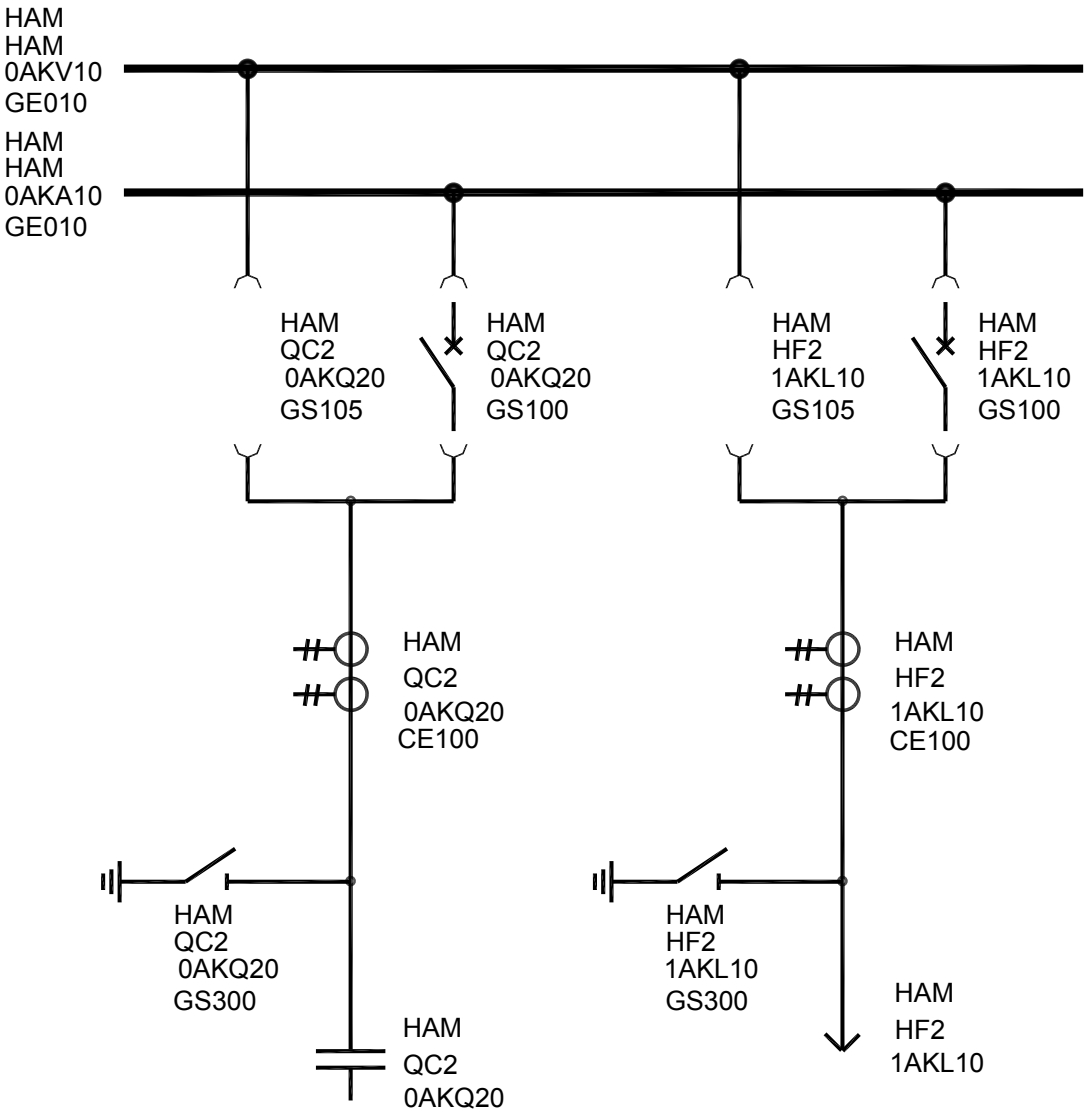


Fig. 4.3.8 Special case, coding of 11 kV circuit breaker carrier in Hamranes.

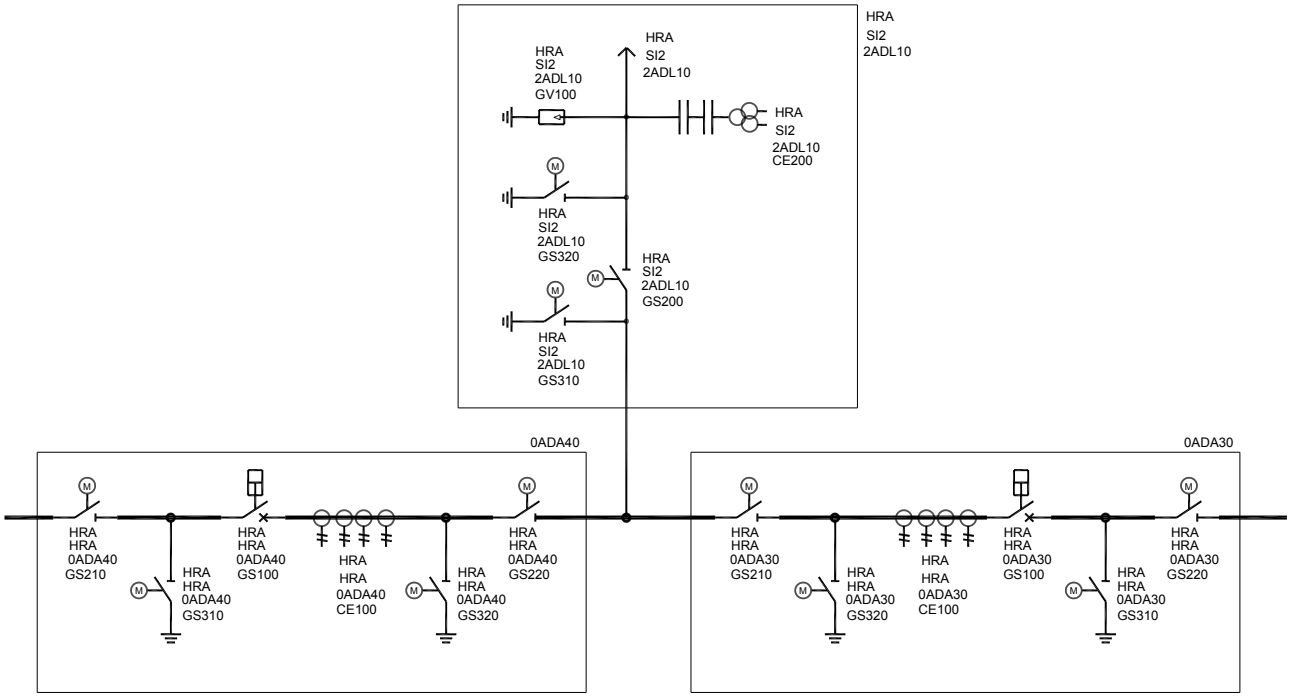


Fig. 4.3.9 Special case, coding of (line) disconnectors in Hrauneyjafossstöð.

4.4 CODING OF MAIN- AND DISTRIBUTION TRANSFORMERS INCLUDING EQUIPMENT CONNECTED TO TRANSFORMER

In F_0 on BDL 1 the equipment gets the same numbering as in F_0 for the transformer. When there are several transformers counting is done here.

Circuit breakers and disconnectors as well as all equipment connected to transformers, which are connected to busbars, shall be coded in F_1 on BDL 1 according to the busbars to which it is connected.

F_2 has a figure according to the voltage level on the equipment in question (see table 4.1.1). **The transformer is coded by its highest voltage.**

F_3 is T indicating transformer and transformer equipment.

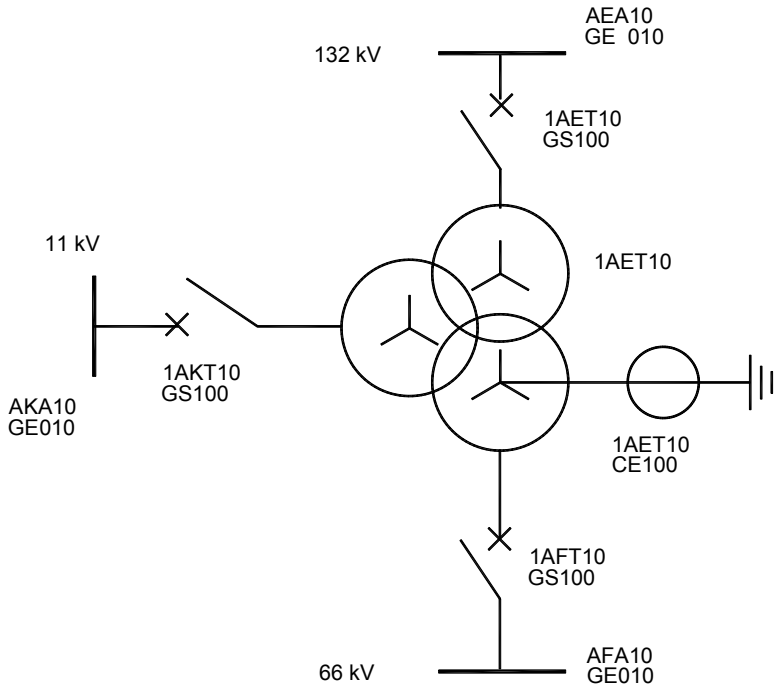


Fig. 4.4.1 Coding of circuit breakers, disconnectors for transformers and coding of busbars distribution outside of Power Plants.

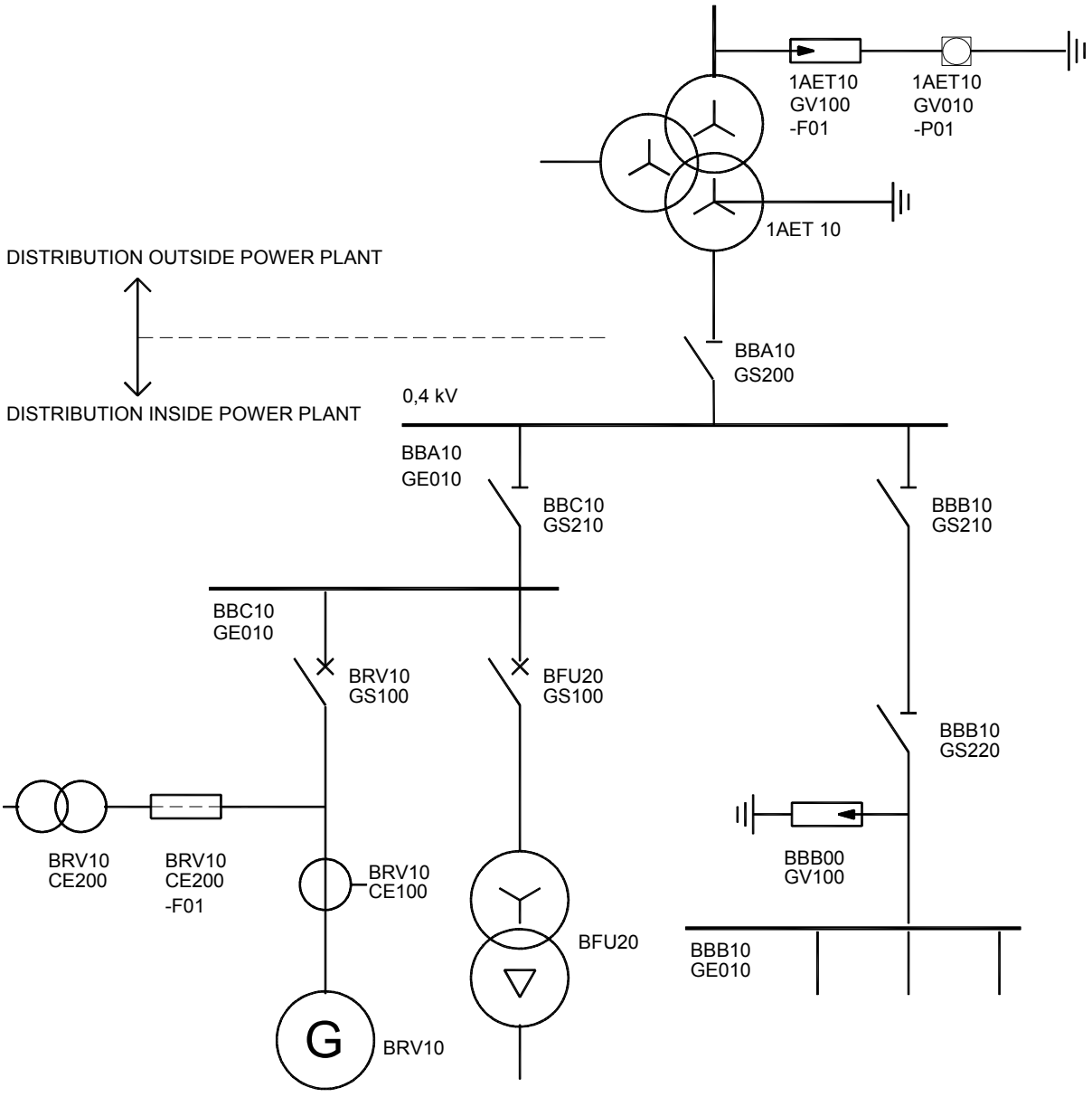


Fig. 4.4.2 Coding of a part of a distribution system.

4.5 MEASURING CIRCUITS

4.5.1 CODING OF CURRENT- AND VOLTAGE CIRCUITS

Electrical measurements are coded as shown in table 4.5.1. The main parts are named CE_ _ _ and are numbered by hundreds on A_N.

A_1	A_2	A_N	A_N	A_N	A_3	Equipment
C	E	1	0	0	-	Current
C	E	1	0	1	-	Current phase L1 or R
C	E	1	0	2	-	Current phase L2 or S
C	E	1	0	3	-	Current phase L3 or T
C	E	2	0	0	-	Voltage
C	E	2	0	1	-	Voltage phase L1 or R
C	E	2	0	2	-	Voltage phase L2 or S
C	E	2	0	3	-	Voltage phase L3 or T
C	E	3	-	-	-	Measurement with different variables, (e.g. power, energy, inductance and resistance, cosφ)
C	E	4	-	-	-	Not in use, spare
C	E	5	-	-	-	Frequency
C	E	6	-	-	-	Special measurements (e.g. earth fault measurements).
C	E	7	-	-	-	Not in use, spare
C	E	8	-	-	-	Not in use, spare
C	E	9	-	-	-	Common/mixed measurements.

Table 4.5.1 Coding of current- and voltage measurements, BDL 2.

Generally, the current transformers and the voltage transformers are only coded down to BDL 2. Mcb's, switches, signal lamps, visual measurements etc. are coded on BDL 3, if needed.

Measuring transformers are coded in the same manner as the part to which they belong. Current measuring transformers connected to generator busbars are for example coded BAA10 CE100 but current and voltage transformers connected to low voltage main distribution and auxiliary distribution systems are coded BFA10 CE100 and CE200.

If, there is more than one measurement (cores) from the same transformer, the letters A, B etc. are used in seat A_3, e.g. CE100A, CE100B (see fig. 4.9.4).

In a multi-line diagram of measuring circuits numbering is done with A_N numbers. Consecutive numbering is used. Phases in current measurements are for instance separated on BDL 2 by numbering, 101, 102 and 103.

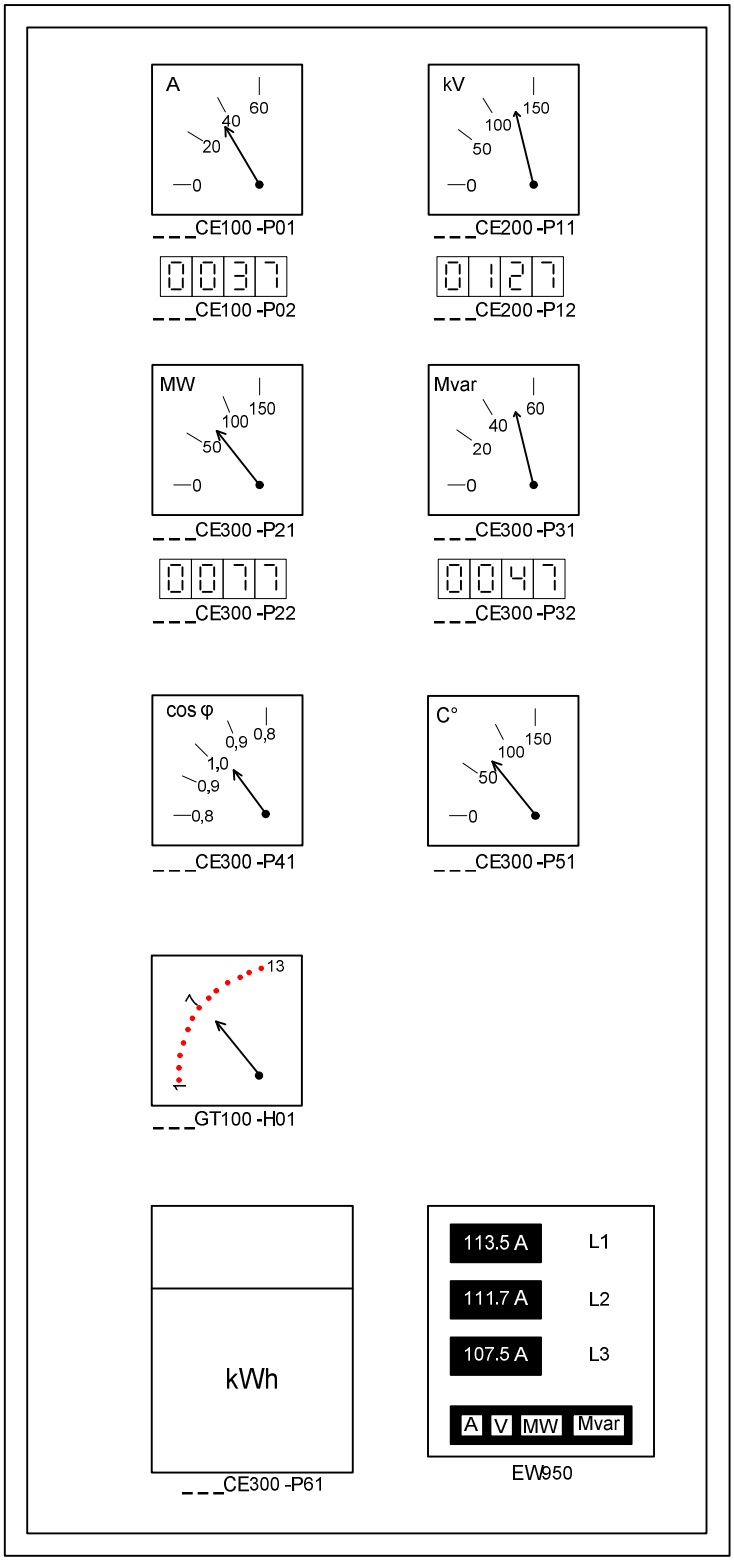


Fig. 4.5.1 Exsample of coding of meters.

NB. BDL 3 is a guideline for counting. See the KKS key.

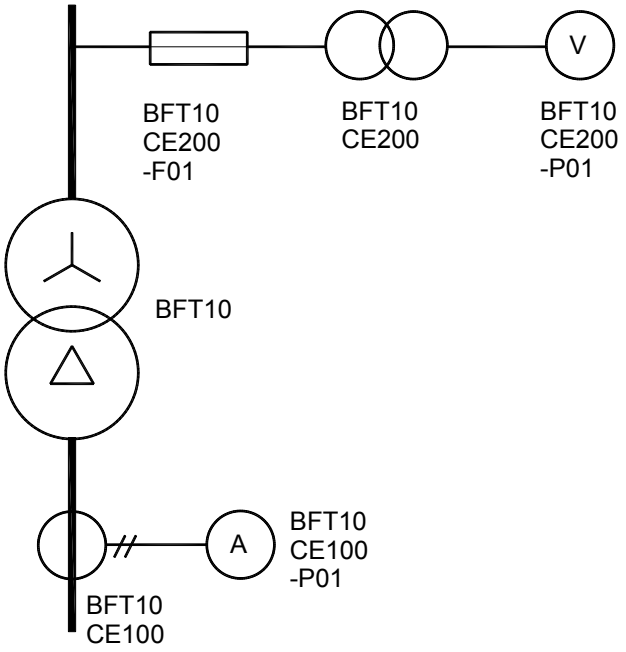


Fig. 4.5.2 Coding of measuring transformers and meters.

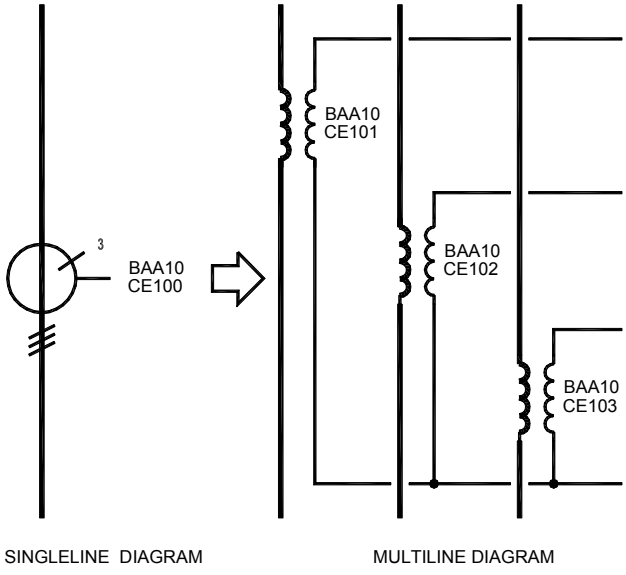
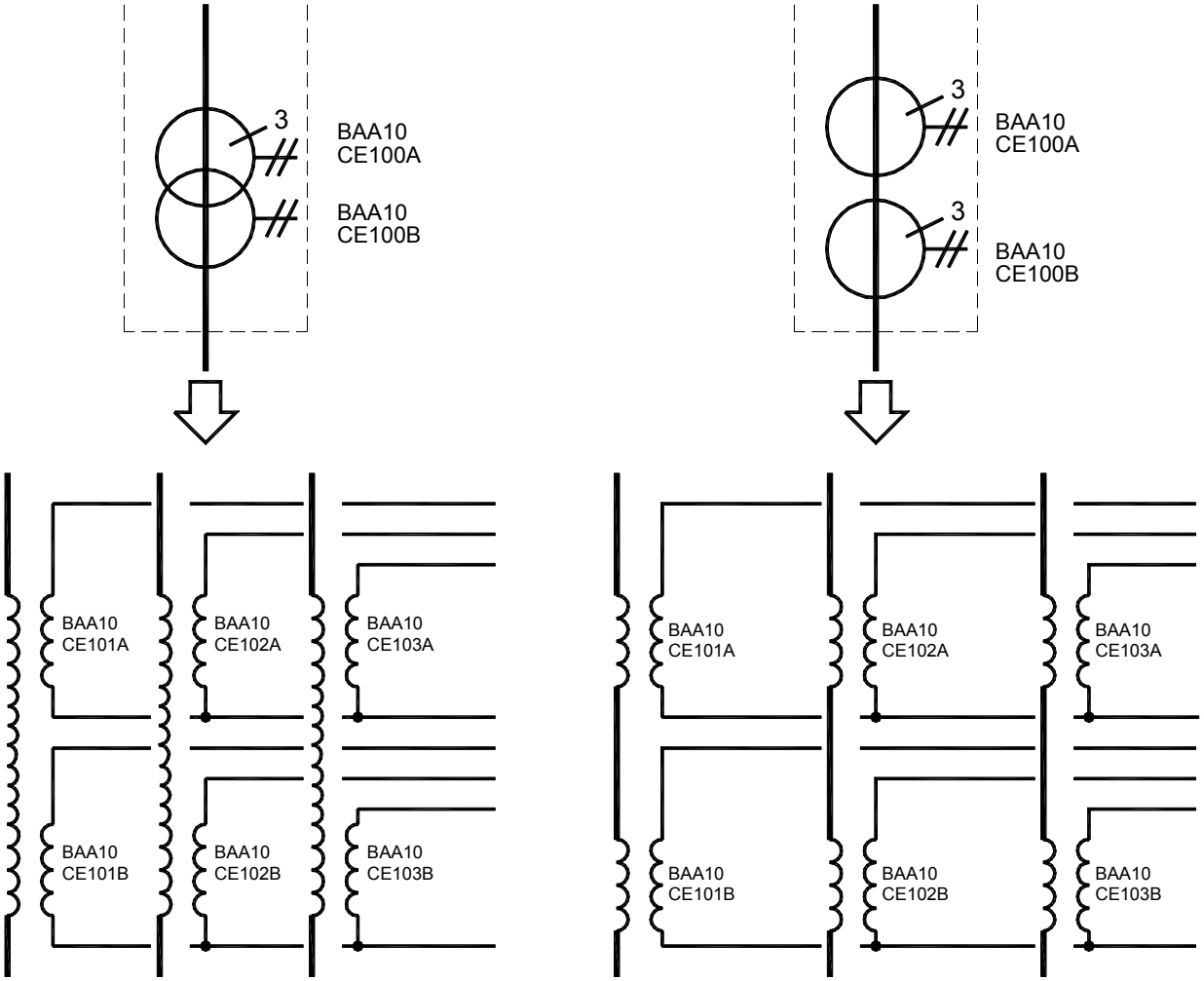


Fig. 4.5.3 Coding of current transformers with one secondary winding.



a) 3x1 with 2 secondary windings on one core

b) 3x1 with 2 secondary windings on different cores

Fig. 4.5.4 Coding of current transformers with two secondary windings.

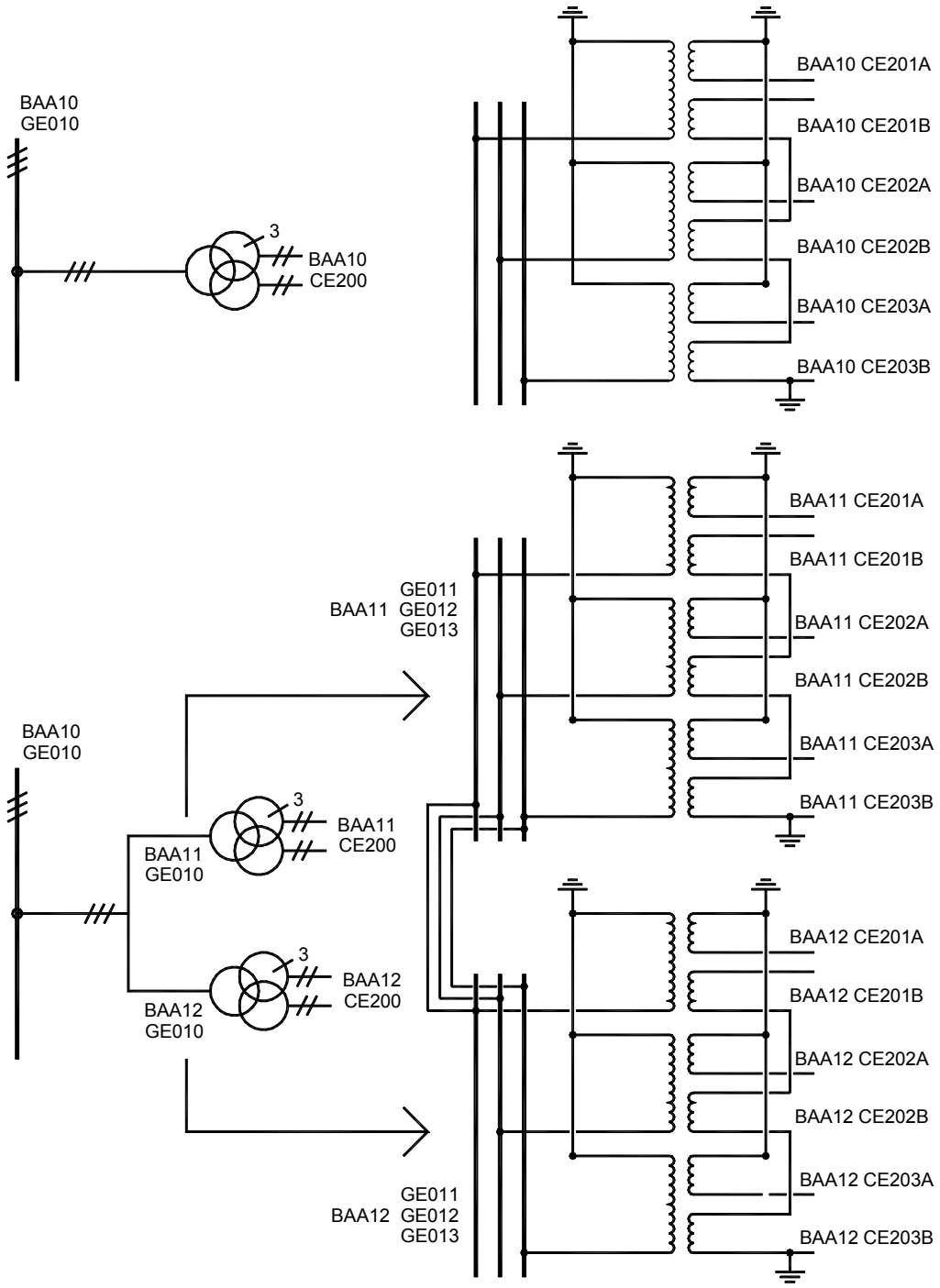


Fig. 4.5.5 Coding of voltage transformers.

4.6 KKS CODING EXAMPLES

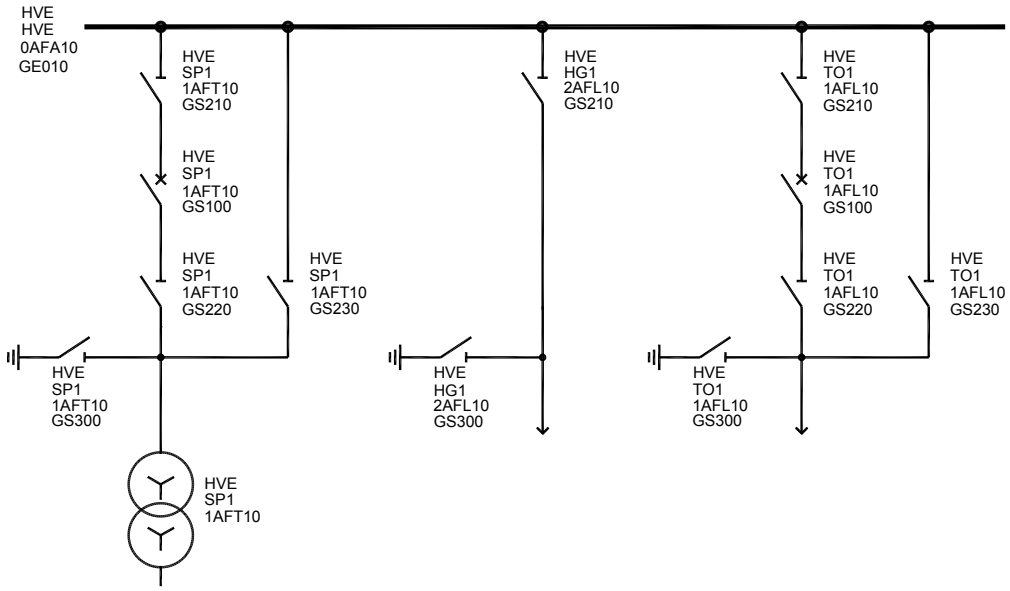


Fig. 4.6.1 Example of coding of line- and transformer bays, single busbar.

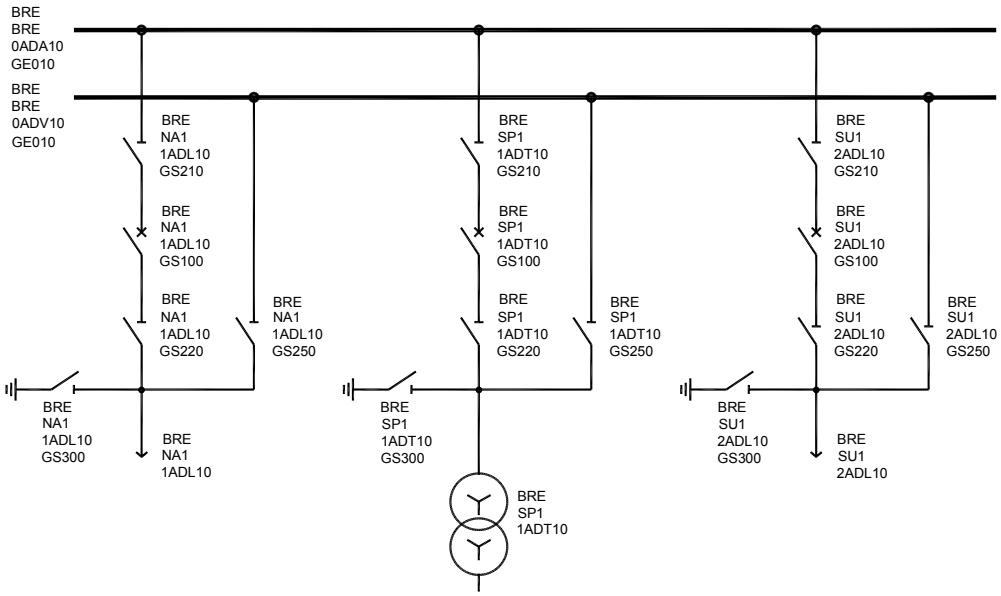


Fig. 4.6.2 Example of coding of line- and transformer bays, main- and spare busbar.

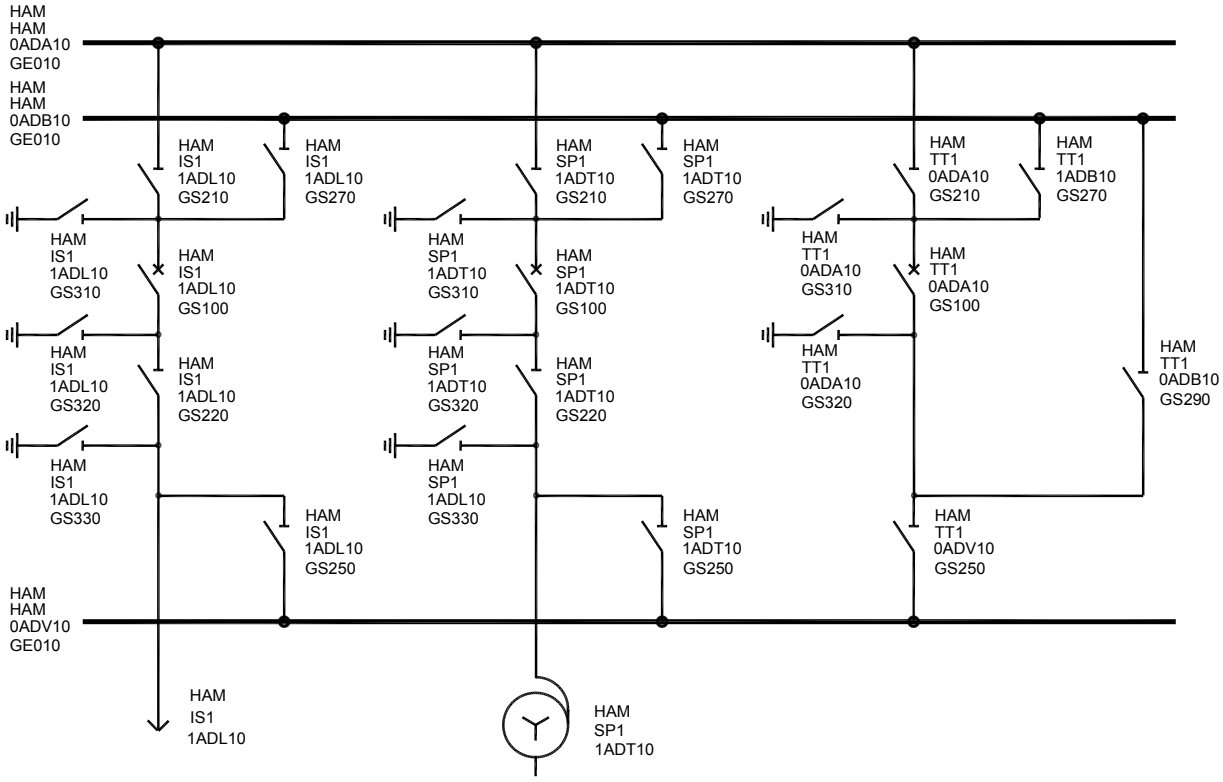


Fig. 4.6.3 Example of coding line- and transformer bays, two busbars and one spare.

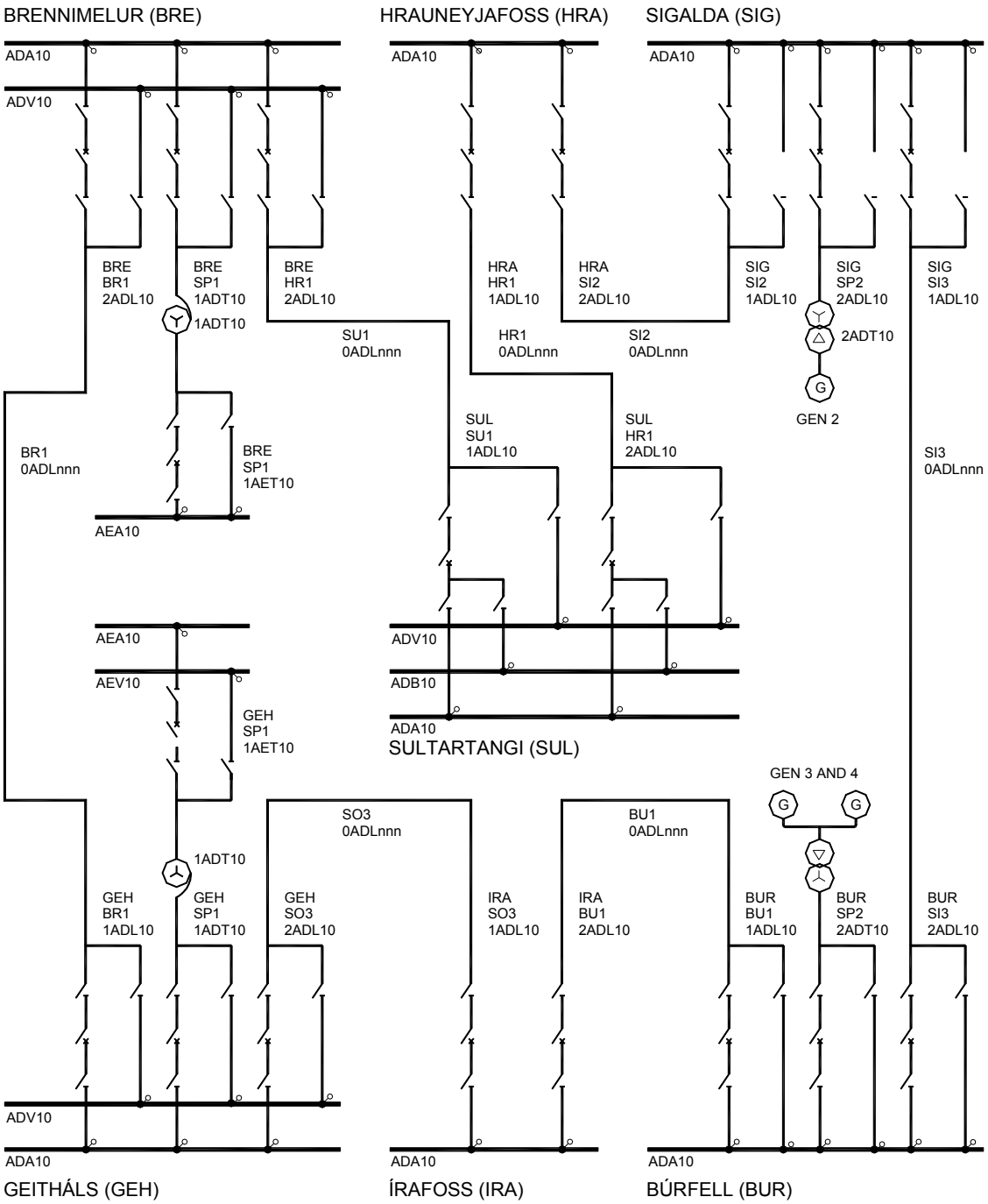


Fig. 4.6.4 Example of coding in the 220 kV grid.

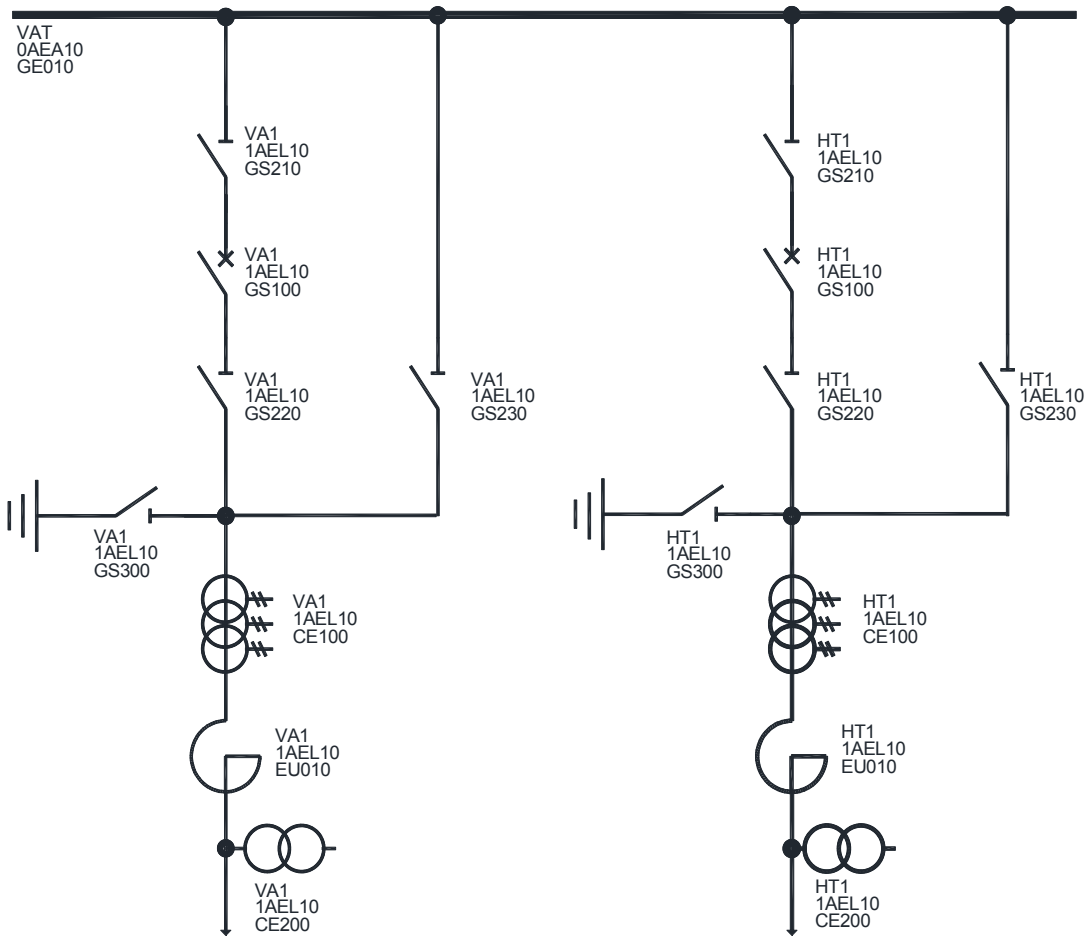


Fig. 4.6.5 Example of single phase coding of a 132 kV bays separated on BDL 0.

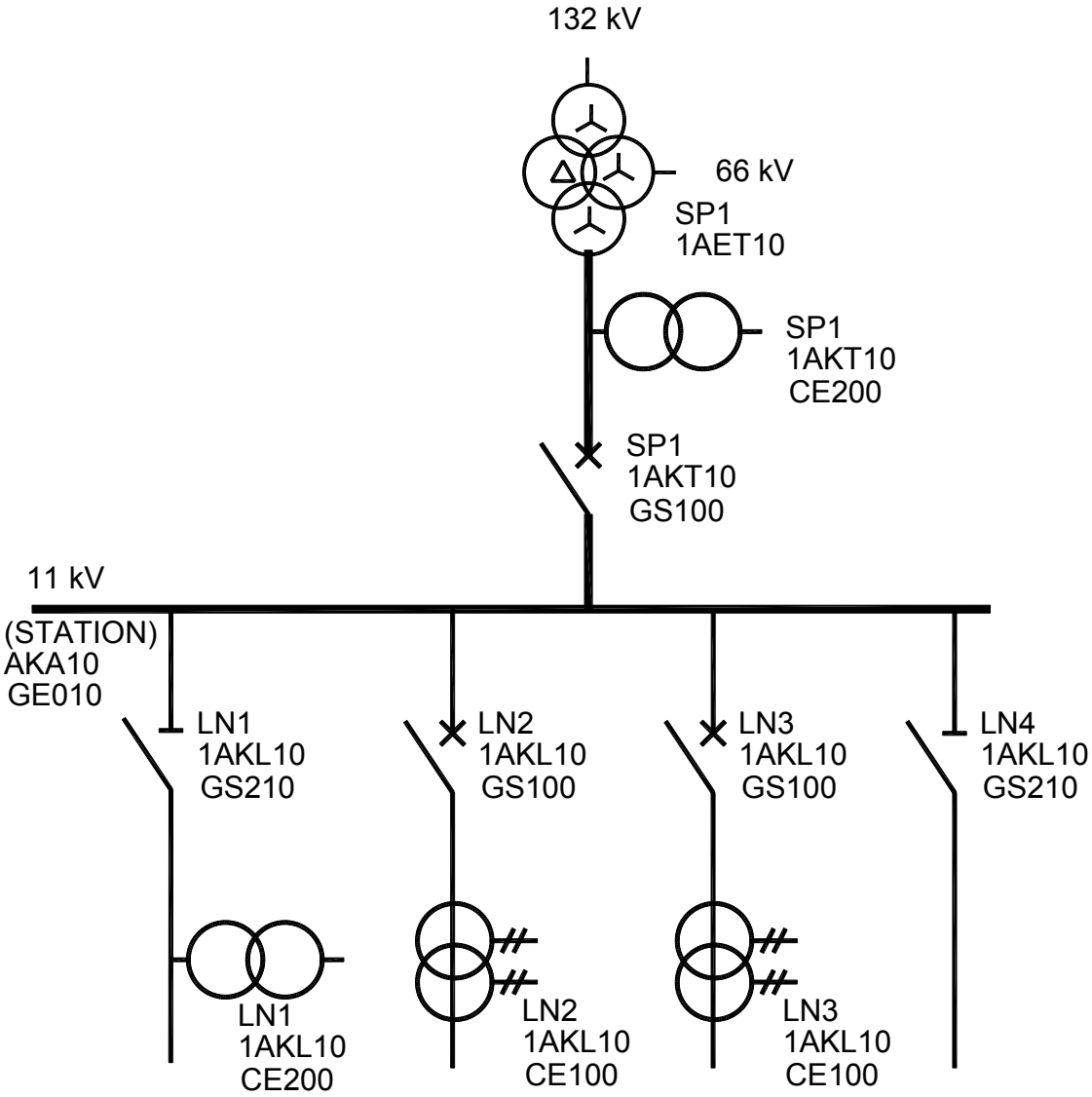


Fig. 4.6.6 Single phase coding on 11 kV bays separated on BDL 0. Lines 1-4.

4.7 Coding of high voltage masts

Coding of HV transmission line is as shown below. Masts are coded with F_N numbers on BDL 1. **When counting masts, 3 alpha letters are allowed on BDL 1**. Parts of the mast insulators, foundations, bridge and guys are coded on BDL 2.

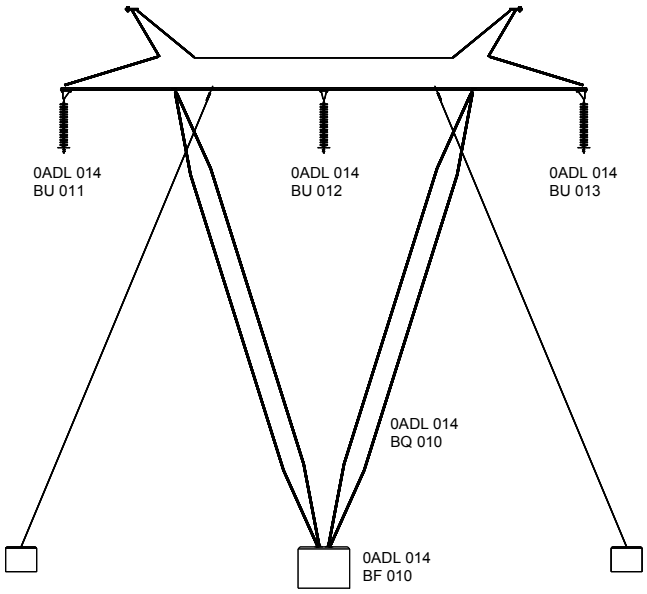


Fig.: 4.7.1 Example of HV tower coding, 220 kV.

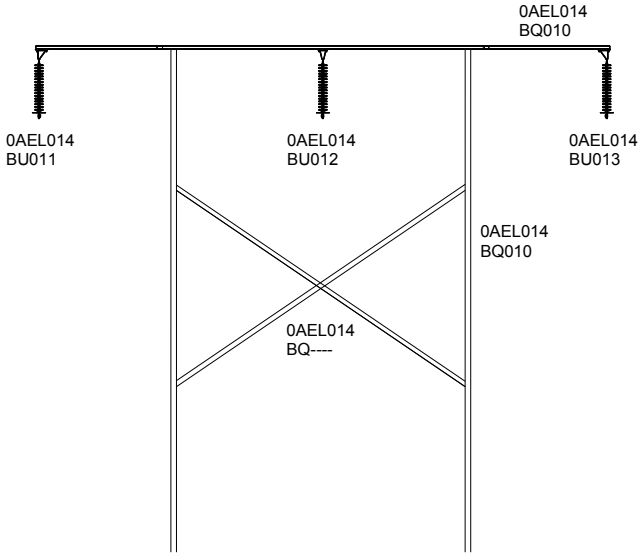


Fig.: 4.7.2 Example of HV tower coding, 132 kV.

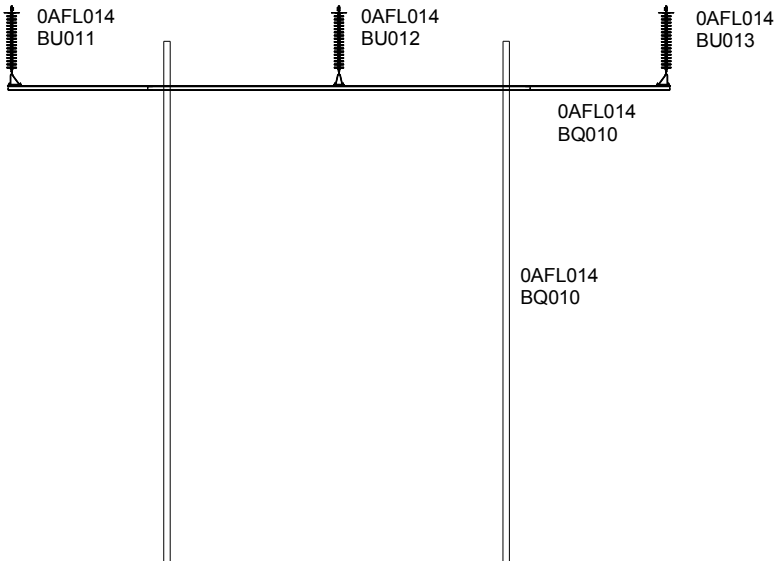


Fig.: 4.7.3 Example of HV tower coding, 66 kV.

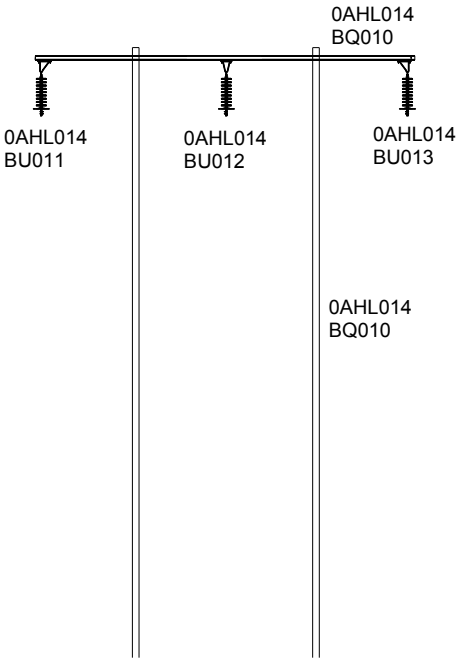


Fig.: 4.7.4 Example of HV tower coding, 33 kV

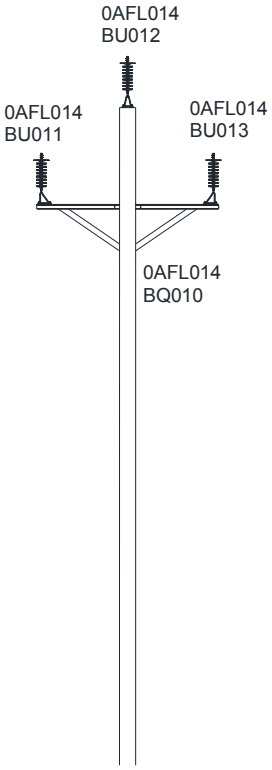


Fig.: 4.7.5 Example of HV tower coding, 33 kV

4.8 CODING FROM GENERATOR TO GENERATOR TRANSFORMER

4.8.1 CODING FROM NEUTRAL POINT OF GENERATOR TO GENERATOR TRANSFORMER

Coding from generator to generator transformer is done in A_N and F_N numbers as shown on figure below. The F_N numbering shall be in units on single line diagrams, i.e. 01, 02, 03 etc., when numbering is done from the neutral point of a generator to the first separation of branches. Thereafter decade numbering applies.

When the phases are coded (numbered) on multi-line diagrams the numbering shall be done with the A_N numbers, i.e. the unit seat in the A_N number is used for numbering of the phases (L1, L2, L3, or R, S, T).

It is shown in the examples on figure 4.8.1 how coding shall be performed, both on single-line and multi-line diagrams.

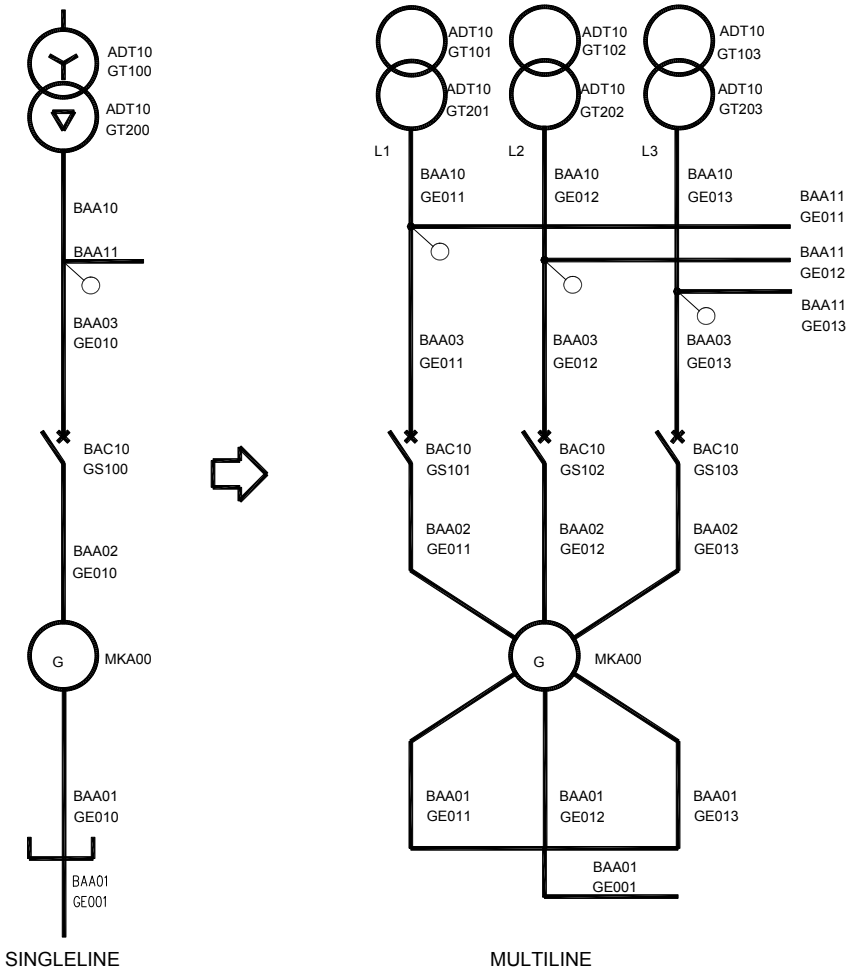


Fig. 4.8.1 KKS coding, single-line and multi-line diagram, counting of phases.

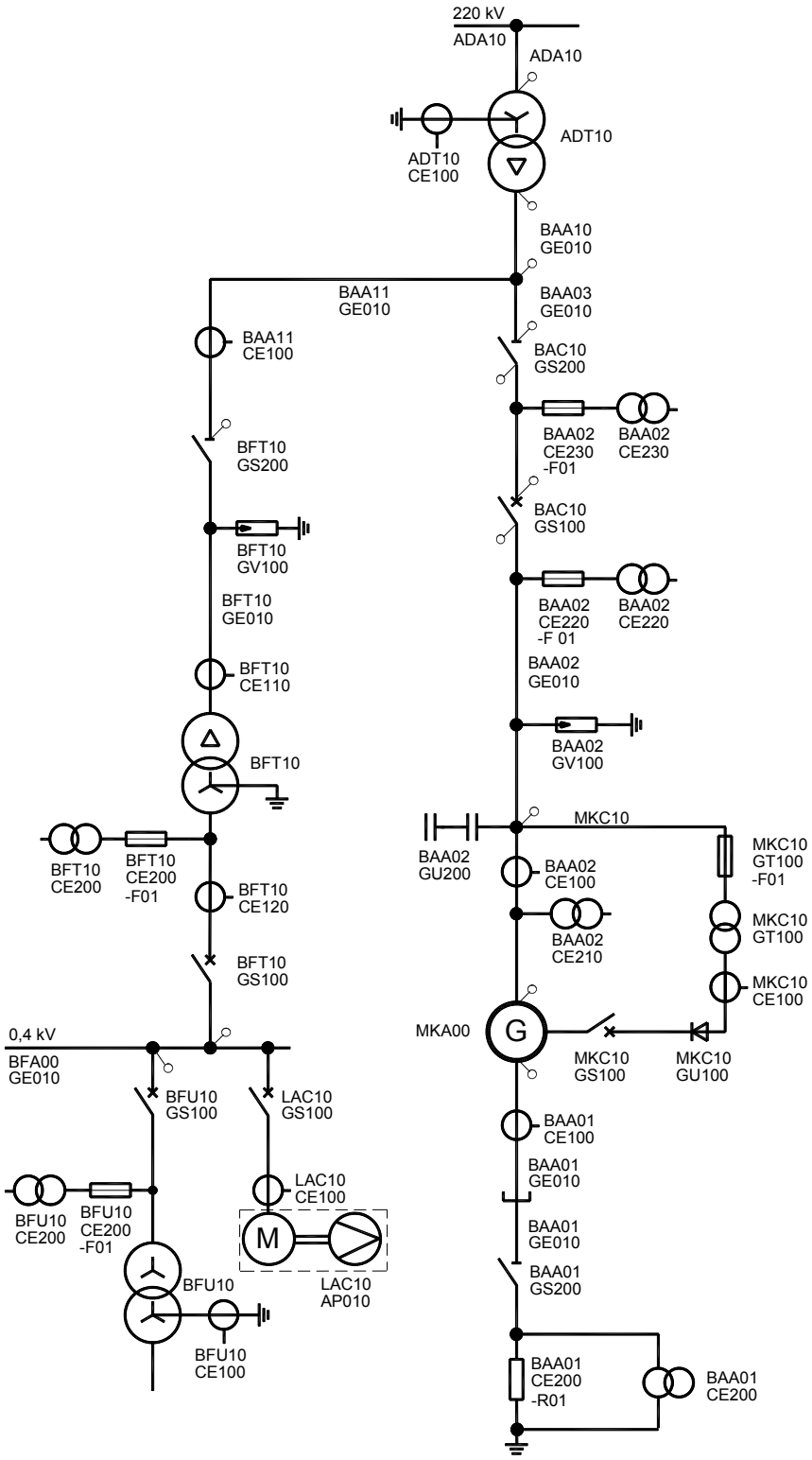


Fig. 4.8.2 Coding from neutral point of generator to generator transformer

4.9 POWER TRANSMISSION AND AUXILIARY POWER SUPPLY IN POWER PLANTS

Auxiliary power supply is all power distribution inside a Power Plant or a Substation used by Landsnet, and shall be coded under B on F_1 (see fig. 4.9.1).

4.9.1 FURTHER DEFINITION OF DISTRIBUTION IN POWER PLANTS

Electrical distribution which in the KKS code is coded under F_3, as "normal system" is defined as auxiliary power supply, and thereby the power that is needed for the production, transmission and distribution of electrical energy.

In this group is ALL distribution inside of a Power Plant, distribution connected to dams, intake and tailrace and ALL distribution connected with the Substations and all emergency Power Plants.

This distribution shall be coded under BB_, BF_, BG_ and BJ_.

Electrical distribution which in the KKS code is coded under F_3 as "general-purpose" is defined as general distribution and this applies to distribution connected to the operation but is not needed for production, transmission and distribution.

This applies to distribution for canteens, garages, staff residence and similar.

This distribution shall be coded under BC_, BH_, BL_ and BU_.

Further explanation is in the KKS keys of LN

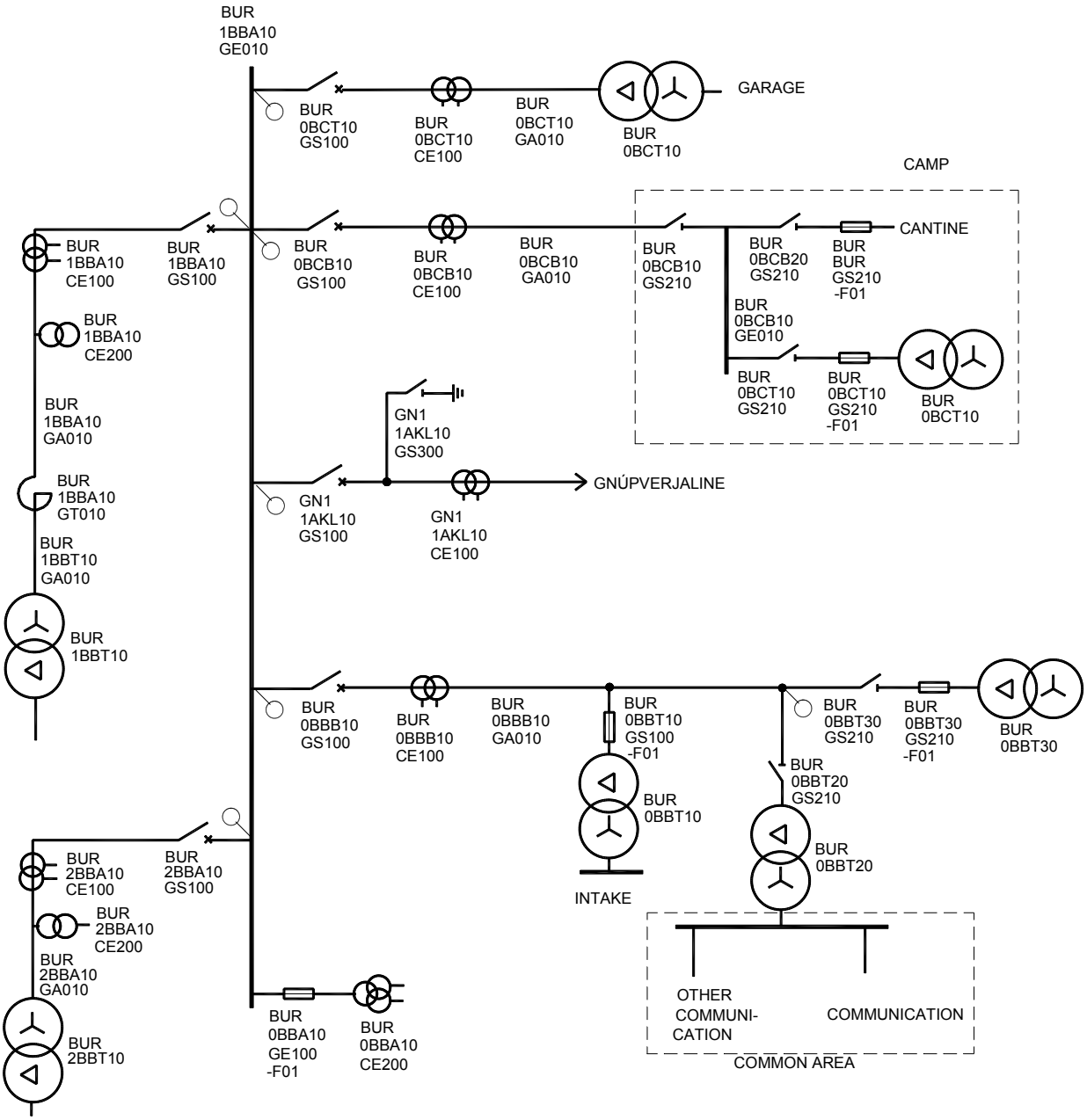


Fig. 4.9.1 Example of coding of distribution in Power Plants.

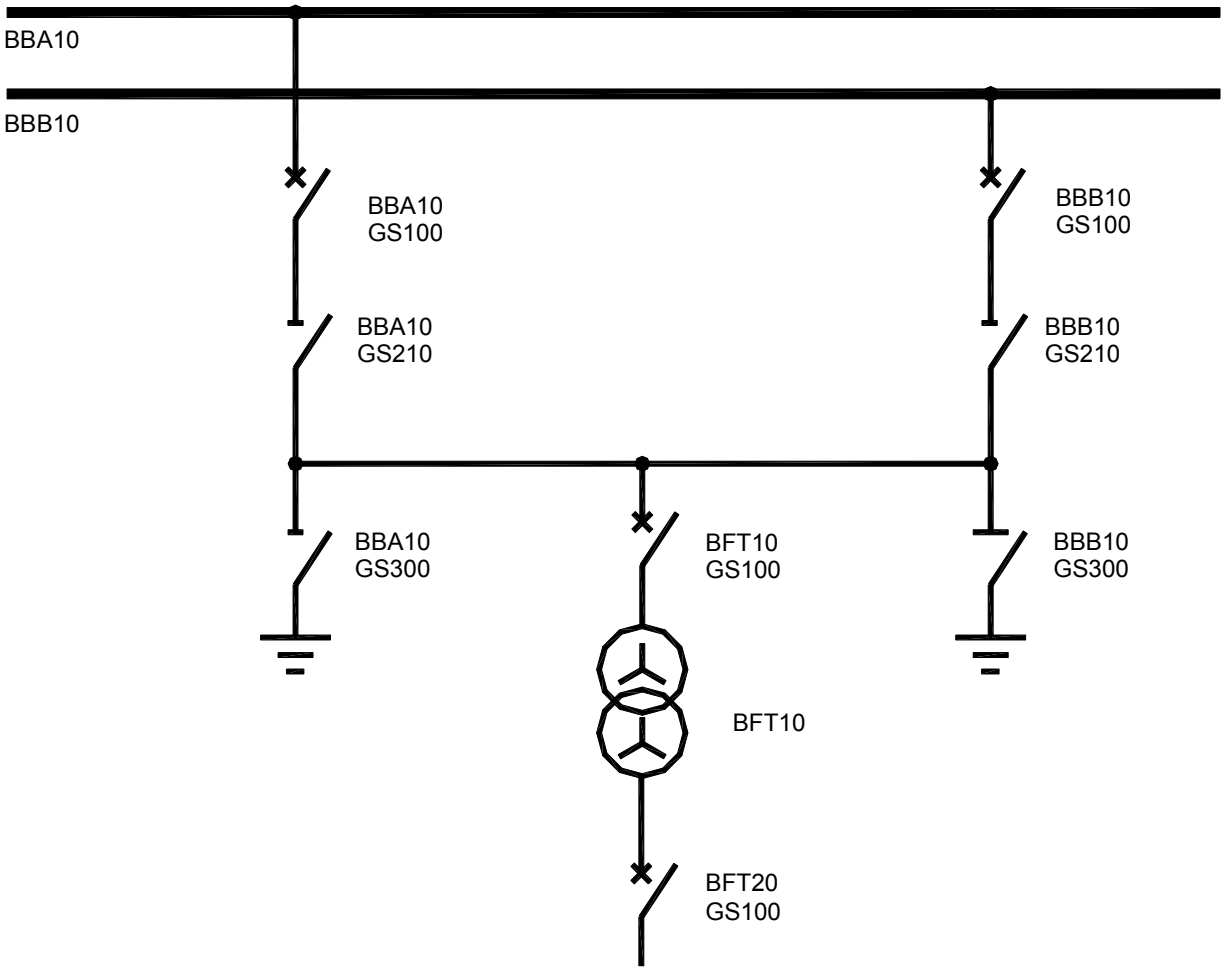


Fig. 4.9.2 Coding of circuit breakers, disconnectors and earthing switches in a Power Plant.

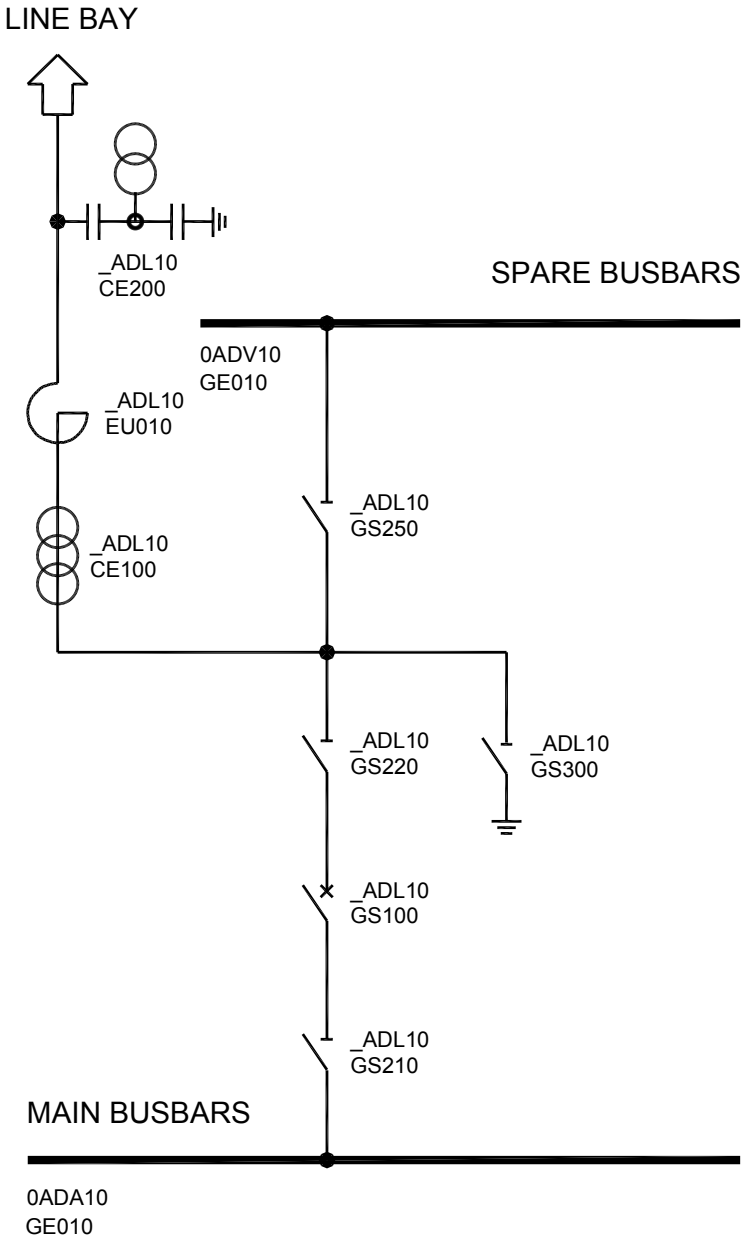


Fig. 4.9.3 Example of a single phase coding of a 220 kV line bay in a switchyard. See three phase coding in figure 4.9.4.

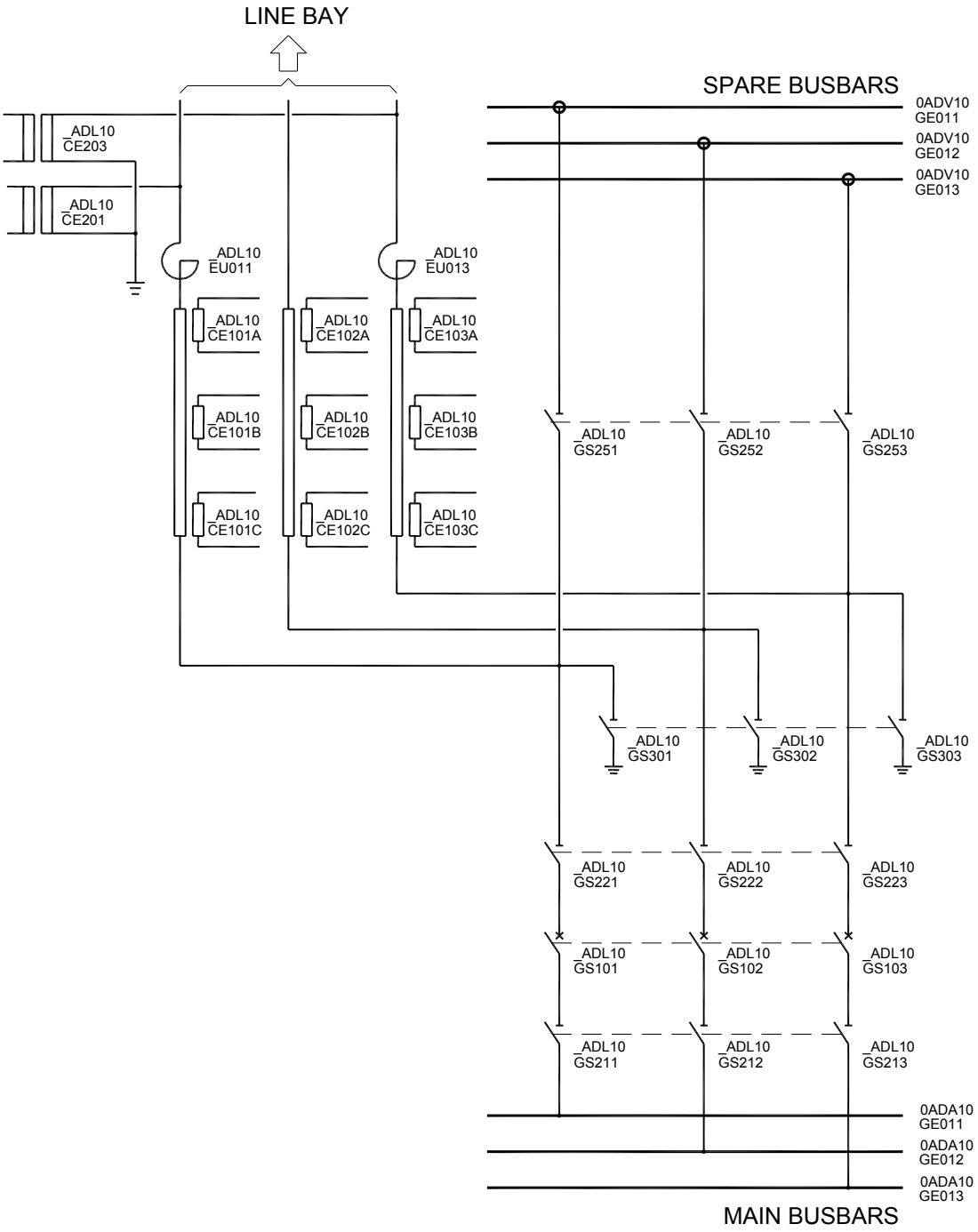


Fig. 4.9.4 Example of three phase coding of a 220 kV line bay in a switchyard. See one phase coding in figure 4.9.3.

4.10 EQUIPMENT AND POWER CIRCUIT CODING

When equipment is coded according to the process code, the whole process shall be coded, i.e. all equipment needed for control, protection etc. shall be coded with the same process code the whole way on BDL 1.

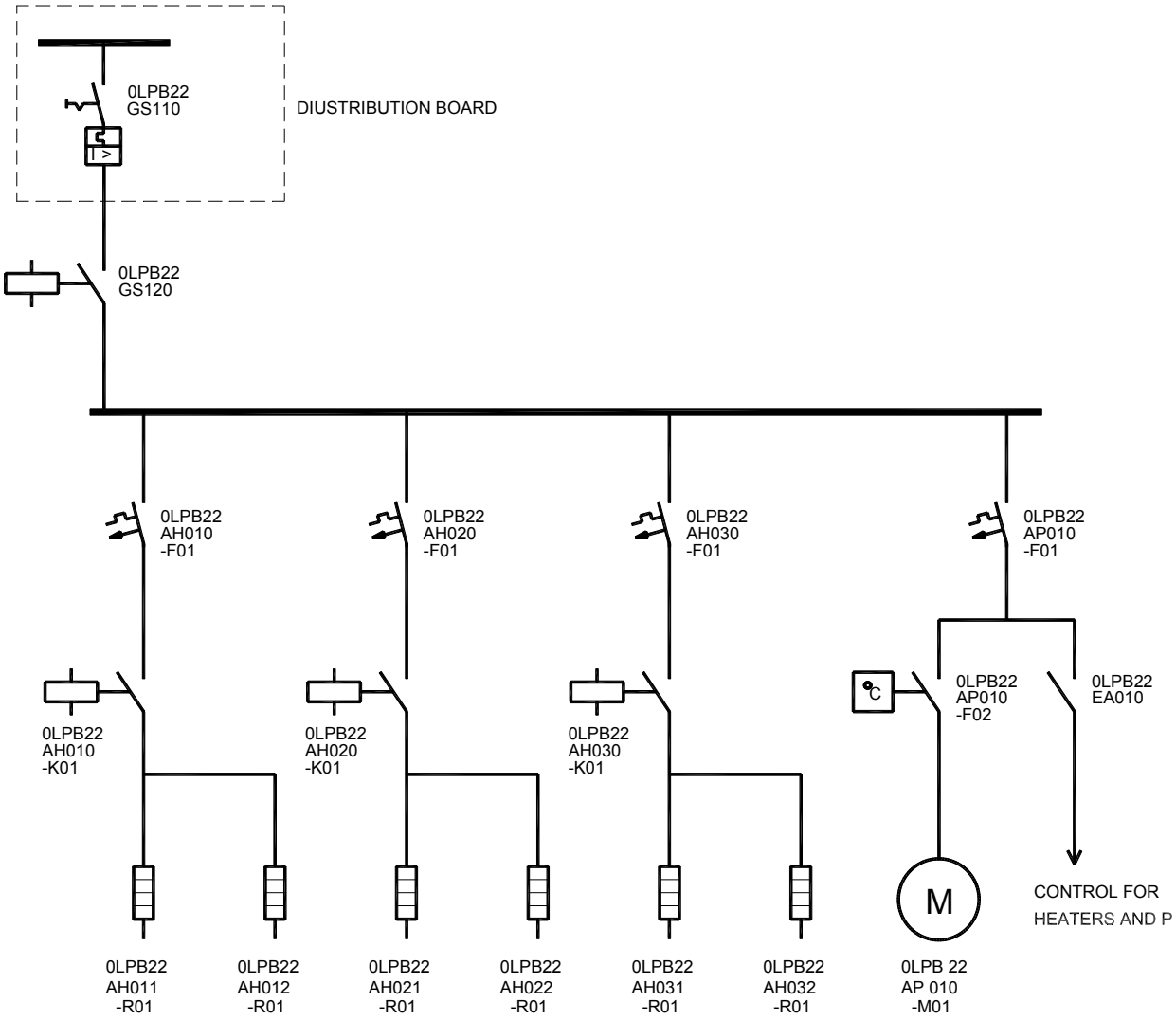


Fig. 4.10.1 Example of coding of equipment belonging to heating system for gates.

4.11 DEFINITION BY LANDSNET ON FREE ALPHABETICAL CHARACTERS

4.11.1 DIRECT CURRENT SYSTEMS

For direct current systems, B shall be used on BDL 1 on F_1 and the coding shall be done according the following table.

DC distribution					Accumulators					Chargers					Voltage
F_1	F_2	F_3	F_N	F_N	F_1	F2	F3	F_N	F_N	F_1	F2	F3	F_N	F_N	[Volt]
B	U	A	-	-	B	T	A	-	-	B	T	L	-	-	≥220 V DC
B	U	B	-	-	B	T	B	-	-	B	T	M	-	-	125 V DC
B	U	C	-	-	B	T	C	-	-	B	T	N	-	-	110 V DC
B	U	D	-	-	B	T	D	-	-	B	T	P	-	-	60 V DC
B	U	E	-	-	B	T	E	-	-	B	T	Q	-	-	48 V DC
B	U	F	-	-	B	T	F	-	-	B	T	R	-	-	36 V DC
B	U	G	-	-	B	T	G	-	-	B	T	S	-	-	24 V DC
B	U	H	-	-	B	T	H	-	-	B	T	T	-	-	12 V DC
B	U	J	-	-	B	T	J	-	-	B	T	U	-	-	6 V DC
B	U	K	-	-	B	T	K	-	-	B	T	V	-	-	<6 V DC

Table 4.11.1 Coding of DC systems, distribution, accumulators racks and chargers on BDL 1.

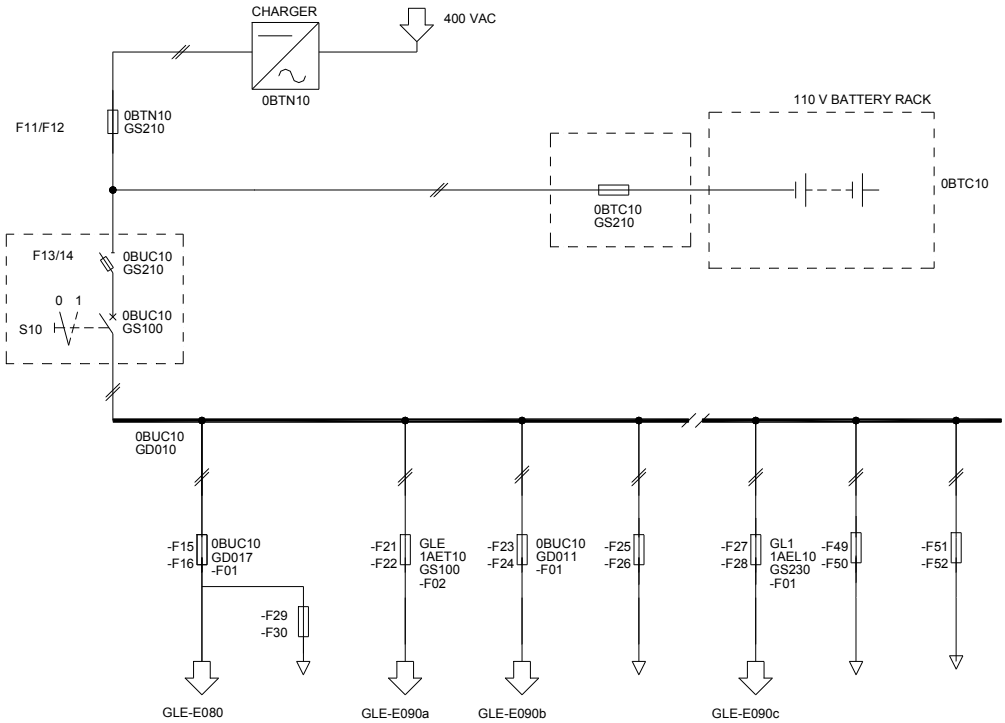


Fig 4.11.1 Example of coding for equipment that belong to DC structure in a switchyard

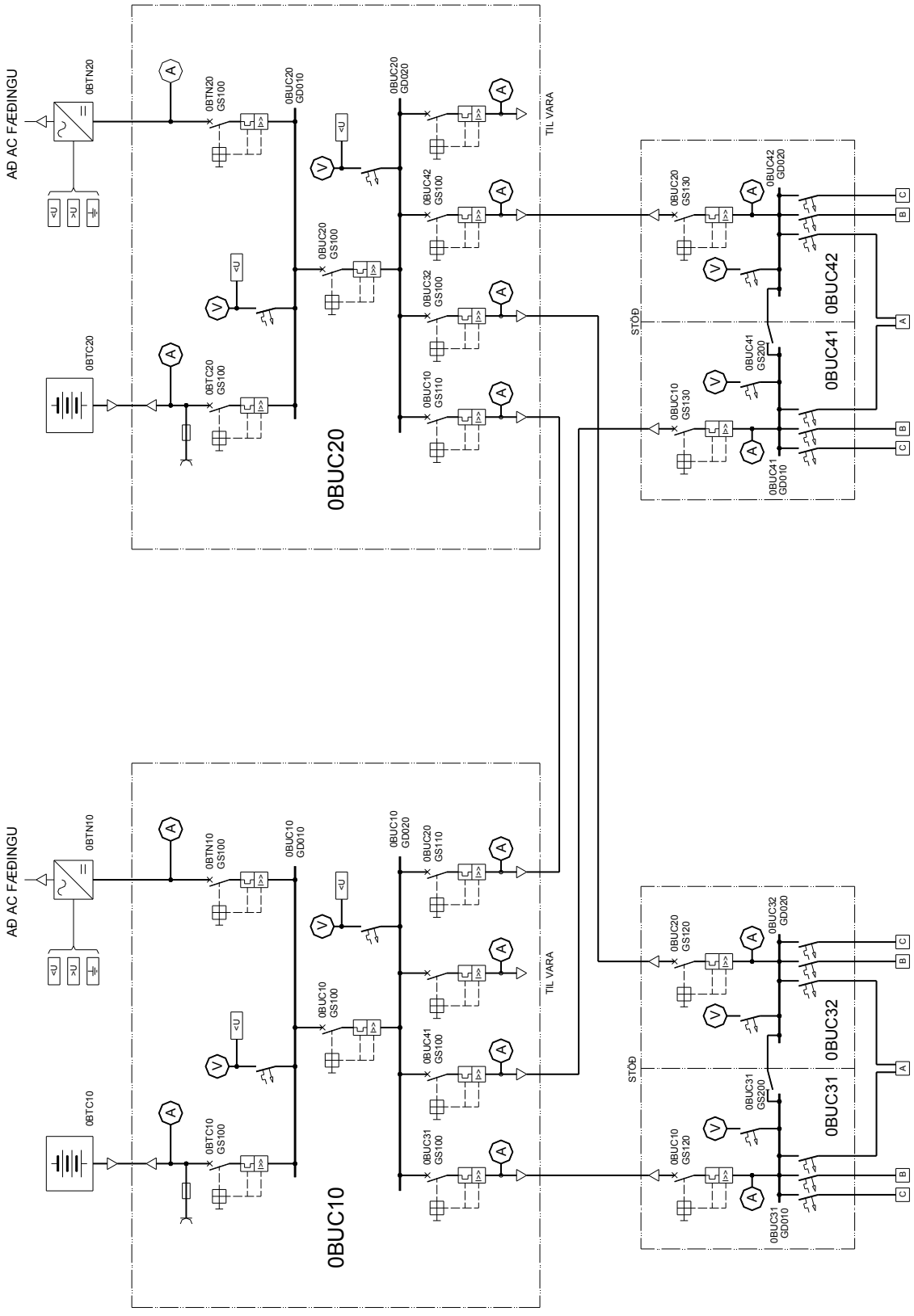


Fig. 4.11.2 Example on coding of equipment in a DC system in switchyards.

4.11.2 CABLES, CONDUCTORS, INTERCONNECTING BOXES, BUSBARS AND HV FEED THROUGH

For cables and installations material G shall be used on BDL 2 on A_1 and the coding shall be done according the following table.

A_1	A_2	A_N	A_N	A_N	A_3	Item
G	A	-	-	-	-	Cables and conductors
G	B	-	-	-	-	Connecting box (“small”)
G	C	-	-	-	-	Transmission line
G	D	-	-	-	-	DC-busbar
G	E	-	-	-	-	AC-busbar
G	F	-	-	-	-	HV feed through
G	G	-	-	-	-	HV terminating
G	H	-	-	-	-	Connecting cabinets (“big” boxes and cabinets)
G	J	-	-	-	-	Capacitors (capacitor batteries)
G	L	-	-	-	-	Induction, coils (capacitor batteries)

Table 4.11.2 Coding of Cables, conductors, interconnecting boxes, busbars and HV feed through on BDL 2.

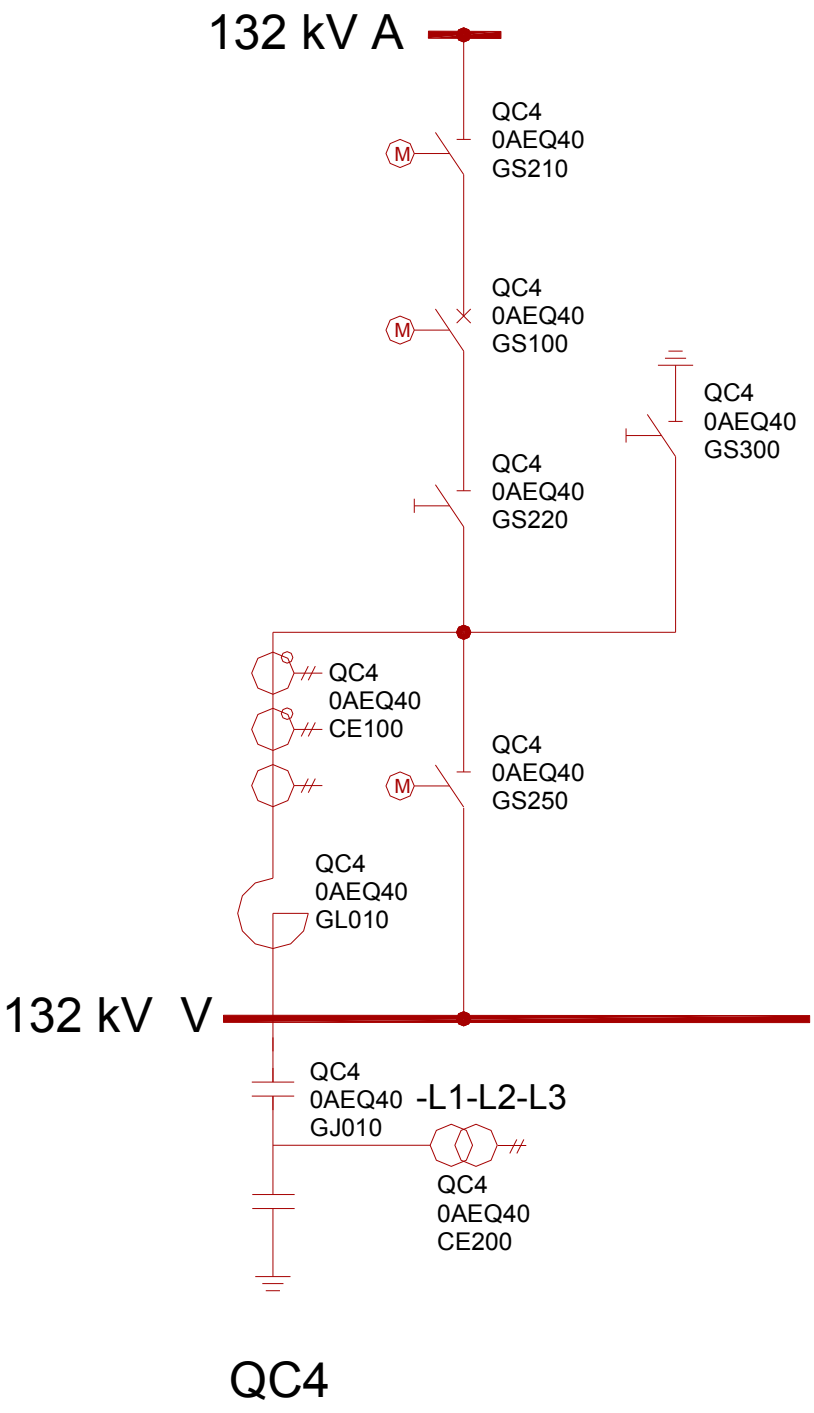


Fig. 4.11.3 Example on coding of capacitor battery/bay 132 kV.

4.12 CONNECTING BOXS AND TRANSFORMERS

4.12.1 CODING OF CONNECTING BOXES/CABINETS

For the process related code the following applies:

Connecting boxes/cabinets shall be coded on BDL 2 according to table 4.12.1(examples):

BDL -1	BDL 0	BDL 1	BDL 2	BDL 3	Explanation
Sultartangalína 1, SU1 in Sultartanga					
SUL	+SU1	1ADL10	GS100		Circuit breaker (Phases GS101, 102 and 103)
SUL	+SU1	1ADL10	GS2**x**0		Disconnectors (Phases GS2**x**1, 2**x**2 and 2**x**3)
SUL	+SU1	1ADL10	GS3**x**0		Earthing switch (Phases GS3**x**1, 3**x**2 and 3**x**3)
SUL	+SU1	1ADL10	CE1**x**0		Current transformers (Phases CE1**X**1, 1**X**2, and 1**X**3)
SUL	+SU1	1ADL10	CE2**x**0		Voltage transformers (Phases CE2**X**1, 2**X**2, and 2**X**3)
SUL	+SU1	1ADL10	GB1**x**0		Connecting box “Small“
SUL	+SU1	1ADL10	GH1**x**0		Connecting cabinet “Large“
Hrútatungulína 1, HT1 in Vatnshömrum					
VAT	+HT1	1AEL10	GS100		Circuit breaker (Phases GS101, 102 and 103)
VAT	+HT1	1AEL10	GS2**x**0		Disconnectors (Phases GS2**x**1, 2**x**2 and 2**x**3)
VAT	+HT1	1AEL10	GS3**x**0		Earthing switch (Phases GS3**x**1, 3**x**2 and 3**x**3)
VAT	+HT1	1AEL10	CE1**x**0		Current transformers (Phases CE1**X**1, 1**X**2, and 1**X**3)
VAT	+HT1	1AEL10	CE2**x**0		Voltage transformers (Phases CE2**X**1, 2**X**2, and 2**X**3)
VAT	+HT1	1AEL10	GB1**x**0		Connecting box “Small“
VAT	+HT1	1AEL10	GH1**x**0		Connecting cabinet “Large“
Hrútatungulína 1, HT1 in Hrútatungu					
HRU	+HT1	2AEL10	GS100		Circuit breaker (Phases GS101, 102 and 103)
HRU	+HT1	2AEL10	GS2**x**0		Disconnectors (Phases GS2**x**1, 2**x**2 and 2**x**3)
HRU	+HT1	2AEL10	GS3**x**0		Earthing switch (Phases GS3**x**1, 3**x**2 and 3**x**3)
HRU	+HT1	2AEL10	CE1**x**0		Current transformers (Phases CE1**X**1, 1**X**2, and 1**X**3)
HRU	+HT1	2AEL10	CE2**x**0		Voltage transformers (Phases CE2**X**1, 2**X**2, and 2**X**3)
HRU	+HT1	2AEL10	GB1**x**0		Connecting box “Small“
HRU	+HT1	2AEL10	GH1**x**0		Connecting cabinet “Large“

Table 4.12.1 Coding of connecting boxes/cabinets on BDL 2.

For the point of installation code the following applies:

If a connection box serves only specified equipment and nothing else, e.g. a circuit breaker, disconnector, current transformers and so on, it is coded with the same code as the equipment on BDL 2, i.e. GS100, GS 200, CE100 etc..
If a connection box serves more equipment it gets the code GB100 if it is a “small” junction boxes, but the code GH100 if it is a “bigger” junction box/cabinet.
It is allowed to use only the BDL 2 on drawings in the Point of Installation code, if it is obvious to which equipment the connection point belongs.
If that is not the case, the whole code shall be used as practised on the LN KKS drawings.

The Point of Installation code for connection boxes/-cabinets. See examples:

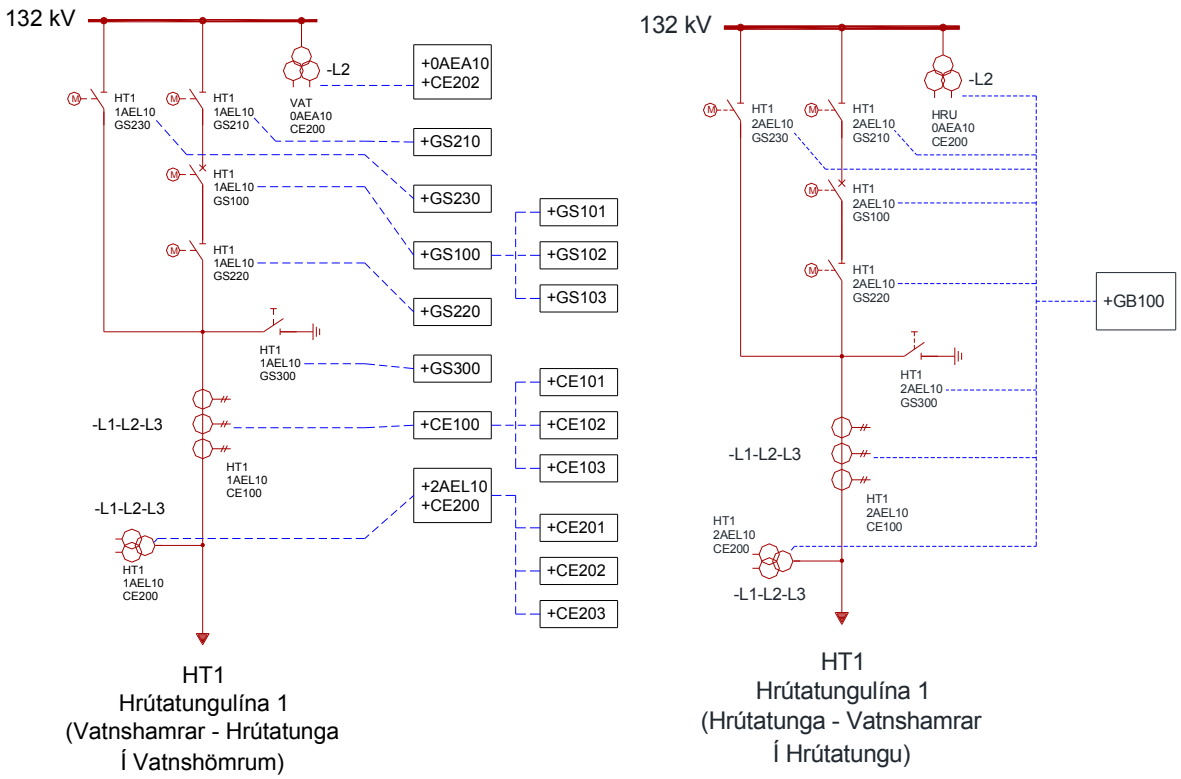


Fig. 4.12.1 Example on coding connection boxes/cabinets in switchyards.

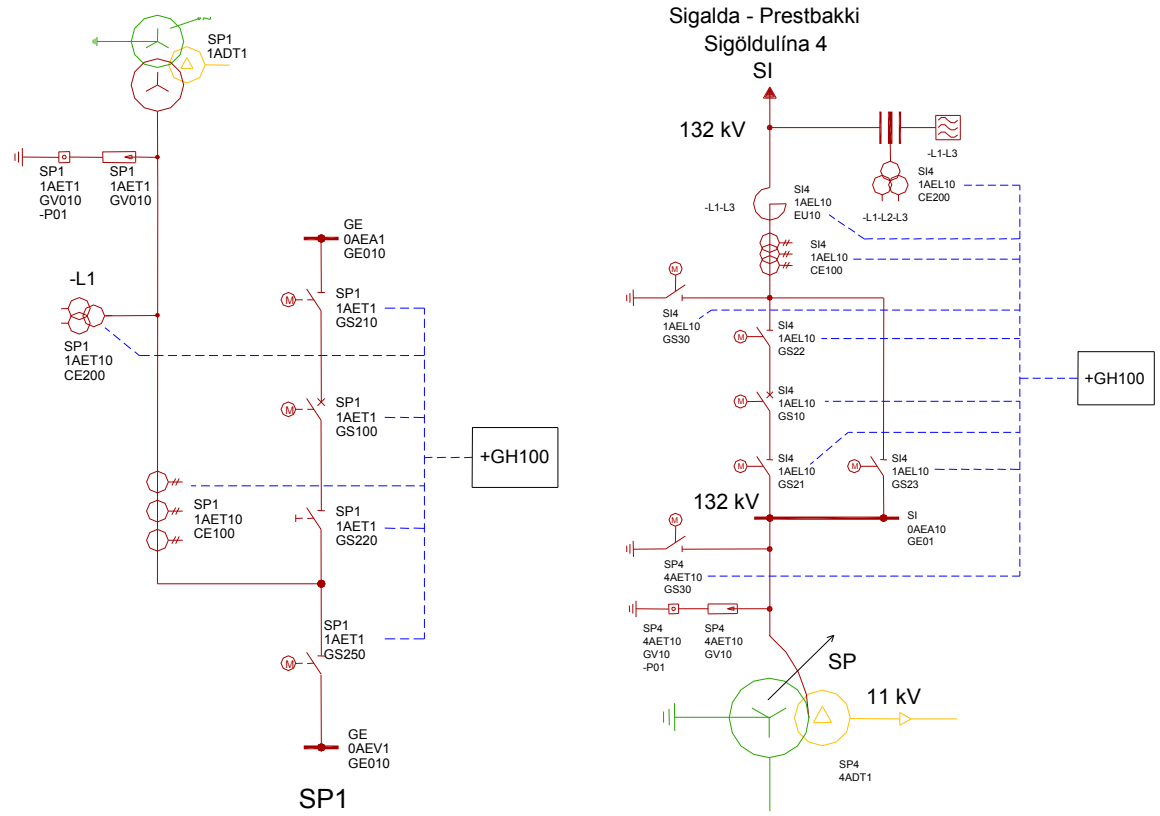


Fig. 4.12.2 Example on coding connection boxes/cabinets in switchyards.

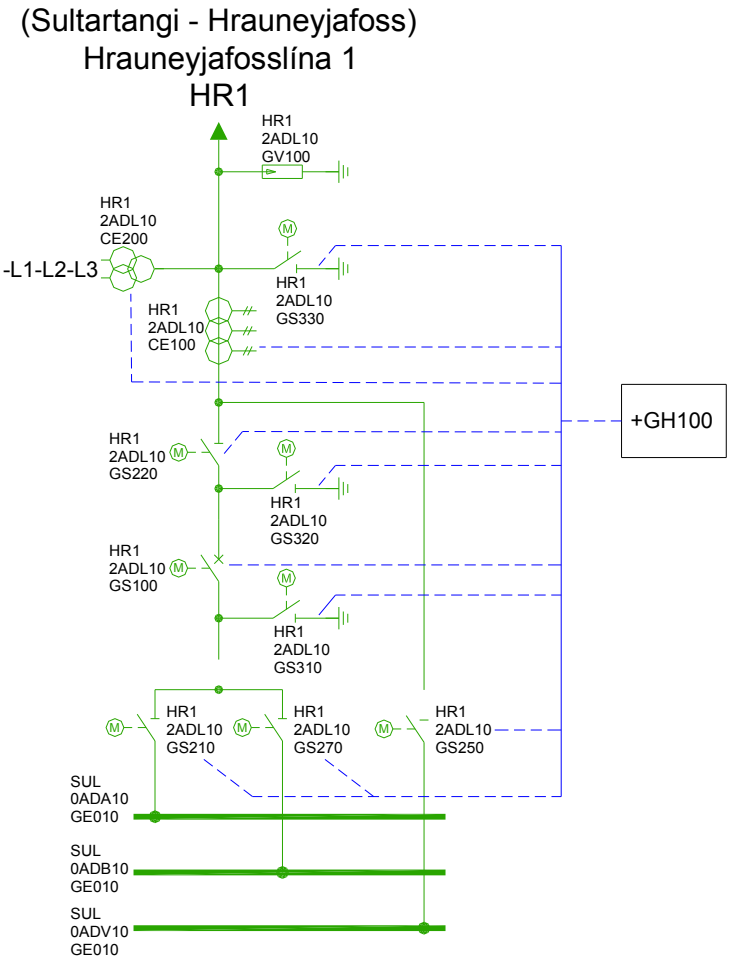


Fig. 4.12.3 Example on coding connection boxes/cabinets in switchyards.

4.12.2 GENERAL CODING OF TRANSFORMER

Following are guidelines and drawings concerning coding of transformer equipment on BDL 2, i.e. minimal coding.
The drawings are symbolic, and the amount of boxes, fans etc. can differ.
It is allowed to do further/deeper coding, but in that case, a proposal shall be submitted to the LN KKS committee.
Coding and counting of valves is not on the drawings, but the definitions of Landsnet and Landsvirkjun written in the respective KKS handbooks, shall prevail.

BDL 2	Explanation	BDL 2	Explanation
AC10**x**	Cooler/cooler group 1	CT011	Winding temperature 11 kV
AC20**x**	Cooler/cooler group 2	CT033	Winding temperature 33 kV
AC30**x**	Cooler/cooler group 3	CT066	Winding temperature 66 kV
AC40**x**	Cooler/cooler group 4	CT132	Winding temperature 132 kV
AN1**xx**	Fan group 1	CT220	Winding temperature 220 kV
AN2**xx**	Fan group 2	GB110	Main connection box
AN3**xx**	Fan group 3	GB120	Connecting box for fans
AN4**xx**	Fan group 4	GB130	Connection box for measurements and alarms
BB100	Main tank	GF01**x**	Bushing 11 kV
BB200	Conservator tank	GF03**x**	Bushing 13 kV
BB300	Tank for OLTC	GF06**x**	Bushing 66 kV
CE1**xx**	Current transformer	GF13**x**	Bushing 132 kV
CL100	Oil level main tank	GF22**x**	Bushing 220 kV
CL200	Oil level conservator tank	GT100	Connection box for tap changer (OLTC)
CL300	Oil level OLTC	GT10**x**	OLTC
CP210	Buchholz	GT20**x**	OFFLTC
CP220	Oil pressure		
CP230	Pressure release main tank		
CP310	Pressure release OLTC		

Table 4.12.2 Coding of transformer equipment on BDL 2.

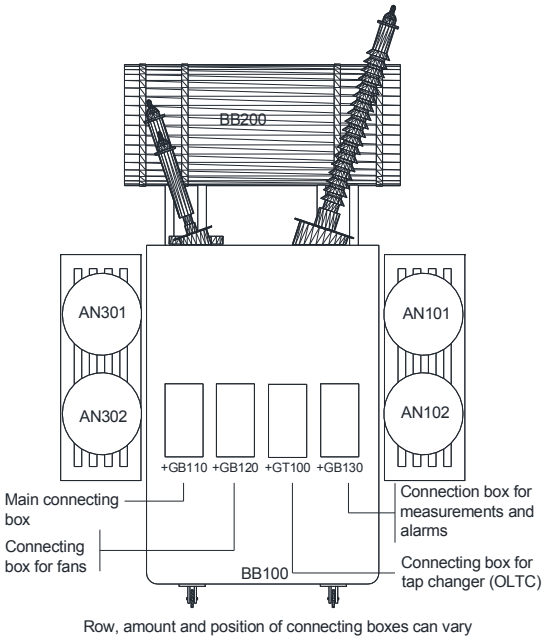


Fig. 4.12.4 Example on coding of a transformer

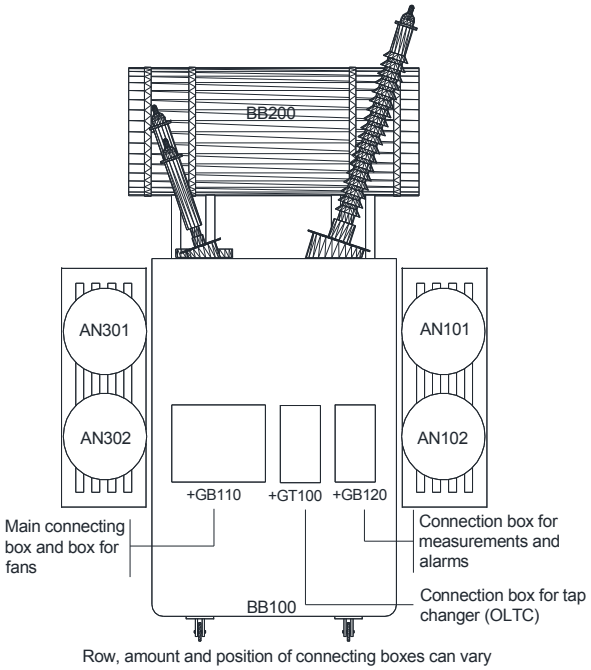


Fig. 4.12.5 Example on coding of a transformer

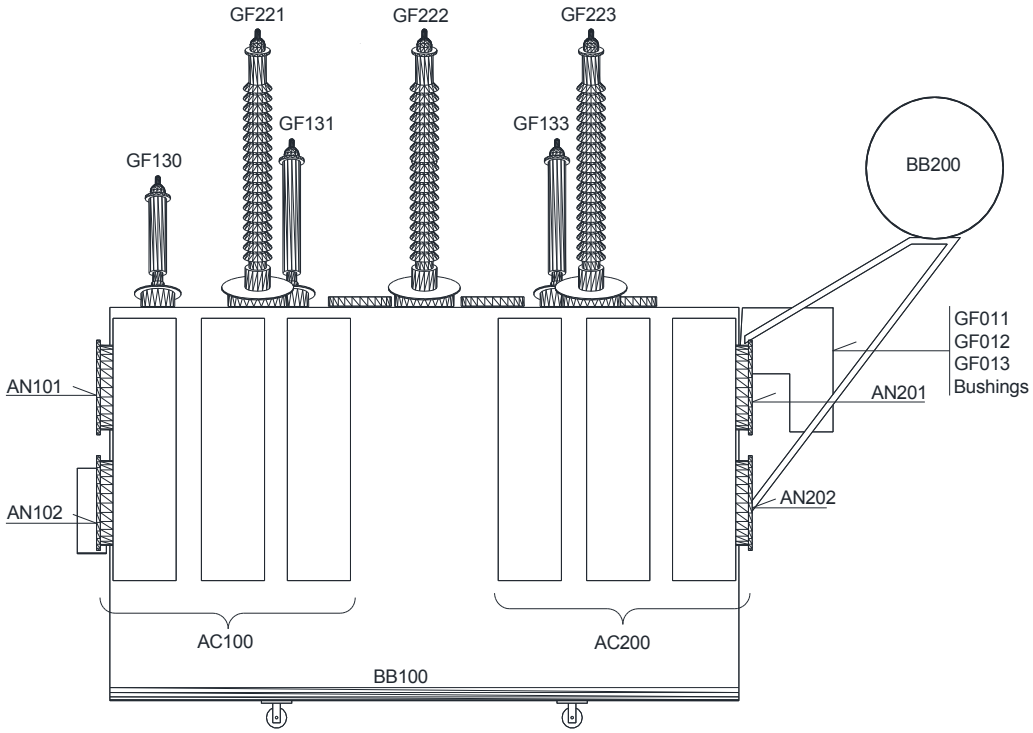


Fig. 4.12.6 Example on coding of a transformer.

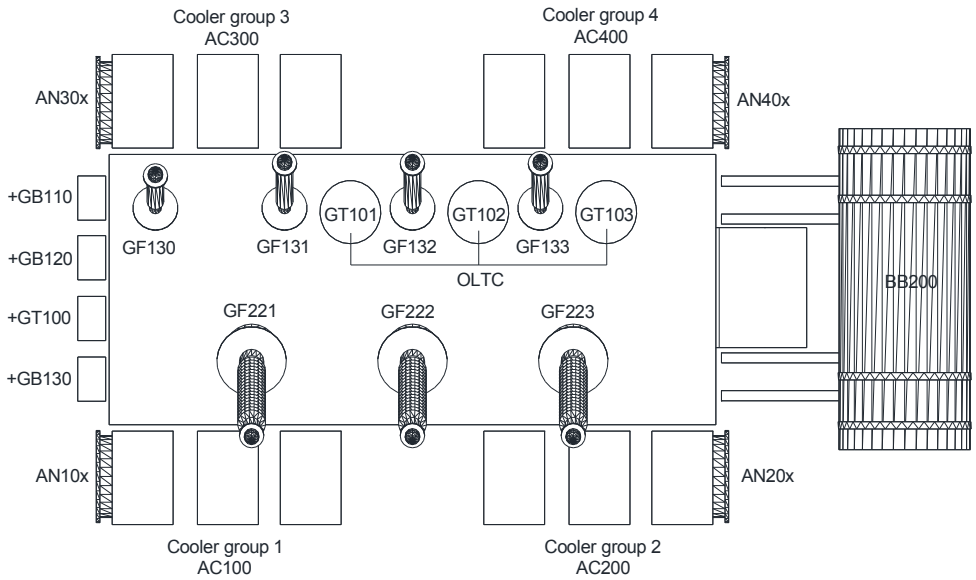


Fig. 4.12.7 Example on coding of a transformer.

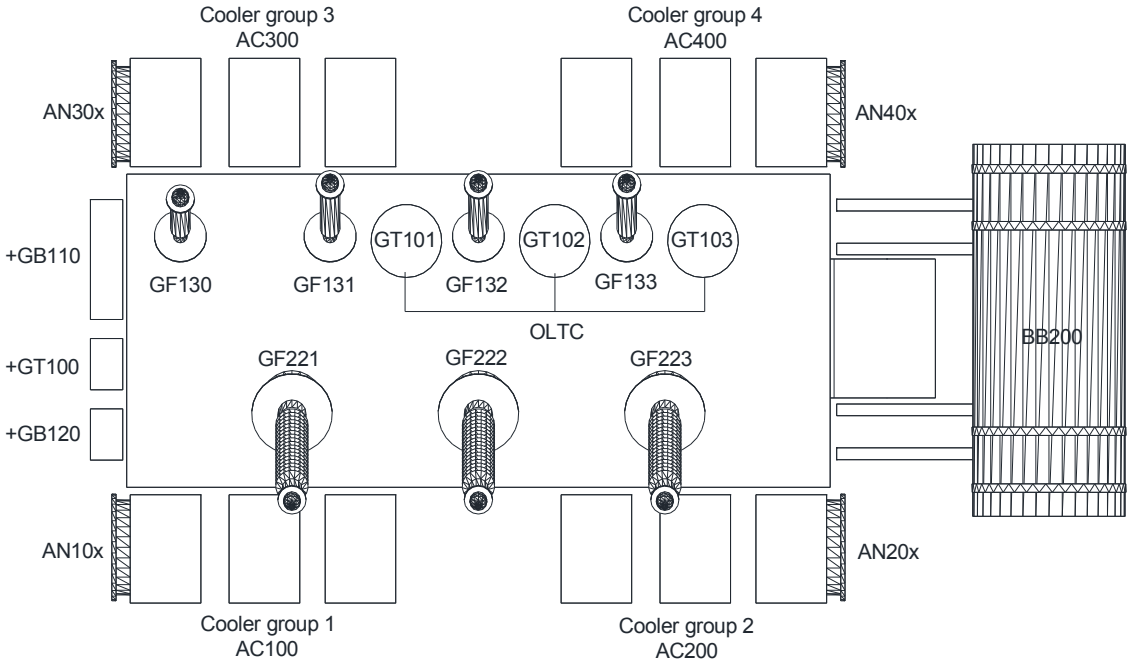


Fig. 4.12.8 Example on coding of a transformer.

5. POINT OF INSTALLATION CODE

5.1 GENERAL

The point of installation code is used by Landsnet to code electrical equipment (cubicles and switchboards) and some points of connection of electrical equipment (in cubicles and switchboards) in electrical systems, by their role and location.

The KKS code consists of alpha letters (A) and numbers (N). The code is divided in various break down levels BDL's. In the point of installation code there are 3 (0-2) BDL's. It is used in a similar way as the process related code. (Mind the use of prefixes and break down symbols, see chapter 1.1.2).

BDL ÷1 and BDL 0 are used in the same manner as in the process code.

BDL	- 1	0	1	2
Definition	Area / total plant	Part of a plant	Installation unit code	Installation space code
Name	S_1 S_2 S_3	G	F_0 F_1 F_2 F_3 F_N F_N	A_1 A_2 A_N A_N A_N A_3
Type of key	A A A/N	A/N A/N N	N A A A N N	A A N N N (A)

Table 5.1.1 Point of installation code.

F_0 on BDL 1 is used when a distinguishing between systems, either in a Power Plant or a Substation, when there are more than one identical system. When one system is common for other systems and where there is no system grouping then F_0 is 0 (zero) else the systems are numbered from 1 to 9.

Groups used on BDL 1 (F_1) are A, B and C. See tables 5.1.2 - 5.1.4. For further information see the guidelines from VGB part C3.

F_0	F_1	F_2	F_3	F_N	F_N	Location
-	A	A	-	-	-	➢ 420 kV system, free use
-	A	B	-	-	-	➢ 420 kV system, free use
-	A	C	-	-	-	380 (420) kV system
-	A	D	-	-	-	220 (245) kV system
-	A	E	-	-	-	110 (150) kV system
-	A	F	-	-	-	60 (72) kV system
-	A	H	-	-	-	30 (35) kV system
-	A	K	-	-	-	10 (15) kV system
-	A	L	-	-	-	6 (5) kV system
-	A	N	-	-	-	< 1 kV system
-	A	P	-	-	-	Control consoles
-	A	Q	-	-	-	Measuring- and metering equipment
-	A	R	-	-	-	Protection equipment
-	A	S	-	-	-	Decentralized panels and cabinets
-	A	T	-	-	-	Transformer equipment
-	A	U	-	-	-	Open-loop control, check back and auxiliary equipment
-	A	V	-	-	-	Control and relay cubicles
-	A	W	-	-	-	Instrument panels
-	A	X	-	-	-	Central equipment
-	A	Y	-	-	-	Communication equipment

Table 5.1.2 Group A codes (grid and distribution) which are used by Landsnet in point of installation code, BDL 1 (F_2).

In the place F_3 the Alpha letters A, B and V etc. are used to code busbars in switchyards, (A for main 1st busbar, B for 2nd busbar and V for spare busbar etc.).

F_0	F_1	F_2	F_3	F_N	F_N	Location
-	B	A	-	-	-	Power production
-	B	B	-	-	-	High voltage distribution boards and transformers, normal system
-	B	C	-	-	-	High voltage distribution boards and transformers, general-purpose
-	B	D	-	-	-	High voltage distribution boards and transformers, emergency power system
-	B	F	-	-	-	Low voltage main distribution boards and transformers, normal system
-	B	H	-	-	-	Low voltage main distribution boards and transformers, general-purpose
-	B	J	-	-	-	Low voltage sub distribution boards and transformers, normal system
-	B	L	-	-	-	Low voltage main distribution boards and transformers, general purpose
-	B	M	-	-	-	Low voltage sub distribution boards and transformers, (diesel) emergency power system 1
-	B	N	-	-	-	Low voltage sub distribution boards and transformers, (diesel) emergency power system 2 (protected against external impact)
	B	P	-	-	-	Power installations for large variable-speed drives, e.g. feed water pump excitation equipment, not power adjusters in switchgear
	B	R	-	-	-	Low voltage distribution, emergency power system 1 (converter)
-	B	T	-	-	-	Battery systems (batteries and chargers)
-	B	U	-	-	-	Direct voltage distribution boards, normal system
-	B	V	-	-	-	Direct voltage distribution boards, emergency power system 1
-	B	W	-	-	-	Direct voltage distribution boards, emergency power system 2
-	B	X	-	-	-	Fluid supply system for control and protection equipment
-	B	Y	-	-	-	Control and protection equipment

Table 5.1.3 Group B codes (power transmission and auxiliary power supply) which are used by Landsnet in point of installation code, BDL 1 (F_2).

F_0	F_1	F_2	F_3	F_N	F_N	Location
-	C	A	-	-	-	Protective interlocks
-	C	B	-	-	-	Functional group control, sub loop control
-	C	C	-	-	-	Binary signal conditioning
-	C	D	-	-	-	Drive control interface
-	C	E	-	-	-	Annunciation
-	C	F	-	-	-	Measuring, recording
-	C	G	-	-	-	Closed-loop control (excl. power section)
-	C	H	-	-	-	Low voltage main distribution boards and transformers, general-purpose
-	C	J	-	-	-	Unit coordination level
-	C	K	-	-	-	Process computer system
	C	M	-	-	-	Instrumentation and control equipment
	C	N	-	-	-	Instrumentation and control equipment
-	C	T	-	-	-	Instrumentation and control equipment
-	C	U	-	-	-	Closed-loop control (power section)
-	C	V	-	-	-	Marshalling racks
-	C	W	-	-	-	Control rooms
-	C	X	-	-	-	Local control station
-	C	Y	-	-	-	Communication equipment

Table 5.1.4 Group C codes (instrumentation and control equipment) which are used by Landsnet in point of installation code, BDL 1 (F_2).

5.1.1 CODING OF HIGH-VOLTAGE CUBICLES IN SUBSTATIONS AND FOR DISTRIBUTION OUTSIDE OF POWER PLANTS

Coding of cubicles shall be as shown on fig 5.1.1. They shall have the same code as the busbar in the respective cubicles when possible.

This applies for high-voltage cubicles in distribution systems and for high-voltage cubicles in bays for systems outside of Power Plants and Substations.

Cubicles are counted from the left to the right, when in front of them.

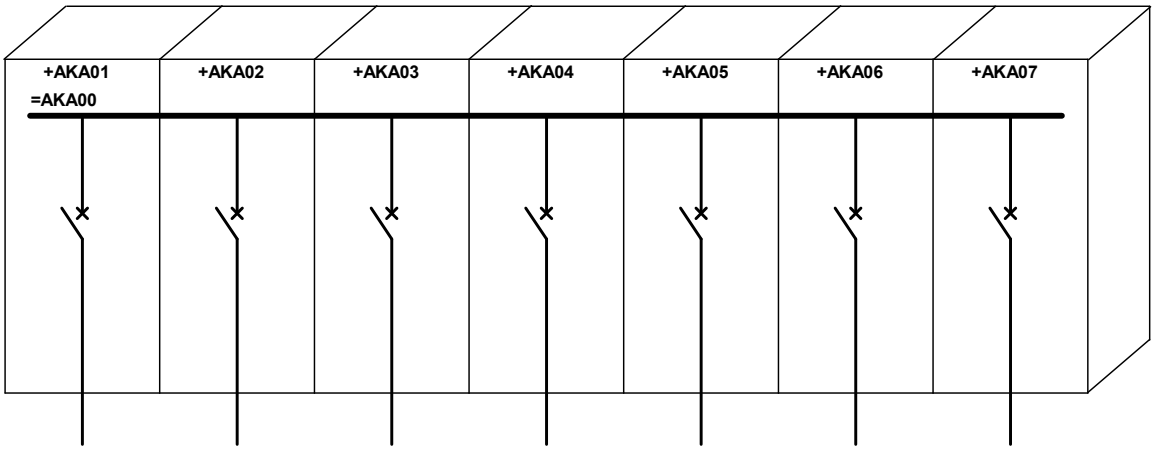


Fig. 5.1.1 Coding of 11 kV cubicles for circuit breakers, common busbar, cubicles in one row.

5.1.2 CODING OF HIGH-VOLTAGE CUBICLES IN POWER PLANTS AND FOR LOCAL DISTRIBUTION AND AUXILIARY SYSTEMS IN POWER PLANTS

Coding of cubicles shall be as shown on fig 5.1.2 and 5.1.3. They shall have the same code as the busbar in the respective cubicle when possible.

This applies for high-voltage cubicles in Power Plants and for high-voltage cubicles in bays for Power Plant distribution systems.

Cubicles are counted from the left to the right, when in front of them.

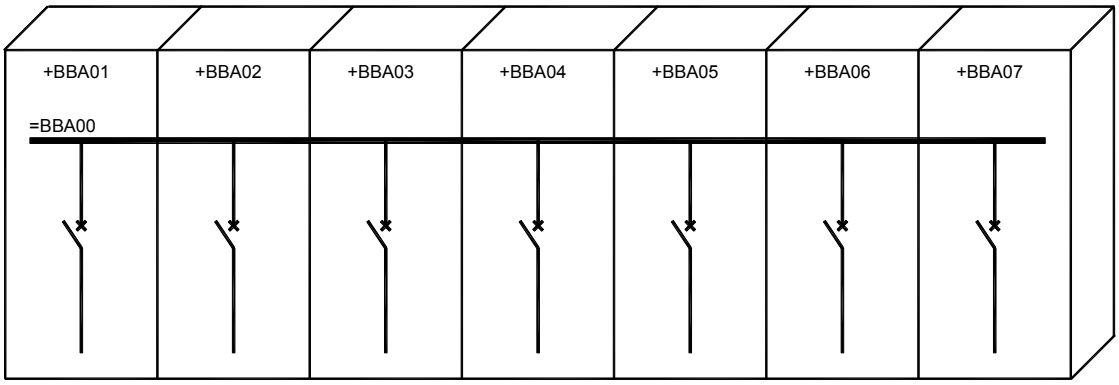


Fig. 5.1.2 Coding of cubicles, common busbar, cubicles in one row.

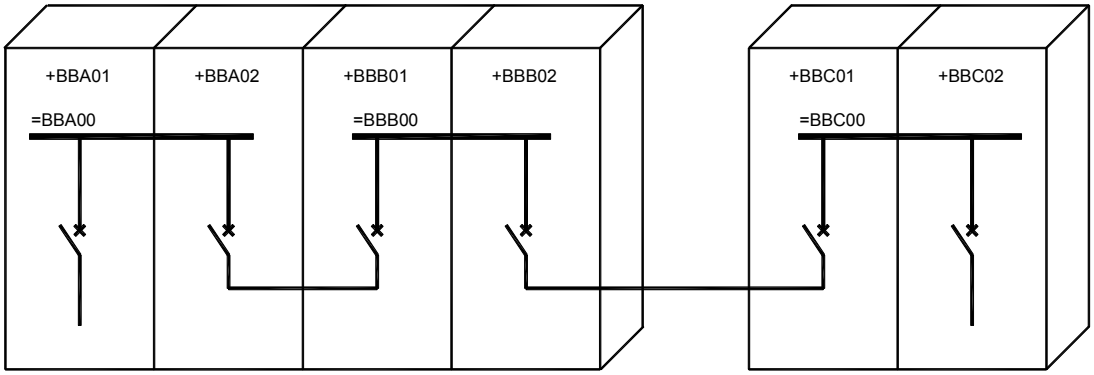


Fig. 5.1.3 Coding of cubicles, no common busbar.

5.1.3 CODING OF CONTROL-, MEASURING-, SIGNALLING-, AND PROTECTION CUBICLES

Coding of cubicles for control-, measuring-, signalling- and protection equipment shall be according to fig. 5.1.4 and 5.1.5.

This applies for all cubicles for control-, measuring-, signalling- and protection equipment

Cubicles are counted from the left to the right, when in front of them.

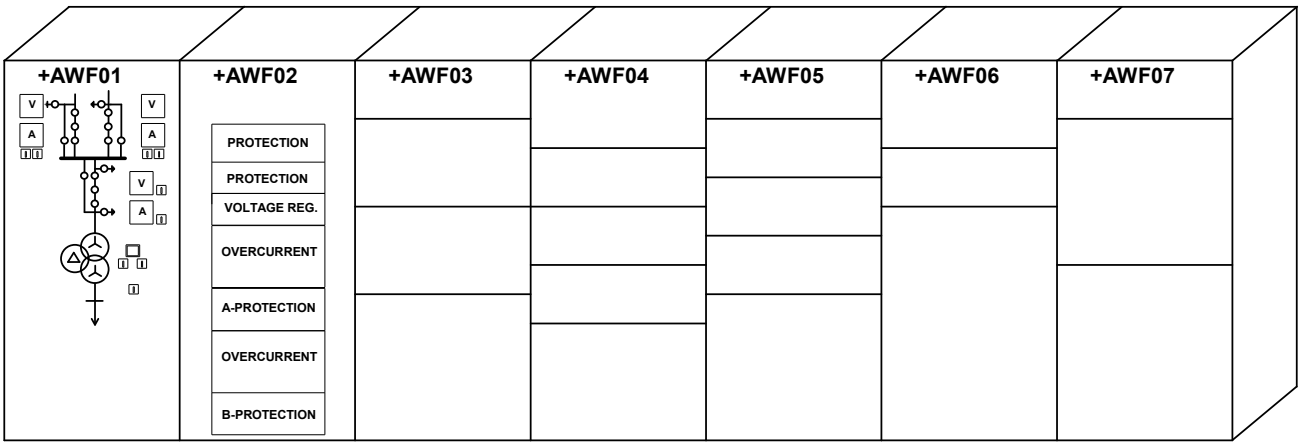


Fig. 5.1.4 Coding of control- and relay cubicles for a switchyard.

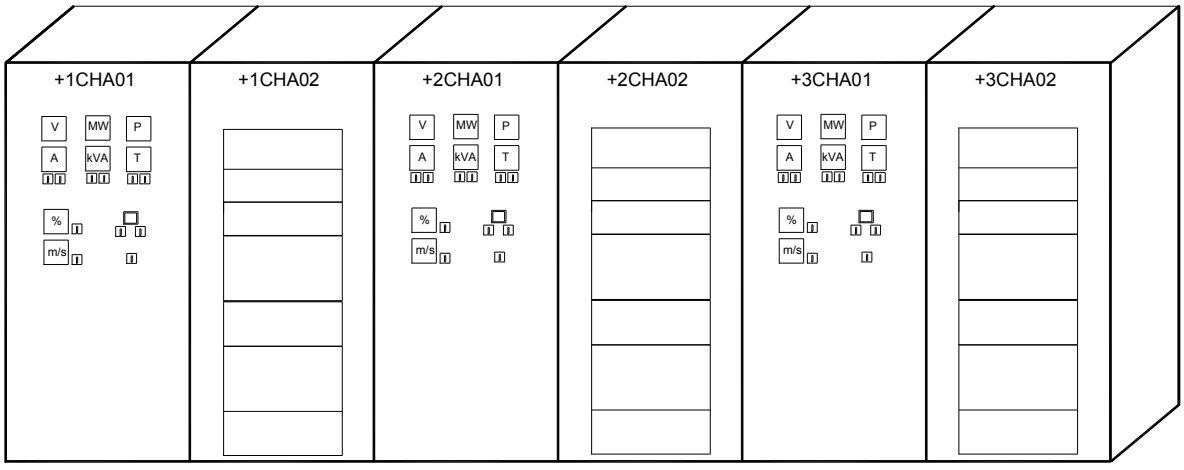


Fig. 5.1.5 Coding of control and protection equipment for Power Plants.

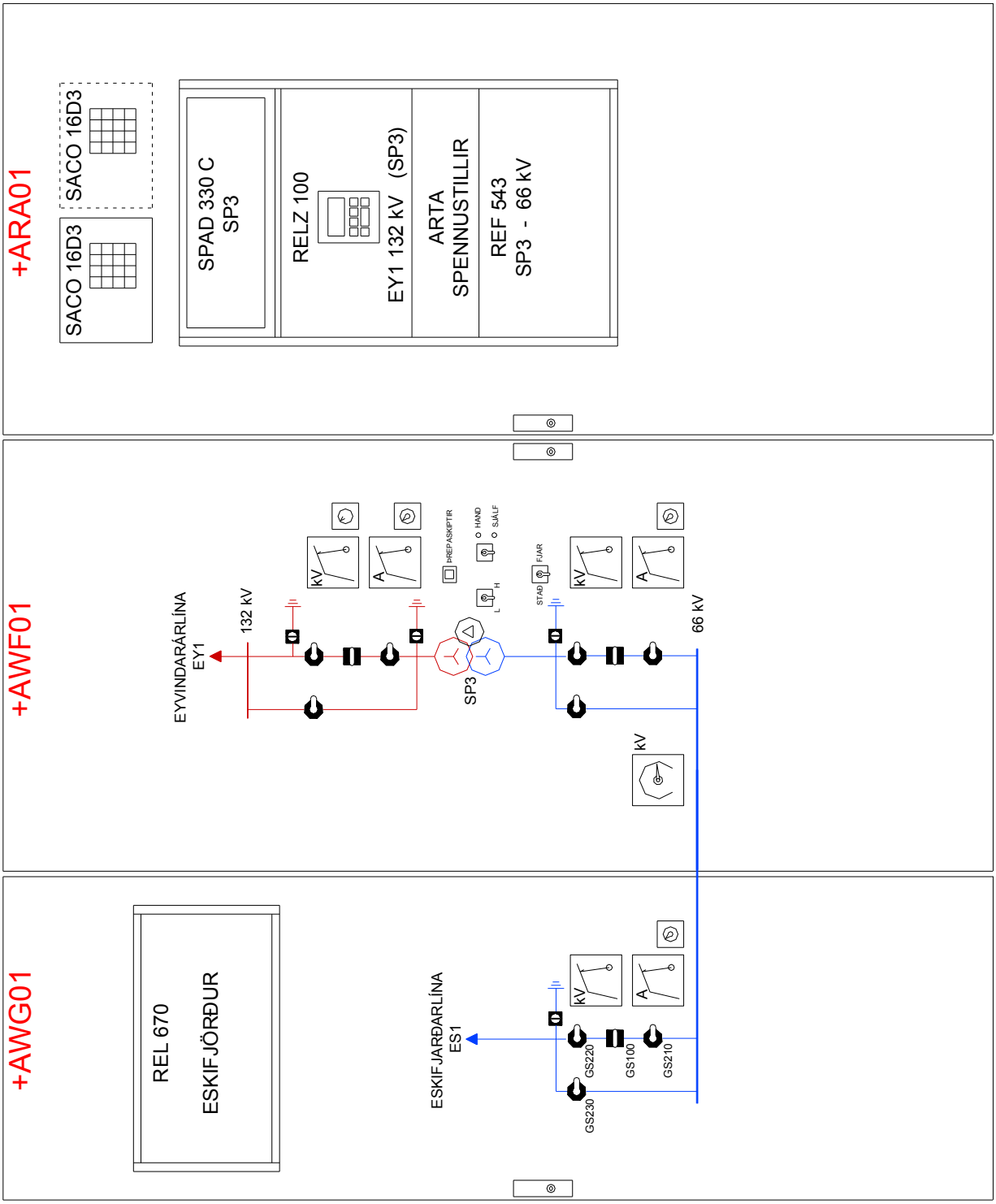


Fig. 5.1.6 Typical coding of cubicles containing mixed control- and protection equipment in switchyards. +AWG01 = mixed protection- and control cubicle, +AWF01 = control cubicle, +ARA01 = protection cubicle

6 LOCATION CODE

6.1 CODING OF STRUCTURES

The location code is used by Landsnet to code structures like dams, tunnels, buildings and part of buildings like rooms etc.

The location code is also used to code the location of machinary in a similar way as the point of installation code is used for electrical equipment.

The KKS code consists of alpha letters (A) and numbers (N). The code is divided in breakdown levels (BDL´s). The location code has 3 (0-2) BDL´s which are used in a similar way as the point of installation code (Note: Use of prefixes and breakdown symbols, see chapter 1.1.2). BDL ÷1 and BDL 0 are used in the same manner as in the process code.

BDL	**0**	**1**						**2**					
Definition	Part of a Plant	Structure code						Room code					
Name	G	F_0	F_1	F_2	F_3	F_N		A_1	A_2	A_N			A_3
Type of key	A or N	N	A	A	A	N	N	A	A	N	N	N	A

Table 6.1.1 Location code, structure.

F_0 on BDL 1 is used where distinction between systems is needed, either in Power Plants or in Substations, where more than one identical system exists. When one system is common for other systems and identical and there is no system grouping then F_0 is 0, otherwise the systems are numbered from 1 to 9.

All structures coded with the location code have the letter U on BDL 1 (F_1). The next two letters (F_2,F_3) are normally the two first letters from the process code which is typical or dominating for the structure.

An example is a structure for the gates, which has the code ULP, as the gates are coded on BDL 1, with LP_ in the two first designation places for data characters.

In table 6.1.2 the main group of structures is listed in the same manner as the KKS-code describes in VGB, book B2.

F_0	F_1	F_2	F_3	F_N	F_N	Text
-	U	A	-	-	-	Structures for grid and distribution systems
-	U	B	-	-	-	Structures for power transmission and auxiliary power supply
-	U	C	-	-	-	Structures for instrumentation and control
-	U	E	-	-	-	Structures for conventional fuel supply and residues
-	U	G	-	-	-	Structures for water supply and disposal
-	U	H	-	-	-	Structures for conventional heat generation
-	U	L	-	-	-	Structures for steam-, water-, gas-cycles
-	U	M	-	-	-	Structures for main machine sets
-	U	N	-	-	-	Structures for process energy supply
-	U	P	-	-	-	Structures for circulating (cooling) water systems
-	U	S	-	-	-	Structures for ancillary systems
-	U	T	-	-	-	Structures for auxiliary systems
-	U	U	-	-	-	Shaft structures
-	U	X	-	-	-	Structures for external systems (power plant specific)
-	U	Y	-	-	-	General service structures
-	U	Z	-	-	-	Structures for transport, traffic, fencing, gardens and other purposes

Table 6.1.2 Location codes, F_1 and F_2 used by Landsnet.

If a structure is hosting equipment coded with different KKS codes, this structure shall be coded on F_2, according to the code dominating or typical for the structure.

F_3 is used when more then one structure of its type is in the same area, if not applicable then A is used.

For coding of the structure itself the BDL 1 is sufficient. Coding of rooms inside structures is according to the official KKS code from VGB on BDL 2.

In case of coding of rooms and floors in structures, the guidelines from VGB, part B2 shall be used.

7. IDENTIFICATION OF CABLES 2

7 IDENTIFICATION OF CABLES

7.1 CABLES

The cable marking used by Landsnet shall be according to the following:

BDL 0 (zero) is used to place/identify a cable according to the customer/user of the cable.

By counting/numbering, a unique counting shall be used, using running/consecutive numbers still with consideration to table 7.1.2 here below.

Definition	**Station/bay**			**Counting**					
Name	A	A	A/N	-	W	N	N	N	N
Example 1	Q	C	1	-	W	3	0	0	1
Exampe 2	S	P	1	-	W	1	2	1	3
Example 3	B	R	E	-	W	4	3	2	1
Example 4	B	R	1	-	W	0	2	2	5

Table 7.1.1 Example of cable markings

Cables shall be identified with the same marking in both ends according to above mentioned.

Designers/Contractors still have the possibility to use own system for labelling in big projects or when addition to and changes on existing plants is applicable, and older existing systems are in use, but **Landsnet´s permission is required**.

-	**W**	**N**	**N**	**N**	**N**	**Use of cables and voltage level**
-	W	0	1	-	-	Power cables, rated voltage **≥** 1 kV
-	W	0	2	-	-	Power cables, rated voltage **<** 1 kV
-	W	1	-	-	-	Cables for current measuring
-	W	2	-	-	-	Cables for voltage measuring
-	W	3	-	-	-	Control and signal cables **≥** 110 V
-	W	4	-	-	-	Control and signal cables **>** 48 V - **<** 110 V
-	W	5	-	-	-	Control and signal cables **>** 24 V - **≤** 48 V
-	W	6	-	-	-	Control and signal cables **≤** 24 V
-	W	7	-	-	-	Control and signal cables, voltage level undefined
-	W	8	-	-	-	Control and signal cables, voltage level undefined
-	W	9	-	-	-	Control and signal cables, voltage level undefined

Table 7.1.2 Classification of cable according to voltage leve lBDL 3, (B_1, B_2 and B_3).

Cables shall be coded with the name of the bay, then with the cable number and the number of the conductors, but **NOT** connection point/terminal markings.

Following there are examples of markings.

Process code LYK 0 connection point A	Process code LYK 2 connection point A	Explanation Connecting point A	Explanation Connecting point B	Cable marking in both ends BDL 0, cable number. Number of conductor
SP1	CE101	Measurement current phase1 on transformer 1	Control cubicle/ Measurement cubicle	SP1 –W1001.01
BU1	CE203	Measurement voltage phase3 on line BU1	Control cubicle/ Measurement cubicle	BU1 –W2003.05
SP2	1AEL10	Control, circuit breaker (110 V DC)	Control cubicle	SP2 –W3008.08
SU3	2ADL10	Position indication to Dispatch	Communication cubicle	SU3 -W4003.03
0BMA10	CT201	Spare generator, heat measurement, coolingwater	Control cubicle	0BMA10 –W5100.02

Table 7.1.3 Example on cable markings.

Sæti	BDL 0			Cable						Number of conductor		
Seat	1	2	3	4	5	6	7	8	9	10	11	12
Explanation	A	A	A/N	-	W	N	N	N	N	.	N	N
Example	***B***	***R***	***1***	***-***	***W***	***2***	***0***	***0***	***4***	***.***	***0***	***5***
Example	***S***	***P***	***2***	***-***	***W***	***3***	***0***	***0***	***8***	***.***	***2***	***1***
Example	***S***	***U***	***3***	***-***	***W***	***1***	***0***	***2***	***5***	***.***	***0***	***2***

Table 7.1.4 Example of markings of conductors in cables in S.S. Brennimelur.

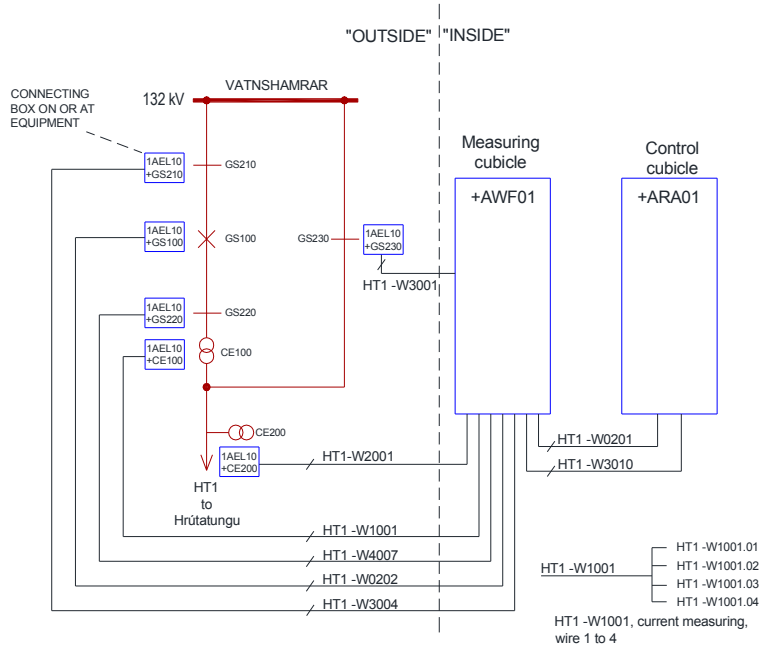


Fig. 7.1.1 Example of cable markings

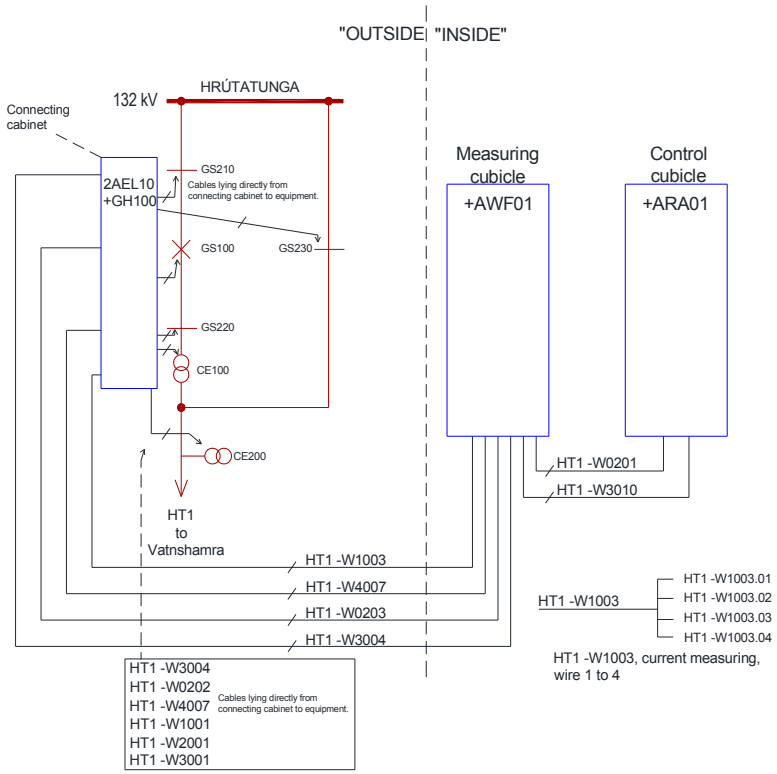


Fig. 7.1.2 Example of cable markings

7.1.1 CONDUCTOR IDENTIFICATION IN CABLES AND FOR FIBER OPTIC CABLES

All conductors shall be connected to marked terminal blocks in cubicle or to connection points directly on the equipment concerned.

Control cables: Only cables with prefabricated numbers may be used.

Signal cables: Cables with coloured or numbered conductors shall be used, and fiber optic cables shall be with a colour code.

Power cables: Cables with coloured or numbered conductors shall be used.

When power cables with coloured conductors are use the following table applies (**valid for older cables)**

Conductor	Colours in 3 conductor cables	Colours in 4 conductor cables	Colours in 5 conductor cables
L	Black		
L1/R		Brown	Brown
L2/S		Black	Black near brown
L3/T		Blue	Black near blue
N	Light bluer		Light blue
PE or PEN	Yellow/green	Yellow/green	Yellow/green

Table 7.1.5 Colour code, **older** power cables.

The colour code shall be according to CENELEC HD 308 S2 and the recommendations colours of conductors from Samorka.

Conductor	Colours in 3 conductor cables	Colours in 4 conductor cables	Colours in 5 conductor cables
L	Brown		
L1/R		Brown	Brown
L2/S		Black	Black
L3/T		Grey	Gray
N	Light bluer		Light blue
PE or PEN	Yellow/green	Yellow/green	Gulur/grænn

Table 7.1.6 Power cables, colour code.

7.2 WIRING WITHIN CUBICLES

Conductors/jumpers within cubicles e.g. short connections between connection points shall be marked with a unique number, 3 to 4 decimals in consecutive numbers according to needs.

Jumpers, visible in both ends, and when it is obvious where they are connected do not need a special marking.

It is not necessary to mark conduits within equipment, e.g. when the wiring is factory delivered.

The conductors in cubicles shall be marked from above and downwards as far as possible, and the lowest number shall start from the top of the cubicle.

Generally the following applies:

Terminal to equipment:	Number
Terminal to terminal:	Number
Junctions (bridges) on terminals:	Not number
Within equipment:	Not number (except in special cases)

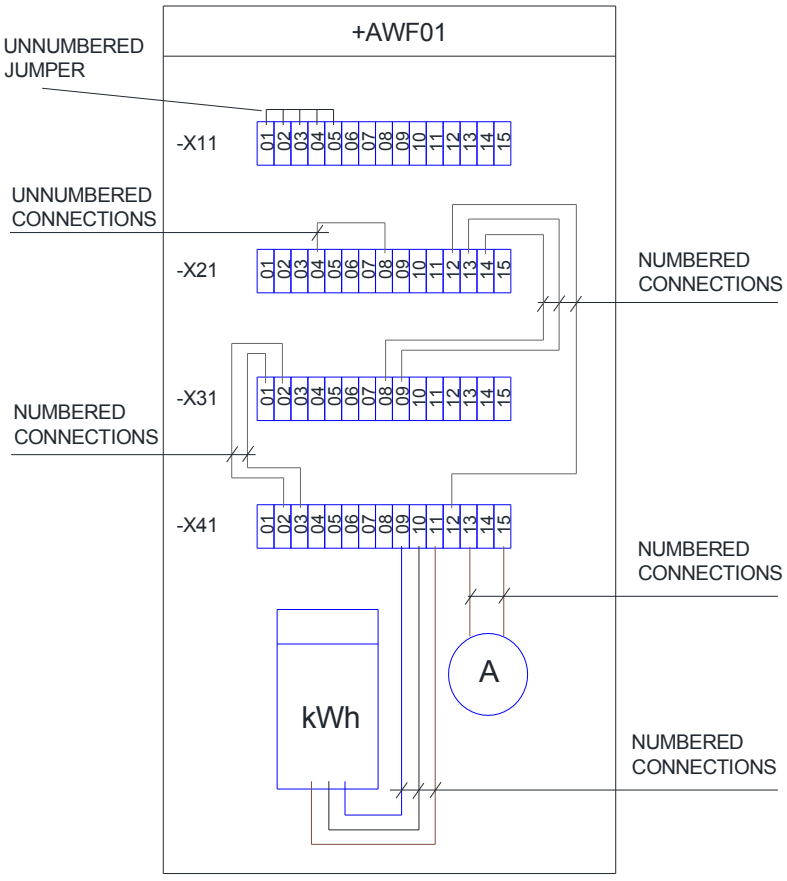


Fig 7.2.1 Example on coding of conductors

7.3 CODING OF FIBER OPTICS

In Landsnet's Substations, the fiber optic cable and equipment shall be coded with the code of the Substation on BDL ÷1 and with the code of the line along which the fiber optic is laid, on BDL 0.

Physically, on the fiber optic, the code of the line shall be visible (on BDL ÷1 and BDL 0). On BDL 1 F_0 shall be 1 where the fiber optic „begins" and 2 where it „ends" as well as 0 (zero) on the fiber itself. F_1 shall be A, F_2 shall be Y and F_3 shall be P, see table here below. The junction box of the fiber is coded with GB100 on BDL 2 as can be seen in table 4.3.2.

F_1	F_2	F_3	F_N	F_N	Equipment
A	-	-	-	-	Switch yard and distribution
A	Y	-	-	-	Communication equipment
A	Y	P	-	-	Fiber optics including equipment

Table 4.3.1 Coding of fiber optics.

Example: Fiber optic between Laxárvirkjun and Rangárvellir would be coded:

LA1 LA1 0AYP10		Fiber optic
LAX LA1 1AYP10	GB100	Junction box in Laxárvirkjun
RAN LA1 2AYP10	GB100	Junction box in Rangárvellir

Name of optic cable	Going from	LYK ÷1	LYK 0	LYK 1	Going to	LYK ÷1	LYK 0	LYK 1	LYK 2
Bjarnarflagslína 1	Bjarnarflag	BJA	BJ1	1AYP	Krafla	KRA	BJ1	2AYP	GB100
Teigarhornslína 1	Hryggstekkur	HRY	TE1	1AYP	Teigarhorn	TEH	TE1	2AYP	GB100
Kröflulína 2	Krafla	KRA	KR2	1AYP	Fljótsdalur	FLJ	KR2	2AYP	GB100
Laxárlína 2	Laxárvirkjun	LAX	LA2	1AYP	Bjarnarflag	BJA	LA2	2AYP	GB100
Laxárlína 1	Rangárvellir	RAN	LA1	1AYP	Laxárvirkjun	LAX	LA1	2AYP	GB100
Hólarlína 1	Teigarhorn	TEH	HO1	1AYP	Hólar	HOL	HO1	2AYP	GB100

Table 4.3.2 Coding of fiber optic on BDL ÷1, BDL 0 and BDL 1.

8. IDENTIFICATION OF I&C EQUIPMENT

8.1 Signal identification

8.1.1 General signal designation

The component code level is used to identify the various signals from measured data and signal processing identified on the system and equipment levels.

BDL	0	1	2	3			
Definition	Part of a plant	System code	Equipment unit code	Component code			
Name				B_1	B_2	B_N	
Type of key				A	A	N	N

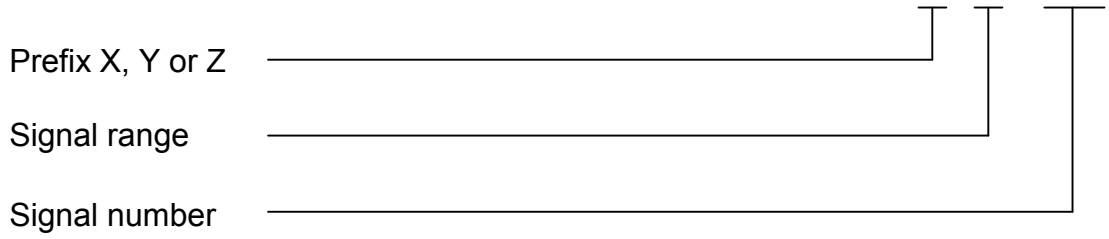


Fig. 8.1.1 KKS codes.

The initial letters X, Y and Z have the following meaning:

X Signal origins

Y Signal applications

Z Gated signals

The signal areas or application areas are identified by the second alpha character B_2. The two numerical characters B_N specify the individual signal type or application.

As the stipulations required as a basis for signal identification depend on the hardware used and the application data characters are also dependent on the documentation method employed, a generic signal designation that is valid in all projects has not been developed.

The following definitions (see appendix 4) illustrate the individual signal applications in Landsnet most recent projects and shall be considered as the Landsnet standard. Exceptions allowed only by permission of Landsnet.

9. Changes

9.1 Changes

9.1.1 Changes since edition 04

The main changes are additional names for lines and for new locations. Also chapter 9, changes has been added.

9.1.2 Changes since edition 05

Header updated.

Contents updated.

Chapter 1:

Text corrected on page 1.5.

Table with Power Plants and Sub Stations updated.

Chapter 4:

Chapter 4 rewritten.

9.1.3 Changes since edition 06

Header updated.

Chapter 1:

Table 1.4 and 1.5 updated.

Chapter 4:

Table 4.4 and 4.8 updated.

Chapter 9:

Changes since edition 06 added.

9.1.4 Changes since edition 07

Total revision has been made and changes are red.

The biggest change was that chapters 2 and 3 were deleted by the vast majority.

Considerable amount of expected names of substations and OH lines were added in chapters 1 and 4.

Explanations/definition regarding capacitors was added in chapter 4. Some editorial corrections were made.

The part containing fiber optics was inserted in chapter 7, Identification of cables.

9.1.5 Changes since edition 08

A complete revision was made, both in the KKS handbook and the KKS keys. Quite a lot of drawings and tables which had nothing to do with LN have been removed, and replaced with new information such as detailed definitions of transformers etc.

The table for BDL 1 was moved from chapter 1 to appendix 1.

The tables for names of HV lines and their coding have been moved from chapter 4 to appendix 2.

The table for the relay protection has been moved to appendix 3

The signal coding has been moved to appendix 4.

Chapter 7 has been rewritten completely.

Since the changes were so many, it was decided not to use red colour to mark any changes. Therefore there is **no red** text like in earlier editions.

A-1 Break Down Levels for various types of codes

A-1.1 Scope of KKS

In front of these codes there is a BDL ÷1 and this BDL is used for identification of Power Plants (P.P.) and Substations (S.S.). It does not belong to the KKS code issued by VGB, but has been decided upon by Landsnet.

As an example the following is mentioned:

BDL	Area	Example	KKS
÷1	Substation	Teigarhorn S.S.	TEH
0	Part of a S.S.	Line 132 kV to HOL	HO1
1	System	Line bay 132 kV	1AEL10
2	Equipment (part of system)	Circuit breaker	GS100
3	Component (part of equipment)	A fuse	-F01

Table A-1.1 Example, use of Break Down Levels.

A-1.2 Break Down Level ÷1

BDL	÷ 1		
Definition	Area / Total plant		
Name	S_1	S_2	S_3
Type of key	A	A	A/N

Table A.1.2 BDL ÷1

The BDL ÷1 is used for definition of names of areas or constructions, which are to be coded. This BDL is free for use, so the short names of the Power Plants and Sub Stations are used for identification. If more than one Power Plant is using the same water impounding works, they have the same name on this BDL.

Normally alpha symbols are used on BDL ÷1 and they occupy 3 places.

Example: BUR for P.P. Búrfell 1 and 2
HRA for P.P. Hrauneyjafoss
LAX for P.P. Laxá 1, 2 and 3
GEH for S.S. Geithals

A-1.3 Power plants, Substations and areas

LYK ÷1	SITE	Role	OPERATED BY:
A12	Aðveitustöð 12	Substation	**LN**-OR
ABA	*Álver á Bakka*	*Substation , planned*	
AD3	Aðveitustöð 3	Substation	**LN**-OR
AHE	*Álver Helguvík*	*Substation, planned*	
AHV	Álver Hvalfirði	Substation	NA
AKR	Akranes	Substation	**LN**-OR
AKU	Akureyri	Substation	RA
AND	Andakíll	Power plant/ Substation	**LN**-OR
ARE	Álver Reyðarfirði	Substation	ALCOA
ARN	*Arnardalur*	*Power plant/ Substation, planned*	
ARS	Árskógur	Substation	RARIK
ASB	Ásbrú	Substation	**LN**-HSV
AST	Álver Straumsvík	Substation	RIO TINTO
BAK	PCC	Substation	**LN**
BFJ	Bakkafjörður	Substation	RARIK
BDA	Búðardalur	Substation	RARIK
BIT	*Bitra*	*Power plant/ Substation, planned*	
BJA	Bjarnarflag	Power plant/ Substation	**LN**-LV
BJV	*Bjallar*	*Power plant, planned*	
BLA	Blanda	Power plant/ Substation	**LN**-LV
BLF	Bláfell	Remote control station	LV
BOF	Borgarfjörður	Substation	OR
BOL	Bolungarvík	Substation	**LN**-OV
BOR	Borgarnes	Substation	OR
BRD	Breiðadalur	Substation	**LN**-OV
BRE	Brennimelur	Substation	**LN**-RARIK
BRF	Brennisteinsfjöll	Research area	
BRL	Brúarland	Substation	RARIK
BRU	*Brúar*	*Power plant/ Substation, planned*	
BRV	Breiðdalsvik	Substation	RARIK
BUD	Búðarháls	Power plant/ Substation	**LN**-LV
BUR	Búrfell	Power plant/ Substation	**LN**-LV
DAL	Dalvík	Substation	**LN**-RARIK
DJV	Djúpivogur	Substation	RARIK
ESK	Eskifjörður	Substation	**LN**-RARIK
EYV	Eyvindará	Substation	**LN**-RARIK
FAN	*Fannlækjarvirkjun*	*Power plant, planned*	
FAS	Fáskrúðsfjörður	Substation	**LN**-RARIK
FIT	Fitjar	Substation	**LN**-HSO
FJA	Fjarðarselsvirkjun	Power plant/Substation	RARIK
FLJ	Fljótsdalur	Substation	**LN**
FLU	Flúðir	Substation	**LN**-RARIK
FRE	*Fremrinámur*	*Power plant/ Substation, planned*	
GAR	Garðsárvirkjun	Power plant/Sub station	RARIK
GED	Geiradalur	Substation	**LN**-OV
GEH	Geithals	Substation	**LN**
GIL	*Gilsárvirkjun*	*Power plant/ Substation*	
GJA	*Gjástykki*	*Power plant/ Substation*	
GLE	Glerárskógar	Substation	**LN**-RARIK

GLG	Glerárgata	Office	LV
GON	Gönguskarðsvirkjun	Power plant/ Substation	RARIK
GRD	*Grændalur*	*Power plant/ Substation, planned*	
GRM	Grímsárvirkjun	Power plant/ Substation	RARIK
GRU	Grundarfjörður	Substation	**LN**-RARIK
GYL	Gylfaflöt 9	Office	**LN**
HAA	Háaleitisbraut 68	Office	LV
HAF	Hafið	Windmill plant	LV
HAG	*Hágöngur*	*Power plant/ Substation, planned*	
HAM	Hamranes	Substation	**LN**
HEL	Hellisheiðarvirkjun	Power plant	OR
HGV	*Hágöngur*	*Power plant/ Substation, planned*	
HLA	Hella	Sub station	**LN**-RARIK
HMV	*Hólmsá*	*Power plant, planned*	
HNO	Hnoðraholt	Substation	**LN**-OR
HOF	Höfn	Substation	RARIK
HOL	Hólar	Substation	**LN**-RARIK
HOS	Hofsós	Substation	RARIK
HOV	*Holtavirkjun*	*Power plant / Substation, planned*	
HRA	Hrauneyjafoss	Power plant/ Substation	**LN**-LV
HRB	*Hrafnabjörg*	*Power plant, planned*	
HRF	Hrútafell	Substation	RARIK
HRS	Hrísey	Substation	RARIK
HRT	*Hrauntungur*	*Sub station/ Substation, planned*	
HRU	Hrútatunga	Substation	**LN**-RARIK
HRY	Hryggstekkur	Substation	**LN**-RARIK
HSA	*Hólasandur*	*Substation, planned*	
HUS	Húsavik	Substation	RH
HVA	Hvammur	Substation	RARIK
HVE	Hveragerði	Substation	**LN**-RARIK
HVH	*Hverahlíð*	*Power plant/ Substation, planned*	
HVI	*Hvítá (Arnessýslu)*	*Power plant/ Substation, planned*	
HVM	*Hvamsvirkjun*	*Power plant/ Substation, planned*	
HVO	Hvolsvöllur	Substation	**LN**-RARIK
HVT	Hvammstangi	Substation	RARIK
IRA	Írafoss	Power plant/ Substation	**LN**-LV
ISA	Ísafjörður	Substation	**LN**-OV
JAR	Járnblendi	Substation	ELKEM
KAL	Kaldakvísl	River (Water impounding structure)	LV
KAR	Kárahnjúkar	Power plant	LV
KEL	Keldeyri	Substation	**LN**-OV
KIF	*Kifsá*	*Substation, planned*	
KLA	Klafastaðir	Substation (capacitor plant)	**LN**
KLE	*Kleifarvirkjun*	*Power plant/ Substation, planned*	
KLK	*Kolkuvirkjun*	*Power plant/ Substation, planned*	
KOG	Kollugerði	Substation	RA
KOL	Kolviðarhóll	Substation	**LN**
KOP	Kópasker	Substation	**LN**-RARIK
KOR	Korpa	Substation	**LN**-OR
KRA	Krafla	Power plant/ Substation	**LN**-LV
KRO	Krossanes	Substation	Orkuvirki/Rafeyri
KUA	*Kúagerði*	*Substation, planned*	
KVI	Kvíslaveita	Distribution structure	LV

LAG	Lagarfossvirkjun	Power plant/ Substation	**LN**-RARIK
LAV	Laxárvatn	Substation	**LN**-RARIK
LAX	Laxárvirkjun	Power plant/ Substation	**LN**-LV-RARIK
LIN	Lindabrekka	Substation	RARIK
LJO	Ljósifoss	Power plant/ Substation	**LN**-LV
MJF	Mjóifjörður	Substation	RARIK
MJO	Mjólká	Power plant/ Substation	**LN**-OV
NES	Nesjavellir	Power plant/Substation	**LN**-OR
NJA	*Njarðvíkurheiði*	*Substation, planned*	
NKS	Neskaupstaður	Substation	**LN**-RARIK
NOR	*Norðlingaalda*	*Reservoir, planned*	
NTH	Neðri Þjórsá	Combined for HVM, HOL & URR	LV
NUP	*Núpur*	*Power plant/Substation, planned*	
OLA	Ólafsvík	Substation	**LN**-RARIK
OLD	Öldugata	Substation	**LN**-HSV
OLF	Ólafsfjörður	Substation	RARIK
OLK	*Ölkelduháls*	*Substation, planned*	
ORU	*Orustuhóll*	*Substation, planned*	
OXF	*Öxarfjörður*	*Power plant, planned*	
PRB	Prestbakki	Substation	**LN**-RARIK
RAH	Raufarhöfn	Substation	RARIK
RAN	Rangárvellir	Substation	**LN**
RAU	Rauðimelur	Substation	**LN**
RED	Reyðarfjörður	Substation	**LN**-RARIK
REK	Reykjahlið	Substation	RARIK
REY	Reykjanes	Power plant/ Substation	**LN**-HSV
RIM	Rimakot	Substation	**LN**-RARIK
RJU	Rjúkandavirkjun	Power plant/Substation	RARIK
RNG	*Rangá í Fellum*	*Power plant /Substation, planned*	
SAF	*Sandfell*	*Substation, planned*	
SAU	Sauðárkrókur	Substation	**LN**-RARIK
SEL	Selfoss	Substation	**LN**-RARIK
SET	*Seltún*	*Substation, planned*	
SEY	Seyðisfjörður	Substation	**LN**-RARIK
SFL	Sauðafell	Reservoir, Sauðafellslón and Þórisós	LV
SID	*Síðuvötn*	*Power plant, planned*	
SIG	Sigalda	Power plant/ Substation	**LN**-LV
SIL	Siglufjörður	Substation	RARIK
SIS	Silfurstjarnan	Substation	RARIK
SKA	*Skatastaðir*	*Power plant, planned*	
SKF	**Skeiðsfossvirkjun**	Power plant/ Substation	RARIK
SKO	*Skógarháls*	*Substation, planned*	
SKS	Skagaströnd	Substation	RARIK
SKT	*Skaftá*	*Power plant/ Substation, planned*	
SKV	*Skaftárveita*	*Reservoir, Skaftárveita, planned*	
SMY	Smyrlabjargaárvirkju	Power plant/Substation	RARIK
SOG	Sogssvæði	Sogs area, IRA, LJO & STE	**LN**-LV
STA	Stakkur	*Substation, planned*	**LN**
STE	Steingrímsstöð	Power plant/ Substation	**LN**-LV
STH	Stóra-Hraun	Substation	RARIK
STJ	Stjórnstöð Gylfaflöt	Control center	**LN**
STL	*Stóra Laxá*	*Power plant/ Substation, planned*	

STO	Stöðvarfjörður	Substation	**LN**-RARIK
STR	Straumsvík	Substation/Emergency/gas plant	LV
STU	Stuðlar	Substation	**LN**-RARIK
STY	Stykkishólmur	Substation	RARIK
SUL	Sultartangi	Power plant/ Substation	**LN**-LV
SVA	Svartsengi	Power plant/ Substation	**LN**-HSO
SVE	Sveinsstaðir	Substation	RARIK
TEH	Teigarhorn	Substation	**LN**-RARIK
THR	*Þeistareykir*	*Power plant/ Substation, planned*	
TIN	Þingvallastræti	Substation	RA
TJO	Þjórsársvæði	Þjórsár-/Tungnaár area	LV
TOH	Þórshöfn	Substation	RARIK
TOJ	*Torfajökull*	*Power plant/ Substation, planned*	
TOR	Þorlákshöfn	Substation	**LN**-RARIK
TRD	*Trölladyngja*	*Substation, planned*	
TVM	Þórisvatnsmiðlun	Water Impounding structure, Vatnsfelli	LV
TVV	Þingvallavatn	Reservoir	LV
URR	*Urriðafoss*	*Power plant/ Substation, planned*	
VAF	Vatnsfell	Power plant/ Substation	**LN**-LV
VAK	Akureyri	Backup plant/ diesel generator	LV
VAL	*Vallarheiði*	*Substation, planned*	
VAR	Varmahlíð	Substation	**LN**-RARIK
VAT	Vatnshamrar	Substation	**LN**-RARIK
VEG	Vegamót	Substation	**LN**-RARIK
VEM	Vestmannaeyjar	Substation	**LN**-HSV
VIK	Vík	Substation	RARIK
VIL	*Villinganes*	*Power plant/ Substation, planned*	
VOG	Vogaskeið	Substation	**LN**-RARIK
VOP	Vopnarfjörður	Substation	**LN**-RARIK

Table A-1.3 Definition of BDL ÷1 for Power Plants and Substations.

These tables are made in collaboration/consultation between the KKS committees from LN and LV and in collaboration with RARIK.

A-2. REGISTRATION OF LINE BAYS

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Brennimelslína 1	Geithális	GEH	BR1	1ADL	Brennimelur	BRE	BR1	2ADL
Búrfellslína 1	Búrfell	BUR	BU1	1ADL	Írafoss	IRA	BU1	2ADL
Búrfellslína 2	Búrfell	BUR	BU2	1ADL	Kolviðarhóll	KOL	BU2	2ADL
Búrfellslína 3	Búrfell	BUR	BU3	1ADL	Hamranes	HAM	BU3	2ADL
Fljótsdalslína 3	Fljótsdalur	FLJ	FL3	1ADL	Álv. Reyðarfirði	ARE	FL3	2ADL
Fljótsdalslína 4	Fljótsdalur	FLJ	FL4	1ADL	Álv. Reyðarfirði	ARE	FL4	2ADL
Hamraneslína 1	Geithális	GEH	HN1	1ADL	Hamranes	HAM	HN1	2ADL
Hamraneslína 2	Geithális	GEH	HN2	1ADL	Hamranes	HAM	HN2	2ADL
Hrauneyjafosslína 1	Hrauneyjafoss	HRA	HR1	1ADL	Sultartangi	SUL	HR1	2ADL
Ísallína 1	Hamranes	HAM	IS1	1ADL	Álv. Straumsvík	AST	IS1	2ADL
Ísallína 2	Hamranes	HAM	IS2	1ADL	Álv. Straumsvík	AST	IS2	2ADL
Járnblendilína 1	Brennimelur	BRE	JA1	1ADL	Járnblendi	JAR	JA1	2ADL
Kolviðarhólslína 1	Kolviðarhóll	KOL	KH1	1ADL	Geithális	GEH	KH1	2ADL
Norðurálslína 1	Brennimelur	BRE	NA1	1ADL	Álv. Hvalfirði	AHV	NA1	2ADL
Norðurálslína 2	Brennimelur	BRE	NA2	1ADL	Álv. Hvalfirði	AHV	NA2	2ADL
Sigöldulína 2	Sigalda	SIG	SI2	1ADL	Hrauneyjafoss	HRA	SI2	2ADL
Sigöldulína 3	Sigalda	SIG	SI3	1ADL	Búrfell	BUR	SI3	2ADL
Sogslína 3	Írafoss	IRA	SO3	1ADL	Geithális	GEH	SO3	2ADL
Sultartangalína 1	Sultartangi	SUL	SU1	1ADL	Brennimelur	BRE	SU1	2ADL
Sultartangalína 2	Sultartangi	SUL	SU2	1ADL	Búrfell	BUR	SU2	2ADL
Sultartangalína 3	Sultartangi	SUL	SU3	1ADL	Brennimelur	BRE	SU3	2ADL
Vatnsfellslína 1	Vatnsfell	VAF	VF1	1ADL	Sigalda	SIG	VF1	2ADL

Table A-2.1 Registration of line bays 220 kV on BDL ÷1, BDL 0 and BDL 1.

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Aðveitustöð 7	Hamranes	HAM	AD7	1AEL	Aðveitustöð 7	AD7	AD7	2AEL
Aðveitustöð 3	Korpa	KOR	AD3	1AEL	Aðveitustöð 3	AD3	AD3	2AEL
Blöndulína 1	Blanda	BLA	BL1	1AEL	Laxárvatn	LAV	BL1	2AEL
Blöndulína 2	Blanda	BLA	BL2	1AEL	Varmahíð	VAR	BL2	2AEL
Eyvindarárlína 1	Hryggstekkur	HRY	EY1	1AEL	Eyvindará	EYV	EY1	2AEL
Fitjalína 1	Rauðimelur	RAU	MF1	1AEL	Fitjar	FIT	MF1	2AEL
Fljótsdalslína 2	Bessastaðir	BES	FL2	1AEL	Hryggstekkur	HRY	FL2	2AEL
Geiradalslína 1	Gleráskógar	GLE	GE1	1AEL	Geiradalur	GED	GE1	2AEL
Glerárskógalína 1	Hrútatunga	HRU	GL1	1AEL	Glerárskógar	GLE	GL1	2AEL
Hafnarfjörður 1	Hamranes	HAM	HF1	1AEL	Öldugata	OLD	HF1	2AEL
Hólalína 1	Teigarhorn	TEH	HO1	1AEL	Hólar	HOL	HO1	2AEL
Hrútatungulína 1	Vatnshamrar	VAT	HT1	1AEL	Hrútatunga	HRU	HT1	2AEL
Korpulína 1	Geithals	GEH	KO1	1AEL	Korpa	KOR	KO1	2AEL
Kröflulína 1	Krafla	KRA	KR1	1AEL	Rangárvellir	RAN	KR1	2AEL
Kröflulína 2	Krafla	KRA	KR2	1AEL	Bessastaðir	BES	KR2	2AEL
Laxárvatnslína 1	Hrútatunga	HRU	LV1	1AEL	Laxárvatn	LAV	LV1	2AEL
Mjólkárlína 1	Geiradalur	GED	MJ1	1AEL	Mjólká	MJO	MJ1	2AEL
Nesjavallalína 1	Nesjavellir	NES	NE1	1AEL	Korpa	KOR	NE1	2AEL
Prestbakkalína 1	Hólar	HOL	PB1	1AEL	Prestbakki	PRB	PB1	2AEL
Rangárvallalína 1	Rangárvellir	RAN	RA1	1AEL	Varmahlíð	VAR	RA1	2AEL
Rangárvallalína 2	Rangárvellir	RAN	RA2	1AEL	Krossanes	KRO	RA2	2AEL
Rauðamelslína 1	Reykjanes	REY	RM1	1AEL	Rauðimelur	RAU	RM1	2AEL
Rauðavatnslína 1	Geithals	GEH	RV1	1AEL	A12	A12	RV1	2AEL
Sigöldulína 4	Sigalda	SIG	SI4	1AEL	Prestbakki	PRB	SI4	2AEL
Sogslína 2	Írafoss	IRA	SO2	1AEL	Geithals	GEH	SO2	2AEL
Suðurnesjalína 1	Hamranes	HAM	SN1	1AEL	Fitjar	FIT	SN1	2AEL
Svartsengislína 1	Svartsengi	SVA	SM1	1AEL	Rauðimelur	RAU	SM1	2AEL
Teigarhornslína 1	Hryggstekkur	HRY	TE1	1AEL	Teigarhorn	TEH	TE1	2AEL
Vatnshamralína 1	Vatnshamrar	VAT	VA1	1AEL	Brennimelur	BRE	VA1	2AEL

Table A-2.2 Registration of line bays 132 kV on BDL ÷1, BDL 0 and BDL 1.

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Andakílslína 1	Andakíll	AND	AN1	1AFL	Akranes	AKR	AN1	2AFL
Akraneslína 1	Brennimelur	BRE	AK1	1AFL	Akranes	AKR	AK1	2AFL
Bolungarvíkurlína 1	Breiðadalur	BRD	BV1	1AFL	Bolungarvík	BOL	BV1	2AFL
Bolungarvíkurlína 2	Ísafjörður	ISA	BV2	1AFL	Bolungarvík	BOL	BV2	2AFL
Breiðadalslína 1	Mjólká	MJO	BD1	1AFL	Breiðadalur	BRD	BD1	2AFL
Dalvíkurlína 1	Rangárvellir	RAN	DA1	1AFL	Dalvík	DAL	DA1	2AFL
Eskifjarðarlína 1	Eyvindará	EYV	ES1	1AFL	Eskifjörður	ESK	ES1	2AFL
Fáskrúðsfjarðarlína 1	Stuðlar	STU	FA1	1AFL	Fáskrúðsfjörður	FAS	FA1	2AFL
Flúðalína 1	Búrfell	BUR	FU1	1AFL	Flúðir	FLU	FU1	2AFL
Grundarfjarðarlína 1	Vogaskeið	VOG	GF1	1AFL	Grundarfjörður	GRU	GF1	2AFL
Hellulína 1	Flúðir	FLU	HE1	1AFL	Hella	HEL	HE1	2AFL
Hellulína 2	Hvolsvöllur	HEL	HE2	1AFL	Hella	HVO	HE2	2AFL
Hveragerðislína 1	Ljósifoss	LJO	HG1	1AFL	Hveragerði	HVE	HG1	2AFL
Hvolsvallarlína 1	Búrfell	BUR	HV1	1AFL	Hvolsvöllur	HVO	HV1	2AFL
Ísafjarðarlína 1	Breiðadalur	BRD	IF1	1AFL	Ísafjörður	ISA	IF1	2AFL
Kollugerðislína 1	Rangárvellir	RAN	KG1	1AFL	Kollugerði	KOG	KG1	2AFL
Kópaskerslína 1	Laxá	LAX	KS1	1AFL	Kópasker	KOP	KS1	2AFL
Lagarfosslína 1	Lagarfoss	LAG	LF1	1AFL	Eyvindará	EYV	LF1	2AFL
Laxárlína 1	Laxá	LAX	LA1	1AFL	Rangárvellir	RAN	LA1	2AFL
Ljósafosslína 1	Ljósifoss	LJO	LJ1	1AFL	Írafoss	IRA	LJ1	2AFL
Neskaupstaðarlína 1	Eskifjörður	ESK	NK1	1AFL	Neskaupstaður	NKS	NK1	2AFL
Ólafsvíkurlína 1	Vegamót	VEG	OL1	1AFL	Ólafsvík	OLA	OL1	2AFL
Rimakotslína 1	Hvolsvöllur	HVO	RI1	1AFL	Rimakot	RIM	RI1	2AFL
Sauðárkrókslína 1	Varmahíð	VAR	SA1	1AFL	Sauðárkrókur	SAU	SA1	2AFL
Selfosslína 1	Ljósifoss	LJO	SE1	1AFL	Selfoss	SEL	SE1	2AFL
Selfosslína 2	Hella	SEL	SE2	1AFL	Selfoss	HEL	SE2	2AFL
Seyðisfjarðarlína 1	Eyvindará	EYV	SF1	1AFL	Seyðisfjörður	SEY	SF1	2AFL
Seyðisfjarðarlína 2	Seyðisfjörður	SEY	SF2	1AFL	SR mjöl	NA	SF2	2AFL
Steingrímsst.lína 1	Streingrímsstöð	STE	ST1	1AFL	Ljósifoss	LJO	ST1	2AFL
Stuðlalína 1	Hryggstekkur	HRY	SR1	1AFL	Stuðlar	STU	SR1	2AFL
Stuðlalína 2	Stuðlar	STU	SR2	1AFL	Eskifjörður	ESK	SR2	2AFL
Tálknafjarðarlína 1	Mjólká	MJO	TA1	1AFL	Keldeyri	KEL	TA1	2AFL
Vatnshamralína 2	Vatnshamrar	VAT	VA2	1AFL	Andakíll	AND	VA2	2AFL
Vegamótalína 1	Vatnshamrar	VAT	VE1	1AFL	Vegamót	VEG	VE1	2AFL
Vogaskeiðslína 1	Vegamót	VEG	VS1	1AFL	Vogaskeið	VOG	VS1	2AFL
Vopnarfjarðarlína 1	Lagarfoss	LAG	VP1	1AFL	Vopnarfjörður	VOP	VP1	2AFL
Þingvallastræti	Rangárvellir	RAN	TI1	1AFL	Þingvallastræti	TIN	TI1	2AFL
Þorlákshafnarlína 1	Hveragerði	HVE	TO1	1AFL	Þorlákshöfn	TOR	TO1	2AFL

Table A-2.3 Registration of line bays 66 kV on BDL ÷1, BDL 0 and BDL 1.

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Ásbrúarlína 1	Fitjum	FIT	AS1	1AHL	Ásbrú	ASB	AS1	2AHL
Ásbrúarlína 2	Fitjum	FIT	AS2	1AHL	Ásbrú	ASB	AS2	2AHL
Ásbrúarlína 3	Ásbrú	ASB	AS3	1AHL	Riðbreytistöð	XXX	XXX	XXX
Ásbrúarlína 4	Asbrú	ASB	As4	1AHL	Riðbreytistöð	XXX	XXX	XXX
Húsavíkurlína 1	Laxá	LAX	HU1	1AHL	Húsavík	HUS	HU1	2AHL
Hvammslína 1	Bessastaðir	BES	PS1	1AHL	Hvammur	HVA	PS1	2AHL
Kárahnjúkalína 1	Bessastaðir	BES	KA1	1AHL	Teigsbjarg	TEI	KA1	2AHL
Kárahnjúkalína 2	Teigsbjarg	TEI	KA2	1AHL	Axará	AXA	KA2	2AHL
Kárahnjúkalína 3	Axará	AXA	KA3	1AHL	Tunga	TGA	KA3	2AHL
Kárahnjúkalína 4	Tunga	TGA	KA4	1AHL	Desjará	DES	KA4	2AHL
Vestm.eyjalína 1	Rimakot	RIM	VM1	1AHL	Vestm.eyjar	VEM	VM1	2AHL
Vestm.eyjalína 3	Rimakot *	RIM	VM3	1AHL	Vestm.eyjar	VEM	VM3	2AHL

* 66 kV cable, but operated on 33 kV

Table A-2.4 Registration of line bays 33 kV on BDL ÷1, BDL 0 and BDL 1..

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Hafnarfjörður 2	Hamranes	HAM	HF2	1AKL	Öldugata	OLD	HF2	2AKL
Hafnarfjörður 3	Hamranes	HAM	HF3	1AKL	Öldugata	OLD	HF3	2AKL
Kárahnjúkalína 5	Tunga	TGA	KA5	1AKL	Laugarás, KAR	LAU	KA5	2AKL
Kárahnjúkalína 6	Laugarás	LAU	KA6	1AKL	Skógarháls	SKO	KA6	2AKL
Reykjarhlíðarlína	Krafla	KRA	RE1	1AKL	Reykjahlíð	REK	RE1	2AKL
Ufsárlónslína 1	Axará	AXA	UF1	1AKL	Ufsárlón, KAR	UFS	UF1	2AKL

Table A-2.5 Registration of line bays 11 kV on BDL ÷1, BDL 0 and BDL 1.

Name of line	From	BDL ÷1	BDL 0	BDL 1	To	BDL ÷1	BDL 0	BDL 1
Bitrulína 1	Bitra	BIT	BI1	1ADL	Hellisheiði	HEH	BI1	2ADL
Bitrulína 2	Bitra	BIT	BI2	1ADL	Hellisheiði	HEH	BI2	2ADL
Bitrulína 3	Bitra	BIT	BI3	1ADL	Hellisheiði	HEH	BI3	2ADL
Bjarnarflagslína 1	Bjarnarflag	BJA	BJ1	1AEL	Krafla	KRA	BJ1	2AEL
Blöndulína 3	Blanda	BLA	BL3	1AEL	Rangárvellir	RAN	BL3	2AEL
Búðarhálslína 1	Búðarháls	BUD	BH1	1ADL	Sultartangi	SUL	BH1	2ADL
Fitjalína 1	Njarðvíkurheiði	NJA	FI1	1AEL	Fitjar	FIT	FI1	2AEL
Fitjalína 2	Fitjar	FIT	FI2	1AEL	Stakkur	STA	FI2	2AEL
Fitjalína 3	Fitjar	FIT	FI3	1AEL	Vallarheiði	VAL	FI3	2AEL
Fitjalína 4	Fitjar	FIT	FI4	1AEL	Vallarheiði	VAL	FI4	2AEL
Fitjalína 5	Fitjar	FIT	FI5	1AEL	Helguvík	XXX	FI5	2AEL
Fitjalína 6	Fitjar	FIT	FI6	1AEL	Helguvík	XXX	FI6	AEL
Helguvíkurlína 1	Njarðvíkurheiði	NJA	HL1	1ADL	Álver Helguvík	AHE	HL1	2ADL
Helguvíkurlína 2	Njarðvíkurheiði	NJA	HL2	1ADL	Álver Helguvík	AHE	HL2	2ADL
Hverahlíðalína 1	Hverahlíð	HVH	HH1	1ADL	Hellisheiði	HEH	HH1	2ADL
Hverahlíðalína 2	Hverahlíð	HVH	HH2	1ADL	Hellisheiði	HEH	HH2	2ADL
Hólasandslína 1	Hólasandur	HSA	HS1	1ADL	Álver á Bakka	ABA	HS1	2ADL
Hólasandslína 2	Hólasandur	HSA	HS2	1ADL	Þeistareykir	TRE	HS2	2ADL
Kolviðarhólslína 2	Kolviðarhóll	KOL	KH2	1ADL	Njarðvíkurheiði	NJA	KH2	2ADL
Kröflulína 3	Krafla	KRA	KR3	1ADL	Fljótsdalur	FLJ	KR3	2ADL
Kröflulína 4	Krafla	KRA	KR4	1ADL	Hólasandur	HSA	KR4	2ADL
Kröflulína 5	Krafla	KRA	KR5	1ADL	Hólasandur	HSA	KR5	2ADL
Nesjavallalína 2	Nesjavellir	NES	NE2	1AEL	Geithals	GEH	NE2	2AEL
Orustuhólslína 1	Hellisheiði	ORU	OR1	1ADL	Kolviðarhóll	KOL	OR1	2ADL
Orustuhólslína 2	Hellisheiði	ORU	OR2	1ADL	Kolviðarhóll	KOL	OR2	2ADL
Rangárvallalína 3	Rangárvellir	RAN	RA3	1AEL	Krossanes	KRO	RA3	2AEL
Reykjaneslína 1	Njarðvíkurheiði	NJA	RN1	1ADL	Reykjanes	REY	RN1	2ADL
Reykjaneslína 2	Njarðvíkurheiði	NJA	RN2	1ADL	Reykjanes	REY	RN2	2ADL
Sandfellslína 1	Trölladyngja	TRD	SD1	1ADL	Sandfell	SAF	SD1	2ADL
Sandskeiðslína 1	Sandskeið	SAN	SS1	1ADL	Hamranes	HAM	SS1	2ADL
Sandskeiðslína 2	Sandskeið	SAN	SS2	1ADL	Geithals	GEH	SS2	2ADL
Seltúnslína 1	Trölladyngja	TRD	SL1	1ADL	Seltún	SET	SL1	2ADL
Suðurnesjalína 2	Njarðvíkurheiði	NJA	SN2	1ADL	Hamranes	HAM	SN2	2ADL
Svartsengislína 1	Svartsengi	SVA	SV1	1AEL	Fitjar	FIT	SV1	2AEL
Trölladyngjulína 1	Trölladyngja	TRD	TD1	1ADL	Kúagerði	KUA	TD1	2ADL
Trölladyngjulína 2	Trölladyngja	TRD	TD2	1ADL	Kúagerði	KUA	TD2	2ADL
Vestm.eyjalína 3	Rimakot	RIM	VM3	1AFL	Vestm.eyjar	VEM	VM3	2AFL
Þeistareykjalína 1	Þeistareykir	THE	TR1	1ADL	Álver á Bakka	ABA	TR1	2ADL
Þorlákshafnarlína 2	Kolviðarhóll	KOL	TO2	1ADL	Þorlákshöfn	TOR	TO2	2ADL
Þorlákshafnarlína 3	Hellisheiði	HEH	TO3	1ADL	Þorlákshöfn	TOR	TO3	2ADL

Table A-2.6 Registration of future line bays on LYK ÷1, LYK 0 and LYK 1.

A-3. RELAY PROTECTION 2

A-3 Relay Protection

For relay protection in distribution, transmission and production the coding shall be done according the following tables.

A-3.1 DISTRIBUTION

Relay protection distribution, KKS coding		
BDL 2		**Explanation**
EY	**000**	Combined relays, such as I>, Z<, Z>, U>, U<, f>, f<, **GENERAL**
EY	010	
EY	020	
EY	030	
EY	040	
EY	050	
EY	060	
EY	070	
EY	080	
EY	090	
EY	**100**	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. **GENERAL**
EY	110	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Power transformers
EY	120	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Lines
EY	130	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Capacitors
EY	140	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Own consumption
EY	150	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Bustie
EY	160	
EY	170	
EY	180	Motor protection
EY	190	
EY	**200**	Differential current Id>, **GENERAL**
EY	210	Differential current Id>, Power transformer
EY	220	Differential current Id>, Lines
EY	230	Differential current Id>, Capacitors
EY	240	Differential current Id>, Own consumption
EY	250	
EY	260	
EY	270	Busbar protection
EY	280	Transformer
EY	290	Lockout relay
EY	**300**	Under voltage / over voltage U<, U>, **GENERAL**
EY	310	Under voltage / over voltage U<, U>, Power transformers
EY	320	Under voltage / over voltage U<, U>, Lines
EY	330	Under voltage / over voltage U<, U>, Capacitors
EY	340	Under voltage / over voltage U<, U>, Own consumption

EY	350	
EY	360	Under voltage / over voltage U<, U>, Busbar - Bustie
EY	370	Syncro-check relay
EY	380	Synchronizing equipment
EY	390	Voltage regulator
EY	**400**	Under frequency / over frequency f<, f>, **GENERAL**
EY	410	Under frequency / over frequency f<, f>, Power transformers
EY	420	Under frequency / over frequency f<, f>, Lines
EY	430	Under frequency / over frequency f<, f>, Capacitors
EY	440	Under frequency / over frequency f<, f>, Own consumption
EY	450	Under frequency / over frequency f<, f>, Bustie
EY	460	
EY	470	
EY	480	
EY	490	
EY	**500**	Distance protection Z<, >, **GENERAL**
EY	510	Distance protection Z<, >, Power transformers
EY	520	Distance protection Z<, >, Lines
EY	530	Reclosing
EY	540	Disturbance recorders
EY	550	
EY	560	
EY	570	Phase selection relays
EY	580	Impedance relays for transformers
EY	590	
EY	**600**	Breaker Failure, **GENERAL**
EY	610	Breaker Failure, Power transformers
EY	620	Breaker Failure, Lines
EY	630	Breaker Failure, Capacitors
EY	640	Breaker Failure, Bus coupler
EY	650	
EY	660	
EY	670	
EY	680	
EY	690	
EY	**700**	
EY	710	
EY	720	
EY	730	
EY	740	
EY	750	
EY	760	
EY	770	
EY	780	

EY	790	
EY	**800**	
EY	810	
EY	820	
EY	830	
EY	840	
EY	850	
EY	860	
EY	870	
EY	880	
EY	890	
EY	**900**	Relay protection undefined
EY	910	Auxiliary relays
EY	920	Test plugs
EY	930	Communication equipment, isolated
EY	940	Trip coil supervision
EY	950	Measuring station
EY	960	Bay control
EY	970	
EY	980	
EY	990	

Table A-3.1 Coding for relay protection in distribution on BDL 2

A-3.2 TRANSMISSION

Relay protection Transmission, KKS coding		
BDL 2		**Explanation**
EW	**000**	Combine relays, such as I>, Z<, Z>, U>, U<, f>, f<, **GENERAL**
EW	010	
EW	020	
EW	030	
EW	040	
EW	050	
EW	060	
EW	070	
EW	080	
EW	090	
EW	**100**	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. **GENERAL**
EW	110	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Power transformer
EW	120	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Lines
EW	130	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Capacitors
EW	140	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Own Consumption
EW	150	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Bustie
EW	160	
EW	170	
EW	180	Motor protection
EW	190	
EW	**200**	Differential current Id>, **GENERAL**
EW	210	Differential current Id>, Power transformer
EW	220	Differential current Id>, Lines
EW	230	Differential current Id>, Capacitors
EW	240	Differential current Id>, Own consumption
EW	250	
EW	260	
EW	270	Busbar protection
EW	280	Transformer
EW	290	Lockout relay
EW	**300**	Under voltage / over voltage U<, U>, **ALMENNT**
EW	310	Under voltage / over voltage U<, U>, Power transformer
EW	320	Under voltage / over voltage U<, U>, Lines
EW	330	Under voltage / over voltage U<, U>, Capacitors
EW	340	Under voltage / over voltage U<, U>, Own consumption
EW	350	
EW	360	Under voltage / over voltage U<, U>, Busbar - Bustie
EW	370	Syncro-check relay
EW	380	Synchronizing equipment
EW	390	Voltage regulator

EW	**400**	Under frequency / over frequency f<, f>, **GENERAL**
EW	410	Under frequency / over frequency f<, f>, Power transformer
EW	420	Under frequency / over frequency f<, f>, Lines
EW	430	Under frequency / over frequency f<, f>, Capacitors
EW	440	Under frequency / over frequency f<, f>, Own consumption
EW	450	Under frequency / over frequency f<, f>, Bustie
EW	460	
EW	470	
EW	480	
EW	490	
EW	**500**	Distance protection Z<, >, **GENERAL**
EW	510	Distance protection Z<, >, Power transformer
EW	520	Distance protection Z<, >, Lines
EW	530	Reclosing
EW	540	Disturbance recorders
EW	550	
EW	560	
EW	570	Phase selection relays
EW	580	Impedance relays for transformers
EW	590	
EW	**600**	Breaker Failure, **GENERAL**
EW	610	Breaker Failure, Power transformer
EW	620	Breaker Failure, Lines
EW	630	Breaker Failure, Capacitors
EW	640	Breaker Failure, Bustie
EW	650	
EW	660	
EW	670	
EW	680	
EW	690	
EW	**700**	
EW	710	
EW	720	
EW	730	
EW	740	
EW	750	
EW	760	
EW	770	
EW	780	
EW	790	
EW	**800**	
EW	810	
EW	820	
EW	830	

EW	840	
EW	850	
EW	860	
EW	870	
EW	880	
EW	890	
EW	**900**	Relay protection undefined
EW	910	Auxiliary relays
EW	920	Test plugs
EW	930	Communication equipment, isolated
EW	940	Trip coil supervision
EW	950	Measuring station
EW	960	Bay control
EW	970	
EW	980	
EW	990	

Table A-3.2 Coding for relay protection in transmission on BDL 2

A-3.3 PRODUCTION

Relay protection Production, KKS coding		
BDL 2		Explanation
EX	**000**	Combined relays, such as I>, Z<, Z>, U>, U<, f>, f<, **GENERAL**
EX	010	
EX	020	
EX	030	
EX	040	
EX	050	
EX	060	
EX	070	
EX	080	
EX	090	
EX	**100**	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. **GENERAL**
EX	110	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Power transformer
EX	120	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Lines
EX	130	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Capacitors
EX	140	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Own consumption
EX	150	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Bustie
EX	160	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Generators
EX	170	Over current, I>, Shaft current
EX	180	Motor protection
EX	190	
EX	**200**	Differential current Id>, **GENERAL**
EX	210	Differential current Id>, Power transformer
EX	220	Differential current Id>, Lines
EX	230	Differential current Id>, Capacitors
EX	240	Differential current Id>, Own consumption
EX	250	Differential current Id>, Generators
EX	260	Differential current Id>, Generators / Transformers (BLOCK)
EX	270	Busbar protection
EX	280	Transformer
EX	290	Lockout relay
EX	**300**	Under voltage / Over voltage U<, U>, **GENERAL**
EX	310	Under voltage / Over voltage U<, U>, Power transformer
EX	320	Under voltage / Over voltage U<, U>, Lines
EX	330	Under voltage / Over voltage U<, U>, Capacitors
EX	340	Under voltage / Over voltage U<, U>, Own consumption
EX	350	Under voltage / Over voltage U<, U>, Generators
EX	360	Under voltage / over voltage U<, U>, Busbar - Bustie
EX	370	Syncro-check relay
EX	380	Synchronizing equipment
EX	390	Voltage regulator

EX	**400**	Under frequency / over frequency f<, f>, **GENERAL**
EX	410	Under frequency / over frequency f<, f>, Power transformer
EX	420	Under frequency / over frequency f<, f>, Lines
EX	430	Under frequency / over frequency f<, f>, Capacitors
EX	440	Under frequency / over frequency f<, f>, Own consumption
EX	450	Under frequency / over frequency f<, f>, Bus coupler
EX	460	Under frequency / over frequency f<, f>, Generators
EX	470	
EX	480	
EX	490	
EX	**500**	Distance protection Z<, >, **GENERAL**
EX	510	Distance protection Z<, >, Power transformers
EX	520	Distance protection Z<, >, Lines
EX	530	Reclosing
EX	540	Disturbance recorders
EX	550	Distance protection Z<, >, Generators
EX	560	Reverse power P<--
EX	570	Phase selection relays
EX	580	Impedance relays for transformers
EX	590	
EX	**600**	Breaker Failure, **GENERAL**
EX	610	Breaker Failure, Power transformer
EX	620	Breaker Failure, Lines
EX	630	Breaker Failure, Capacitors
EX	640	Breaker Failure, Bustie
EX	650	Breaker Failure, Generators
EX	660	
EX	670	
EX	680	
EX	690	
EX	**700**	Rotor earth Re<, Stator earth Se, **GENERAL**
EX	710	Rotor earth Re<
EX	720	Stator earth Se, 100% inj.
EX	730	Stator earth Se, 100% 3. Harm.
EX	740	Stator earth Se, 95% Un
EX	750	Stator earth Se, 80% Un
EX	760	
EX	770	
EX	780	
EX	790	
EX	**800**	Neg.-Seq Insc>, Therm. Overload θ>, Loss of Ex. Φ<, Over excitation U/f>, Under excitation U/f< **GENERAL**
EX	810	Neg.-Seq Insc>
EX	820	Therm. Overload θ>

EX	830	Loss of Ex. Φ<
EX	840	Over excitation U/f>
EX	850	Under excitation U/f<
EX	860	
EX	870	
EX	880	
EX	890	
EX	**900**	Relay protection undefined
EX	910	Auxiliary relays
EX	920	Test plugs
EX	930	Communication equipment, isolated
EX	940	Trip coil supervision
EX	950	Measuring station
EX	960	Bay control
EX	970	Relay protection undefined
EX	980	
EX	990	

Table A-3.3 Coding for relay protection in production on BDL 2

A-4 Individual signal designation

Individual designation list for signal letters and signal numbers.

Code	Description	Type
X	**Signal origins**	
XA	**Binary signals - Automatic control**	**VARIOUS**
XA21	Automatic start	PLC
XA31	Automatic stop	PLC
XA26	Automatic start	Dispatch
XA36	Automatic stop	Dispatch
XB	**Binary signals - Individual control**	**VARIOUS**
XB20	Open / set / start equipment from local	Local / DI
XB21	Open / set / start equipment from SCADA	SCADA
XB22	Pulse-open/raise equipment from local	Local / DI
XB23	Pulse-open/raise equipment from SCADA	SCADA
XB24	Select connection to duty- from local	Local / DI
XB25	Select connection to duty- from SCADA	SCADA
XB26	Open / set / start equipment from dispatch	Dispatch
XB27	Pulse-open/pulse-raise a valve from dispatch	Dispatch
XB28	Select connection to duty- from dispatch	Dispatch
XB30	Close / reset / stop equipment from local	Local / DI
XB31	Close / reset / stop equipment from SCADA	SCADA
XB32	Pulse-close/lower equipment from local	Local / DI
XB33	Pulse-close/lower equipment from SCADA	SCADA
XB34	Select connection to standby- from local	Local / DI
XB35	Select connection to standby- from SCADA	SCADA
XB36	Close / reset / stop equipment from dispatch	Dispatch
XB37	Pulse-close / pulse-lower a valve from dispatch	Dispatch
XB38	Select connection to standby- from dispatch	Dispatch
XB43	Command: Switch to Automatic mode	Dispatch
XB44	Command: Switch to Manual mode	Dispatch
XB45	Command: Switch to Blocked mode	Dispatch
XB46	Command: Switch to Unblocked mode	Dispatch
XC	**binary signals - internal closed loop control**	**VARIOUS**
XD	**Emergency control functions**	**VARIOUS**
XD01	Command: Emergency stop, manual	PLC
XD02	Command: Emergency stop, electrical	PLC
XD03	Command: Emergency stop, mechanical	PLC
XE	**Protection relay signals**	**VARIOUS**
XE01	Start fault phase L1	Relay prot.
XE02	Start fault phase L2	Relay prot.
XE03	Start fault phase L3	
XE05	Start fault common	Relay prot.
XE06	Trip phase L1	Relay prot.
XE07	Trip phase L2	Relay prot.
XE08	Trip phase L3	Relay prot.

XE10	Over current I> alarm	Relay prot.
XE11	Over current I> trip	Relay prot.
XE12	Short circuit I>> alarm	Relay prot.
XE13	Short circuit I>> trip	Relay prot.
XE14	Voltage dep. over current alarm	Relay prot.
XE15	Voltage dep. over current trip	Relay prot.
XE16	Under impedance alarm	Relay prot.
XE17	Under impedance trip	Relay prot.
XE20	Differential current alarm	Relay prot.
XE21	Differential current trip	Relay prot.
XE24	Block differential alarm	Relay prot.
XE25	Block differential trip	Relay prot.
XE26	Busbar protection trip	Relay prot.
XE28	Dead machine alarm	Relay prot.
XE29	Dead machine trip	Relay prot.
XE30	Under voltage alarm	Relay prot.
XE31	Under voltage trip	Relay prot.
XE32	Over voltage alarm	Relay prot.
XE33	Over voltage trip	Relay prot.
XE34	Negative phase sequence alarm	Relay prot.
XE35	Negative phase sequence trip	Relay prot.
XE36	Voltage balance alarm	Relay prot.
XE37	Voltage balance trip	Relay prot.
XE38	Under excitation alarm	Relay prot.
XE39	Under excitation trip	Relay prot.
XE40	Over excitation alarm	Relay prot.
XE41	Over excitation trip	Relay prot.
XE42	Trip circuit supervision 1 alarm	Relay prot.
XE43	Trip circuit supervision 2 alarm	Relay prot.
XE44	Trip circuit supervision 3 alarm	Relay prot.
XE45	Trip circuit supervision 4 alarm	Relay prot.
XE46	Trip circuit supervision 5 alarm	Relay prot.
XE47	Trip circuit supervision 6 alarm	Relay prot.
XE48	Overload alarm	Relay prot.
XE49	Overload trip	Relay prot.
XE50	Low forward power alarm	Relay prot.
XE51	Low forward power trip	Relay prot.
XE52	Reverse power alarm	Relay prot.
XE53	Reverse power trip	Relay prot.
XE54	Shaft current alarm	Relay prot.
XE55	Shaft current trip	Relay prot.
XE58	Rotor earth fault alarm	Relay prot.
XE59	Rotor earth fault trip	Relay prot.
XE60	Stator earth fault alarm	Relay prot.
XE61	Stator earth fault trip	Relay prot.
XE62	Neutral displacement alarm	Relay prot.
XE63	Neutral displacement trip	Relay prot.
XE64	Sense direct earth fault alarm	Relay prot.
XE65	Sense direct earth fault trip	Relay prot.
XE66	Earth fault alarm	Relay prot.
XE67	Earth fault trip	Relay prot.
XE70	Under frequency trip	Relay prot.
XE71	Under frequency alarm step 1	Relay prot.

XE72	Under frequency alarm step 2	Relay prot.
XE73	Under frequency alarm step 3	Relay prot.
XE74	Under frequency alarm step 4	Relay prot.
XE75	Over frequency trip	Relay prot.
XE76	Over frequency alarm step 1	Relay prot.
XE77	Over frequency alarm step 2	Relay prot.
XE78	Over frequency alarm step 3	Relay prot.
XE79	Over frequency alarm step 4	Relay prot.
XE80	Distance protection start	Relay prot.
XE81	Distance protection zone 1	Relay prot.
XE82	Distance protection zone 2	Relay prot.
XE83	Distance protection zone 3	Relay prot.
XE84	Distance protection zone 4	Relay prot.
XE85	Distance protection zone reverse 1	Relay prot.
XG	**Binary process signals (Conditioning of signals from contacts)**	**VARIOUS**
XG10	Equipment ready	DI
XG11	Internal mechanism charged (Spring position)	DI
XG12	Equipment not ready	DI
XG14	Start contactor on	DI
XG16	Equipment closing	DI
XG17	Equipment opening	DI
XG18	Battery in floating charging	DI
XG19	Battery in boost charging	DI
XG21	Position - in / closed (breaker)	DI
XG22	Position - in / closed (breaker)	DI
XG23	Position - in / closed (breaker)	DI
XG24	Position - in / closed (breaker)	DI
XG25	Position - in / closed (breaker)	DI
XG26	Position - in / closed (breaker)	DI
XG27	Position - in / closed (breaker)	DI
XG28	Position - in / closed (breaker)	DI
XG29	Position - in / closed (breaker)	DI
XG31	Position - out / open (breaker)	DI
XG32	Position - out / open (breaker)	DI
XG33	Position - out / open (breaker)	DI
XG34	Position - out / open (breaker)	DI
XG35	Position - out / open (breaker)	DI
XG36	Position - out / open (breaker)	DI
XG37	Position - out / open (breaker)	DI
XG38	Position - out / open (breaker)	DI
XG39	Position - out / open (breaker)	DI
XG40	Remote control mode	DI
XG41	Auto control mode	DI
XG42	Manual control mode	DI
XG43	Local control mode	DI
XG50	Free for use	DI
XG60	Free for use	DI
XG70	Breaker in connected position / available	DI
XG71	Breaker in withdrawn position	DI
XG72	Breaker in test position	DI
XG73	Breaker pole discrepancy	DI
XG74	Auto reclose activated	DI

XG75	Safety switch open	DI
XG80	Free for use	DI
XG90	Free for use	DI
XH	**Binary limit signals**	**VARIOUS**
XH15	Valve position intermediate	DI
XH16	Limiter in operation	DI
XH21	Valve / gate position open	DI
XH31	Valve / gate position closed	DI
XH40	Low indication	DI
XH41	Low indication - alarm	DI
XH42	Low indication - trip	DI
XH50	High indication	DI
XH51	High indication - alarm	DI
XH52	High indication - trip	DI
XJ	**Derived analog values**	**VARIOUS**
XJ11	Analog signal - free for use (current)	AI
XJ12	Analog signal - free for use (voltage)	AI
XJ13	Analog signal - free for use (RTD)	AI
XJ14	Analog signal - free for use	AI
XJ15	Analog signal - free for use	AI
XJ16	Analog signal - free for use	AI
XJ21	Set point	SCADA
XJ26	Set point from Dispatch	Dispatch
XJ31	Calculated values	PLC
XJ51	Voltage Phase L1	Meas.center
XJ52	Voltage Phase L2	Meas.center
XJ53	Voltage Phase L3	Meas.center
XJ54	Current Phase L1	Meas.center
XJ55	Current Phase L2	Meas.center
XJ56	Current Phase L3	Meas.center
XJ57	Active Power	Meas.center
XJ58	Reactive Power	Meas.center
XJ59	Virtual (3 phase) Power	Meas.center
XJ60	Cos phi	Meas.center
XJ61	Frequency Phase L1	Meas.center
XJ62	Frequency Phase L2	Meas.center
XJ63	Frequency Phase L3	Meas.center
XL	**Control rooms and control stations**	**VARIOUS**
XM	**Alarms**	**VARIOUS**
XM01	Alarm 01	DI
XM02	Alarm 02	DI
XM03	Alarm 03	DI
XM04	Alarm 04	DI
XM05	Alarm 05	DI
XM11	Trip 01	DI
XM12	Trip 02	DI
XM13	Trip 03	DI
XM14	Trip 04	DI
XM15	Trip 05	DI
XM41	Event 1	DI
XM42	Event 2	DI
XM49	Timeout (control failure)	DI
XM51	Alarm	DI

XM52	Alarm	DI
XM53	Alarm	DI
XM54	Alarm	DI
XM55	Alarm	DI
XM80	Alarm	DI
XM90	Alarm	DI
XN	**Various parameters**	**VARIOUS**
XN03	Timer	PLC
XN21	Regulator gain	PLC
XN22	Regulator reset time constant	PLC
XN30	Pulse	PLC
XN31	Active energy import (pulse)	PLC
XN32	Reactive energy import (pulse)	PLC
XN36	Active energy export (pulse)	PLC
XN37	Reactive energy export (pulse)	PLC
XN41	Desired high warning	PLC
XN42	Desired high high warning	PLC
XN51	Desired low warning	PLC
XN52	Desired low low warning	PLC
XP	**Logical (gated) indication signals**	**VARIOUS**
XP10	Word for equipment indication	PLC
XQ	**Analog signal conditioning**	**VARIOUS**
XR	**Reserved (LV)**	**VARIOUS**
XS	**Steps for open loop control (sequences)**	**VARIOUS**
XT	**Reserved (LV)**	**VARIOUS**
XU	**Gated signals**	**VARIOUS**
XV	**Gated signals**	**VARIOUS**
XW	**Gated signals**	**VARIOUS**

Table A-4.1 Coding and numbering of signals on BDL 3.

Y	**Signal applications**	
YB	**Digital outputs**	**VARIOUS**
YB01	Emergency stop, manual	DO
YB02	Emergency stop, electrical	DO
YB03	Emergency stop, mechanical	DO
YB13	Select equipment A as primary	DO
YB14	Select equipment B as primary	DO
YB15	Select equipment C as primary	DO
YB21	Digital output from PLC open / start / on	DO
YB22	Increase/raise	DO
YB31	Digital output from PLC close / stop / off	DO
YB32	Decrease/lower	DO
YB41	Auto control mode command from PLC	DO
YB42	Manual control mode command from PLC	DO
YB43	Auto control mode in PLC	PLC
YB45	Blocked	PLC
YB50	Alarm / indication	DO
YB51	Alarm / indication	DO
YB52	Alarm / indication	DO
YB53	Alarm / indication	DO
YB54	Alarm / indication	DO
YB55	Alarm / indication	DO
YB56	Alarm / indication	DO
YB57	Alarm / indication	DO
YB58	Alarm / indication	DO
YB59	Alarm / indication	DO
YJ	**Analog outputs**	**VARIOUS**
YJ11	Analog output from PLC	AO
YJ21	Setpoint for regulator	AO

Table A-4.2 Coding and numbering of signals on BDL 3.

Z	**Gated signals**	
ZB	**Combined feedback signals**	**VARIOUS**
ZB01	Binary signals (combined feedback signals)	
ZB07	Fault (combined feedback signals drive, actuator, solenoid valve, circuit breaker)	
ZV	**Signal gating protective logics**	

Table A-4.3 Coding and numbering of signals on BDL 3.