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Anleggstransformatorer

Anleggstransformatorer

Kunde: Hæhre Entreprenør AS

Anlegg: SATCON TA-F 1250KVA
Ordrenr: 24383
Dato: 31.08.2015
Kiosk 2

SATEMA
Enebakkveien.127.Pb 21 Manglerud,0612 Oslo.
Telefon 22 57 93 00.Fax 22 57 93 01.

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

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Tekniske hoveddata

PRODUKT:	**SATCON TA-F**
Typebetegnelse:	1250kVA
Ordrenummer:	24383
Trafokapasitet:	Inntil 1250kVA
Utvendige mål:	B=2500mm
	L=3050mm
	H=2750mm
Vekt med trafo:	ca. 5900 kg
SF6 anlegg:	
Fabrikat:	ABB
Serienr:	201511706770001
Tegn.Nr:	1VDW302606A0010
Type:	C
	1 Lastskillebryter (C) for innkommende kabel
Serienr:	201511706780001
Tegn. Nr:	1VDW302606A0030
Type:	CV
	1 Lastskillebryter (C) for utgående kabel
	1 Vakuum effektbryter (V) for transformator
Vern (V):	MPRB06 - Overstrøms relé
Strømtrafoer (V):	MPRB 06 CT1 (15-112A)
Fabrikat:	ABB
Type:	SAFEPLUS M – Målefelt
Serienummer:	201511709230001
Tegn. Nr:	1VDW302606A0020
Spenning:	11 eller 22kV (Vender)
Transformator:	
Fabrikat:	Norsk Transformator
Serienr:	304869
Ytelse:	1250kVA
Olje Type:	FR.3
Primærspenning:	22/11kV
Regulering 22/11kV:	+2x2,5% -4x2,5% på primærsiden
Sekundær spenning:	415V
Trafo overvåkning:	Overstrøms relé (SF6 anlegg, felt +H3)
Avganger 415V:	
Avgang 1:	252-630A
Avgang 2:	252-630A
Avgang 3:	252-630A
Avgang 4:	252-630A
Avgang 5:	160-400A
Avgang 6:	160-400A
Avgang 7:	100-250A
Avgang 8:	100-250A

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Aktuelle innstillinger ved levering

SF6 anlegg – Transformator vern:

Innstilling av relé:	Spenning: 22kV
	Merkestrøm: 33A
	Frekvens: 50Hz

Transformator 1:

Innstilling av transformator:	
Spenning på primærside:	22kV
Trinn (Spennings regulering):	3
Nettype:	TN-S nett
Anvendelse:	415V avganger

Lavspent fordeling:

Avgang 1:	630A Effektbryter	Innstilt på minimum (252A)
Avgang 2:	630A Effektbryter	Innstilt på minimum (252A)
Avgang 3:	630A Effektbryter	Innstilt på minimum (252A)
Avgang 4:	630A Effektbryter	Innstilt på minimum (252A)
Avgang 5:	400A Effektbryter	Innstilt på minimum (160A)
Avgang 6:	400A Effektbryter	Innstilt på minimum (160A)
Avgang 7:	250A Effektbryter	Innstilt på minimum (100A)
Avgang 8:	250A Effektbryter	Innstilt på minimum (100A)

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Informasjon

Primærside

På primærsiden er det montert såkalt SF6 anlegg fra ABB. Anlegget har fire felt (+H1,+H2,+H3+H4). Felt +H1 brukes om inntak fra E-verk. Felt +H2 og +H3 brukes for videreføring av høyspenningsnettet. Felt +H4 brukes som fordeling til kioskens primærtransformator. I felt +H3 er det montert overstrømsrelé for beskyttelse av transformatoren (overstrøm og kortslutning).

Hvis transformatoren skal tas ut av drift må effektbryteren i felt +H3 brukes. Årsaken til dette er at kiosken muligens kan være en del av ringnett eller radialnett på høyspentsiden. Hvis bryterne i felt +H1 eller +H2 frakobles, kan det få store konsekvenser for øvrige forbrukere på forsyningsnettet.

Se avsnitt 3 for ytterligere informasjon om SF6 anlegget.

Transformator

Transformatorens maksimale kapasitet er 1250kVA. Transformatoren har to trinn på primærsiden, 11kV trinn og 22 kV trinn. Det er veldig viktig at transformatoren trinnes i henhold til spenningen på høyspenningsnettet før kiosken tas i bruk. Transformatorvernet er plassert i SF6 anlegget (felt +H3). Trinnkobleren på primærsiden brukes til å justere spenningen på sekundærsiden opp eller ned.

Se avsnitt 4 for ytterligere informasjon om transformatoren.

Sekundærside

Sekundærsiden har ni effektbryteravganger av typen Tmax av fabrikat ABB. På 400 og 250 avganger er det montert jordfeilmodul av typen RC222.

Det er veldig viktig at effektbryterne innstilles slik at transformatoren ikke overbelastes i lange perioder.

Se avsnitt 5 for ytterligere informasjon.

Styrestrøm

Styrestrømmen i kiosken består av et multimeter for måling av strøm og spenning. Det anbefales at disse sjekkes regelmessig på grunn av overbelastning og spenningskvalitet.

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Plassering og montering

- Kiosken må plasseres i en avstand minst 7,6m fra bygninger med brennbare overflater og 3m fra andre transformator kiosker og/eller bygninger med ikke brennbare overflater.
- Vær forsiktig med inn og utgående kabler, kabler må dimensjoneres i henhold til gjeldende forskrifter.

Betjening og adgang

- Kun sakkyndig personell med nødvendig kunnskap og forståelse for transformatordrift og drift av høyspenningsnett må betjene kioskens høyspenningsside.
- Lavspenningssiden av transformatoren er ikke berøringssikker, derfor må transformator-rommet være avlåst under drift.
- Av sikkerhetsmessige årsaker anbefales det, at kun sakkyndig personell har adgang til kiosken under drift, samt at øvrige rom holdes avlåst under drift.

Idriftsettelse

- Transformatorens primærspenning må være lik spenningen på høyspenningsnettet i området.
- Sjekk transformatorvern (overstrøms) i SF6 anlegget. Kontroller at vernet er innstilt for transformerens parametre og nettets spenning.
    - Vernet skal programmers i henhold til opplysninger i avsnitt 3.
- Transformatorens sekundærspenning skal sjekkes før avganger tas i bruk.
    - Bruk trinnkobler på sekundærsiden for at justere spenningen opp eller ned.
- Test kioskens verneutstyr på lavspenningssiden med tilhørende testknapper før avgangerne tas i bruk.

Under drift.

- Alle dører skal være avlåst under drift.
- Sjekk kioskens verneutstyr regelmessig under langvarig drift.
- Sjekk spenningen på transformatorens sekundærside regelmessig. Bruk trinnvelgeren på transformatorens sekundærside for at justere spenningen opp eller ned etter behov.
    - Før trinnkobleren brukes må transformatoren utkobles. Bruk effektbryteren i felt +H3 i SF6 anlegget for å slå av transformatoren.
- Sjekk belastningen regelmessig. Pass på at transformatoren ikke blir overbelastet i lange perioder.

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TA-F-1250kVA
ORDRE: 24383
Kiosk 2

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SATEMA
-El-tavler
-Aluminiumskap
-Midlertidige el-anlegg
-Kabelføringsmatriell
-Aggregater
TLF: +47 62 33 44 40
FAX: +47 62 33 44 32
Mail: satema@satema.no
Web: www.satema.no

Utskrift av Spesifikasjoner

Dato: 10.06.2015
Revidert: 31.08.2015
Utskriftskr.dato:31.08.2015

Prosjekt: TA-F 1250kVA
Ordrenr: 24383
Tilbudsnr:
Kalkylenr: 817
Tavle: Kiosk 2
Kunde: Hæhre Entreprenør AS

Elnr	Varenr	Produktgruppe	Produkttype	Fabrikat	Produkt	Antall	Kjennetegn
B137SP	85372000	Høyspent inntaksanlegg	SF6 Anlegg	ABB	Safeplus C	1,0	
B137SP	8537200	Høyspent inntaksanlegg	SF6 Anlegg	ABB	Safeplus CV	1,0	
B137M	85372000	Høyspent inntaksanlegg	SF6 Anlegg	ABB	Safeplus M	1,0	
		Høyspent inntaksanlegg	SF6 Anlegg	ABB	Diverse til SF6	1,0	Diverse sammenkolbingsutstyr
		Trafo	Spenning	Norsk Transformator	Steinkjer 1250kVA 22/11kV//0,415kVA	1,0	
4383614	1SDA054400R0001	Effektbryter 320-630 Amp	Elektronisk vern 4 pol	ABB	T5N 630 PR221DS-LS/I In=630 4p F F	4,0	Q1,Q2,Q3,Q4
4383684	1SDA055033R0001	Effektbryter 320-630 Amp tilbehør	klemmer 4pol	ABB	KIT FC CuAl 2x240mm2 T5 630 4pcs	6,0	Q1,Q2,Q3,Q4,Q5,Q6
4383611	1SDA054325R0001	Effektbryter 320-630 Amp	Elektronisk vern 4 pol	ABB	T5N 400 PR221DS-LS/I In=400 4p F F	2,0	Q5,Q6
4383654	1SDA054961R0001	Effektbryter 320-630 Amp tilbehør	Terminaldeksler 4pol	ABB	HTC T5 4p TERMINAL COVERS HIGH 2pcs	6,0	Q1,Q2,Q3,Q4,Q5,Q6
4383605	1SDA054011R0001	Effektbryter 0-250 Amp	Elektronisk vern 4 pol	ABB	T4N 250 PR221DS-LS/I In=250 4p F F	2,0	Q7,Q8
0	1SDA064550R0001	Effektbryter 0-250 Amp tilbehør	klemmer 4pol	ABB	Kit FC CuAl 1x240mm2 T4 4pcs	2,0	Q7, Q8
4383652	1SDA054959R0001	Effektbryter 0-250 Amp tilbehør	Terminaldeksler 4pol	ABB	HTC T4 4p TERMINAL COVERS HIGH 2pcs	2,0	Q7, Q8
4309719	1SDA067410R0001	Effektbryter 0-250 Amp	Termisk vern 4 pol	ABB	XT1C 160 TMD 160-1600 4p F F InN=100%	1,0	Q01
1665734	2CDS274001R0024	Automat C	4 pol	ABB	AUTOMAT S204M-C 2	1,0	F0
1686993	2CSR272140U1164	Automat C	2 pol Jordfeilautomat	ABB	JF.AUT DS202C M C16 A30mA,BULK	3,0	JFA1, JFA2, JFA3

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Ordrenr: 24383
Tilbudsnr:
Kalkylenr: 817
Tavle: Kiosk 2
Kunde: Hæhre Entreprenør AS

Elnr	Varenr	Produktgruppe	Produkttype	Fabrikat	Produkt	Antall	Kjennetegn
1653595	2CSR274101R1324	Automat C	4 pol jordfeilautomat	ABB	JF.AUT DS204 M A-C32/0,03	2,0	JFA4, JFA5
1665743	2CDS274001R0634	Automat C	4 pol	ABB	AUTOMAT S204M-C 63	1,0	F6
1662969	2CSF204101R2630	Jordfeilbrytere	4 pol	ABB	JF.BR. F204 A-63/0,1	1,0	JF6
	75200S	installasjonsmateriell	Stikk innfelt	Mennekes	2/16+J (Schuko)	3,0	E1, E2, E3
	75207S	installasjonsmateriell	Stikk innfelt	Mennekes	Rett 432-6	2,0	E4, E5
	75211S	installasjonsmateriell	Stikk innfelt	Mennekes	Rett 463-6	1,0	E6
0	LED02541.0-01	Skap tilbehør	Armatur/lampe	Carlo Gavazzi	LED LAMPE,PIR,SKRUE 100-240VAC, 5W#LED02541.0-01	1,0	H01
0	LED025-244356	Skap tilbehør	Armatur/lampe	Carlo Gavazzi	2M AC HUNPLUGG M/KABEL FOR LED025#LED025-244356	1,0	H01
0	TASO50D2003	Trafo	Strøm klasse 0,5 \1 \3	IME	TAS84. *2000/5A Tilkobling på STRØMTRAFO. 84x34mm	3,0	T21, T22, T23
0	B93100533	Instrument	Mult/nettanalysator 96*96	Elteco	PEM533. 0-400V 480 V. -/5 A. Nøyaktighet kl. 0.5s IEC62053	1,0	P1

Hæhre Entreprenør AS
SATCON TA-F 1250KVA
MASKIN NR:

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A	PRODUKSJON		ES	ES

SATEMA

OSLO Tlf.22 57 93 00

MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
FORSIDE

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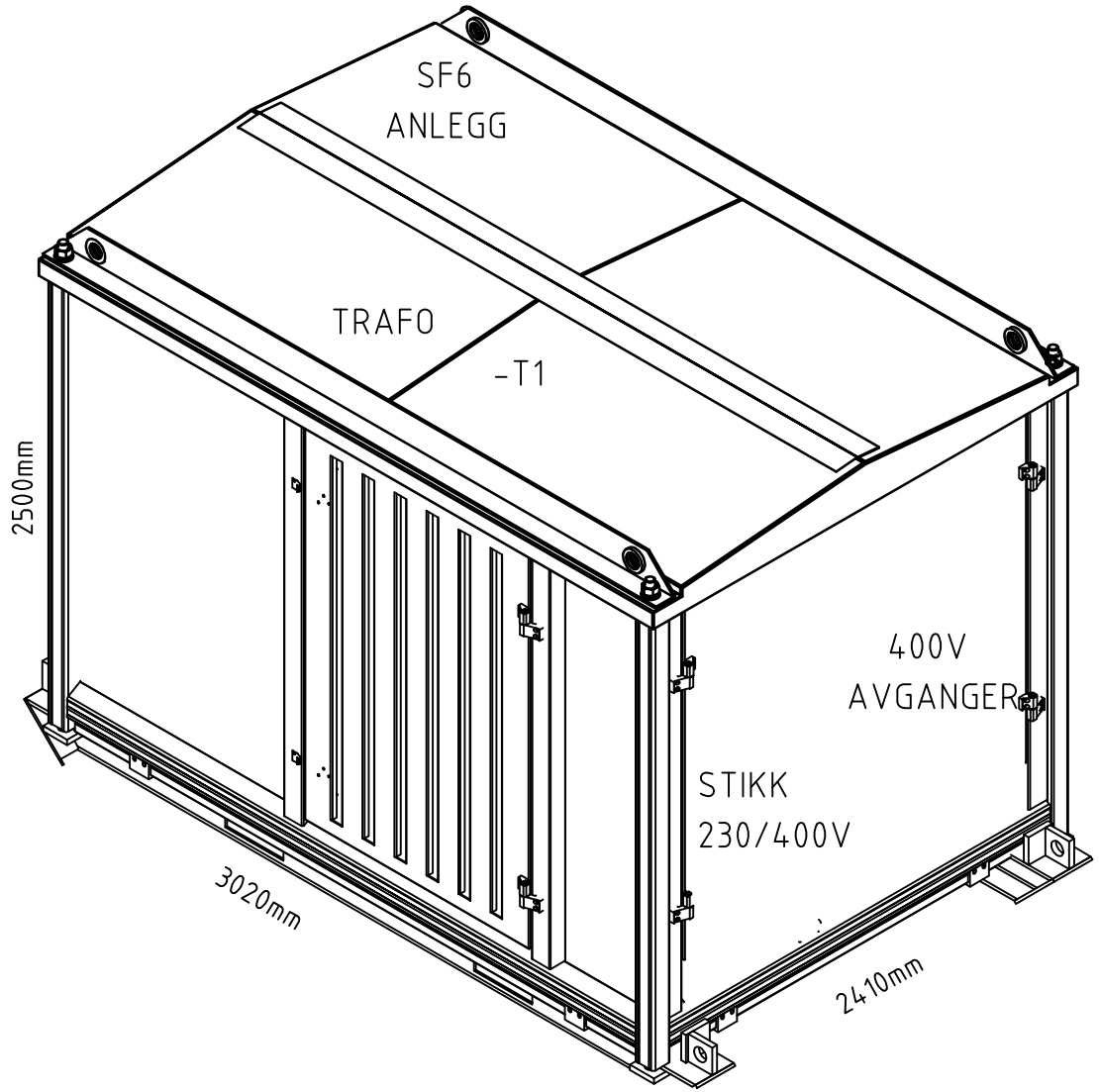

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A	PRODUKSJON		ES	ES

SATEMA

OSLO Tlf.22 57 93 00

MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
KIOSKHUS

JOB NUMBER	24383			DRAWING NUMBER	24383
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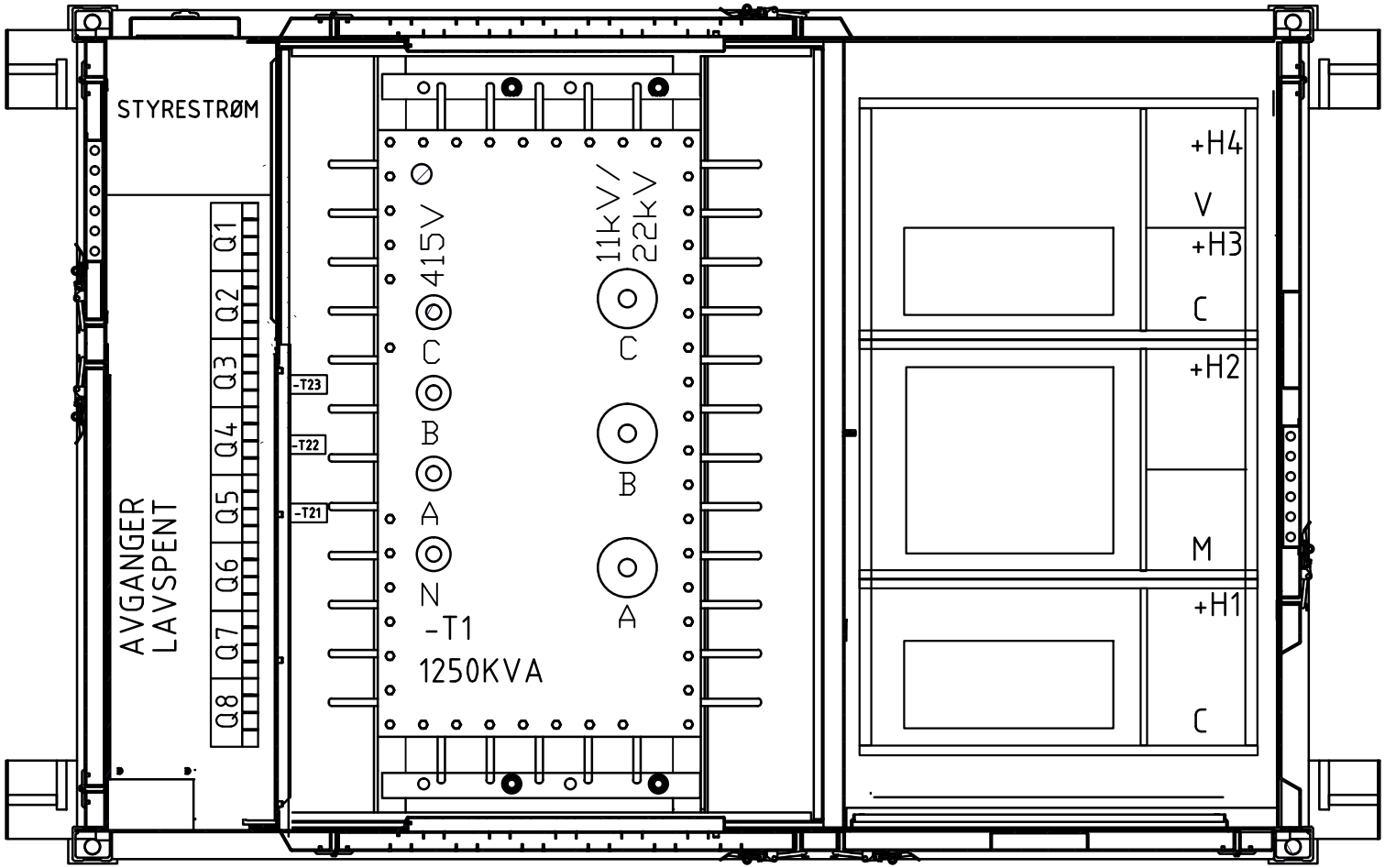

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SATEMA

OSLO Tlf.22 57 93 00

MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
KIOSKHUS

JOB NUMBER	24383			DRAWING NUMBER	24383
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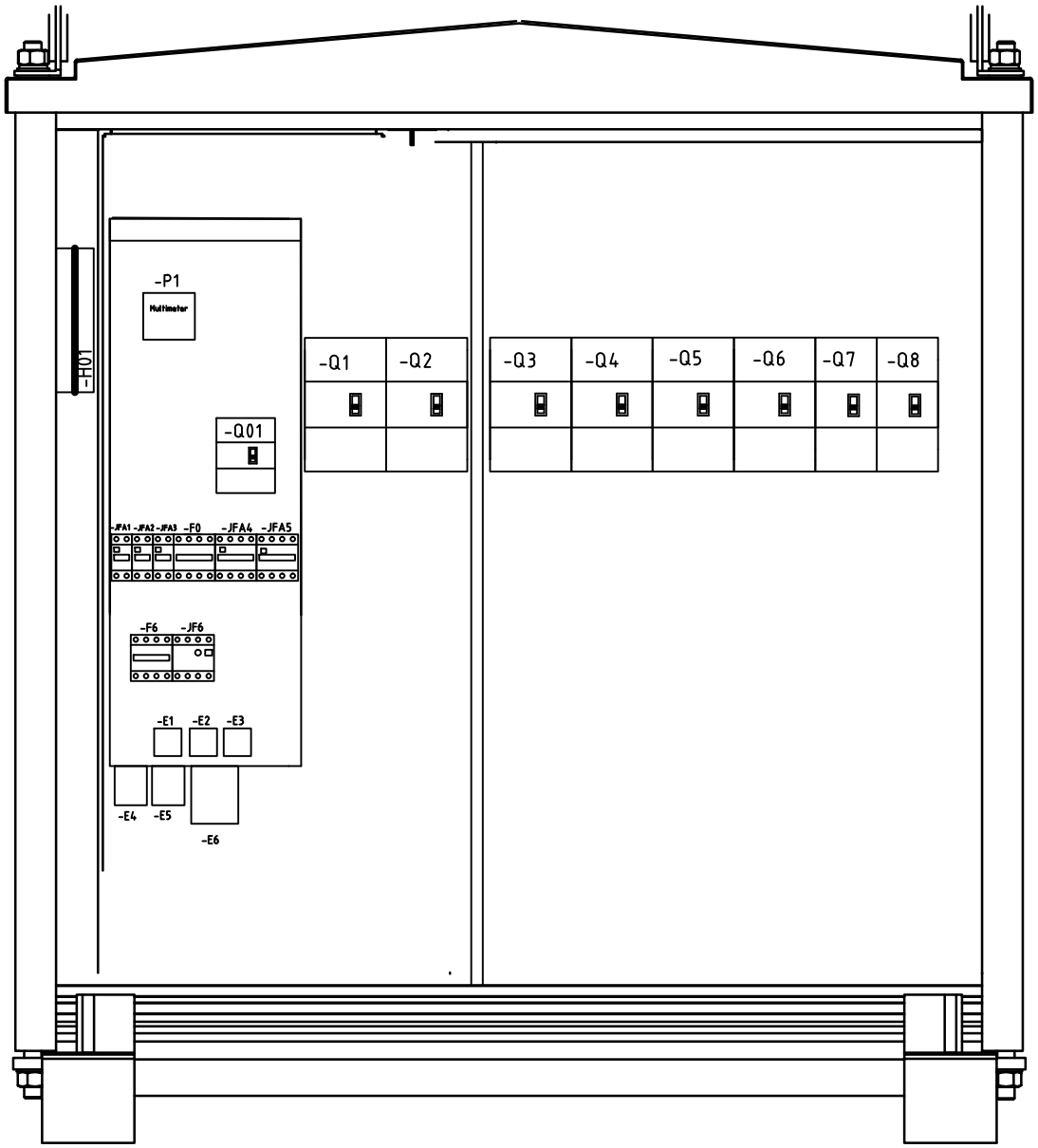

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A	PRODUKSJON		ES	ES

SATEMA

OSLO Tlf.22 57 93 00

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Hæhre Entreprenør AS

SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz

ARRENGEMENT

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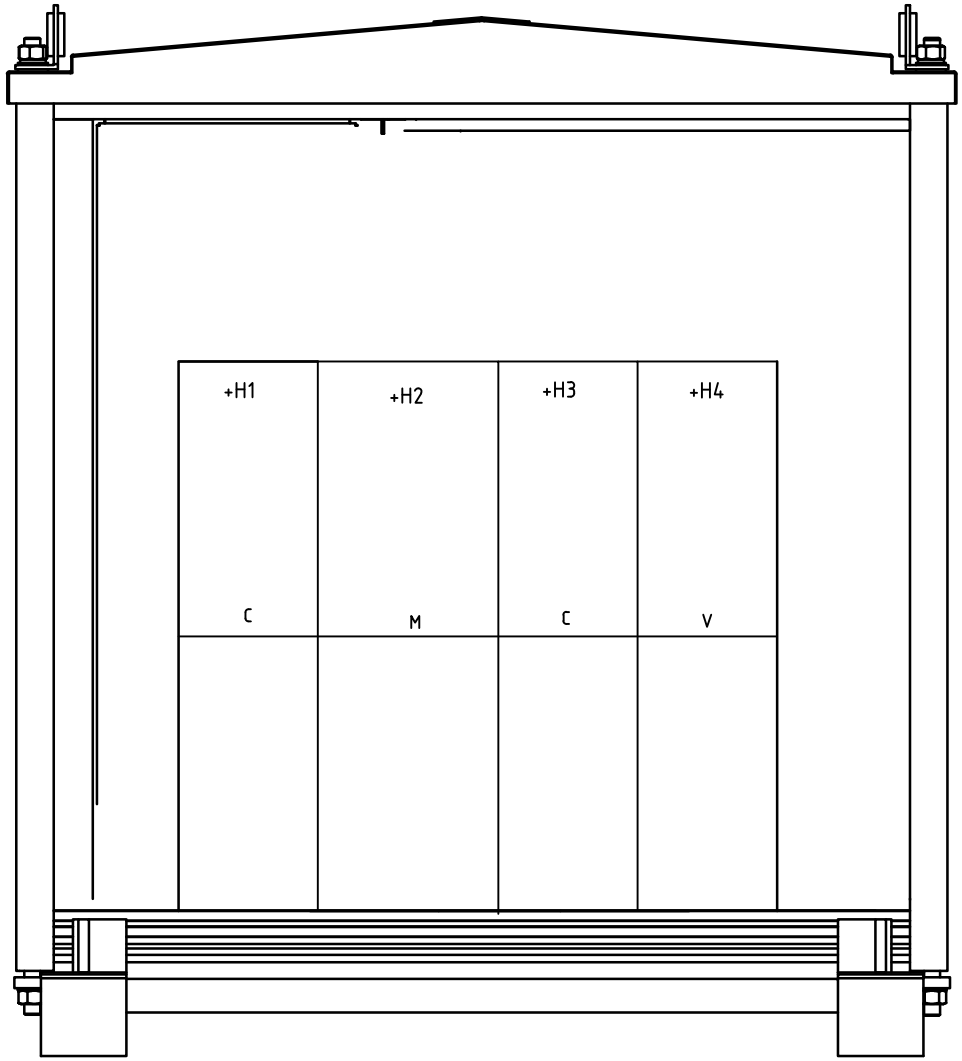

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A	PRODUKSJON		ES	ES

SATEMA
OSLO Tlf.22 57 93 00
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Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
ARRENGEMENT

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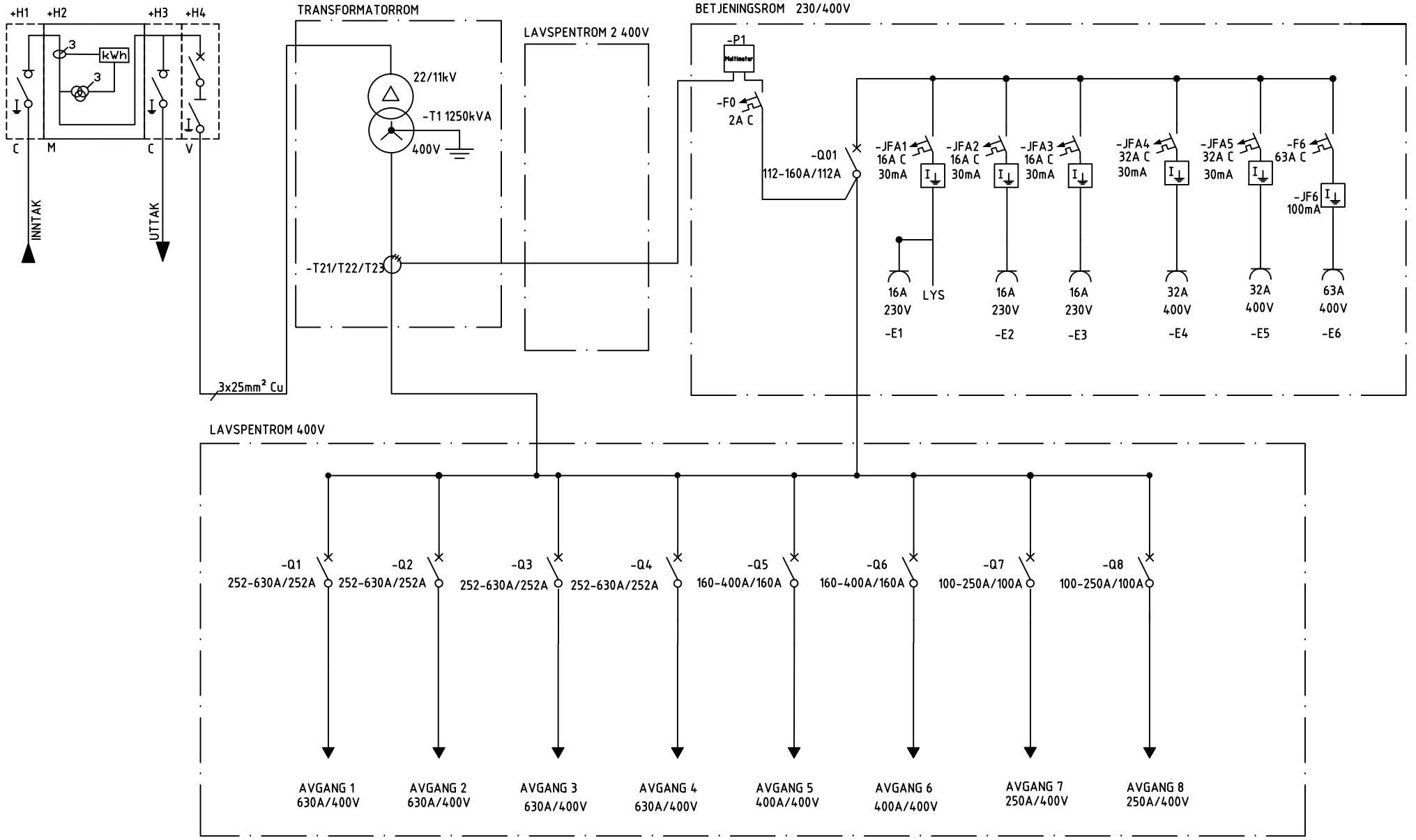

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A	PRODUKSJON		ES	ES

SATEMA

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22/11kV//0,415kV 50Hz
ENLINJESKJEMA

JOB NUMBER 24383				DRAWING NUMBER 24383	
DRAWN	ES	DESIGNED	ES	APPROVED	
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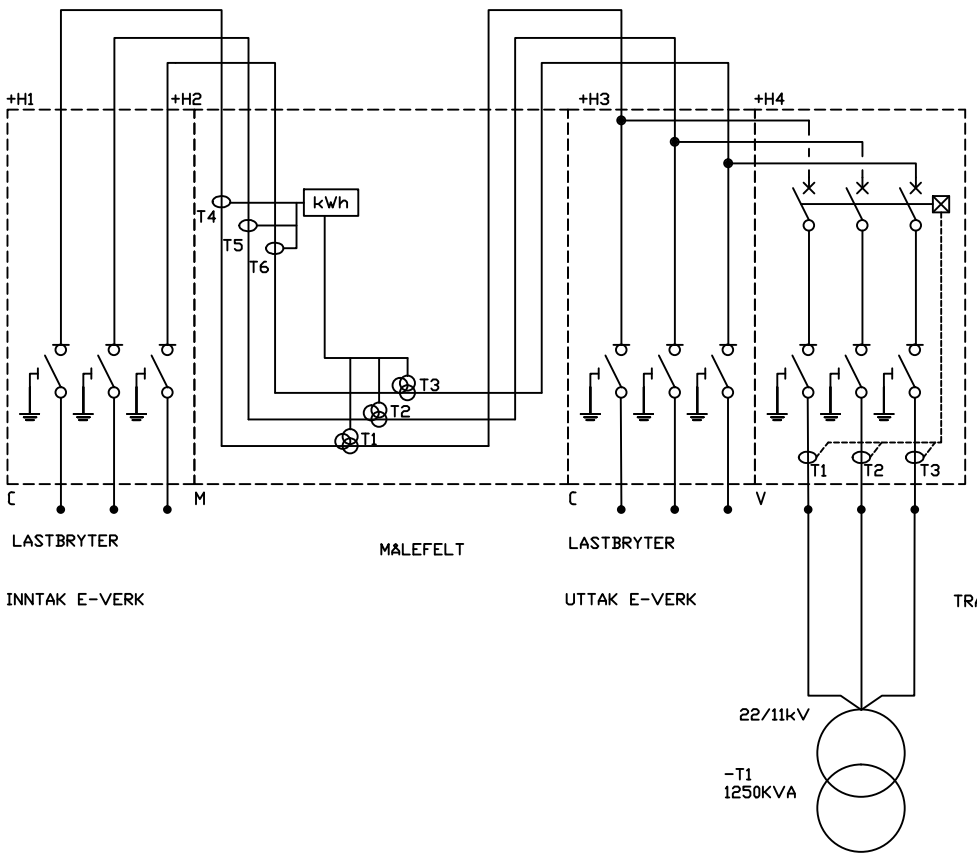
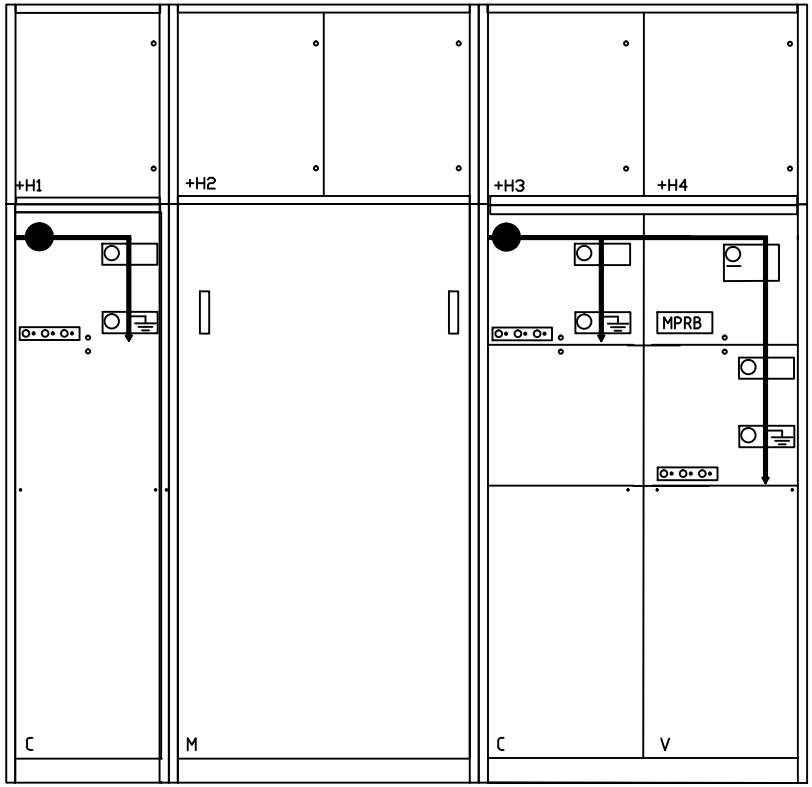
DATE	09.06.2015	REV.	09.06.2015	CONT SH.	

SF6 ANLEGG 1
PRIMÆRSIDE
24kV





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OSLO Tlf.22 57 93 00
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SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
SF6-ANLEGG

JOB NUMBER 24383				DRAWING NUMBER 24383	
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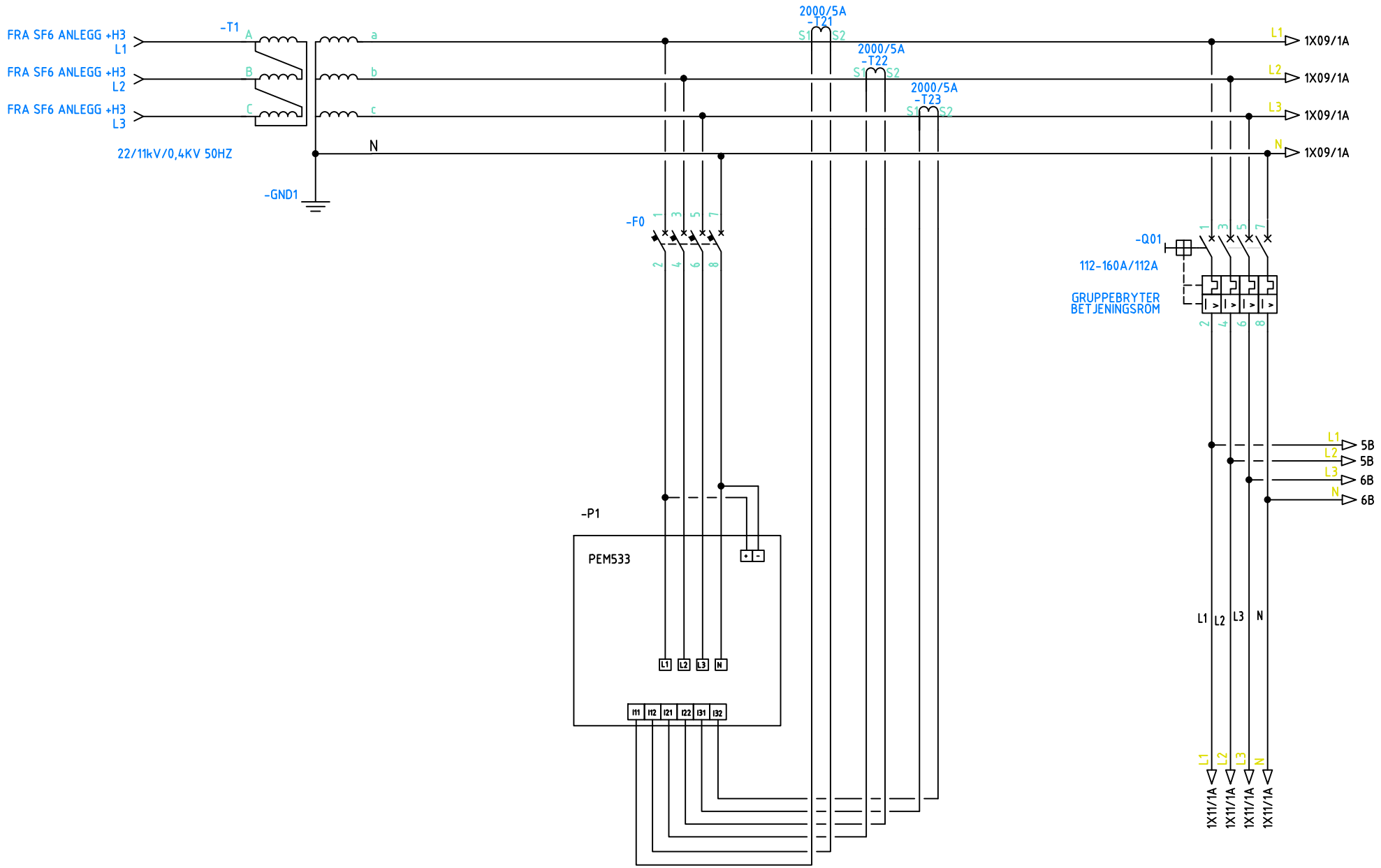

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B	ASBUILT		ES	ES
A	PRODUKSJON		ES	ES

SATEMA

OSLO Tlf.22 57 93 00

MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
HOVEDSTRØM

JOB NUMBER	24383			DRAWING NUMBER	24383
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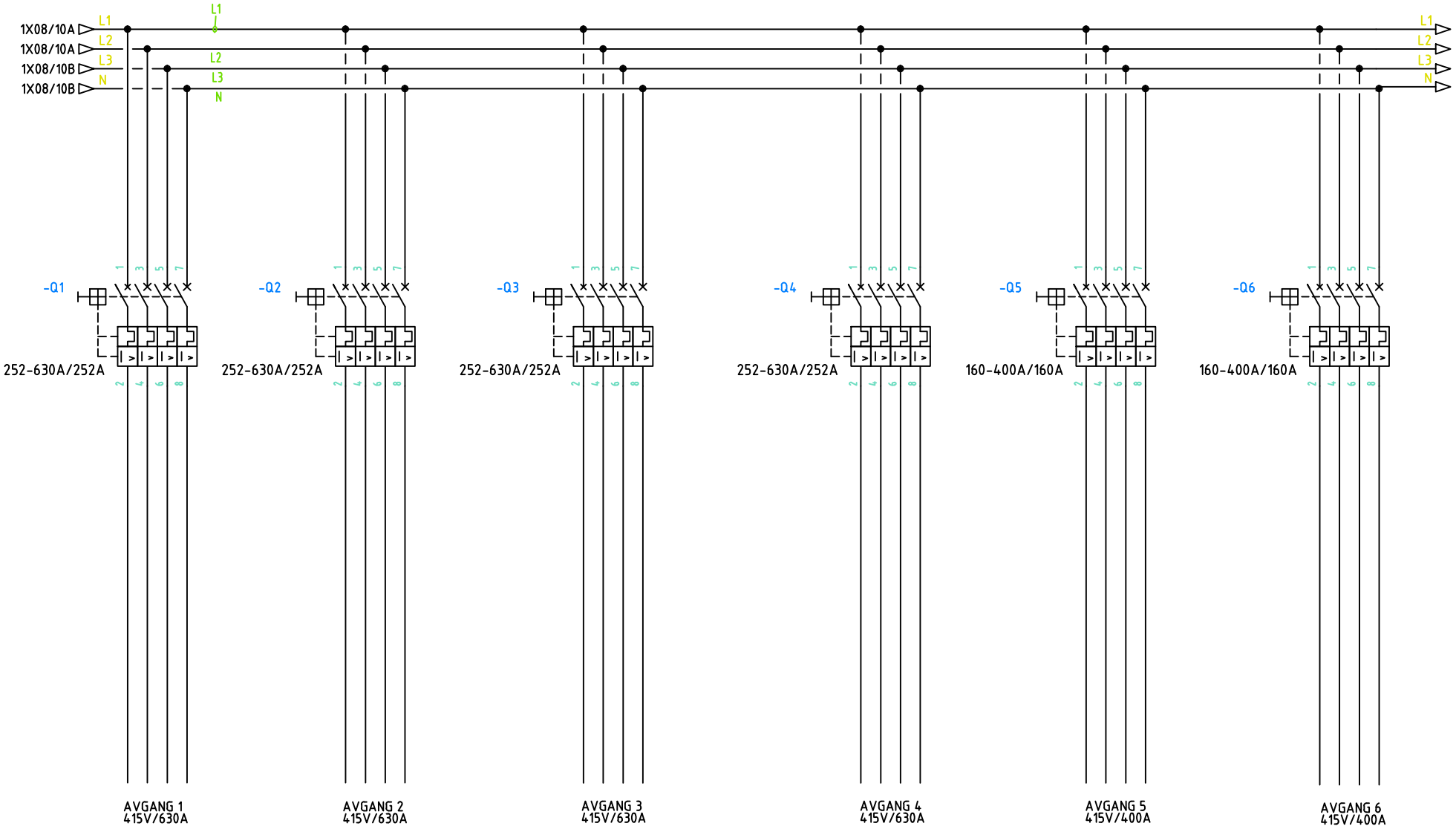
DATE	09.06.2015	REV.	09.06.2015	CONT SH.	



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B	ASBUILT		ES	ES
A	PRODUKSJON		ES	ES

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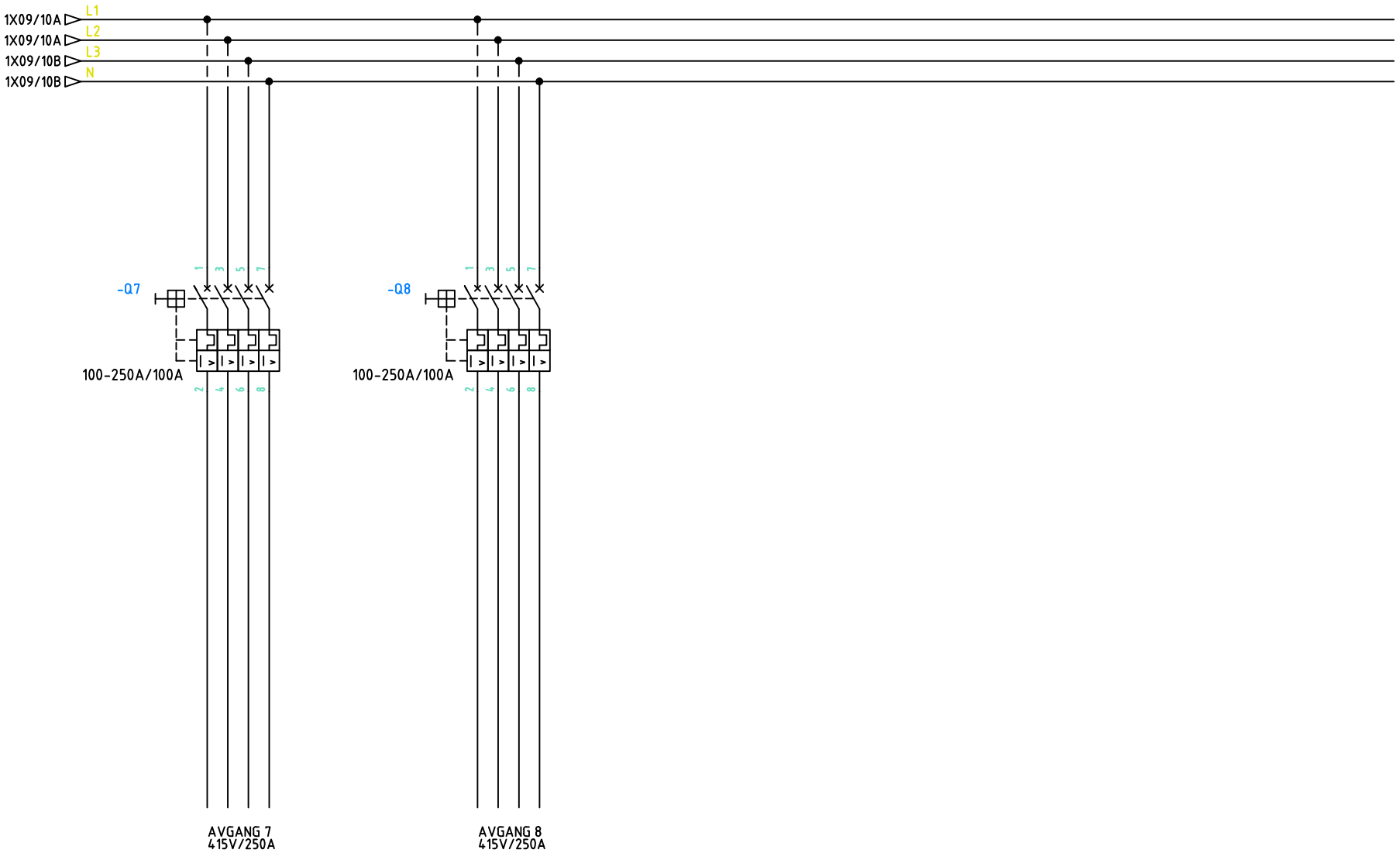
22/11kV//0,415kV 50Hz
HOVEDSTRØM

JOB NUMBER 24383			DRAWING NUMBER 24383
DRAWN ES	DESIGNED ES	APPROVED	
PAPER SIZE A3	SCALE	SHEET 1X09	
DATE 09.06.2015	REV. 09.06.2015	CONT SH.	



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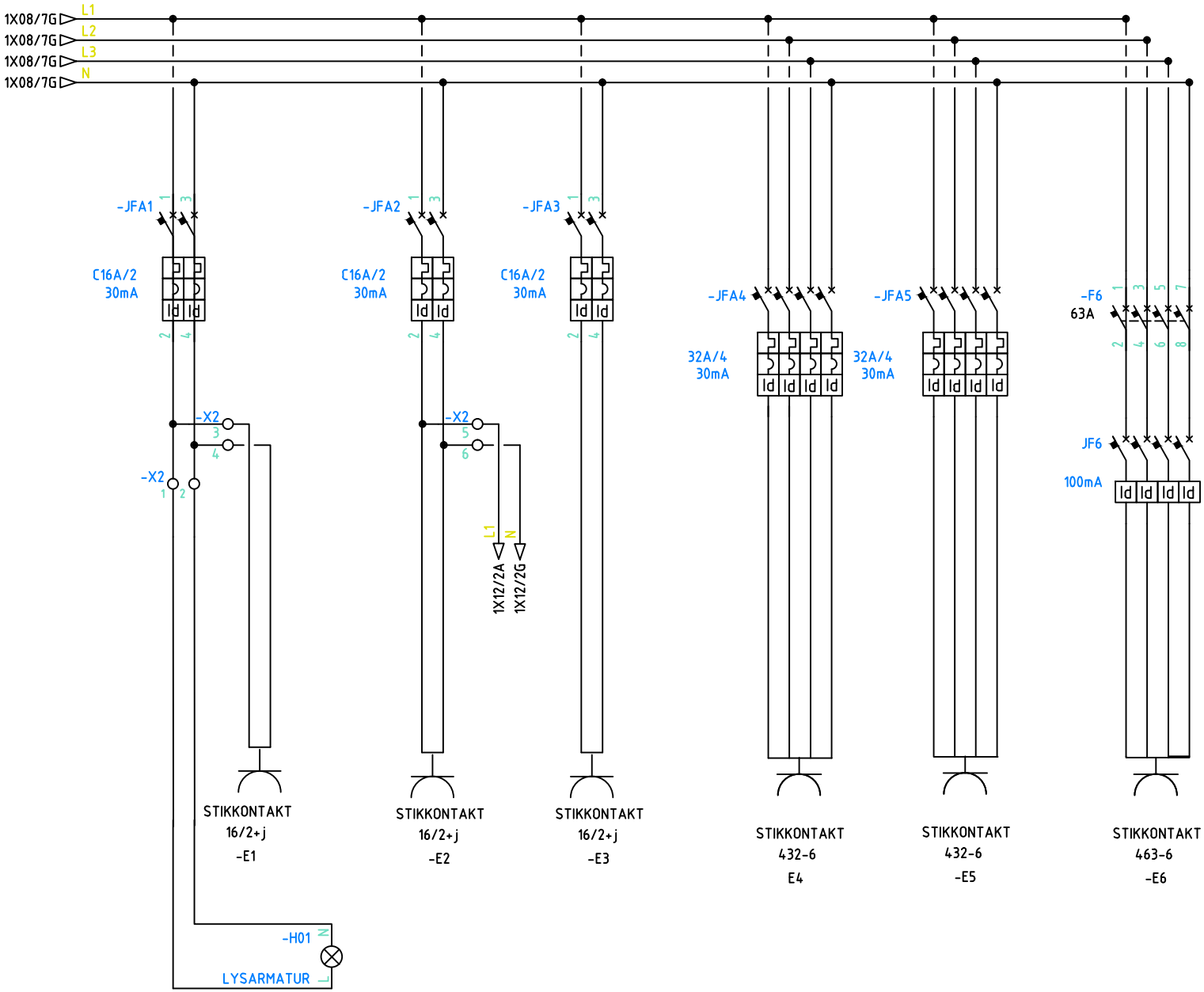
-	-	-	-	-
B	ASBUILT		ES	ES
A	PRODUKSJON		ES	ES

SATEMA
OSLO Tlf.22 57 93 00
MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
HOVEDSTRØM

JOB NUMBER	24383			DRAWING NUMBER	24383
DRAWN	ES	DESIGNED	ES	APPROVED	
PAPER SIZE	A3	SCALE		SHEET	1X10
DATE	09.06.2015	REV.	09.06.2015	CONT SH.	



REV.	DESCRIPTION	DATE	DWN	REV.SIGN
-	-	-	-	-
-	-	-	-	-
B	ASBUILT		ES	ES
A	PRODUKSJON		ES	ES

SATEMA

OSLO Tlf.22 57 93 00

MOELV Tlf.62 33 44 30

Hæhre Entreprenør AS
SATCON TAF 1250kVA

22/11kV//0,415kV 50Hz
230/400V FORDELING

JOB NUMBER 24383			DRAWING NUMBER 24383
DRAWN ES	DESIGNED ES	APPROVED	
PAPER SIZE A3	SCALE	SHEET 1X11	
DATE 09.06.2015	REV. 09.06.2015	CONT SH.	

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

SF6 anlegg fra ABB

SF6 anlegget i kiosken har fire felt.

+H1

Type:	C – Lastskillebryter
Gjennomføring:	400 Series Bolt
Vern:	Ingen
Anvendelse:	Innkommende kabel (E-verk)

+H2

Type:	Målefelt (M)
Gjennomføring :	400 series bolt
Vern:	Ingen
Spenningstrafoer:	TJC6 11-22kV:V3/110: 10VA CL.0,2
Strømtrafoer:	TPU6 100/5A 10VA CL.0,2S Fs5
Anvendelse:	Energimåling

+H4

Type:	C – Lastskillebryter
Gjennomføring :	400 Series Bolt
Vern:	Ingen
Anvendelse:	Utgående kabel
Spenning:	11 eller 22kV

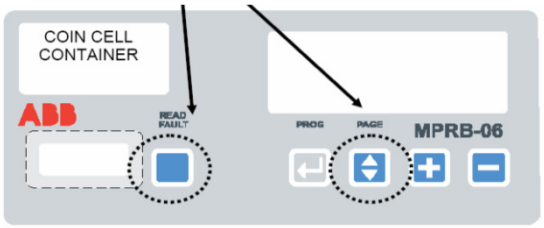
+H4

Type:	V – Vakuum Effektbryter
Gjennomføring	200 Series plugg
Vern:	MPRB06 - Overstrøms relé
Strømtrafoer:	MPRB 06 CT1 (15-112A)
Anvendelse:	Transformator 1

OVERSTRØMSRELE TYPE MPRB-06

Valg av type strømtrafo og innstilling av rele for beskyttelse av distribusjonstrafo

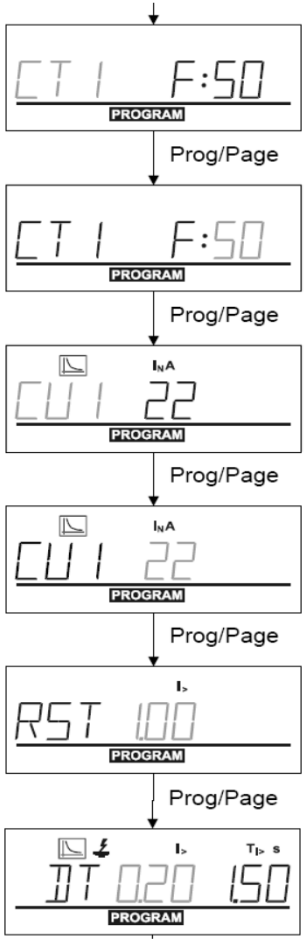
Lesing av feilminne og innstillte verdier uten å ta av plastdeksel



PROG holdes inne mer enn 5 sek for start/avslutte programmering
For å lagre trykkes PROG etter endring.
(+ og - brukes for å endre verdiene)

Ytelse (kVA) (merkestrøm (A))			STRØMTRAFO	InA/I>
11 kV	15 kV	22 kV	Type	
100 (5,2)		200 (5,2)	CT1 15-112	15/0,9
	200 (7,7)			15/1
		315 (8,3)		15/1,1
200 (10,5)				15/1,4
	315 (12,1)			15/1,6
		500 (13,1)		15/1,75
315 (16,5)		630 (16,5)		17/1,95
	500 (19,2)			19/2
		800 (21,0)		21/2
	630 (24,2)			24/2
500 (26,2)		1000 (26,2)		27/1,95
	800 (30,8)			31/2
630 (33,1)		1250 (32,8)		33/2
	1000 (38,5)			39/2
800 (42,0)		1600 (42,0)		42/2
	1250 (48,1)			48/2
1000 (52,5)		2000 (52,5)		53/2
	1600 (61,6)		CT2 64-448	62/2
1250 (65,6)		2500 (65,6)		66/2
	2000 (77,0)			77/2
		3150 (82,7)		83/2
1600 (84,0)				84/2
	2500 (96,2)			96/2
2000 (105)		4000 (105)		105/1,9

Tabell 1



Velg strømtrafotype iht tabell 1: CT1

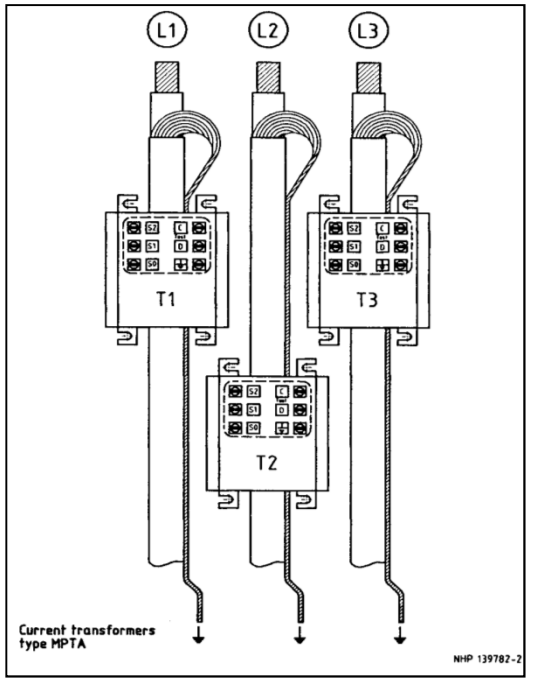
Velg frekvens: 50Hz

Utløsekarakteristikk
For trafobeskyttelse anbefales
kurve CU 1

Velg InA iht tabell 1
11kV=33A
22kV=17A

I> settes slik at
11kV=1,95
22kV=2

Jordfeilsfunksjon
benyttes ikke
og settes til OFF



<u>Kobling strømtransformatorer</u>
NB! Skjermen må føres tilbake gjennom strømtransformatoren

ABB

ABB AS

Utstedt av	Dokument type	Fil ref.
Divisjon Kraftprodukter	Rutinetest rapport	SAFP EA

Rutinetest i henhold til IEC 62271-200

Der det er relevant er også følgende normer lagt til grunn: IEC 62271-1/IEC 60265-1/IEC 62271-100/IEC 62271-102/IEC 62271-105

Vårt ordrenummer.:	Type :	Kunde
0000302606-000010	**SafePlus**	**0000100621 , SATEMA A/S**
Serienummer.:	Konfigurasjon:	Levert til:
201511706770001	**C -**	**SATEMA MOELV AS**
	Nominell spenning (Ur):	Kundens ref. Nr.:
	24 kV	**JOHNNY RAFOSS ,**

Har gjennomgått rutinetester i henhold til paragraf 7 i ovenfor angitte IEC normer.
Rutinetesten består av:

1 **Spenningsprøving i henhold til IEC 62271-200, paragraf 7.1**
Test spenning:50 kV AC varighet 1 minutt.

2 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 7.2**
Det har blitt verifisert at lavspentkabling er i henhold til skjema.
Funksjonsprøving av hjelpe og styrekretser.
Kontroll av jordforbindelser til innkapslinger.
Spenningsprøving av hjelpe og styrekretser.

3 **Motstandsmåling av hovedkrets i henhold til IEC 62271-200, paragraf 7.3.**
Motstandsmåling av hovedkrets har blitt utført.

4 **Gasstetthets kontroll av anlegg i henhold til 62271-200, paragraf 7.4**
Bryteranlegget er gasstetthetskontrollert.
Den relative lekkasjeraten for bryteranlegget, Frel, er mindre enn 0.1 % per år av fylletrykket på 0.14 MPa.
(Absolutt trykk ved 20 °C.)
og SF6 gassen tilfredstiller krav gitt i IEC 60376, 60376A og 60376B.

5 **Design og visuell sjekk i henhold til IEC 62271-200, paragraf 7.5.**
Anlegget har blitt sjekket visuelt mot ordre.

6 **Partiell utladningsmåling i henhold til IEC 62271-200, paragraf 7.101**
Utladinger har blitt målt i henhold til måleprosedyre som beskrevet i tillegg B.
Maksimale målte partielle utladninger er ved 1.1 Ur <= 50 pC

7 **Mekaniske koblinger er testet i henhold til IEC 62271-200, paragraf 7.102**
10 betjeninger inn og ut har blitt utført på alle brytere.
5 forsøk på å betjene mot mekaniske forriglinger er utført.

8 **Test av elektriske hjelpeutrustninger i henhold til IEC 62271-200, paragraf 7.104**
5 betjeninger inn og ut med elektriske hjelpeutrustninger har blitt utført ved de mest ugunstige grenseverdier på hjelpespenningen.

Kompaktanlegget har blitt testet og godkjent som beskrevet ovenfor uten anmerkninger

ABB AS
Divisjon Kraftprodukter

10.07.2015
Dato.

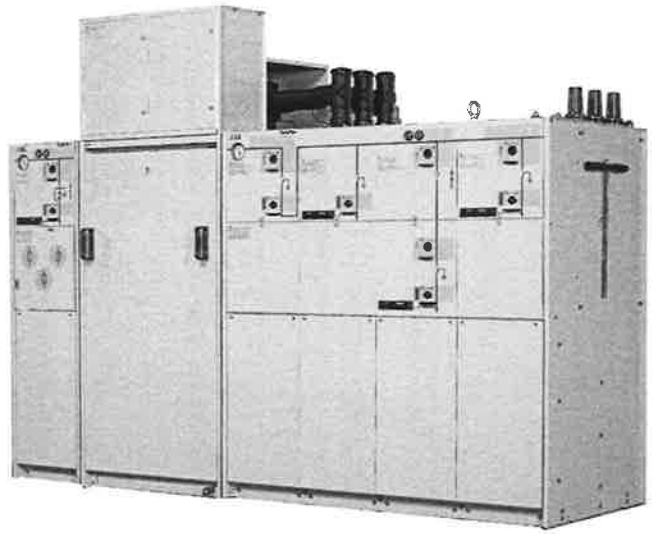
Arne Solbakken
QA/QC Avdeling (Sign)

ABB AS
Divisjon Kraftprodukter
Quality Control

ABB AS
Amtm. Aallsgate 73
Skien, N-3701, NORWAY

KUNDE	SATEMA A/S
KUNDE REFERANSE	JOHNNY RAFOSS
SALGSORDRE	302606
POSISJON NUMMER	0010

TYPE	SafePlus C - M - C V
NOMINELLE VERDIER	24kV 630A 21kA BIL 125
FREKVENS	50Hz
MERKESTRØM SAMLESKINNER	630A
REVISJON	



During the installation, commissioning period and the time of operation, client is obliged to follow all instructions and recommendation given by manufacturers of individual instruments installed inside supplied equipment.

Rev.	Beskrivelse	Dato	Navn	Dato
			Utført	nojahel
			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA FORSIDE
Ref. beskrivelse = +	
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0010
DCC	
Side	01
Neste side	02
Språk	NO
Skala	

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Innholdsfortegnelse

F06_ABB_TABLEOFCONTENTS_2,0

Side	Sidebeskrivelse	Sidetillegsfelt	Dato	Redigert av
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02	INNHOLDSFORTEGNELSE		11.06.2015	nojahel
03	INNHOLDSFORTEGNELSE		20.05.2015	NOJAHEL
+FVD 01	FRONT ARRANGEMENT		20.05.2015	NOJAHEL
+FVD 02	FRONT ARRANGEMENT		20.05.2015	NOJAHEL
+SLD 01	ENLINJESKJEMA		11.06.2015	nojahel
+A01 05	OVERSIKT C		20.05.2015	NOJAHEL
+A01 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A01 07	APPARATLISTE		20.05.2015	NOJAHEL
+A02 05	OVERSIKT M		20.05.2015	NOJAHEL
+A02 06	STRØM MÅLING		20.05.2015	NOJAHEL
+A02 07	SPENNINGS MÅLING		20.05.2015	NOJAHEL
+A02 08	SPENNINGS MÅLING		11.06.2015	nojahel
+A02 09	APPARATLISTE		11.06.2015	nojahel
+A02 10	APPARATLISTE		20.05.2015	NOJAHEL
+A02 11	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 12	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 13	REKKEKLEMMELISTE		11.06.2015	nojahel
+A03 05	OVERSIKT C		20.05.2015	NOJAHEL
+A03 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A03 07	APPARATLISTE		20.05.2015	NOJAHEL

Rev.	Beskrivelse	Dato	Navn	Dato
			Utført	nojahel
			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:
Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
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Tittel: KRETSSKJEMA INNHOLDSFORTEGNELSE

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Eksternt dok. id
Dokumentnr.: 1VDW302606 A0010
DCC:
Side: 02
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Språk: NO
Skala:

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Innholdsfortegnelse

F06_ABB_TABLEOFCONTENTS_2,0

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+A04 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A04 07	OVERSTRØMSRELE TYPE MPRB-06		20.05.2015	NOJAHEL
+A04 08	APPARATLISTE		20.05.2015	NOJAHEL
+A04 09	APPARATLISTE		20.05.2015	NOJAHEL
+A04 10	REKKEKLEMMELISTE		20.05.2015	NOJAHEL

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Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:
Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:
Tittel: KRETSSKJEMA INNHOLDSFORTEGNELSE
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Eksternt dok. id
Dokumentnr.: 1VDW302606 A0010
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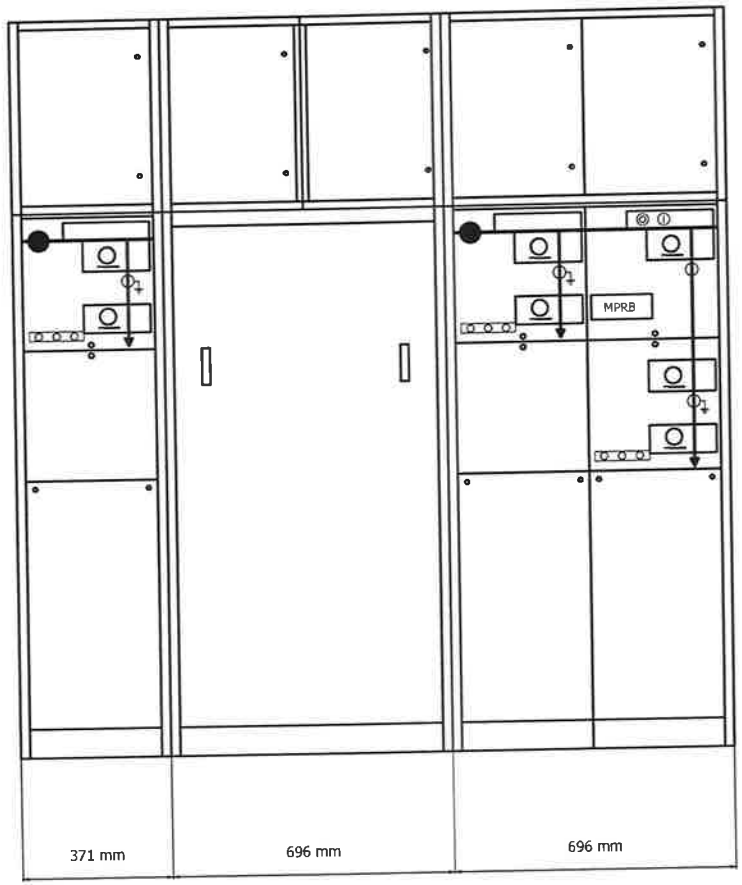
Side: 03
Neste side: =FVD+FVD/01
Språk: NO
Skala:



Felt	A01	A02	A03	A04
Feltnavn	C	M	C	V

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Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS								

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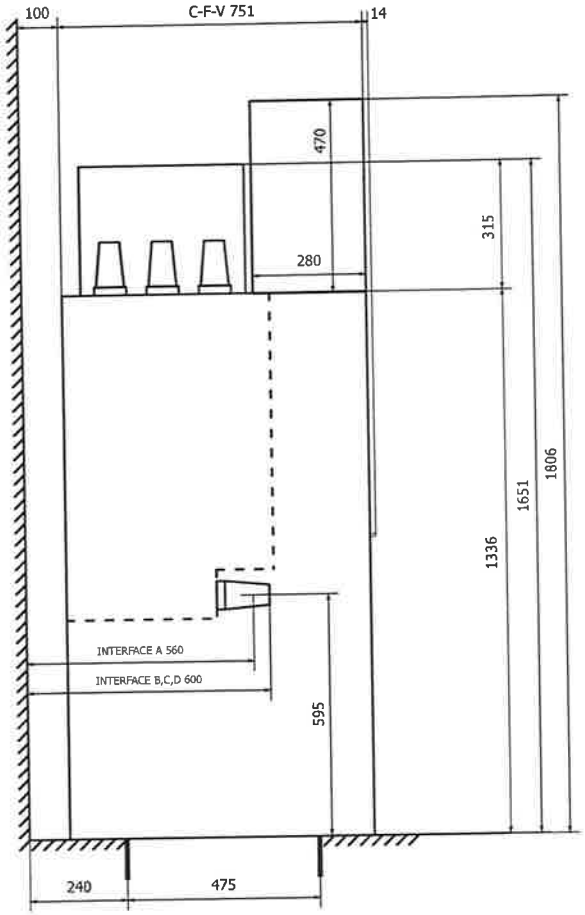

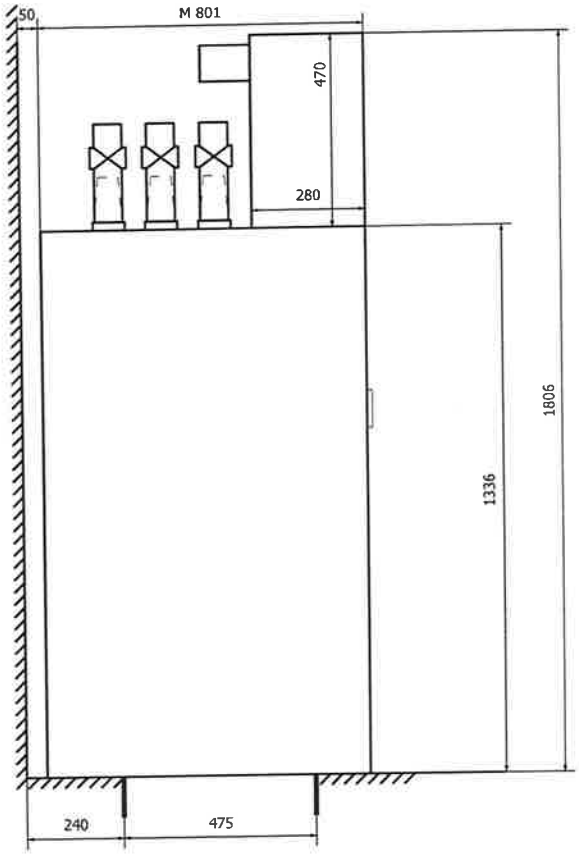

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Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
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Eksternt dok. id	
Dokumentnr.	1VDW302606 A0010
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Neste side	=SLD+SLD/01
Språk	NO
Skala	

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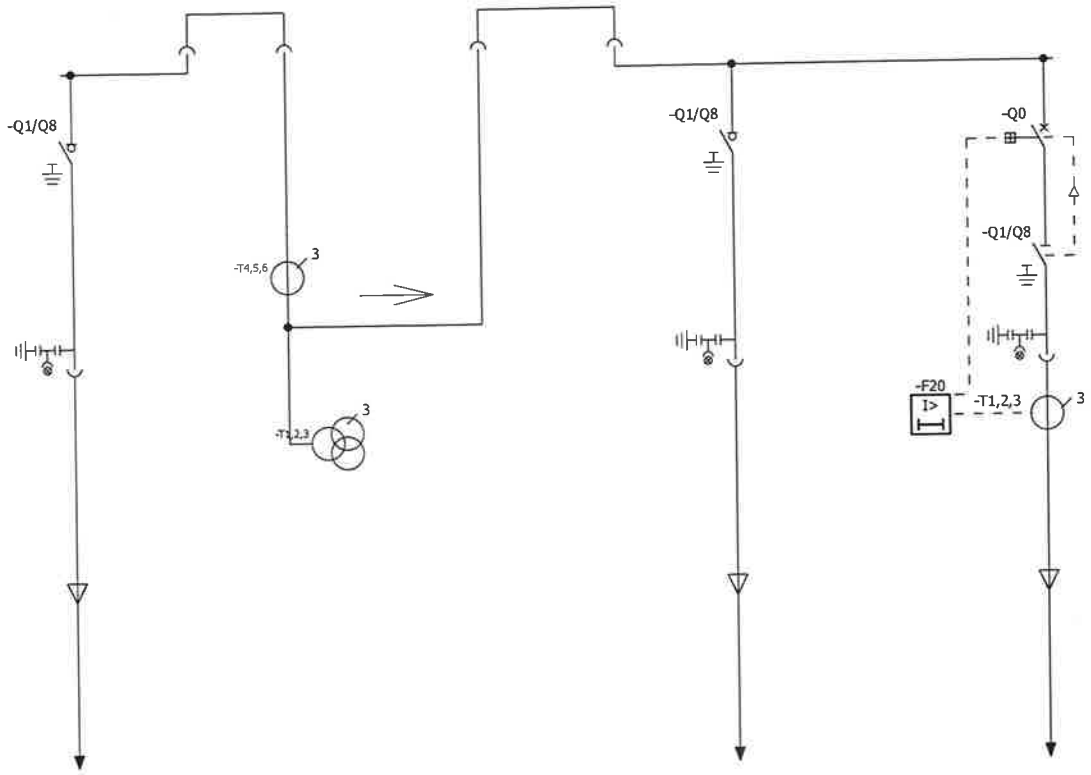

Felt	A01	A02	A03	A04
Feltnavn	C	M	C	V
Modul	SafePlus C	SafePlus M	SafePlus C	SafePlus V
Relévern				MPRB-06
Strømtransformator		75-150/5A		MPRB 06 CT1 15-112A
Spenningstransformator		11000-22000:√3/110:√3/110:3V		
Tegningsnummer	1VDW302606A0010	1VDW302606A0020	1VDW302606A0030	1VDW302606A0030

Rev.	Beskrivelse	Dato	Navn	
			Utført	nojahel
			Sjekket	OWS
			Godkjent	GL
			Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
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Eksternt dok. id	
Dokumentnr.	1VDW302606 A0010
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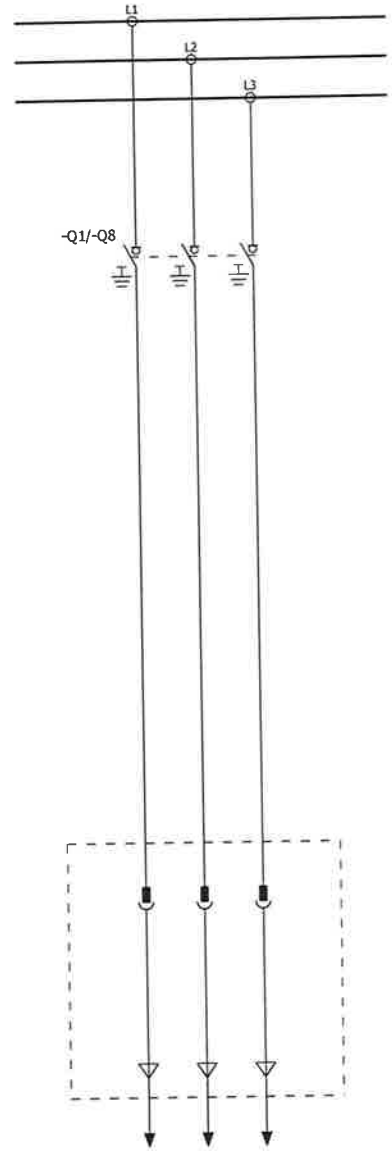
Side	01
Neste side	=A01+A01/05
Språk	NO
Skala	



				Utført	nojahel	Prosjektnavn	24383 HÆHRE	Kunde	SATEMA A/S	Basert på		Ref. beskrivelse = A01 + A01		Språk	Skala
				Sjekket	OWS			Sluttkunde		Dokument navn		Ekstemt dok. id		NO	
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Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS		ABB AS, PPMV Skien		OVERSIKT C	1VDW302606 A0010		05	06

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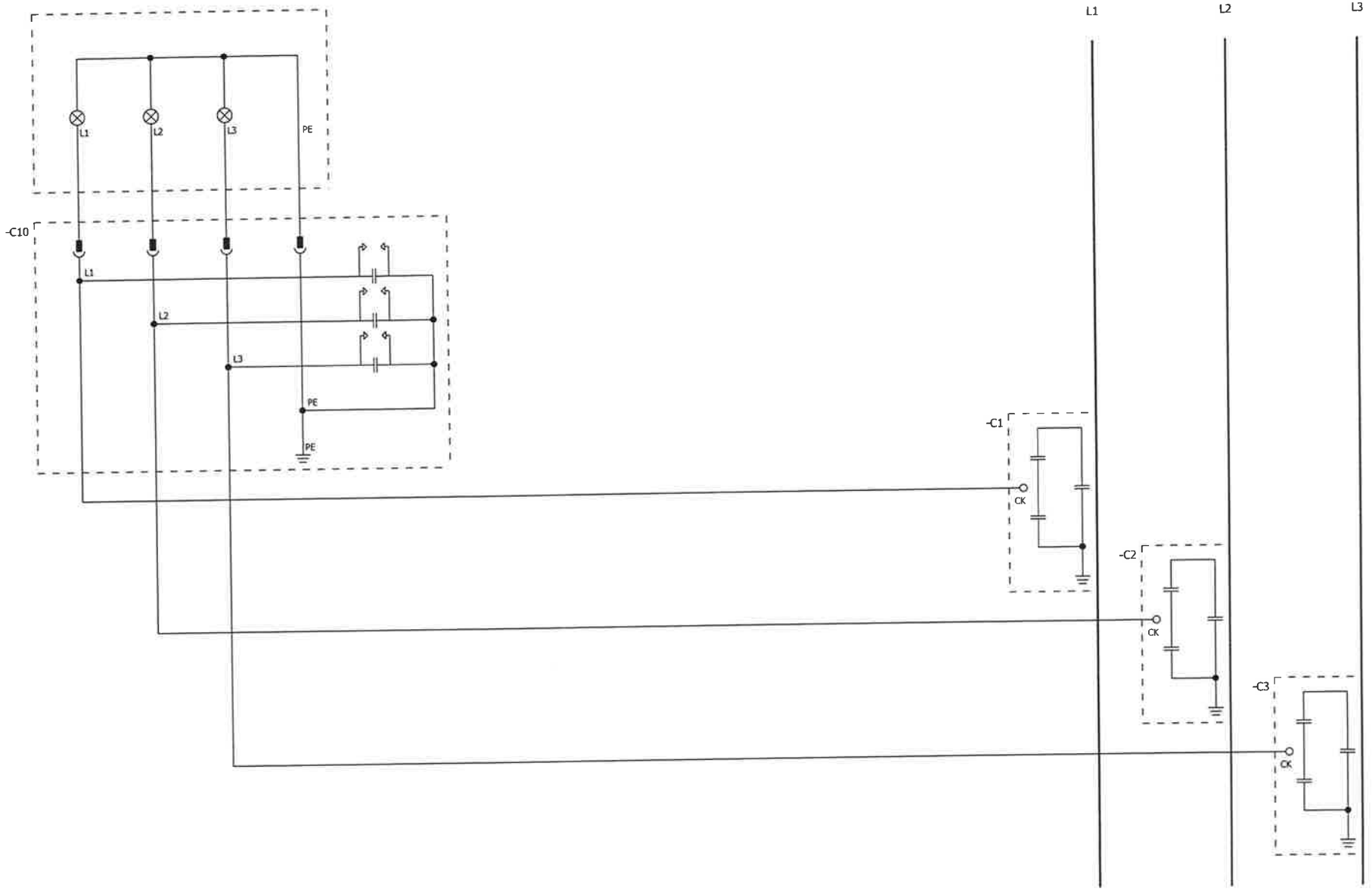

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Rev.	Beskrivelse	Dato	Navn
			Utført nojahel
			Sjekket OWS
			Godkjent GL
			Dato 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:
Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:
Tittel: KRETSSKJEMA HR-MODUL VDS 10-24KV

Ref. beskrivelse = A01 + A01
Eksternt dok. id:
Dokumentnr.: 1VDW302606 A0010
DCC:
Side: 06
Neste side: 07
Språk: NO
Skala:

Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
-C1	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.6:C	ABB	
-C2	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.7:D	ABB	
-C3	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.8:E	ABB	
-C10	NHP 201701R0010		SPENNINGSIND HR-MODUL 10-24kV C/F-CUBICLE	/06.1:B	MAXETA	
-Q1/-Q8	NHP 102099R0001		LASTSKILLEBRYTER/JORDSLUTTER CFE 12/24	/05.2:B	ABB	
-Q1/-Q8	NHP 101935R0001		BRYTERMEKANISME 3PKE	/05.2:B	ABB	

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Rev.	Beskrivelse	Dato	Navn	Dato
			Utført	nojahel
			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	JOHNNY RAFOSS 11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA APPARATLISTE
Ref. beskrivelse	= A01 + A01
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0010
DCC	
Side	07
Neste side	=A02+A02/05
Språk	NO
Skala	

ABB AS

Utstedt av	Dokument type	Fil ref.
Divisjon Kraftprodukter	Rutinetest rapport	SAFP EA

Rutinetest i henhold til IEC 62271-200

Der det er relevant er også følgende normer lagt til grunn: IEC 62271-1/IEC 60265-1/IEC 62271-100/IEC 62271-102/IEC 62271-105

Vårt ordrenummer.:	Type :	Kunde
0000302606-000030	**SafePlus**	**0000100621 , SATEMA A/S**
Serienummer. :	Konfigurasjon:	Levert til:
201511706780001	**-C V**	**SATEMA MOELV AS**
	Nominell spenning (Ur):	Kundens ref. Nr.:
	24 kV	**JOHNNY RAFOSS ,**

Har gjennomgått rutinetester i henhold til paragraf 7 i ovenfor angitte IEC normer.
Rutinetesten består av:

1 **Spenningsprøving i henhold til IEC 62271-200, paragraf 7.1**
Test spenning:50 kV AC varighet 1 minutt.

2 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 7.2**
Det har blitt verifisert at lavspentkabling er i henhold til skjema.
Funksjonsprøving av hjelpe og styrekretser.
Kontroll av jordforbindelser til innkapslinger.
Spenningsprøving av hjelpe og styrekretser.

3 **Motstandsmåling av hovedkrets i henhold til IEC 62271-200, paragraf 7.3.**
Motstandsmåling av hovedkrets har blitt utført.

4 **Gasstetthets kontroll av anlegg i henhold til 62271-200, paragraf 7.4**
Bryteranlegget er gasstetthetskontrollert.
Den relative lekkasjeraten for bryteranlegget, Frel, er mindre enn 0.1 % per år av fylletrykket på 0.14 MPa.
(Absolutt trykk ved 20 °C.)
og SF6 gassen tilfredstiller krav gitt i IEC 60376, 60376A og 60376B.

5 **Design og visuell sjekk i henhold til IEC 62271-200, paragraf 7.5.**
Anlegget har blitt sjekket visuelt mot ordre.

6 **Partiell utladningsmåling i henhold til IEC 62271-200, paragraf 7.101**
Utladinger har blitt målt i henhold til måleprosedyre som beskrevet i tillegg B.
Maksimale målte partielle utladninger er ved 1.1 Ur <= 50 pC

7 **Mekaniske koblinger er testet i henhold til IEC 62271-200, paragraf 7.102**
10 betjeninger inn og ut har blitt utført på alle brytere.
5 forsøk på å betjene mot mekaniske forriglinger er utført.

8 **Test av elektriske hjelpeutrustninger i henhold til IEC 62271-200, paragraf 7.104**
5 betjeninger inn og ut med elektriske hjelpeutrustninger har blitt utført ved de mest ugunstige grenseverdier på hjelpespenningen.

Kompaktanlegget har blitt testet og godkjent som beskrevet ovenfor uten anmerkninger

ABB AS
Divisjon Kraftprodukter

13.07.2015
Dato.

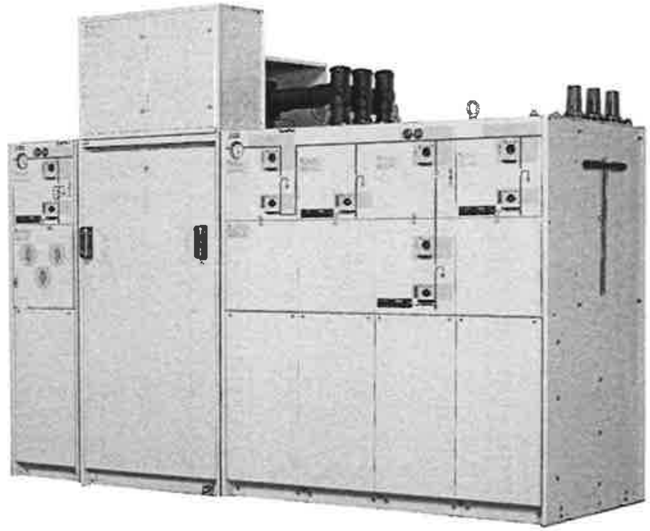
Arne Solbakken
QA/QC Avdeling (Sign)

ABB AS
Divisjon Kraftprodukter
Quality Control

ABB AS
Amtm. Aallsgate 73
Skien, N-3701, NORWAY

KUNDE	SATEMA A/S
KUNDE REFERANSE	JOHNNY RAFOSS
SALGSORDRE	302606
POSISJON NUMMER	0030

TYPE	SafePlus C - M - C V
NOMINELLE VERDIER	24kV 630A 21kA BIL 125
FREKVENS	50Hz
MERKESTRØM SAMLESKINNER	630A
REVISJON	



During the installation, commissioning period and the time of operation, client is obliged to follow all instructions and recommendation given by manufacturers of individual instruments installed inside supplied equipment.

Utført	nojahel
Sjekket	OWS
Godkjent	GL
Dato	11.06.2015
Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA FORSIDE
Ref. beskrivelse	= +
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	01
Neste side	02
Språk	NO
Skala	

Rev. | Beskrivelse | Dato | Navn

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Innholdsfortegnelse

F06_ABB_TABLEOFCONTENTS_2,0

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03	INNHOLDSFORTEGNELSE		20.05.2015	NOJAHEL
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+FVD 02	FRONT ARRANGEMENT		20.05.2015	NOJAHEL
+SLD 01	ENLINJESKJEMA		11.06.2015	nojahel
+A01 05	OVERSIKT C		20.05.2015	NOJAHEL
+A01 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A01 07	APPARATLISTE		20.05.2015	NOJAHEL
+A02 05	OVERSIKT M		20.05.2015	NOJAHEL
+A02 06	STRØM MÅLING		20.05.2015	NOJAHEL
+A02 07	SPENNINGS MÅLING		20.05.2015	NOJAHEL
+A02 08	SPENNINGS MÅLING		11.06.2015	nojahel
+A02 09	APPARATLISTE		11.06.2015	nojahel
+A02 10	APPARATLISTE		20.05.2015	NOJAHEL
+A02 11	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 12	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 13	REKKEKLEMMELISTE		11.06.2015	nojahel
+A03 05	OVERSIKT C		20.05.2015	NOJAHEL
+A03 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A03 07	APPARATLISTE		20.05.2015	NOJAHEL

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Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
			Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA INNHOLDSFORTEGNELSE
Ref. beskrivelse = +	
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	02
Neste side	03
Språk	NO
Skala	

Innholdsfortegnelse

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+A04 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A04 07	OVERSTRØMSRELE TYPE MPRB-06		20.05.2015	NOJAHEL
+A04 08	APPARATLISTE		20.05.2015	NOJAHEL
+A04 09	APPARATLISTE		20.05.2015	NOJAHEL
+A04 10	REKKEKLEMMELISTE		20.05.2015	NOJAHEL

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Rev.	Beskrivelse	Dato	Navn	
			Utført	nojahel
			Sjekket	OWS
			Godkjent	GL
			Dato	11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:

ABB

Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:

Tittel: KRETSSKJEMA INNHOLDSFORTEGNELSE

Ref. beskrivelse = +
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Dokumentnr.: 1VDW302606 A0030
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Språk: NO
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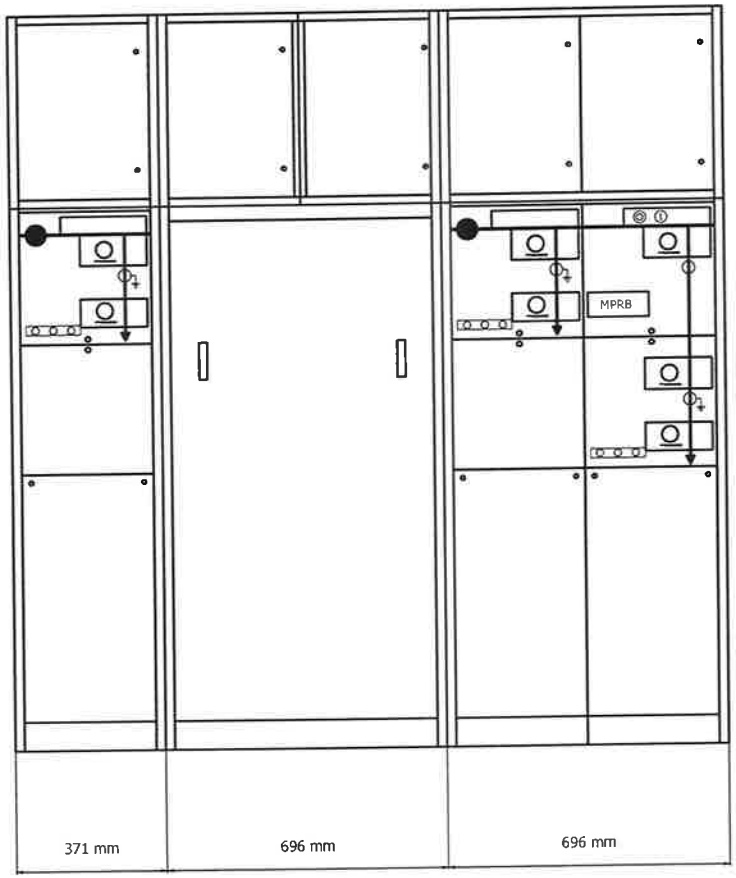

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Feltnavn	C	M	C	V

Rev.	Beskrivelse	Dato	Navn		
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				Sjekket	OWS
				Godkjent	GL
				Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
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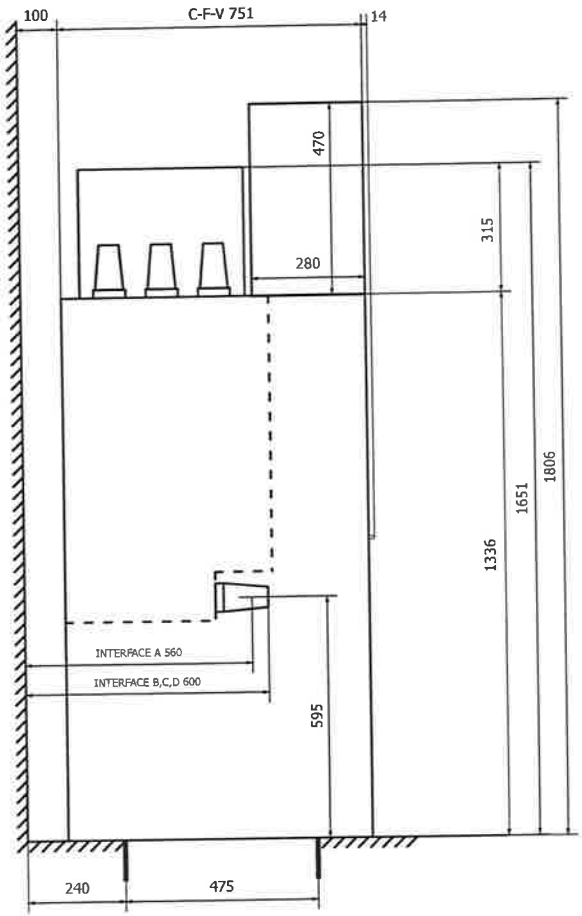

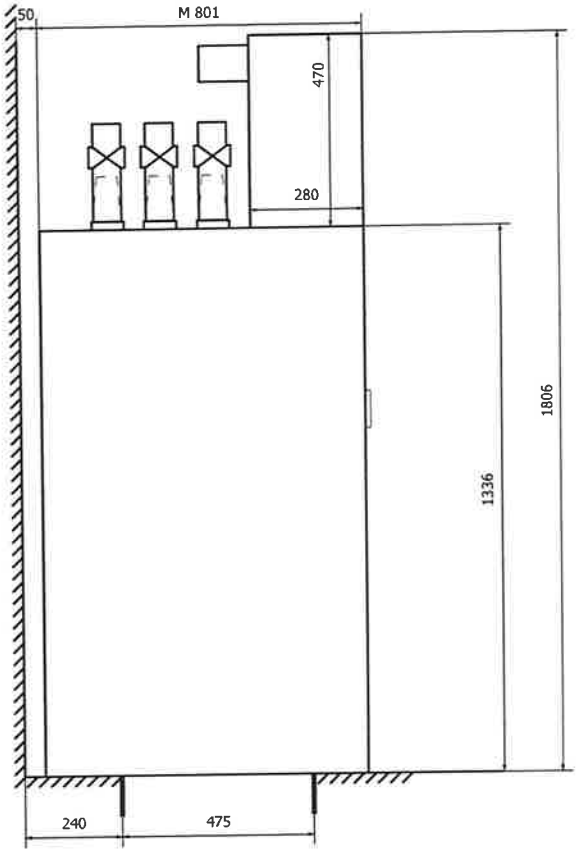

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			Sjekket	OWS
			Godkjent	GL
			Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
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Ref. beskrivelse	= FVD + FVD
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
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Neste side	=SLD+SLD/01
Språk	NO
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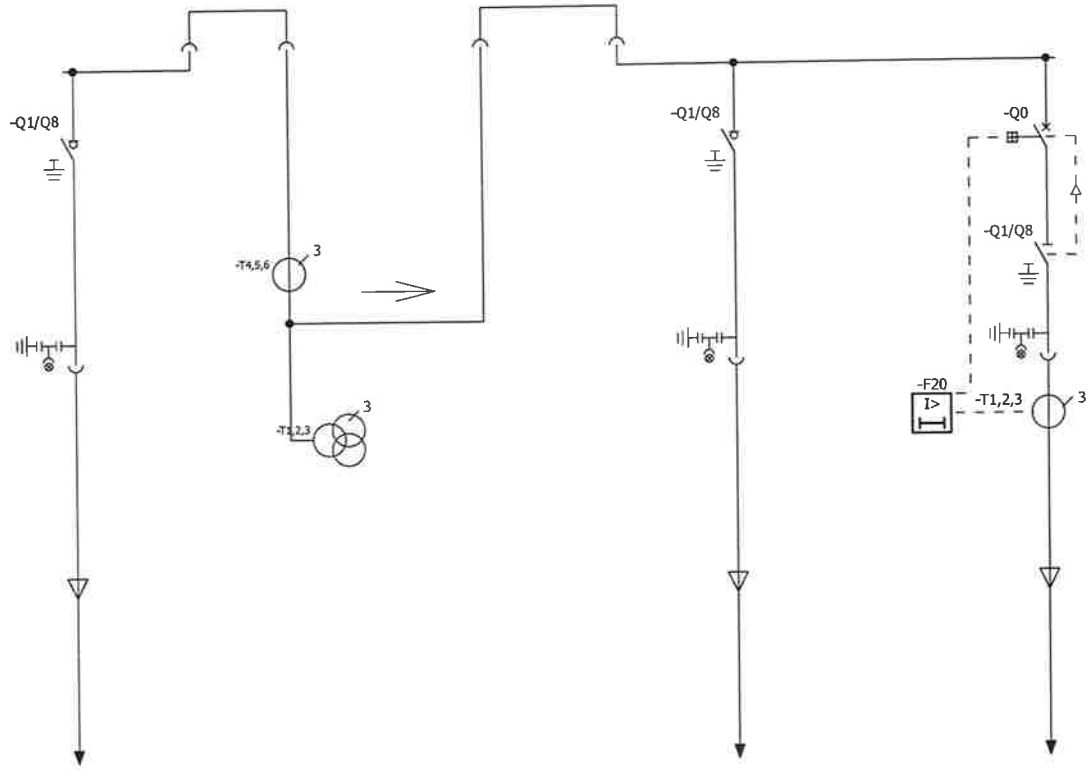

Felt	A01	A02	A03	A04
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Relévern				MPRB-06
Strømtransformator		75-150/5A		MPRB 06 CT1 15-112A
Spenningstransformator		11000-22000:√3/110:√3/110:3V		
Tegningsnummer	1VDW302606A0010	1VDW302606A0020	1VDW302606A0030	1VDW302606A0030

Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
				11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
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Ekstern dok. id	
Dokumentnr.	1VDW302606 A0030
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Side	01
Neste side	=A01+A01/05
Språk	NO
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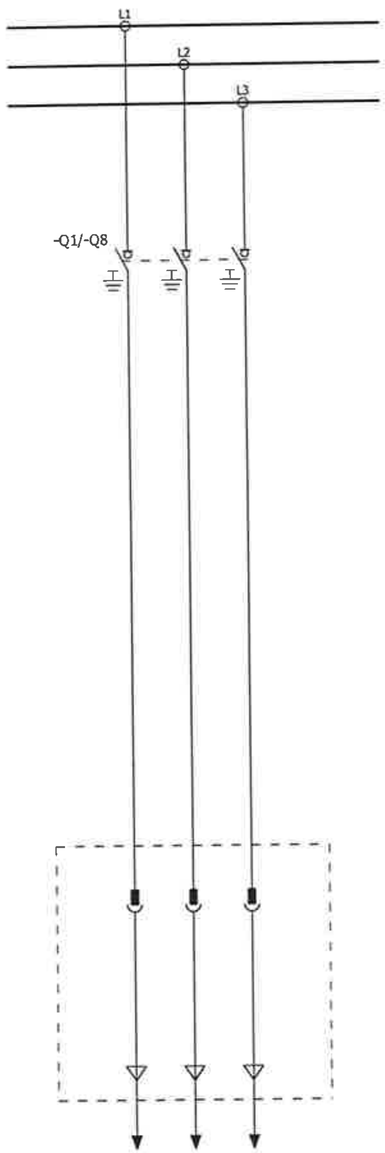

Rev.	Beskrivelse	Dato	Navn		
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				Sjekket	OWS
				Godkjent	GL
				Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
ABB – Ansv. (divisjon/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
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Eksternt dok. id	
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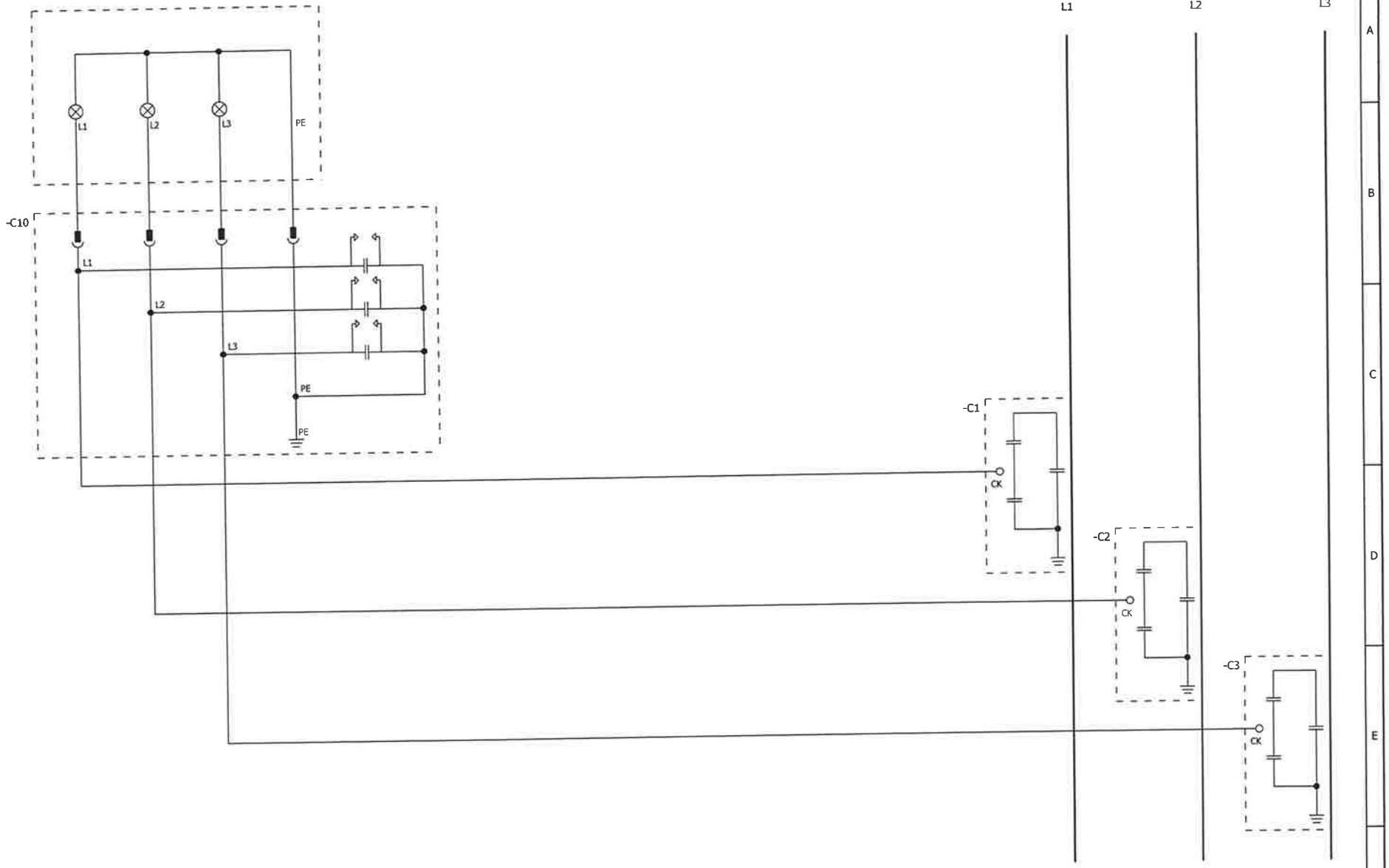

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Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA HR-MODUL VDS 10-24KV
Ref. beskrivelse	= A03 + A03
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	06
Neste side	07
Språk	NO
Skala	

Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
-C1	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.6:C	ABB	
-C2	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.7:D	ABB	
-C3	NHP 201699R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/06.8:E	ABB	
-C10	NHP 201701R0010		SPENNINGSIND HR-MODUL 10-24kV C/F-CUBICLE	/06.1:B	MAXETA	
-Q1/-Q8	NHP 102099R0001		LASTSKILLEBRYTER/JORDSLUTTER CFE 12/24	/05.2:B	ABB	
-Q1/-Q8	NHP 101935R0001		BRYTERMEKANISME 3PKE	/05.2:B	ABB	

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Rev.	Beskrivelse	Dato	Navn	Dato
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			Sjekket	OWS
			Godkjent	GL
			Arbeidsordre id.	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA APPARATLISTE
Ref. beskrivelse	= A03 + A03
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	07
Språk	NO
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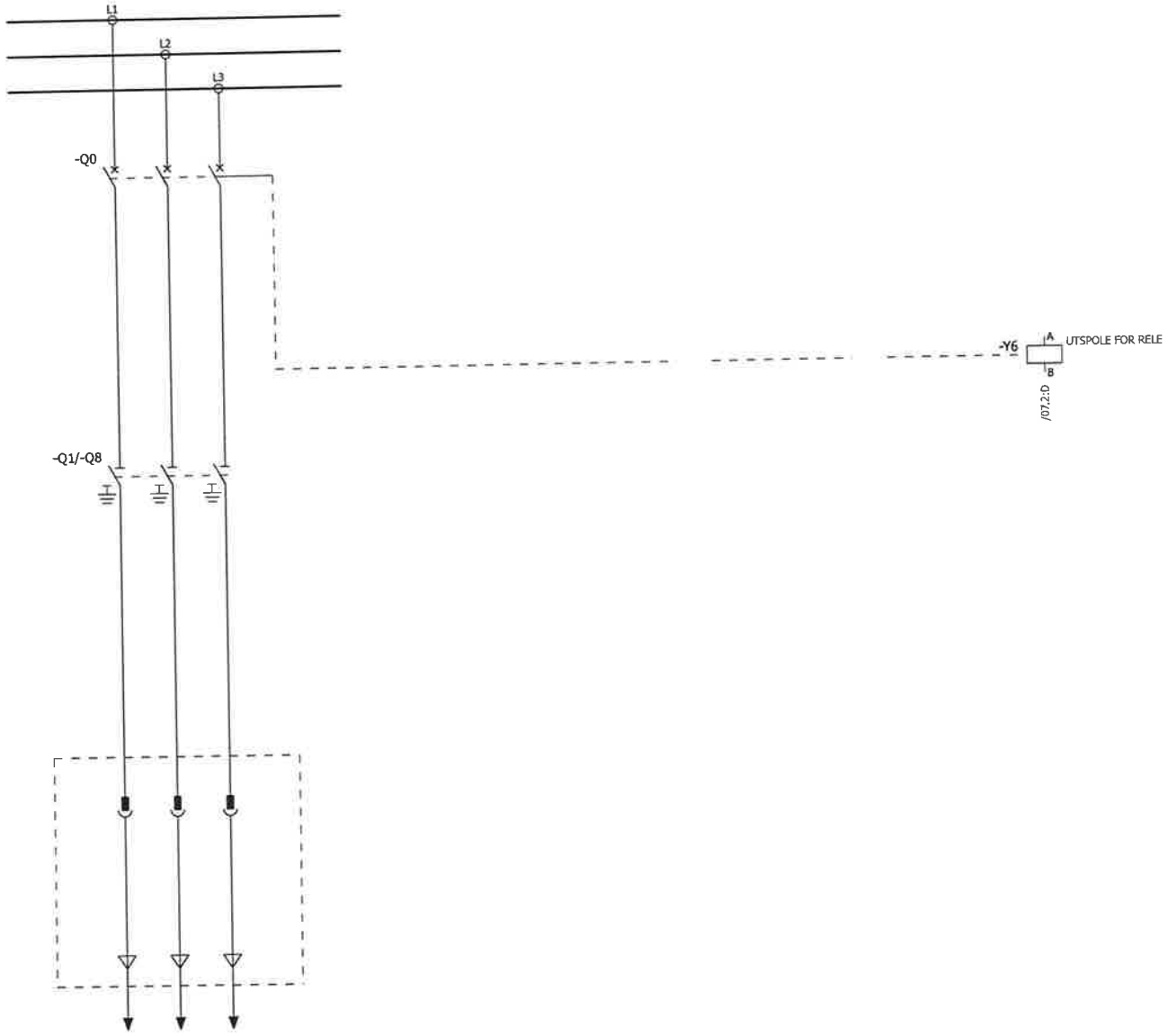
Neste side	=A04+A04/05



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				Godkjent	GL	Anleggsnavn	SafePlus C - M - C V	ABB	Ansv. (division/avdeling) ABB AS, PPMV Skien	Tittel	KRETSSKJEMA OVERSIKT V	Dokumentnr. 1VDW302606 A0030	DCC	Side 05	Neste side 06
Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS								

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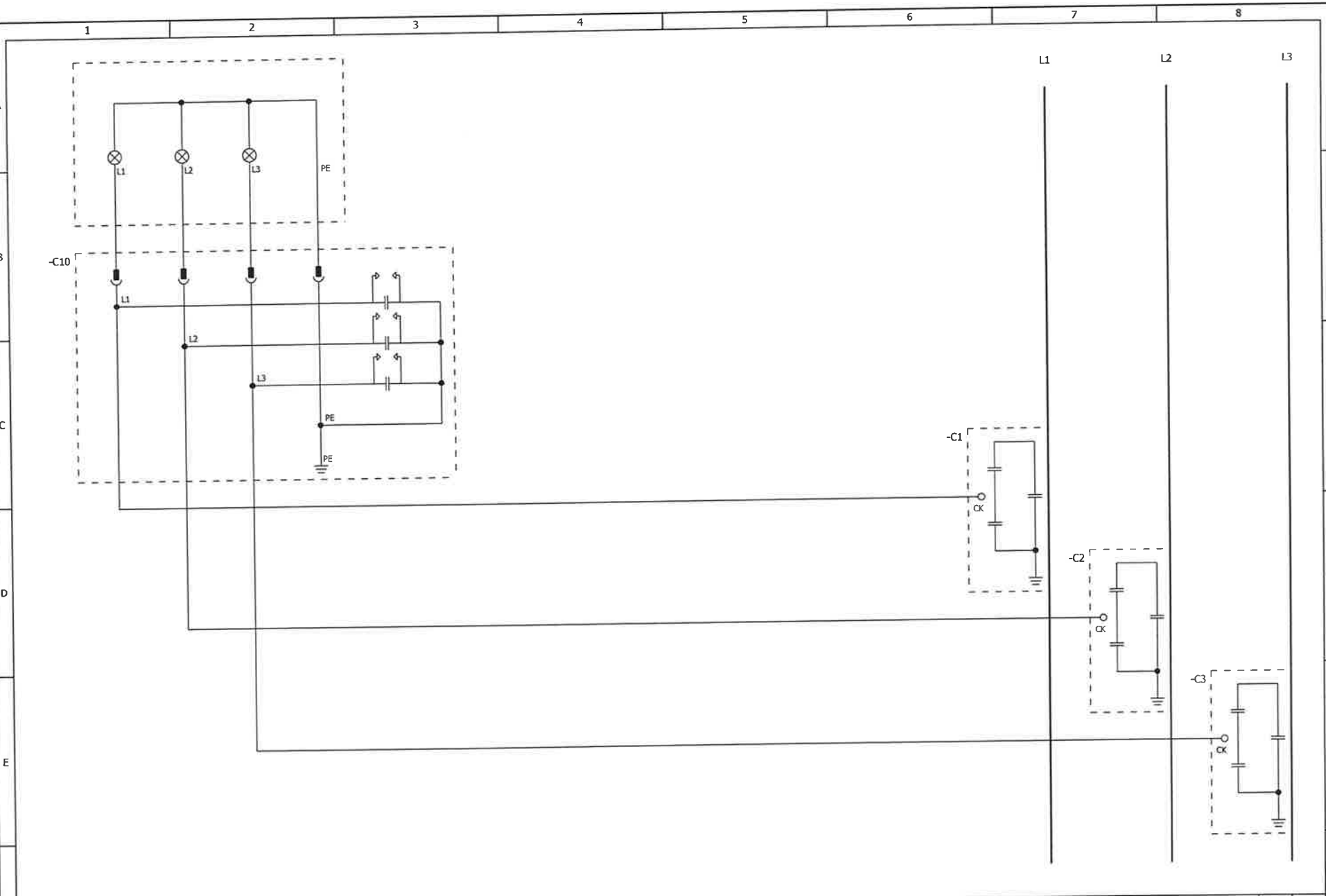

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Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS								

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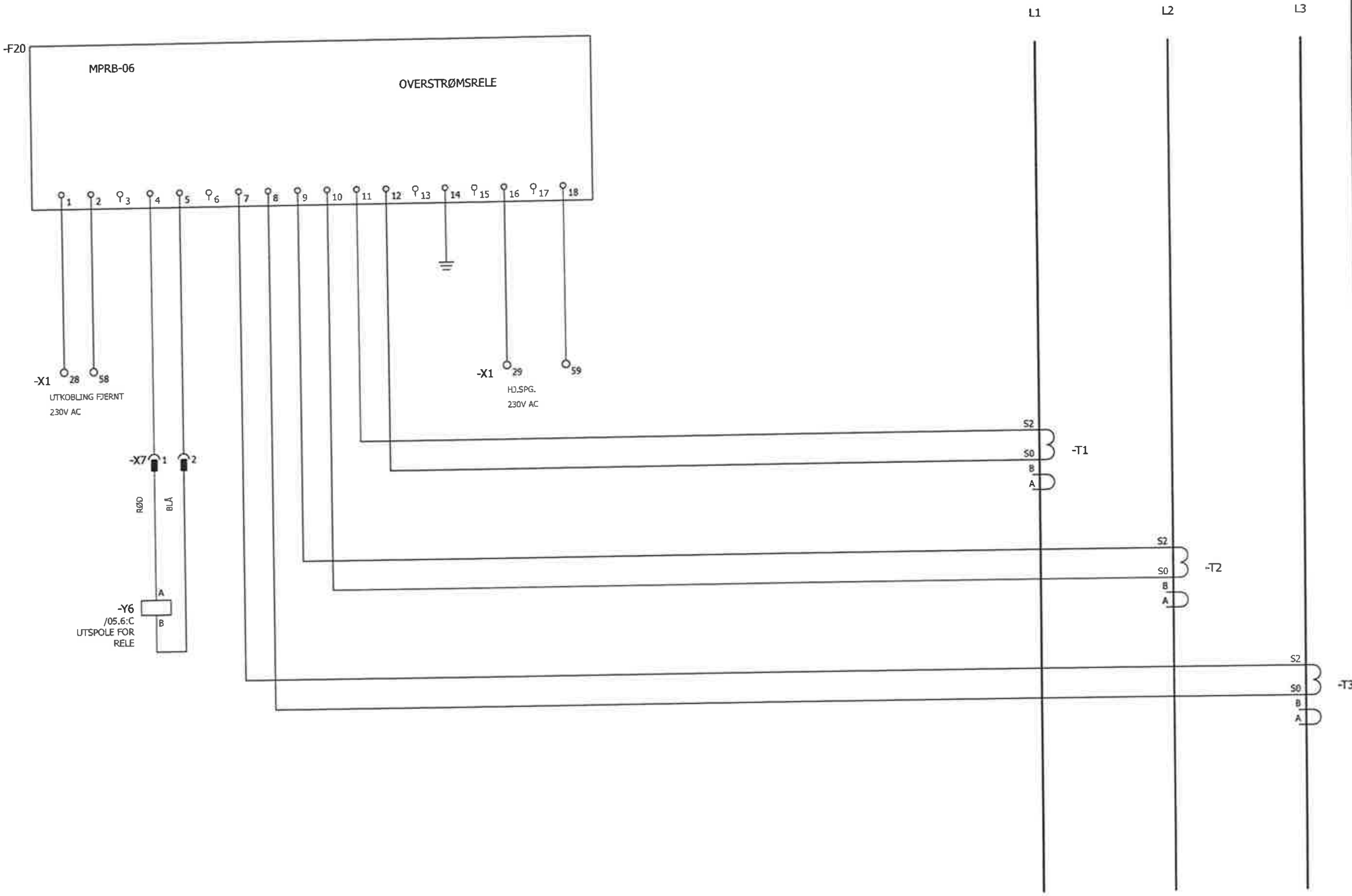

Utført	nojahel	Prosjektnavn	24383 HÆHRE	Kunde	SATEMA A/S	Basert på	Ref. beskrivelse = A04 + A04	Språk NO / Skala
Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V	Sluttkunde		Dokument navn	Eksternt dok. id	
Godkjent	GL			ABB	Ansv. (divisjon/avdeling) ABB AS, PPMV Skien	Tittel KRETSSKJEMA OVERSTRØMSRELE TYPE MPRB-06	Dokumentnr. 1VDW302606 A0030	DCC / Side 07 / Neste side 08
Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS					

Rev.	Beskrivelse	Dato	Navn

Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
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-C2	NHP 201532R0001		GJENNOMFØRING MED KAP. SPG IND 200 PLUG INTERFACE A	/06.7:D	ABB	
-C3	NHP 201532R0001		GJENNOMFØRING MED KAP. SPG IND 200 PLUG INTERFACE A	/06.8:E	ABB	
-C10	NHP 201701R0009		SPENNINGSIND HR-MODUL 10-24kV V-CUBICLE	/06.1:B	MAXETA	
-F20	NHSN706030P0106	OVERSTRØMSRELE	OVERSTRØMSRELE MPRB 06	/07.1:A	CIRCUTOR	
-Q0	NHP 102110R0001		EFFEKT-BRYTER 12/24kV 200/630A	/05.2:B	ABB	
-Q0	NHP 101985R0001		BRYTERMEKANISME 2PA	/05.2:B	ABB	
-Q1/-Q8	NHP 101963R0001		SKILLEBRYTER/JORDSLUTTER CFE-V 12/24	/05.2:C	ABB	
-Q1/-Q8	NHP 101935R0001		BRYTERMEKANISME 3PKE	/05.2:C	ABB	
-T1	NHSN718034P0011		STRØMTRANSFORMATOR MPRB-06 CT1 15-112A	/07.7:C	CIRCUTOR	
-T2	NHSN718034P0011		STRØMTRANSFORMATOR MPRB-06 CT1 15-112A	/07.8:D	CIRCUTOR	
-T3	NHSN718034P0011		STRØMTRANSFORMATOR MPRB-06 CT1 15-112A	/07.8:D	CIRCUTOR	
-X1	NHSN722028P0001	A	MBKKB 2,5 REKKEKLEMME	/07.1:C;/07.4:C	Phoenix	

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Rev.	Beskrivelse	Dato	Navn	Dato
			Utført	nojahel 11.06.2015
			Sjekket	OWS
			Godkjent	GL

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA APPARATLISTE
Ref. beskrivelse	= A04 + A04
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	08
Neste side	09
Språk	NO
Skala	

Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
-Y6	NHP 407883P0001	UTSPOLE FOR RELE	UTSPOLE FOR RELE KUHNKE H34-F- HS3192	/05.6:C	KUHNKE	

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Rev.	Beskrivelse	Dato	Navn	
			Utført	nojahel
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			Godkjent	GL
			Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA APPARATLISTE
Ref. beskrivelse	= A04 + A04
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0030
DCC	
Side	09
Neste side	10
Språk	NO
Skala	

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REKKEKLEMMELISTE

-X1

APPARAT BETEGNELSE / APPARAT NR.	POTENSIAL/ FARGE	LEDNINGS- LASK / LASK	POTENSIAL/ FARGE	APPARAT BETEGNELSE	APPARAT NR.	SIDE	KLEMMETYPE
		-	28	-F20	1	/07.1:C	MBKKB 2,5
		-	29	-F20	16	/07.4:C	MBKKB 2,5
		-	58	-F20	2	/07.1:C	MBKKB 2,5
		-	59	-F20	18	/07.4:C	MBKKB 2,5

Rev.	Beskrivelse	Dato	Navn	Dato	
					Utført: nojahel
					Sjekket: OWS
					Godkjent: GL
					Dato: 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS
Kunde: SATEMA A/S
Sluttkunde:
Ansv. (division/avdeling): ABB AS, PPMV Skien
Basert på:
Dokument navn:
Tittel: KRETSSKJEMA REKKEKLEMMELISTE
Ref. beskrivelse: = A04 + A04
Eksternt dok. id:
Dokumentnr.: 1VDW302606 A0030
DCC:
Side: 10
Språk: NO
Skala:
Neste side:

ABB AS

Utstedt av	Dokument type	Fil ref.
Divisjon Kraftprodukter	Rutinetest rapport	SAFP-M EA

Rutinetest i henhold til IEC 62271-200

Der det er relevant er også følgende normer lagt til grunn: IEC 62271-1/IEC 60265-1/IEC 62271-100/IEC 62271-102/IEC 62271-105

Vårt ordrenummer.:	Type :	Kunde
0000302606-000020	**SafePlus**	**0000100621 , SATEMA A/S**
Serienummer. :	Konfigurasjon:	Levert til:
201511709230001	**-M -**	**SATEMA MOELV AS**
	Nominell spenning (Ur):	Kundens ref. Nr.:
	24 kV	**JOHNNY RAFOSS ,**

Har gjennomgått rutinetester i henhold til paragraf 7 i ovenfor angitte IEC normer.
Rutinetesten består av:

1 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 7.2**
Test spenning:50 kV 50Hz varighet 1 minutt.

2 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 7.2**
Det har blitt verifisert at lavspentkabling er i henhold til skjema.
Funksjonsprøving av hjelpe og styrekretser.
Kontroll av jordforbindelser til innkapslinger.
Spenningsprøving av hjelpe og styrekretser.

3 **Motstandsmåling av hovedkrets i henhold til IEC 62271-200, paragraf 7.3.**
NA

4 **Gasstetthets kontroll av anlegg i henhold til 62271-200, paragraf 7.4**
NA

5 **Design og visuell sjekk i henhold til IEC 62271-200, paragraf 7.5.**
Anlegget har blitt sjekket visuelt mot ordre.

6 **Partiell utladningsmåling i henhold til IEC 62271-200, paragraf 7.101**
NA

7 **Mekaniske koblinger er testet i henhold til IEC 62271-200, paragraf 7.102**
NA

8 **Test av elektriske hjelpeutrustninger i henhold til IEC 62271-200, paragraf 7.104**
NA

Målefeltet har blitt testet og godkjent som beskrevet ovenfor uten anmerkninger

ABB AS
Divisjon Kraftprodukter
Quality Control

ABB AS
Divisjon Kraftprodukter

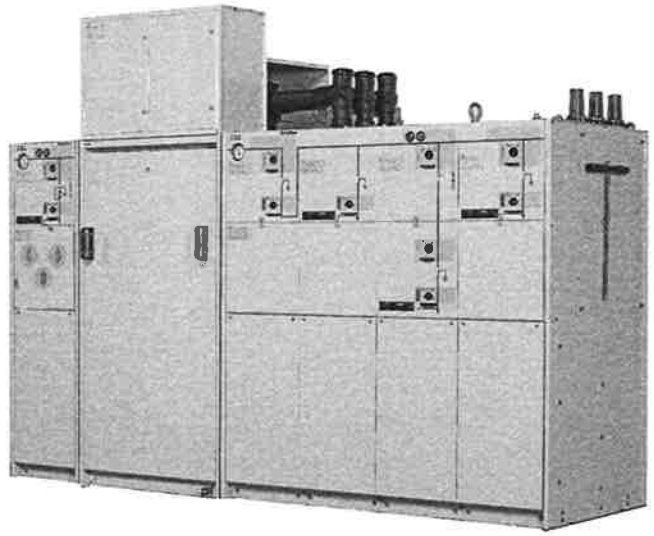
10.07.2015
Dato.

Rolf Amundsen
QA/QC Avdeling (Sign)

ABB AS
Amtm. Aallsgate 73
Skien, N-3701, NORWAY

KUNDE	SATEMA A/S
KUNDE REFERANSE	JOHNNY RAFOSS
SALGSORDRE	302606
POSISJON NUMMER	0020

TYPE	SafePlus C - M - C V
NOMINELLE VERDIER	24kV 630A 21kA BIL 125
FREKVENS	50Hz
MERKESTRØM SAMLESKINNER	630A
REVISJON	



During the installation, commissioning period and the time of operation, client is obliged to follow all instructions and recommendation given by manufacturers of individual instruments installed inside supplied equipment.

Rev.	Beskrivelse	Dato	Navn

Utført: nojahel
Sjekket: OWS
Godkjent: GL
Dato: 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:

ABB

Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:

Tittel: KRETSSKJEMA FORSIDE

Ref. beskrivelse = +
Eksternt dok. id

Dokumentnr.: 1VDW302606 A0020

DCC:

Side: 01

Neste side: 02

Språk: NO

Skala:

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Innholdsfortegnelse

F06_ABB_TABLEOFCONTENTS_2,0

Side	Sidebeskrivelse	Sidetillegsfelt	Dato	Redigert av
01	FORSIDE		20.05.2015	NOJAHEL
02	INNHOLDSFORTEGNELSE		11.06.2015	nojahel
03	INNHOLDSFORTEGNELSE		20.05.2015	NOJAHEL
+FVD 01	FRONT ARRANGEMENT		20.05.2015	NOJAHEL
+FVD 02	FRONT ARRANGEMENT		20.05.2015	NOJAHEL
+SLD 01	ENLINJESKJEMA		11.06.2015	nojahel
+A01 05	OVERSIKT C		20.05.2015	NOJAHEL
+A01 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A01 07	APPARATLISTE		20.05.2015	NOJAHEL
+A02 05	OVERSIKT M		20.05.2015	NOJAHEL
+A02 06	STRØM MÅLING		20.05.2015	NOJAHEL
+A02 07	SPENNINGS MÅLING		20.05.2015	NOJAHEL
+A02 08	SPENNINGS MÅLING		11.06.2015	nojahel
+A02 09	APPARATLISTE		11.06.2015	nojahel
+A02 10	APPARATLISTE		20.05.2015	NOJAHEL
+A02 11	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 12	REKKEKLEMMELISTE		20.05.2015	NOJAHEL
+A02 13	REKKEKLEMMELISTE		11.06.2015	nojahel
+A03 05	OVERSIKT C		20.05.2015	NOJAHEL
+A03 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A03 07	APPARATLISTE		20.05.2015	NOJAHEL

Rev.	Beskrivelse	Dato	Navn

Utført: nojahel
Sjekket: OWS
Godkjent: GL
Dato: 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:

ABB

Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:

Tittel: KRETSSKJEMA INNHOLDSFORTEGNELSE

Ref. beskrivelse: = +
Eksternt dok. id:
Dokumentnr.: 1VDW302606 A0020
DCC:
Side: 02
Neste side: 03

Språk: NO
Skala:

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Innholdsfortegnelse

F06_ABB_TABLEOFCONTENTS_2,0

Side	Sidebeskrivelse	Sidetillegsfelt	Dato	Redigert av
+A04 05	OVERSIKT V		20.05.2015	NOJAHEL
+A04 06	HR-MODUL VDS 10-24KV		20.05.2015	NOJAHEL
+A04 07	OVERSTRØMSRELE TYPE MPRB-06		20.05.2015	NOJAHEL
+A04 08	APPARATLISTE		20.05.2015	NOJAHEL
+A04 09	APPARATLISTE		20.05.2015	NOJAHEL
+A04 10	REKKEKLEMMELISTE		20.05.2015	NOJAHEL

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Rev.	Beskrivelse	Dato	Navn

Utført	nojahel	
Sjekket	OWS	
Godkjent	GL	
Dato	11.06.2015	
Prosjektnavn	24383 HÆHRE	
Anleggsnavn	SafePlus C - M - C V	
Arbeidsordre id.	JOHNNY RAFOSS	
Kunde	SATEMA A/S	
Sluttkunde		
Ansv. (division/avdeling)	ABB AS, PPMV Skien	
Basert på		
Dokument navn		
Tittel	KRETSSKJEMA INNHOLDSFORTEGNELSE	
Ref. beskrivelse =	+	
Eksternt dok. id		
Dokumentnr.	1VDW302606 A0020	
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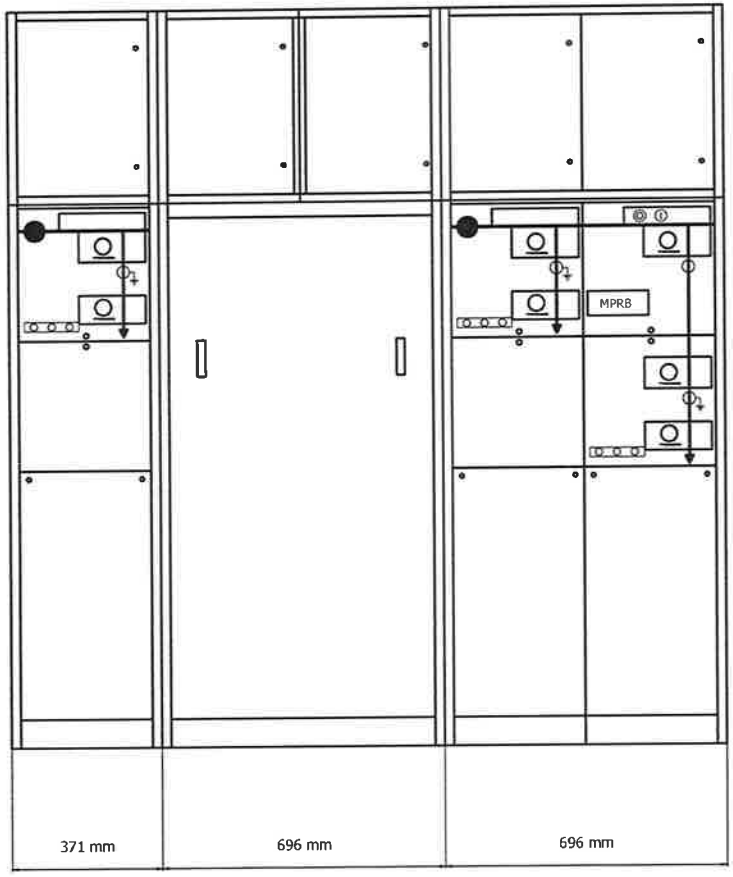
Skala		



Felt	A01	A02	A03	A04
Feltnavn	C	M	C	V

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				Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V	Sluttkunde		Dokument navn		Eksternt dok. id		NO	
				Godkjent	GL			ABB	Ansv. (division/avdeling) ABB AS, PPMV Skien	Tittel	KRETSSKJEMA FRONT ARRANGEMENT	Dokumentnr. 1VDW302606 A0020	DCC	Side 01	Neste side 02
Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS								

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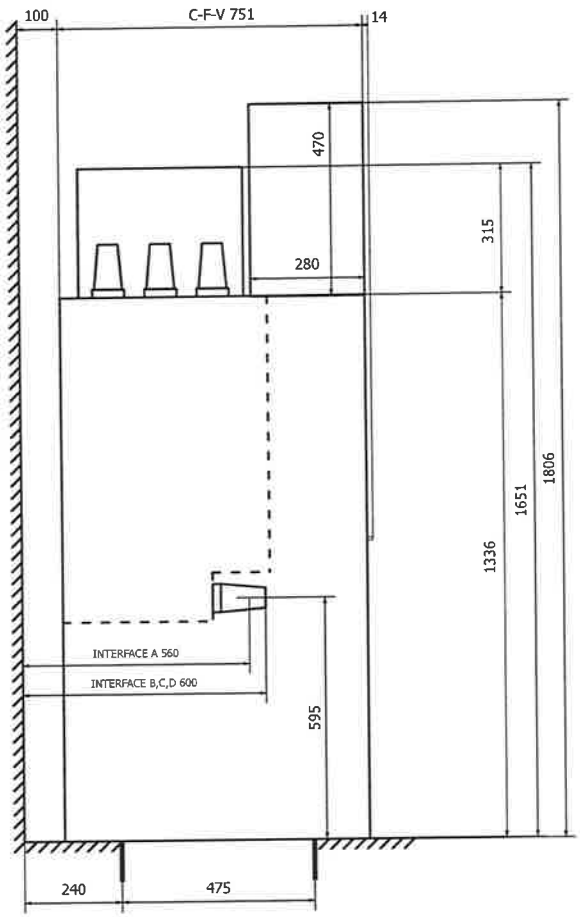

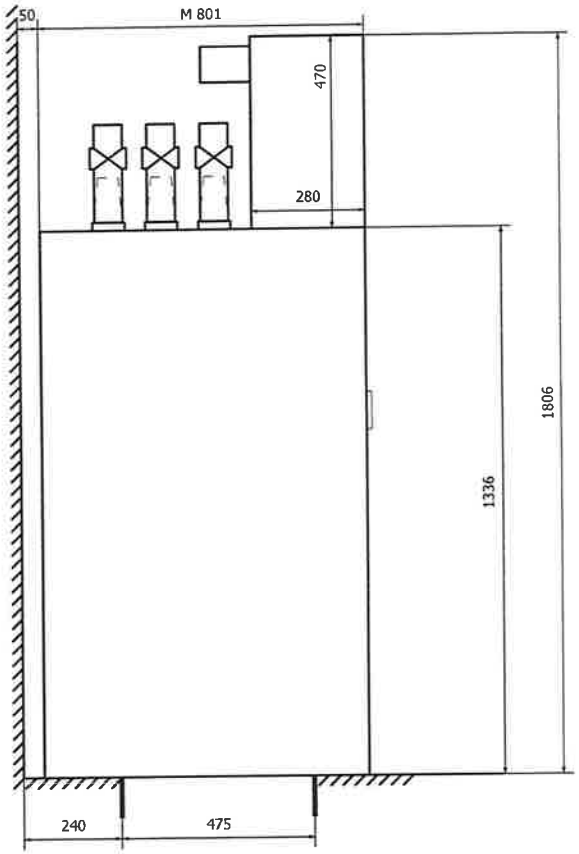

Rev.	Beskrivelse	Dato	Navn		
				Utført	nojahel
				Sjekket	OWS
				Godkjent	GL
				Dato	11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA FRONT ARRANGEMENT
Ref. beskrivelse	= FVD + FVD
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0020
DCC	
Side	02
Språk	NO
Skala	
Neste side	=SLD+SLD/01

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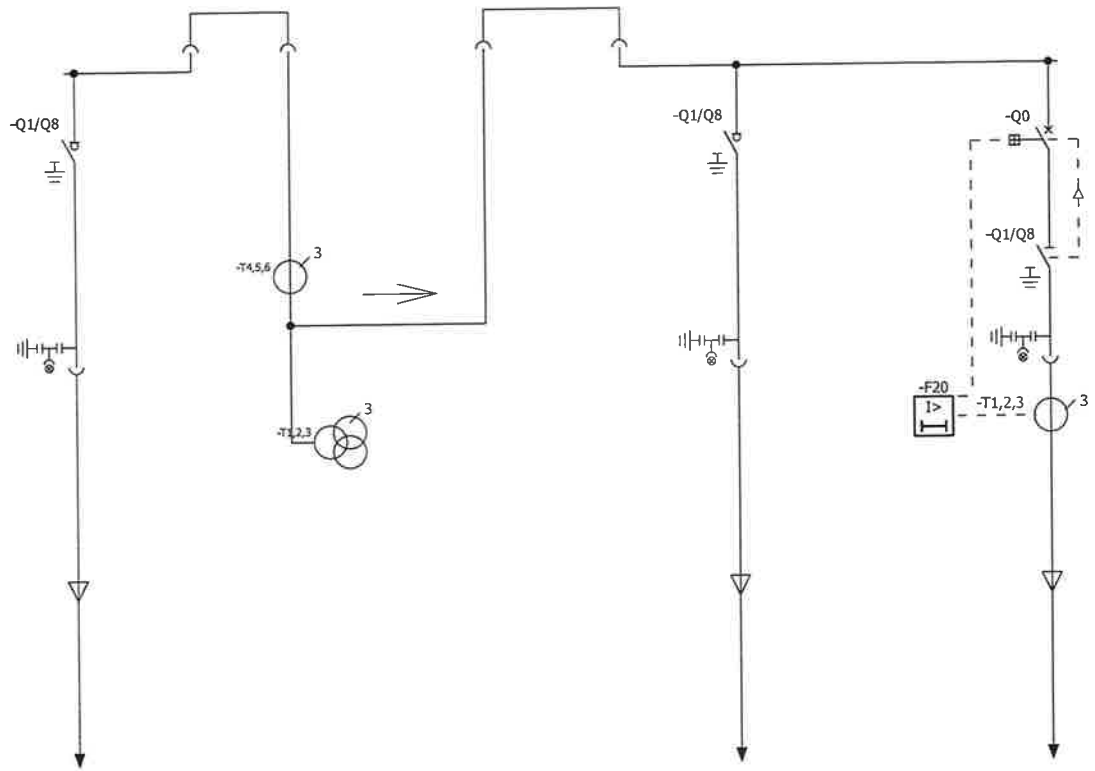

Felt	A01	A02	A03	A04
Feltnavn	C	M	C	V
Modul	SafePlus C	SafePlus M	SafePlus C	SafePlus V
Relévern				MPRB-06
Strømtransformator		75-150/5A		MPRB 06 CT1 15-112A
Spenningstransformator		11000-22000:√3/110:√3/110:3V		
Tegningsnummer	1VDW302606A0010	1VDW302606A0020	1VDW302606A0030	1VDW302606A0030

Rev.	Beskrivelse	Dato	Navn

Utført	nojahel	
Sjekket	OWS	
Godkjent	GL	
Dato	11.06.2015	

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS

Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien

Basert på	
Dokument navn	
Tittel	KRETSSKJEMA ENLINJESKJEMA

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Eksternt dok. id			NO	
Dokumentnr.	DCC	Side	Neste side	
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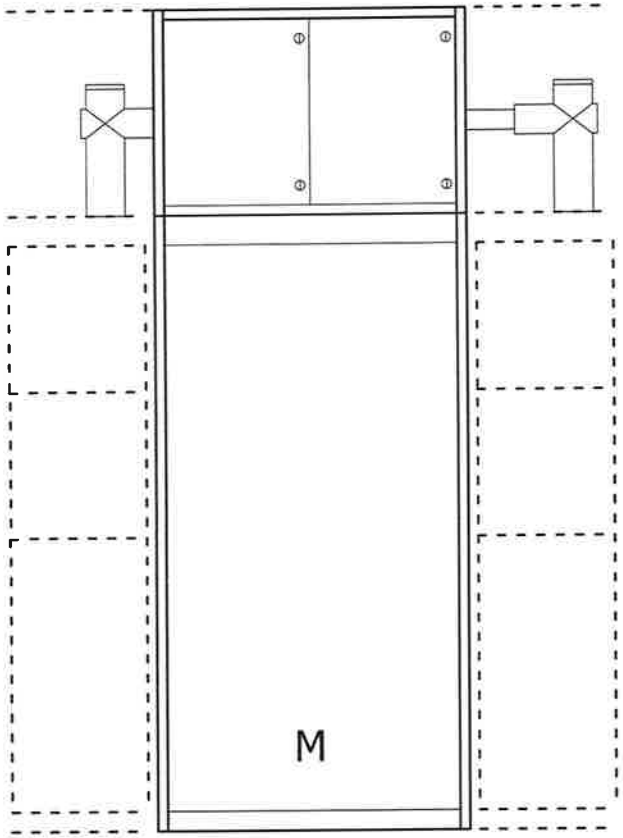

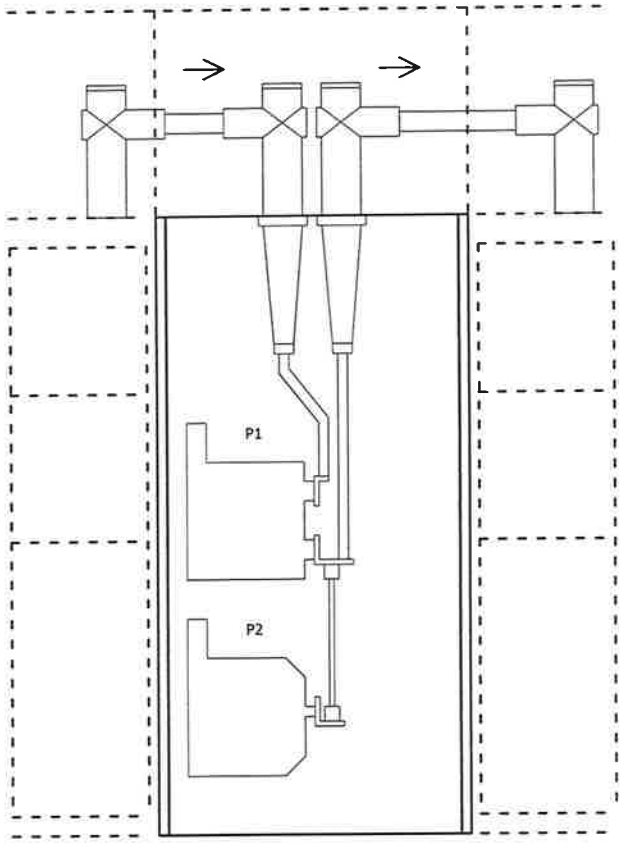

Rev.	Beskrivelse	Dato	Navn

Utført	nojahel	Prosjektnavn	24383 HÆHRE
Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V
Godkjent	GL	Arbeidsordre id.	JOHNNY RAFOSS
Dato	11.06.2015		

Kunde	SATEMA A/S	Basert på	
Sluttkunde		Dokument navn	
Ansv. (division/avdeling)	ABB AS, PPMV Skien	Tittel	KRETSSKJEMA OVERSIKT M

Ref. beskrivelse	= A02	+ A02	Språk	Skala	
Eksternt dok. id			NO		
Dokumentnr.	DCC	Side	Neste side		
1VDW302606 A0020		05	06		

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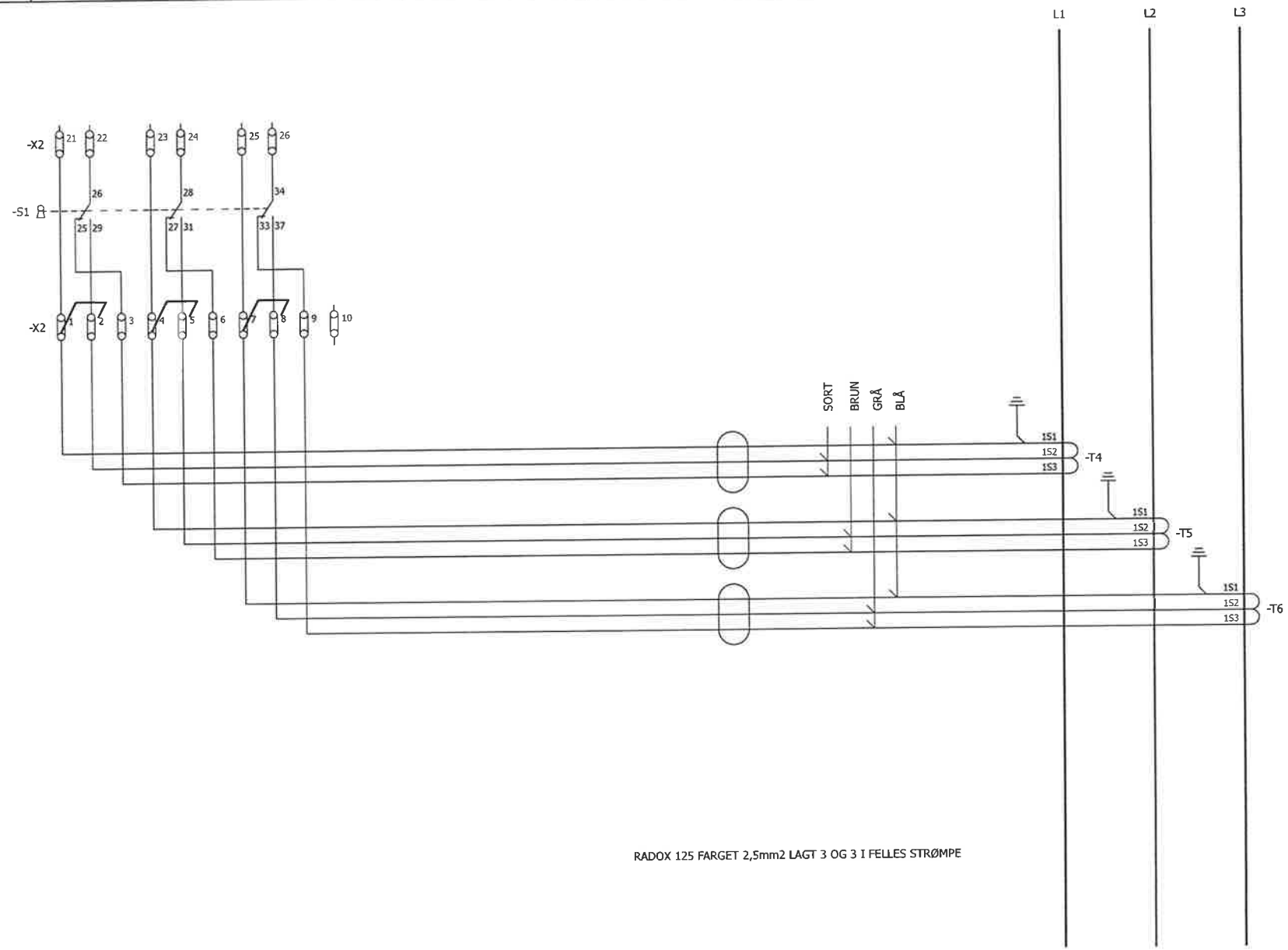

RADOX 125 FARGET 2,5mm2 LAGT 3 OG 3 I FELLES STRØMPE

Rev.	Beskrivelse	Dato	Navn
			Utført: nojahel
			Sjekket: OWS
			Godkjent: GL
			Dato: 11.06.2015

Prosjektnavn	24383 HÆHRE
Anleggsnavn	SafePlus C - M - C V
Arbeidsordre id.	JOHNNY RAFOSS
Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA STRØM MÅLING
Ref. beskrivelse	= A02 + A02
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0020
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Neste side	07
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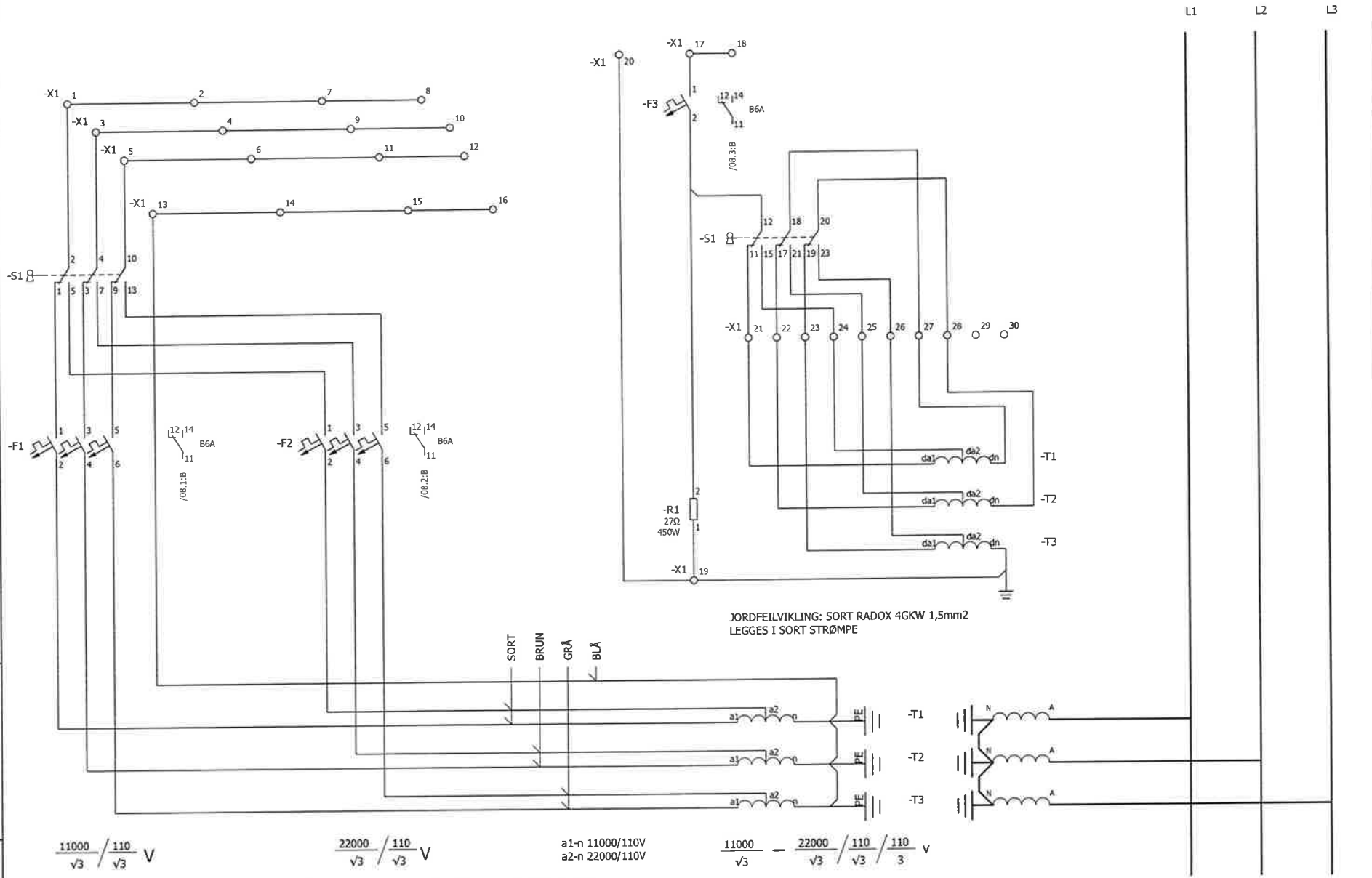
Skala	



JORDFEILVIKLING: SORT RADOX 4GKW 1,5mm2
LEGGES I SORT STRØMPE

$\frac{11000}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ V

$\frac{22000}{\sqrt{3}} / \frac{110}{\sqrt{3}}$ V

a1-n 11000/110V
a2-n 22000/110V

$\frac{11000}{\sqrt{3}} - \frac{22000}{\sqrt{3}} / \frac{110}{\sqrt{3}} / \frac{110}{3}$ V

MÅLEVIKLING: SORT RADOX 4GKW 1,5mm2 LEGGES I FARGET STRØMPE

				Utført	nojahel	Prosjektnavn	24383 HÆHRE	Kunde	SATEMA A/S	Basert på		Ref. beskrivelse = A02 + A02	Språk NO / Skala
				Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V	Sluttkunde		Dokument navn		Eksternt dok. id	
				Godkjent	GL			ABB	Ansv. (division/avdeling) ABB AS, PPMV Skien	Tittel	KRETSSKJEMA SPENNINGS MÅLING	Dokumentnr. 1VDW302606 A0020	DCC / Side 07 / Neste side 08
Rev.	Beskrivelse	Dato	Navn	Dato	11.06.2015	Arbeidsordre id.	JOHNNY RAFOSS						

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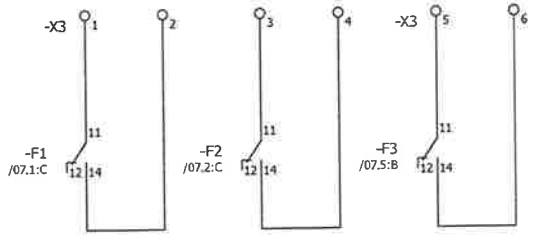
SIKRING
11kV MÅLEKRETS

SIKRING
22kV MÅLEKRETS

SIKRING
JORDFEILKRETS



Rev.	Beskrivelse	Dato	Navn

Utført	nojahel	Prosjektnavn	24383 HÆHRE
Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V
Godkjent	GL	Arbeidsordre id.	JOHNNY RAFOSS
Dato	11.06.2015		

Kunde	SATEMA A/S
Sluttkunde	
Ansv. (division/avdeling)	ABB AS, PPMV Skien
Basert på	
Dokument navn	
Tittel	KRETSSKJEMA SPENNINGS MÅLING
Ref. beskrivelse	= A02 + A02
Eksternt dok. id	
Dokumentnr.	1VDW302606 A0020
DCC	
Side	08
Neste side	09
Språk	NO
Skala	

Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
-F1	2CDS273001R0065	B6A	AUTOMATSIKRING S203M-B6 6A	/07.1:C	ABB	
-F2	2CDS273001R0065	B6A	AUTOMATSIKRING S203M-B6 6A	/07.2:C	ABB	
-F3	2CDS271001R0065.	B6A	AUTOMATSIKRING S201M-B6 6A	/07.5:B	ABB	
-R1	NZN 000576P1700	27Ω 450W	MOTSTAND 27 OHM 450W	/07.5:D	ALNÆS NYE	
-S1	4560383829		TO-STILLINGSVENDER CG8-A376-61-FT2	/07.1:B	KRAUS & NAIMER	
-T1	4560514483		SPG.TRANSF. TJC6 11000/√3-22000:√3/110:√3/110:3V a1-a2-n: 0-10VA 0,2 da1-da2-dn: 30VA CL. 3P	/07.6:E	ABB	
-T2	4560514483		SPG.TRANSF. TJC6 11000/√3-22000:√3/110:√3/110:3V a1-a2-n: 0-10VA 0,2 da1-da2-dn: 30VA CL. 3P	/07.6:E	ABB	
-T3	4560514483		SPG.TRANSF. TJC6 11000/√3-22000:√3/110:√3/110:3V a1-a2-n: 0-10VA 0,2 da1-da2-dn: 30VA CL. 3P	/07.6:E	ABB	
-T4	4560514483		STRØMTRANFORMATOR TPU60.13 75-150/5A S1-S2: 1-5VA CL. 0,2S Fs5 S1-S3: 1-5VA CL. 0,2S Fs5	/06.7:C	ABB	
-T5	4560514483		STRØMTRANFORMATOR TPU60.13 75-150/5A S1-S2: 1-5VA CL. 0,2S Fs5 S1-S3: 1-5VA CL. 0,2S Fs5	/06.7:D	ABB	
-T6	4560514483		STRØMTRANFORMATOR TPU60.13 75-150/5A S1-S2: 1-5VA CL. 0,2S Fs5 S1-S3: 1-5VA CL. 0,2S Fs5	/06.8:D	ABB	
-X1	GZN 590045R0001		UK 5N REKKEKLEMME 4MM2	/07.1:A;/07.1:B;/07.2:A;/07.2:B /07.3:A;/07.3:B;/07.4:A;/07.5:A /07.5:C;/07.5:D;/07.6:C	Phoenix	
-X2	GZN 590055R0001		URTK/S REKKEKLEMME 6MM2	/06.2:A;/06.2:B;/06.3:A;/06.3:B	Phoenix	

Rev.	Beskrivelse	Dato	Navn
			Utført nojahel
			Sjekket OWS
			Godkjent GL
			Dato 11.06.2015

Prosjektnavn 24383 HÆHRE
Anleggsnavn SafePlus C - M - C V
Arbeidsordre id. JOHNNY RAFOSS

Kunde SATEMA A/S
Sluttkunde
Ansv. (division/avdeling) ABB AS, PPMV Skien

Basert på
Dokument navn
Tittel KRETSSKJEMA APPARATLISTE

Ref. beskrivelse = A02 + A02
Eksternt dok. id
Dokumentnr. 1VDW302606 A0020
DCC
Side 09
Neste side 10
Språk NO
Skala

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Apparatliste

Komponentbetegnelse	ABB Identnummer	Funksjons text	Beskrivelse	Side referanse	Fabrikat	Pos
-X3	GZN 590045R0001		UK 5N REKKEKLEMME 4MM2	/08.1:B;/08.2:B;/08.3:B	Phoenix	

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Rev.	Beskrivelse	Dato	Navn

Utført: nojahel
Sjekket: OWS
Godkjent: GL
Dato: 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Arbeidsordre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:

ABB

Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på:
Dokument navn:

Tittel: KRETSSKJEMA APPARATLISTE

Ref. beskrivelse: = A02 + A02
Eksternt dok. id:

Dokumentnr.: 1VDW302606 A0020
DCC:
Side: 10
Neste side: 11

Språk: NO
Skala:

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REKKEKLEMMELISTE

-X1

APPARAT NR.	APPARAT BETEGNELSE / POTENSIAL/ FARGE
2	-S1
4	-S1
10	-S1
n	-T1
1	-F3
1	-R1
da1	-T1
da1	-T2
da1	-T3
da2	-T1
da2	-T2
da2	-T3
dn	-T1
dn	-T2

LEDNINGS- LASK / LASK	
	1
	2
	3
	4
	5
	6
	7
	8
-	9
-	10
-	11
-	12
	13
	14
	15
	16
	17
	18
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	20
-	21
-	22
-	23
-	24
-	25
-	26
-	27
-	28
-	29
-	30

POTENSIAL/ FARGE / APPARAT BETEGNELSE	APPARAT NR.
-T3	dn
-S1	11
-S1	17
-S1	19
-S1	15
-S1	21
-S1	23
-S1	18
-S1	20

SIDE	KLEMMETYPE
/07.1:A	UK 5N
/07.2:A	UK 5N
/07.1:B	UK 5N
/07.2:B	UK 5N
/07.1:B	UK 5N
/07.2:B	UK 5N
/07.2:A	UK 5N
/07.3:A	UK 5N
/07.3:B	UK 5N
/07.3:B	UK 5N
/07.3:B	UK 5N
/07.3:B	UK 5N
/07.1:B	UK 5N
/07.2:B	UK 5N
/07.3:B	UK 5N
/07.3:B	UK 5N
/07.5:A	UK 5N
/07.5:A	UK 5N
/07.5:D	UK 5N
/07.4:A	UK 5N
/07.5:C	UK 5N
/07.5:C	UK 5N
/07.5:C	UK 5N
/07.5:C	UK 5N
/07.6:C	UK 5N
/07.6:C	UK 5N
/07.6:C	UK 5N
/07.6:C	UK 5N
/07.6:C	UK 5N
/07.6:C	UK 5N

Rev.
Beskrivelse
Dato
Navn
Utført
Sjekket
Godkjent
Dato
11.06.2015
GL
OWS
nojahel
Prosjektnavn
24383 HØHRE
Anleggsnavn
SafePlus C - M - C V
Arbeidsordre id.
JOHNNY RAFOSS
Kunde
SATEMA A/S
Slutbrukr
Ansv. (divisjon/avdeling)
ABB AS, PPMV Skien
Basert på
Dokument navn
Tittel
KRETSSKJEMA
REKKEKLEMMELISTE
Ref. beskrivelse = A02
Eksternt dokk. id
Dokumentnr.
1VDW302606 A0020
+ A02
DCC
Side
11
Språk
NO
Neste s.de
Skala

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REKKEKLEMMELISTE

-X2

APPARAT NR.	APPARAT BETEGNELSE	POTENSIAL/ FARGE	LEDNINGS- LASK	LASK	POTENSIAL/ FARGE	APPARAT BETEGNELSE	APPARAT NR.	SIDE	KLEMMETYPE
1S1		-T4			1			/06.2:B	URTK/S
1S2		-T1			2	-S1	29	/06.2:B	URTK/S
1S3		-T1			3	-S1	25	/06.2:B	URTK/S
1S1		-T5			4			/06.2:B	URTK/S
1S2		-T5			5	-S1	31	/06.2:B	URTK/S
1S3		-T2			6	-S1	27	/06.2:B	URTK/S
1S1		-T6			7			/06.3:B	URTK/S
1S2		-T6			8	-S1	37	/06.3:B	URTK/S
1S3		-T3			9	-S1	33	/06.3:B	URTK/S
					10			/06.3:B	URTK/S
					21			/06.2:A	URTK/S
26		-S1			22			/06.2:A	URTK/S
					23			/06.2:A	URTK/S
28		-S1			24			/06.2:A	URTK/S
					25			/06.3:A	URTK/S
34		-S1			26			/06.3:A	URTK/S

Utfert	nojahel	Prosjektnavn	24383 HÆHRE
Sjekket	OWS	Anleggsnavn	SafePlus C - M - C V
Godkjent	GL	Arbeidsordre id.	JOHNNY RAFOSS
Dato	11.06.2015	Kunde	SATEMA A/S
Sluttkunde		Basert på	
Ansv. (division/avdeling)	ABB AS, PPMV Skien	Dokument navn	
Tittel	KRETSSKJEMA REKKEKLEMMELISTE	Ref. beskrivelse	= A02 + A02
Eksternt dok. id		Dokumentnr.	1VDW302606 A0020
DCC		Side	12
Språk	NO	Skala	
Neste side	13		

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REKKEKLEMMELISTE

-X3

APPARAT BETEGNELSE APPARAT NR.	POTENSIAL/ FARGE	LEDNINGS- LASK LASK		POTENSIAL/ FARGE	APPARAT NR. APPARAT BETEGNELSE		SIDE	KLEMMETYPE
11	-F1	-	1				/08.1:B	UK 5N
14	-F1	-	2				/08.2:B	UK 5N
11	-F2	-	3				/08.2:B	UK 5N
14	-F2	-	4				/08.2:B	UK 5N
11	-F3	-	5				/08.3:B	UK 5N
14	-F3	-	6				/08.3:B	UK 5N

Rev.	Beskrivelse	Dato	Navn
			Utført: nojahel
			Sjekket: OWS
			Godkjent: GL
			Dato: 11.06.2015

Prosjektnavn: 24383 HÆHRE
Anleggsnavn: SafePlus C - M - C V
Artikkelsondre id.: JOHNNY RAFOSS

Kunde: SATEMA A/S
Sluttkunde:
Ansv. (division/avdeling): ABB AS, PPMV Skien

Basert på
Dokument navn: KRETSSKJEMA
Tittel: REKKEKLEMMELISTE

Ref. beskrivelse: = A02
Etablert dokl. id: + A02
Dokumentnr.: 1VDW302606 A0020
DCC:
Side: 13
Neste side: =A03+A03/05

Språk: NO
Skala:

Job No.: 516189
Order No.: 4560514483

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5215010042
Highest voltage: 24.0 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-10-0-10/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2015

TESTS:

1. Power-frequency voltage withstand tests on primary terminals acc.to IEC 61869-3 clause 7.3.1
   Common mode (separate source) power frequency withstand test acc.to IEC 61869-3 clause 7.3.1.302
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
2. Differential mode (induced) AC voltage test acc. to IEC 61869-3 clause 7.3.1.303
   Test value: 50.0 kV, 100 Hz, 1 minute
   Conclusion: Satisfactory
3. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
4. Power-frequency voltage withstand test on secondary terminals acc.to IEC 61869-3 clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
5. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-10-0-10 VA/class 0,2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory
6. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory

The voltage transformer complies with tests required according to IEC Publications 61869-3.

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619 00 Brno, Vídeňská 117
Řízení jakosti

Brno, the: 17.06.2015

Ing. Radek Bártek

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Job No.: 516189
Order No.: 4560514483

Measurements with Automatic Transformer Test Set, ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5215010042

Test Object: TJC6:E43936599
Nominal Freq.: 50 Hz
Date: 17.06.2015 Operator: Jan Hlavac

Winding No.	PXR//SXR(V)	Burden(VA)	COS ß	% Un	ei(%)	di(min)	Burden of other winding (VA)
1	11000/√3//110/√3	10,00	0,80	120	-0.164	-3.189	0,00
1	11000/√3//110/√3	10,00	0,80	100	-0.169	-3.232	0,00
1	11000/√3//110/√3	10,00	0,80	80	-0.177	-3.259	0,00
1	11000/√3//110/√3	0,00	0,80	120	0.159	-1.011	0,00
1	11000/√3//110/√3	0,00	0,80	100	0.155	-1.071	0,00
1	11000/√3//110/√3	0,00	0,80	80	0.150	-1.140	0,00
2	22000/√3//110/√3	10,00	0,80	120	0.066	-0.729	0,00
2	22000/√3//110/√3	10,00	0,80	100	0.065	-0.794	0,00
2	22000/√3//110/√3	10,00	0,80	80	0.062	-0.854	0,00
2	22000/√3//110/√3	0,00	0,80	120	0.173	-0.942	0,00
2	22000/√3//110/√3	0,00	0,80	100	0.172	-1.021	0,00
2	22000/√3//110/√3	0,00	0,80	80	0.170	-1.101	0,00
3	11000/√3//110/3	30,00	0,80	190	-0.749	7.387	0,00
3	11000/√3//110/3	30,00	0,80	100	-0.754	5.465	0,00
3	11000/√3//110/3	30,00	0,80	5	-1.050	13.852	0,00
3	11000/√3//110/3	7,50	0,80	190	0.121	0.901	0,00
3	11000/√3//110/3	7,50	0,80	100	0.106	0.946	0,00
3	11000/√3//110/3	7,50	0,80	5	-0.042	3.523	0,00
4	22000/√3//110/3	30,00	0,80	190	-0.825	6.368	0,00
4	22000/√3//110/3	30,00	0,80	100	-0.822	5.132	0,00
4	22000/√3//110/3	30,00	0,80	5	-0.955	9.505	0,00
4	22000/√3//110/3	7,50	0,80	190	-0.492	1.336	0,00
4	22000/√3//110/3	7,50	0,80	100	-0.489	0.910	0,00
4	22000/√3//110/3	7,50	0,80	5	-0.577	2.207	0,00

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Phone: + 420 5 4715 2609
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Job No.: 516189
Order No.: 4560514483

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5215010043
Highest voltage: 24.0 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-10-0-10/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2015

TESTS:

1. Power-frequency voltage withstand tests on primary terminals acc.to IEC 61869-3 clause 7.3.1
   Common mode (separate source) power frequency withstand test acc.to IEC 61869-3 clause 7.3.1.302
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
2. Differential mode (induced) AC voltage test acc. to IEC 61869-3 clause 7.3.1.303
   Test value: 50.0 kV, 100 Hz, 1 minute
   Conclusion: Satisfactory
3. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
4. Power-frequency voltage withstand test on secondary terminals acc.to IEC 61869-3 clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
5. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-10-0-10 VA/class 0,2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory
6. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory

The voltage transformer complies with tests required according to IEC Publications 61869-3.

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619 00 Brno, Vídeňská 117
Řízení jakosti

Brno, the: 17.06.2015

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Phone: + 420 5 4715 2609
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Job No.: 516189
Order No.: 4560514483

Measurements with Automatic Transformer Test Set, ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5215010043

Test Object: TJC6:E43936599
Nominal Freq.: 50 Hz
Date: 17.06.2015 Operator: Radek Putna

Winding No.	PXR//SXR(V)	Burden(VA)	COS ß	% Un	ei(%)	di(min)	Burden of other winding (VA)
1	11000/√3//110/√3	10,00	0,80	120	-0.154	-3.262	0,00
1	11000/√3//110/√3	10,00	0,80	100	-0.156	-3.315	0,00
1	11000/√3//110/√3	10,00	0,80	80	-0.160	-3.344	0,00
1	11000/√3//110/√3	0,00	0,80	120	0.169	-1.077	0,00
1	11000/√3//110/√3	0,00	0,80	100	0.168	-1.158	0,00
1	11000/√3//110/√3	0,00	0,80	80	0.166	-1.222	0,00
2	22000/√3//110/√3	10,00	0,80	120	0.054	-0.362	0,00
2	22000/√3//110/√3	10,00	0,80	100	0.060	-0.602	0,00
2	22000/√3//110/√3	10,00	0,80	80	0.064	-0.803	0,00
2	22000/√3//110/√3	0,00	0,80	120	0.161	-0.590	0,00
2	22000/√3//110/√3	0,00	0,80	100	0.167	-0.842	0,00
2	22000/√3//110/√3	0,00	0,80	80	0.172	-1.064	0,00
3	11000/√3//110/3	30,00	0,80	190	-0.751	7.129	0,00
3	11000/√3//110/3	30,00	0,80	100	-0.745	4.982	0,00
3	11000/√3//110/3	30,00	0,80	5	-1.007	13.284	0,00
3	11000/√3//110/3	7,50	0,80	190	0.121	0.965	0,00
3	11000/√3//110/3	7,50	0,80	100	0.117	0.768	0,00
3	11000/√3//110/3	7,50	0,80	5	0.007	3.227	0,00
4	22000/√3//110/3	30,00	0,80	190	-0.849	7.493	0,00
4	22000/√3//110/3	30,00	0,80	100	-0.827	5.366	0,00
4	22000/√3//110/3	30,00	0,80	5	-0.930	9.221	0,00
4	22000/√3//110/3	7,50	0,80	190	-0.514	2.426	0,00
4	22000/√3//110/3	7,50	0,80	100	-0.491	1.116	0,00
4	22000/√3//110/3	7,50	0,80	5	-0.544	2.285	0,00

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Phone: + 420 5 4715 2609
Fax: + 420 5 4715 2626

Job No.: 516189
Order No.: 4560514483

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5215010044
Highest voltage: 24.0 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-10-0-10/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2015

TESTS:

1. Power-frequency voltage withstand tests on primary terminals acc.to IEC 61869-3 clause 7.3.1
   Common mode (separate source) power frequency withstand test acc.to IEC 61869-3 clause 7.3.1.302
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
2. Differential mode (induced) AC voltage test acc. to IEC 61869-3 clause 7.3.1.303
   Test value: 50.0 kV, 100 Hz, 1 minute
   Conclusion: Satisfactory
3. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
4. Power-frequency voltage withstand test on secondary terminals acc.to IEC 61869-3 clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 minute
   Conclusion: Satisfactory
5. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-10-0-10 VA/class 0,2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory
6. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory

The voltage transformer complies with tests required according to IEC Publications 61869-3.

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Řízení jakosti

Brno, the: 17.06.2015

Ing. Radek Bártek

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Job No.: 516189
Order No.: 4560514483

Measurements with Automatic Transformer Test Set, ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5215010044

Test Object: TJC6:E43936599
Nominal Freq.: 50 Hz
Date: 17.06.2015 Operator: Jiri Tesarek

Winding No.	PXR//SXR(V)	Burden(VA)	COS ß	% Un	ei(%)	di(min)	Burden of other winding (VA)
1	11000/√3//110/√3	10,00	0,80	120	-0.161	-3.400	0,00
1	11000/√3//110/√3	10,00	0,80	100	-0.167	-3.409	0,00
1	11000/√3//110/√3	10,00	0,80	80	-0.174	-3.400	0,00
1	11000/√3//110/√3	0,00	0,80	120	0.162	-1.169	0,00
1	11000/√3//110/√3	0,00	0,80	100	0.159	-1.199	0,00
1	11000/√3//110/√3	0,00	0,80	80	0.153	-1.229	0,00
2	22000/√3//110/√3	10,00	0,80	120	0.068	-0.986	0,00
2	22000/√3//110/√3	10,00	0,80	100	0.067	-1.033	0,00
2	22000/√3//110/√3	10,00	0,80	80	0.064	-1.075	0,00
2	22000/√3//110/√3	0,00	0,80	120	0.175	-1.191	0,00
2	22000/√3//110/√3	0,00	0,80	100	0.174	-1.254	0,00
2	22000/√3//110/√3	0,00	0,80	80	0.172	-1.308	0,00
3	11000/√3//110/3	30,00	0,80	190	-0.745	6.739	0,00
3	11000/√3//110/3	30,00	0,80	100	-0.749	4.912	0,00
3	11000/√3//110/3	30,00	0,80	5	-1.022	13.191	0,00
3	11000/√3//110/3	7,50	0,80	190	0.122	0.593	0,00
3	11000/√3//110/3	7,50	0,80	100	0.108	0.709	0,00
3	11000/√3//110/3	7,50	0,80	5	-0.014	3.175	0,00
4	22000/√3//110/3	30,00	0,80	190	-0.825	6.053	0,00
4	22000/√3//110/3	30,00	0,80	100	-0.820	4.833	0,00
4	22000/√3//110/3	30,00	0,80	5	-0.941	9.026	0,00
4	22000/√3//110/3	7,50	0,80	190	-0.495	1.078	0,00
4	22000/√3//110/3	7,50	0,80	100	-0.488	0.657	0,00
4	22000/√3//110/3	7,50	0,80	5	-0.561	2.111	0,00

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Job No.: 516189
Order No.: 4560514483

ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5115034656

Type: TPU 60.13
Accuracy class: 0.2SFS5
Rated ratio: 75-150//5 A
Output: 1-5-1-5 VA
Rated short-time thermal current: 21 kA [1s]
Rated dynamic current: 52.50 kA

Highest voltage: 24 kV

Year of production: 2015

Icth: 180 A
Ambient temperature: 40 °C
Rated frequency: 50 Hz

TESTS:

1. Verification of marking acc. to clause 7.3.6
   Conclusion: Satisfactory
2. Power-frequency voltage withstand test on primary terminals acc. to clause 7.3.1
   Test value: 50 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
3. Partial discharge measurement acc. to clause 7.3.2
   Conclusion: Satisfactory
4. Power-freguency voltage withstand test on secondary terminals acc. to clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
5. Inter-turn overvoltage test acc. to clause 7.3.204
   Conclusion: Satisfactory
6. Tests for accuracy acc. to clause 7.3.5
   Winding I.: 1-5-1-5 VA/ class 0.2SFS5, ext.120-120%
   Conclusion: Satisfactory

The current transformer complies with tests required according to:
IEC 61869-2

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Řízení jakosti

Brno, the: 18.6.2015

Ing. Radek Bártek

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Job No.: 516189
Order No.: 4560514483

ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5115034656

Test Object: TPU 60.13; 75-150//5 A, ext.120 %; 1-5-1-5 VA; cl.0.2SFS5
Rated frequency: 50 Hz
Date: 18.6.2015

Operator: M Matusek

Terminals	Class	PXR/SXR [A]	Burden [VA]	COS φ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	0.8	120	0.0789	0.7
S1-S2	0.2S	75/5	5	0.8	100	0.0773	0.49
S1-S2	0.2S	75/5	5	0.8	20	-0.0063	2.74
S1-S2	0.2S	75/5	5	0.8	5	-0.0485	8.42
S1-S2	0.2S	75/5	5	0.8	1	-0.0245	12.83
S1-S2	0.2S	75/5	1.25	1	120	0.1259	1.01
S1-S2	0.2S	75/5	1.25	1	100	0.1239	1.34
S1-S2	0.2S	75/5	1.25	1	20	0.1157	3.8
S1-S2	0.2S	75/5	1.25	1	5	0.1569	6.31
S1-S2	0.2S	75/5	1.25	1	1	0.1633	7.23
S1-S3	0.2S	150/5	5	0.8	120	0.05	0.18
S1-S3	0.2S	150/5	5	0.8	100	0.0449	0.49
S1-S3	0.2S	150/5	5	0.8	20	0.0264	2.02
S1-S3	0.2S	150/5	5	0.8	5	0.0328	3.68
S1-S3	0.2S	150/5	5	0.8	1	0.0352	4.38
S1-S3	0.2S	150/5	1.25	1	120	0.0631	0.47
S1-S3	0.2S	150/5	1.25	1	100	0.0631	0.68
S1-S3	0.2S	150/5	1.25	1	20	0.0666	1.9
S1-S3	0.2S	150/5	1.25	1	5	0.083	2.68
S1-S3	0.2S	150/5	1.25	1	1	0.0849	2.92

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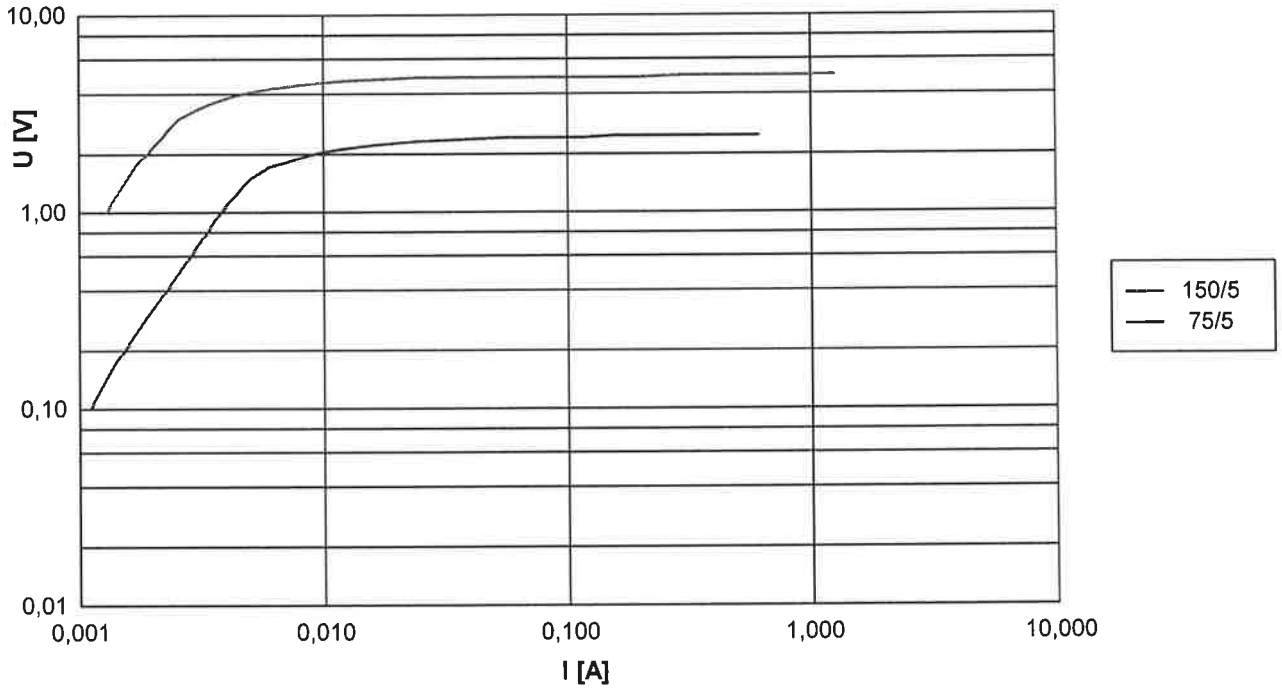
EXCITATION CURVE

Production number: 1VLT5115034656



Core	Ipr/Isr [A]	Class	Rct (75°C) [Ω]		Uknee [V]		Iknee [A]		FS		ALF	
			Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured
1	75/5	0.2S	-	0.061	-	1.95	-	0.0085	<5	1.989	-	-
1	150/5	0.2S	-	0.143	-	3.90	-	0.0042	<5	3.113	-	-

Frequency: 50 Hz
Operator: M Matusek
Date: 18.6.2015

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ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5115034657

Type: TPU 60.13
Accuracy class: 0.2SFS5
Rated ratio: 75-150//5 A
Output: 1-5-1-5 VA
Rated short-time thermal current: 21 kA [1s]
Rated dynamic current: 52.50 kA

Highest voltage: 24 kV

Year of production: 2015

Icth: 180 A
Ambient temperature: 40 °C
Rated frequency: 50 Hz

TESTS:

1. Verification of marking acc. to clause 7.3.6
   Conclusion: Satisfactory
2. Power-frequency voltage withstand test on primary terminals acc. to clause 7.3.1
   Test value: 50 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
3. Partial discharge measurement acc. to clause 7.3.2
   Conclusion: Satisfactory
4. Power-freguency voltage withstand test on secondary terminals acc. to clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
5. Inter-turn overvoltage test acc. to clause 7.3.204
   Conclusion: Satisfactory
6. Tests for accuracy acc. to clause 7.3.5
   Winding I.: 1-5-1-5 VA/ class 0.2SFS5, ext.120-120%
   Conclusion: Satisfactory

The current transformer complies with tests required according to:
IEC 61869-2

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Brno, the: 17.6.2015

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Job No.: 516189
Order No.: 4560514483

ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5115034657

Test Object: TPU 60.13; 75-150//5 A, ext.120 %; 1-5-1-5 VA; cl.0.2SFS5
Rated frequency: 50 Hz
Date: 17.6.2015 Operator: Jiri Kotlan

Terminals	Class	PXR/SXR [A]	Burden [VA]	COS φ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	0.8	120	0.0928	0.48
S1-S2	0.2S	75/5	5	0.8	100	0.0938	0.04
S1-S2	0.2S	75/5	5	0.8	20	0.0254	1.76
S1-S2	0.2S	75/5	5	0.8	5	-0.015	6.81
S1-S2	0.2S	75/5	5	0.8	1	0.009	10.93
S1-S2	0.2S	75/5	1.25	1	120	0.1299	0.81
S1-S2	0.2S	75/5	1.25	1	100	0.1274	0.9
S1-S2	0.2S	75/5	1.25	1	20	0.1179	2.9
S1-S2	0.2S	75/5	1.25	1	5	0.1512	5.46
S1-S2	0.2S	75/5	1.25	1	1	0.1574	6.16
S1-S3	0.2S	150/5	5	0.8	120	0.055	0.16
S1-S3	0.2S	150/5	5	0.8	100	0.054	0.09
S1-S3	0.2S	150/5	5	0.8	20	0.0356	0.98
S1-S3	0.2S	150/5	5	0.8	5	0.0386	2.66
S1-S3	0.2S	150/5	5	0.8	1	0.0345	3.21
S1-S3	0.2S	150/5	1.25	1	120	0.0664	0.32
S1-S3	0.2S	150/5	1.25	1	100	0.0656	0.37
S1-S3	0.2S	150/5	1.25	1	20	0.0639	1.17
S1-S3	0.2S	150/5	1.25	1	5	0.0791	1.99
S1-S3	0.2S	150/5	1.25	1	1	0.0793	2.17

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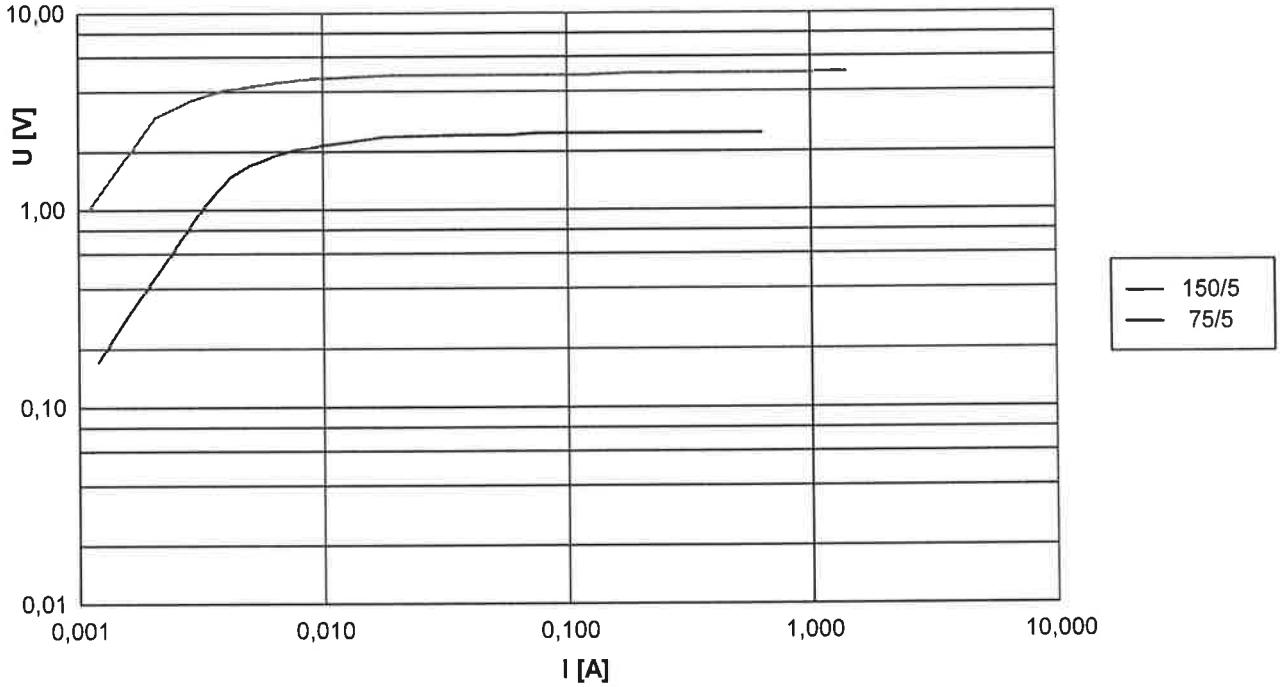
EXCITATION CURVE

Production number: 1VLT5115034657



Core	Ipr/Isr [A]	Class	Rct (75°C) [Ω]		Uknee [V]		Iknee [A]		FS		ALF	
			Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured
1	75/5	0.2S	-	0.061	-	1.98	-	0.0071	<5	1.995	-	-
1	150/5	0.2S	-	0.142	-	3.97	-	0.0036	<5	3.131	-	-

Frequency: 50 Hz
Operator: Jiri Kotlan
Date: 17.6.2015

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Order No.: 4560514483

ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5115034658

Type: TPU 60.13
Accuracy class: 0.2SFS5
Rated ratio: 75-150//5 A
Output: 1-5-1-5 VA
Rated short-time thermal current: 21 kA [1s]
Rated dynamic current: 52.50 kA

Highest voltage: 24 kV

Year of production: 2015

Icth: 180 A
Ambient temperature: 40 °C
Rated frequency: 50 Hz

TESTS:

1. Verification of marking acc. to clause 7.3.6
   Conclusion: Satisfactory
2. Power-frequency voltage withstand test on primary terminals acc. to clause 7.3.1
   Test value: 50 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
3. Partial discharge measurement acc. to clause 7.3.2
   Conclusion: Satisfactory
4. Power-freguency voltage withstand test on secondary terminals acc. to clause 7.3.4
   Test value: 3 kV, 50 Hz, 1 min.
   Conclusion: Satisfactory
5. Inter-turn overvoltage test acc. to clause 7.3.204
   Conclusion: Satisfactory
6. Tests for accuracy acc. to clause 7.3.5
   Winding I.: 1-5-1-5 VA/ class 0.2SFS5, ext.120-120%
   Conclusion: Satisfactory

The current transformer complies with tests required according to:
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ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5115034658

Test Object: TPU 60.13; 75-150//5 A, ext.120 %; 1-5-1-5 VA; cl.0.2SFS5
Rated frequency: 50 Hz
Date: 17.6.2015 Operator: Jiri Kotlan

Terminals	Class	PXR/SXR [A]	Burden [VA]	COS φ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	0.8	120	0.0757	0.51
S1-S2	0.2S	75/5	5	0.8	100	0.0718	0.47
S1-S2	0.2S	75/5	5	0.8	20	-0.0212	2.34
S1-S2	0.2S	75/5	5	0.8	5	-0.0909	8.33
S1-S2	0.2S	75/5	5	0.8	1	-0.051	14.72
S1-S2	0.2S	75/5	1.25	1	120	0.1234	1.03
S1-S2	0.2S	75/5	1.25	1	100	0.1204	1.43
S1-S2	0.2S	75/5	1.25	1	20	0.1122	4.23
S1-S2	0.2S	75/5	1.25	1	5	0.1501	7.17
S1-S2	0.2S	75/5	1.25	1	1	0.1702	8.15
S1-S3	0.2S	150/5	5	0.8	120	0.0465	0.28
S1-S3	0.2S	150/5	5	0.8	100	0.0402	0.59
S1-S3	0.2S	150/5	5	0.8	20	0.0165	2.03
S1-S3	0.2S	150/5	5	0.8	5	0.0209	4.13
S1-S3	0.2S	150/5	5	0.8	1	0.037	5.11
S1-S3	0.2S	150/5	1.25	1	120	0.0615	0.52
S1-S3	0.2S	150/5	1.25	1	100	0.0606	0.75
S1-S3	0.2S	150/5	1.25	1	20	0.0613	2.06
S1-S3	0.2S	150/5	1.25	1	5	0.0834	3.12
S1-S3	0.2S	150/5	1.25	1	1	0.0896	3.33

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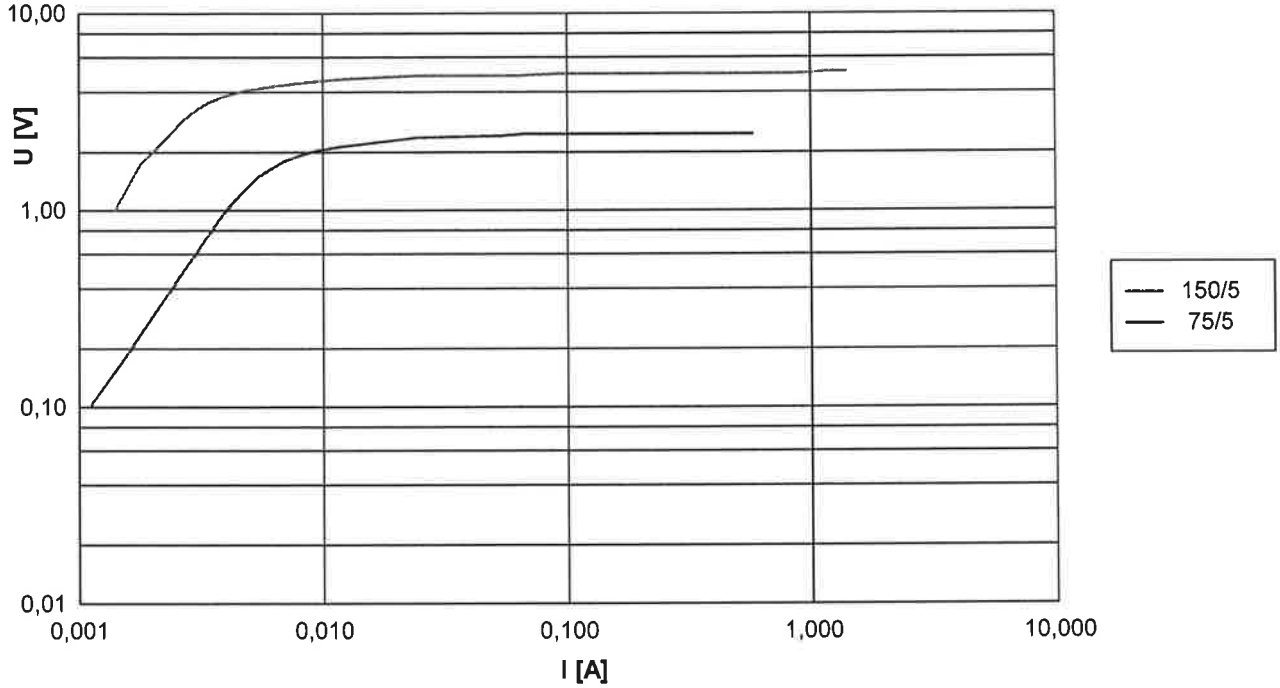
EXCITATION CURVE

Production number: 1VLT5115034658



Core	Ipr/Isr [A]	Class	Rct (75°C) [Ω]		Uknee [V]		Iknee [A]		FS		ALF	
			Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured	Rated	Measured
1	75/5	0.2S	-	0.060	-	1.97	-	0.0086	<5	2.006	-	-
1	150/5	0.2S	-	0.142	-	3.95	-	0.0043	<5	3.144	-	-

Frequency: 50 Hz
Operator: Jiri Kotlan
Date: 17.6.2015

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Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

Primær Transformator

Transformatoren er av typen Steinkjer fra Norsk Transformator, 1250kVA 22/ 11//0,415kV (Dyn11)

Mating på primærsiden

Mating av transformator ved levering:

Spenning på primærside:	**22/11kV**
Trinn (Spennings regulering):	**7**

22kV Mating

- Utfør visuell kontroll av trafoen. Sjekk olje nivå
- Trinnvelger med 2 trin settes i "Trinn 1" (22kV)
- Trinnvelger med 7 trinn, trinnes slikt at sekundærspenningen blir ca 415V
    - Sekundærspenningen leses av voltmetre i betjeningsrommet
- Sjekk vern i SF6 anlegg (se avsnitt 3)

11kV Mating

- Utfør visuell kontroll av trafoen. Sjekk olje nivå
- Trinnvelger med 2 trinn settes i "Trinn 2" (11kV)
- Trinnvelger med 7 trinn, trinnes slikt at sekundærspenningen blir ca 415V
    - Sekundærspenningen leses av voltmetre i betjeningsrommet
- Sjekk vern i SF6 anlegg (se avsnitt 3)

Mating på sekundærsiden

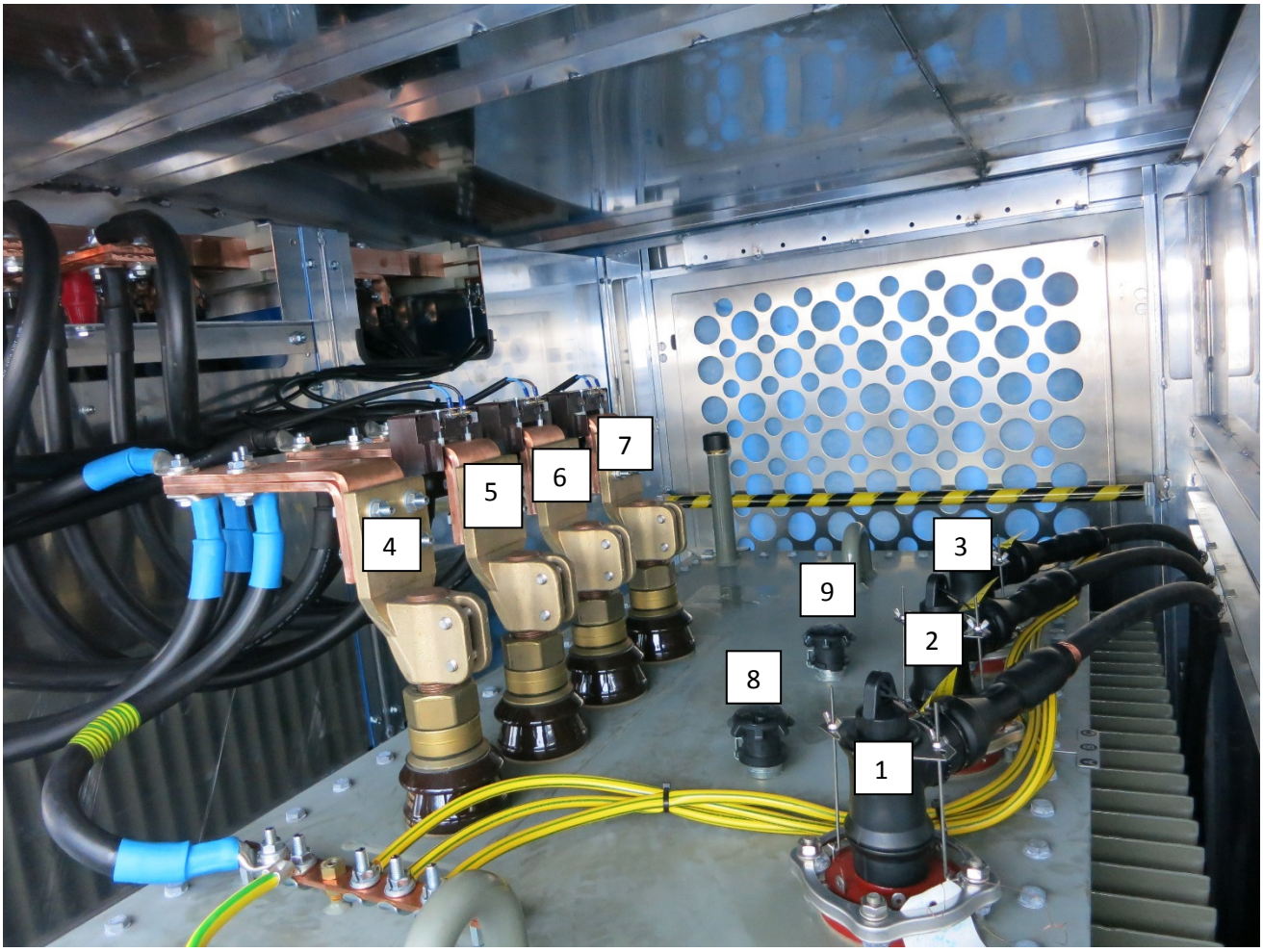
Transformatorens sekundærside (415V) forsyner kioskens 8 avganger og styrestrøm.

Maksimal belastning på transformatorens sekundærside er 1740 Ampere.

Det er svært viktig at effektbryterne innstilles slikt at transformatoren ikke blir overbelastet i lange perioder. Overbelastning betyr økt tap i transformeren (varme og økt driftskostnad), samt økt fare for feil. Langvarig overbelastning kan ødelegge transformatoren.

På sekundær siden er TN-S nett.

Oversiktsbilde:



1: 11/22V L1
2: 11/22kV L2
3: 11/22kV L3
4: 415V N
5: 415V L1
6: 415V L2
7: 415V L3
8: Trinnvelger 11/22kV
9: Spenningsjustering.

Hæhre Entreprenør AS
SATCON TA-F 1250kVA
Ordre nr: 24383
Kiosk 2

Kardex-kort

Norsk Transformator	Lnr	KVA	Per	Omsetning	På lager	Bør revideres	Olje bør prøves	Er overbelastet
		1250	**50**	**22000+2x2.5%-4x2,5% 11000+2x2.5%-4x2,5%/415V**				
	Revidert den							

Norsk Transformator AS Steinkjer - Norway		Omsetning Volt **22000**	**11000**	**415**	St	A - B - C Volt	A - B - C Volt
Kunde **Satema AS**		Normal str. Amp **32,80**	**65,61**	**1739**	1	**23 100**	**11 550**
Type **Steinkjer**		Po **1369**	**1369**		2	**22 550**	**11 275**
Fabr nr. **304869**	År **2015**	Pk 75 **8769**	**9487**		3	**22 000**	**11 000**
Total vekt **3480** kg	Total bredde **970** mm	Uz % **4,67**	**4,60**	xo **6,37** m Ω	4	**21 450**	**10 725**
Olje vekt **815** kg	Total lengde **1810** mm	Ur % **0,70**	**0,76**	ro **0,95** m Ω	5	**20 900**	**10 450**
Oljetype **Mineral**	Total høyde **1970** mm	Kobling og gruppe **Dyn11**			6	**20 350**	**10 175**
Omkobler **Utvendig**	Trans.hjul **Med**				7	**19 800**	**9 900**

Øverige opplysninger om utstyr etc. **Hermetisk tett, Malt, Berøringssikre HS-Gjennomføringer DIN 42358, Mrk. 24383 Hære**

Dato i drift	Dato ut av drift	Transformatorkrets nr/navn	Dato	Oljemerke	Syretal MgKOH/g	Gj.slag KV/cm	Slamdannelse
		Revider år					

L.nr	KVA	Per	Omsetning	På lager	Bør revideres	Olje bør prøves	Er overbelastet
	1250	**50**	**22000+2x2.5%-4x2,5% 11000+2x2.5%-4x2,5%/415V**				

Norsk Transformator AS Steinkjer — Prøveprotokoll for Transformator

Ordre nummer **83418**
Transformator nummer **304869**
Transformator type **Steinkjer**
Konstruksjons oppgave **300**
Normer **IEC 60076**
Dato **16.06.2015**

Kunde **Satema AS**

Ytelse (kVA) **1250** Frekvens (Hz) **50**
Spenning (kV) **22+2x2.5%-4x2,5%/11+2x2.5%-4x2,5%/0,415** Kobling **Dyn11**
Strøm (A) **33/66/1739**

Omsetning		
Stilling	1	2
1	**55,71**	**27,85**
2	**54,39**	**27,18**
3	**53,07**	**26,52**
4	**51,74**	**25,86**
5	**50,42**	**25,20**
6	**49,10**	**24,54**
7	**47,78**	**23,88**

Viklings motstand ved **20,0**°C

Mellom klemmer:

A B	B C	C A
2,2674	2,1921	2,1776
a b	b c	c a
0,5913	0,5532	0,5495
0,6428	0,6334	0,6646

Tomgangstap målt på viklinger med merkespenning **415**V ved **50**Hz

U mid.	U eff.	Strøm A	Strøm B	Strøm C	Strøm mid.	P0
417	**415**	**2,31**	**1,70**	**2,64**	**2,22**	**1362**

Kortslutningstap målt ved viklingstemperatur **20,1**°C og **50** Hz

Målt	Kortsl.	U eff.	Strøm A	Strøm B	Strøm C	Strøm mid.	Pk
22000	**415**	**618,0**	**19,67**	**19,91**	**19,79**	**19,79**	**2727**
11000	**415**	**301,6**	**38,98**	**39,42**	**39,19**	**39,20**	**2975**

Spenningsprøve mot jord og øvrige viklinger i 1 minutt

Merkespenning	**22,0 kV**	**11,0 kV**
Prøvespenning	**50 kV**	**28 kV**

Indusert 200Hz spenning i 30 sekunder

Mellom klemmer **a-b-c**
Prøvespenning **0.83** kV

Garantert og målte verdier referert til **75**°C viklingstemperatur.

Merkespenning	Ytelse		P0 (W)	Pk (W)	I0%	Ez%	Er%
V/V	kVA	Garantert	**0**	**0**			
22000/415	**1250**	Målt	**1369**	**8769**	**0,13**	**4,67**	**0,70**
11000/415	**1250**		**1369**	**9487**	**0,13**	**4,60**	**0,76**

Testet av: Godkjent av:

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

Lavspenning

415V avganger

Avgang 1: 630A (-Q1)

Effektbryter:	ABB T5N 630A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 2: 630A (-Q2)

Effektbryter:	ABB T5N 630A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 3: 630A (-Q3)

Effektbryter:	ABB T5N 630A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 4: 630A (-Q4)

Effektbryter:	ABB T5N 630A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 5: 400A (-Q5)

Effektbryter:	ABB T5N 400A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 6: 400A (-Q6)

Effektbryter:	ABB T5N 400A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	2x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 7: 250A (-Q7)

Effektbryter:	ABB T4N 250A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Jordfeildel:	RC222/4
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	1x240mm^2 Al/Cu
Moment:	31 Nm

Avgang 8: 250A (-Q8)

Effektbryter:	ABB T4N 250A 4-Pol
Vern:	PR221DS
Innstilling ved levering:	Innstilt på minimum
Jordfeildel:	RC222/4
Innstilling ved levering:	Innstilt på minimum
Kabelklemmer for utgående kabler:	1x240mm^2 Al/Cu
Moment:	31 Nm

Maksimal belastning på sekundærsiden er:1740 Ampere.

Det må tas hensyn til dette ved innstilling av bryterne.

For å kunne innstille vernet (PR221DS) på annet enn minimum, må man vite maksimal belastning på kursen og den minste kortslutningsstrøm (Ik_{min}) på enden av kursen.

Kortslutningseffekt:

Den maksimale kortslutningsstrøm på lavspenningssiden er beregnet til:

Ik_{max}= ca 20kA

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

Styrestrøm

Det er montert multimeter som viser strøm, spenning og effekt på anlegget. Multimeteret kan også stilles inn til flere funksjoner som, harmoniske strømmer, effekt topper, samt mange flere (se brukerveiledning).

Effektbryterne (-Q1 til –Q8) er utstyret med vern av typen PR221DS (ABB). Vernet løser bryterne ut ved eventuell overbelastning/kortslutning.

Styringen har følgende hovedkomponenter:

Kjennetegn:	Komponent:	Anvendelse:
-P1	Multimeter	Måler strøm/spenning/effekt på sekundærside.

Funksjon av styring

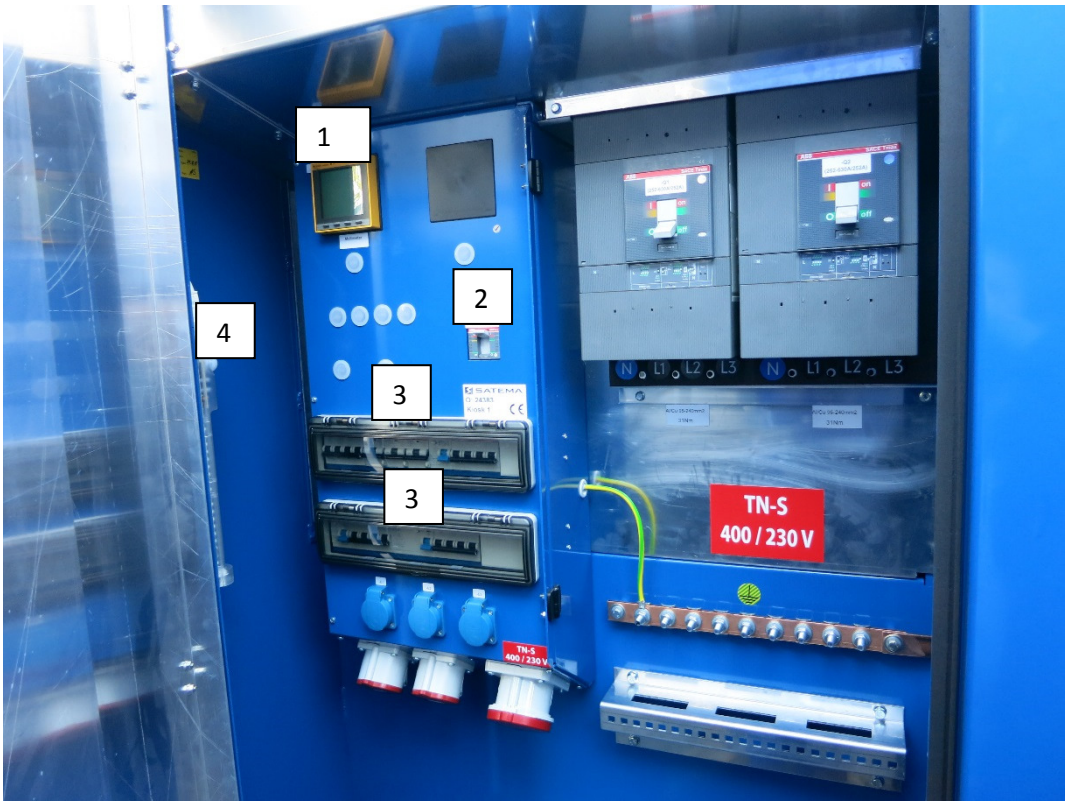
Feilfri tilstand:

I feilfri tilstand skal multimeteret vise ca. 400V og indikere eventuell belastning på avgangene. Det mulig å teste overbelastning/kortslutningsvernet (PR221). Hvis det trykkes på testknappen skal tilhørende effektbryter løse ut. Det anbefales at testfunksjonene på effektbryterne anvendes regelmessig.

Ved feil:

Ved overbelastning/kortslutning på en av avgangene, skal tilhørende effektbryter løse ut. Resterende avganger skal forbli i drift ved over-belastning eller kortslutning.

Oversiktsbilder styring / 400/230V fordeling:



1: Multimeter
2: Gruppebryter styrestrøm
3: Sikringer for styrestrøm og kontakter
4: Lysarmatur

Hæhre Entreprenør AS
SATCON TA-F 1250kVA
Ordre nr: 24383
Kiosk 2

4.6 Wiring diagram

Connect the device according the wiring diagram. The connections are located on the rear of the device.

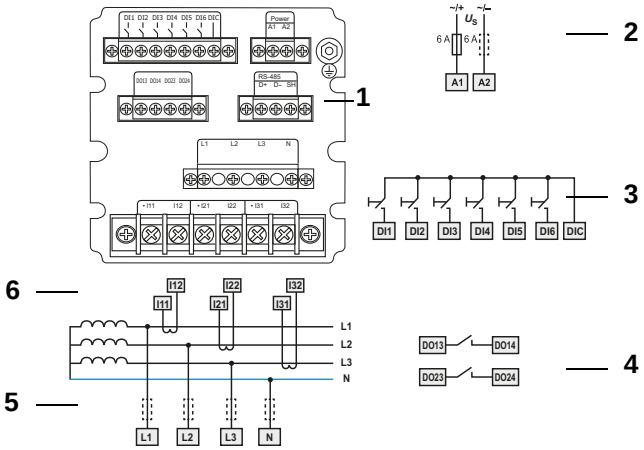


Fig. 4.4: Wiring diagram

Legend to wiring diagram

1	Connection RS-485 bus
2	Supply voltage. Power protection by a 6 A fuse, quick response. If being supplied from an IT system, both lines have to be protected by a fuse.
3	Digital inputs
4	Digital outputs (N/O contacts)
5	Measuring voltage inputs
6	Connection to the system to be monitored: The measuring leads should be protected with appropriate fuses.

4.7 Connection diagram voltage inputs

4.7.1 Three-phase 4-wire systems (TN, TT, IT systems)

The universal measuring device PEM533 can be used in 3-phase-4-wire systems, independent of the type of distribution system (TN, TT, IT system).

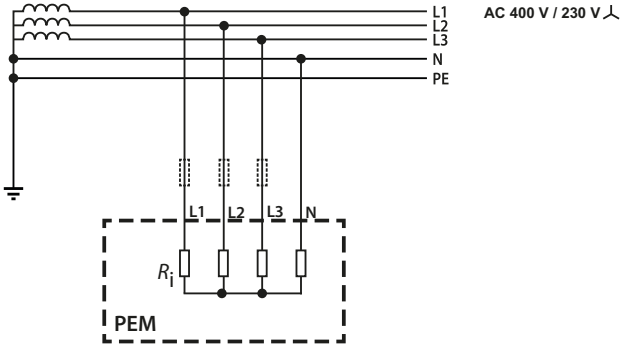


Fig. 4.5: Connection diagram three-phase 4-wire system (e.g. TN-S system)

4.7.2 Three-phase 3-wire system

The PEM can be used in three-phase 3-wire systems. The line conductor voltage must not exceed AC 400 V.

*When used in 3-wire systems, the connection type (**TYPE**) has to be set to delta connection **(DELTA,** page 40).*
*For this purpose, **the measuring inputs L2 and N** are to be **bridged**.*

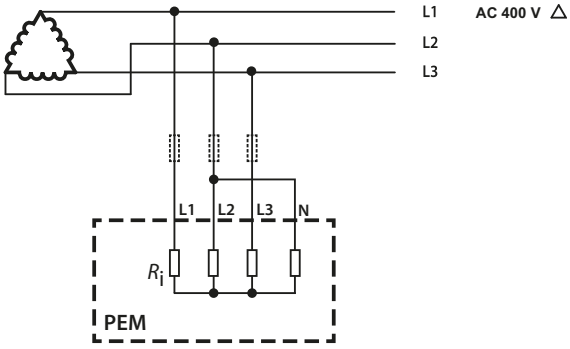


Fig. 4.6: Connection diagram three-phase 3-wire system

4.7.3 Connection via voltage transformers

The coupling via measuring current transformers allows the use of the measuring device in medium and high voltage systems. The transformation ratio can be adjusted in the PEM533 (1…2200).

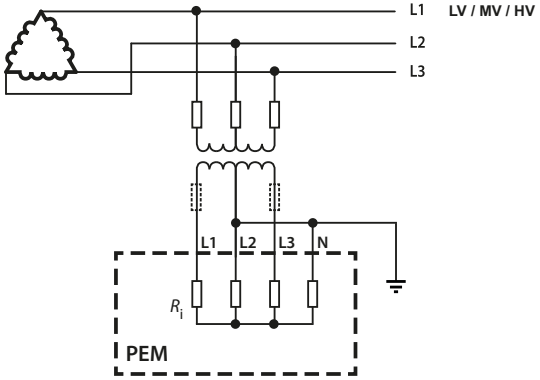
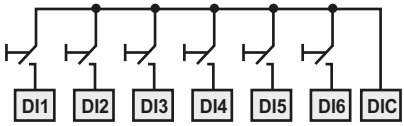


Fig. 4.7: Connection diagram 3-wire system via voltage transformers

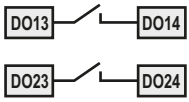
4.8 Digital inputs

The universal measuring device PEM533 provides 6 digital inputs. The inputs are supplied by a galvanically isolated DC 24 V voltage. Through an external wiring a current of at least I_{min} > 2.4 mA must flow in order to trigger the inputs.



4.9 Digital outputs

The universal measuring device PEM533 features 2 configurable outputs (N/O contact).



Rated operational voltage	AC 230 V	DC 24 V	AC 110 V	DC 12 V
Rated operational current	5 A	5 A	6 A	5 A

6. Operation

6.1 Getting to know the operating elements

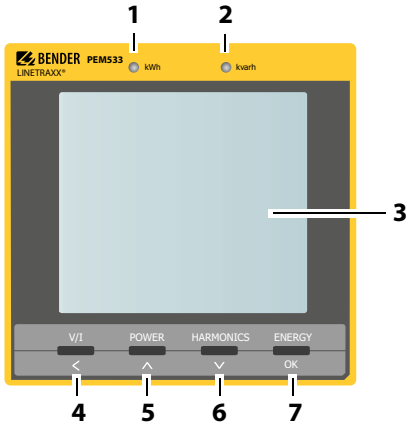


Fig. 6.1: Operating elements

Legend to operating elements

No.	Element	Description
1	LED kWh	Pulse output, See “LED indication” on page 32.
2	LED kvarh	
3	LC display	
4	"V/I" button <	Display mean values and total values (current, voltage) in the menu: in case of numerical values: move the cursor one position to the left
5	"POWER" button ∧	Display power-related measured quantities in the menu: go up one entry in case of numerical values: increase the value

6	"HARMONICS" button V	Display harmonics in the menu: move down one entry in case of numerical values: reduce the value
7	"ENERGY" button OK	Press > 3 s: toggling between setup menu and standard display Display measured values: Active and reactive energy import / active and reactive energy export (line 5) in the menu: selection of the parameter to be edited confirm entry

6.2 LCD testing

Pressing both the "POWER" and "HARMONICS" buttons simultaneously for > 2 seconds enters the LCD testing mode. During testing, all LCD segments are illuminated for one second and then turned off for 1 second. This cycle will be repeated 3 times. After completion of the test run, the device automatically returns to its normal display mode.

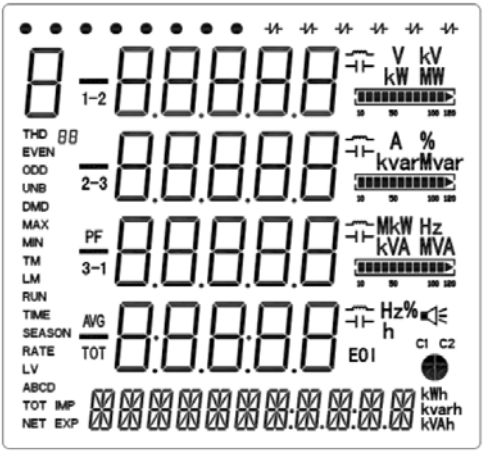


Fig. 6.2: Display during an LCD test

6.3 Getting to know standard display areas

The display can generally be divided into five areas.

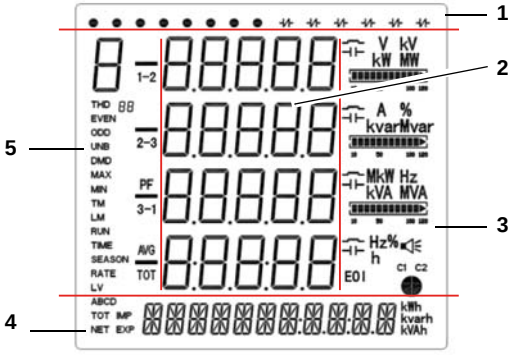


Fig. 6.3: Display areas

Legend to the display areas

1	Displays the indicators for digital input and output status (DI status, DO status)
2	Measured values
3	Harmonic Distortion HD, unbalance (unb), quadrant, measurement units
4	Displays energy information such as active energy (import, export, net energy and total energy in kWh), reactive energy (import, export, energy net amount and total energy in kvar), apparent energy (S_{ges} in kVAh)
5	Displays parameters relating to voltage, current, fundamental component, power, total harmonic distortion THD, TOHD, TEHD (2nd …31st harmonics) k-factor, unbalance (unb), phase angle for voltages and currents, demands

Description of standard display indications (ranges 1, 3 and 4)

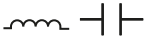
<table>
<tr><th>Area</th><th>Segments</th><th colspan="3">Symbol description</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2"></td><td colspan="2">DI open</td><td>DI closed</td></tr>
<tr><td colspan="2">DO open</td><td>DO closed</td></tr>
<tr><td rowspan="3">3</td><td rowspan="3"> </td><td colspan="2">V, kV, A, %, Hz
Measurement units for
U, I, THD, f</td><td>kW, MW, kvar,
kVA, MVA
Measurement units for
P, Q, S</td></tr>
<tr><td colspan="2">
Current value expressed as a percentage</td><td> 
inductive, capacitive</td></tr>
<tr><td>C1
Status communication interface</td><td>
Alarm symbol</td><td>
Quadrant</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3"> </td><td>IMP kWh
Active energy import</td><td>EXP kWh
Active energy export</td><td>NET kWh
Active energy net amount</td></tr>
<tr><td>TOT kWh
Total active energy</td><td>IMP kvarh
Reactive energy import</td><td>EXP kvarh
Reactive energy export</td></tr>
<tr><td>NET kvar
Reactive energy net amount</td><td>TOT kvarh
Total reactive energy</td><td>
Apparent energy</td></tr>
</table>

Fig. 6.4: Standard display indications

6.4 Power and current demand (Demand display)

The demands are indicated on the display according to the following scheme:

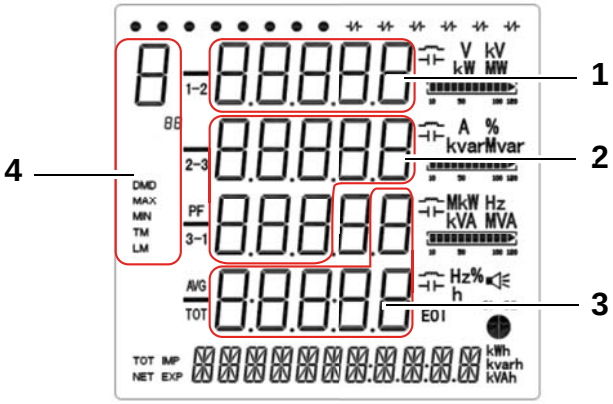


Fig. 6.5: Display: peak demand

No.	Description
1	Peak demand value
2	Peak demand timestamp (date): JJJJ.MM.TT
3	Peak demand timestamp (time): HH:MM:SS
4	Demand displays: **I1**: I1 **I2**: I2 **I3**: I3 **P**: Active power demand P **q**: Reactive power demand Q **S**: Apparent power demand **DMD**: Demand **MAX** Maximum **TM**: this month **LM**: last month

6.5 LED indication

The universal measuring device features two red LEDs on its front panel: kWh and kvarh.
The two LED indicators are used for the indication of kWh and kvar, if the EN PULSE function is enabled. The setting can be carried out in the setup menu using the buttons on the front or via the communications interface (only).
The LEDs flash each time a certain amount of energy is reached (1 kWh resp.1 kvarh).
The amount of energy displayed corresponds to the amount of energy converted by the measuring device. In order to determine the actual amount of energy, the flashing frequency can be calculated from the CT ratio and the pulse constant.

6.6 Standard display

The universal measuring device automatically shows the default display screen, if there is no button pressed for 3 minutes in the Setup mode.

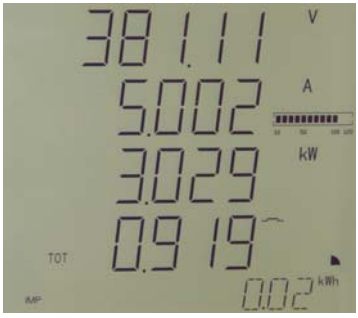


Fig. 6.6: Standard display

6.7 Data display

There are four buttons on the display to view measuring data: "V/I", "POWER , "HARMONICS" and "ENERGY". The following tables illustrate how to retrieve individual values.

6.7.1 "V/I" button

Left column	Right column	First line	Second line	Third line	Fourth line
TOT	V A W	Ø *U*	Ø *I*	P_{ges}	Power factor λ
U1 U2 U3 U_{AVG}	V	U_{L1}	U_{L2}	U_{L3}	Ø U_{LN}
U_{1-2} U_{2-3} U_{3-1} U_{AVG}	V	U_{L1L2}	U_{L2L3}	U_{L3L1}	Ø U_{LL}
I_1 I_2 I_3 I_{AVG}	A	I_1	I_2	I_3	Ø *I*
I_4	A		I_4		
F	Hz			*F*	
U unb	%		Unbalance *U*		
I unb	%		Unbalance *I*		
U1 PA U_2 U3		Phase angle U_{L1}	Phase angle U_{L2}	Phase angle U_{L3}	
I_1 PA I_2 I_3		Phase angle I_1	Phase angle I_2	Phase angle I_3	
I1 DMD I_2 I_3 I_{AVG}	A	Demand I_1	Demand I_2	Demand I_3	Ø Demand *I*
I_1 DMD MAX TM	A	Peak demand I_1 this month	JJJJ.MM.TT hh:mm:ss		
I_2 DMD MAX TM	A	Peak demand I_2 this month	JJJJ.MM.TT hh:mm:ss		
I_3 DMD MAX TM	A	Peak demand I_3 this month	JJJJ.MM.TT hh:mm:ss		

Left column	Right column	First line	Second line	Third line	Fourth line
I_1 DMD MAX LM	A	Peak demand I_1 last month	JJJJ.MM.TT hh:mm:ss		
I_2 DMD MAX LM	A	Peak demand I_2 last month	JJJJ.MM.TT hh:mm:ss		
I_3 DMD MAX LM	A	Peak demand I_3 last month	JJJJ.MM.TT hh:mm:ss		

Table 6.1: Display possibilities via the "V/I" button

6.7.2 "POWER" button

Left column	Right column	First line	Second line	Third line	Fourth line
* P_1 P_2 P_3 P_{TOT}	kW kW kW	P_{L1}^*	P_{L2}^*	P_{L3}^*	P_{ges}
*q_1 q2 q3 q_{TOT}	var var var	Q_{L1}^*	Q_{L2}^*	Q_{L3}^*	Q_{ges}
*S_1 S2 S3 S_{TOT}	kVA kVA kVA	S_{L1}^*	S_{L2}^*	S_{L3}^*	S_{ges}
*PF_1 PF_2 PF_3 PF_{TOT}		λ_{L1}^*	λ_{L2}^*	λ_{L3}^*	λ_{ges}
*dPF1 dPF2 dPF3 dTOT		Displacement factor cos $(\varphi)_{L1}^*$	Displacement factor cos $(\varphi)_{L2}^*$	Displacement factor cos $(\varphi)_{L3}^*$	
TOT	W var VA	P_{ges}	Q_{ges}	S_{ges}	λ_{ges}
DMD	W var VA	Demand *P*	Demand *Q*	Demand *S*	Demandλ

Left column	Right column	First line	Second line	Third line	Fourth line
P DMD MAX TM		Peak demand *P* this month	JJJJ.MM.TT hh:mm:ss		
Q DMD MAX TM	var	Peak demand *Q* this month	JJJJ.MM.TT hh:mm:ss		
S DMD MAX TM	VA	Peak demand *S* this month	JJJJ.MM.TT hh:mm:ss		
P DMD MAX LM	W	Peak demand *P* last month	JJJJ.MM.TT hh:mm:ss		
Q DMD MAX LM	var	Peak demand *Q* last month	JJJJ.MM.TT hh:mm:ss		
S DMD MAX LM	VA	Peak demand *S* last month	JJJJ.MM.TT hh:mm:ss		

Table 6.2: Display possibilities via the "POWER" button

Note:
* *In "DELTA" mode, the display is skipped.*

6.7.3 "HARMONICS" button

Left column	Right column	First line	Second line	Third line	Fourth line
THD U_1 U2 U3 U_{AVG}	%	THD_{UL1}	THD_{UL2}	THD_{UL3}	Ø THD_{ULN}
THD $_I$1 I_2 I_3 I_{AVG}	%	THD_{I1}	THD_{I2}	THD_{I3}	Ø THD_I
k 1 2 3		k-factor I_1	k-factor I_2	k-factor I_3	
U THD Even	%	$TEHD_{UL1}$	$TEHD_{UL2}$	$TEHD_{UL3}$	Ø $TEHD_{ULN}$
I THD Even		$TEHD_{I1}$	$TEHD_{I2}$	$TEHD_{I3}$	Ø $TEHD_I$
U THD ODD		$TOHD_{UL1}$	$TOHD_{UL2}$	$TOHD_{UL3}$	Ø $TOHD_{ULN}$
I THD ODD		$TOHD_{I1}$	$TOHD_{I2}$	$TOHD_{I3}$	Ø $TOHD_I$
HD2 U_1 U2 U3 U_{AVG}	%	2nd harmonic U_{L1}	2nd harmonic U_{L2}	2nd harmonic U_{L3}	Ø 2nd harmonic U_{LN}
HD2 I_1 I_2 I_3 I_{AVG}	%	2nd harmonic I_1	2nd harmonic I_2	2nd harmonic I_3	Ø 2nd harmonic I
HD3 U_1 U2 U3 U_{AVG}	%	3rd harmonic U_{L1}	3rd harmonic U_{L2}	3rd harmonic U_{L3}	Ø 3rd harmonic U_{LN}
...					

Left column	Right column	First line	Second line	Third line	Fourth line
HD31 U_1 U2 U3 U_{AVG}	%	31st harmonic U_{L1}	31st harmonic U_{L2}	31st harmonic U_{L3}	Ø 31st harmonic U_{LN}
HD31 I_1 I_2 I_3 I_{AVG}	%	31st harmonic I_1	31st harmonic I_2	31st harmonic I_3	Ø 31st harmonic I

Table 6.3: Display possibilities via the "HARMONICS" button

6.7.4 "ENERGY" button

Switches through the displays of the fifth line:

Left column	Right column	Value
IMP	kWh	Active energy import
EXP	kWh	Active energy export
nEt	kWh	Active energy net amount
TOT	kWh	Total active energy
IMP	kvarh	Reactive energy import
EXP	kvarh	Reactive energy export
nEt	kvarh	Reactive energy net amount
TOT	kvarh	Total reactive energy
S	kVAh	Apparent energy

Table 6.4: Display possibilities via the "ENERGY" button

6.8 Setup using the button at the device

Press the "ENERGY" button (> 3 s) to access the Setup mode.
Press the "ENERGY" button again (> 3 s) to return to the display mode.

*To change parameters you must first **enter the password**. (factory setting: 0)*

6.8.1 Setup: Function of the buttons

The meanings of the buttons in the SETUP mode are indicated below each button:

"**V / I"**
Arrow button "<": Moves the cursor to the left by one position if the parameter being changed is a numerical value

"**POWER"**
Arrow button "∧" : To move up in the menu or increments a value

"„**HARMONICS"**
Arrow button "∨ " : Goes back to the last parameter in the menu or decrements a numeric value.

"**ENERGY"**
Enter button: To confirm the value entered

6.8.2 Setup: Overview diagram menu

The following diagram will help you to familiarise yourself with the menu:

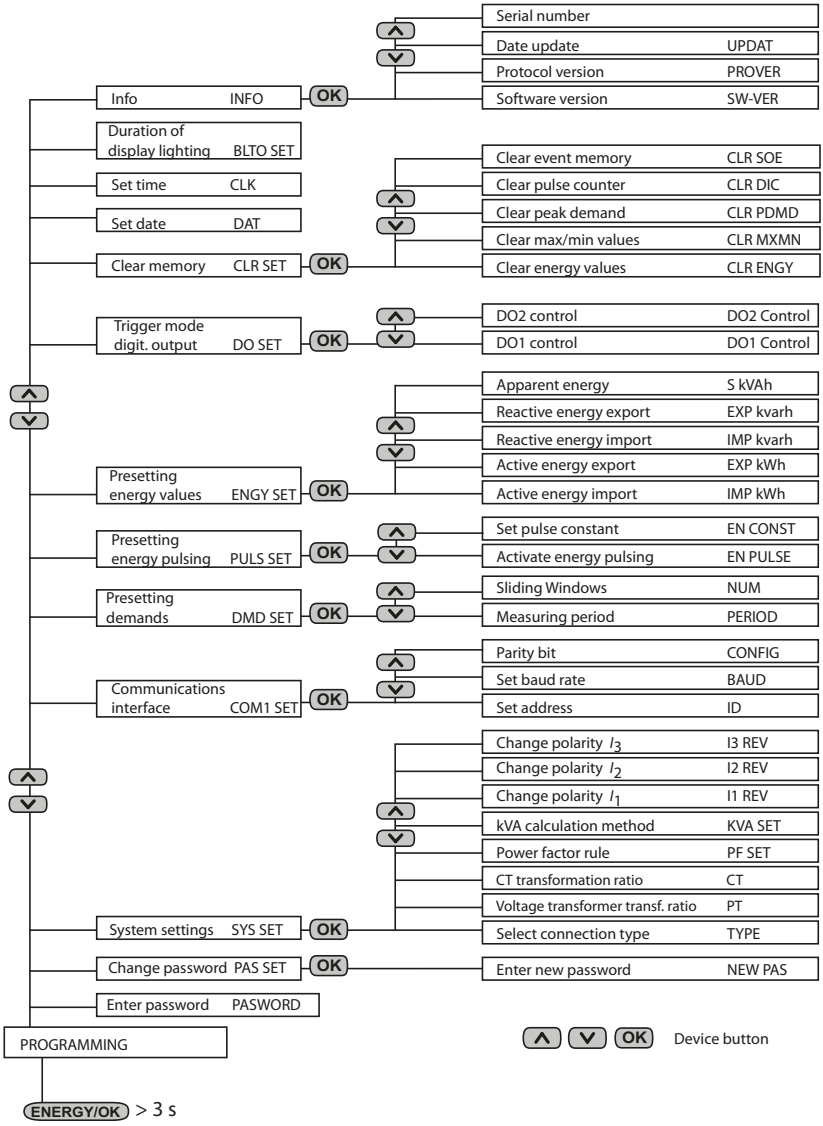


Fig. 6.7: Setup: Adjustment options

6.9 Setup: possibilities

The table shows the messages indicated on the display, their meaning and the setting possibilities.

Display entry Level 1 Level 2	Parameters	Description	Setting options	Factory setting
PROGRAM-MING	Setup mode			
PASWORD	Password	Enter password	/	0
PAS SET		Change password?	YES/NO	NO
NEW PAS	New password	Enter new password	0000…9999	0
SYS SET	System settings		YES/NO	NO
Type	Type of connection	Select type of connection	WYE/DELTA/ DEMO	WYE
PT	Voltage transformer	Select transformer ratio for the voltage transformer	1…2200	1
CT	Measuring current transformers	Select CT transformer ratio	1…30,000 (1 A) 1… 6,000 (5 A)	1
PF SET	Power factor rule	Power factor rule*	IEC/IEEE/-IEEE	IEC
KVA SET		*S* calculation method **	V/S	V
I1 REV	I_1 CT	I_1 Change CT polarity	YES/NO	NO
I2 REV	I_2 CT	*I2* Change CT polarity	YES/NO	NO
I3 REV	I3 CT	I_3 Change CT polarity	YES/NO	NO
COM 1 SET	Configure communications interface		YES/NO	NO
ID	Address for measuring device	Set address for measuring device	1-247	100
Baud	Baud rate	Set baud rate	1200/2400/4800/ 9600/19200 bps	9600
CONFIG	Parity bit	Configuration Parity bit	8N2/8O1/8E1/ 8N1/8O2/8E2	8E1

Display entry Level 1 Level 2	Parameters	Description	Setting options	Factory setting
DMD SET	Demand measurement on/off		YES/NO	NO
PERIOD	Length of measurement period	Set the measurement period for demand measurement	1, 2, 3, 5, 10, 15, 30, 60 (minutes)	15
NUM	Number of measurement periods for Sliding Window	Set the number of sliding windows	1…15	1
PULS SET	Set pulse output		YES/NO	NO
EN PULSE	Energy pulsing	Activate kWh and kvar energy pulsing	YES/NO	NO
EN CONST	Pulse constant	Number of LED pulses per amount of energy	1K	1K
ENGY SET	Presetting of energy values		YES/NO	NO
IMP kWh	Active energy import	Presetting of active energy import	0… 999,999,999	0
EXP kWh	Active energy export	Presetting of active energy export	0… 999,999,999	0
IMP kvarh	Reactive energy import	Presetting of reactive energy import	0… 999,999,999	0
EXP kvarh	Reactive energy export	Presetting of reactive energy export	0… 999,999,999	0
S kVah	Apparent energy	Presetting of apparent energy	0… 999,999,999	0
DO SET	Change trigger mode for digital outputs		YES/NO	NO
DO1	Operating mode DO1	Set operating mode DO1	NORMAL/ON/OFF	NORMAL
DO2	Operating mode DO2	Set operating mode DO2	NORMAL/ON/OFF	NORMAL
CLR SET	Clear memory		YES/NO	NO
CLR ENGY	Clear energy values	Clear kWh, kvar and kVAh	YES/NO	NO
CLR MXMN	Clear Max and Min values	Clear Max and Min values of this month	YES/NO	NO

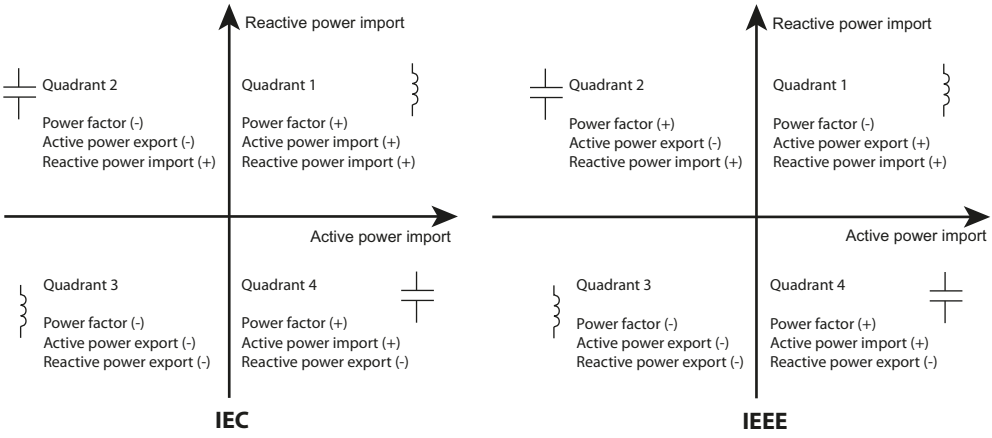
Display entry Level 1 Level 2	Parameters	Description	Setting options	Factory setting
CLR PDMD	Clear peak demand	Clear values peak demand of this month	YES/NO	NO
CLR DIC	Clear pulse counter		YES/NO	NO
CLR SOE	Clear event memory	Clear event memory	YES/NO	NO
DAT	Date	Set current date	YY-MM-DD	/
CLK	Time	Set current time	HH:MM:SS	/
BLTO SET	Display lighting	Time duration until the display gets dark	0…59 (minutes)	3
Info	Device information	read only	YES/NO	NO
SW-VER	Software version		/	/
PRO VER	Protocol version	50 means V5.0	/	/
UPDAT	Date Software update	jjmmtt	/	/
	Serial number	Serial number device	/	/

Table 6.5: Setup adjustment options

Comments on the table above

*

Power factor λ rules



"**IEEE**" and "**–IEEE**" only differ by reversed signs.

** There are two different methods for the calculation of the apparent power *S*:

Vector method V:

$$S_{ges} = \sqrt{P_{ges}^{\,2} + Q_{ges}^{\,2}}$$

Scalar method S:

$$S_{ges} = S_{L1} + S_{L2} + S_{L3}$$

The calculation method can be selected:
V = Vector method
S = Scalar method

6.10 Configuration example: Setting measuring current transformer

Ratio 1000 : 5 (= 200)

Button	Indication display	Description
ENERGY > 3 s	PROGRAMMING	
∧	PASWORD ****	
OK (or password)	PASWORD 0	0 flashes
OK	PASWORD 0	0 Factory setting
∧	PAS SET NO	
∧	SYS SET NO	
OK	SYS SET NO	NO flashes
∧or∨	SYS SET YES	YES flashes
OK	SYS SET YES	
∧	TYPE WYE	Factory setting
∧	PT 1	Factory setting
∧	CT 1	Factory setting
OK	CT 1	1 flashes (units place)
∨	CTERR 0	0 flashes (units place)
<	CTERR 00	0 on the left flashes (tens place)
<	CTERR 0 0	0 on the left flashes (hundreds place)
∧∧	CT 200	2 flashes
OK	CT 200	CT ratio 200 adjusted
OK > 3 s	Standard display	

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

WACKER SILICONES

HMS - datablad

Material: 60004396 **POWERSIL® FLUID TR 50**

Versjon: 1.7 (NO) Trykningsdato: 07.09.2009 Gjennomgått den: 20.11.2008

1 Stoff-/tilberednings- og firmabetegnelse

1.1 Stoffets/produktets navn

Handelsnavn: POWERSIL® FLUID TR 50

1.2 Stoffets/produktets bruk: Industriell.
Kjemisk intermediat

1.3 Firmanavn

Produsent/leverandør: Wacker Chemie AG
Vei/postboks: Hanns-Seidel-Platz 4
Nasj.kjennet./postnr./sted: D 81737 München
Telefon: +498962790
Telefax: +498962791770

Opplysning om HMS-databladet:	Telefon	+49/(0) 8677/83-4888
	Telefax	+49/8677/83-5590
	e-post	WLCP-MSDS@wacker.com

1.4 Telefonnr ved ulykker

Informasjon ved uheil (tysk):	Bedriftens brannvesen	+49/(0) 8677/83-2222
Informasjon ved uheil (internasjonalt):	National Response Center	+49/(0) 621/60-43333

2 Eventuell risiko

2.1 Rubrisering:

R-Setn.	Betegnelse
R-	-

3 Sammensetning/opplysninger om bestanddeler

3.1 Kjemisk karakterisering (enkeltstoff):

Kjemisk karakterisering
polydimetylsiloxan

4 Førstehjelps forholdsregler

4.1 Generelt:
Ved uhell eller illebefinnende kontakt lege vis etiketten hvis mulig.

4.2 Etter innånding:
Sørg for frisk luft.

4.3 Etter hudkontakt:
Produktet fjernes mekanisk med papir eller tekstil. Vask med rikelig vann eller vann og såpe.
Søk legeråd ved synlig hudendring eller plager (vis etiketten eller HMS-databladet hvis mulig).

4.4 Etter øyekontakt:
Skyll straks med rikelig vann. Ved vedvarende irritasjon kontakt lege.

4.5 Etter svelging:
Drikk rikelig vann i små porsjoner. Ikke frremkall oppkast.

5 Forholdsregler ved brannslukning

5.0 Generelt:
-

5.1 Egnede brannslukningsmidler:
vanntåke , slukningspulver , alkoholbestandig skum , kulldioksid , sand .

5.2 Av sikkerhetsgrunner uegnede brannslukningsmidler:
vanndusjstråle , vannstråle .

5.3 Spesiell risiko ved selve stoffet eller tilberedningen, forbrenningsprodukter av det eller gass som utvikles:
bortfaller

5.4 Spesielt verneutstyr ved brannslukning:
Bruk åndedrettsvern som er uavhengig av omgivelsesluften.

6 Forholdsregler ved ufrivillig utslipp

6.1 Forsiktighetsregler gjeldende personer:
Ved spill gjöres oppmerksom på sklifare. Gå ikke på spilt materiale.

6.2 Miljøvernforholdsregler:
Skal ikke slippes ut til vannmiljø, avløp og miljøet. Spilt vaeske demmes opp av egnet materiale (f.eks jord). Stopp lekkasjen hvis dette kan gjores sikkert.

6.3 Metoder for rensing/opptak:
Tas opp mekanisk og deponeres forskriftsmessig. Ved små mengder: Tas opp med væskebindende materiale, f.eks. kiselgur og deponeres forskriftsmessig. Større mengder oppdemmes og pumpes opp i egnede beholdere. Det eventuelt gjenværende glatte belegg fjernes med biologisk nedbrytbart vaskemiddel/såpeløsning eller annet egnet middel. Påfør sand eller annet inert kornet materiale for å få bedre grep.

7 Håndtering og lagring

7.0 Generelt:
Ingen spesielle vernetiltak nødvendig.

7.1 Håndtering

Instrukser for sikker behandling:
Sølt substans fører til større sklifare.

Instrukser for brann- og eksplosjonsvern:
Følg generelle regler for forebyggende brannvern.

7.2 Lagring

Krav til lagerrom og containere:
ikke kjent

Instrukser for sammenlagring:
bortfaller

Ytterligere opplysninger om lagerbetingelser:
Emballasjen skal holdes tett lukket. Oppbevares kjølig og tørt.

8 Eksponeringsbegrensning og personlig verneutstyr

8.1 Grenseverdier for eksponering

Grenseverdier for luft på arbeidsplassen:
bortfaller
-

8.2 Begrensning og overvåking av eksponeringen
8.2.1 Begrensning og overvåking av eksponeringen på arbeidsplassen

Generelle verne- og hygieneforholdsregler:
Følg allmenne hygieniske forholdsregler ved håndtering av kjemiske stoffer. Det må ikke spises eller drikkes under arbeidet.

Personlig verneutstyr:
Åndedrettsvern:
ikke nødvendig .

Håndbeskyttelse:
Anbefaling: Vernehansker av butylgummi , Vernehansker av nitrilgummi .

Øyevern:
Anbefaling: vernebriller .

8.2.2 Begrensning og overvåking av miljøeksponeringen:
Skal ikke slippes ut til vannmiljø eller til miljøet.

9 Fysikalske og kjemiske egenskaper

9.1 Generelle opplysninger

Form.....: vaeske
Farge.....: fargeloes
Lukt.....: luktfri

9.2 Viktig opplysninger om beskyttelse av helse, miljo og sikkerhet

		Metode (67/548/EØF):
Smeltepunkt	bortfaller	
Kokepunkt	bortfaller	
Flammepunkt	> 240 °C	(ISO 2719)
Tenningstemperatur	> 340 °C	(ISO 2592)
Nedre eksplosjonsgrense	bortfaller	
Øvre eksplosjonsgrense	bortfaller	
Damptrykk	bortfaller	
Tetthet	0,96 g/cm³ ved 20 °C	(ISO 3675)
Oppløselighet i vann	praktisk uoppløselig ved 20 °C	
pH-Verdi	ikke brukbar	
Viskositet (kinematisk)	40 mm²/s ved 40 °C	(ISO 3104)

10 Stabilitet og reaktivitet

10.0 Generelt:
Ved fagkyndig lagring og håndtering ingen farlige reaksjoner kjent.

10.1 Betingelser som må unngåes:
ikke kjent

10.2 Stoffer som må unngåes:
ingen kjent(e)

10.3 Farlige spaltningsprodukter:
Ved forskriftsmessig lagring og håndtering: ingen kjent(e) . Målinger ved temperaturer fra ca. 150 °C har vist at det ved oksidativ nedbrytning avspaltes små mengder formaldehyd.

11 Opplysninger om toksikologi

11.0 Generelt:
De påfølgende oppførte toksikologiske resultater ble nàdd ved forsøk med lignende produkter. Etter dagens kunnskapsnivaa fysiologisk kompatibel. Etter dagens kunnskapsniva hverken mutagen kreftfremkallende eller teratogen.

11.1 Opplysninger om toksikologi

Akutt toksisitet (klassifiseringsrelevante LD50/LC50-verdier):

Fremstilling	Verdi/verdiområde	Spesielle typer	Kilde
oral	> 5000 mg/kg	rotte	litterature
dermal	> 2008 mg/kg	rotte (Limittest)	forsØksrapp.

Primær irriterende virkning:

Fremstilling	Virkning	organismer/testsystem	Kilde
hud	ikke irriterende	kanin	forsØksrapp.
Øye	mildt irriterende	kanin	forsØksrapp.

Sensibilisering:

Fremstilling	Virkning	Testart	Spesielle typer	Kilde
hud	ikke allergifremkallende	Magnusson-Kligmann	marsvin	forsØksrapp.

Tilleggsopplysninger:

-

Holdepunkter for arveanleggs-forandrende potensiale:

Testsystem	Virkning	Kilde
Bacterial Reverse Mutation Test	ikke mutagen	forsØksrapp.

11.2 Erfaringer fra mennesker:

Plasterprøve: Produktet har god forenlighet med huden.

11.3 Ytterligere toksikologiske instrukser:

-

12 Opplysninger ang. økologi

12.1 Okotoksisitet

Spesielle typer	Testart	Eksp. tid	Resultat	Kilde
Goldorfe (Leuciscus idus)	akutt	96 h	200 mg/l (LC0)	litteratur

Ifølge erfaringer hittil forventes ingen fisketoksisitet.

Reaksjon i renseanlegg (bakterietoksisitet: åndedretts-/formeringshemming):

Testsystem	Eksp. tid	Resultat	Kilde
Pseudomonas putida		> 1000 mg/l (EC50)	litteratur

Etter dagens erfaringer forventes ingen uheldige innvirkninger på renseanlegg.

12.2 Mobilitet

Danner en tynn oljefilm på vannoverflaten. Adsorberes av svevedeler. Utskilling ved sedimentering.

12.3 Persistens og nedbrytbarhet

Bionedbryting / tilleggsopplysninger:
Biologisk ikke nedbrytbart. Polydimetylsiloksaner er i ei viss utsrekning nedbrytbare ved abiotiske prosesser.

Tilleggsopplysninger:
Elimineres ved adsorbering i aktivt slam.

12.4 Fare for biologisk akkumulering

Bioakkumulering usannsynlig.

12.5 Andre skadelige virkninger

-

12.6 Ytterligere henvisninger

Generelt:
Ved fagkyndig håndtering og bruk forventes ingen miljøproblemer.

13 Instruks for avfallshåndtering

13.1 Produkt

Anbefaling:
Materiale som ikke kan brukes eller finne kjemisk gjenvinning må bringes til en godkjent bedrift for avfallsbehandling i henhold til stedlige forskrifter.

13.2 Ikke rengjort emballasje

Anbefaling:
Emballasjen må tømmes fullstendig (dryppfri, rislefri, sparkelren). Emballasjen skal overensstemmende med de til enhver tid gjeldende lokale/nasjonale bestemmelser tilføres gjenbruks- hhv. utnyttelsesformål.

14 Transportforskrifter

14.1 Landtransport ADR og RID:

Veitransport ADR:
Vurdering.....: ikke farlig gods

Jernbane RID:
Vurdering.....: ikke farlig gods

14.2 Skipstransport IMDG-Code
Vurdering.....: ikke farlig gods

14.3 Flytransport ICAO-TI/IATA-DGR
Vurdering.....: ikke farlig gods

14.4 Transport/tilleggsopplysninger

Informerende område til punkt 14. Transportforskrifter:
Avdeling for service på farlig gods, faks +49(0)8677/83-5589, telefon +49(0)8677/83.4950

15 Forskrifter

15.1 Merking (EF)

R-Setn.	Betegnelse
R-	-

S-setn.	Betegnelse
S-	-

15.2 Nasjonale forskrifter:

P-No.: P-93854

15.3 Andre internasjonale ordninger

Informasjon om internasjonal registrering
Oppført i eller i overensstwemmende med følgemde lister:
IECSC - China
EINECS - Europe
ENCS - Japan
PICCS - Philippines
ECL - Korea
DSL - Canada
TSCA - USA
AICS - Australia

16 Andre opplysninger

16.1 Produkt

Disse data beskriver utelukkende sikkerhetskravene til produktet/produktene og bygger på status quo for vår viten. De gir ingen garanti for egenskaper ved det produkt/de produkter som er beskrevet, i gjeldende lovbestemmelsers betydning for garanti.
Leveringsspesifikasjonene finner De i de respektive produktdatablader.

16.2 Tilleggsopplysninger:

Komma i numeriske oppgaver anngir desimalpunktet. Loddrette streker på venstre kant viser til endringer i forrige versjon. Denne utgaven erstatter alle tidligere.

- Slutten på HMS-databladet -

HMS-DATABLAD

SF6

1. IDENTIFIKASJON AV KJEMIKALIET OG ANSVARLIG FIRMA

Handelsnavn	SF6		
Kjemisk navn	Svovelheksafluorid		
Revisjonsdato	27.08.99	**Intern nr**	
Gruppe		**CAS nr**	2551-62-4
Resept nr		**Formel**	SF6
Produsent-importør	MULTICHEM WALLINCO AS POSTBOKS 3473 - BJØLSEN N-0406 OSLO Tlf: 23 005200 Fax: 23 005201 Nødtelefon: Giftinfo: 22 591300		
Ansvarlig	Kaj Peter Boland		
Utarbeidet av	HMS LOGICONSULT AS v/FJ		

2. OPPLYSNINGER OM KJEMISK SAMMENSETNING

Ingrediens	Cas nr	Innhold	Klasse	Risikosetninger
svovelheksafluorid (sf6)	2551-62-4	>99,9	IK	

Tegnforklaring FB/FH/FM=Fareklasse brann/-helse/-miljø, Tx=Meget Giftig, T=Giftig, C=Etsende, Xn=Helseskadelig, Xi=Irriterende, IK=Ikke klassifiseringspliktig, E=Eksplosiv, O=Oksyderende, Fx=Ekstremt brannfarlig ,F=Meget brannfarlig, N=Miljøskadelig, M=Arve- stoffskadelig, A=Allergifremkallende, K=Kreftfremkallende, R=Reproduksjonsskadelig.

Ingredienskommentarer nr.1: Klass: Merck

3. VIKTIGSTE FAREMOMENTER

Viktigste skadevirkninger på mennesker: Fare for kvelning ved store gassutslipp i trange rom. Viktigste skadevirkninger på miljø: Ingen spesielle opplysninger. Ved oppvarming dannes giftige gasser. T>200 °C

4. FØRSTEHJELPSTILTAK

Innåndning	Ved innånding av giftige spaltningsprodukter, tilkall lege. Generelt: Ved bevisshet: Løs stramtsittende klær, stabilt sideleie.
Hudkontakt	Frostskader skal ikke gnis eller frotteres, men skylles straks med rikelige mengder vann og tildekkes sterilt.
Øyekontakt	Eksposisjon av kald gass: Skyll med store mengder lunkent vann. Unngå gnidning. Unngå vanntrykk mot øyet.
Svelging	-
Medisinsk informasjon	-
Annen informasjon	Personer som er blitt utsatt for overskudd av SF6, bringes ut i frisk luft. Vanlig førstehjelp: Holdes varm og i ro. Ved bevisstløshet: Løs stramtsittende klær. Skadede legges og transporteres i stabilt sideleie. Sørg for frie luftveier. NB! Absolutt hvile ved mistanke om forgiftning. Kontakt lege. Gi oksigen og behandling for eventuell acidose. Vurdering av hypoksiskader. Ved alvorlige tilfeller tilkall/oppsøk medisinsk ekspertise. Acidose: tilstand hvor blodet er surere enn normalt. Ved åndedrettsforstyrrelser kan acidose utvikles når organismen ikke får avgitt tilstrekkelig karbondioksid. Hypoksi: tilstand som betegner en akutt oksygenmangel i kroppens blod og vev.

5. TILTAK VED BRANNSLUKKING

Passende slukningsmidler	OBS! Hvis flytende eller gassformig SF6 er direkte utsatt for brann, bruk vann i tåkestråle for å uskadeliggjøre eventuelle spaltningsprodukter.
Uegnede slukningsmidler	Vann i samlet stråle.
Brann og eksplosjonsfarer	- Beholdere bør fjernes evt. nedkjøles med vannspray. Ved oppvarming dannes giftige gasser. T>200 °C
Personlig verneutstyr	Brannslukkere må benytte røykdykkerutstyr.
Annen informasjon	SF6 er ikke brennbar. Ved oppvarming av gassflasker kan trykket stige så mye at det blir fare for flaske-sprengning. Ved fare for oppvarming, skal flaskene kjøles kontinuerlig med vann inntil de har nådd normal temperatur.

6. TILTAK VED UTILSIKTET UTSLIPP

Sikkerhetstiltak for å beskytte personell	Sørg for god ventilasjon. Bruk angitt verneutstyr.

Sikkerhetstiltak for å beskytte miljø	se nedenfor.
Egnede metoder for skadebegrensning og opprenskning	Utslipp til vann: Ingen opplysninger. Utslipp på gater, mark, etc.: Ved lekkasjer i lukkete rom, sørg for god ventilasjon før rommet blir tatt i bruk. Evakuer og avsperr området, (forsamlingsrom, etc.) hvor større utslipp har funnet sted. Det må vurderes om politi og brannvesen skal tilkalles. (Husk at gassen er ca. 5 ggr. tyngre enn luft og vil derfor samles i dypere liggende områder).
Annen informasjon	GENERELT: Mindre mengder kan slippes i fri luft på en slik måte at det ikke oppstår miljøskader. Ved destruksjon av større mengder ta kontakt med leverandør. Ved lekkasje: Steng ventilen hurtigst mulig hvis dette kan gjøres uten risiko. Sørg for god ventilasjon. Dersom lekkasjen ikke lar seg stanse, bringes om mulig gassflasken ut i friluft hvor lekkasjen kan skje uten fare for omgivelsene inntil den blir stanset eller flasken er tømt. Søk råd hos leverandør.

7. HÅNDTERING OG OPPBEVARING

Spesielle egenskaper og farer	Forebyggende tiltak: Sørg for god ventilasjon. Stående flasker sikres. Luftens innhold av SF6 bør kontrolleres føre ubeskyttende personer går inn i rom det det er fare for høye gasskonsentrasjoner. Trykkbeholdere må ikke punkteres, selv ikke når de er tomme. Unngå sollys og temperaturer over 50°C.
Håndterings-veiledning	Forsiktighetsregler før bruk: Unngå at gassflasker blir utsatt for støt eller varme. Bruk kun utstyr (slanger, regulatorer, ventiler, osv.) som er beregnet for SF6. Ventiler skal åpnes langsomt. Påse at slanger, ventiler etc. ikke har lekkasjer. Skadede gassflasker returneres til leverandør med opplysninger om skade og årsak.
Lagringsanvisning	Forsiktighetsregler ved lagring: Gassflasker skal lagres i godt ventilerte rom, eller utendørs i nettingbur. Beskytt flaskene mot solstråling, nedbør og korrosivt miljø. Påse at flaskeventiler er stengt og at flaskehetten er påskrudd. Varselskilt "GASS UNDER TRYKK" må brukes. Kontakt branntilsynet ved lagring.

8. EKSPONERINGSKONTROLL OG PERSONLIG VERNEUTSTYR

Ingrediens	Cas nr	Adm.Norm	Note
svovelheksafluorid (sf6)	2551-62-4	6000 mg/m3	

Forebyggende tiltak	Ved fare for innånding av gass som inneholder gifige spaltningsprodukter, anbefales bruk av vernemaske med filter B grå. Husk at dette er ufullstendig åndedrettsbeskyttelse og må bare brukes når det er nok oksygen i luften. Ved fare for oksygenunderskudd må friskluftsmaske brukes. Gassflaskene skal holdes godt lukket og oppbevares på et godt ventilert sted. Stående flasker skal sikres. Bruk hansker og vernesko ved omgang med gassflasker. Relevante standarder fra Den europeiske standardiseringskomite (CEN): - Arbeidstilsynet har fastsatt forskrift om personlig verneutstyr på arbeidsplassen. Best.nr. 524. Varme flater med T>200 °C samt røyking forbudt grunnet fare for dekomponering. Ved faste fylleplasser innendørs bør lages rutiner for kontinuerlig målinger av gass inkl. oksygen. Forurensningsnivået skal forsøkes holde lavest mulig under adm.normer

	(best.nr.361) og ihvertfall lavere enn 1/3 av adm.norm.
Åndedrettsvern	Se ovenfor
Øyevern	-
Arbeidshansker	Bruk lær-hansker ved håndtering av flasker.
Verneklær	Vernesko kan være påkrevet ved flytting av flasker.

9. FYSISKE OG KJEMISKE EGENSKAPER

Produktets form	Gass eller flytende.	**Lukt**	Gass: luktfri
Farge	Gass: fargeløs	**Oppløselig i**	-
Smelte/frysepunkt	-50,8°C (2,24 bar)	**Kokepunkt**	-63,8°C
Tetthet	1,4 g/cmü (20°C)	**Flammepunkt**	Ikke brannfarlig
Eksplosjonsområde		**pH (kons.)**	-
Damptrykk	21,1 (20°C)	**Viskositet**	
Dekomponeringstemp.	500°C	**Luktegrense**	
pH løsning		**Damptetthet (luft=1)**	-5
Rel. spesifikk vekt (l=1)			
Trippelpunkt:			

10. STABILITET OG REAKTIVITET

Stabilitet	Generelt: Ved vanlig temperatur betraktes SF6 som en inert gass. SF6 vil spaltes (dekomponeres) ved 200°C når den kommer i kontakt med visse reaktive metaller. Men i kontakt med de mest anvendte metaller og legeringer, blir spaltningen først merkbar ved temperaturer i området +400°C til +600°C. Trykkbeholder. Skal beskyttes mot sollys og må ikke utsettes for temperaturer over 50 °C. Må ikke punktertes eller brennes, selv ikke når den er tom.
Reagerer med	Materialvalg: Ingen begrensninger for vanlige metaller. Unngå kontakt med alkaline metaller og alkaline jord metaller.
Farlige spaltnings-produkter	Ved brann: Fluss-syre. Svoveloksyder (SOx)

11. HELSEFAREOPPLYSNINGER

Generelt	Svovelheksafluorid er ikke giftig, men kan fortrenge luften slik at det i lukkede eller dårlig ventilerte rom kan oppstå grøfter o.l. Når oksygeninnholdet i luften synker under eller blir lik ó av det normale, vil asfyksi inntre. Asfyksi er farlig på den måte at den

	kommer snikende. Den rammede merker ikke noe før det er for sent. Før man tillater folk tilgang til lukkete rom hvor nitrogengass er lekket ut må luftens oksygeninnhold måles, eventuelt brukes verneutstyr som f.eks. friskluftmaske. SF6 som har vært utsatt for sterk varme eller elektriske ladninger, kan inneholde giftige spaltningsprodukter (f.eks. hydrogenfluorid).
Innånding	Innånding av svovelheksafluorid i store konsentrasjoner kan medføre svimmelhet, bevisstløshet og kvelning.
Hudkontakt	Kald svovelheksafluorid gass kan gi alvorlige frostskader.
Øyekontakt	Kald gass vil kunne gi frostskader. Unngå gasstrykk mot øynene. Da gassen står under høyt trykk på gassflasken må eventuell åpning av flaskeventilen skje slik at ventilen vendes bort fra ansiktet. Dette for å unngå at løse partikler i ventilåpningen slynges mot ansikt og øynene. Generelt frarådes å åpne ventilen på gassflasker uten påmontert trykkreduksjonventil.
Svelging	-
Akutte og kroniske skadevirkninger	-
Allergi	-
Mutagene effekter	-
Kreft	-
Reproduksjonsskade effekter	-
Oral toksisitet	Ikke kjent
Dermal toksisitet	Ikke kjent
Inh.toksisitet	Ikke kjent

12. MILJØOPPLYSNINGER

Mobilitet	-
Nedbrytbarhet	-
Akkumulering	-
Økotoksisitet	-
Andre skadevirkninger	-
Annen informasjon	Potensial for nedbrytning av ozonlaget: Ingen opplysninger. Potensial for fotokjemisk ozondannelse: Ingen opplysninger. Virkninger på kloakkrenseanlegg: Ingen skadelige effekter.

13. FJERNING AV KJEMIKALIEAVFALL

Generelt	Ved svovelheksafluoridgass lekkasje i rom o.l. må disse luftes omhyggelig. Se forøvrig punkt 11.

Avfallsgrupper -

14. OPPLYSNINGER OM TRANSPORT

Proper shipping name COMPRESSED GAS NON FLAMMABLE

Annet Veitransport: Gassflasker skal under transport ha ventilbeskyttelsen montert og blindmutter på ventil påskrudd. Gassflasker skal transporteres godt ventilert og omhyggelig transportsikret mot velt. Tenk spesielt på kollisjonsfaren.

ADR (vei)	UN nr	1080	Klasse	2	Fareseddel
	Farlig gods	ja	Marg nr		Fare nr
RID (jernbane)	UN nr	1080	Klasse	2	Etikett
	Farlig gods	ja	Fare nr		
IMDG (sjø)	UN nr	1080	Side	2179	Forp.gr.
	Farlig gods	ja	MFAG	620	Sub.risk
	Klasse	2.2	Etikett		
	EmS	2-09	Marine poll.		
IATA(fly)	UN nr	1080	Klasse	2.2	Etikett
	Farlig gods	ja	Sub.risk		Forp.gr.

15. OPPLYSNINGER OM LOVER OG FORSKRIFTER

Yl-gruppe -

Yl-tall -

S-setninger S51 Må bare anvendes på godt ventilert sted.

Referanser Norsk stoffliste og forskrifter (Statens forurensningstilsyn, Direktoratet for arbeidstilsynet, Direktoratet for Brann- og Eksplosjonsvern (DBE)). Forskrift om spesialavfall. Transport

av farlig gods: ADR, RID, IMDG og IATA.

16. ANDRE OPPLYSNINGER AV BETYDNING FOR BRUKERENS SIKKERHET OG HELSE

Leverandørens anmerkninger	Opplysningene i dette Produktdatablad er i henhold til vår informasjon og så vidt vi vet korrekte på den angitte dato for siste revidering. De angitte opplysningene er ment å være retningsgivende for sikker håndtering, anvending, bearbeiding, transport, avhending og utslipp, og må ikke ansees å være noen garanti for kvalitetsspesifikasjon. Generelt: Gassen fylles på gassflasker med trykk på ca. 20 bar. Returneres til levereandør med ca. 2 bars resttrykk. SF6 må aldri omfylles til andre beholdere. HMS LOGICONSULT AS er f.o.m. 10.8.98 godkjent i henhold til Oljeindustriens Landsforenings (OLF) ordning for kvalitetssikring av HMS-datablader. Ring eventuelt Giftinformasjonssentralen, tlf. 22 59 13 00 hele døgnet eller fax 22 60 85 75. PRODUKTREGISTRET NR. HMS Logiconsult as. Fabrikkvn. 27, 4033 STAVANGER, TLF: 51578005, FAX. 51578006, Internett: www. hmslogiconsult.com
Første gang utgitt	27.08.99

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
2	Tegninger og spesifikasjon
3	SF6 Anlegg
4	Transformator
5	Lavspenning
6	Styrestrøm
7	HMS Datablad
8	Samsvarserklæring og sluttkontrol
9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

SAMSVARSERKLÆRING

Produsentens navn	AS SATEMA-MOELV
Adresse	Industriveien 15 2391 Moelv

Anlegg	TA-F 1250KVA
Ordre nummer	24383 -
Fordelingsidentifikasjon	Kiosk 2
Netttype/frekvens	22/11//0,415KV 50Hz
Produksjonsår	2015

Undertegnede erklærer at lavspenningsutstyr og apparater er montert i overenstemmelse med montasjeanvisninger og el.data angitt i kataloger fra produsenter/leverandører.

[x] LDV

Normer

- [ ] EN 60898
- [ ] EN 60947-2
- [ ] EN 60439-1
- [ ] EN 60439-3
- [x] EN 60439-4
- [ ] EN 60439-5

[ ] EMC

Normer

- [ ] EN 50082-1
- [ ] EN 50082-2
- [ ] EN 50081-1

[ ] Maskindirektivet

Norm

- [ ] EN 60204-1

Ferdig produkt er testet i henhold til vår **K**valitetssikring (KS)
Rutine 2.4.0 Kontroll og prøving
Rutine 2.4.1 Løpende kontroll
Rutine 2.4.2 Sluttkontroll

Dato	31.08.2015
Saksbehandler	*Eirik Strandum*

Produksjonsansvarlig

AS SATEMA MOELV
Tore Persson D.L.

.....

A/S SATEMA - MOELV

Rutinens navn: **Sluttkontroll / prøving**		KVALITETS-SIKRING QUALITY-ASSURANCE	
Rutine nr.2.4.2.1.1			Dato:14.12.92
Side 1 av 1		Rev. nr: 4	Dato:29.05.2009
Utarbeidet av:	T Bergseth	Kontrollert/godkjent av: T persson	

Prosjekt nr: 24383
Anlegg.: TA-F 1250 kVA
Fordeling.: Kiosk 2

Nr.	Spørsmål/sjekkepunkt		Montør *	Kontr.	Kommentar
1	Isolasjonsmåling mot jord			X	
2	Spenning på alle kurser			X	
3	Riktig sikr. riktig kurs	*		X	
4	Innstiling av vern (min)	*		X	
5	Riktig fasefølge/fordeling på 3	*		X	
6	Jordforbindelser (1 stk. tilkobl.	*		X	
7a	Riktig moment.	*		X	
7b	Sjekket moment			X	
8	Funksjonstest av styring			X	
9	Alle nødv. skilt og merker	*		X	
10	Dekking/Faseskille	*		X	
11	Festeanordning for inn- og utg.	*		X	
12	Dører, hengsler, låser,	*		X	
13	Lakk. og finish.	*		X	
14	Rengjøring/støvsuging			X	
15	Kursfortegnelser/sjema o.a.			X	
16	Test merkelapp datert/sign., og			X	
17	Emballering i.h.h.t. prod. ordre			X	
18	Nødv.skilt påsatt	*		X	
19	Alt materiell montert	*		X	
20					
21					

Endringer / ombygging etc. anføres på stemplingskort.
Beskrivelse avvik:

Forsendelsersdokumenter utleveres ikke før dette skjema er forevist -- og undertegnet.
(Min. 2 underskrifter.)

Arkiveres på sak.(O-nr.)hos saksbehandler. 1.stk. kopi arkiveres i samleperm ved testbenk.

Montør: ..... Kontr.av: MB AS Ansv.saksbehandler: .....

Dato: 24/8-15 Dato: 24/8-15 Dato:

SATEMA

Enebakkvn. 127
Pb.67, Simensbråten
1107 Oslo
Telefon: 22 57 93 00
Telefaks: 22 57 93 01
Foretaksnr: 856457192

Fabrikk:
Pb. 4
2391 Moelv
Telefon: 62 33 44 30
Telefaks: 62 33 44 32
Foretaksnr: 956456940

Sluttkontroll/prøving apparatanlegg.

Prosjekt nr: 24383
Anlegg: TA-F 1250 kVA
Fordeling: Kiosk 2

Utstyret er kontrollert og testet i h.h.t. følgende punkter.

Nr.	Kontroll og test
1	Isolasjonsmåling mot jord
2	Spenning på alle kurser
3	Riktig sikr. riktig kurs
4	Instilling av vern. (min)
5	Riktig fasefølge/fordeling på 3 faser
6	Jordforbindelser (1 stk. tilkobl. pr. avgang)
7a	Riktig moment.
7b	Sjekket moment
8	Funksjonstest av styring
9	Alle nødv. skilt og merker påsatt/retthet
10	Dekking/Faseskille
11	Festeanordning for inn- og utg. kabler
12	Dører, hengsler, låser, (klaringer o.l.)
13	Lakk. og finish.
14	Rengjøring/støvsuging
15	Kursfortegnelser/skjema o.a. dok. vedl.
16	Test merkelapp datert/sign., og påklistret anl.
17	Emballering i.h.h.t. prod. ordre
18	Nødv.skilt påsatt
19	Alt materiell Montert

Mangler ved lev.:

24/8-15
Dato

Kontrollør

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

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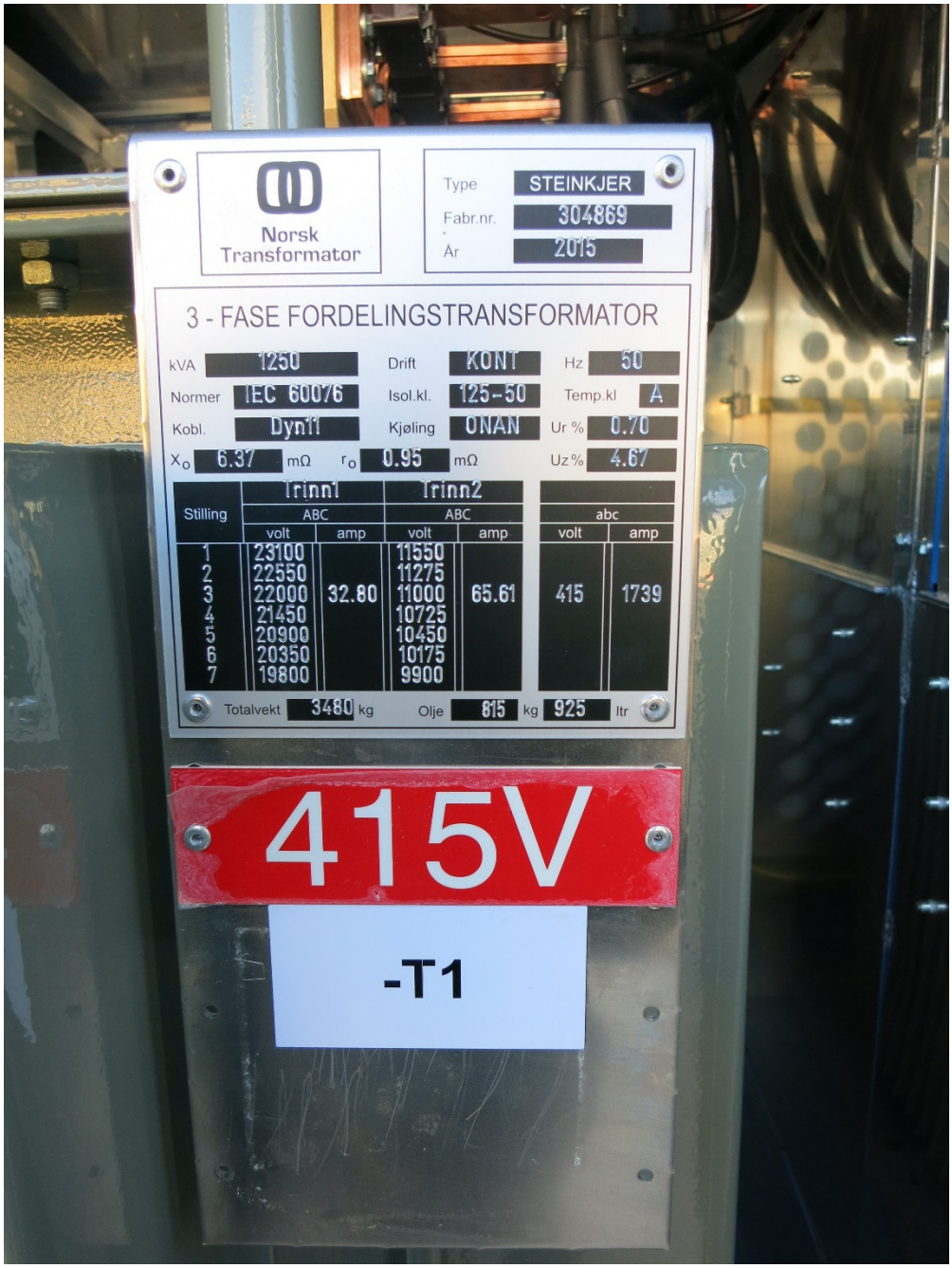
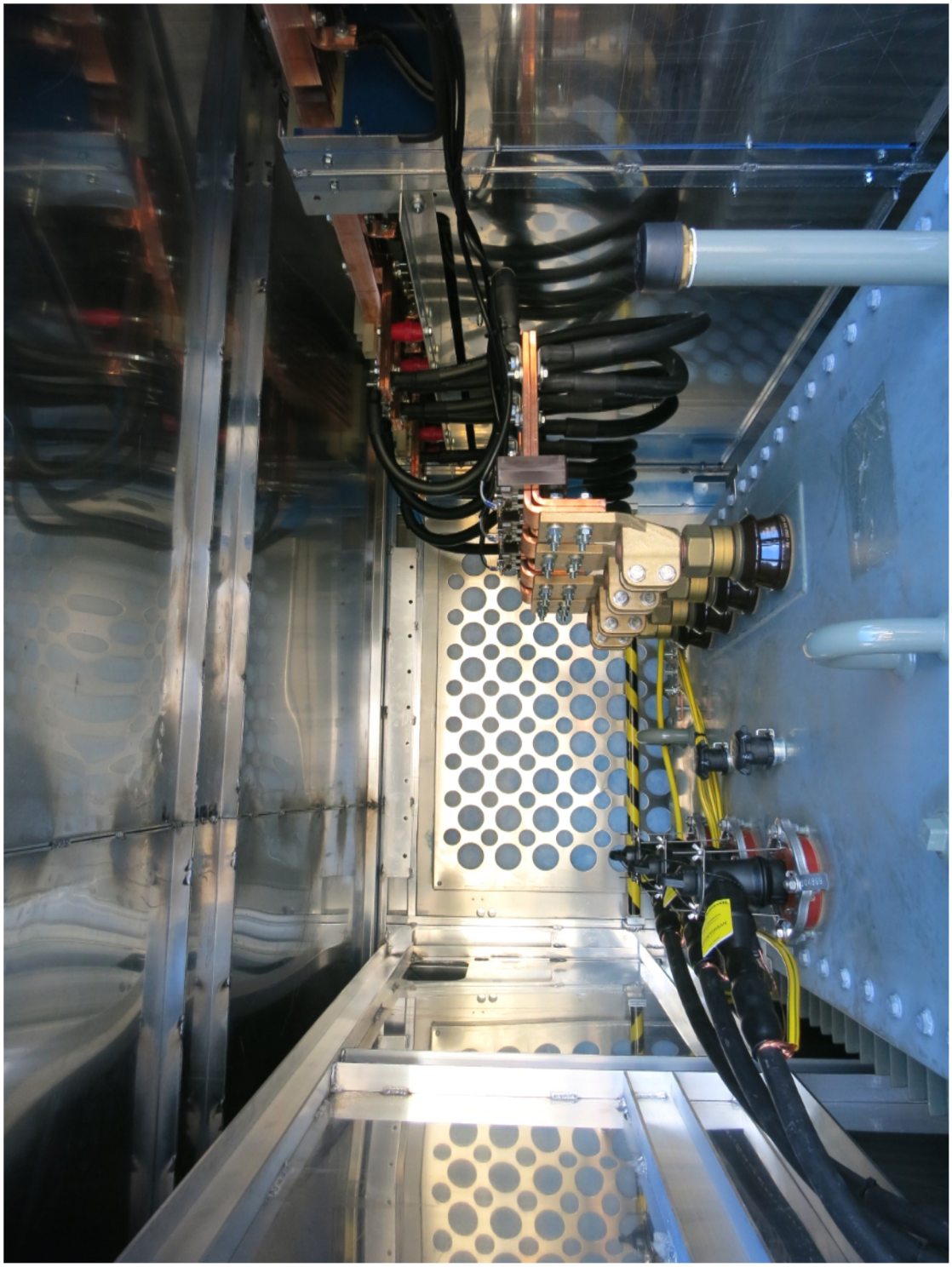


Hæhre Entreprenør AS
SATCON TA-F 1250kVA
Ordre nr: 24383
Kiosk 2

Hæhre Entreprenør AS
SATCON TA-F 1250kVA
Ordre nr: 24383
Kiosk 2



Hæhre Entreprenør AS
SATCON TA-F 1250kVA
Ordre nr: 24383
Kiosk 2

Hæhre Entreprenør AS
TA-F-1250kVA
ORDRE: 24383
Kiosk 2

SATEMA

1	Tekniske hoveddata
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9	Bilder
10	Produktblader/kataloger
11	Kunde
12	Kunde

DS202C M A-C16/0,3

General Information

Extended Product Type:	DS202C M A-C16/0,3
Product ID:	2CSR272140R3164
EAN:	8012542120551
Catalog Description:	DS202C M A-C16/0,3 - RCBo
Long Description:	The DS202C series RCBO is a 2P in two-modules device for the protection of end user single-phase circuits against overload and short-circuit currents; protection against the effects of sinusoidal alternating and direct pulsating earth fault currents; protection against indirect contacts and additional protection against direct contacts (with sensitivity = 30 mA).

Categories

Products » Low Voltage Products and Systems » Modular DIN Rail Products » Residual Current Devices RCDs » Residual Current Breakers with Overload Protection RCBo

Ordering

EAN:	8012542120551
Minimum Order Quantity:	1 piece
Customs Tariff Number:	85389099

Dimensions

Product Net Width:	0.036 m
Product Net Height:	0.083 m
Product Net Depth:	0.067 m
Product Net Weight:	0.239 kg

Container Information

Package Level 1 Units:	5 piece
Package Level 1 Width:	0.253 m
Package Level 1 Height:	0.088 m
Package Level 1 Length:	0.108 m
Package Level 1 Gross Weight:	1.446 kg
Package Level 1 EAN:	8012542120568

Environmental

RoHS Status:	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Additional Information

Number of Poles:	2
Number of Protected Poles:	2
Power Loss:	Per Pole 11.3 W
Product Main Type:	DS202C
Product Name:	Residual Current Breaker with Overload Protection
Rated Current (I_n):	16 A
Rated Residual Current:	300 mA
Rated Short-Circuit Capacity (I_{cn}):	(230 / 400V AC) 10 kA
RoHS Date:	20090529
Standards:	IEC EN 61009
Tripping Characteristic:	C
Type of Residual Current:	A type

Certificates and Declarations (Document Number)

Declaration of Conformity - CE:	ITSCE182DS202CM;

Classifications

Object Classification Code:	Q

N

S204M-C2

General Information

Extended Product Type:	S204M-C2
Product ID:	2CDS274001R0024
EAN:	4016779550680
Catalog Description:	Miniature Circuit Breaker - S200M - Number of Poles 4 - Tripping characteristic C
Long Description:	System pro M compact S200M miniature circuit breakers are current limiting. They have two different tripping mechanisms, the delayed thermal tripping mechanism for overload protection and the electromechanic tripping mechanism for short circuit protection. They are available in different characteristics (B,C,D,K,Z), configurations (1P,1P+N,2P,3P,3P+N,4P), breaking capacities (up to 10 kA at 230/400 V AC) and rated currents (up to 63A). All MCBs of the product range S200M comply with IEC/EN 60898-1 and IEC/EN 609 47-2, allowing the use for residential, commercial and industrial applications. Bottom-fitting auxiliary contact can be mounted on S200M to save 50% space.

Categories

Products » Low Voltage Products and Systems » Modular DIN Rail Products » Miniature Circuit Breakers MCBs

Ordering

EAN:	4016779550680
Minimum Order Quantity:	1 piece
Customs Tariff Number:	85362090

Dimensions

Product Net Width:	70.0 mm
Product Net Depth:	69.0 mm
Product Net Height:	88.0 mm
Product Net Weight:	0.500 kg

Container Information

Package Level 1 Units:	1 piece
Package Level 1 Width:	92.0 mm
Package Level 1 Length:	78.0 mm
Package Level 1 Height:	80.0 mm
Package Level 1 Gross Weight:	0.510 kg
Package Level 1 EAN:	4016779606400

Environmental

Ambient Air Temperature:	Operation -25 … +55 °C Storage -40 ... +70 °C
Reference Temperature for Tripping Characteristics:	30 °C
Resistance to Shock acc. to IEC 60068-2-27:	25g, 2 shocks, 13 ms
Resistance to Vibrations acc. to IEC 60068-2-6:	5g, 20 cycles at 5...150...5 Hz with load 0.8 In
Environmental Conditions:	28 cycles with 55 °C / 90-96% and 25 °C / 95-100%
RoHS Status:	Following EU Directive 2002/95/EC August 18, 2005 and amendment

Technical

Standards:	IEC/EN 60898-1 IEC/EN 60947-2
Number of Poles:	4
Tripping Characteristic:	C
Rated Current (I_n):	2.00 A
Rated Operational Voltage (U_e):	400 V AC
Power Loss:	7.2 W Per Pole 1.8 W
Rated Insulation Voltage (U_i):	Phase to Ground 250 V AC Phase to Phase 500 V AC
Operational Voltage:	Maximum 440 V AC Maximum 125 V DC Minimum 12 V AC Minimum 12 V DC
Rated Frequency (f_r):	50 / 60 Hz
Rated Short-Circuit Capacity (I_{cn}	10 kA

):	
Rated Ultimate Short-Circuit Breaking Capacity (I_{cu}):	15 kA
Rated Service Short-Circuit Breaking Capacity (I_{cs}):	11.2 kA
Energy Limiting Class:	3
Overvoltage Category:	III
Pollution Degree:	2
Rated Impulse Withstand Voltage (U_{imp}):	4 kV (6.2 kV @ sea level) (5.0 kV @ 2000 m)
Dielectric Test Voltage:	50/60 Hz, 1 min.: 2 kV
Housing Material:	Insulation group I, RAL 7035
Actuator Type:	Insulation group II, black, sealable
Actuator Marking:	I / O
Contact Position Indication:	ON / OFF
Degree of Protection:	IP20
Remarks:	IP40 in enclosure with cover
Electrical Endurance (N_{elec}):	20000 cycle
Mechanical Endurance (N_{endu}):	20000 cycle
Terminal Type:	Screw Terminals
Screw Terminal Type:	Failsafe Bi-directional Cylinder-lift Terminal
Connecting Capacity:	Busbar 10 / 10 mm² Rigid 0.75...25 mm² Stranded 0.75...25 mm² Flexible 0.75...16 mm² Flexible with Ferrule 0.75...16 mm²
Tightening Torques:	2.8 N·m
Recommended Screw Driver:	Pozidriv 2
Mounting on DIN Rail:	TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715 TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715
Mounting Position:	Any

Technical UL/CSA

Tightening Torques UL/CSA:	25 in·lb

Certificates and Declarations (Document Number)

Declaration of Conformity - CE:	2CDK403001D0602;

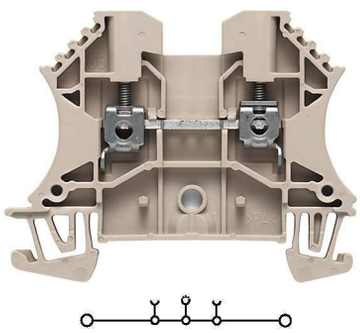
Classifications

E-nummer:	2101257
ETIM 4.0:	EC000042 - Miniature circuit breaker (MCB)
ETIM 5.0:	EC000042 - Miniature circuit breaker (MCB)
Object Classification Code:	F

WDU 2,5

3039102000

WDU 2,5



Artikkelnr.	: 3039102000
El.nr.	: 12 688 00
Type	: WDU 2,5
Beskrivelse	: Gjennomgangsklemme, Merketverrsnitt: 2.5 mm², Tilkoblingstype: Skru tilkobling, Isolasjonsmateriale: Wemid, Farge på Isolasjonsmateriale: Beige, Installasjon: TS 35

Tilkobling:	Screwed
Leverandør vare nr.:	1020000000
Leverandørs betegnelse:	WDU 2.5
Engelsk beskrivelse:	Feed-through terminal, 2.5 mm², Screw connection, Wemid, dark beige, TS 35
ATEX sertfikat nr:	KEMA98ATEX1683U
IECEx sertifikat:	IECEXULD05.0008U
ATEX spenning:	550 V
ATEX strøm:	21 A
ATEX tverrsnitt:	2.5 mm²
IECEx spenning:	550 V
IECEx strøm:	20 A
IECEx tversnitt:	2.5 mm²
EN60079-7 merking:	Ex e II
ATEX merking:	Ex II 2 G D
Godkjenninger:	CSA; CSAEX; CURUSEX; DETNORVER; GERMLLOYD; GOSTEX; IECEXULD; KEMAATEX; KEMAKEUR; LLOYDSREG; MARITREG; NEMKO; RINA; UR; BURVER; GOSTME25
Bredde:	5.1 mm
Lengde:	60 mm
Bredde:	5.1 mm
Høyde:	47 mm
Lengde:	60 mm
CSA spenning:	600 V
CSA strøm:	20 A
CSA tverrsnitt(min):	AWG 26
CSA tverrsnitt(maks):	AWG 12

Tilkoblings tverrsnitt (min):	0.05 mm²
Tilkoblings tverrsnitt (maks):	4 mm²
Tilkoblingsteknikk:	Screw connection
Avisoleringslengde:	10 mm
Klemskrue:	M 2.5
Skrutrekkerblad:	0.6 x 3.5 mm
Tiltrek. Moment:	0.4...0.8 Nm
Målepinne:	A3
Enleder (min) Hoved:	0.5 mm²
Enleder (max) Hoved:	4 mm²
Flertråd (min) Hoved:	1.5 mm²
Flertråd (max) Hoved:	4 mm²
Fleksibel (min) Hoved:	0.5 mm²
Fleksibel (max) Hoved:	4 mm²
Fleksibel m.endhylse (min) Hoved:	0.5 mm²
Fleksibel m.endehylse (max) Hoved:	2.5 mm²
Temperaturområde:	- 50 °C, + 120 °C
Brennbarhetsgrad:	V-0
TS skinne:	TS 35
Tilkoblingstype:	Screwed
UL spenning:	600 V
UL strøm:	25 A
UL tverrsnitt(min):	AWG 30
UL tverrsnitt(maks):	AWG 12
Enleder (min) to ledere samme tver.:	0.5 mm²
Enleder (max) to ledere samme tver.:	1.5 mm²
Fleksibel (min) to ledere samme tver.:	0.5 mm²
Fleksibel (max) to ledere samme tver.:	1.5 mm²
Fleksibel m. endehylse(min) to ledere samme tver.:	0.5 mm²
Fleksibel m. endehylse(max) to ledere samme tver.:	1.5 mm²
IEC tverrsnitt:	2.5 mm²
IEC spenning:	800 V
Målestøtspenning:	8 kV
IEC strøm:	24 A
Norm:	IEC 60947-7-1
Maks strøm:	32 A
Forurensningsgrad:	3

Eksempel på innstilling av vern PR221DS på ABB SACE Tmax

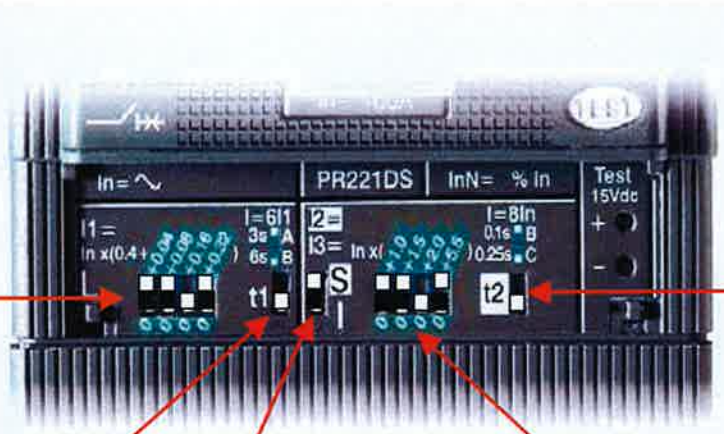
I1 er innstilling av overbelastningsbeskyttelse.

Eksempel:

Vernets størrelse er 100 A
Kabelen etter bryteren tåler en strøm Iz= 87 Amp.

I1 skal stilles på 87/100= 0,87xIn
Innstilling med knappen 0,16 ned og resten opp gir innstilling:
In x (0,4+0,04+0,08+0,32)=100x0,84= 84A.

Dette blir den nærmeste innstilling til 87 A.



T2 er innstilling av idsforsinkelse ved kortslutning.

Virker kun når S=I2 er valgt og tiden velges ut fra start-strømmer og selektivitet.

Eksempel: Siden det tidligere i eksempelet er valgt S-funksjon på kortslutnings-utløseren kan det velges mellom tidsforsinkelse på 0,1 og 0,25 sekunder.

Velger 0,25 sek for å få best mulig selektivitet. Knappen settes i nedre posisjon.

T1 er innstillingen for tregheten på bryteren ved overbelastning.

Eksempel: Velger 6 sek fordi det er små kortvarige overbelastninger i anlegget.

Knappen settes i nedre posisjon B.

OBS!!!! For i det hele tatt å kunne innstille vernet må du vite maks. belastning – Iz for kabelen og minste kortslutningsstrøm –Ikmin på enden av kursen. Hvis du ikke vet dette og må spenningsette kursen allikevel – så still vernet inn på minimum.

Denne knappen gir valget mellom å ha en kortslutningsutløser med tidsforsinkelse – S – eller momentan utkobling – I –

Eksempel: Det ønskes best mulig selektivitet mot etterkoblet bryter i anlegget og derfor velges funksjon S.

Knappen settes i øvre posisjon.

I2 og I3 er innstilling av kortslutningsutløseren. Velges S som kortslutningsutløser blir det automatisk I2, og velges det I som utløser blir det I3.

I2 eller I3 Innstilles lavere enn beregnet Ikmin (minste kortslutningsstrøm).

Eksempel:

Ikmin er beregnet til 475A

I2 skal stilles på 475/100=4,75xIn

Knappen + 5,5 settes i nedre posisjon og de andre knappene i øvre posisjon som gir innstillingen In x (1+1,5+2) = 100 x 4,5 = 450A.

Kortslutningsutløseren er da innstilt lavere enn minste kortslutningsstrøm og dette garanterer utkobling når det oppstår en feil på kursen.

Vedlikehold og drift av ABB SACE effektbrytere

Generelle vilkår for korrekt funksjon for bryterne:

- Temperatur i tavle eller skap må ikke overstige grensetemperatur for bryterne
- Luftfuktighet og luftforurensning må ikke overskride bryternes funksjonsgrense
- Tilkoblinger må være korrekt utført med momentnøkkel

Krav til vedlikehold for effektbrytere i seriene Isomax og Tmax:

Utfør følgende minst en gang årlig ved normale forhold, eller hver 6. måned når bryteren opererer under spesielle forhold og hver gang bryteren har brutt en kortslutning:

- Fjern støv og røykmerker ved hjelp av tørr klut
- Betjen bryteren manuelt og aktiver testknappen noen ganger før bryteren legges inn mot normal belastning
- For plugg- og uttrekkbare brytere må kontaktene mellom bryter og underdel inspiseres
- Sørg for at alle skruer og tilkoblinger blir korrekt tiltrukket
- Dersom bryteren er tydelig preget av skade etter gjentatte kortslutninger må den skiftes ut.

For øvrig henvises til bruksanvisningen som følger bryteren ved leveranse

Krav til vedlikehold for effektbrytere i serien Emax:

Advarsler

- Før det gjøres noen form for vedlikehold eller inspeksjon inne i bryteren må det kontrolleres at bryterens operasjonsfjær ikke er spent. Dette vises i front av bryteren med teksten "springs discharged"!
- Hvis bryteren er av uttrekkbar utførelse må bryteren kobles ifra og trekkes ut i serviceposisjon
- Husk at diverse ekstrautstyr inni bryteren som regel er spenningsatt fra andre kurser enn den selve bryteren er montert i.

Vedlikeholdprogram

Operasjon	Intervall i normal installasjon	Intervall i støvete, varme eller forurensede områder
Generell inspeksjon	Årlig og etter kortslutning	Hver 6. måned og etter kortslutning
Visuell sjekk	Årlig	Hver 6. måned
Vedlikehold av brytemekanismen	Årlig eller etter 10000 operasjoner	Hver 6. måned eller etter 10000 operasjoner

For øvrig henvises til den bruksanvisning som følger bryteren ved leveranse. Der detaljer rundt drift og vedlikehold er beskrevet

SERVICE på effektbrytere:

ABB har en egen avdeling for service lokalisert i Skien som tar på seg oppdrag i forbindelse med:

- Tilstandsvurdering for vedlikeholdsbehov eller utskifting
- Service og vedlikehold
- Reparasjon og utskifting
- Reservedeler til gamle brytere

Kontakt Trond Løvskeid på telefon 35 58 27 98 eller trond.lovskeid@no.abb.com

ABB AS, Automasjonsprodukter

Effektbrytere for kraftdistribusjon
Tekniske data

				Tmax T1 1P	Tmax T1			Tmax T2			
Nominell merkestrøm, **Iu [A]**			[A]	160	160			160			
Poler			[Nr]	1	3/4			3/4			
Nominell servicespenning, **Ue**	(AC) 50-60 Hz		[V]	240	690			690			
	(DC)		[V]	125	500			500			
Nominell impulsspenning, **Uimp**			[kV]	8	8			8			
Nominell isolasjonsspenning, **Ui**			[V]	500	800			800			
Testspenning for standard frekvens i 1 min.			[V]	3000	3000			3000			
Bryteevne ved kortslutning, **Icu**				**B**	**B**	**C**	**N**	**N**	**S**	**H**	**L**
	(AC) 50-60 Hz 220/230 V		[kA]	25*	25	40	50	65	85	100	120
	(AC) 50-60 Hz 380/415 V		[kA]	–	16	25	36	36	50	70	85
	(AC) 50-60 Hz 440 V		[kA]	–	10	15	22	30	45	55	75
	(AC) 50-60 Hz 500 V		[kA]	–	8	10	15	25	30	36	50
	(AC) 50-60 Hz 690 V		[kA]	–	3	4	6	6	7	8	10
	(DC) 250 V - 2 poler i serie		[kA]	25 (at 125 V)	16	25	36	36	50	70	85
	(DC) 250 V - 3 poler i serie		[kA]	–	20	30	40	40	55	85	100
	(DC) 500 V - 2 poler i serie		[kA]	–	–	–	–	–	–	–	–
	(DC) 500 V - 3 poler i serie		[kA]	–	16	25	36	36	50	70	85
	(DC) 750 V - 3 poler i serie		[kA]	–	–	–	–	–	–	–	–
Bryteevne ved kortslutning, **Ics**											
	(AC) 50-60 Hz 220/230 V		[%Icu]	75%	100%	75%	75%	100%	100%	100%	100%
	(AC) 50-60 Hz 380/415 V		[%Icu]	–	100%	100%	75%	100%	100%	100%	75% (70 kA)
	(AC) 50-60 Hz 440 V		[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
	(AC) 50-60 Hz 500 V		[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
	(AC) 50-60 Hz 690 V		[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
Maks nominell slutteevne ved kortslutning, **Icm**											
	(AC) 50-60 Hz 220/230 V		[kA]	52.5	52.5	84	105	143	187	220	264
	(AC) 50-60 Hz 380/415 V		[kA]	–	32	52.5	75.6	75.6	105	154	187
	(AC) 50-60 Hz 440 V		[kA]	–	17	30	46.2	63	94.5	121	165
	(AC) 50-60 Hz 500 V		[kA]	–	13.6	17	30	52.5	63	75.6	105
	(AC) 50-60 Hz 690 V		[kA]	–	4.3	5.9	9.2	9.2	11.9	13.6	17
Utløsertid utkobling (415 V)			[ms]	7	7	6	5	3	3	3	3
Brukskategori (IEC 60947-2)				A	A			A			
Referanse standard				IEC 60947-2	IEC 60947-2			IEC 60947-2			
Skillebryter funksjon				■	■			■			
Vern:	Termomagnetisk										
	T fast, M fast	TMF		■	–			–			
	T justerbar, M fast	TMD		–	■			■			
	T justerbar, M justerbar (5...10 x In)	TMA		–	–			–			
	T justerbar, M fast (3 x In)	TMG		–	–			■ [1]			
	T justerbar, M justerbar (2.5...5 x In)	TMG		–	–			–			
	Kun elektromagnetisk	MA		–	–			■ (MF up to In 12.5 A)			
	Elektronisk	PR221DS		–	–			■			
		PR222DS		–	–			–			
		PR223DS		–	–			–			
		PR231/P		–	–			–			
		PR232/P		–	–			–			
		PR331/P		–	–			–			
		PR332/P		–	–			–			
Utskiftbare vern				–	–			–			
Varianter				F	F			F-P			
Tilkobling	fast			FC Cu	FC Cu-EF-FC CuAl-HR			F-FC Cu-FC CuAl-EF-ES-R			
	plugg-inn			–	–			F-FC Cu-FC CuAl-EF-ES-R			
	uttrekkbare			–	–			–			
Montasje på DIN skinne				–	DIN EN 50022			DIN EN 50022			
Mekanisk levetid			[No. operations]	25000	25000			25000			
			[No. Hourly operations]	240	240			240			
Elektrisk levetid @ 415 V AC			[No. operations]	8000	8000			8000			
			[No. Hourly operations]	120	120			120			
Fysisk størrelse - fast bryter		3 poler	W [mm]	25.4 (1 pole)	76			90			
		4 poler	W [mm]	–	102			120			
			D [mm]	70	70			70			
			H [mm]	130	130			130			
Vekt	fast	3/4 poler	[kg]	0.4 (1 pole)	0.9/1.2			1.1/1.5			
	plugg-inn	3/4 poler	[kg]	–	–			1.5/1.9			
	uttrekkbare	3/4 poler	[kg]	–	–			–			

Tilkoblings koder
F = Front
EF = Front forlenget
ES = Front forlenget - spredere
FC Cu = Front for kopper kabel
FC CuAl = Front for CuAl cables
R = Bakside tilkobling
HR = Bakside - horisontal skinne
VR = Bakside - vertikal skinne
HR/VR = Bakside horisontal/vertikal tilkobling
MC = Multikabel
F = Fast bryter
P = Plugg-inn bryter
W = Uttrekkbar bryter

[1] Bryteevnen for 16 og 20A er 16kA

	Tmax T3		Tmax T4					Tmax T5					Tmax T6				Tmax T7			
	250		250/320					400/630					630/800/1000				800/1000/1250/1600			
	3/4		3/4					3/4					3/4				3/4			
	690		690					690					690				690			
	500		750					750					750				–			
	8		8					8					8				8			
	800		1000					1000					1000				1000			
	3000		3500					3500					3500				3500			
	N	S	N	S	H	L	V	N	S	H	L	V	N	S	H	L	S	H	L	V[6]
	50	85	70	85	100	200	200	70	85	100	200	200	70	85	100	200	85	100	200	200
	36	50	36	50	70	120	200	36	50	70	120	200	36	50	70	100	50	70	120	150
	25	40	30	40	65	100	180	30	40	65	100	180	30	45	50	80	50	65	100	130
	20	30	25	30	50	85	150	25	30	50	85	150	25	35	50	65	40	50	85	100
	5	8	20	25	40	70	80	20	25	40	70	80	20	22	25	30	30	42	50	60
	36	50	36	50	70	100	150	36	50	70	100	150	36	50	70	100	–	–	–	–
	40	55	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	–	–	25	36	50	70	100	25	36	50	70	100	20	35	50	65	–	–	–	–
	36	50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	–	–	16	25	36	50	70	16	25	36	50	70	16	20	36	50	–	–	–	–
	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	100%	100%
	75%	50% (27 kA)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	100%	100%
	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75%	100%	100%	100%	100%
	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%	100%[1]	100%[2]	100%	100%	100%	75%	100%	100%	75%	100%
	75%	50%	100%	100%	100%	100%	100%	100%	100%	100%[1]	100%[2]	100%[2]	75%	75%	75%	75%	100%	75%	75%	75%
	105	187	154	187	220	440	660	154	187	220	440	660	154	187	220	440	187	220	440	440
	75.6	105	75.6	105	154	264	440	75.6	105	154	264	440	75.6	105	154	220	105	154	264	330
	52,5	84	63	84	143	220	396	63	84	143	220	396	63	94.5	105	176	105	143	220	286
	40	63	52.5	63	105	187	330	52.5	63	105	187	330	52,5	73,5	105	143	84	105	187	220
	7,7	13,6	40	52.5	84	154	176	40	52.5	84	154	176	40	48,4	55	66	63	88,2	105	132
	7	6	5	5	5	5	5	6	6	6	6	6	10	9	8	7	15	10	8	8
	A		A					B (400 A)[3] - A (630 A)					B (630A - 800A)[5] - A (1000A)				B[7]			
	IEC 60947-2		IEC 60947-2					IEC 60947-2					IEC 60947-2				IEC 60947-2			
	■		■					■					■				■			
	–		–					–					–				–			
	■		■ (up to 50 A)					–					–				–			
	–		■ (up to 250 A)					■ (up to 500 A)					■[4]				–			
	■		–					–					–				–			
	–		–					■ (up to 500 A)					–				–			
	■		■					–					–				–			
	–		■					■					■				–			
	–		■					■					■				–			
	–		■					■					■				–			
	–		–					–					–				■			
	–		–					–					–				■			
	–		–					–					–				■			
	–		–					–					–				■			
	–		■					■					■				■			
	F-P		F-P-W					F-P-W					F-W[4]				F-W			
	F-FC Cu-FC Cu Al-EF-ES-R		F-FC Cu-FC CuAl-EF-ES-R-MC					F-FC CuAl-EF-ES-R-RC					F-FC Cu-FC CuAl-EF-ES-R				F-EF-ES-FC CuAl-HR/VR			
	F-FC Cu-FC Cu Al-EF-ES-R		EF-ES-HR-VR-FC Cu-FC CuAl					EF-ES-HR-VR-FC Cu-FC CuAl					–				–			
	–		EF-ES-HR-VR-FC Cu-FC CuAl					EF-ES-HR-VR-FC Cu-FC CuAl					EF-HR-VR				F-HR/VR			
	DIN EN 50022		–					–					–				–			
	25000		20000					20000					20000				10000			
	240		240					120					120				60			
	8000		8000 (250 A) - 6000 (320 A)					7000 (400 A) - 5000 (630 A)					7000 (630A) - 5000 (800A) - 4000 (1000A)				2000 (S, H, L versions) / 3000 (V version)			
	120		120					60					60				60			
	105		105					140					210				210			
	140		140					184					280				280			
	70		103.5					103.5					103.5				154 (manual) /178 (motorizable)			
	150		205					205					268				268			
	1.5/2		2.35/3.05					3.25/4.15					9.5/12				9.7/12.5 (manual) - 11/14 (motorizable)			
	2.7/3.7		3.6/4.65					5.15/6.65					–				–			
	–		3.85/4.9					5.4/6.9					12.1/15.1				29.7/39.6 (manual) - 32/42.6(motorizable)			

[1] 75% for T5 630
[2] 50% for T5 630
[3] Icw = 5 kA
[4] W finnes ikke for T6 1000A
[5] Icw = 7.6 kA (630 A) - 10 kA (800 A)
[6] Kun for T7 800/1000/1250 A
[7] Icw = 20 kA (S,H,L versions) - 15 kA (V version)
[8] Spør ABB

Note: Innpluggbar versjon reduseres belastbarhet med 10% ved 40°C

OVERCURRENT / SHORT CIRCUIT / EARTH FAULT PROTECTION RELAY

MPRB 06

M98204412-03-06B

INSTRUCTION MANUAL

(c) ABB

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BLOCK DIAGRAM OF THE RELAY 38

1.- DESCRIPTION

The MPRB-06 is a self powered electronic protection relay, with phase overload in a time dependant basis (ansi 51 with IEC curves), phase short-circuit (ansi 50) and earth fixed time (ansi 50/51 N), intended for protection of medium voltage systems like motors, transformers or distribution lines. This relay is designed for working with two specifically designed transformers (CT1 MPRB-06 and CT2 MPRB 06), covering the full range needed in the application.

Interface with the user is based on push buttons and a wide temperature range LCD, the combination of which allows a extended functionality compared to dip switch adjusted relays, including continuous adjusting of parameters (instead of defined steps), displaying of measures of the instantaneous RMS value of every phase current and earth, and visualization of the last trip conditions (origin and values of current and time).

Furthermore, this relay is battery operated for non-critical functions, allowing reading of the last trip conditions and adjusting of all the protection parameters. The battery is a standard coin model available in the entire world, and is easily replaceable.

Protection degree IP 67 of the relay and transformers resin containers, provide high level of functionality over adverse climatic situations.

2.- SECURITY RELATED EXPLANATIONS

WARNING: This symbol ⚠ means that there is a potential risk for the user, and the manual must be checked for information of the referred part.

Any employment of this equipment in a different way than specified on this manual can compromise the security of this equipment and affect to the protection of the user.

3.- TECHNICAL SPECIFICATIONS

3.1 Power Supply

This relay can be powered by AUXILIARY SUPPLY or by special current transformers (non standard)

- AUXILIARY SUPPLY: 230 Vac +/- 30% 5VA (other voltages on request)
- SELF POWERING
  - **CT1 MPRB 06** [1]
    - Starting current: 12 AMPS
  - **CT2 MPRB 06**[2]

[1] **MPTA 96-14-90 already installed can be used** (So and S2 connections only)
[2] **MPTA 96-117-737 already installed can be used** (So and S2 connections only)

  - Starting current: 51 AMPS

- Load in measurement transformer caused by self-power in nominal range: < 100 mVA

3.2 Ambient conditions

- Temperature working: - 40 to 85 ºC
- LCD optimal: -10 ºC to 60 ºC.
- Humidity: 95% Hr (not condensating)
- Salt moisture resistant, always with sealing front plate mounted.

3.3 Inputs and outputs

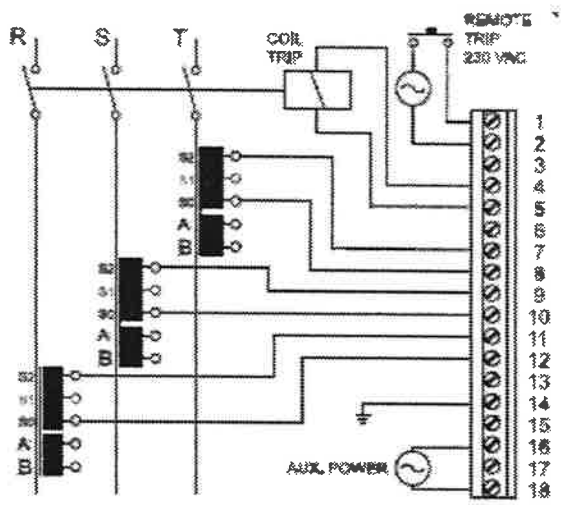
Specifications

Terminal blocks are 2,54 mm spaced, PA66 1,5 mm^2 cable section. For improved isolation, some connections are not used

- External trip input: 230 Vac +/- 30 %, 0.7W
- Output coil trip: 45 mJ (14V / 470 uF)
- Earth protection connection (intended for being the only earth connected point of the transformers and the relay. In case the transformers needed to be earth connected, "A" terminal should be used.
- A and B (in CTs): Test input connection

Relay terminal block

1 and 2:	External trip input
4 and 5:	Output coil trip
7 and 8:	T phase CT
9 and 10:	S phase CT
11 and 12:	R phase CT
14:	Protection earth connection
16 and 18:	Auxiliary power



Transformers connection

So and S2: Measuring and self-powering
A and B: Input test current

Insulation coordination

Groups of insulation are listed:

- EARTH GROUP at 0Vac, includes
  - CT inputs
  - Tripping coil output
  - Factory programming plug (not accessible)

- EXTERNAL TRIP INPUT GROUP: 3700 Vac; 50 Hz

- AC MAINS GROUP: 3700 Vac; 50 Hz

3.4 Weight and dimensions

Relay: 154 x 64 x 127 mm (width, height, depth)
CTs: 100 x 118 x 130 mm (including clips)
Weight: Relay: TBD
CT1: TBD
CT2: TBD

3.5 Measuring and protection specifications

Main characteristics of the relay

- Phase protection:
  - Temporized, standard (IEC) current curves (In, I>, k)
  - Time defined (I>>, t)
- Earth protection:
  - Time defined (Io>>)
- RMS measure of current employing three oversized internal transformers.
- RMS Measure of earth current by summation of secondary signals.
- Continuous curve computation by means of adjusting parameters I> y K.
  - Inverse
  - Normal inverse
  - Very inverse
  - Time defined
  - Curve n°1, (C1) - Protection transformers standard characteristic. (Figure 1)
  - Curve n°2, (C2) - Wire protection. (Figure 2)
  - Curve n°3, (C3) - "S1" Protection characteristic for Sweden transformers with increase of overload capability. (Figure 3)
  - Curve n°4, (C4) - "S2" Protection characteristic for Sweden transformers with increase of overload capability. (Figure 4)
  - Curve n°5, (C5) - Characteristic "FULL RANGE" protection transformers for Denmark. (Figure 5)

Protection and measuring ranges

- Overload current: 21 kA 3 sec
- Permanent current
  - CT1 MPRB 06: 288

- CT2 MPRB 06: 1120

Table 1: Margin of measure

	In	*I self power*	*I>*	*I>>*
CT1 MPRB 06	15 – 112 A	12 A	13.5 – 288 A	15 – 2240 A
CT2 MPRB 06	64 – 448 A	51 A	57.6 – 1120 A	64 – 8960 A

Table 2: Precision of the measure

CT	*I >*		*I >>*	
CT1 MPRB 06	13.5 – 288 A	3 %	288 – 2240 A	5 %
CT2 MPRB 06	57.6 – 1120 A	3 %	1120 – 8960 A	5 %

Higher currents are measured and recorded, but precission is not ensured. This case is warned with a flashing in the measurement.

3.6 Measuring performance and powering mode:

The MPRB-06 can work with external power supply or with self-power from its transformers.

When the relay works with auxiliary supply, the burden seen by the transformers is lower than the burden seen in self-powering mode. The linearity is thus improved, and the earth current measurement gets more precise.

As the relays start at a minimum current the error is kept lower than the stated percentile of the phase current, for every phase and also for earth measurement.

3.7 Protection and measuring limitations

The nominal range of the current transformers defines the main limitation in the application of the relay. There are more limitations associated with the physical implementation of protection relays, and are related to this transformers.

Starting current self-powered: When there is not auxiliary supply, the relay can get the power from the transformers. There is a minimum current for activate all the functionality of the relay, and has been designed for being the same independently of the number of phases with current.

Starting current with auxiliary supply: With auxiliary supply the relay does not need to get the power from the transformers and the minimum current is much lower. **If the current is lower than the minimum, the displays shows dashes "—" instead of zero.**

I earth minimum: This relay is optimized for measuring earth current without a costly fourth frame transformer, with the well know summation of the signals given by the transformers. The limitations of this system arise from the composite error of every transformer, and thus there is a minimum phase current for having valid earth estimation.

I earth at maximum Phase current: Connected with the last point, the transformers saturate with big currents. Before the phase currents reach the saturation value, **the earth measurement is inhibited, as well the associate protection.**
In this case the earth current is displayed as "OVL".

Table 3: Protection and measuring limitations

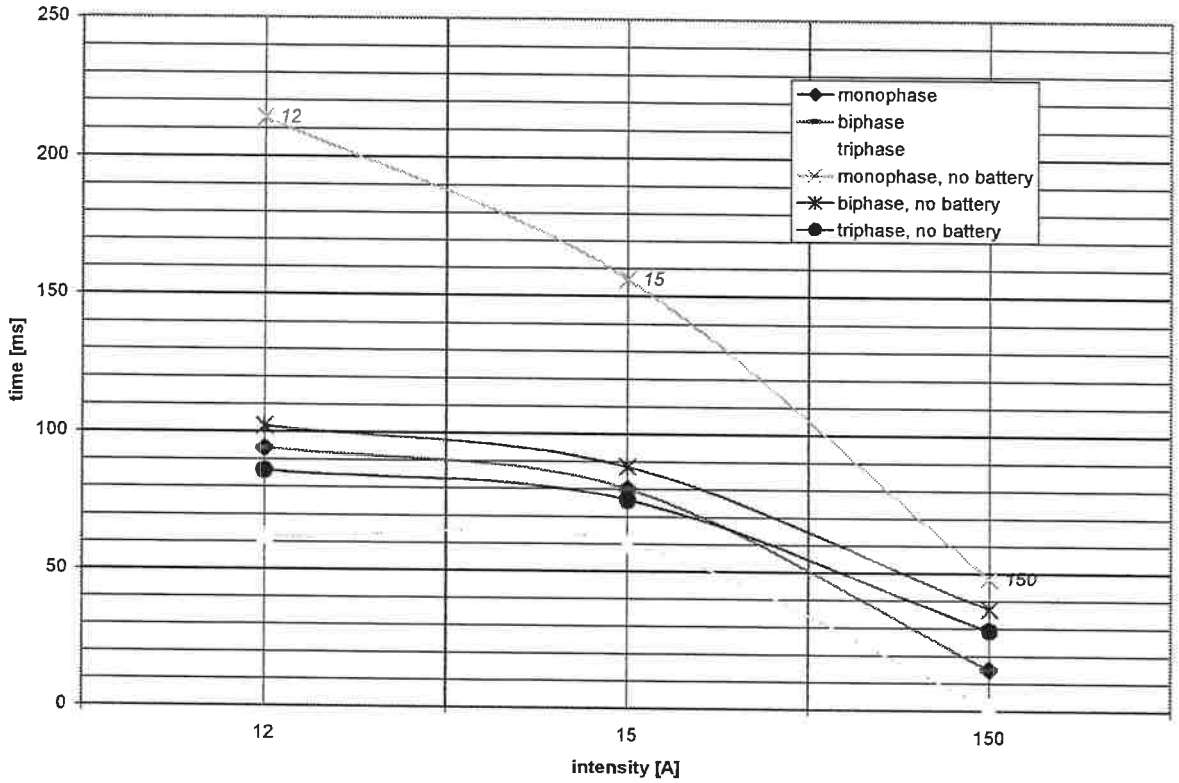
Transformer / Parameter	Turns ratio 1/N	Test winding	Nominal current range	Starting current self powered	Starting current with auxiliary supply	I earth minimum	I earth at maximum Phase current
CT1	380	50	15 – 112	80 % In min **I_{SSP}= 12**	5 % In min **0,75 A**	**4 % of phase current**	3 x I nom Max **I_{hmpc}= 336 A**
CT2	1160	200	64 – 448	80 % In min **I_{SSP}= 51**	5 % In min **3,20 A**	**4 % of phase current**	3 x I nom Max **I_{hmpc}= 1334 A**

Starting Times of the relay / Reset time:

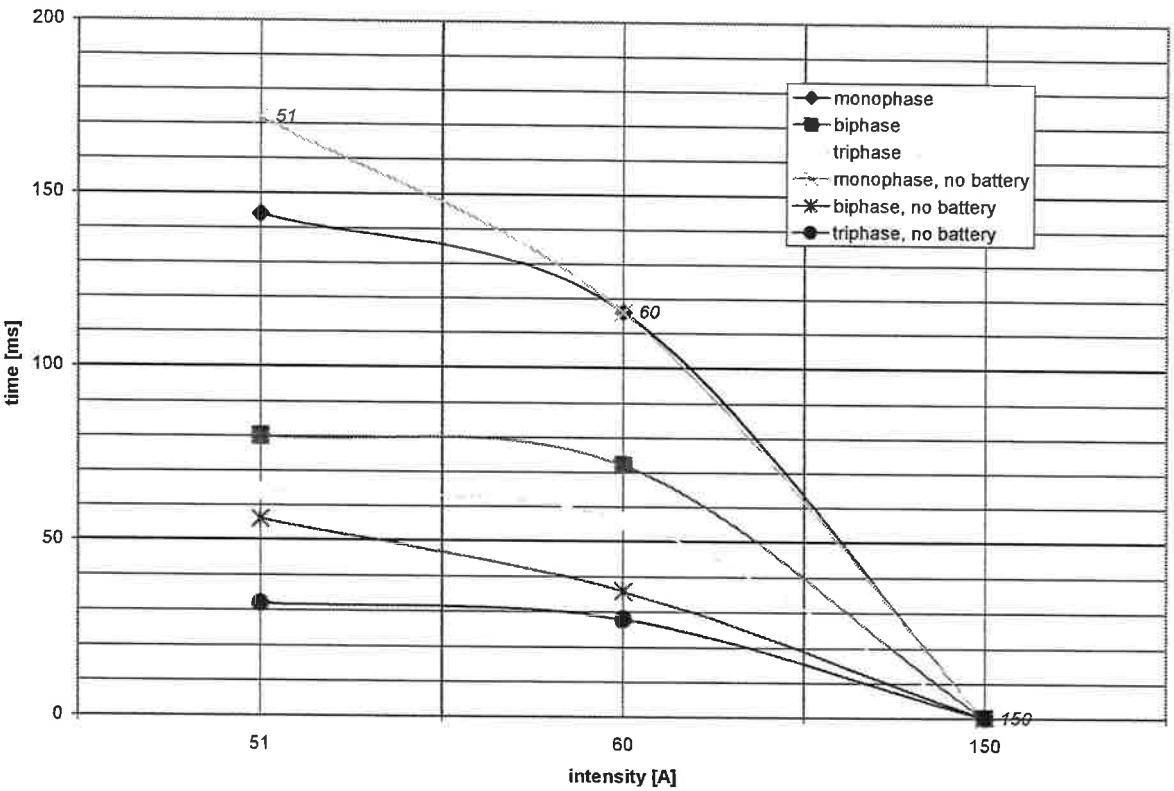
The starting time of relay is the time needed for start measures and compute trip times, from the application of an energizing input. This time follows different situations.

- Auxiliary supply: Less than 5 ms
- Self powered
    - Coin cell: If the battery is full, starting time is slightly faster with low currents than a relay with an empty battery (or is not present). This time also depends on the current amount and the number of phases (see graphs)
    - Current transformer: Also affect the starting time

CT1 - Self powered starting times, with and without battery



CT2 - Self powered starting times, with and without battery



4.- SECURITY CLASIFICATION OF THE MPRB 06

OVERVOLTAGE CATEGORY (according EN 61010-1)
- Current measuring (medium voltage side): Not applicable. Isolation given by the high voltage cable.
- Auxiliary power: Category III 230 Vac

SECURITY CLASS (according EN 61010-1)
- Current measuring (medium voltage side): Not applicable. Isolation given by the high voltage cable.
- AC powering: Class II (ground connection is not security intended)

CASING, relay and current transformers
- Material: Plastic, ABS V0
- Protection degree: IP 67 (sealed box)

5.- INSTALLATION

5.1.- Wiring instructions (Figure 6)

Transformers must be connected to inputs (**7-8**), (**9-10**) and (**11-12**).
Tripping coil will be connected to outputs (**4-5**). When external tripping is required a source of voltage with a serial switch (remote controller, thermostatic switch) must be connected to (**1-2**).

Shielding of high voltage cable, once has been taken through the hole of the CT, must be wired again through the CT hole to the earthen point for avoid wrong readings (the shield carries a high current taken through the scattering capacitance).

After adjusting the relay, the cover has to be screwed in its place for providing the intended protection against ambient agents (moist, salt, dust). It is commendable to seal the front cover for avoiding undesirable changes of the trip adjusting.

⚠ WARNING

In high voltage facilities there is a risk of personal injuries and death. Operation of an installed relay must be carried by specialized and specifically trained operators. High voltage working regulations must be followed, besides of technical procedures of electrics companies and authorized installers.

A wrong or faulty programming of this relay can lead to costly accidents including fire, destruction of the protected machines, and interruption of electrical service in big areas or other dangerous situations.

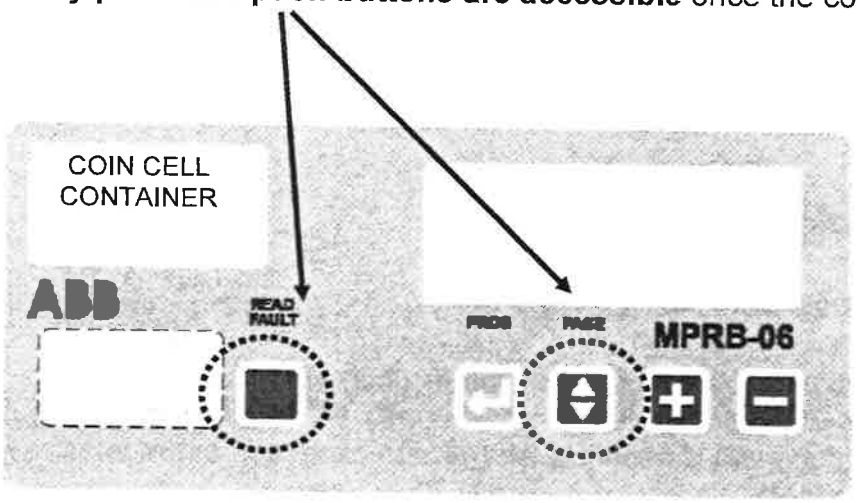
Always ask for assistance in case of doubt.

6.- USER INSTRUCTIONS

6.1 Description of the relay, LCD and buttons

FRONT SIDE: This relay is provided with a transparent cover that can be sealed using two holes at each side of the case.

Nevertheless, for allowing phase current readings, trip adjustments, and the causes of a trip, **two specially protected push buttons are accessible** once the cover has been secured.



Functionality of push buttons

- **"READ FAULT"**: Not sealed key. Shows the information of last trip (the name of the phase that had generated the trip, current in the trip for that phase, time the fault has remained, curve or short-circuit...).
    - Pushing **"PAGE"** button while in trip visualization mode will show in the screen the current in the trip for each phase.

- **"PAGE"**: Not sealed key, function depends on the two contexts
    - **Visualization mode**: Changes the visualization adjustable parameters screen.
    - **Programming mode**: Changes the selected parameter and adjusting parameter screen. While a value is being modified, pushing PAGE before "PROG / RETURN", jumps to next parameter without saving the new value.

- **"PROG / RETURN"**: When pushed for more than two seconds, changes to PROG mode. While in PROG mode, selects a parameter to be changed, pushing it again saves the new value and jumps to next parameter.

- **"+"**: In PROG mode increments the selected parameter.

- "-": In PROG mode decrements the selected parameter.

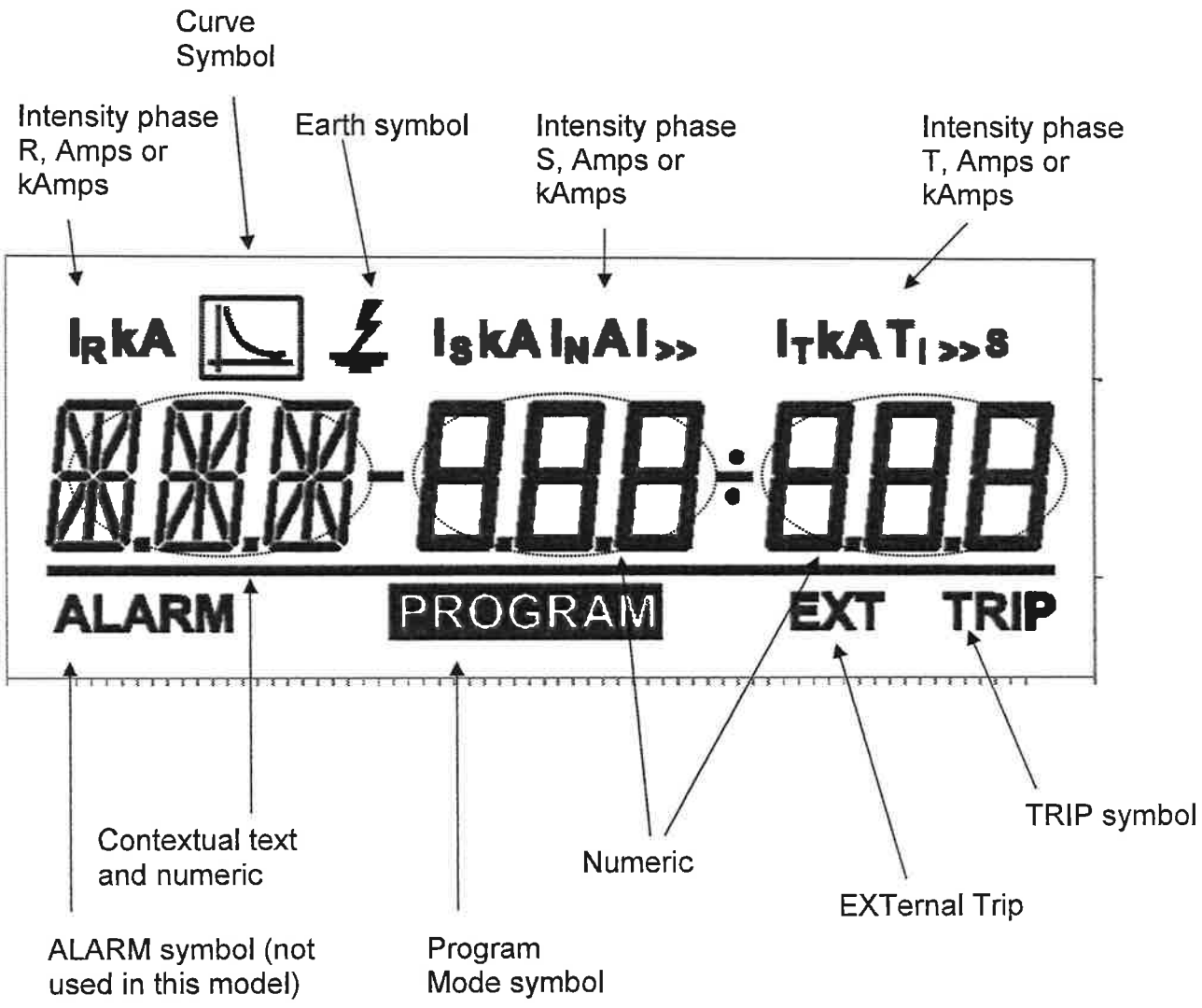
Functionality of the LCD

The LCD is a custom made component, and its purpose is to permit readings and programming of all the parameters of the relay.

Because its high number and different nature, the design includes

- Fixed literals: IR, IS, IT, etc. Main parameters to be shown and also units of measure
- Symbols: For ease of understand, when it was possible, graphical symbols explain the kind of parameter shown
- Numeric digits: For the purpose of showing just numbers
- Alphanumerical digits: For any kind of least used literal.

Fixed literals and symbols define a context in which the numbers, with its measurement units, take whole sense.



6.2 Readings of the relay

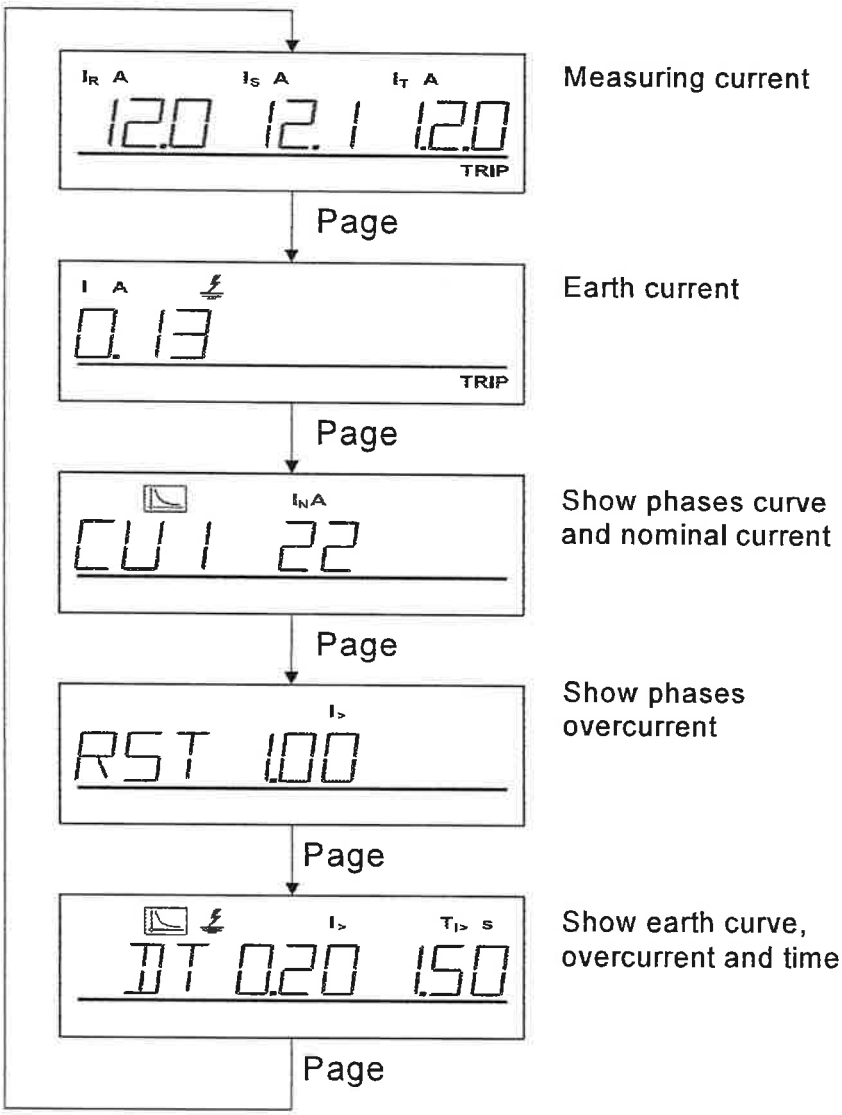
Taking advantage of the full-protected accessible push buttons "READ FAULT" and "PAGE", it is possible to read some VISUALITATION SCREENS

- Measuring current
- Earth current
- Show phases curve and nominal current
- Show phases over current and time for over current(*)
- Show phases short-circuit(*) and instantaneous time(*)
- Show earth curve, over current and time

6.2.1 VISUALITATION SCREENS

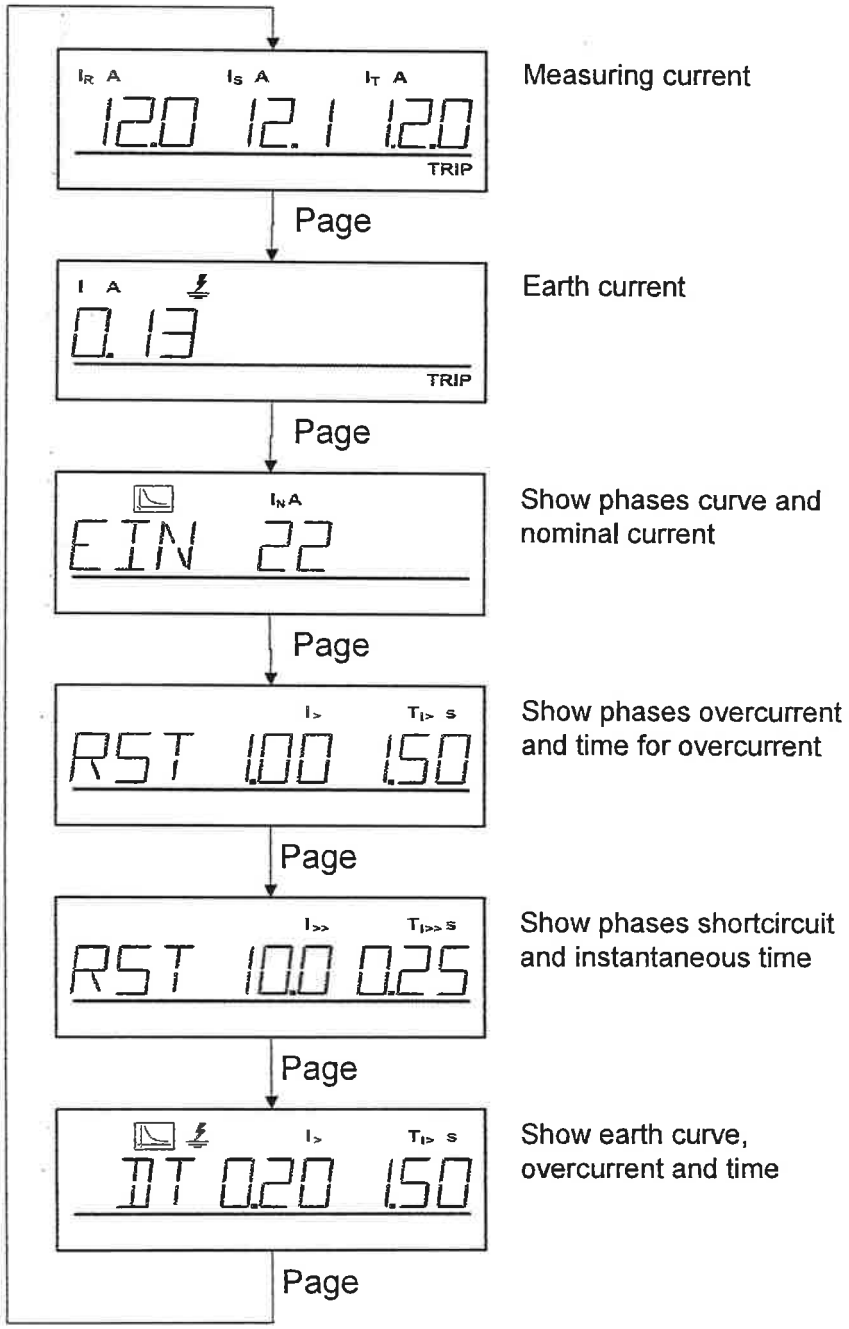
"Normal mode" operation. These screens rotate with the PAGE push button. If any push button is not touched in 20 sec, the "measuring current" screen returns automatically.

For curves CU1 to CU5



For curves NIN, VIN, IN and DT, there are three more parameters to configure. So, these curves have one more visualization screen

For curves NIN, VIN, IN, DT



Measuring current

Earth current

Show phases curve and nominal current

Show phases overcurrent and time for overcurrent

Show phases shortcircuit and instantaneous time

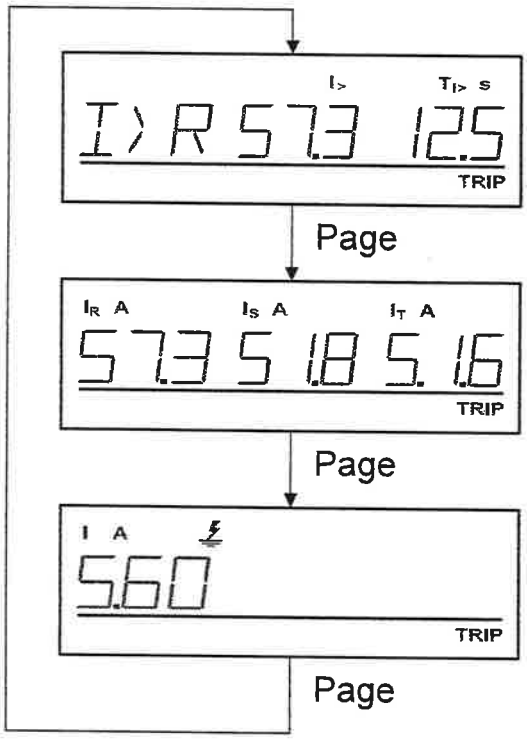
Show earth curve, overcurrent and time

6.2.2 TRIP SCREENS

In case there is a trip in the installation, there is a big advantage on the use of the back up coin battery. Without the need of auxiliary supply or self-powering, the causes and details of a trip can be easily read.

Push "READ FAULT" key to enter in this screens, and then use the "PAGE" push button to rotate through screens. Push again "READ FAULT" or wait for timeout (20 sec) to return main screen.

To show trip information



Show last trip information:
- Instantaneous current
- Trip time
- Trip type

Shows current for each phase, at trip instant.

Show earth current at trip instant.

TRIP TYPES

I> R	Phase R trip
I> S	Phase S trip
I> T	Phase T trip
I> E	Earth current trip
EXT	External trip

6.2.3 Operations modes of the relay

The relay behaves in different ways for different powering situations

- POWERED: Although the relay is powered, **after 5 minutes the LCD is switched off** for improve its life. It lits again in case of trip or operation of any push-button
- STAND BY: If there is not any source of power. The LCD is off but can be activated using any push-button for reading or programming purposes. It switches off again after 2 minutes.

6.3 Relay settings

6.3.1 Parameters:

Parameters that can be programmed and its adjusting range:

- **Frequency of operation**
  - 50 / 60 Hz

- **Type of Current Transformer** [3]
  - CT1, CT2, CT3, CT4

- **Nominal current (I_N)**[4]
  - CT1: 16 – 112 A, minimum increment 1 A
  - CT2: 64 – 448 A, minimum increment 1 A

- **CURVE type (see addendum for curves)**:
  - INVERSE (IEC)
  - VERY INVERSE (IEC)
  - EXTREMELY INVERSE (IEC)
  - DEFINITE TIME (IEC)
  - Curve n°1, (C1) - Protection transformers standard characteristic. (Figure 1)
  - Curve n°2, (C2) - Wire protection. (Figure 2)
  - Curve n°3, (C3) - "S1" Protection characteristic for Sweden transformers with increase of overload capability. (Figure 3)
  - Curve n°4, (C4) - "S2" Protection characteristic for Sweden transformers with increase of overload capability. (Figure 4)
  - Curve n°5, (C5) - Characteristic "FULL RANGE" protection transformers for Denmark. (Figure 5)

- **I >**: Factor of the curve referred to the nominal current
  - 0.90 to 2.50, least increment 0.05. This parameter can be set to OFF, so curve is off too, and relay only trips on overcurrent.

- **$T_{I>}$**: Time factor in curves, Time in seconds in definite time
  - 0.05 to 10, least increment 0.05
  - 0.05 to 300 seconds only in defined time

---

[3] CT3 for MPTA 96-14-90 and CT4 for MPTA 96-117-737 already installed (S0 and S2 connections only)

[4] CT3 has the same range as CT1 and CT4 has the same range as CT1, always connect S0 and S2.

- **I >>**: Short circuit factor referred to the nominal current
  - 1 to 20, least increment 1

- **T I>>**: Time in seconds in short circuit
  - 0.02 to 3.0, least increment 0.01

- **I >&** : Earth fault current factor referred to the nominal current
  - 0.2 to 2.5, least increment 0.1. This parameter can be set to OFF, so earth curve is off too, and relay only trips on overcurrent.

- **T I>**: & : Time in seconds for earth fault
  - 0.1 to 20, least increment 0.1

There is provided a minimum tripping time of the relay for avoiding damage in the switch breaker (related with high dc component), and is 20 ms in any case.

6.3.2 Programming

For programming the parameters of this relay, the transparent cover has to be taken out, so that the special programming push buttons became accessible.

ENTERING PROGRAM MODE

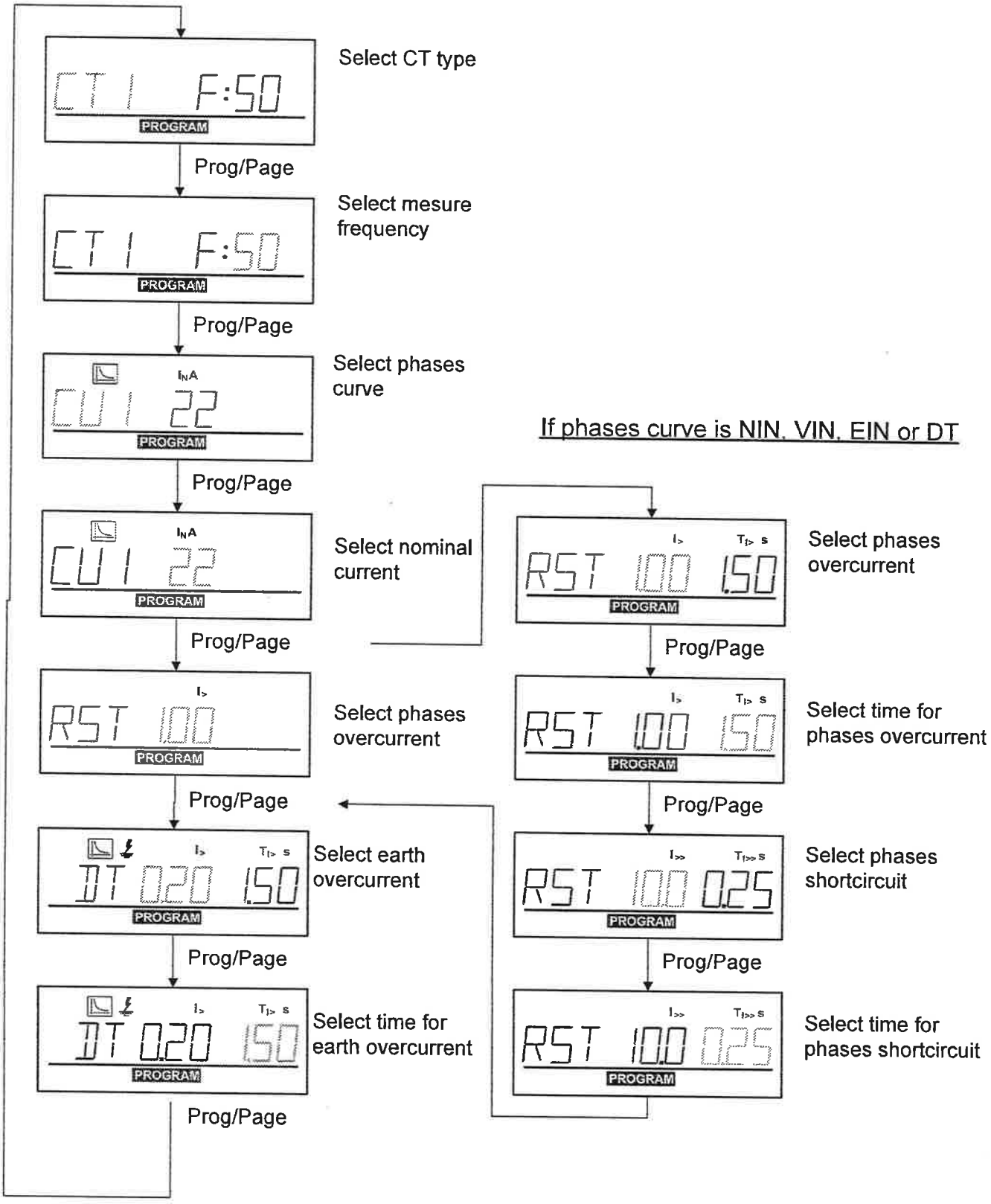
Push PROG key for 5 sec. to enter in this screens.

NAVIGATION

- PAGE: selection of next parameter, **discarding the modified value**
- PROG: selection of next parameter, **validating the modified value**
- + / - KEYS: modification of values (number or list of options)

RESUMING NORMAL FUNCTIONS IN PROG MODE

- Push PROG key for 5 sec. for save and exit.
- Push PAGE key for 5 sec. for exit without save.
- After 60 sec of no pushing any key, exits without save


CT 1 F:50
PROGRAM
Select CT type
Prog/Page
CT 1 F:50
PROGRAM
Select mesure frequency
Prog/Page
CU 1 22
PROGRAM
Select phases curve
Prog/Page
CU 1 22
PROGRAM
Select nominal current
Prog/Page
RST 100
PROGRAM
Select phases overcurrent
Prog/Page
DT 020 150
PROGRAM
Select earth overcurrent
Prog/Page
DT 020 150
PROGRAM
Select time for earth overcurrent
Prog/Page
If phases curve is NIN, VIN, EIN or DT
RST 100 150
PROGRAM
Select phases overcurrent
Prog/Page
RST 100 150
PROGRAM
Select time for phases overcurrent
Prog/Page
RST 100 025
PROGRAM
Select phases shortcircuit
Prog/Page
RST 100 025
PROGRAM
Select time for phases shortcircuit

6.4 External Trip

This input is intended for remote trip of the relay, and can be wired to any automatic or manual system able to provide the input operation voltage. This input is protected against noise and bounces, and a minimum time needs to be applied.

The trip is only functional if the relay is powered by self-power or by auxiliary supply. The remote trip does not work only with battery energy.

6.5 Testing of the installed relay

The transformer currents are provided with two terminal blocks labeled A and B, intended to connect a protection relay tester.

CT1 has 50 turns
CT2 has 200 turns

The current applied to these windings is seen by the relay multiplied by the number of turns, so 1 amp is equivalent to 50 Amps in CT1, and 200 Amps in CT2. It is expected to have a relation error, so this test is only functional, and is provided to check the trip adjusting of the relay. It is recommended to use the readings of the display to contrast the equivalent currents.

7.- MAINTENANCE OF THE RELAY

The relay employs a 3V coin cell Lithium type primary battery, for adjusting, visualization and checking purposes. **The failure of this battery does not cause disoperation of the relay,** and can be overcame by changing the battery or by powering the relay with auxiliary supply, through the test windings with a relay tester, or by the powering of the installation itself.

The battery recommended is PANASONIC BR2032, but other types or brands of the same size and voltage can be used (CR2032, CR2032H, etc). BR2032 has self discharge of 0.5% per year while the CR2032 types exhibit 1%.

For changing the battery, the plastic cover of the relay has to be taken out by unscrewing the four PHILIPS type screws, and the battery case has to be pulled using a flat screwdriver. Once the battery case is out, the battery can be changed by hand and the exhaust component must be disposed in a recycling container according the local regulations.

7.1 Life expectancy of the battery

The life depends on the use of the relay.

In a real life situation, with an 80 % of the time being powered (by self-powering or auxiliary supply), and a 20% of the time without any power in which there has been 20 readings of "LAST TRIP", "SETTINGS" or programing parameters, the life expectancy is **higher than 20 years**.

If the relay is stored with the battery attached, its life reduces to more than 6 years.

If the relay is powered by self-power or auxiliary supply, the battery expectancy is higher than 30 years (slightly lower than the self-life of the battery out of the relay).

Note: In extreme conditions of temperature gradient, the relay can suffer moisture from condensation. In this situations, the battery life can be reduced.

⚠

Take care of not shorting the battery as it can overheat and leak toxic components.

Do not swallow, eat, or try to open it.

In case of taking contact with the internal components, wash the exposed skin. If it is ingested contact to a toxicological attention service.

8.- TECHNICAL ASSISTANCE

In case of failure of the relays, contact with the local dealer

(Stamp)

9.- STANDARDS

Insulation

Insulation voltage withstand
Test of withstand alternating voltage for 1 min: IEC 60255-5 2.5 kV
Test of lightning surge voltage 1.2/50 µs, 0.5 J IEC 60255-5 5 kV

EMC

Interference immunity against discharges of static electricity

EN 60255-22-2 [05/97]	Air discharge	8 kV
EN 61000-4-2 [03/96]	contact discharge	6 kV
Class 3		

Interference immunity against high-speed transient interference quantities

IEC 60255-22-4 [10/93]	power supply, mains inputs	±4 kV, 2.5 kHz
EN 61000-4-4 [03/96]	other inputs and outputs	±2 kV, 5 kHz
Class 4		

Interference immunity against 1 MHz burst disturbance tests

EN 60255-22-6 [11/94]	differential mode	2.5 kV, 1 MHz
IEC 60255-22-1 [05/91]	common mode	1 kV, 2 s

Interference immunity against surge immunity test

EN 61000-6-2 [03/00]	4 kV/2 kV
EN 61000-4-5 [09/96]	

Interference immunity against high-frequent electromagnetic fields

EN 61000-4-3 [08/97]	10 V/m
Class 3	

Interference immunity against magnetic fields of energy based frequency

EN 61000-4-8 [05/94]	continuously	100 A/m
Class 5	3 s	1000 A/m

Interference immunity against line conducted interference quantities induced by high-frequent fields

EN 61000-4-6 [04/97]	10 V/m
Class 3 (0.15-230 MHz)	

Interference immunity against surge voltage

EN 61000-4-5 [09/96]	within a current circuit	2 kV
Class 4	current circuit to Herat	4 kV

Measuring of the radio interference voltage
EN 55011 [10/97] Limit. value class B

Measuring of the radio interference radiation
EN 55011 [10/97] Limit. value class B

Ambient conditions

Vibration and continuous vibration test
EN 60255-21-1 [05/96] Class 2

Shock and continuous shock test
EN 60255-21-2 [05/96] Class 2

Earthquake test
EN 60255-21-3 [11/95] Class 2

Test Ad: Cold
EN 60068-2-1 [03/95]; Temperature -40°C; Period of stress 16 h

Test Bd: Dry heat
EN 60068-2-2 [08/94]; Temperature +85°C; Rel. humidity <50%; Period of stress 72 h

Test Ca: Humid heat (constantly)
IEC 60068-2-3 [12/86] Temperature +40°C; Rel. humidity 93%; Period of stress 56 d

Test Db :Humid heat (cyclic)
IEC 60068-2-30 [09/86] Temperature +85°C; Rel. humidity 95%; Cyclen (12 + 12-hours)

Class of protection
IP 67

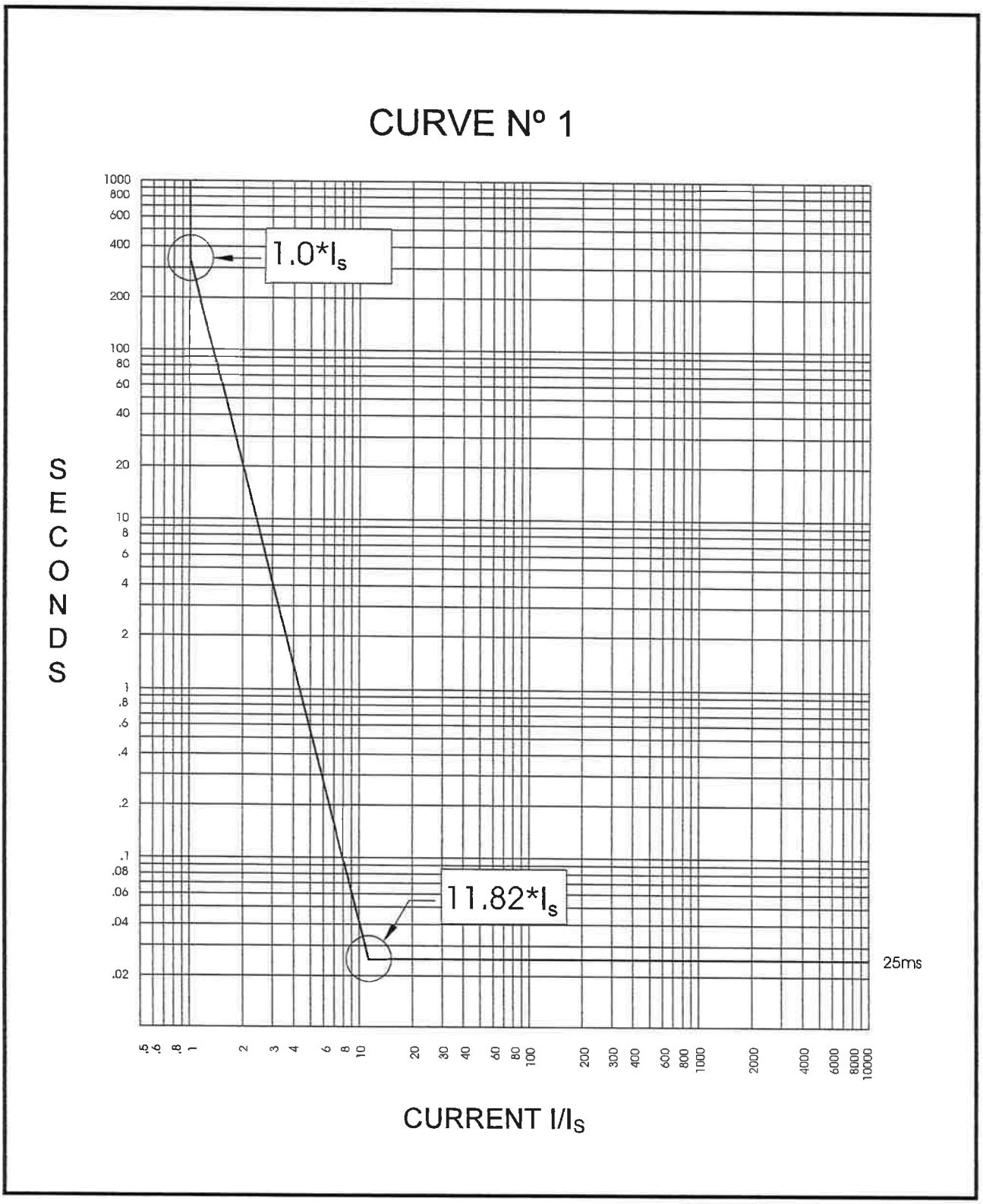
ADDENDUM

Curves:

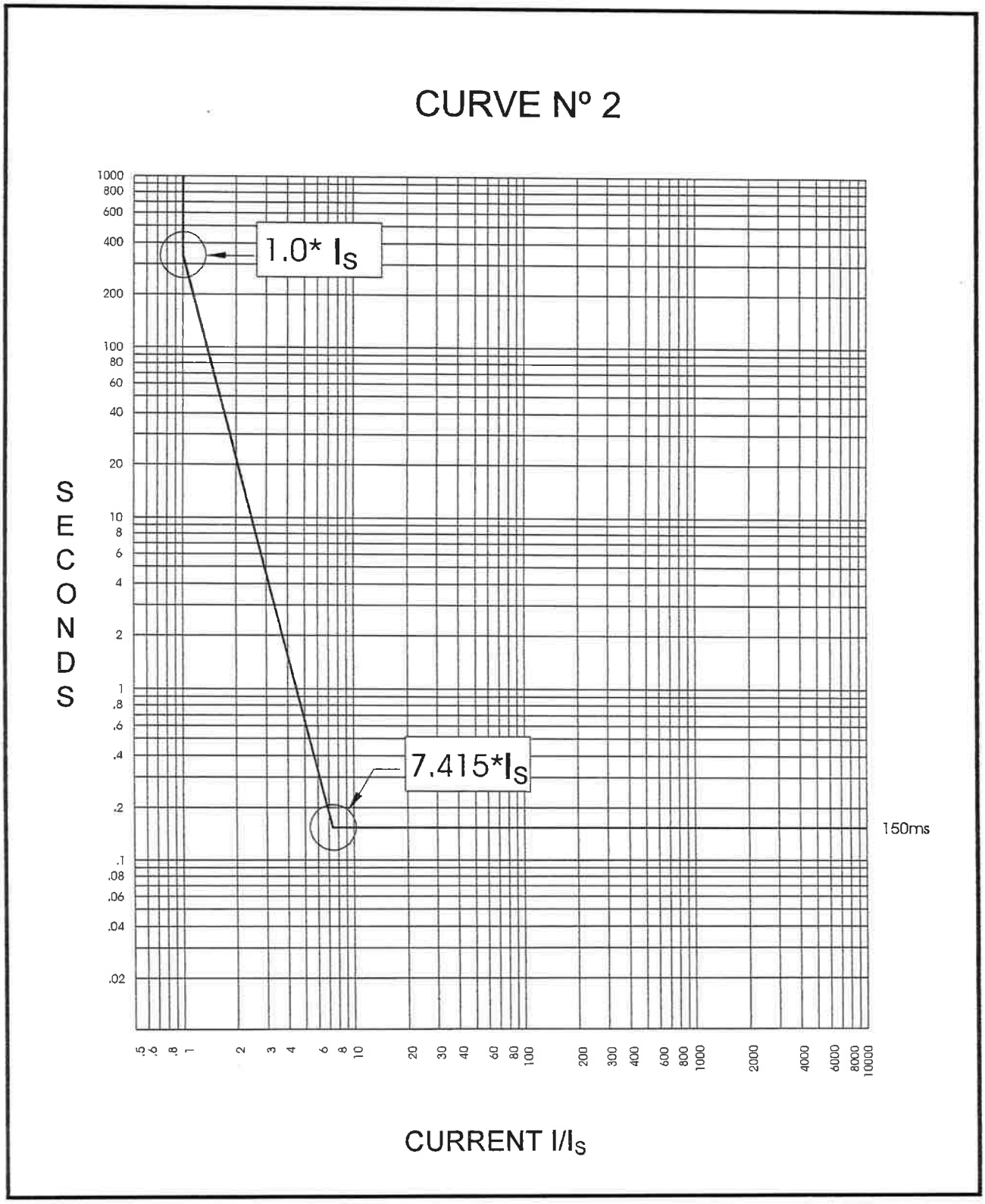
Define $I_S = I_N \cdot I_>$

CURVE	EQUATION	CURVE	EQUATION
CU1 Curve n° 1	$t_s = \begin{cases} 330\left(\frac{I}{I_S}\right)^{-3.841} & I_S < I < 11.82 \cdot I_S \\ 0.025 & 11.82 \cdot I_S \le I \end{cases}$	**NIN** Normal inverse	$t_s = \frac{0.14 \cdot T_{I>}}{\left(\frac{I}{I_S}\right)^{0.02} - 1}$
CU2 Curve n° 2	$t_s = \begin{cases} 330\left(\frac{I}{I_S}\right)^{-3.841} & I_S < I < 7.415 \cdot I_S \\ 0.125 & 7.415 \cdot I_S \le I \end{cases}$	**EIN** Extremly inverse	$t_s = \frac{80 \cdot T_{I>}}{\left(\frac{I}{I_S}\right)^{2} - 1}$
CU3 Curve n° 3	$t_s = \begin{cases} 300\left(\frac{I}{I_S}\right)^{-4.7256} & I_S < I < 4.7 \cdot I_S \\ 0.044\left(\frac{I}{I_S}\right)^{-0.2415} & 4.7 \cdot I_S \le I < 10 \cdot I_S \\ 0.025 & 10 \cdot I_S \le I \end{cases}$	**VIN** Very inverse	$t_s = \frac{13.5 \cdot T_{I>}}{\left(\frac{I}{I_S}\right) - 1}$
CU4 Curve n° 4	$t_s = \begin{cases} 300\left(\frac{I}{I_S}\right)^{-4.3365} & I_S < I < 5.4 \cdot I_S \\ 0.049\left(\frac{I}{I_S}\right)^{-0.2958} & 5.4 \cdot I_S \le I < 10 \cdot I_S \\ 0.025 & 10 \cdot I_S \le I \end{cases}$		
CU5 Curve n° 5	$t_s = \begin{cases} 1000\left(\frac{I}{I_S}\right)^{-6.644} & 1 \cdot I_S < I < 2 \cdot I_S \\ 512.28\left(\frac{I}{I_S}\right)^{-5.679} & 2 \cdot I_S \le I < 3 \cdot I_S \\ 119.46\left(\frac{I}{I_S}\right)^{-4.354} & 3 \cdot I_S \le I < 7 \cdot I_S \\ 0.025 & 7 \cdot I_S \le I \end{cases}$		

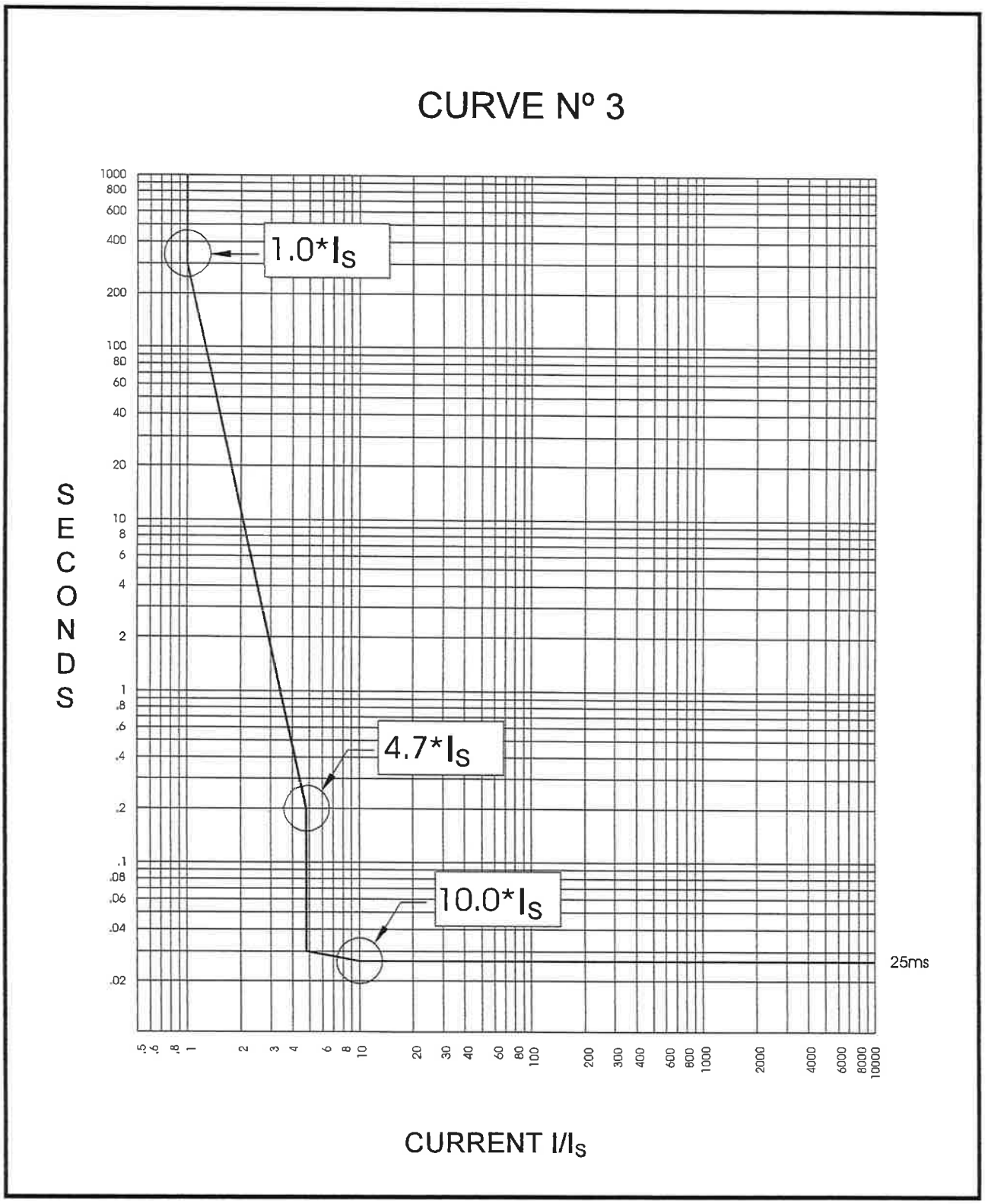
CURVE # 1.
(Figure 1).



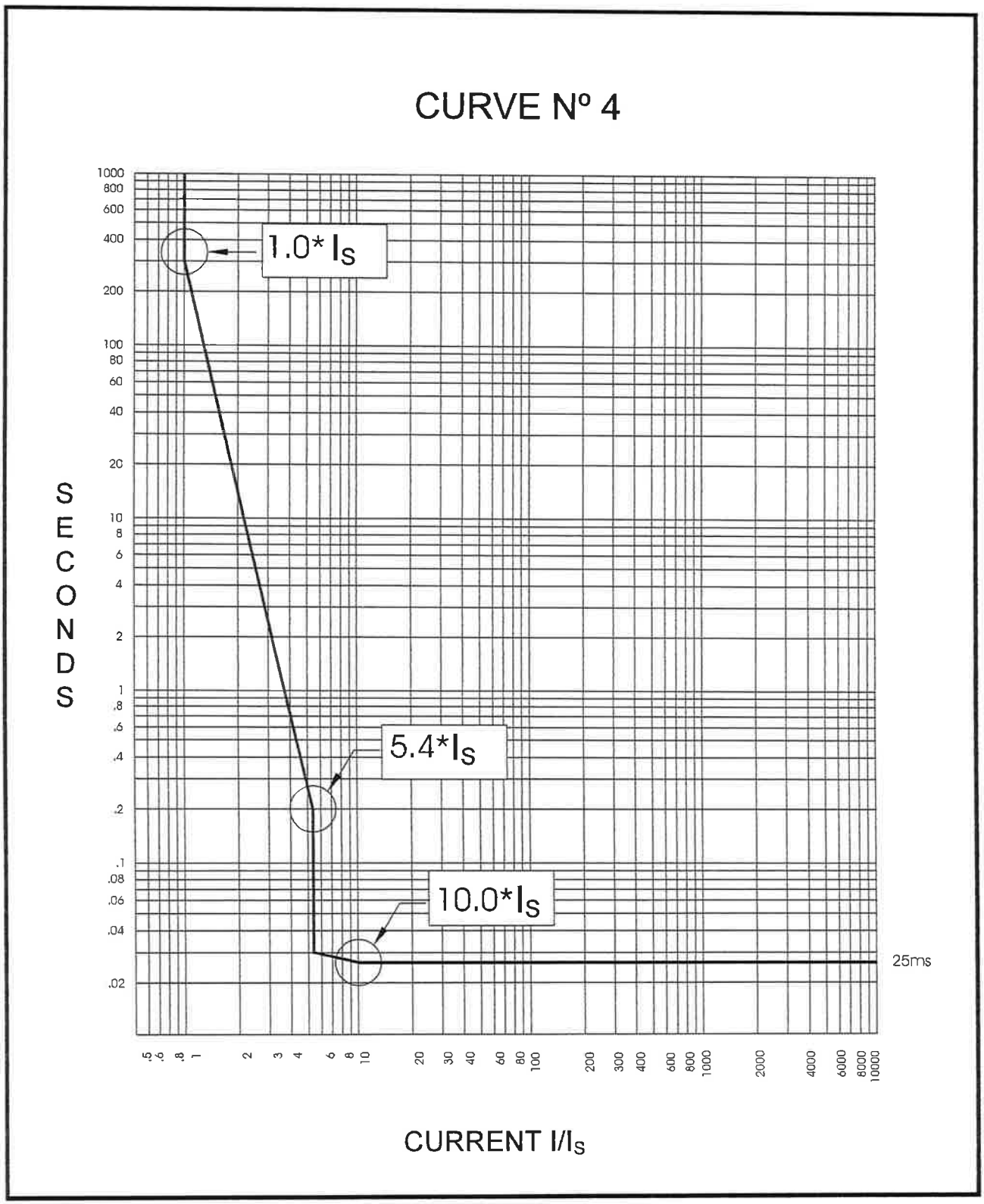
CURVE # 2.
(Figure 2).



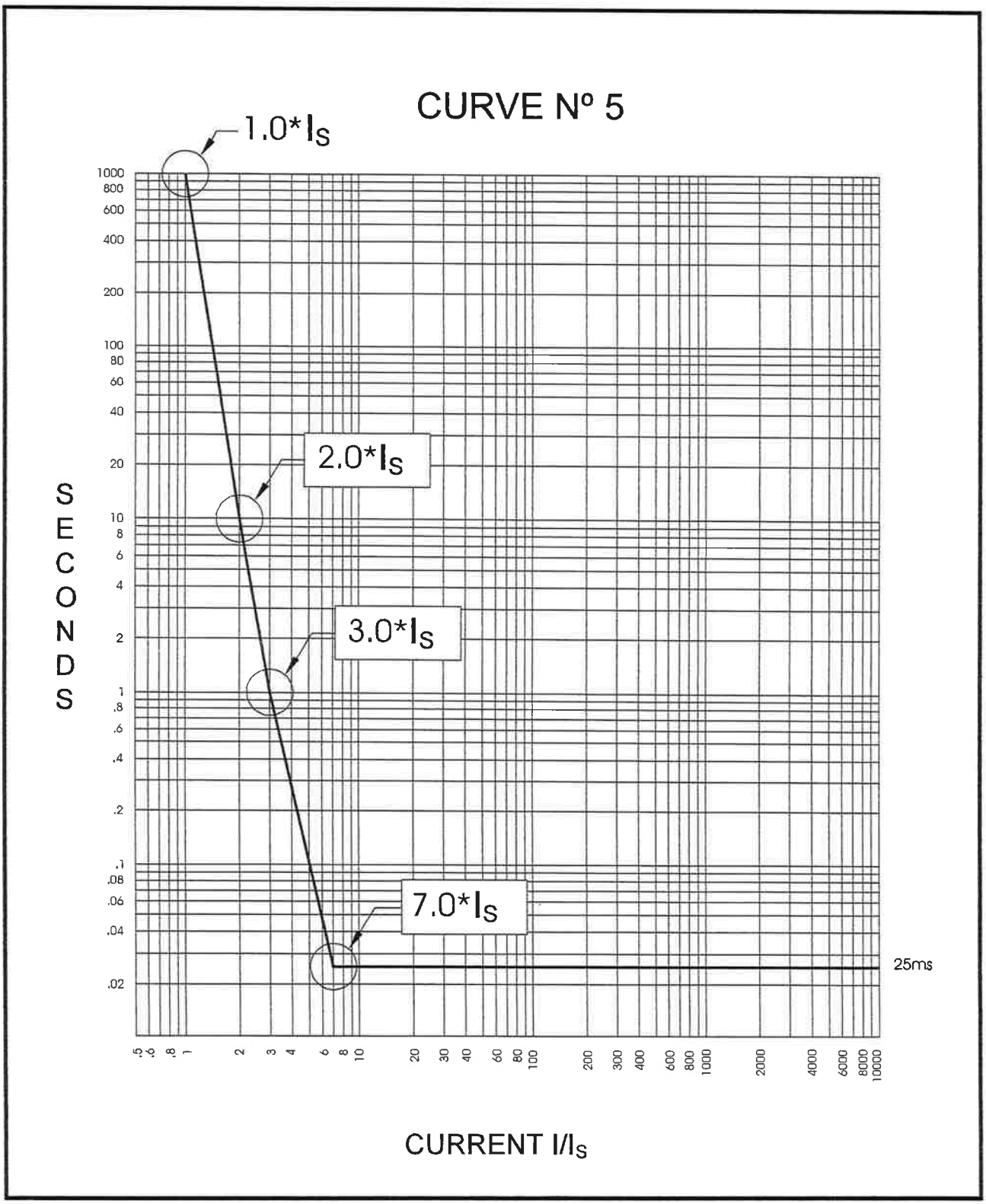
CURVE # 3.
(Figure 3).



CURVE # 4.
(Figure 4).

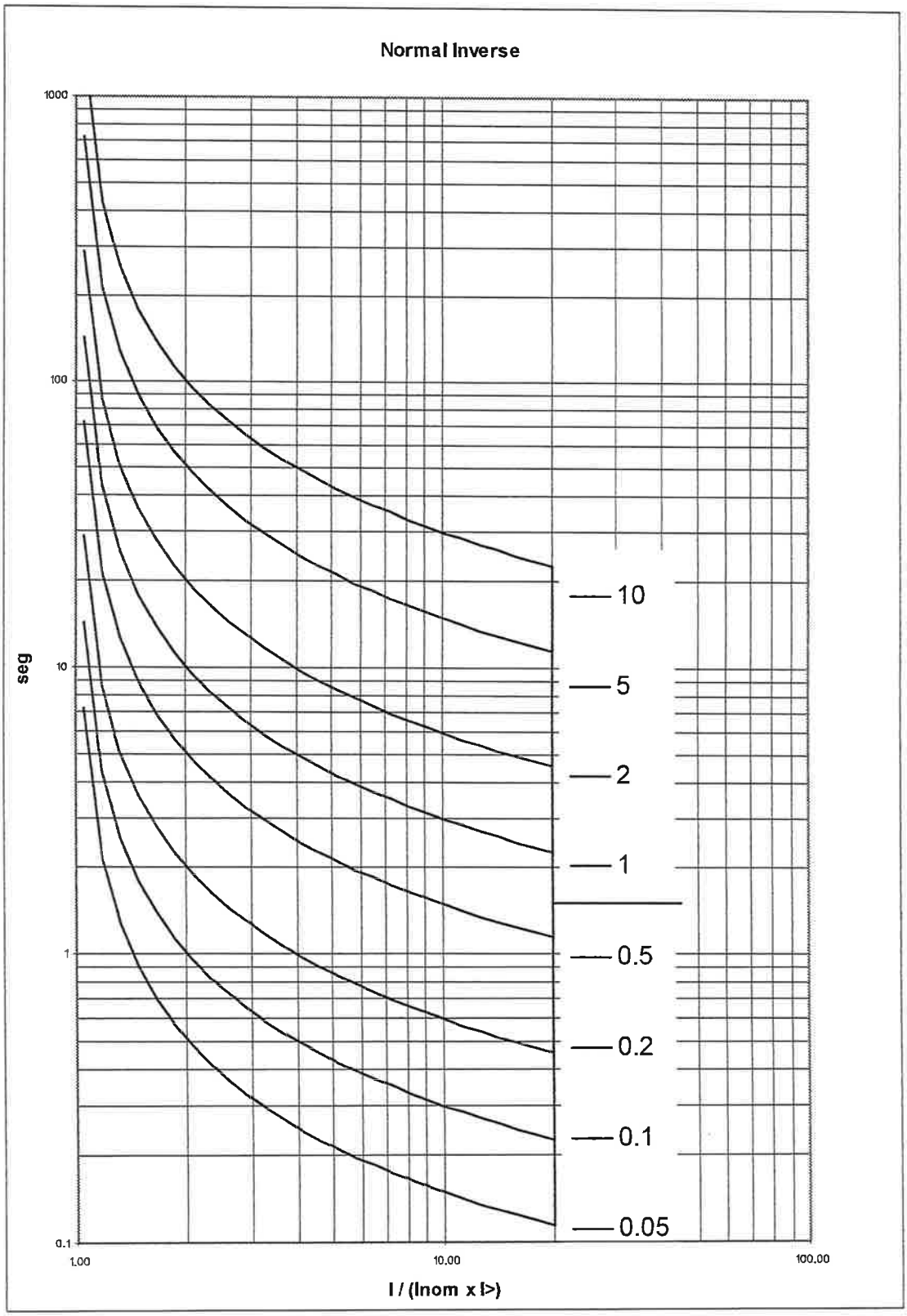


CURVE # 5.
(Figure 5).

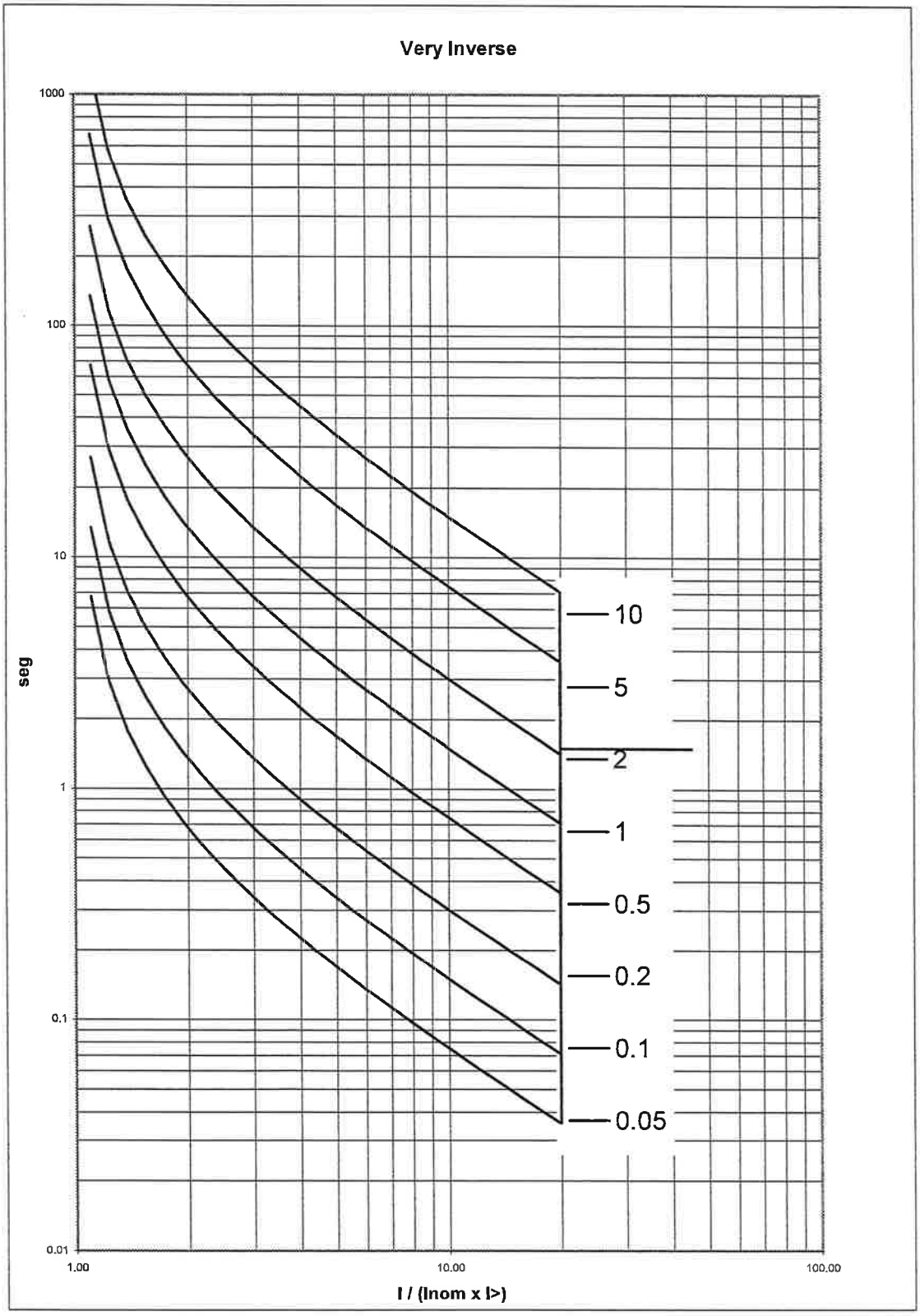


CURVE NORMAL INVERSE

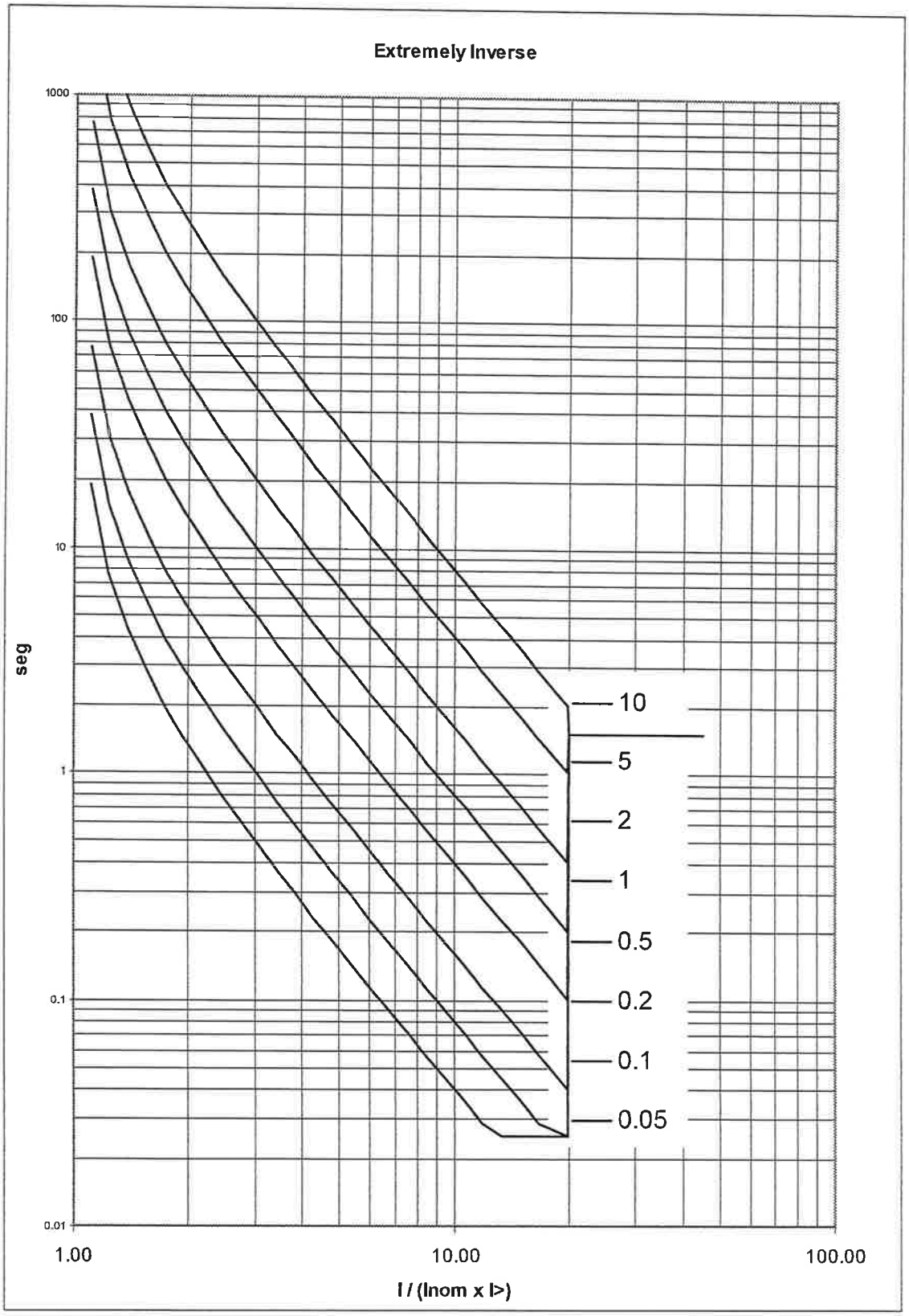
(Figure 6).



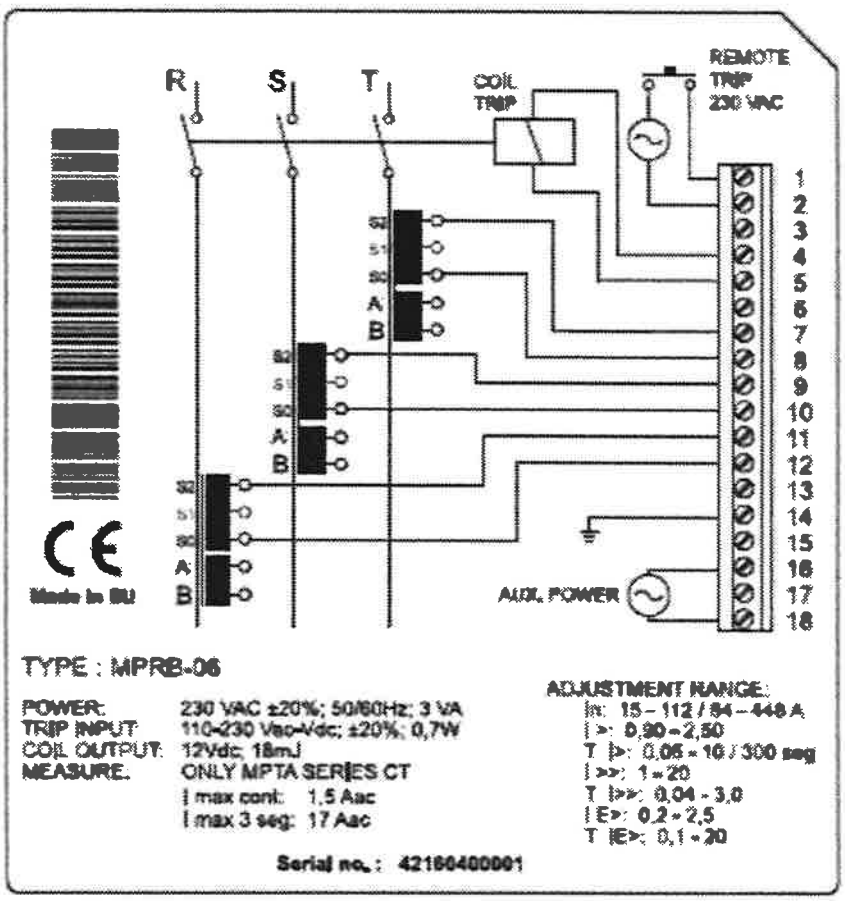
CURVE VERY INVERSE
(Figure 7).



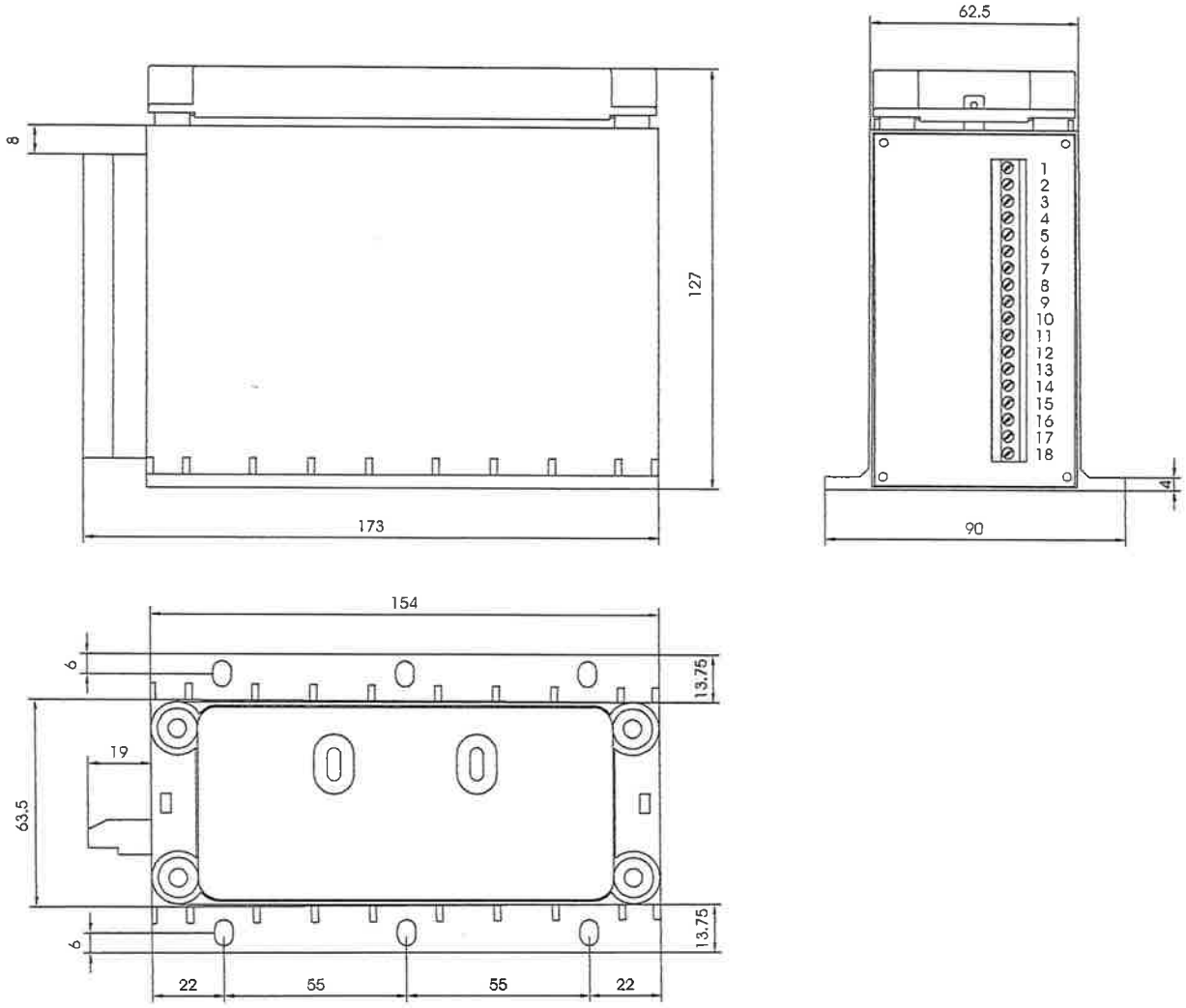
CURVE EXTREMELY INVERSE
(Figure 8).



WIRING AND SPECIFICATIONS LABEL

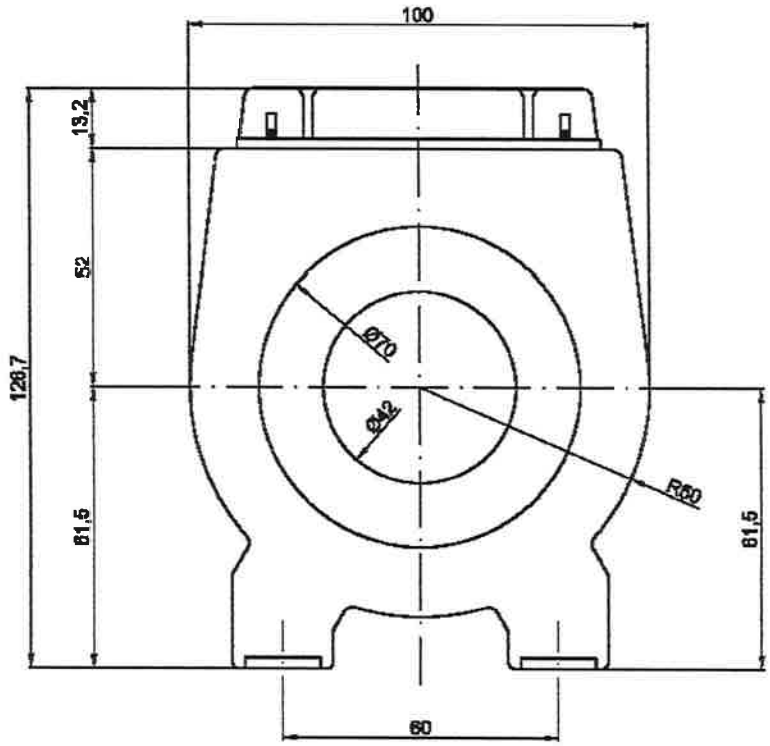


DIMENSIONS OF RELAY MPRB 06

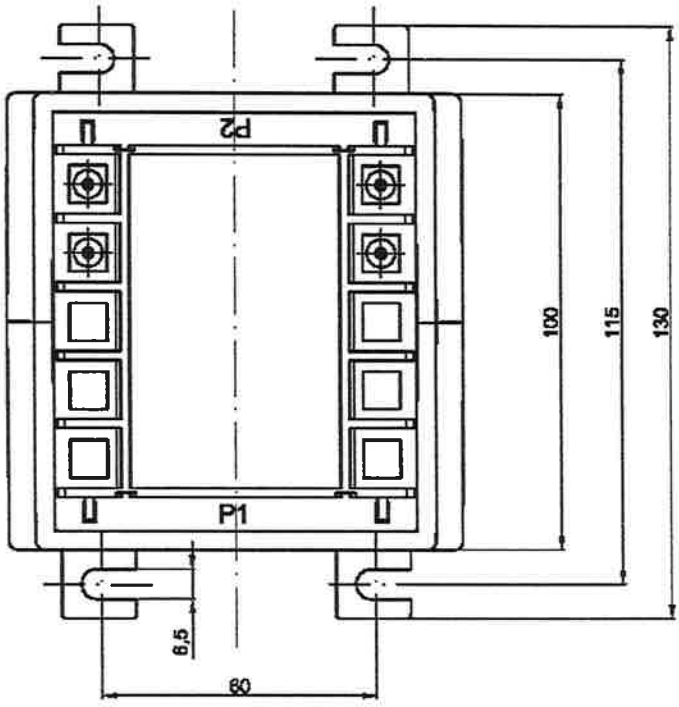


DIMENSIONS AND WIRING OF TRANSFORMER CT1 MPRB-06.

(Figure 10).

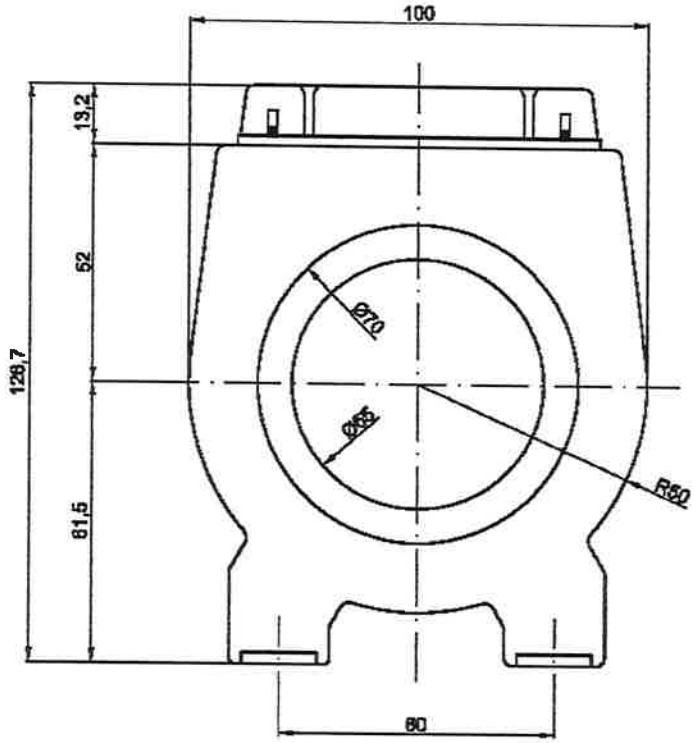


MODELO Ø INTERIOR 42

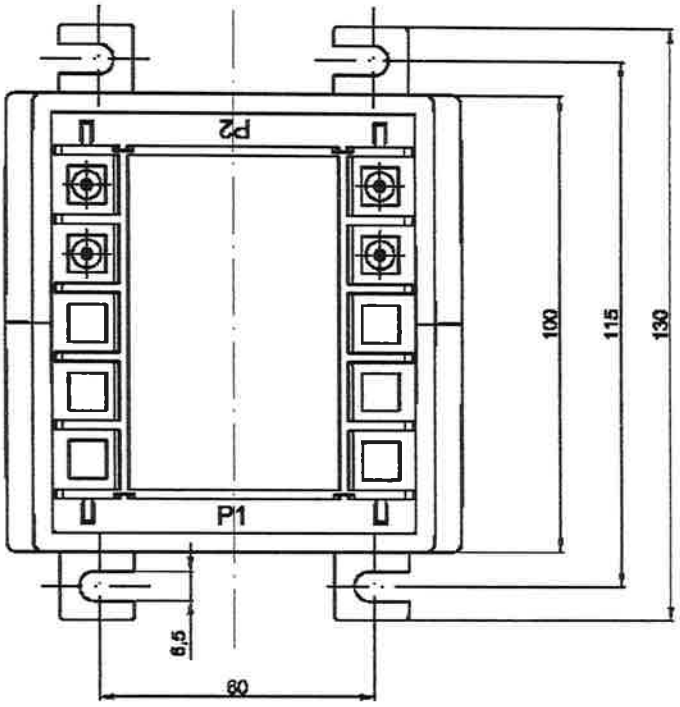


DIMENSIONS AND WIRING OF TRANSFORMER CT2 MPRB-06.

(Figure 11).



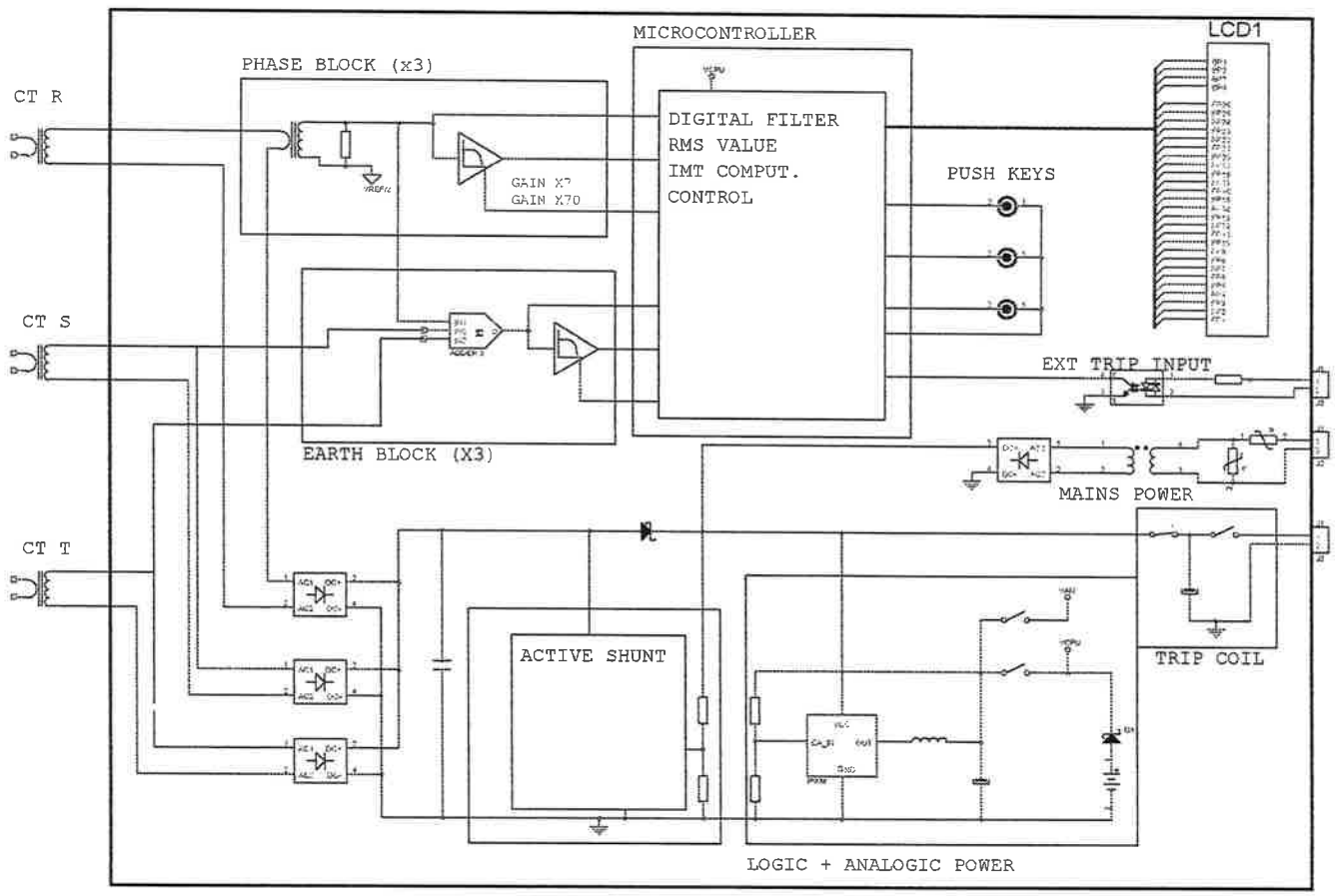
MODELO Ø INTERIOR 55



Working limitations of the protection relay with old CTs

Transformer / Parameter	Turns ratio 1/N	Test winding	Nominal current range	Starting current self powered	Starting current with auxiliary supply	I earth minimum	I earth at maximum Phase current
CT1	290	50	15 – 112	80 % In min **I_{SSP}= 12**	5 % In min **0,75 A**	**4 % of phase current**	3 x I nom Max **I_{hmpc}= 336 A**
CT2	1160	200	64 – 448	80 % In min **I_{SSP}= 51**	5 % In min **3,20 A**	**4 % of phase current**	3 x I nom Max **I_{hmpc}= 1334 A**
CT3 S0 and S2 **MPTA 96-14-90**	137	48	15 – 112	80 % In min **I_{SSP}= 12**	5 % In min **0,75 A**	**5 % of phase current**	3 x I nom Max **I_{hmpc}= 336 A**
CT4 S0 and S2 **MPTA 96-117-737**	1116	391	64 – 448	80 % In min **I_{SSP}= 51**	5 % In min **3,20 A**	**5 % of phase current**	3 x I nom Max **I_{hmpc}= 1334 A**

Block Diagram of the relay



OVERCURRENT / SHORT CIRCUIT / EARTH FAULT PROTECTION RELAY

MPRB 06

M98233101-03-10A

ADDENDUM
REVISION 1.0

INTRODUCTION

This document contains the revised pages of the ADDENDUM present in the MPRB 06 INSTRUCTION MANUAL code: M98204412-03-06A. These pages have been revised because the old ones where not enough clear to explain the functionality of the MPRB 06 trip curves.

ADDENDUM

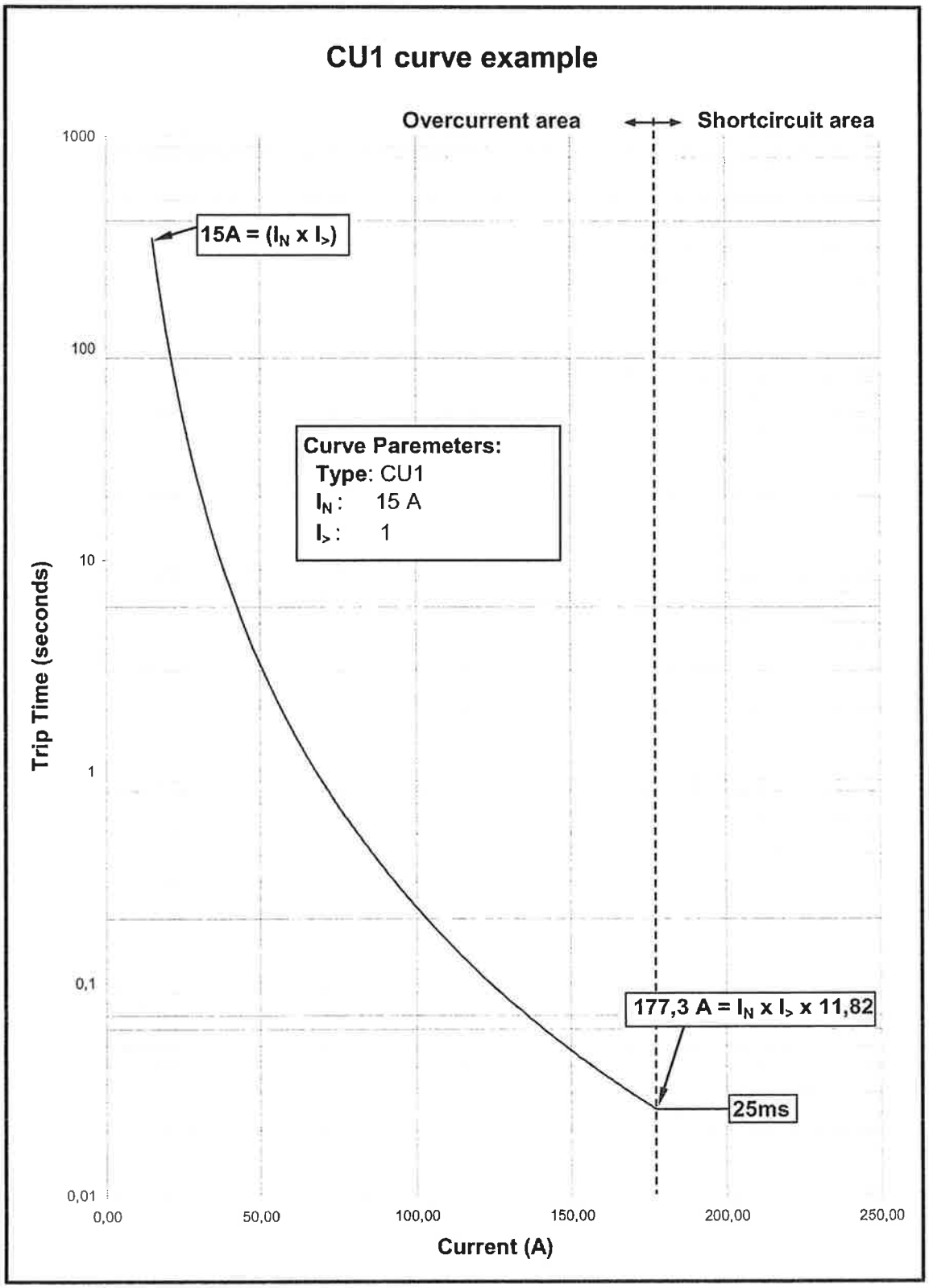
Curves:

Define over current setting as: $I_S = I_N \cdot I_>$

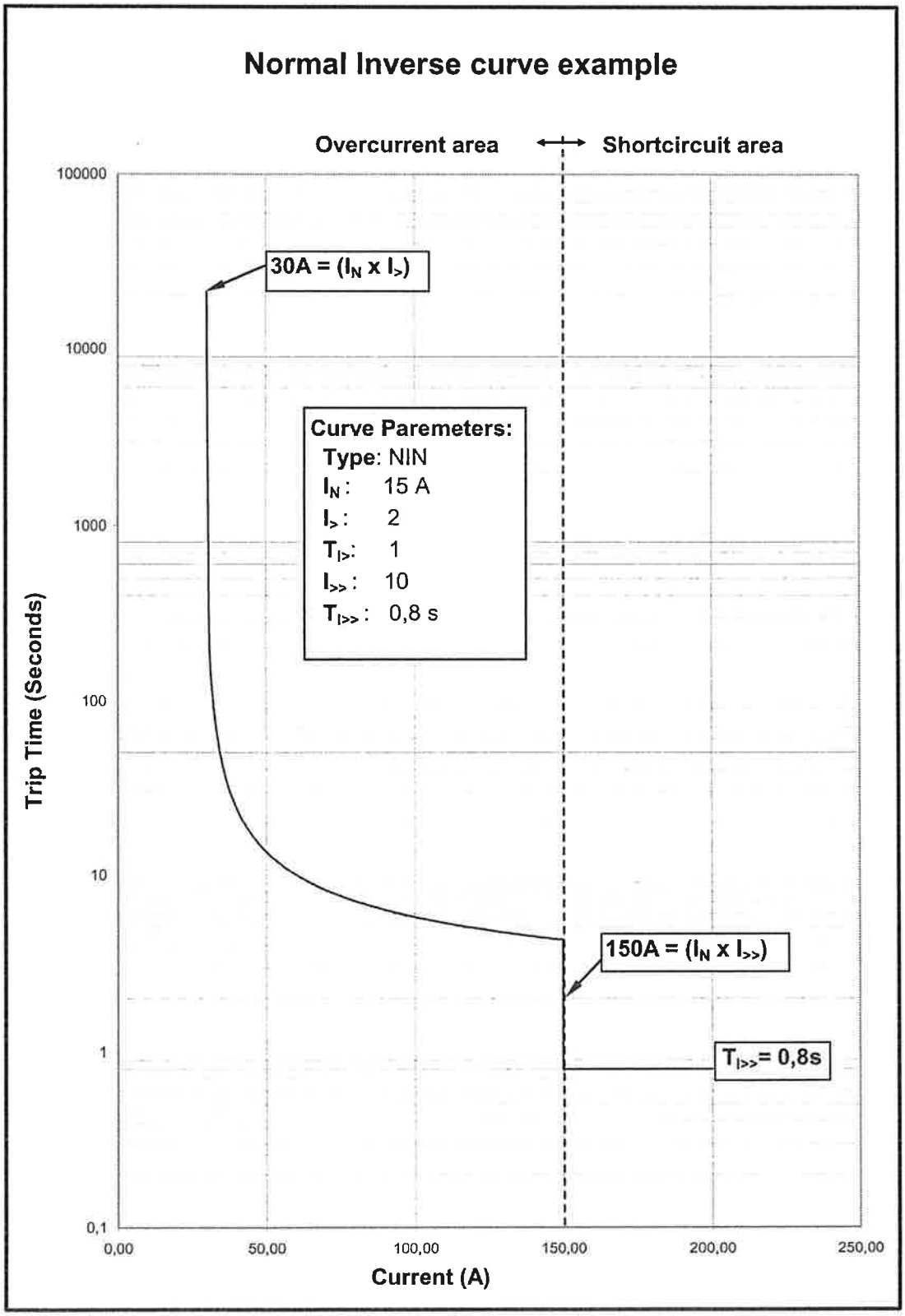
Define shortcircuit current setting as: $I_{SC} = I_N \cdot I_{>>}$

CURVE	EQUATION	CURVE	EQUATION
CU1 Curve n° 1	$t_s = \begin{cases} 330\left(\frac{I}{I_S}\right)^{-3.841} & I_S < I < 11.82 \cdot I_S \\ 0.025 & 11.82 \cdot I_S \le I \end{cases}$	**NIN** Normal inverse	$t_s = \begin{cases} \frac{0.14 \cdot T_{I>}}{\left(\frac{I}{I_S}\right)^{0.02} - 1} & I_S < I < I_{SC} \\ T_{I>>} & I_{SC} < I \end{cases}$
CU2 Curve n° 2	$t_s = \begin{cases} 330\left(\frac{I}{I_S}\right)^{-3.841} & I_S < I < 7.415 \cdot I_S \\ 0.125 & 7.415 \cdot I_S \le I \end{cases}$	**EIN** Extremely inverse	$t_s = \begin{cases} \frac{80 \cdot T_{I>}}{\left(\frac{I}{I_S}\right)^{2} - 1} & I_S < I < I_{SC} \\ T_{I>>} & I_{SC} < I \end{cases}$
CU3 Curve n° 3	$t_s = \begin{cases} 300\left(\frac{I}{I_S}\right)^{-4.7256} & I_S < I < 4.7 \cdot I_S \\ 0.044\left(\frac{I}{I_S}\right)^{-0.2415} & 4.7 \cdot I_S \le I < 10 \cdot I_S \\ 0.025 & 10 \cdot I_S \le I \end{cases}$	**VIN** Very inverse	$t_s = \begin{cases} \frac{13.5 \cdot T_{I>}}{\left(\frac{I}{I_S}\right) - 1} & I_S < I < I_{SC} \\ T_{I>>} & I_{SC} < I \end{cases}$
CU4 Curve n° 4	$t_s = \begin{cases} 300\left(\frac{I}{I_S}\right)^{-4.3365} & I_S < I < 5.4 \cdot I_S \\ 0.049\left(\frac{I}{I_S}\right)^{-0.2958} & 5.4 \cdot I_S \le I < 10 \cdot I_S \\ 0.025 & 10 \cdot I_S \le I \end{cases}$	**DT** Definite time	$t_s = \begin{cases} T_{I>} & I_S < I < I_{SC} \\ T_{I>>} & I_{SC} < I \end{cases}$
CU5 Curve n° 5	$t_s = \begin{cases} 1000\left(\frac{I}{I_S}\right)^{-6.644} & 1 \cdot I_S < I < 2 \cdot I_S \\ 512.28\left(\frac{I}{I_S}\right)^{-5.679} & 2 \cdot I_S \le I < 3 \cdot I_S \\ 119.46\left(\frac{I}{I_S}\right)^{-4.354} & 3 \cdot I_S \le I < 7 \cdot I_S \\ 0.025 & 7 \cdot I_S \le I \end{cases}$		

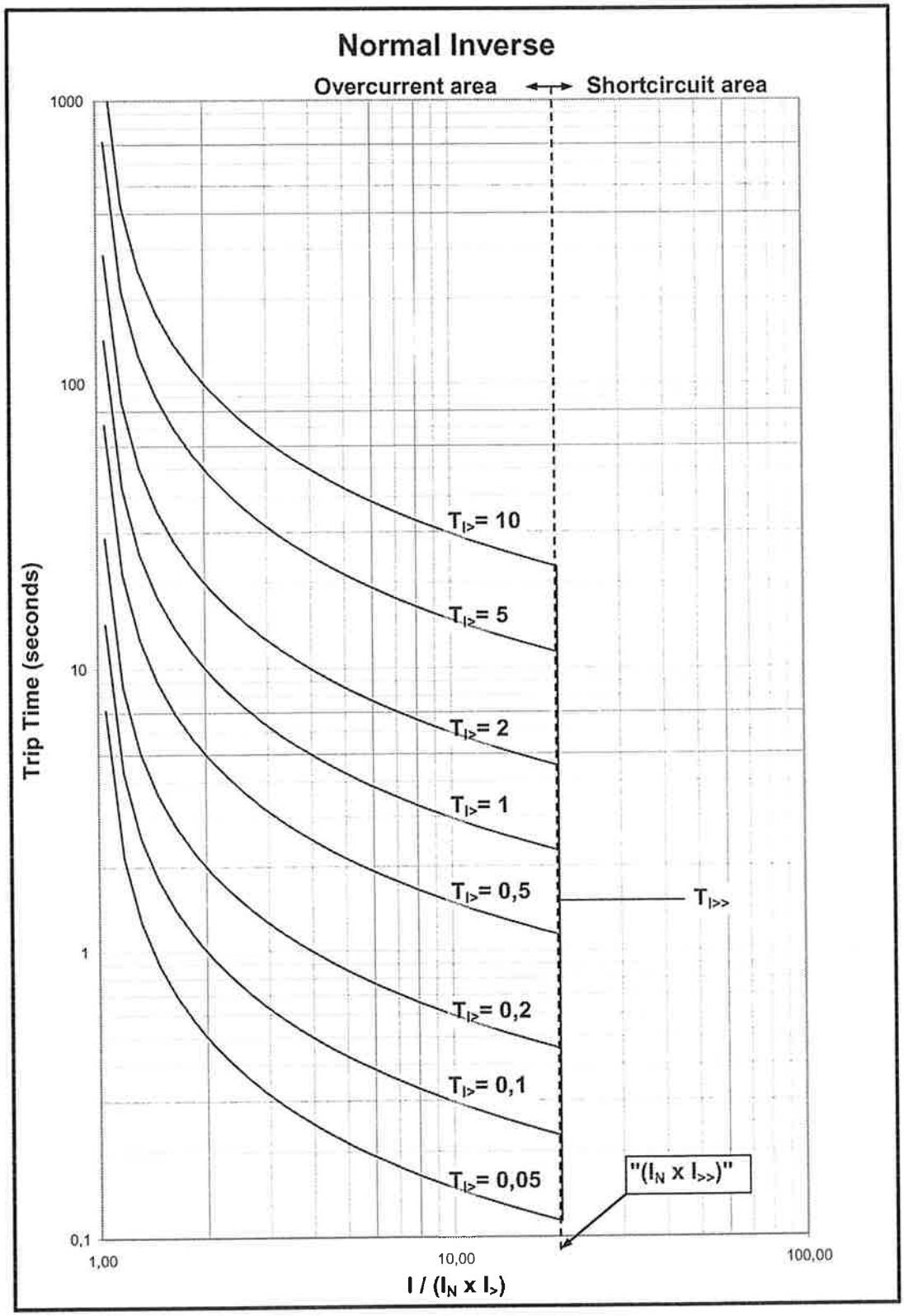
Understanding CUx curves (Figure 1).



Understanding IEC curves
(Figure 2).

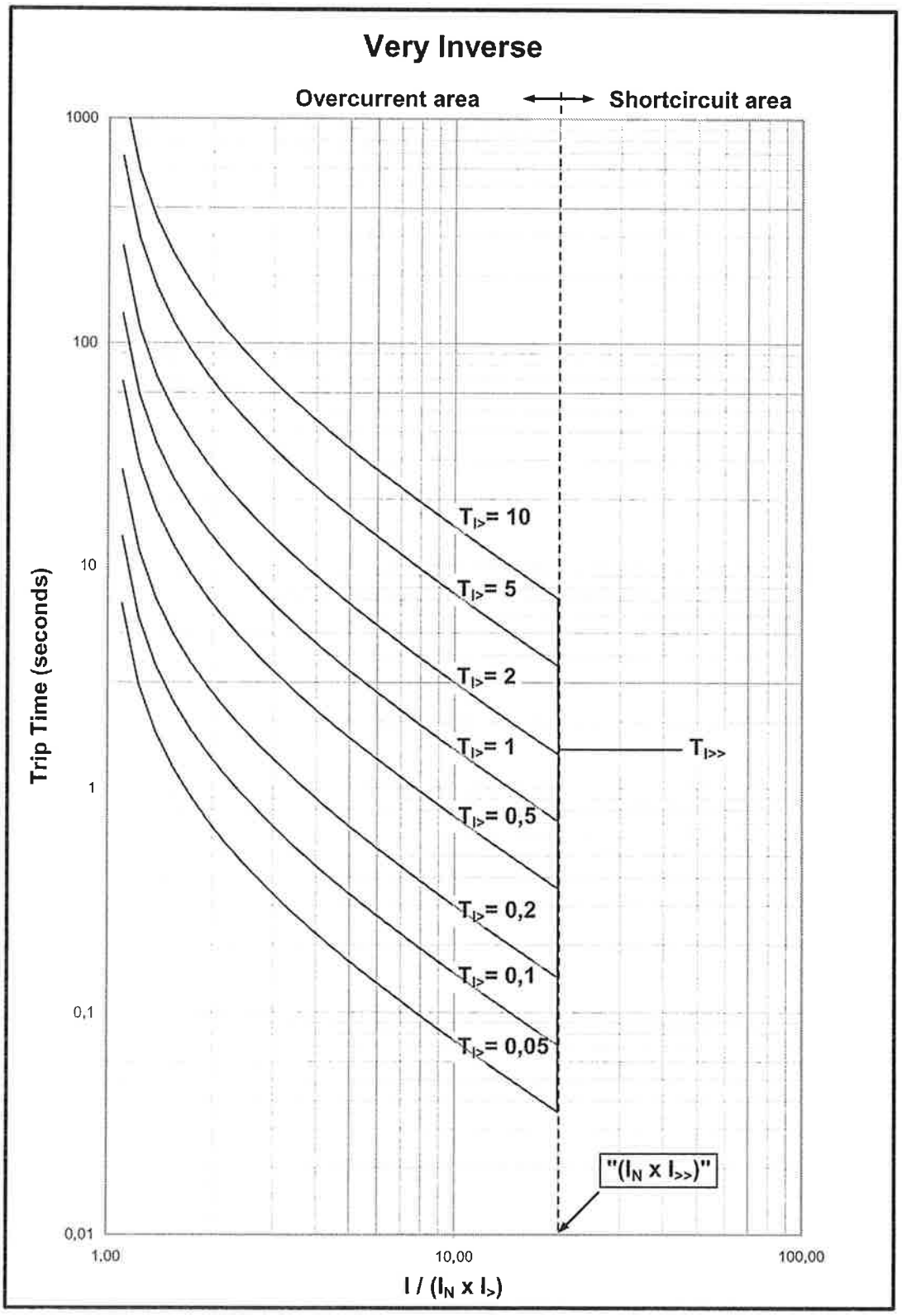


CURVE NORMAL INVERSE
(Figure 8).

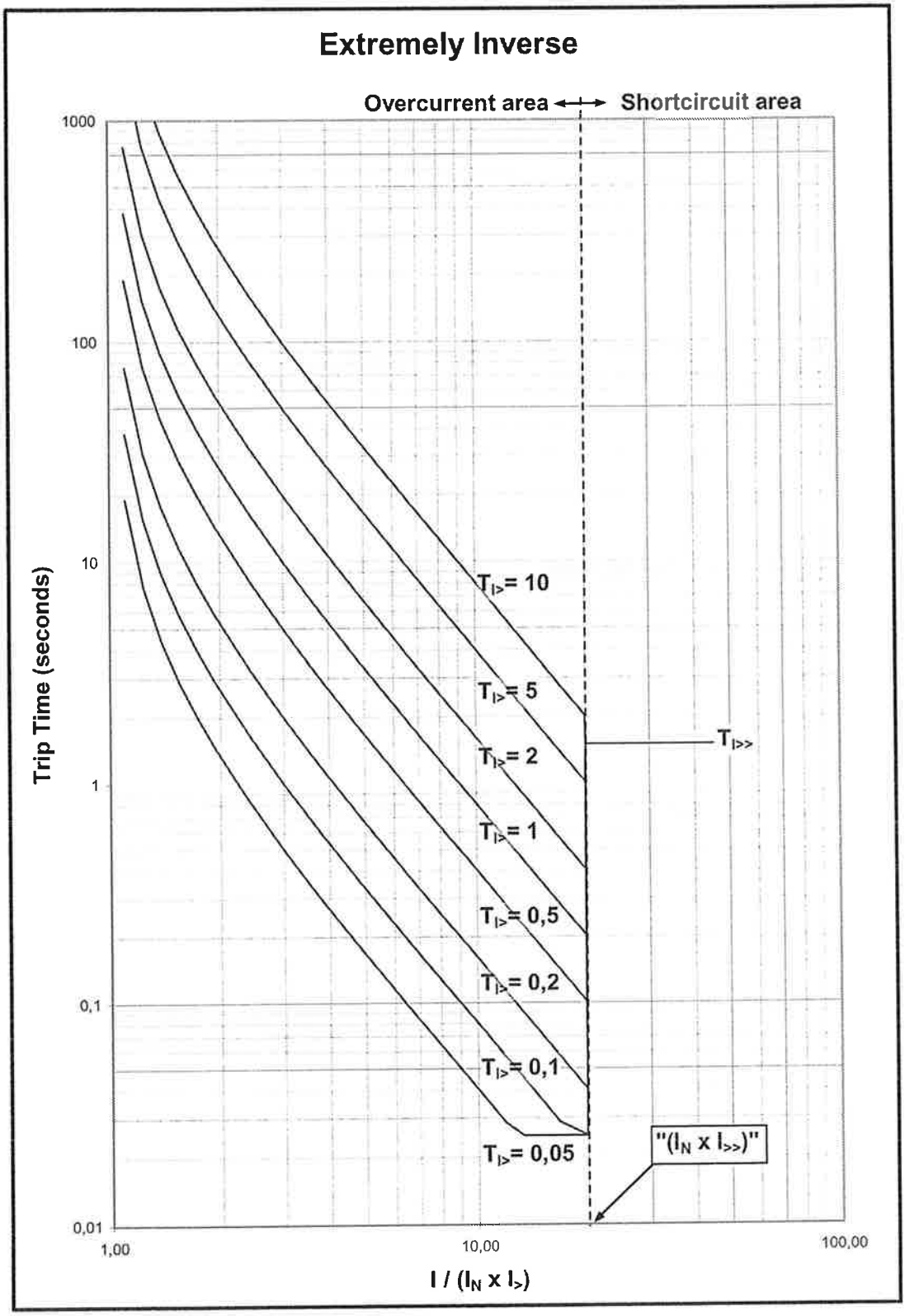


THIS PAGE IS INTENDED TO REPLACE PAGE N°32 OF THE "MPRB INSTRUCTION MANUAL"

CURVE VERY INVERSE
(Figure 9).

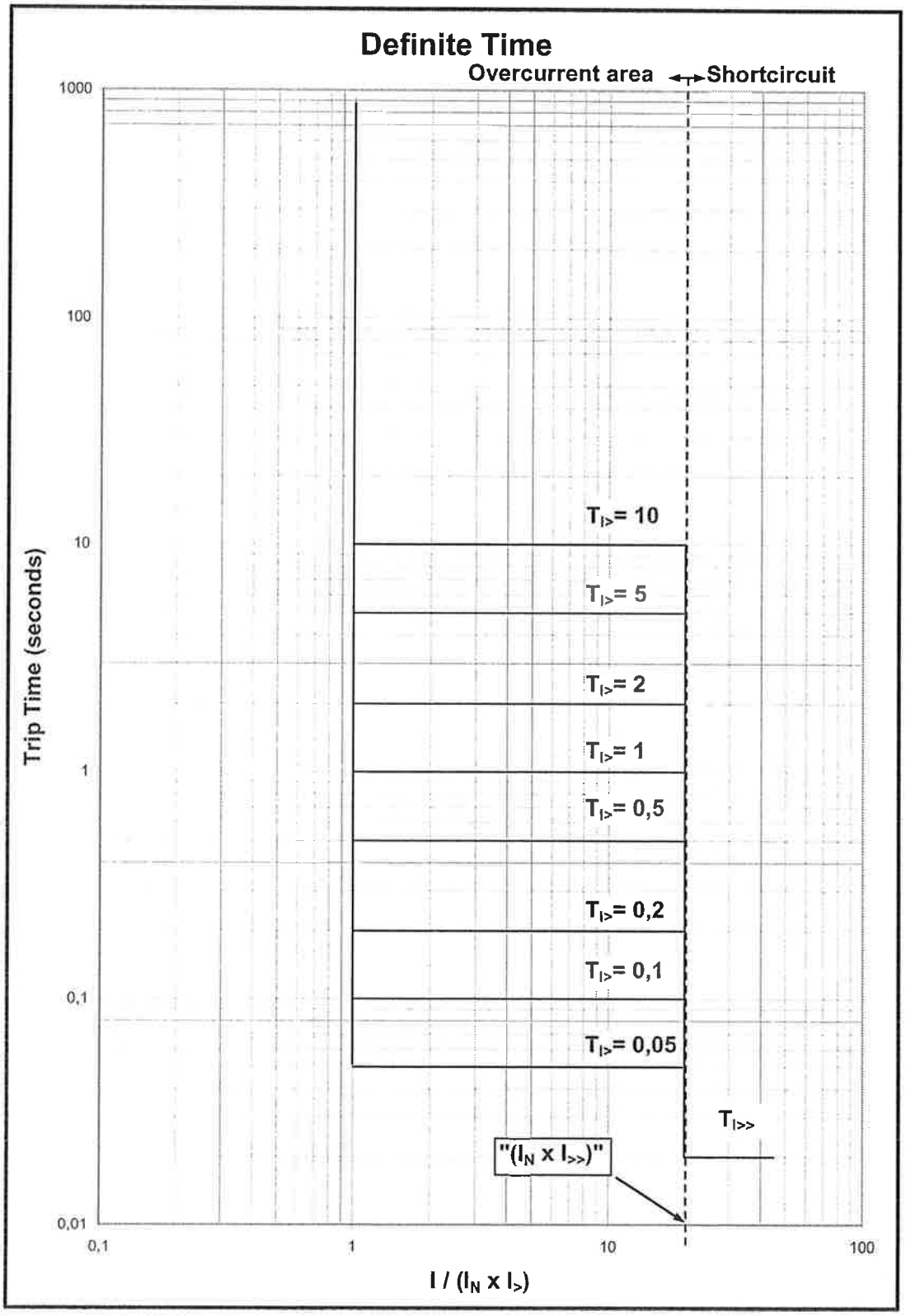


CURVE EXTREMELY INVERSE
(Figure 10).



CURVE DEFINITE TIME

(Figure 11).



SafeRing / SafePlus

SF_6 insulated Ring Main Unit and Compact Switchgear
Installation and operating instructions

1VDD005976 GB

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SafeRing 3 - way unit CCV

1. GENERAL DESCRIPTION

SafeRing is a SF_6 insulated ring main unit and SafePlus is a compact switchgear for applications in medium voltage distribution networks. SafeRing can be supplied as a 2, 3 or 4-way standard configurations with additional equipment according to customer specification. DF, CCF, CCC, CCCF, CCFF, DV, CCV, CCCC, CCCV, CCVV.
SafePlus has a unique flexibility due to its extendibility and the possible combination of fully modular and semi modular configurations. Be - SL - Sv - M - C - De - D - F - V.
SafeRing and SafePlus offers a sealed stainless steel tank which contains all the live components and switching functions. The transformer is protected either by a switch fuse combination or a vacuum circuit-breaker.
The units/ modules are delivered from the factory ready for installation.
Routine tests are carried out on all units/ modules before dispatch.
No special tools are required for installing the equipment.
Available modules are :

C - Cable switch
F - Switch fuse disconnector
D- Direct cable connection
De - Direct cable connection with earthing
V - Vacuum circuit breaker
SL - Busbar sectionalizer, load break switch
Busrise needed when SL on right side of SF6 tank
Sv - Busbar sectionalizer, vacuum circuit breaker
Sv always together with busrise (total width=650 mm)
Be - Busbar earthing
M - Metering cubicle

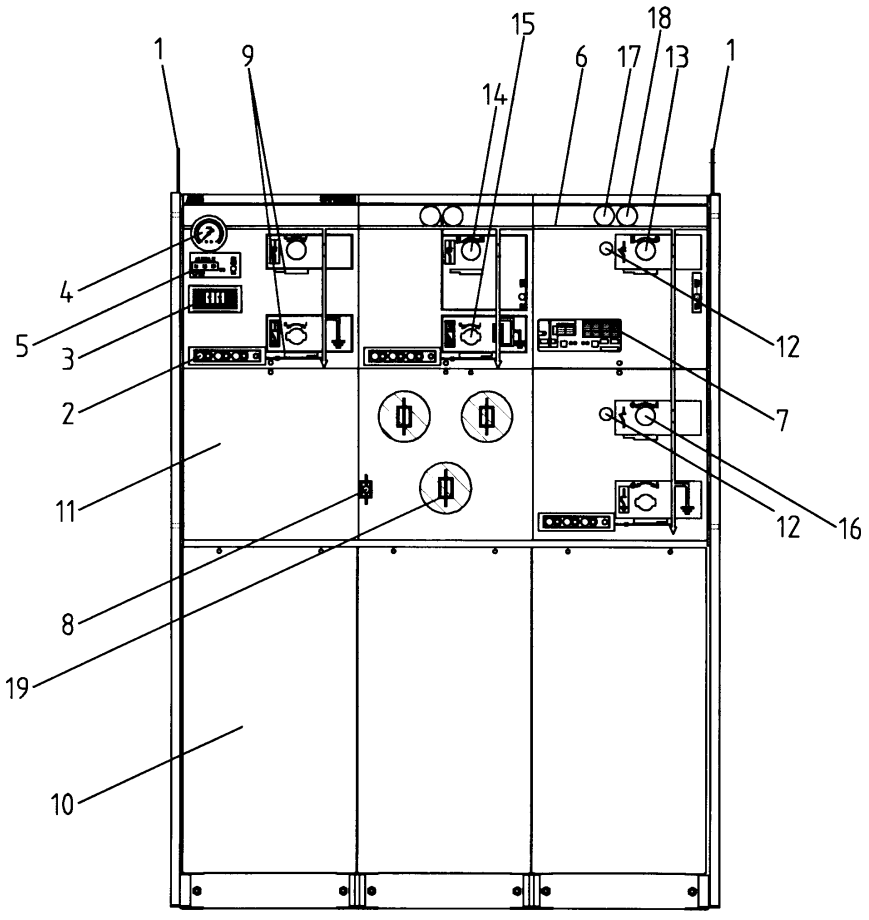
SafeRing / SafePlus with switch fuse combination in compliance with IEC 62271-105.
With this unit the transformer will be protected by current-limiting HV fuses in combination with a load break switch. The load break switch is equipped with a stored spring energy mechanism which can be tripped by the fuse striker pin.

SafeRing / SafePlus with vacuum circuit-breaker in compliance with IEC62271-100
With this unit the transformer will be protected by a vacuum circuit breaker combined with relays and current transformers. The standard relays are based on digital technology and do not require an external power supply.

Further information can be found in the product catalogue for SafeRing and SafePlus, 1VDD006104 GB.

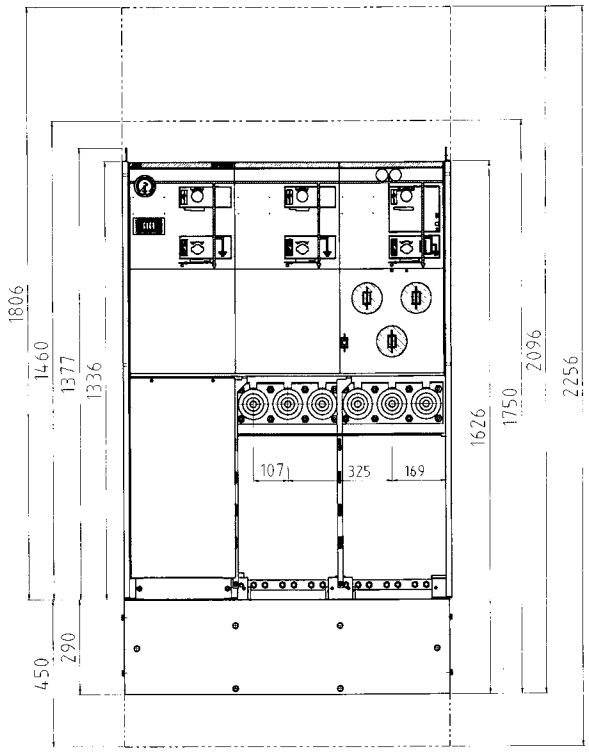
1.1 TABLE OF LOCATIONS

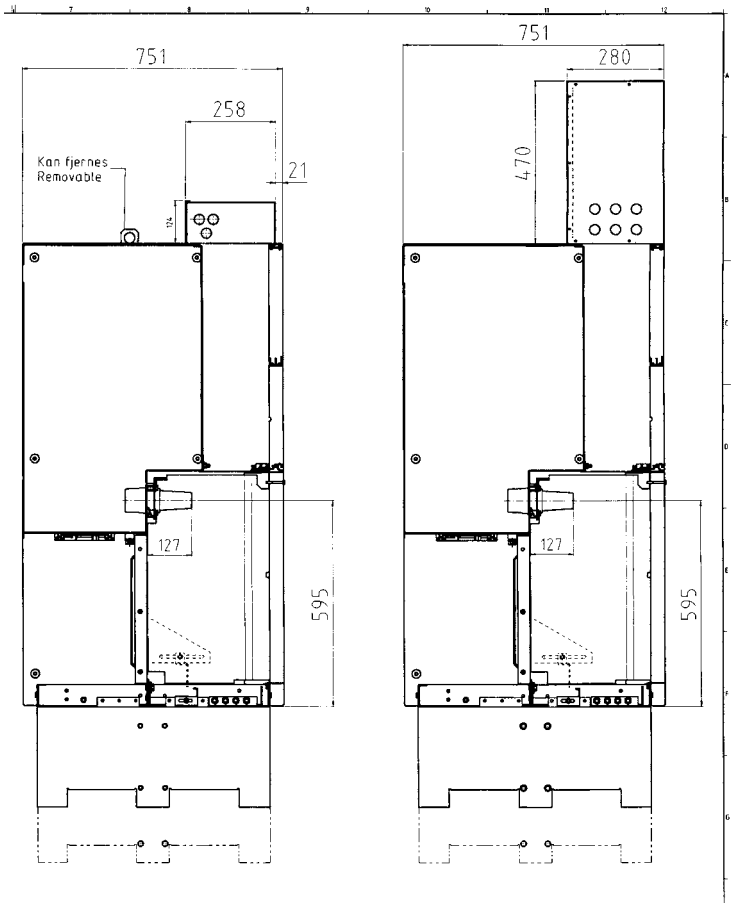
1. Lifting lugs
2. Capacitive voltage indication (additional equipment)
3. Short circuit indicator (additional equipment)
4. Pressure indicator (additional equipment)
5. Legend plate with serial number
6. Mimic diagram
7. Relay protection
8. Blown fuse indicator
9. Padlock device
10. Cable compartment
11. Test bushings (additional equipment)
12. Ronis key interlock (additional equipment)
13. Circuit breaker
14. Fuse switch disconnector
15. Earthing switch
16. Isolator
17. Circuit breaker open/ emergency stop
18. Circuit breaker close
19. Fuses



NHP 304711

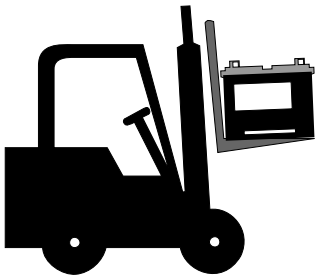
1.2 Dimensional drawings

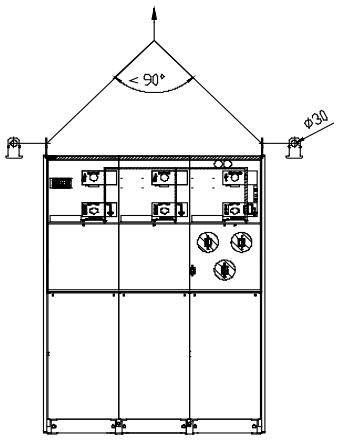




Unit	mm
1-way	371
2-way	696
3-way	1021
4-way	1346
5-way	1671

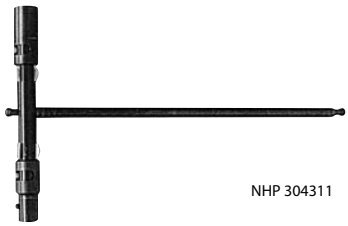
NHP 102103





NHP 408156

Unit	h_{min} (mm)
1-way	200
2-way	350
3-way	520
4-way	680
5-way	850



NHP 304311

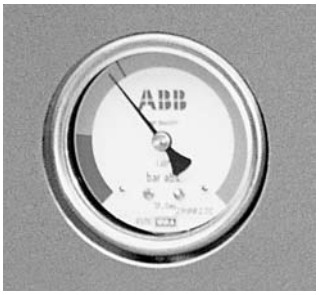


ABB			
Serial No.		Prod. year	IEC 62271-200
SafePlus	Medium Voltage Metal Enclosed Switchgear Type :		
Ur	kV	Ik	kA
fr	Hz	Ip	kA
Up	kV	tk	s
Ud	kV	Pre	0.04 MPa
Ir	A	SF6	kg
Temp. Class -25°C to +40°C indoor		IAC AFL	kA s
Made in Skien Norway		Weight max (m)	kg

2. TRANSPORT AND HANDLING

The units are delivered from the factory ready for installation.

Weight table for standard SafeRing

2-way DV	300 kg	2-way DF	300 kg
3-way CCV	450 kg	3-way CCF	450 kg
4-way CCCV	600 kg	4-way CCCF	600 kg
4-way CCVV	600 kg	4-way CCFF	600 kg
3-way CCC	450 kg		
4-way CCCC	600 kg		

SafePlus

Standard 1-way	150 kg
2–3 and 4-way as for SafeRing	
5-way approx. between	750 kg
M-metering cubicle approx.	250 kg

The weights is without additional equipment

SafeRing / SafePlus is fitted with lifting lugs, but can also be moved on pallets with a forklift truck.

2.1 BY RECEIVING INSPECTION

Upon receiving the SafeRing / SafePlus please check that the delivered equipment has not been damaged during transport. If any such damage has occurred, a claim must be submitted to the carrier immediately.

After unpacking, the following must be checked:

1. Operating handle – 1 piece should be included.
2. Check that the pointer on the pressure indicator is in the green area.
3. Carry out a function test on the mechanical parts.

Any faults or omissions must be reported immediately to the supplier.

2.2 STORAGE

SafeRing / SafePlus must be stored under cover in a dry and well-ventilated area until it is installed and put into operation.

3. TECHNICAL DATA

3.1 ELECTRICAL DATA

SafeRing		C-Module		F-Module		V-Module	
		Switch-disconnector	Earthing switch	Switch-fuse combination	Downstream earthing switch	Vacuum circuit breaker	Earthing switch
Rated voltage	kV	12/15/17,5/24	12/15/17,5/24	12/17,5/24	12/17,5/24	12/15/17,5/24	12/15/17,5/24
Power frequency withstand voltage	kV	28/38/38/50	28/38/38/50	28/38/50	28/38/50	28/38/38/50	28/38/38/50
Impulse withstand voltage	kV	95/95/95/125	95/95/95/125	95/95/125	95/95/125	95/95/95/125	95/95/95/125
Rated current	A	630/630/630/630		see 1)		200/200/200/200	
Breaking capacities:							
active load	A	630/630/630/630					
closed loop	A	630/630/630/630					
off load cable charging	A	135/135/135/135					
off load transformer	A			20/20/20			
earth fault	A	200/150/150/150					
earth fault cable charging	A	115/87/87/87					
short circuit breaking current	kA			see 2)		16/16/16/16	
Making capacity	kA	52,5/52,5/40/40	52,5/52,5/40/40	see 2)	12,5/12,5/12,5	40/40/40/40	40/40/40/40
Short time current 0,5 sec.3)	kA					16/16/16/16	
Short time current 1 sec. 4)	kA				5/5/5		
Short time current 3 sec. 5)	kA	21/21/16/16	21/21/16/16			16/16/16/16	16/16/16/16

1) Depending on the current rating of the fuse-link
2) Limited by high voltage fuse-links
3) Maximum rating for bushings Interface A (200 series plug-in)
4) Maximum rating for bushings Interface B (400 series plug-in)
5) Maximum rating for bushings Interface C (400 series bolted)

SafeRing is tested according to IEC publications IEC 60265, IEC 60694 and IEC 62271, parts 100, 102, 105, 200

SafePlus		C-Module		F-Module		V-Module	
		Switch-disconnector	Earthing switch	Switch-fuse combination	Downstream earthing switch	Vacuum circuit breaker	Earthing switch
Rated voltage	kV	12/15/17,5/24	12/15/17,5/24	12/17,5/24	12/17,5/24	12/15/17,5/24	12/15/17,5/24
Power frequency withstand voltage	kV	28/38/38/50	28/38/38/50	28/38/50	28/38/50	28/38/38/50	28/38/38/50
Impulse withstand voltage	kV	95/95/95/125	95/95/95/125	95/95/125	95/95/125	95/95/95/125	95/95/95/125
Rated current	A	630/630/630/630		see 1)		630/630/630/630	
Breaking capacities:							
active load	A	630/630/630/630					
closed loop	A	630/630/630/630					
off load cable charging	A	135/135/135/135					
off load transformer	A			20/20/20			
earth fault	A	200/150/150/150					
earth fault cable charging	A	115/87/87/87					
short circuit breaking current	kA			see 2)		21/21/16/16	
Making capacity	kA	62,5/52,5/50/50	62,5/52,5/50/50	see 2)	12,5/12,5/12,5	52,5/52,5/40/40	52,5/52,5/40/40
Short time current 0,5 sec.3)	kA					16/16/16/16	
Short time current 1 sec.4)	kA	25/-/-/-	25/-/-/-		5/5/5	16/16/16/16	
Short time current 3 sec.	kA	21/21/21/21	21/21/21/21			21/21/16/16	21/21/16/16

1) Depending on the current rating of the fuse-link
2) Limited by high voltage fuse-link
3) Maximum rating for bushings Interface A (200 series plug-in) with rated current 200A
4) Maximum rating for bushings Interface B (400 series plug-in)

SafePlus is tested according to IEC publications IEC 60265, IEC 60694 and IEC 62271, parts 100, 102, 105, 200

3.2 FUSE TABLE FOR MODULES

100% Transformer rating (kVA)

U_N (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	CEF
3	16	25	25	40	40	50	50	80	100	125	160	160					7,2 kV
3,3	16	25	25	40	40	50	50	63	80	100	125	160					
4,15	10	16	25	25	40	40	50	50	63	80	100	125	160				
5	10	16	25	25	25	40	40	50	50	63	80	100	160	160			
5,5	6	16	16	25	25	25	40	50	50	63	80	100	125	160			
6	6	16	16	25	25	25	40	40	50	50	80	100	125	160	160		
6,6	6	16	16	25	25	25	40	40	50	50	63	80	100	125	160		
10	6	10	10	16	16	25	25	25	40	40	50	50	80	80	125	125	12 kV
11	6	6	10	16	16	25	25	25	25	40	50	50	63	80	100	125	
12	6	6	10	16	16	16	25	25	25	40	40	50	63	80	100	125	
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	63	80	100	17,5 kV
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	
17,5	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	80	
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	63	24 kV
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

– The table is based on using fuses type ABB CEF
– Normal operating conditions with no overload
– Ambient temperature -25°C + 40°C

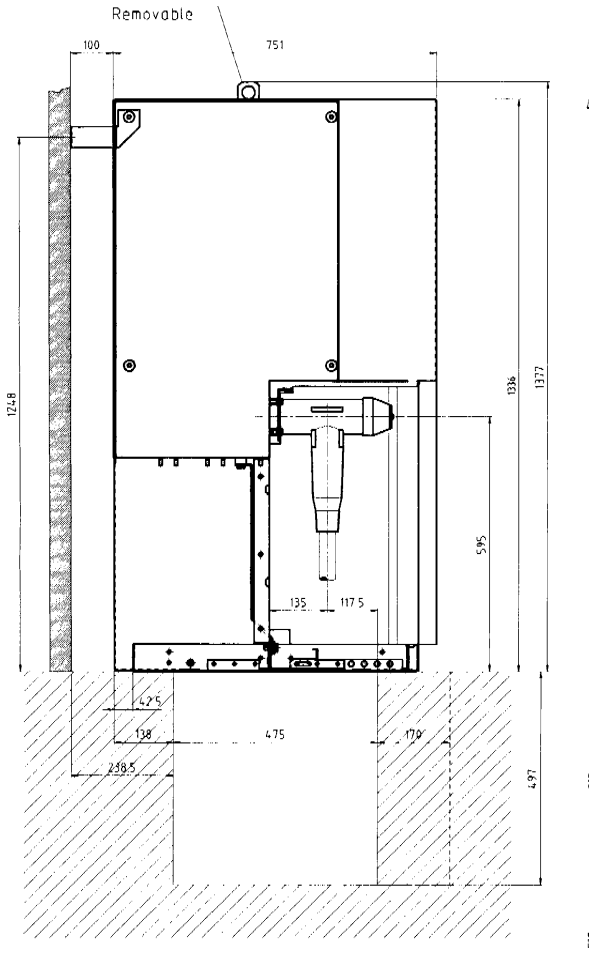
120% Transformer rating (kVA)

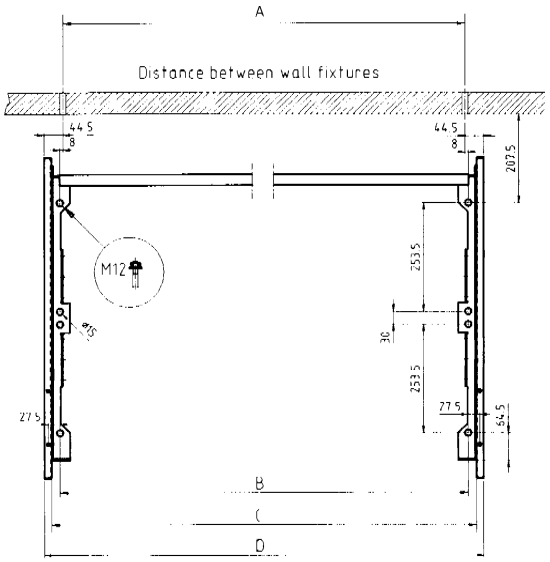
U_N (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	CEF
3	16	25	25	40	40	50	63	80	100	125	160						7,2 kV
3,3	16	25	25	40	40	50	63	80	80	100	125						
4,15	10	16	25	25	40	40	50	63	80	80	100	125					
5	10	16	25	25	25	40	40	50	63	80	80	125	160				
5,5	6	16	16	25	25	25	40	50	50	80	80	100	125	160			
6	6	16	16	25	25	25	40	40	50	63	80	100	125	160			
6,6	6	16	16	25	25	25	40	40	50	63	80	80	100	125			
10	6	10	10	16	16	25	25	25	40	40	50	63	80	80	125		12 kV
11	6	6	10	16	16	25	25	25	25	40	50	50	80	80	100	125	
12	6	6	10	16	16	16	25	25	25	40	40	50	63	80	100	125	
13,8	6	6	10	10	16	16	25	25	25	25	40	50	50	80	80	100	17,5 kV
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	
17,5	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	80	
20	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	24 kV
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

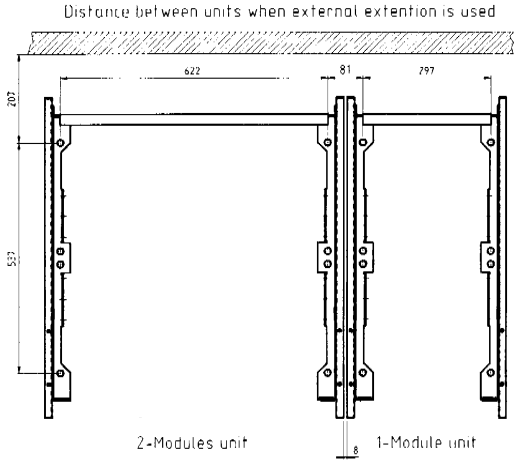
– The table is based on using fuses type ABB CEF
– Normal operating conditions with 20% overload
– Ambient temperature -25°C + 40°C

4. INSTALLATION

The base must be flat and fitted with anchor bolts in accordance with the dimensional drawing for the number of modules or units as

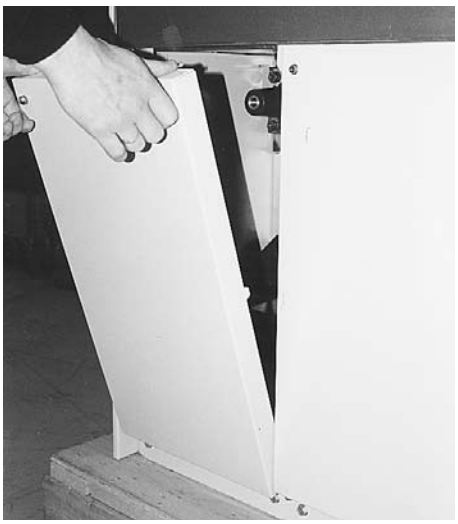






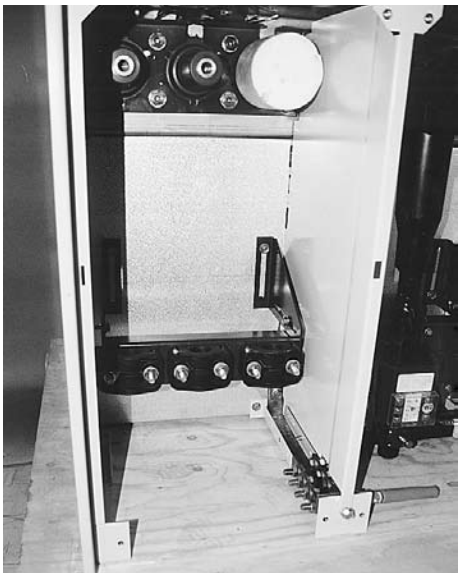
NHP 102102

Unit	A	B	C	D
1-way	271	297	336	371
2-way	696	622	661	696
3-way	1021	947	986	1021
4-way	1346	1272	1313	1346
5-way	1581	1597	1636	1671



1. Loosen the screws on the cable cover, pull out and lift cover off.

2. Removal of front section.



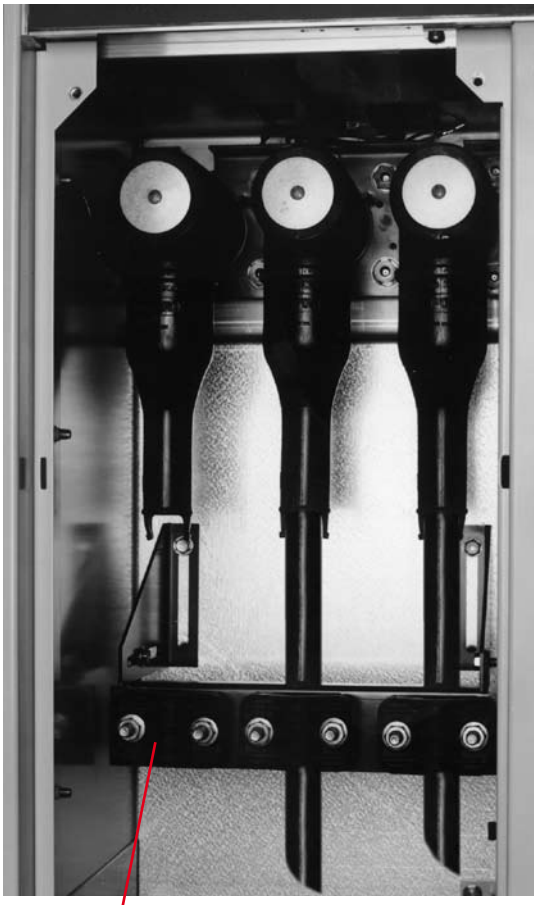
3. Front section removed.

4.1 CABLE COMPARTMENT

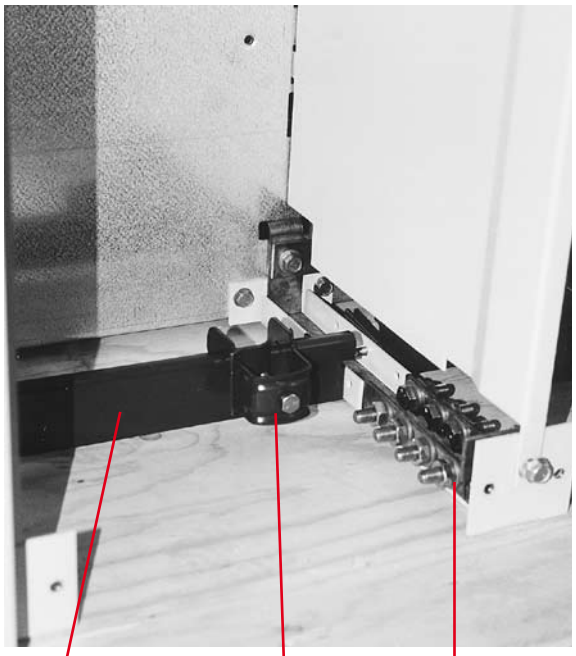
Removal of cable cover:

NB!
The cable cover can be supplied with interlocking to earthing switches. When interlocking is fitted, the cable cabinet can only be accessed when the earthing switch is in the closed position.

4. The panel can be removed by unscrewing A and B.



Adjustable cable support beam (additional equipment).



Cable support beam

Earthing bar

Cable clamp(additional equipment).

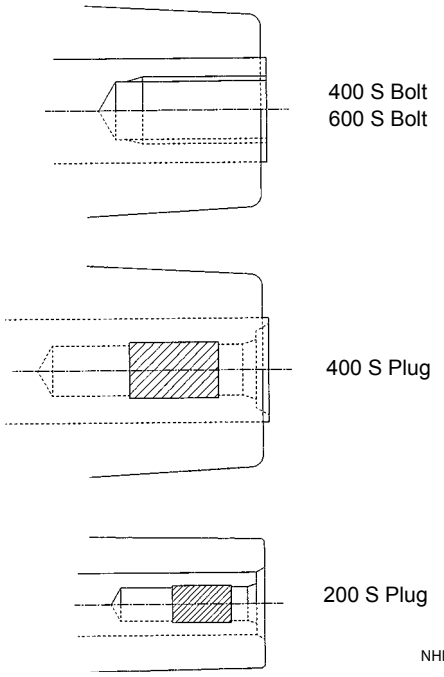
4.2 CABLE CONNECTION

SafeRing/ SafePlus is equipped with external bushings which comply with DIN47636T1 & T2/EDF HN 525-61 for termination of cables.

All bushings are situated in the same height from the floor and are protected by the cable cover.

SafeRing / SafePlus can be supplied with the following bushings for the various type of cubicle.

Type of module / Bushings	C	F	V
200 series plug in		X	X
400 series plug in	X	X	X
400 series bolted	X	X	
600 series bolted	X		



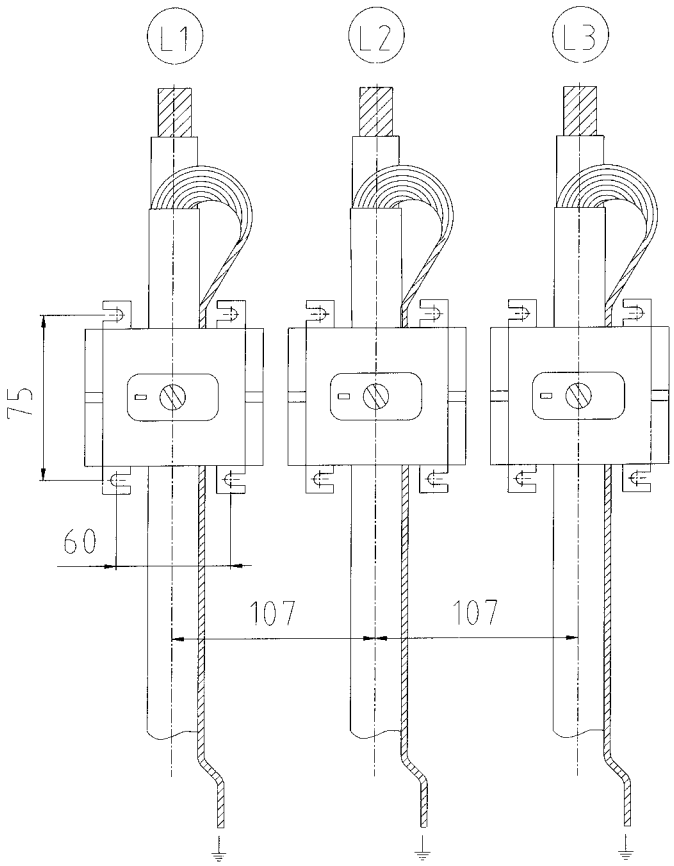
Cable adapters

The following types are recommended:
ABB Kabeldon
ABB Kabel und Draht
Elastimold
Raychem
Cooper
3M

Please see supplier documentation for details.

The manufacturer's installation instructions must be followed. Be sure to lubricate the bushings thoroughly with the silicone supplied.

N**B!**
Where cables are not connected, the earthing switch must be locked in closed position or the bushings must be fitted



NHP 304712

The cable shielding is led back through the centre hole and earthed.

4.3 CURRENT TRANSFORMERS FOR RELAY PROTECTION

Installing current transformers. The cable shielding is led back through the centre hole and earthed.

A protection relay is installed in each vacuum circuit breaker module. The cables from the protection relay to the current transformers are placed in the cable compartment, ready for connection to the three current transformers supplied.

Before installation:

- Check that the three current transformers have been delivered and that they are all of the same type.
- Check that the current transformers are of the correct type, with the correctly rated transformer ratio, for the distribution transformer's rated current and for the adjustment range on the protection relay (see protection relay manual).

Each current transformer must be mounted onto its high voltage cable before the cable termination is fitted.

The earth shield on the cable must be led back through the centre hole in the current transformer (see figure on left) and earthed on the earthing bar in the cable compartment. A mounting plate for the current transformers is fitted in the cable compartment.

After the current transformers have been installed in the unit, the cables from the protection relay are connected. Consult the manual supplied with the protection relay for a description of the connections.

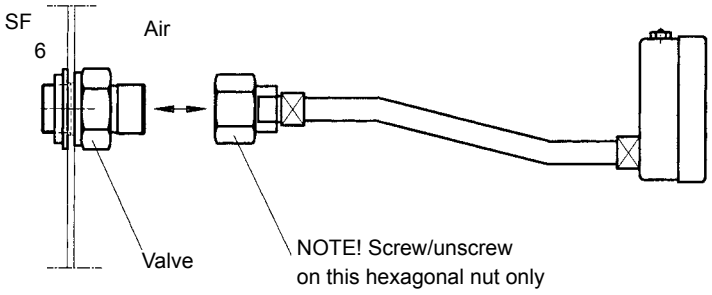
SafeRing with vacuum circuit breakers are prepared for three different types of protection relays: SACE PR521, SEG WIC1 and MPRB 99-1.0-GF. All three types are designed so that there is no need for external auxiliary voltage for correct functioning.

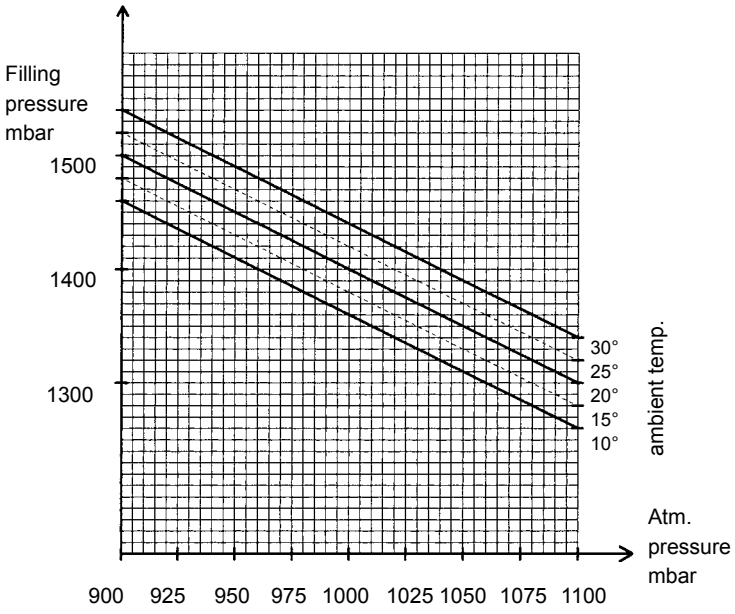
Separate manuals have been prepared for each of these protection relays, with examples of adjustments.

SACE PR 521 and SEG WIC1
These relays offers advanced protection with facilities for constant-time, normal inverse, very inverse and extremely inverse characteristics as well as simple earth fault protection in accordance with IEC 60255-3.

MPRB 99-1.0-GF
This is a simple type of inverse-time protection relay, with fixed settings specially developed for distribution transformers.The MPRB 99-1.0-GF also has a earthfault protection module.
It is essential for correct functioning that the current transformers are properly connected and that the protection relay is properly adjusted.

SafePlus can be delivered with advanced protection relays. As option SPAJ140 can be delivered and also other ABB relays like REJ and REF54_ can be fitted. This will require additional low voltage compartment.
See separate documentation for these relays.





NHP 408025

Refilling of SF_6 gas in SafeRing/SafePlus

Following equipment is needed gas bottle with manometer and reduction valve adapter pressure measuring device

1. Remove front cover and unscrew manometer as shown.
2. Screw (tightening the torque.45 Nm) the adapter to the valve.
3. Before connecting the hose from the gas bottle to the adapter, the air in the hose must be removed by running SF_6 gas through the hose.
4. When gas is flowing into the RMU/switchgear, the manometer on the gas bottle has to be observed. When it shows 0.4 bar at ambient tem perature 20° Celsius, (1,4 bar absolute) the gas filling must be stopped. See table for filling pressure above.
5. Remove the filling hose and connect the pressure device to check the pressure inside the RMU/switchgear.
6. When the correct pressure of 0.4 bar (1,4 bar absolute) is obtained, re move the adapter and screw with tightening torque 45 Nm the manom eter to the RMU/switchgear as shown above.
   Observe that the sealing between the manometer and the valve is smooth and clean.

4.4 GAS PRESSURE

SafeRing / SafePlus contains SF_6 gas with a nominal pressure of ***1.4*** bar at 20º C.

SafeRing/ SafePlus is «sealed for life» and is fitted with a temperature-compensated pressure indicator.
A temperature-compensated device that emits an electrical signal to indicate lower pressure can be supplied on request.

Pointer in green area	- unit has correct pressure
Pointer in red area	- pressure is too low

5. OPERATION

5.1 OPERATING CONDITIONS

Normal ambient conditions
SafeRing / SafePlus is generally equipped for operation/service in normal indoor conditions in accordance with IEC 60694.
The following limitations apply:

Ambient temperature	
Max. temperature	+40°C
Max. temperature (24-hour average)	+35°C
Min. temperature	- 25°C

Humidity

Max. average relative humidity measured over 24 hours	95%
Max. average relative humidity measured over 1 month	90%

Max height above sea level for installation without reducing gas pressure	1,500 metres

Special conditions
In accordance with IEC 60694, the manufacturer and end-user must agree about special operating conditions which deviate from operation under normal conditions.
The manufacturer/supplier must be consulted in advance if especially difficult operating conditions are involved. When electrical equipment is installed at more than 1,500 metres above sea level, for example, the atmospheric pressure will be lower and the overpressure in the tank will have to be reduced.

Airfreight
Units / modules delivered with reduced overpressure - see procedure for refilling.

Switch disconnector:
Close: Turn the operating handle clockwise.
Open: Turn the operating handle anti-clockwise.

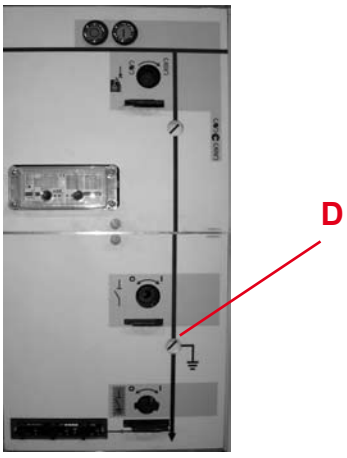
Earthing switch:
Close: Turn the operating handle clockwise.
Open: Turn the operating handle anti-clockwise.

Switch fuse disconnector.
Close: Turn the operating handle clockwise to charge the close/open spring. Then push the green button. **(A)**
Open: Push the red button. **(B)**
In circuit breaker configurations, the transformer circuit breaker can be tripped by the protection relay, while in switch fuse configurations fuse switch disconnector can be triggered by the fuse striker pin if an over current or short-circuit occurs.

5.2 OPERATION

All switches can be operated with the included operating handle.
Internal mechanical interlocking between the switch disconnector/isolator and the associated earthing switches prevents incorrect operation.
The isolator in the V-Module can only be opened after the circuit breaker is opened. Then the circuit breaker can be closed for testing purpose.The operation of the switch disconnector/circuit breaker and earthing switches can be further interlocked by means of a padlock. The earthing switches are operated by a snap action mechanism, which ensures fast closing.
The earthing switch is closed by turning the operating handle clockwise. Turning the operating handle anti-clockwise opens the switch.
For closing the switch fuse disconnector / circuit breaker the spring mechanism must be charged. Turning the operating handle clockwise does this. Then the green “on” button must be pressed to close the switch/breaker.
An anti-reflex system, standard on all operating handles, prevents the immediate re-operation of switches.

F-Module

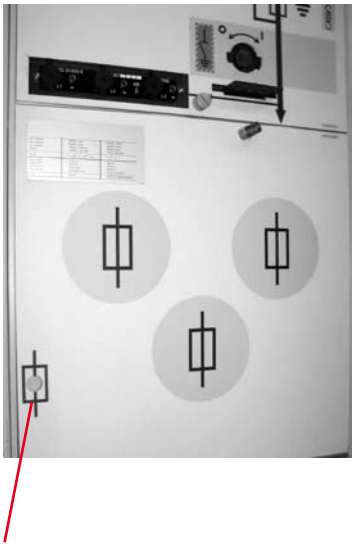


V-Module

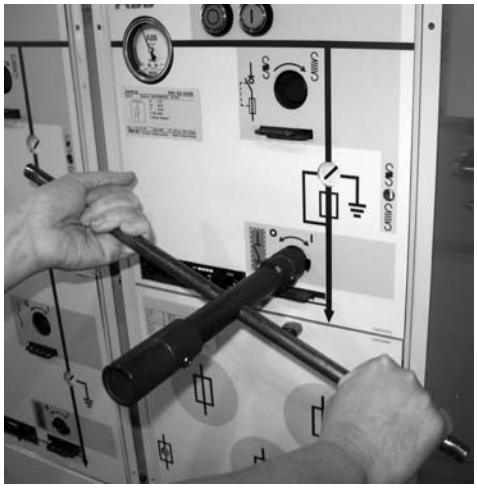
Mechanical position indicators:
C: Switch fuse disconnector and Earthing switch both open
D: Isolator and Earthing switch both open

5.3 INSTALLATION AND REPLACEMENT OF FUSES

A red indicator below the fuse symbol on the lower front panel indicates a fuse trip. Fuses are replaced as shown in the sequence of illustrations. Switch fuse configurations are supplied without fuses installed.
When installing fuses for the first time, follow the sequence of illustrations 1-9.



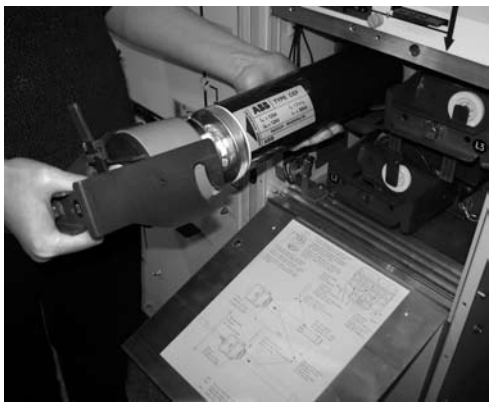
1. Fuse trip indicator.



2. Close earthing switch by turning operating handle clockwise.

3. Unscrew fuse cover.
4. Tilt out the fusepanel to gain access to fuse canisters.

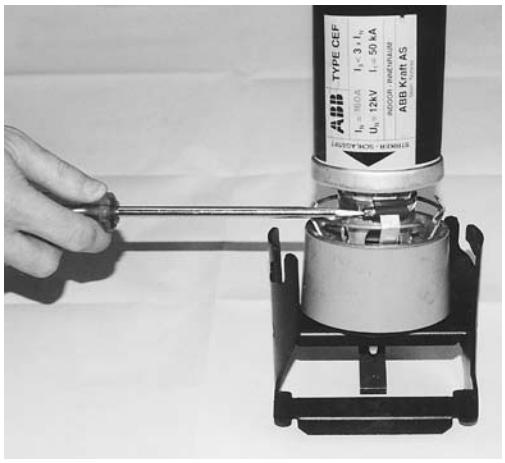
5. Applying the operating handle and turning anti-clockwise opens the fuse canisters.



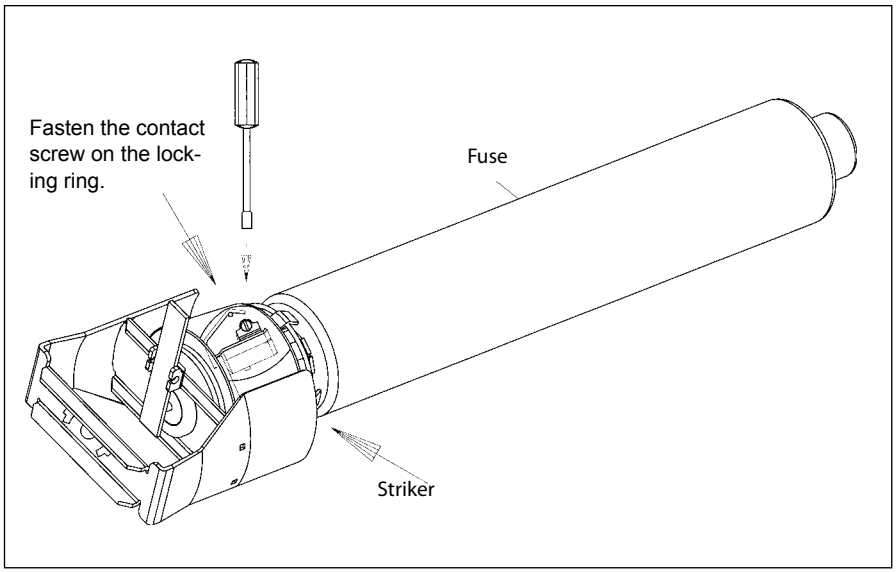
6. Pull out the fuse handle. The fuses are firmly fixed in the fuse cover.

8. Turn the handle on the fuse cover clockwise to lose and seal the fuse canister. Use the operating handle.

9. Close the fuse panel.
The switches are ready for operation.



7. Fix the fuses to the fuse cover using the contact screw
- The striker must point out from the fuse canister for the fuse to function properly.



5.4 RELAYS

SafeRing / SafePlus with vacuum circuit breakers are prepared for three different types of protection relays: SACE PR521, Circutor, MPRB 99-1.0-GF and SEG WIC1. All three types are designed so that there is no need for external auxiliary voltage for correct functioning.

Separate manuals have been prepared for each of these protection relays, with examples of adjustments.

MPRB 99-1.0-GF

This is a simple type of inverse-time protection relay, with fixed settings specially developed for distribution transformers.The MPRB 99-1.0-GF also has a earthfault protection module.
It is essential for correct functioning that the current transformers are properly connected and that the protection relay is properly adjusted.

SafePlus can be delivered with advanced protection relays. As option SPAJ140 can be delivered and also other ABB relays like REJ and REF54_ can be fitted. This will require additional low voltage compartment.
See separate documentation for these relays.

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6. ADDITIONAL EQUIPMENT

6.1 LOW-VOLTAGE CONNECTIONS

AUXILIARY CONTACTS

(2NO+2NC) can be supplied to indicate switch positions on all switches/breakers. Access to the low-voltage connections is gained by removing the top front panel. A shunt trip coil (AC or DC) can be fitted on the transformer switch/breaker.

6.2 REMOTE CONTROL AND MONITORING UNIT

SafeRing can be equipped with an integrated remote control and monitoring unit (see picture left).
This unit is preengineered and can be delivered and installed as a retrofit solution or complete from factory.
SafePlus can have the same equipment but need an additional low voltage compartment on top of the switchgear.

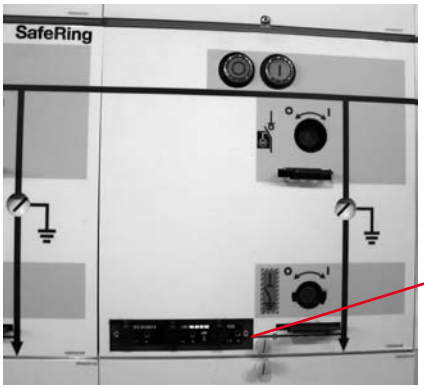
6.3 CAPACITIVE VOLTAGE INDICATION

Socket for capacitive voltage ondication
HR-module IEC 61243-5

Vim 1

Voltage indicator

Vim 3



Capacitive voltage indicator type HR

Phase balance check

6.4 SHORT CIRCUIT INDICATOR

Three types can be supplied:
Horstman ALPHA-M
Horstman ALPHA-E
Horstman GAMMA

6.5 MOTOR OPERATION

Cable switches, vacuum circuit-breakers and earthing switches are operated by mechanisms located behind the front panel. The mechanisms for all the switches and breakers are operated manually with the operating level (standard), or are fitted with motor operation (additional equipment). The earthing switch can only be operated manually and is fitted with mechanisms to achieve fault making capabilities.

Motor operation can be easily retrofitted.

6.6 CABLE TESTING

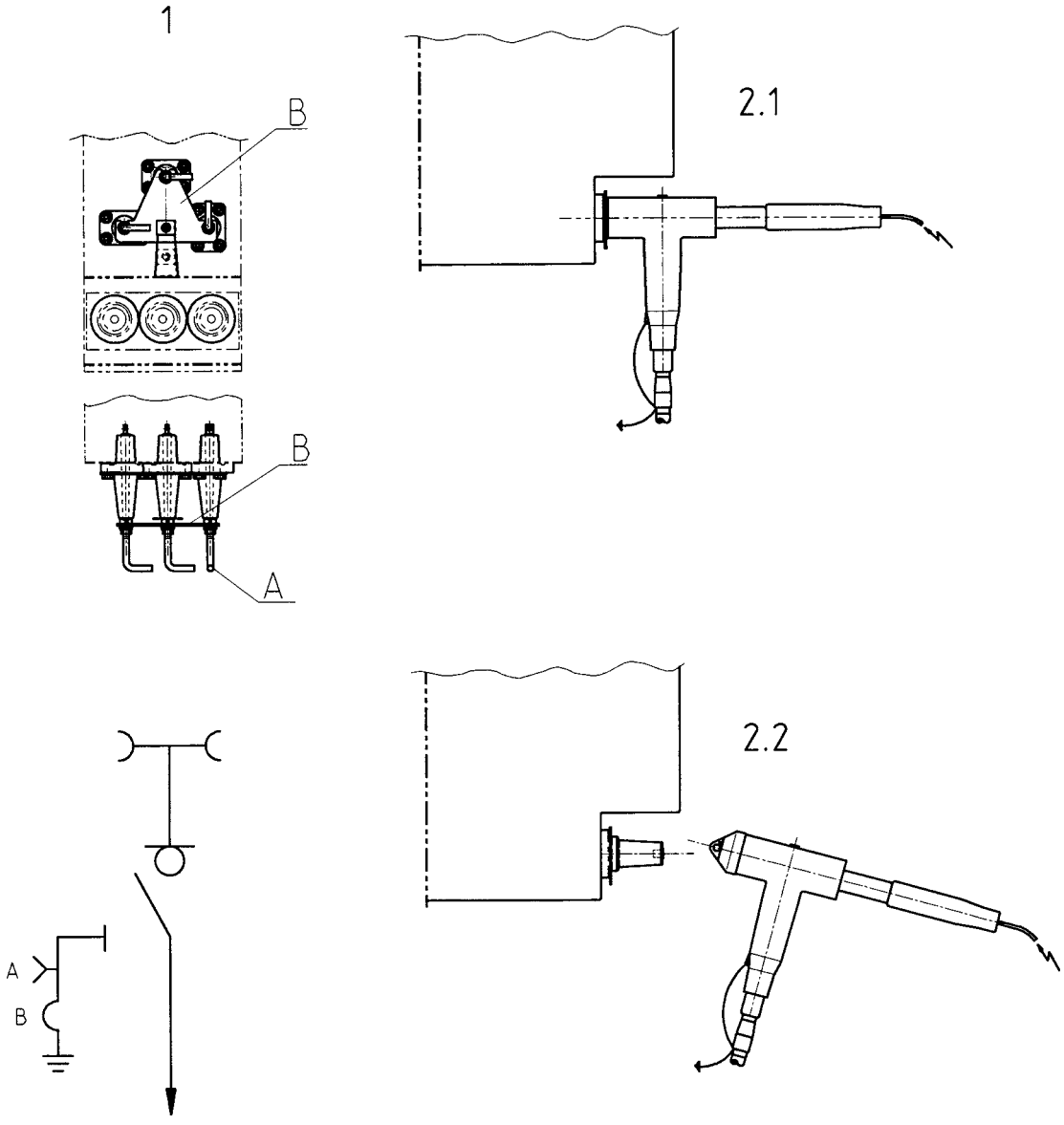
Voltage testing and locating cable faults can be performed in two ways:

1. Directly at the testing points (A) if they are fitted on the unit. Proceed as follows: engage the earthing switch. Connect the testing equipment on top of the testing points which hold the earth bar (B). Remove the earth bar and perform the test. Refit the earth strip before the testing equipment is disconnected

2. Directly at the cable connectors which are designed for test ing the voltage of the cable.
   Follow the supplier's instructions.

   2.1. Cable connector connected

   2.2. Cable connector dismounted



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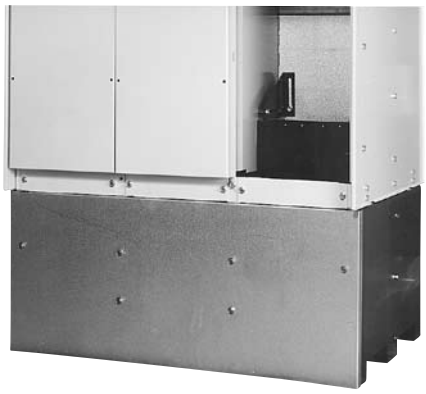


Base frame

Top entry box low voltage cables

6.7 EXTERNAL BUSBAR
SafeRing and SafePlus can be equiped with an external busbar. See seperate instruction manual NOPOWSP 6006 GB.

6.8 ARC-SUPPRESSOR
An arc-suppressor can be fitted on all cable modules for SafeRing and C, D, De and V-modules on SafePlus. They must be ordered together with the unit and cannot be retrofitted.
The tripped of an arc-suppressor is indicated by means of a electric contact in the SF_6 tank, wired to the terminal strip behind the top front panel. (This requires aux. voltage supply.)

6.9 PRESSURE INDICATOR
SafeRing / SafePlus is always supplied with a pressure indicator in the form of a manometer. Additionally it is possible to fit device for an electric signal if the pressure is low. This requires aux. voltage supply.

6.10 BASE FRAME
SafeRing/ SafePlus can be installed on a separate base frame. The base frame is designed for cable entry from both sides or from the back.
Two different heights 290 mm and 450 mm.

6.11 RONIS KEY INTERLOCK
SafeRing / SafePlus can be supplied with a RONIS, EL 11 AP key interlocking system for breakers, switches and earthing switches

6.12 TOP ENTRY BOX FOR LOW VOLTAGE CABLES
SafeRing/SafePlus can be supplied with top entry box for low voltage cables.

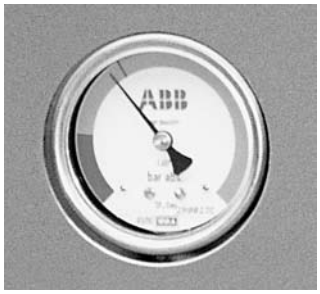
6.13 LOW VOLTAGE COMPARTMENT
SafePlus can be supplied with low voltage compartment for protection relays, metering and other secondary equipment.

7. MAINTENANCE

All components in the SF_6 tank are maintenance-free for the declared life expectancy of the product. The tank is made of stainless steel.
If the panels substain any scratches or damage, these must be repaired with paint to prevent corrosion.

Mechanical parts are positioned outside the tank and behind the front panel. This enables easy access and replacement if required.

Mechanical parts are surface-treated to prevent corrosion. Moving parts are lubricated at the factory for the product's life expectancy. In extreme conditions (dust, sand and pollution), inspection and maintenance will be imperative, and in some cases replacements will be necessary. Check that the lubricant is not washed or wiped away from the mechanical moving parts.



7.1 CONTROL AND MONITORING THE GAS

SafeRing / SafePlus is a pressure-sealed system that normally does not require special inspections. However the gas pressure on the manometer should always be checked prior to operation.

7.2 ENVIRONMENTAL CERTIFICATION

1. LIFE EXPECTANCY OF PRODUCT

The product is developed in compliance with the requirements denoted by IEC 298. The design incorporates a life span under indoor service conditions exceeding 30 years (IEC 298 annex GG).
The switchgear is gas-tight with an expected diffusion rate of less than 0.1 % per annum. Referring to the reference-pressure of 1.4 bar, the switchgear will maintain gas-tightness and a gas-pressure better than 1.3 bar* throughout its designed life span. *) at 20°C.

2. RECYCLING CAPABILITY

Raw Material	Weight	% of total weight – 320kg	Re-cycle	Environmental effects & recycle/reuse processes
Iron	132,80 kg	42,53%	Yes	Separate, utilise in favour of new source (ore)
Stainless steel	83,20 kg	24,93%	Yes	Separate, utilise in favour of new source (ore)
Copper	43,98 kg	14,09%	Yes	Separate, utilise in favour of new source (ore)
Brass	2,30 kg	0,74%	Yes	Separate, utilise in favour of new source (ore)
Aluminium	8,55 kg	2,74%	Yes	Separate, utilise in favour of new source (ore)
Zinc	3,90 kg	1,25%	Yes	Separate, utilise in favour of new source (ore)
Silver	0,075 kg	0,024	Yes	Electrolysis, utilise in favour of new source
Thermoplastic	5,07 kg	1,63%	Yes	Make granulate, re-use or apply as energy superior additive in refuse incineration
Epoxy incl. 60% quartz	26,75 kg	8,35 %	Yes	Grind to powder and use as high-grade energy additive in cement mill
Rubber	1,35 kg	0,42 %	Yes	High-grade energy additive in refuse incineration
Dielectric oil	0,21 kg	0,066 %	Yes	Reclaim or use as High-grade energy additive in refuse incineration
SF_6 gas	3,24 kg	1,04%	Yes	ABB AS in Skien reclaims used SF_6 gas.
Total for recycling	**311,44kg**	**97,25 %**		
Not specified *	9,00 kg			*Stickers, Film-foils, powder coating, screws, nuts, tiny components, grease ….
Total weight **	320,00 kg	100 %		
Packing foil	0,2 kg		Yes	High-grade energy additive in refuse incineration
Wooden pallet	21,5 kg		Yes	Re-use or use as energy additive in refuse incineration

**)All figures are collected from CCF 3-way unit with arc suppresser.

3. END-OF-LIFE

ABB AS, Power Products Division, is committed to the protection of the environment and adhere to ISO 14001 standards. It is our obligation to facilitate end-of-life recycling for our products.
There exist no explicit requirements for how to handle discarded switchgears at end-of-life. ABB's recycling service is according to IEC 1634 edition 1995 section 6: «*End of life of SF_6 filled equipment*» and in particular 6.5.2.a: «*Low decomposition*»: «*No special action is required; non-recoverable parts can be disposed of normally according to local regulations*.»
We also recommend ABB's website : http://www.abb.com/sf6 .

ABB AS, Power Products Division in Skien is equipped to reclaim SF_6 gas from discarded switchgears.

Text and illustrations are not binding.
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