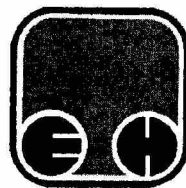




ЈП ЕПС-Привредно друштво
"Термoeлектране Никола Тесла" д.о.о.
Обреновац
Број: 1799
23-01-2014₂₀ год.



Електропривреда Србије - ЕП

ПРИВРЕДНО ДРУШТВО
ТЕРМОЕЛЕКТРАНЕ НИКОЛА ТЕСЛА, ОБРЕНОВАЦ

ЈАВНО ПРЕДУЗЕЋЕ "ЕЛЕКТРОПРИВРЕДА СРБИЈЕ"
ПРИВРЕДНО ДРУШТВО "ТЕРМОЕЛЕКТРАНЕ НИКОЛА ТЕСЛА" Д.О.О
ОБРЕНОВАЦ

БОГОЉУБА УРОШЕВИЋА ЦРНОГ БРОЈ 44, 11500 ОБРЕНОВАЦ

Телефон: 011/205-46-92

Телефакс: 011/8754-979

e-mail: jelena.mihajlovic@tent.rs

ПОЈАШЊЕЊА КД – ОДГОВОРИ НА ПИТАЊА ПОНУЂАЧА БРОЈ 7

Јавна набавка број: 004463/2013

ЈАВНА НАБАВКА – Јавна набавка број: 004463/2013

Пројектовање, израда, испорука, демонтажно – монтажни радови и
пуштање у рад система за редукцију емисије азотних оксида (NOx) блока
А3 по систему „кључ у руке“, примарним мерама

Преговарачки поступак са објавом позива за подношење понуда
применом члана 35. став 1. тачка 3) ЗЈН, а у вези са чланом 123. ЗЈН из
области IV - ЈАВНЕ НАБАВКЕ У ОБЛАСТИ ВОДОПРИВРЕДЕ; ЕНЕРГЕТИКЕ;
САОБРАЋАЈА И ПОШТАНСКИХ УСЛУГА

Обреновац, јануар 2014.год.

СВИМ УЧЕСНИЦИМА У ПОСТУПКУ ЈАВНЕ НАБАВКЕ

Поштовани,

у прилогу вам достављамо одговоре на питања која смо добили 21.01.2014 године:

ПИТАЊЕ 1:

С обзиром на Ваше обавештење о продужењу рока за доставу понуда као и чињеницу да су нека документа којима се доказује испуњеност услова из тачака 2-4 Упутства како се доказује испуњеност услова, већ прибављена тако да се испуњава услов валидности истих на претходно предвиђени дан предаје и отварања понуда, да ли ће се за испуњење услова из тачака 2-4 прихватити докази, односно документа, који нису старија од два месеца од претходно назначеног датума отварања понуда, 13.02.2013., односно ако је датум издавања документа нпр. 18.12.2013. године?

ОДГОВОР 1:

Не. Да би документа која се достављају у понуди имала функцију доказа о испуњености тражених услова, морају бити издата у складу са ЗЈН, подзаконским актима и конкурсном документацијом.

Управа за јавне набавке ближе је уредила начин доказивања испуњености услова (чланови 21-24 Правилника). Правилник о обавезним елементима конкурсне документације у поступцима јавних набавки и начину доказивања испуњености услова ступио је на снагу 1. априла 2013. године, објављен је на сајту УЈН и у "Службеном гласнику РС" бр. 29/13. Правилник о изменама и допунама Правилника о обавезним елементима конкурсне документације у поступцима јавних набавки и начину доказивања испуњености услова објављен је на сајту УЈН и у „Службеном гласнику РС“, бр. 104/13.

Према наведеним актима докази из тачака 2), 3) и 4) не могу бити старији од два месеца пре отварања понуда (тј. према најновијем термину за подношење понуда, не старији од 24.12.2013.), са тим да доказ из тачке 3) мора бити издат након објављивања позива за подношење понуда (тј. након 31.12.2013), што је и наведено на стр. 72 и 73/155 к.д, само без датума.

ПИТАЊЕ 2:

На страни 115/155, у напоменама уз образац понуде, назначено је да уколико се понуда подноси са подизвођачем, образац понуде потписују и оверавају и сви подизвођачи. С обзиром на велики број подизвођача, практичне проблеме око

потписивања свих на једном обрасцу, као и на чињеницу да за подизвођаче у потпуности одговара понуђач, да ли је могуће да понуђачи не потписују образац понуде већ да нпр. дају своју писмену изјаву којом се саглашавају да узму учешће у понуди?

ОДГОВОР 2:

Конкурсном документацијом је предвиђено да садржину понуде чини и Изјава о наступу са подизвођачем / подизвођачима (тачка 2, подтачка 2.4 на стр.80/155) коју обавезно потписују и подизвођач/и (подразумева се да Изјава може да обухвата све подизвођаче или да се да за сваког подизвођача појединачно, али уз законско ограничење да укупно учешће подизвођача не може да пређе 50% вредности понуде), а у тачки 7. на страни 83/155 дато је упутство за понуде са подизвођачем и Додатни захтеви код понуде са подизвођачем.

Уважавајући наведено у вашем питању, одустајемо од захтева да Образац понуде обавезно потписују и подизвођачи, тј. **брише се** део напомене који се односи на тај случај на страни 115/155: „Уколико понуђач подноси понуду са подизвођачем Образац понуде потписују и оверавају печатом понуђач и подизвођач“, што значи да место за потпис подизвођача у овом обрасцу може да буде празно или избрисано.

ПИТАЊЕ 3:

Да ли је дозвољена измена образаца конкурсне документације у смислу промене форме, не и садржине, нпр. проширења простора предвиђених за потписивање, додавање додатних места за потписивање образаца од стране подизвођача и чланова групе понуђача и сл?

ОДГОВОР 3:

Да, понуђач може да промени форму образаца, а измена садржине образаца дозвољена је једино уколико је извршена у складу са појашњењима која су саставни део конкурсне документације.

ПИТАЊЕ 4:

Везано за питање бр 1, из појашњења бр. 5, да ли се докази из тачке 2 члана 75 ЗЈН достављају и за остале, не само законске заступнике и Ваш одговор „Да. Односи се на све заступнике...“ наглашавамо чињеницу да Агенција за привредне регистре прави разлику између законских заступника (којих може бити и више) и осталих заступника и да у том смислу у регистру понуђача води евиденцију о испуњености тачке 2. само за законске заступнике.

Да ли је, узевши у обзир напред наведено, за испуњење неведеног услова ипак довољна само регистрација понуђача у регистру понуђача АПРа или је с обзиром на Ваш одговор да је потребно доказе доставити за све заступнике (и остале и законске) потребно за остале заступнике о којима се у Регистру понуђача не води евиденција, поднети засебно потврде МУП-а којима се доказује испуњеност услова тачке 2 члана 75. Став 1. ЗЈН?

ОДГОВОР 4:

Видети одговор на питање 1 у оквиру ових појашњења.

Споменути одговор из појашњења 5, односио се на све законске заступнике (уколико их има више), како је и наведено на страни 72/155 конкурсне документације.

Уколико је учесник у понуди уписан у Регистар понуђача не доставља доказе у вези са чланом 75. став 1. тачке под бројем 1 до 4 (видети Опште напомене у вези са одељком V на страни 74 - 75/155 к.д.).

ПИТАЊЕ 5:

На страни 23/155 наводи се да је АКЗ означавање: обележавање опреме и делова у складу са означавањем у ТЕНТ-у. Молимо Вас да нам доставите упутство ТЕНТ-а за обележавање опреме и делова.

ОДГОВОР 5:

У прилогу вам достављамо два документа која се односе на АКЗ означавање у ТЕНТ-у, у pdf. формату на српском и енглеском језику.

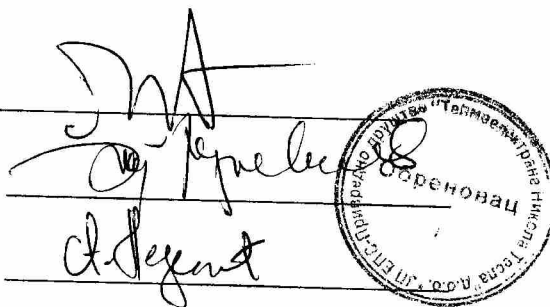
Ова Појашњења 7 постају саставни део конкурсне документације за ЈН 004463/2013. У осталом делу конкурсна документација са пратећим Појашњењима – Одговорима – Допуном 1 до 6 од 08.01.2014, 10.01.2014, 15.01.2014, 16.01.2014. , 20.01.2014. 21.01.2014. и 22.01.2014. остаје непромењена.

Чланови комисије:

Илија Чаировић,

Јелена Михајловић,

Атина Недељковић,



NOMENKLATURA POSTROJEIJA PRIMENJENA NA EL. 3 TERMOELEKTRANE OBRÉNOVAC

Primenjeni sistem se zasniva na kombinaciji cifara (N) i slova (A) razvrsta-
nih u 5 odnosno 7 grupa.

0	1	2	3	4	5	6
N	AA	NN	A	NNN	A	NNN

Grupa 0: Jedna cifra, označava broj bloka

Grupa 1: Dva slova, označavaju skup postrojenja. Prvo slovo označava postro-
jenje a oba deo postrojenja. Razvrstavanje po prvom slovu je:

A Postr. vis. i sr. napona	G Kom. pultevi i table	N Kotao
B Postr. 6, 3kV sopstv. potr.	H Ormani kom. zašt. signal.	P Manipulacija gorivom
C Razvod 400V gl. table	J Ormani reg. mer. upravlj.	R Sistem voda para
D Razv. 400V pom. t. kotao	K Pom. razvodi (kutije)	S Turbina, generator
E Razv. j. n. i 127V, 50Hz	L Razžir razdelnik	U Pomoćne instalacije
F Razv. 400V pom. t. ostalo	M Oprema za informacije	V Sistem rashladne vode

Podela postrojenja na delove data je u prilogu 1.

Grupa 2: Broj od dve cifre, označava dalju podelu delova postrojenja (1 do 99)

Grupa 3: Jedno slovo, označava vrstu opreme:

A Mer. hemijskih veličina	J Filtri (mehanički)	S Armatura
B Rezervoari	K	T Mer. temperature
C	L Mer. nivoa	U Pok. pisaci, štampači
D Mašine (rotirajuće)	M Mer. specijalna	V Mer. mehaničkih vel.
E Mer. električnih vel.	N	W
F Mer. protoka	P Mer. pritiska	X
G	Q	Y Mer. broja obrtaja
H	R	Z Elementi cevovoda

Grupa 4: Broj od tri cifre, označava nabrojanje vrste opreme istog tipa.

Oznake grupa 3. i 4. vezane su samo za mašinska postrojenja /tj. za slova
N do V u grupi 1., tako da kod čisto električnih uređaja izostaju oznake
grupa 3. i 4./

Grupa 5: Jedno slovo i to malo, označava tip električnog uređaja:

a Prekidač	f Merni pretvarač	n ispravljač, baterija
b Pomoćni prekidač	g Pokazni uređaj	p Cev, pojačavač
c Sklopka	h Signalni taбло, lampa	r Otpornik
d Releji, pom sklopka	k Kondenzator, prigušnica	s Drugi meh. ur. sa el. pog.
e Zaštitni uređaj	m Motor, transformator	u Sve ostalo

Grupa 6: Broj od tri cifre, označava nabrojanje električnih uređ. istog tipa.

Primeri:

3- RM 6 D 1 m 1

3 RM 6 D 1 f 2

0	3	Blok broj 3	0	3	Blok broj 3
1	RM	Rashladna voda	1	RM	Rashladna voda
2	6	Grana 6.	2	6	Grana 6.
3	D	Rotirajuća mašina /pumpa/	3	D	Rotirajuća mašina /pumpa/
4	1	Broj 1 /pumpa br 1/	4	1	Broj 1 /pumpa br 1/
5	m	Elektro motor	5	f	Merni pretvarač
6	1	Broj 1 /elektro motor br 1/	6	2	Broj 2 /merni pretvarač br 2/

PRIMENA nomenklature za označavanje na električnim šemama:

Po pravilu na jednoj šemi se prikazuje samo jedna funkcija uređaja (komanda
jednim elementom, jedan merni krug, ...) a obeležavanje uređaja (oznaka od
grupa 0 do 4.) se navodi samo u zaglavlju šeme. Svi električni uređaji koji
pripadaju ovoj šemi nose deo oznake 1 to grupe 5. i 6. a svi električni ure-
djeji koji pripadaju drugim funkcionalnim grupama nose potpunu oznaku.

A POSTROJENJA VISOKOG I SREDNJEG NAPONA

AA 220kV	AJ 15kV	AS
AB	AK	AT Transformator 360MVA
AC	AL	AU
AD	AM	AV
AE	AN	AW
AF	AP	AX
AG	AQ	AY
AH	AR	AZ

B POSTROJENJA 6,3kV SOPSTVENE POTROŠNJE I TRANSFORM. 15/6,3kV

BA 6,3kV tabla A	BL	BS
BB 6,3kV tabla B	BM	BT Tr. 36/21/21MVA
BC	BL 6,3kV rezerva I	BU
BD	BM 6,3kV rezerva II	BV
BE	BN	BW
BF	BP	BX
BG	BQ	BY
BH	BR	BZ

C RAZVOD 400V GLAVNE TABLE I TRANSFORMATORI 6300/400V

CA Gl.tabla 400V kotao A	CJ	CS Tabla elektrofiltra
CB Gl.tabla 400V kotao B	CK	CT Tr. 6300/400V
CC Gl.t.turboagregat A	CL Opšta grupa 1 A	CU
CD Gl.t.turboagregat B	CM Opšta grupa 1 B	CV
CE	CN	CW
CF	CP	CX
CG	CQ Opšta grupa 2 A	CY
CH	CR Opšta grupa 2 B	CZ

D RAZVOD 400V POMOĆNE TABLE - KOTAO

DA Priprema mazuta	DJ Stanica mazuta	DS
DB Trake i mlinovi A,B	EK Duvači gara - kotao	DT
DC Vazd.gas zagř.vazd A,B	EL Duvači gara - zagř.v.	DU
DD Transport pepela	EM Bunker A,B	DV El.filter, treš. elektr.
DE Voda-para, bypass, start	EN Rager stanica	DW El.filter, grejanje
DF Ventili turbina	EP Gorionici	DX Osvetljenje bunkera
DG Ventili kotao	DQ	EY
DH Regulacija Bailey	DR	DZ Osvetljenje kotla

E RAZVOD JEDNOSMERNOG NAPONA I NAIZMENIČNOG 127V, 50Hz

EA 220V-	EJ	ES
EB	EK Akumulator 24V-	ET
EC Aku baterija 220V-	EL	EU Gl.tabla za rez. 400V
ED Razvodna tabla 110V -	EM Razv. tabla 127V, 50Hz	EV
EE -	EN Razv.t. 127V, 50Hz lab.	EW
EF Aku baterija 110V-	EP	EX
EG	EQ	EY Dizel agregat
EH Razvodna tabla 24V-	ER Invertor 127V, Tr400/127	EZ 220V- kočenje mlina

F RAZVOD 400V POMOĆNE TABLE - OSTALO

FA Turbina	FJ Pročišćavanje kond.	FS
FB Generator	FK Osvetljenje	FT
FC Tabla 2 kond.i predgr.	FL Ispravljači	FU
FD Tabla 1 kond.i predgr.	FM Kompresor	FV
FE Razno	FN	FW
FF Hladjenje pom.postr.	FP	FX
FG Kompresor	FQ	FY
FH	FR	FZ Osvetljenje maš. sala

G KOMANDNI PULTEVI I TABLE

GA Pult u termokomandi	GJ	GS
GB Table u termokomandi	GK Pult kod turbine	GT
GC	GL Pult kotao:odv.i ubr.	GU
GD Ste u termokomandi	GM	GV
GE	GN	GW
GF	GP	GX
GG	GQ	GY
GH	GR	GZ

H ORMANI KOMANDE, ZAŠTITE, SIGNALIZACIJE

HA	HJ Kotao	HS Jedn.napon;127V, 50Hz
HB	HK Turboagregat	HT Brojila
HC	HL Napajanje kotla	HU Gorionici mazuta
HD Ormani isključenja	HM Hladjenje	HV Spojnice
HE Kontrola turbine	HN Opšta grupa	HW
HF Centr. signalizacija	HP Vis.napon;dizel	HX
HG	HQ Duvači gara na kotlu	HY
HH Zaštita	HR Grupa stanica	HZ

J ORMANI REGULACIJE, MERENJA, OBRADA PODATAKA, AUTOMATSKOG UPRAVLJANJA

JA Bailey	JJ	JS Kompresor; spojnice
JB Generators	JK	JT Glavna pobuda
JC Turbomat, TT 4	JL	JU Budilica
JD Regalacija pobude	JM	JV Tapprege
JE Reg. elektrofiltra	JN	JW Data logger
JF	JP Tapon 15kV	JX By pass
JG	JQ	JY Gorionici mazuta
JH	JR Dizel	JZ Erzina troka

K POMOĆNI RAZVODNI UREĐJAJI /KUTIJE/

KA Turbina	KJ Kotao	KS
KB Hl.generatora vodom	KL Otporno cond-e-mab. delakt	KT Sumpneri
KC Hl.generatora gasom	KE Otp. cond-e-kotao, tr.	KU
KD Hl.uzija za zaptivanje	KF Rager stanica	KV Elektrofilter
KE Transformator 15kV	KN Termostati kotao	KW El.filter zagrevanje
KF Opšte hl.generatora	KP	KX Laboratorija
KG Pobuda	KQ	KY Lab. za merenja
KH Mašinska sala	KA	KZ Varenje na kotlu

L RANŽIR RAZDELNIK

LA Napajanje kotla	LJ Merenje, maš. sala	LC
LB Turbina	LK Merenje, kotao	LT
LC Generator	LL Pretvarači mA/mV	LU
LD Pomoćni uređjaji	LM Merenje temperatura	LV
LE Kotao	LN	LW
LF Kotao	LO	LX
LG Kotao	LQ	LY
LH Kotao	LR	LZ Spojnice

M OPREMA ZA INFORMACIJE

MA	MJ	MS
MB	MK	MT
MC	ML	MU
MD Razglasna stanica	MM	MV
ME	MN	MW
MF	MP	MX
MG Časovnici	MQ	MY
MH	MR	MZ

N K O T A O

NA Doz. VP ekonomajzer	NJ Parni. zagr. vazduha	NS Recirk. dimnih gasova
NB Ubrizgavanje	NK Potpala	NT Recirk. letecog pepela
NC Odvodnj. ; odzračivanja	NL Lož. ugljem; vazd. mlin.	NU Otpepeljivanje
ND Pregrejači	NM Loženje mazutom	NV Duvanje gara. parom
NE Medjupregrejači	NN	NW Pranje vodom
NF Drugo medjupregrevanje	NP	NX
NG Dovod svežeg vazduha	NQ Izdvajanje pepela	NY
NH Zagrejači vazduha	NR Odvod dimnih gasova	NZ

P M A N I P U L A C I J A G O R I V O M

PA Istovar i uskl. uglja	PJ Vazd. za hl. gor. mazuta	PS
PB Priprema i transport	PK Vazd. za maz. stanice	PT
PC	PL Uredjaji za utovar	PU
PD Istovar i uskl. mazuta	PM Uredjaji za montažu	PV
PE Transport mazuta	PN	PW
PF Razvod pare za maz. st.	PP	PX
PG Stanica gasa	PQ	PY
PH Konč. maz. stanice	PR	PZ

R S I S T E M V O D A - P A R A

RA By pass vis. pritiska	RI Vakuumiranje	IS Para za pom. postr. Gat.
RB By pass nisk. pritiska	RJ	IT Provetrovanje, odzrač.
RC By pass VP iza reduc.	RL Vaporna voda	IU
RD	RM Rashladna voda	IV Regeneracija kondenz.
RE	RN Odvodnj. zagrejača NP	IW
RF Oduzimanja VP	RO Odvodnj. zagrejača VP	IX
RG	RI	IY
RH Oduzimanja NP	RJ Rashl. voda pre grej.	AZ Skracivanje regener.

S T U R B I N A G E N E R A T O R

SA Cilindar turbine	SD Regulacioni fluid	ST Napajanje vodom za hl.
SB Ležaji turbine	SE Sistem kompr. vazduha	ST Napajanje vodonikom
SC Uljni sistem	SI	SU Sistem ulja za zapt.
SD Kondenzacija	SK Reduktor	SV
SE Reg. i zašt. uredjaji	SN	SH
SF Zaobilazni sistem	SP Generator	SI
SG Zaptivna para	SS Ležaji generatora	SY
SH Odvodnjavanje	SA Budilica	SO Zaj. delovi turb. i gen.

U P O M O Ć N E I N S T A L A C I J E

UA Pripr. dodatne vode	UJ Vodovodna mreža	USK Kompri. i reži vazduh
UB	UK Voda za plće	UT Transport pepela
UC	UL Otpadne vode	UU Pomoćna kotlarnica
UD	UM	UV Klimatizacija
UE	UN	UW Grejanje
UF	UP	UX Protivpožarni uredjaj
UG	UQ Liftovi, dizalice	UY Pogoni za vrata, proz.
UH	UR Radionice, magacini	UZ Kompim. vazd. za reg.

V S I S T E M R A S H L A D N E V O D E

VA	VJ	VS
VB	VK	VT
VC Voda u kondenzatoru	VL Dodatna dem. voda	VU
VD	VM Nepreradjena voda	VV
VE	VN Proizv. preradjene vode	VW
VF Neprer. rashladna voda	VP	VX
VG Dem. rashladna voda	VQ	VY
VH Preradjena rashl. voda	VR	VZ

Authors: Dr. Horst Anders, Philipp Freymeyer, Helmut Hotes*

The authors first explain the necessity for the uniform designation of all equipment, plant and sections of plant which go to make up an installation and then state the requirements for a classification system which will satisfy this need. A system which has been evolved for both the mechanical and electrical equipment of thermal power stations is described. The possibilities for further extension of the system and practical experience with its application are also briefly described.

1. The necessity for a uniform classification system

In the design, construction and operation of any technical installation it is necessary to have a system of classification which permits the individual items and sections of the plant to be clearly designated in all drawings and literature and for operation of the station. In the case of complex installations such as power stations, the mechanical and electrical sides are so closely interwoven that the classification system must be suitable for both.

These are the reasons why the design departments of three major manufacturers agreed to evolve the present classification system which gives uniform designations for all plant in a thermal power station and replaces the differing systems which had previously been used for various sections of the installations.

The classification system is applied to the multifarious parts of a power station in a logical sequence and so permits a reader understanding of the plant and facilitates design, ordering, preparation of construction data, erection, commissioning, operation, maintenance and fault finding. The system enables the same designation to be given to the same pieces of plant in all drawings and literature – regardless of the company, department or factory from which they originated. It is the responsibility of the company having overall project leadership, or of the consulting engineers, to advise the departments responsible for the individual parts of the plant of the appropriate classification groups within the framework of the total system and also to ensure that the classification system is being properly applied throughout the entire contract.

The uniform application of the classification system to all new installations by manufacturer and operator will permit rationalisation in design and operation, through the use of data processing equipment for example, which will save both time and expense.

2. Requirements for a uniform classification system

A satisfactory classification system must comply with the following requirements:

- it must be clear;
the designation of an item must appear only once in the whole plant;
- it must be easy to remember;
- it must be built up uniformly for each section of the power station;
- it must be easily understood;
- it must be possible to give similar items in different power stations the same designation;
- it should be generally applicable;

- all possible items and combinations should be catered for with sufficient reserve for those which could not be foreseen;
- it must be suitable for use with electronic data processing;
- it must allow the various component manufacturers an adequate degree of freedom;

the manufacturers of the various items and sections of the installation must have sufficient freedom to designate their components themselves; it must be possible to give items their final designation even when the details of the whole installation have not been finally settled;

- it must be flexible;

since the functional area boundaries vary from case to case, the system must be capable of being modified to suit the requirements.

The present system satisfies all above requirements for the classification of plant and equipment in thermal power stations. It is based on the DIN 40719, Annexe 1 system and incorporates the recommendations of the International Electrical Commission, the Instrument Society of America and the British Standards Institution. Designations of the same basic composition can also be used for hydroelectric power stations and transformer stations.

3. Basic composition of the designations

The designations for all items are built up in the same manner. They are comprised of numerals, letters and special signs which can be handled by electronic data processing equipment. Each designation is divided into sections which are given an ordinal number. Each ordinal section relates to a particular characteristic of the item in question.

Ordinal section:

Designation:

0	1	2	3	4
N	AA	NN	A	NNN

N is a numeric character, arabic numeral

A is an alpha character, latin capital letter

As will be explained later, ordinal section 0 may be omitted or, in the case of electrical equipment, the designation may end at ordinal section 2 or 3. It is not necessary to insert the leading zeros in ordinal sections 2 and 4.

Examples:

Theoretically complete designation

N	AA	NN	A	NNN
1	RP	10	D	021
1	HA	03	B	014
0	BA	02	0	000

Normal method of writing designation

N	AA	NN	A	NNN
	RP	10	D	21
	HA	3	B	14
	BA	2		

The make-up of the designation, particularly the sole occurrence of double letters at ordinal section 1, ensures that it is always clear which ordinal sections have been written even when the designation is not complete.

N	AA	NN	A	NNN
---	----	----	---	-----

The zero ordinal section indicates the number of the power station unit. Items of equipment not associated with any particular unit are prefixed zero.

* The authors are in the power station departments of Messrs. Brown, Boveri & Cie. AG, Siemens AG and AEG-Telefunken. On April 1, 1969 the power station departments of Messrs. Siemens AG and AEG-Telefunken were merged to form Kraftwerk Union AG.

Table 1. Designation of plant groups

Ordinal section 1, 1st letter	N	AA	NN	A	NNN
-------------------------------	---	----	----	---	-----

Electrical plant

- A High-voltage distribution systems and system transformers
- B High-voltage auxiliary supply systems and auxiliary transformers
- C Low-voltage auxiliary supply systems — normal system main distribution boards and auxiliary transformers
- D Low-voltage auxiliary supply systems — normal system subdistribution boards
- E Direct-current and emergency generating plant and distribution boards
- F
- G Control rooms and local control stations
- H Open-loop control, alarm and protection system boards and cubicles
- J Closed-loop control and measuring system boards and cubicles
- K Subdistributors
- L Marshalling racks
- M Communications equipment

Mechanical plant

- N Boilers
- P Fuel handling (PA to PK);
Fuel element handling, transport and storage (PL to PZ)
- Q Gas turbine plant
- R Water/steam system
- S Steam turbine and generator
- T Reactor auxiliaries
- U Conventional auxiliaries
- V Circulating water system
- W
- X Reactor containment and internals, radiation monitoring
- Y Nuclear steam generator
- Z

The ordinal section can be omitted completely when the power station has only one unit. In the case of power stations with several units, the drawings and data are normally clearly related to a particular unit. In this case, therefore, the zero ordinal section can be omitted. On the other hand, however, it will still be required in the case of electrical circuit diagrams for the interconnections between two units or in similar circumstances.

N	AA	NN	A	NNN
---	----	----	---	-----

The various plant groups of the power station are designated in ordinal section 1. The first letter is a broad indication of the part of the plant involved. Letters A to M refer to electrical equipment and letters N to Z refer to mechanical equipment (see Table 1). The second letter provides a more precise identification of the piece of plant involved and this will be explained below.

4. Designation of mechanical plant

The composition of the designation and the meaning of the individual ordinal sections are shown in Table 2.

4.1 Ordinal section 1

N	AA	NN	A	NNN
---	----	----	---	-----

In defining the lines of division between the various sections of mechanical plant, those items which together fulfill a common function are usually grouped together in ordinal section 1. Examples are:

- NK Lighting-up equipment
- NM Oil firing equipment

In the case of other groups of plant on the other hand, it is better to make the divisions from a purely constructional standpoint, e.g. as with the turbine:

- SA Turbine casings
- SB Turbine bearings

It is also possible to group items according to functional areas, e.g. in the feedwater system:

- RL Feedwater transfer from suction line to boiler inlet

Table 2. Designation of mechanical plant

Ordinal section	0	1	2	3	4
General composition	N	AA	NN	A	NNN

Example	1	RL	2	S	7
---------	---	----	---	---	---

No. of unit Unit 1					
Plant group or main group Water/steam system R					
Plant item or functional area Feedwater transfer RL					
Subgroup or parallel set Feed pump 2					
Type of machine or equipment Solenoid valve S					
Consecutive number of machine or equipment No. 7					

Finally, the limits of a group can also be defined so that they fall in line with the normal scope of delivery of the manufacturers. This provides the easiest means of fulfilling the requirements that the manufacturer should be able to determine the designations of individual items within his particular group or groups himself.

Annexe 2 gives designations for those items of plant which are found in all power stations. Sufficient spare designations remain for those items of plant found in only some power stations. Wherever possible, the boundaries between the various functional groups or plant groups are drawn so that they agree with the manufacturer's scope of delivery. In the cases where this is not possible the divisions are made according to whichever of the following provides the most practical solution:

- functional relationship,
- construction or
- scope of delivery.

Any alterations to the divisions between the groups must be determined by the mechanical project leader very early at the beginning of design and made known to all concerned.

4.2 Ordinal section 2

N	AA	NN	A	NNN
---	----	----	---	-----

Ordinal section 2 provides a further subdivision into subgroups, parallel plant or trains or a further subdivision of the section of plant. Again there are a variety of possible arrangements.

In the case of feedwater transfer RL, for example, it is logical to divide into parallel trains at this point.

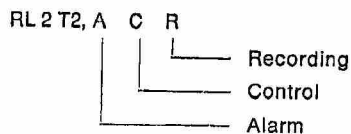
With the turbine it is again the construction which determines the method of designation. Thus for example, the first turbine casing is SA 1, the second SA 2, etc. The procedure is similar with the turbine bearings SB and they are designated SB 1, SB 2, etc. (Fig. 1). In the case of the turbine oil system, on the other hand, the functional groups are divided into related subgroups. The designations should be given relatively freely and also varied to suit the particular function as closely as possible.

Ordinal section 2 may also be used for a further main division. For example, in the case of a cross-compound turbine (two main turbines in one unit) the equipment for the two main turbines may be differentiated by means of ordinal section 2, thus:

- SA 11 First turbine casing of first turbine.
- SA 21 First turbine casing of second turbine.

7.2 Designation for type of measuring point

In English-speaking countries and in the chemical industry it is usual to add an indication as to the type of application (indication, control, etc.) to the designations for measuring points. This procedure is also possible with the system described here where a special character is inserted after ordinal section 4 and followed by a letter:



One disadvantage of this arrangement is that the overall designation becomes very long when a measuring point has a number of applications and also a great number of alterations have to be made in the drawings, etc. every time a change in the application of a measuring point is made during the development of the project. Therefore, it seems to be a practical solution only to include the application of the measuring points in the designations in the list of measuring points.

7.3 Designation of mechanical equipment

With mechanical equipment it can be very useful to include more information in the designation about the particular piece of equipment. A good example of this are the many thousands of fittings in a power station unit. All fittings, including the manually operated ones, can easily be given a designation related to the section of plant, set or piping system. Furthermore, additional information such as the complete contents of the usual list of fittings (pressure, nominal size, ends, type, manufacturer, erector, actuator, position indication, etc.) can be coded if required and added to the designation of the fittings after ordinal section 4. When this has been done, the possibility presents itself of using data processing equipment to assemble data required during the course of planning and erection, e.g. ordering, erection schedules, etc.

The list of fittings is only one example of the many possibilities offered by consistent application of the suggested classification system.

7.4 Designations for the civil engineering side

During the course of the discussions which preceded the development of this classification system, the wish was expressed to take this opportunity of selecting a system which also permitted the designation of civil engineering items such as buildings, spaces, levels, columns, etc. The discussions on this aspect have not yet reached a stage where any useful report can be made.

8. Experience so far

The classification system described in this article has developed step by step from the practical application of DIN 40719 during the last few years. It was first generally applied on the heavy current side. The increasing amount of automatic equipment in modern thermal power stations made it absolutely essential to find a uniform classification system for the whole power station which would permit both electrical and mechanical engineers to identify their items of equipment accurately.

This system has been used successfully on a number of projects, among them the Obrigheim nuclear power station and the Niederaussem thermal power station. It has proved to be of great value in the planning, development, commissioning and operation of the extensive and complicated systems. Practical experience showed that personnel quickly became conversant with the system and the use of longhand descriptions was largely dropped. Mistakes in the interchange of information was eliminated completely by the use of proper care in the application of the system.

Naturally the success and benefits of the system will be all the greater the more the various manufacturers begin to apply it to their own products.

Annexe 1

Group designation for electrical plant

A High-voltage distribution systems and system transformers

AA	
AB	
AC	380 kV system
AD	220 kV system
AE	110 kV system
AF	60(50) kV system
AG	45 kV system
AH	30 kV system
AJ	20 kV system
AK	10 kV system
AL	6 kV system
AM	
AN	
AP	Generator leads and generator foundation cells
AQ	
AR	
AS	
AT	Transformers (unit transformer)
AU	
AV	
AW	
AX	
AY	
AZ	

B High-voltage auxiliary supply systems and auxiliary transformers

BA	H.V. unit auxiliary system, half bus 1
BB	H.V. unit auxiliary system, half bus 2
BC	Other main distribution boards (e.g. arranged according to voltage 10 kV, 5 kV)
BD	
BE	
BF	
BG	
BH	
BJ	
BK	
BL	H.V. start-up plant, half bus 1
BM	H.V. start-up plant, half bus 2
BN	
BP	
BQ	
BR	
BS	
BT	H.V. auxiliary transformers (unit or start-up)
BU	H.V. emergency plant (diesel), half bus 1
BV	H.V. emergency plant (diesel), half bus 2
BW	
BX	
BY	
BZ	

G Control rooms and local control stations

GA	Control room consoles
GB	Control room boards
GC	
GD	Control room desk
GE	Electrical control room consoles
GF	Electrical control room boards
GG	System control room consoles
GH	System control room boards
GJ	
GK	Local control stands and control boards
GL	
GM	
GN	
GP	
GQ	
GR	
GS	
GT	
GU	
GV	
GW	
GX	
GY	
GZ	

H Open-loop control, alarm and protection system boards and cubicles

HA	Open-loop control cubicles, e.g. individual control, interlocking, group control
HB	
HC	
HD	
HE	
HF	Alarm cubicles
HG	Cubicles for alarm printer, etc.
HH	Protection system cubicles or panels (for generators, motors, transformers)
HJ	Other cubicles and boards, possibly separate designation for start-up plant or system sections
HK	
HL	
HM	
HN	
HP	
HQ	
HR	
HS	Power supply boards and cubicles
HT	Meter panels
HU	
HV	
HW	Process computer cubicles if not under JW, JX, JY
HX	
HY	
HZ	

C Low-voltage auxiliary supply systems, normal system main distribution boards and auxiliary transformers

CA	L.V. main distribution board, section 1 (with coupler)
CB	L.V. main distribution board, section 2
CC	Other main distribution boards arranged according to rated voltage and system, e.g. 500 V and 380 V
CD	
CE	
CF	
CG	
CH	
CJ	
CK	
CL	L.V. main distribution board, general, section 1
CM	L.V. main distribution board, general, section 2
CN	L.V. main distribution board, lighting, section 1
CP	L.V. main distribution board, lighting, section 2
CQ	L.V. transformers
CR	
CS	
CT	
CU	
CV	
CW	
CX	
CY	
CZ	

D Low-voltage auxiliary supply systems, normal system subdistribution boards

DA	Arrangement according to plant
DB	
DC	
DD	
DE	
DF	
DG	
DH	
DJ	
DK	
DL	
DM	
DN	
DP	
DQ	
DR	
DS	
DT	
DU	
DV	
DW	
DX	
DY	
DZ	

J Closed-loop control and measuring system boards and cubicles

JA	Closed-loop control cubicles
JB	Turbo-set cubicles
JC	
JD	Generator voltage regulator cubicle
JE	Other closed-loop cubicles, e.g. in other buildings
JF	
JG	
JH	
JJ	
JK	
JL	Measuring system cubicles
JM	
JN	
JP	
JQ	Power supply boards and cubicles
JR	
JS	
JT	
JU	Process computer cubicles if not under HW, HX, HY
JV	
JW	
JX	
JY	
JZ	

K Subdistributors

KA	Normally for open-loop control, alarm, protection; arrangement according to plant
KB	
KC	
KD	
KE	
KF	
KG	
KH	
KJ	
KK	
KL	Normally for closed-loop control and measurement; arrangement according to plant
KM	
KN	
KP	
KQ	
KR	
KS	
KT	
KU	
KV	
KW	
KX	
KY	
KZ	

E Direct-current and emergency generating plant and distribution boards

EA	220 (110) V d.c. distribution board, section 1
EB	220 (110) V d.c. distribution board, section 2
EC	220 V batteries and chargers
ED	1st extra low-voltage (e.g. 60 V, 48 V) arrangement as for EA, EB, EC
EE	
EF	
EH	
EJ	2nd extra low-voltage (e.g. 24 V, 12 V) arrangement as for EA, EB, EC
EK	
EM	Secure-supply distribution boards
EN	
EP	
EQ	
ER	M.G. sets or inverters for EM
ES	
ET	
EU	Diesel generator main distribution board, section 1
EV	Diesel generator main distribution board, section 2
EW	
EX	
EY	Emergency diesel generator sets
EZ	Aviation obstruction lighting systems

F

FA	Spare
FB	
FC	
FD	
FE	
FF	
FG	
FH	
FJ	
FK	
FL	
FM	
FN	
FP	
FQ	
FR	
FS	
FT	
FU	
FV	
FW	
FX	
FY	
FZ	

L Marshalling racks

LA	Normally for open-loop control, alarm, protection; arrangement according to plant
LB	
LC	
LD	
LE	
LF	
LG	
LH	
LJ	
LK	
LL	
LM	Marshalling rack, 220 V section
LN	
LP	
LQ	
LR	Normally for closed-loop control and measurement; arrangement according to plant
LS	
LT	
LU	
LV	
LW	
LX	
LY	Marshalling rack, 220 V section
LZ	

M Communications equipment

MA	Telephone system (PABX)
MB	Two-way intercom system
MC	
MD	Loudspeaker system (alarm, paging)
ME	Visual paging system
MF	Fire alarm system
MG	Master clock system
MH	
MJ	
MK	Remote control system
ML	Remote measuring system
MM	Remote metering system
MN	HF telephone system
MP	
MQ	
MR	
MS	
MT	
MU	
MV	
MW	
MX	
MY	
MZ	

Annexe 2

Group designation for mechanical plant

N Boilers

Boundaries of functional areas

NA	H.P. section	Boiler inlet header to h.p. outlet header
NB	Circulation system / auxiliary start-up lines	Connections on separator drum to end of circulation line / auxiliary start-up lines
NC	Drains and vents	Connecting stubs to outlet from heater/funnel
ND		
NE	Reheat	Boiler inlet header to boiler outlet header
NF	Second reheat	Boiler inlet header to boiler outlet header
NG	Air supply	Air inlets in suction duct to furnace (not incl. air heaters)
NH	Flue gas air heater	Air heater inlet to air heater outlet
NJ	Separately-heated air heater	Air heater inlet to air heater outlet
NK	Lighting-up equipment*	Equipment associated with unit
NL	Coal-firing equipment, mill air, vapour dust extraction	
NM	Oil-firing equipment	
NN	Gas-firing equipment	
NP	Reserved for other forms of firing, e.g. refuse incineration	
NQ	Flue gas cleaning	Separator inlet to separator outlet
NR	Flue gas extraction	Furnace to chimney outlet (not incl. air heaters or flue gas cleaning)
NS	Flue gas recirculation	
NT	Fly ash return	
NU	Ash and slag removal and transport	Equipment associated with unit
NV	Heating surface cleaning	Soot blowers, shot cleaning, boiler washing, air heater washing
NW		
NX		
NY		
NZ		

* Includes lighting-up fans and ignition transformers

Q Gas turbine plant

QA	Turbine bearings
QB	Turbine bearings
QC	Oil system
QD	Combustion chamber
QE	Air compressor
QF	Air heater
QG	
QH	
QJ	Starter
QK	Ignition system
QL	
QM	Oil burning
QN	Gas burning
QP	
QQ	
QR	
QS	
QT	
QU	
QV	
QW	
QX	
QY	
QZ	

P Fuel handling (PA to PK), fuel element handling, transport and storage (PL to PZ)

Scope of systems

PA	Coal unloading and storage
PB	Coal preparation and transport
PC	
PD	Oil unloading and storage
PE	Oil transport and distribution
PF	
PG	Gas reception
PH	
PJ	
PK	
PL	Charging machine, fuel pit bridge
PM	Erection equipment
PN	New fuel element storage equipment
PP	Fuel element testing equipment
PQ	Lining for fuel pit and store
PR	Internals in fuel pit and store
PS	
PT	Vehicles and containers for fuel element transport
PU	
PV	
PW	Tools and devices
PX	
PY	
PZ	

Up to discharge into boiler bunker

Incl. heating

Incl. heating

Incl. heating

Explanatory note on „Boundaries of functional areas“ between P and N:

In the case of coal supply, group PB ends with the coal discharge chute over the boiler bunker. Equipment on the bunkers such as measuring and agitating devices and the delivery to the mills is included in NL coal-firing equipment. Group NM oil-firing equipment begins after PE oil transport at a point which is clearly related either to a particular unit or boiler.

In the case of gas firing, group PG includes the gas reception station together with the h.p. reducing station and the supply lines to the various units. Group NN gas-firing equipment begins at the inlet to the l.p. reducing station or the regulating station before the boilers.

R Water/steam system

Boundaries of functional areas

RA	Initial steam line, h.p. bypass
RB	Hot reheat line, l.p. bypass
RC	Cold reheat line
RD	Spare for second reheat
RE	Spare for second reheat
RF	H.P. extractions
RG	
RH	L.P. extractions (RH1 = lowest extraction)
RJ	
RK	Drain from start-up flash tank
RL	Feedwater transfer
RM	Main condensate transfer (condensing system see SD)
RN	Auxiliary condensate transfer/drain (l.p. feed heater)
RP	Auxiliary condensate transfer/drain (h.p. feed heater)
RQ	Auxiliary steam equipment
RR	
RS	
RT	Piping drains (when not included in other groups)
RU	Drain and return systems
RV	
RW	Bled steam turbine condensate transfer
RX	
RY	
RZ	

Boiler outlet to emergency stop valve / after bypass valve / after safety valve

Boiler outlet to emergency stop valve / after bypass valve / after safety valve

Exhaust from h.p. cylinder / check valves / after h.p. bypass to boiler inlet header (not incl. branches, these incl. in RF)

Extraction fitting to and including feed heater

Extraction fitting / l.p. cylinder to and including feed heater / deaerator / feedwater tank

From feedwater suction line, feed pumps, discharge line to boiler inlet header / h.p. injection points

From main condensate pump suction line to deaerator inlet (not incl. condensate demineralisation and filtering)

Outlet from auxiliary boiler / after reducing station / external supply feed point to load

From condensate pump suction line to connection on RM/SD

S Steam turbine and generator

SA	Turbine casing
SB	Turbine bearings
SC	Oil system
SD	Condensing system (not incl. condensate transfer, see RM)
SE	Governing and protection equipment
SF	Bypass
SG	Gland steam system
SH	Drain system
SJ	Control fluid system
SK	Compressed air system
SL	
SM	Gearing
SN	
SO	Shared equipment for turbine and generator
SP	Generator (stator, rotor and cooling systems)
SQ	Generator bearings
SR	Exciter (incl. cooling system)
SS	Water supply (direct water cooling incl. secondary circuit)
ST	Hydrogen supply
SU	Sealing oil system
SV	
SW	
SX	
SY	
SZ	

T Reactor auxiliaries

TA	Volumetric flow control
TB	
TC	Coolant purification
TD	
TE	
TF	Nuclear intermediate cooling system
TG	Fuel pit cooling system
TH	Residual heat removal system, no-load cooling
TJ	Safety injection system
TK	
TL	Ventilation plant in controlled area
TM	
TN	Plant ancillary equipment
TP	
TQ	
TR	Liquid radioactive waste treatment
TS	Gaseous radioactive waste treatment
TT	Solid radioactive waste treatment
TU	Spare, e.g. for decontamination plant
TV	Sampling
TW	
TX	
TY	Plant drainage and ventilation
TZ	Building drainage

W

WA	
WB	
WC	
WD	
WE	
WF	
WG	
WH	
WJ	
WK	
WL	Spare
WM	
WN	
WP	
WQ	
WR	
WS	
WT	
WU	
WV	
WW	
WX	
WY	
WZ	

X Reactor containment and internals, radiation monitoring

XA	Steel containment shell
XB	Material lock
XC	Personnel lock
XD	Emergency air-lock
XE	
XF	Pipe penetrations
XG	Cable penetrations
XH	Equipment in building
XJ	
XK	
XL	
XM	
XN	
XP	
XQ	Monitoring of internal spaces
XR	Monitoring of personnel
XS	Monitoring of surroundings
XT	
XU	
XV	
XW	
XX	
XY	
XZ	

U Conventional auxiliaries

UA Demineralisation, make-up water treatment
UB Condensate demineralisation and filtering
UC Other water treatment and filtering
(excluding circulating water)
UD
UE
UF
UG
UH Dosing equipment
UJ Service water and fire-fighting water supply and system
UK Drinking water supply and system
UL Building drainage, waste water plant, oil separators
UM District heating system
UN District heating (primary plant)
UP Process steam incl. condensate return
UQ Hoists and lifts
UR Workshops, stores, laboratories
US Compressed air supply
UT Slag and ash transport (not related to units)
UU Auxiliary boiler plant
UV Air conditioning plant
UW Heating and ventilating plant
UX Fire and gas protection equipment
(except fire-fighting water supply, see UJ)
UY Drives for roller doors, windows, etc.
UZ

V Circulating water system

VA Circulating water treatment (mechanical)
VB
VC Main circulating water system
(not incl. condenser, see SD)
VD Closed cooling systems
VE
VF Auxiliary circulating water system
VG Closed auxiliary cooling systems
VH
VJ Chemical circulating water treatment and aeration
VK
VL
VM
VN
VO
VP
VQ
VR
VS
VT
VU
VV
VW
VX
VY
VZ

Y Nuclear steam generator

YA Primary circuit
YB
YC Vessel
YD
YE
YF Thermal and neutron shield
YG
YH Nuclear internals
YJ Loading, shielding and poisoning internal equipment
YK
YL Hoisting and erecting equipment
YM Fuel element (fuel element arrangement)
YN Neutron source
YP
YQ Nuclear instrumentation
YR
YS Control rods
YT
YU
YV
YW Tools, equipment
YX
YY
YZ

Z

ZA
ZB
ZC
ZD
ZE
ZF
ZG
ZH
ZJ
ZK
ZL } Spare
ZM
ZN
ZP
ZQ
ZR
ZS
ZT
ZU
ZV
ZW
ZX
ZY
ZZ

This article is based on the article "Classification System Equipment for Plant and in Thermal Power Stations" written by the same authors and explains the application of the classification system for the electrical plant involved. The paper also deals with the designations used for equipment, circuit diagrams, and cables.

1. Designations for electrical, measuring, and control equipment

The article "Classification System Equipment for Plant and in Thermal Power Stations"¹⁾ presents the basic pattern and application of the classification system. The purpose of this article is to deal more with the problems concerning the electrical equipment.

As indicated earlier, the electrical equipment permanently associated and operating with a mechanical piece of equipment is always given the designation of the mechanical equipment, up to ordinal section 2. Electrical equipment of a general and primary nature is designated with electrical-category letters of ordinal section 1.

A breakdown of the electrical equipment into groups is shown in Appendix 2 of the "System description"¹⁾.

N	AA	NN	A	NNN
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In a manner similar to the designations used for mechanical equipments, ordinal section 1 makes a distinction as to function, e.g. AT distribution transformers,

EY Emergency diesel generating sets,

or as to design criteria,

e.g. GA Control room consoles,

JS Power supply boards and cubicles for measuring and control systems

Under ordinal section 1, it is also possible to distinguish between equipment operating on the same voltage,

e.g. BA 6 kV unit auxiliary system, half bus 1,

BB 6 kV unit auxiliary system, half bus 2.

A distinction may also be made according to scope of supply, e.g. KA...KM Subdistribution boards for open-loop control, alarm and protection

KN...KZ Subdistribution boards for measurement and closed-loop control.

N	AA	NN	A	NNN
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Ordinal section 2 indicates the numbers of the switchgear panel, cubicle, switchboard, and cabinet,

e.g. AB 10 380 kV system, panel 10,

BB 13 6 kV system, half bus 2, cell 13,

HF 4 Alarm system cubicle 4.

Ordinal sections 3 and 4 are used for further sub-classification of identical items of a group. With the examples just given,

there is no need for such sub-classification; the designation then ends with ordinal section 2.

N	AA	NN	A	NNN
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Low-voltage switchgear permits the arrangement of several outgoing feeders in a single panel; these are designated by ordinal section 3 (Fig. 1):

e.g. CA 13 D Main l.v. distribution board, section 1, panel 13, feeder D.

Ordinal section 4 is not required here.

N	AA	NN	A	NNN
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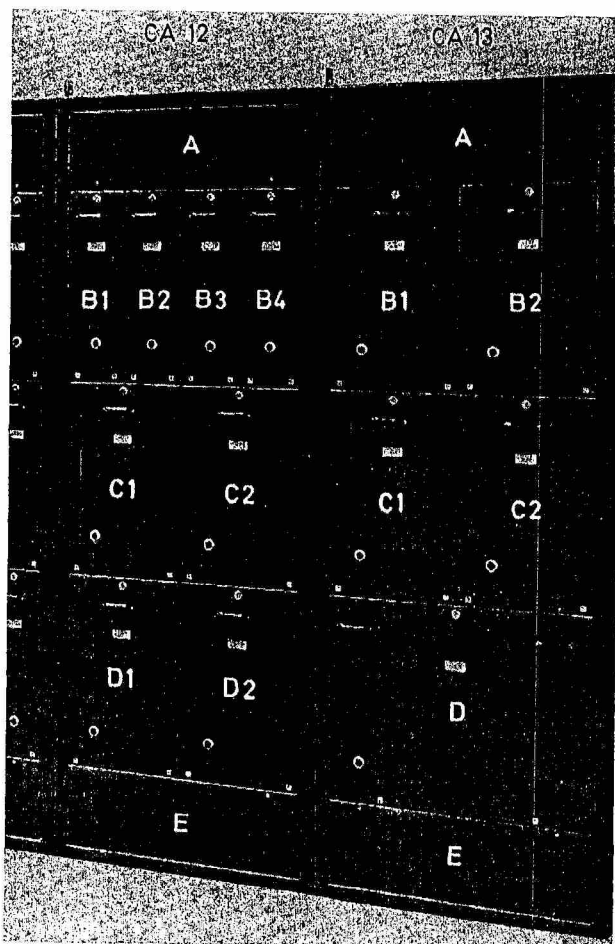


Fig. 1 Designation used for l.v. switchboard (BBC photo)

* The authors are in the power station departments of Brown, Boveri & Cie. AG, Siemens AG and AEG-Telefunken, respectively.

¹⁾ See "Classification System for Plant and Equipment", translation of a reprint of an article by the same authors from Elektrizitätswirtschaft, Vol. 68 (1969) No. 6, pp. 181 to 192.

On April 1, 1969, the power station departments of AEG-Telefunken and Siemens AG were merged to form the Kraftwerk Union AG.

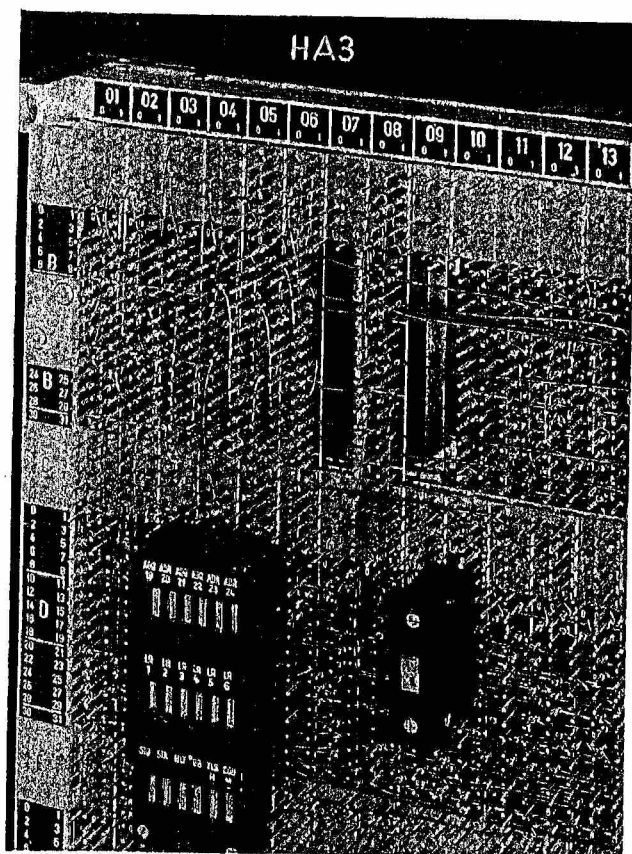


Fig. 2 Designation of alarm cubicle
(Siemens photo)

Ordinal sections 3 and 4 are frequently given the character of coordinates. This practice is gaining in importance primarily with cubicles accommodating electronic sub-assemblies. Normally, these cubicles have several tiers and various positions within the tiers, which for the most part are already provided with designations by the manufacturers (Fig. 2). The general practice is to use letters for tiers and numbers for positions. This is illustrated by the following example of a designation:

HF3B4 Alarm cubicle 3, second tier (B), position 4, or, with a control cubicle (Fig. 3); HA11C11 Control cubicle 11, third tier (C), cable plug, position 11.

2. Designations of electrical equipment and in circuit diagrams

Each piece of electrical equipment has a particular function and is arranged at a particular location. Circuit diagrams should show both function and location. A distinction is therefore made between "Function designation" and "Location designation".

The groups for electrical, measuring, and control equipment in Appendix 2 are arranged by design criteria¹⁾, thus readily indicating the location of a piece of equipment. For the electrical engineer, the mechanical-equipment designation described in the above-mentioned article¹⁾ is also a location designation whose composition tells him exactly where the equipment in question is located.

In the planning stage, the location of numerous pieces of electrical equipment is not yet known, making it impossible to assign location designations to these in advance. Moreover, it is quite likely that the location designation (e.g. the coordinates of a plug-in unit) may have to be changed several times during the planning stage. For this reason, a function designation is assigned to the electrical equipment. The function is determined at the beginning of the planning stage and is permanent even if the location is changed. It clearly designates and assigns

equipment in schematic diagrams used for planning purposes and in the plant itself, e.g. in a switchgear cell. In the planning stage and during operation, it is the basic designation of a

Table 1. Designation of electrical and mechanical plant

Plant designation						Apparatus designation
0	1	2	3	4	5	6
N	AA	NN	A	NNN	A	NN

Ordinal section

General composition

Examples

a) Electrical plant item

b) Switching device for drive

c) Measurement in mechanical plant

1	BA	11	—	—	a	4
1	NL	12	S	7	c	1
1	RL	2	T	3	f	1

No. of unit (only required if more than one unit, for interconnected units)
Unit: 1

Plant group or main group

- a) H. V. auxiliary supply system B
- b) Boiler N
- c) Water-steam system R

Plant item or functional area

- a) 6 kV switchgear BA
- b) Coal firing system NL
- c) Feedwater transfer RL

Subgroup or parallel branch or train

- a) Cubicle 11
- b) Tier 1, burner 2
- c) Train 2

Type of equipment, or measuring or control circuit

- a) None
- b) Solenoid valve S
- c) Temperature measurement T

Consecutive number of equipment, or of measuring or control circuit

- a) Circuit breaker a
- b) Power contactor c
- c) Transducer f

Consecutive number of electrical apparatus

piece of equipment. The function designations is made up as follows:

Ordinal	0	1	2	3	4	5	6
Function designation	N	AA	NN	A	NNN	A	NN
Plant designation							
Apparatus designation							

The plant designation is entered in the title block of a schematic diagram and normally applies for all apparatus on that diagram. Apparatus or items of equipment serving another functional area are marked by their complete function designation. The circuit diagrams involved should be arranged in such a way that a diagrams shows only one function, e.g. a drive, a measuring or control circuit.

The use of individual circuit diagrams corresponds to arranging the entire installation by functional areas, functional groups and subgroups. An example is given in Fig. 4. The plant designation is derived from the designation of the mechanical or electrical equipment performing the dominant function.

With drives and measuring points of the mechanical plant, the mechanical function is always the dominant one. The electrical equipment which, for example, is used for operating the feed pump RL1D1 is thus given the designation of the feed pump and not that of the associated switchgear unit, as was formerly practiced.

If the drawings (e.g. schematic diagrams) are filed according to these designations, the resulting arrangement will be that required for functional tests.

The electrical plant itself may also have a dominant function, such as network switchgear, transformers, incoming feeders, bus coupler ties and metering cells (Table 1 and Fig. 4). For subdividing into individual circuit diagrams and determining the dominant plant item, the following rules are proposed:

- H. V. transformers are functionally independent and are shown in a separate connection diagram. They are not assigned to the connection diagram of the high or low side (BT1 in Fig. 4).

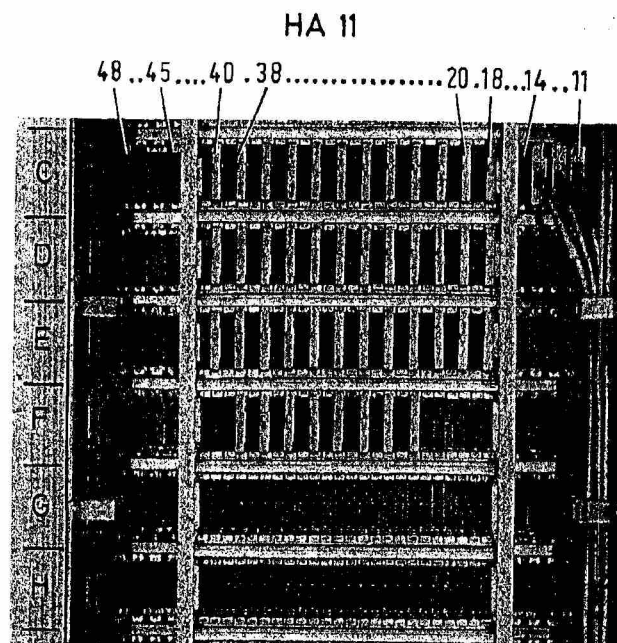
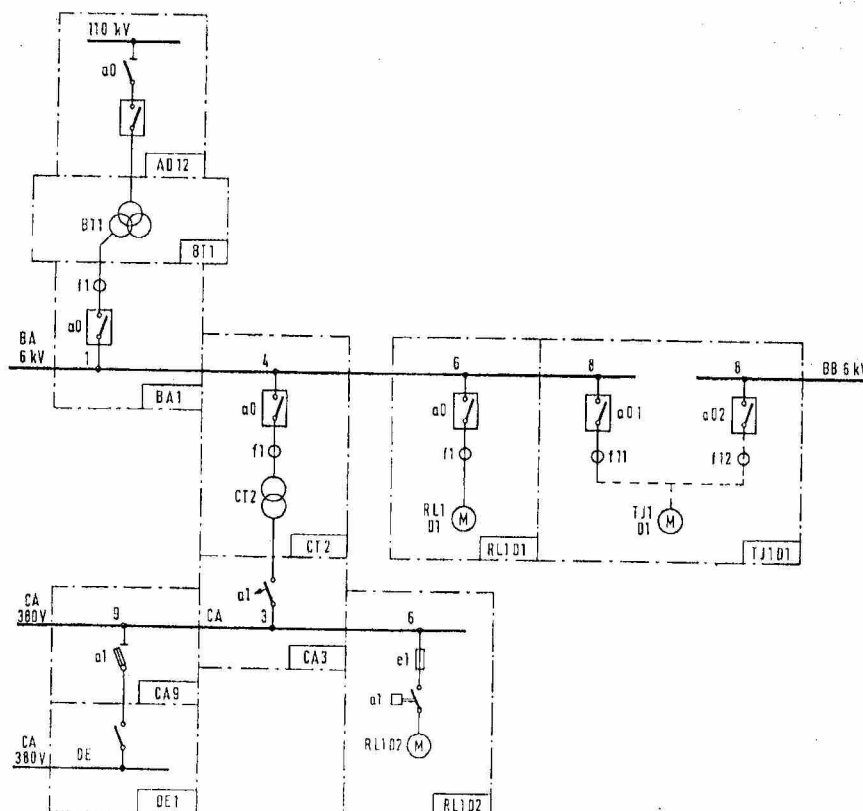


Fig. 3 Designation of control cubicle (AEG photo)

- L. V. transformers are assigned to the high-side switchgear in connection diagrams. The transformer has the dominant function; the connection diagram and all equipment are given the plant designation of the transformer (CT2).
- With incoming feeders or branch circuits in main switchgear, the switchgear assumes the dominant function and determines the designation (BA1, CA3, DE1).
- Branch circuits to motors and other mechanical equipment follow the designation of the dominant mechanical function (RL1D1, RL1D2).

Fig. 4 Circuit diagram divided into functional areas



Consecutive number	Type of cable
1001-1999	Power cable above 1 kV
2001-2999	Power cable up to 1 kV
3001-4999	Control and measuring cable above 60 V
5001-9999	Control and measuring cable up to 60 V

For each letter group of ordinal section 1, the series of cable numbers begin anew. In the case of parallel cables, each cable has its own number.

Examples of cable designations

From	To	Type of cable	Number of cable
6 kV Incoming feeder BA2	Unit auxiliary transformer BT1	Power 6 kV	BA 1025/ BA 1026
6 kV motor cell BA8	Local control station RD1D1u9	Control 220 V	BA 3124
6 kV motor cell BA8	Marshalling rack LK	Control 24 V	BA 5327
L. V. distribution CD3	Valve TG3A2	Power 380 V	CD 2117
Subdistribution KA	Marshalling rack LF	Control 24 V	KA 6340

Fig. 6 shows a cable list produced by a digital computer. The list gives the connections between a control cubicle HA and zone LA of the marshalling rack. For both cable connecting points, i.e. a plug in the cubicle magazine and a group of tiers in a subdistributor, the list indicates the circuit diagrams according to which the cores are to be connected. From only a minimum of input data, the wiring programme prints out such lists for all cubicles of the electric control system.

4. Summary

Compared with earlier systems, the one described does not represent a new designation code. The only novel feature is the inclusion of mechanical designations in the circuit diagrams. This has the considerable benefit of ensuring uniform designation for all plant items and plants if the rules set out are followed. Broad application of this system will better enable all companies and agencies involved in a project to understand each other correctly.