	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 1	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
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Translation

This document is a translation from Swedish of LKAB Technical Instruction LKT 1500.180.019. In the event of disagreement concerning the interpretation and content of this text, the Swedish version shall have priority.

Latest revision

The latest revision of this instruction can be obtained by e-mail from: tekadm.krn@lkab.com or tekadm.mbg@lkab.com

All LKAB LKTs can also be retrieved from <https://www.lkab.com/sv/om-lkab/leverantor/styrdokument-och-mallar/tekniska-anvisningar-lkt/>


	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 2	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Table of contents

REFERENCES	2
DEFINITIONS	2
BACKGROUND AND PURPOSE	4
LKAB HAS THREE SYSTEMS FOR REFERENCE CODING:	4
LKAB'S REQUIREMENTS, APPLICATION AND INTERPRETATION	5
ORIENTATION	5
FUNCTIONALLY ORIENTATED ITEM REFERENCE CODE	6
PLACEMENT ORIENTATED ITEM REFERENCE CODE	8
CABLE DESIGNATION.....	10
FUNCTIONALLY ORIENTATED CODING OF CABLES	10
PLACEMENT ORIENTATED CABLE DESIGNATION	10
TABLES	11
SUGGESTIONS FOR IMPROVEMENTS	15

References

SS-ISO 10006	Quality management systems – Guidelines for quality management in projects
SS-EN 61082-1	Preparation of documents used in electrotechnology - Part 1: General requirements
SS-ISO 3511-1, -2	Process measurement control functions and instrumentation - Symbolic representation – Part 1: Basic requirements Part 2: Extensions of basic requirements
SS-EN 81346-1	Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations - Part 1: Basic rules


LKAB Technical instructions:

LKT 1500.180.002 -010	Plant reference coding
LKT 1500.180.022	Reference coding of instrument circuits
LKT 1500.800.005	Signal designations (Only in Swedish)

Definitions

According to SS IEC 750 Rules for electrical diagrams - item designation

<i>Item</i>	Element, component, equipment, function unit, etc., normally represented by a diagram symbol.
<i>Item type</i>	Type or class of items regardless of its function within a class. All types of switches are considered as of one and the same item type. Units can be classified in accordance with their intended usage within a certain circuit.
<i>Presign character</i>	Signs (equals sign, plus sign, minus sign) are used to identify the different code blocks.

	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 3	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Item reference code An unambiguous code, used to identify a post in a scheme, a list, a diagram or in equipment.

According to SS EN 81346-1 *Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations – Part 1: Basic rules*

Object Item that needs to be identified during planning, design, construction, commissioning, preparation/production, operation, maintenance and dismantling.

Note! This item may be either a material object or a collection of (material) objects, or information describing the particular item. The item may be seen from different perspectives, or aspects, depending on its purpose.

Product Intended or achieved result of work, or the result of a natural or created process.

Reference designation A reference designation should identify, unambiguously, an object in the system within which it is a component.

Aspect Stated way of selecting information of, or describing a system or an item from a certain perspective. Examples of aspects:

- what the system/item does (functional aspect)
- how the system/item is designed/constructed (product aspect)
- where the system/item is located (placement aspect)

Presign character The item reference code is made up of letters and digits and a number of presign characters.

= Presign indicating functional main component
 - Presign indicating component or group of components
 + Presign indicating physical location (placement)


Item reference code By item reference code is meant the unambiguous code given to each component, or group of components, that is part of the plant.

The purpose of the item reference code is to identify components, within the plant as well as in the documentation.

According to SS-ISO 3511-2 *Process measurement control functions and instrumentation – Symbolic representation - Part 2: Extensions of basic requirements*

Letter code The component function must be defined by a letter code.

Sensor element Part of a circuit that directly senses the value of a process variable and that assumes a predetermined and defined state or start value.

	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 4	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Background and purpose

LKAB strives to follow international standards as much as possible and in our Technical instructions, called LKTs, the company's specific requirements and interpretations of standards are defined precisely. The instructions also express the company's experience as well as giving information on LKAB's choice of alternative solutions within standards.

LKAB can also state requirements that are higher than those found in standards. By following this instruction, LKAB's requirements are fulfilled.

LKAB has three systems for reference coding:


LKT 1500.180.001 Plant reference coding General section: Used when reference coding, Plant object, Mobile object and Individual object

LKT 1500.180.019 Plant reference coding for Electrical facilities: Used when reference coding, components included in the Electric system, in addition to the reference coding used in accordance to LKT 1500.180.001

LKT 1500.180.021 Reference coding of instrument circuits: Used when reference coding Instrument components. In addition to the reference coding used in accordance to LKT 1500.180.001

In older existing Plants, deviations from the above may exist. When reference coding these, first contact the Technical Administration.

In case of any other uncertainties, on how the reference coding is to be carried out. Contact the Technical Administration

	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 5	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

LKAB's requirements, application and interpretation

Orientation

This instruction is based on SS-IEC 750, which has now, however, been replaced by SS-EN 61346-1. In this instruction LKAB has decided to keep the definitions and codes of SS-IEC 750.


In order for a system to be planned, designed, constructed, maintained and operated in an efficient way the system and the information regarding the system is divided into sections. Each section may then be further divided. This successive breakdown into sections, and the organisation of these sections, is called structuring.

There are three different ways of structuring:

- Functionally orientated structure (What the item does)
- Product orientated structure (How the item is designed and will be constructed)
- Placement orientated structure (Where the item is located)

LKAB primarily applies a functionally orientated structure and secondarily a placement orientated structure.

A larger scope of instrument circuits can be reference coded in accordance to LKT 1500.180.022 (Reference coding of instrument circuits)

	Document type	Document number		Page	of
	TECHNICAL INSTRUCTION	LKT 1500.180.020		6	15
Prepared by	Replaces	Project number	Revision	Lang	Date
Stig Johansson	LKS 080.04		14	en	2018-01-03
Approved by	Title	Technical area			
Per-Erik Jönsson	Reference coding of electrical facilities	General			
Status	Subtitle	Plant reference code /object			
Approved	Item reference codes				

Functionally orientated item reference code

Structure of the item reference code

An item reference code of a functionally orientated structure constitutes of two parts:

Part 1 Plant reference code

Part 2 Supplementary code

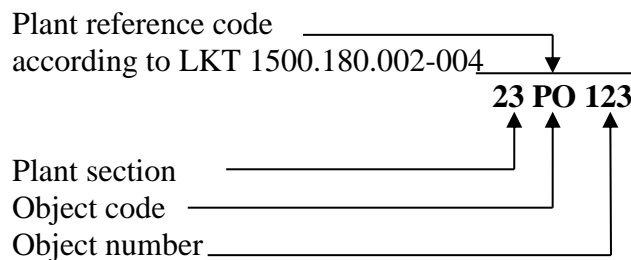
Part 1

The plant reference code (reference designation) describes the function of the plant.

Within LKAB the plant reference coding, as described in LKT 1500.180.002-010, should be carried out in accordance with the functionally orientated structure.

Example of plant reference code

Oil pump No.123, part of section 23 of the Kiruna dressing plant, receives the following reference code:




Part 2

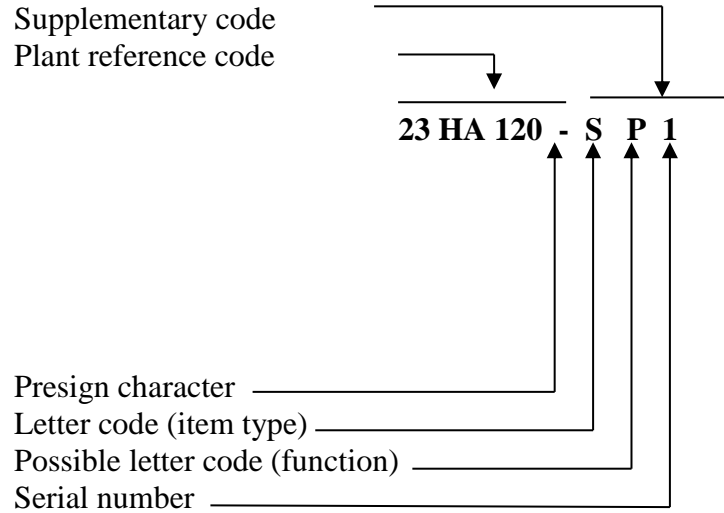
Supplementary code describing type and number of the component or component group.

Within LKAB equipment or components that are part of one object only (see plant reference code) are to be designated with a supplementary code (item reference code) consisting of:

- Presign character "-" (hyphen) and:
- A letter code for the first sign of the code according to SS-IEC 750, which can also be found in Table 1 below.
- Where applicable, a supplementary letter code referring to function or quantity according to Table 1 a below.
- A serial number (1 or higher) to separate equipment or components with the same letter code, e.g. -SP1 referring to the first switch and -SP2 to the second, and so on.

Example of item reference code

	Document type	Document number		Page	of
	TECHNICAL INSTRUCTION	LKT 1500.180.020		7	15
Prepared by	Replaces	Project number	Revision	Lang	Date
Stig Johansson	LKS 080.04		14	en	2018-01-03
Approved by	Title		Technical area		
Per-Erik Jönsson	Reference coding of electrical facilities		General		
Status	Subtitle		Plant reference code /object		
Approved	Item reference codes				




Designation of P/D boxes, (test switch)

When designating P/D boxes a functionally orientated item reference code must be used as far as possible.

A P/D box intended for several objects should be designated with the lowest possible plant reference code.

A common P/D box for e.g. 23PO123 and 23PO124 is, consequently, designated **23PO123-A1**.

	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 8	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Placement orientated item reference code

Structure of the item reference code

A placement orientated structure describes the physically location of the component/component group and is based on the topographical layout of the system and/or the place where the system is located.


A placement orientated structure also illustrates the split of the system into parts, sections including references to the placement aspect, not necessarily considering the products and/or the functions of the system.

Within a placement orientated structure locations may be successively split into, e.g.:

- Area
- Level
- Placement of a unit consisting of a number of cabinets, e.g. switchgears
- Rooms, coordinates
- Location of a panel
- Location of a circuit board

Within LKAB equipment/components must be designated with an item reference code consisting of:

- The presign character "+" and:
- Digits referring to a part of the plant according to LKT 1500.180.002- 010.
- A letter code indicating type of equipment according to Table 2 below.
- In some cases a second letter (A-H, K-N, P-Z freely chosen).
- A second letter (freely chosen) to distinguish equipment (of the same type within the same location). For example **+23SA** referring to low voltage switchgear 1 and **+23SB** referring to low voltage switchgear 2 within one and the same switchgears room.
- A serial number (01 and higher) to identify equipment or components with same letter code.

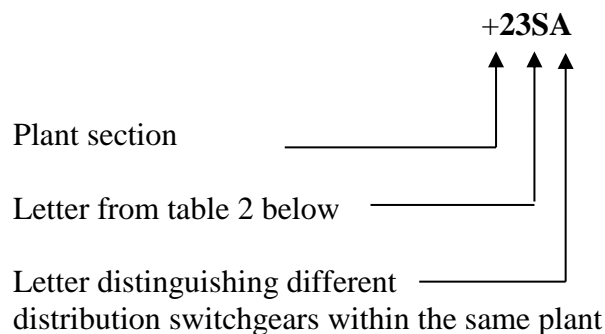
	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 9	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Number series

Sometimes it can be practical to use certain preferred number series. In a switchgears cabinet with a circuit breaker and multiple disconnectors, the circuit breaker can be designated -Q1, while the disconnectors receive reference codes -Q11, -Q12 etc.

Example:

A low-tension distribution switchgear placed in the Kiruna dressing plant 1, serving section 23, is designated:



Cubicle no. 3 in this distribution switchgear is designated:

+23SA03

Distribution switchgear group 12 in this cubicle may be designated:


+23SA03G12

A contactor placed in group 12 may be designated:

+23SA03G12-K11

When required, an enclosure can be split up into smaller sections, e.g. modular sections of a distribution switchgear. When designating these it is recommended to adhere to the division made by the supplier.

Normally several suppliers participate in the production and construction of a plant. Each supplier is responsible for a specific part or parts. When deciding on the product orientated reference codes this fact should be kept in mind.

	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 10	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Cable designation

Within LKAB the coding of cables should primarily be functionally orientated. The placement orientated structure should be applied as a second alternative.

Functionally orientated coding of cables

Cables connecting equipment/enclosures that are part of the same object should be designated with the plant reference code and a cable code according to table 3 below.

Example:

The energy cable (power cable) connecting feeder distribution switchgear and the drive (FRO) is denoted **23PO123.W1**.

The control cable connecting enclosure 23PO123-A2 and the control system cross-connection cabinet is denoted **23PO123.M2**.

Sometimes it can be practical for a plant to decide on a preferred number series. For example, a cable connecting the cross-connection cabinet and P/D box (test switch) might always be designated **.M1**, and the cable connecting the safety switch and the P/D- box might always be denoted **.M3**.

Placement orientated cable designation

Cables that are assignable to more than one object should be designated with the item reference code of the more peripheral equipment and a cable code according to Table 3 below.

Example:

A control cable between junction cabinet +23XB01 and enclosure +23LB02 is designated **23LB02.M1**.

Earthing diagram

Earth bars, potential bars and instrument busbars are coded according to Table 2 below.

Earthing diagrams must show how earthing straps/ potential lines / instrument leads are connected.


Cables are coded in plain text between bar and location to which the cable is connected.

Example



Kabelplan bl 11.pdf Kabelplan bl 11-1.pdf Kabelplan bl 30.pdf Jordningsschema.pdf

Example in pdf-file *bl11*, *bl 11-1*, and *bl 30* shows Cable plan. *Jordningsschema* shows Grounding Scheme

	Document type	Document number		Page	of
	TECHNICAL INSTRUCTION	LKT 1500.180.020		11	15
Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities		Technical area General		
Status Approved	Subtitle Item reference codes		Plant reference code /object		

Tables

Table 1 Letter codes for supplementary code based on functional structure

Letter	Item type	Example
A	Unit, sub-unit	P/D box, (test switch) , box with apparatus
B	Converter for conversion of non-electric signals to electric signals and the reverse.	Thermoelectric sensing unit, thermocell, pick-up, loudspeaker, temperature and pressure converter See also supplementary letter in Table 1a below
C	Capacitor	Capacitor device
D	Binary element, memory	Digitally integrated circuit and device, bistable element, register
E	Miscellaneous	Lighting and heating devices, device not stated in other section of this table
F	Protective devices	Fuse, surge protector, surge arrester, relay protection, automatic circuit breaker, miniature circuit breaker, residual current device (earth-fault protection)
G	Generator, power pack unit	Rotating generator, rotating frequency converter, battery
H	Signalling device	Optical and acoustic signalling device
I	Not used	
J	Junction	Junction box
K	Relay, contactor	Time relay
L	Inductor, reactor	Induction coil, carrier frequency arrester, reactor (shunt or serial)
M	Motor	
N	Analogue element	Operational amplifier, analogue digital device of hybrid type
O	Not used	
P	Measuring instrument, test equipment	Indicating, printing or integrating measuring equipment, signal generator, watch
Q	Power circuit switch	Circuit breaker, disconnecter
R	Resistance	Adjustable resistance, potentiometer, shunt, thermistor
S	Control circuit switch	Actuator switch, push-button, change-over switch, limit switch, switch, detector, sensor See also supplementary letter in tables 1a and 1b below
T	Transformer	Voltage transformer, current transformer, power transformer, measuring transformer
U	Modulator, transducer, converter	Discriminator, demodulator, drive/frequency converter, static current changer/static power rectifier/converter, alternating voltage converter, code converter, inverter, amplifier
V	Tube/valve semiconductor	Electronic valve/electron tube, gas-filled valve/tube, diode, transistor, thyristor, triac
W	Transmission path, waveguide, antenna, dipole	Conductor, omnibus bar, distribution bar, waveguide, waveguide directional coupler, parabolic antenna
X	Socket or connecting device	Plug and jack, clamp, connection- and terminal block, closing link, cable box
Y	Electrically controlled mechanical device	Brake, locking device, pneumatic valve, hydraulic valve, solenoid
Z	Impedance net, hybrid, filter, equalizer, limiter	Cable balancing net


	Document type	Document number		Page	of
	TECHNICAL INSTRUCTION	LKT 1500.180.020		12	15
Prepared by	Replaces	Project number	Revision	Lang	Date
Stig Johansson	LKS 080.04		14	en	2018-01-03
Approved by	Title		Technical area		
Per-Erik Jönsson	Reference coding of electrical facilities		General		
Status	Subtitle		Plant reference code /object		
Approved	Item reference codes				

Table 1a Letter codes to supplement Table 1 codes

Letter	Function or quantity	Explanation	Unit
A	Alarm		
B	Not used		
C	Conductivity	E.g. conductivity of fluids,	S/m (Siemens/meter)
D	Density	Previously denoted 'specific gravity'	kg/m ³
E	Electrical quantities	Voltage, current, power, etc.	V, A, W, etc.
F	Flow		t/h, m ³ /h, 1/min
G	Position, length	Angular position, distance, thickness, etc.	%, m
H	Manual impact	Manual operation	Percentage, open-closed, etc.
I	Industrial television	Image transmission for monitoring	
J	Not used		
K	Time	Pre-programmed timed function, e.g. percolate flushing program	S
L	Level	Fluid or material level	%, m, m ³ , l (liter)
M	Humidity	Humidity in material or air, moisture content	%
N			
O	Automatic impact	Direct automatic impact	E.g. open-closed valve at stop of pumps
P	Pressure		Pascal
Q	Concentration	Fluid fibre concentration	%, g/l
R			
S	Speed, frequency	E.g. conveyor speed, rpms, vibration	m/s, (r/min), Hz
T	Temperature		°C (degree centigrade),(Celsius)
U			
V	Viscosity	Fluid viscosity	Pa s (Pascal-seconds)
W	Weight (mass), force, torque		kg, N, Nm (Newton meter)
X	Internal signal processing	E.g. addition of two flows	
Y	Measuring relay, relay		
Z	Emergency or safety function		


	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 13	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Table 1b Letter codes to supplement Table 1 codes

Letter	Explanation
Ö	Open
S	Closed
F	Front
B	Rear
H	High
HH	High High
L	Low
LL	Low Low
I	In
U	Out


	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 14	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Table 2 Letter codes for placement orientated references

Letter	Equipment/component	Explanation
A		
B	Lighting power distribution cubilce	
C	General power distribution cubilce	
D	Computer and auxiliary equipment	Control equipment enclosures, printer
E	Connecting equipment for energy feeding of control and supervision equipment	E.g. UPS equipment
F	Connecting equipment for special-purpose	E.g. heating cable or auxiliary power in emergency power supply systems
G		
H	High-voltage distribution switchgear	
I	Not used	
J	Connection box	
K	Connecting equipment containing mainly control equipment	
L	Instrument cabinet or other box with apparatus	
M	Connecting equipment containing mainly energy measurement equipment	
N	Zero equipment	
O	Not used	
P	Control desk, control board, control panel	Operator's desk
Q	Connecting equipment containing mainly manoeuvring and regulating equipment	
R	Connecting equipment containing mainly relay protection devices	
S	Low-voltage distribution switchgear	
T	Transformer	
U		
V		
W	Earth bar, ground (reference) plane	Supplementary letter: WE-Protective earth, WS-Equipotential, WT-Instrument earth
X	Cross-connection	Stand or enclosure
Y		
Z		


	Document type TECHNICAL INSTRUCTION		Document number LKT 1500.180.020		Page 15	of 15
	Prepared by Stig Johansson	Replaces LKS 080.04	Project number	Revision 14	Lang en	Date 2018-01-03
Approved by Per-Erik Jönsson	Title Reference coding of electrical facilities			Technical area General		
Status Approved	Subtitle Item reference codes			Plant reference code /object		

Table 3 Letter codes for cable designation

Letter	Explanation
.A	Cable for analogue signals
.H	Power cable > 1000 V
.W	Power cable < 1000 V
.M	Manoeuvre/control cable
.Y	Data cable (copper)
.F	Fibre optical cable (.F replaces .O)
.P	Cable transmitting other medium besides electrical current, e.g. pneumatic or hydraulic
.J	Earth wire

Suggestions for improvements

LKAB carries out continual improvements in accordance with the LKAB quality policy (SS-ISO 10006, sections 8.2 and 5.2.7) and this also applies to instructions and codes of practice. Comments and suggested improvements are welcome at the following e-mail address: instructions@lkab.com

The LKAB internal address in Outlook: *SE SM Anvisningar LKT*