PowerCon XT HV-hus m/CCV-M

Produktbeskrivelse:

Komplett flyttbart høyspent koblingsanlegg med solid utendørs kapsling for midlertidige elektriske anlegg.

Yttermål (cm): ca. B234,2 x L106,8 x H231,1

Vekt: ca. 1 250kg

Kapsling:

Flyttbar kompakt koblings hus, fra Power Connection Nordic, type PowerCon XT HV-hus 6-felt skreddersydd til frittstående montasje av SF6 anlegg fra ABB, utført i aluminiumsplater, veggplater og dører/tak av pulverlakkerte aluminiumsplater, med galvanisert stål ramme med truck lommer / uten sokkel, sammen boltet med utskiftbare deler. Utstyrt med heisebolter og gjennomgående gjengestenger festet i rammen. Slik at hele kiosken kan flyttes med kran. Kraftige hengsler i rustfritt stål på dørene.

Rom for høyspent koblingsanlegg med plass til inntil 6 felt, eller 3 felt, målefelt (M-felt) og 2P spennings trafo.

Inntak:

Høyspent koblingsanlegg:

ABB SafePlus, SF6 isolert ringkabelanlegg.

-A01	C	Lastbryter	Inngående HSP kabel
-A02	C	Lastbryter	Utgående HSP kabel
-A03	V	Effektbryter	Hovedbryter for effektavgang, via målefelt -A04. Rele vern av type REF615, med 80A/22kV combi sensorer.
-A04	M	Målerfelt Luft isolert	kWh måling av -A03 avgangen. 22-11kV/110V spenningstrafoer og 75-150A/5A strømtrafoer.

Vender i front av Målerfelt, -A04:

	I 11kV stilling:	I 22kV stilling:
Spenningstrafoer	a1-n: 11kV/110V	a2-n: 22kV/110V
Strømtrafoer	S1-S3: 150/5A	S1-S2: 75/5A
2polt 400VA strømtrafo	a1-b: 11kV-230V	a2-b: 22kV/230V

Se leverandørens dokumentasjon for flere detaljer.

Avgang:

Effektavgang med tilkobling av topp av M-felt.

Styrestrøms trafo (-XT2):

Ritz transformator, 1-fase 1-viklingstrafo med 2 utgangspenninger tilpasset for 11 eller 22kV inn.

Voltamper:	400VA
Primærspenning:	22/11kV
Primærstrøm:	0,02A ved 22kV / 0,04A ved 11kV
Sekundærspenning:	230V
Sekunderstrøm:	1,7A

FDV

Drift

-Kiosken må kun betjenes av sakkyndig personell.

-Spennings velgere **MÅ IKKE** betjenes under spenning/drift.

-Ved arbeid på HSP delen må korrekt jordslutter være påslått. Hvis koblingsanlegget er en del av ringnett må utkobling og jordsluttning utføres med høy aktsomhet.

-Ved utkobling som følge av jordfeil/overstrøm bør avgangen kontrolleres før effektbryteren forsøkes gjeninnkoblet.

-Maks temperatur +40° C, Maks temp.(24t gj.snitt): +35°C Min.temp. -25°C
Maks høyde: 1500m

-Frekvens 50Hz hvis ikke annet er spesifisert.

Før forflytting/transport

-Kontrollere at alle deler er avslått/spenningsløse.

-Kontrollere at alle jordsluttere er på slått.

-På 24VDC UPS, demonter/fjerne sikring til batteripakken.

-Kontroller at alle kabler er frakoblet.

-På måler-celle/V-felt/HSP kWh-måler, må laskene mellom strøm og spenningstrafoer demontert. Dette er viktig får å unngå skade på målertrafoer

-Sjekke at alle dører/dørlåser er lukket.

Idriftsettelse

Før innkobling:

-Kontrollere hus for skader/mangler.

-Kontrollere at barometer på HSP koblingsanlegget står på grønt området.

-Alle tilkoblinger bør inspiseres.

-Koblingsanlegget er utstyrt med måler-celle/M-felt/ HSP kWh-måler, på dette må lasker mellom strøm og spenningstrafoer monteres.

-Stille og kontrollere at alle spenningsvelger i måler-celle/M-felt, står i rett posisjon i forhold til forsyningsspenningen.

-Vernet i V-feltet -A03 (hovedbryteren) må kontrolleres, at det er korrekt innstilt i forhold til strømtrekket som tillates av nettselskapet, og ikke høyre enn strømtrafoen i -A04, for strømgjeldende forsyningsspenning. Ved endring av forsyningsspenning må vernet stilles.

-Isolasjonsmåling anbefales. Styrestrøms sikringer anbefales å ha avslått ved isolasjonsmåling.

-Kontroll av jord kontinuitet anbefales.

-kontrollere at korrekte jordsluttere er avslått.

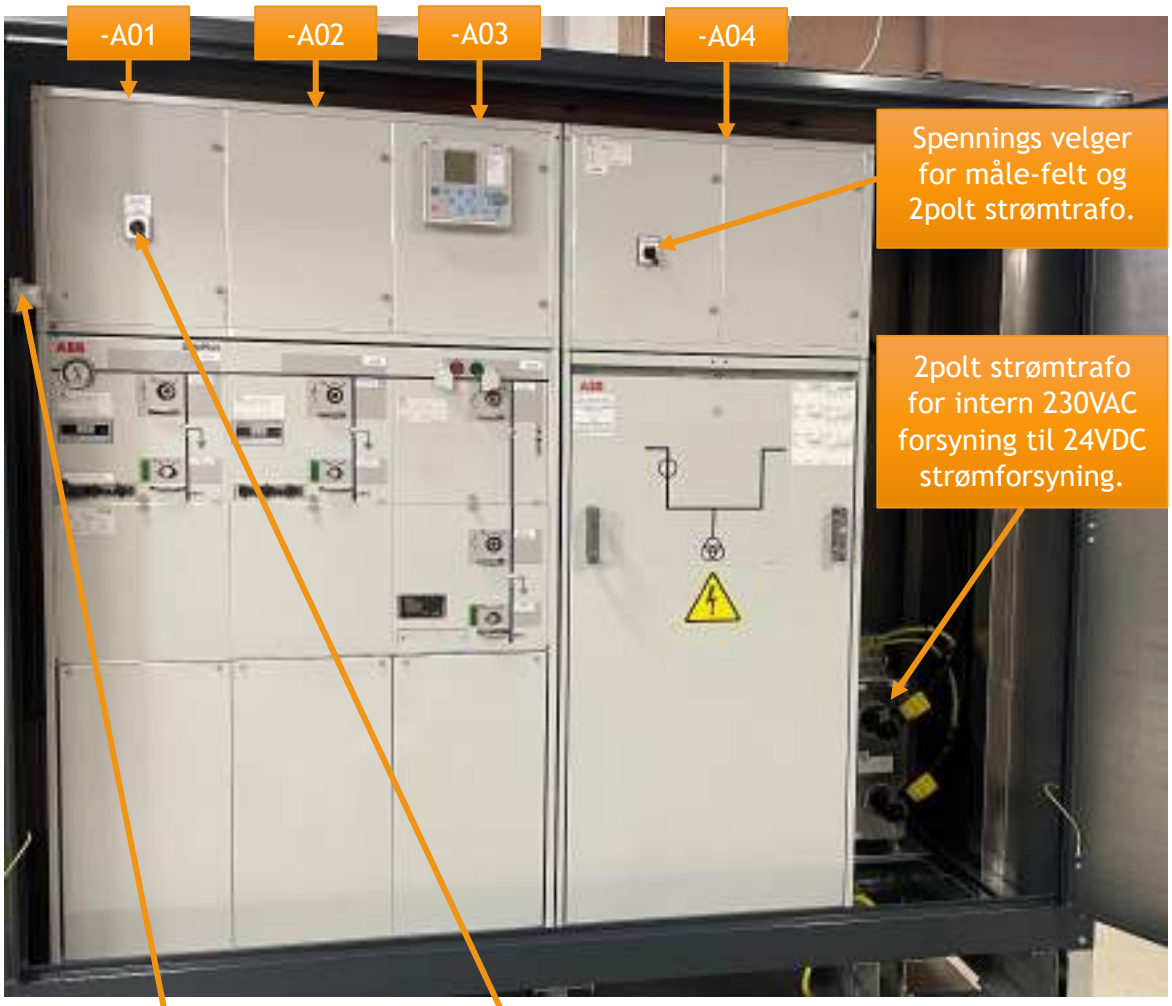
- På 24VDC UPS, montere/plugge i sikringen i batteripakken. UPS'en vil ikke gi ut 24VDC før den har fått tilført 24VDC på input.

-Hovedbryterbryteren i -A03 er utstyrt med et vern som ikke er selvforsynt (REF615) dette må settes i drift før bryteren legges inn. Derfor må det tilføres 230VAC til schuko inntak og vender for ekstern/intern styrestrøms forsyning må stå på Ekstern. 230VAC sikring til 24VDC strømforsyning må slås på (-XF100). Vernet i -A03 er forsynt direkte fra 24VDC strømforsyning uten sikring, via UPS.

Etter innkobling:

-Spenningstesting og kontroll av dreieretning.

-Vender for ekstern/intern styrestrøms forsyning bør slåes over til Intern, slik at 230V kan frakobles schuko inntak uten at styrestrømmen forsvinner.


-A01
-A02
-A03
-A04
Spennings velger for måle-felt og 2polt strømtrafo.
2polt strømtrafo for intern 230VAC forsyning til 24VDC strømforsyning.
Schuko inntak, for ekstern 230VAC forsyning til 24VDC strømforsyning.
Vender for 230VAC forsyning fra 2polt strømtrafo eller Schuko inntak.

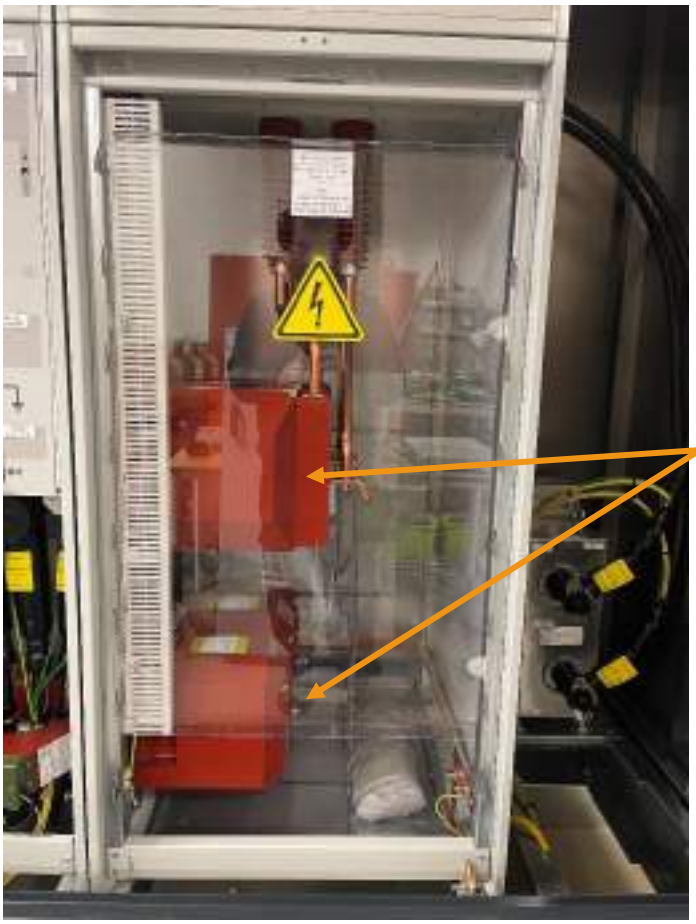
-A01

230VAC sikring forsynt fra 2polt strømtrafo.

-A02

24VDC Strømforsyning

24VDC 24VDC UPS m/batteri, for forsyning av REF615 i felt -A03



Obs!
Laskene mellom strøm og spenningstrafoen må monteres før anlegget settes i drift. Disse må demonteres før transport eller flytting. Dette får å unngå skadde på trafoene undre transport.


ABB
s.n. 1VLT5124018343
TPU 60.13
or.n.:974854
75-150//5A
50Hz
S1-S2 75/5A cl.0.2FS5 1-5VA ext.120%
S1-S3 150/5A cl.0.2FS5 1-5VA ext.120%
Icth: 180A
Ith: 21(1s)kA
Idyn: 52.5kA
35.0 kg
-5/+40°C
E
2024
24/50/125kV
IEC 61869-2
TCM 212/18-5547
Made by ABB
ABB
s.n. 1VLT5224005916
TJC 6
or.n.:974854
11000/√3-22000/√3//110/√3/110/3V
a1-n 11000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
a2-n 22000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
da1-dn 11000/√3/110/3V cl.3P 30VA 1.9xUn/8h
da2-dn 22000/√3/110/3V cl.3P 30VA 1.9xUn/8h
38.0 kg
50Hz -5/55°C
E
2024
24/50/125 kV
500VA
IEC 61869-3
TCM 212/95-2151
Made by ABB
ABB
s.n. 1VLT5124018344
TPU 60.13
or.n.:974854
75-150//5A
50Hz
S1-S2 75/5A cl.0.2FS5 1-5VA ext.120%
S1-S3 150/5A cl.0.2FS5 1-5VA ext.120%
Icth: 180A
Ith: 21(1s)kA
Idyn: 52.5kA
35.0 kg
-5/+40°C
E
2024
24/50/125kV
IEC 61869-2
TCM 212/18-5547
Made by ABB
ABB
s.n. 1VLT5224005917
TJC 6
or.n.:974854
11000/√3-22000/√3//110/√3/110/3V
a1-n 11000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
a2-n 22000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
da1-dn 11000/√3/110/3V cl.3P 30VA 1.9xUn/8h
da2-dn 22000/√3/110/3V cl.3P 30VA 1.9xUn/8h
38.0 kg
50Hz -5/55°C
E
2024
24/50/125 kV
500VA
IEC 61869-3
TCM 212/95-2151
Made by ABB
ABB
s.n. 1VLT5124018345
TPU 60.13
or.n.:974854
75-150//5A
50Hz
S1-S2 75/5A cl.0.2FS5 1-5VA ext.120%
S1-S3 150/5A cl.0.2FS5 1-5VA ext.120%
Icth: 180A
Ith: 21(1s)kA
Idyn: 52.5kA
35.0 kg
-5/+40°C
E
2024
24/50/125kV
IEC 61869-2
TCM 212/18-5547
Made by ABB
ABB
s.n. 1VLT5224005918
TJC 6
or.n.:974854
11000/√3-22000/√3//110/√3/110/3V
a1-n 11000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
a2-n 22000/√3/110/√3V cl.0.2 0-5VA 1.9xUn/8h
da1-dn 11000/√3/110/3V cl.3P 30VA 1.9xUn/8h
da2-dn 22000/√3/110/3V cl.3P 30VA 1.9xUn/8h
38.0 kg
50Hz -5/55°C
E
2024
24/50/125 kV
500VA
IEC 61869-3
TCM 212/95-2151
Made by ABB


Serie nr: PCN-2023-00131
Type: PowerCon XT HV-hus
O. nr: 146
Norm: NEK EN61439-4
POWER CONNECTION NORDIC
CE
B: 234cm
L: 107cm
H: 232cm
Vekt: Ca. 1 250kg


ABB
Serial No: 202413908120002
Year: 2024
IEC 62271-200 2011-10
SafePlus
HV metal-enclosed switchgear
Type: C C V
Ur 24 kV
fr 50 Hz
Up 125 kV
Ud 50 kV
Ir bus bar 630 A
Ik bus bar 21 kA
Ip 52.5 kA
tk 3 s
Pre 0.04 MPa
SF6 3.45 kg
TC -25° C to +40° C indoor
Made in ABB
Weight max (m) 450 kg

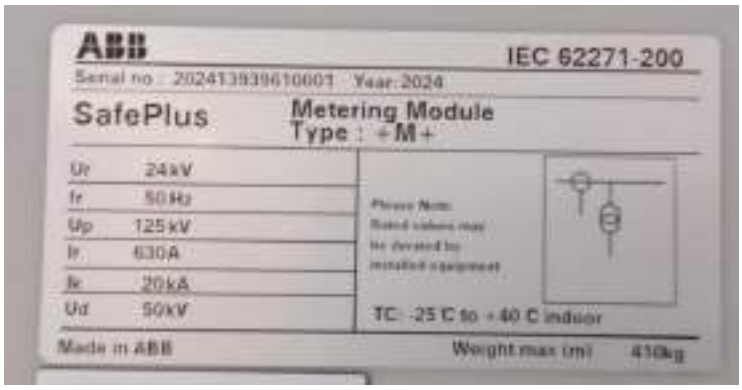


ABB
IEC 62271-200
Serial no: 202413939610001 Year: 2024
SafePlus
Metering Module
Type : +M+
Ur 24kV
fr 50Hz
Up 125kV
Ir 630A
Ik 20kA
Ud 50kV
TC: -25 C to +40 C indoor
Made in ABB
Weight max (m) 410kg


ixing points are
rounding points
RITZ
VOLTAGE TRANSFORMER
TYPE GBZA 24
S.NO 23 / 20514476
24/50/125 kV
11000-22000 V
A - B U1n/V U2n/V Sn/VA Cl Sth/VA No.
11000 230 400 (pfl) 3 400 a1- b
22000 230 400 (pfl) 3 400 a2- b
class 3 valid for sr and ur only
-5°C<=Tamb<=40°C
1xUn cont.
E 50 Hz
IEC 61869-3 72 kg


-A03

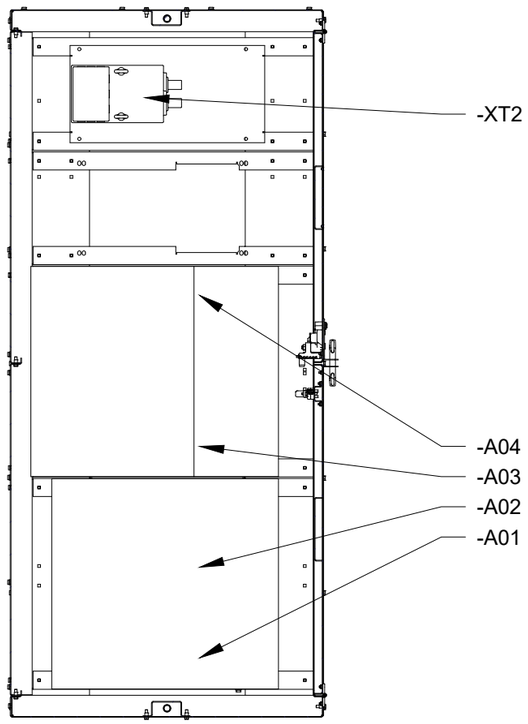

ABB

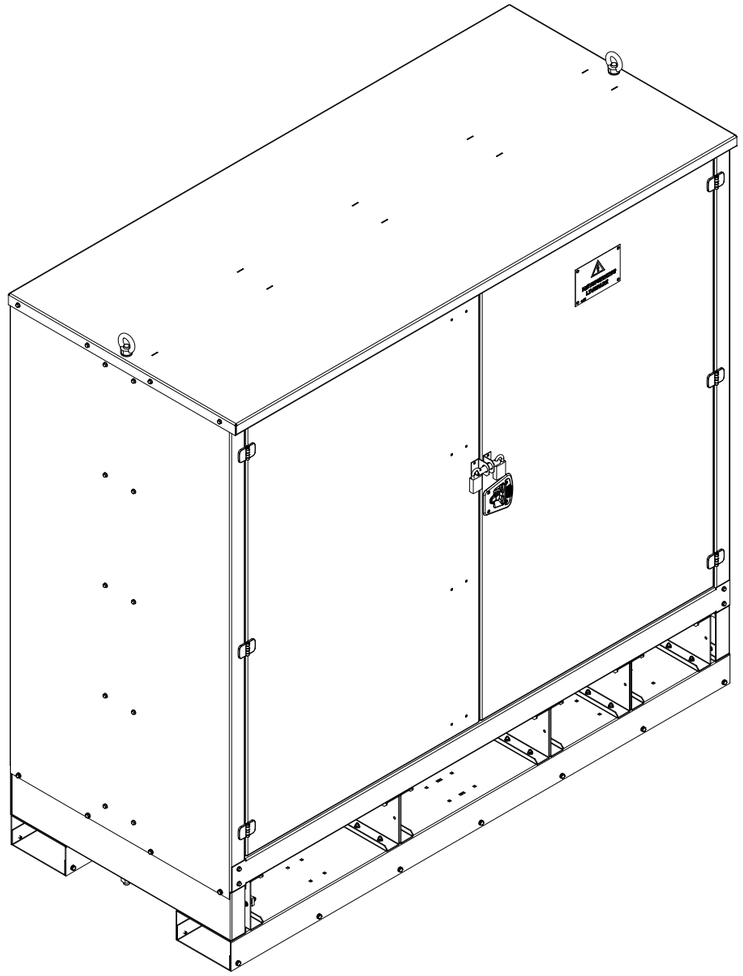
Power Connection Nordic

PowerCon XT HV-hus

				Designer	PCN-2023-00131		
				JJ	PowerCon XT HV-hus m/CCVM		
				Dato	Framside	Lokasjon (+)	Installasjon (=)
				30.01.2024	Front page	Blad 1 / Antall blad 5	
A	Produksjon	JJ	16/2-24	Godkjent av		Prosjektnummer	
Revisjon	Beskrivelse	Signatur	Dato	Godkjent dato		146/2062	

B: 2342
H: 2311
L: 1068





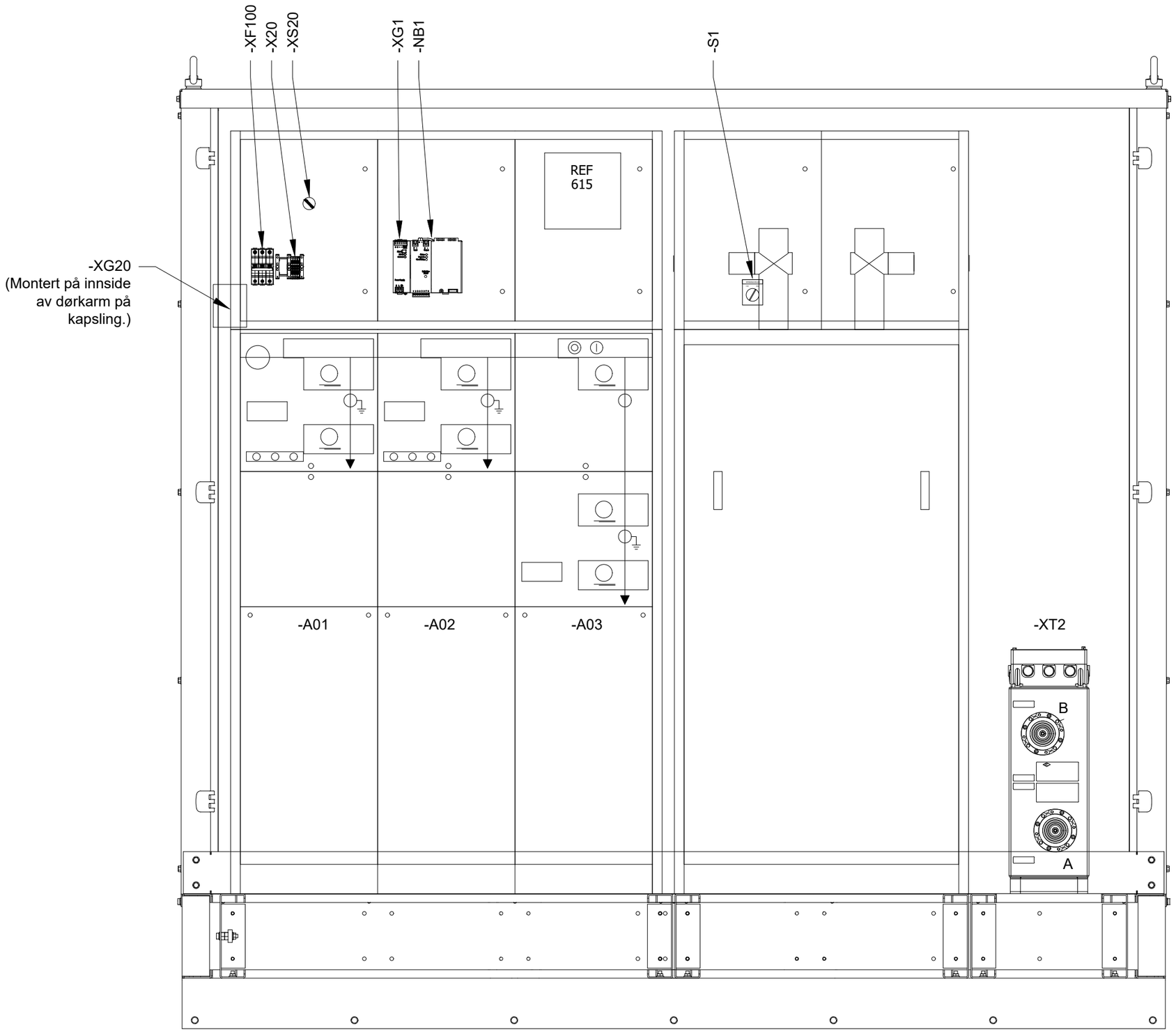
Revisjon	Beskrivelse	Signatur	Dato
A	Produksjon	JJ	16/2-24

Designer: JJ
Dato: 30.01.2024
Godkjent av:
Godkjent dato:

PCN-2023-00131
PowerCon XT HV-hus m/CCVM
Arrangement
Oversikt

POWER CONNECTION NORDIC

Lokasjon (+):
Installasjon (=):
Blad: 2
Antall blad: 5
Prosjektnummer: 146/2062



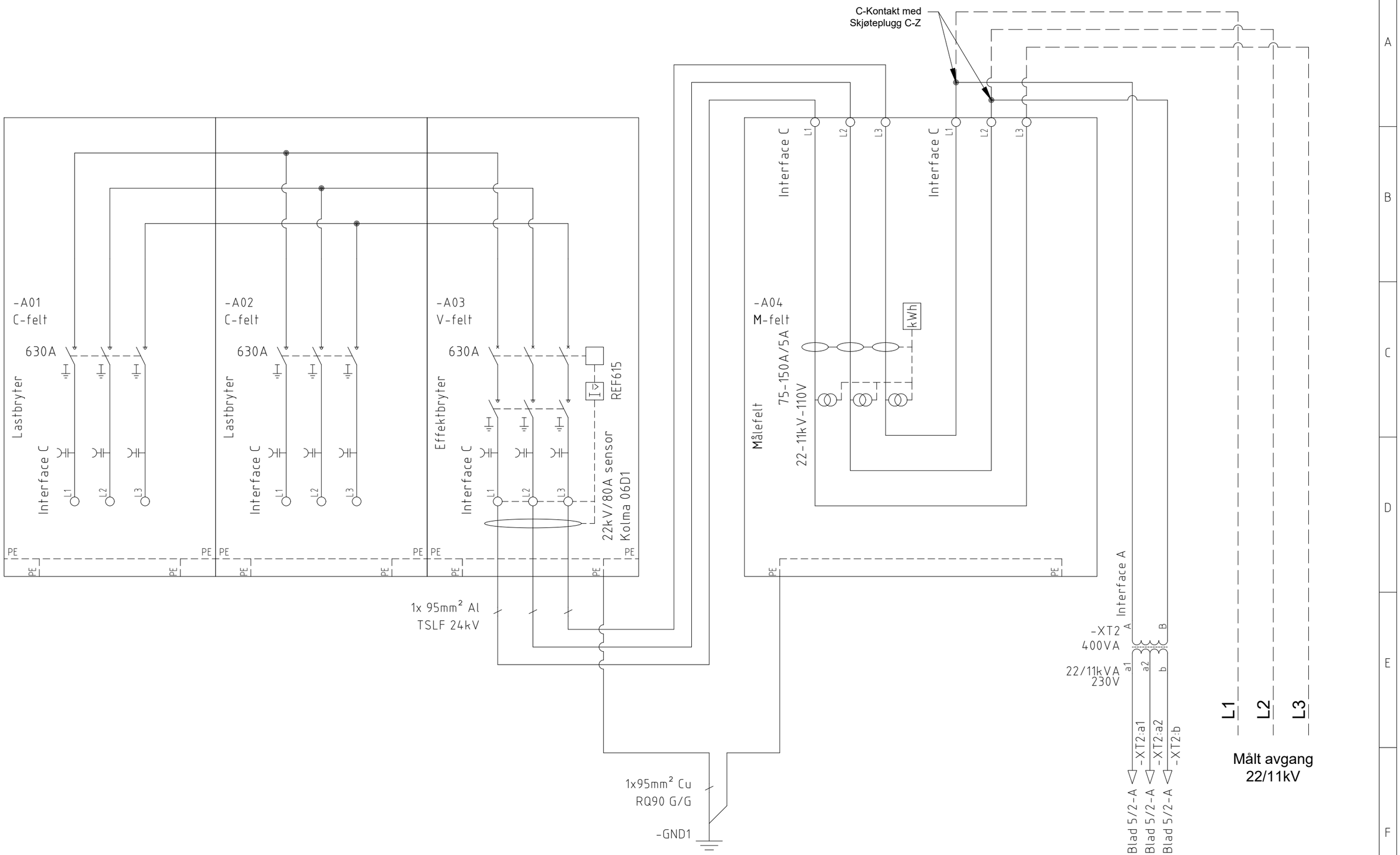
Revisjon	Beskrivelse	Signatur	Dato
A	Produksjon	JJ	16/2-24

Designer: JJ
Dato: 30.01.2024
Godkjent av:
Godkjent dato:

PCN-2023-00131
PowerCon XT HV-hus m/CCVM
Arrangement
Koblings anlegg mm

POWER CONNECTION NORDIC

Lokasjon (+)
Installasjon (=)
Blad: 3
Antall blad: 5
Prosjektnummer: 146/2062



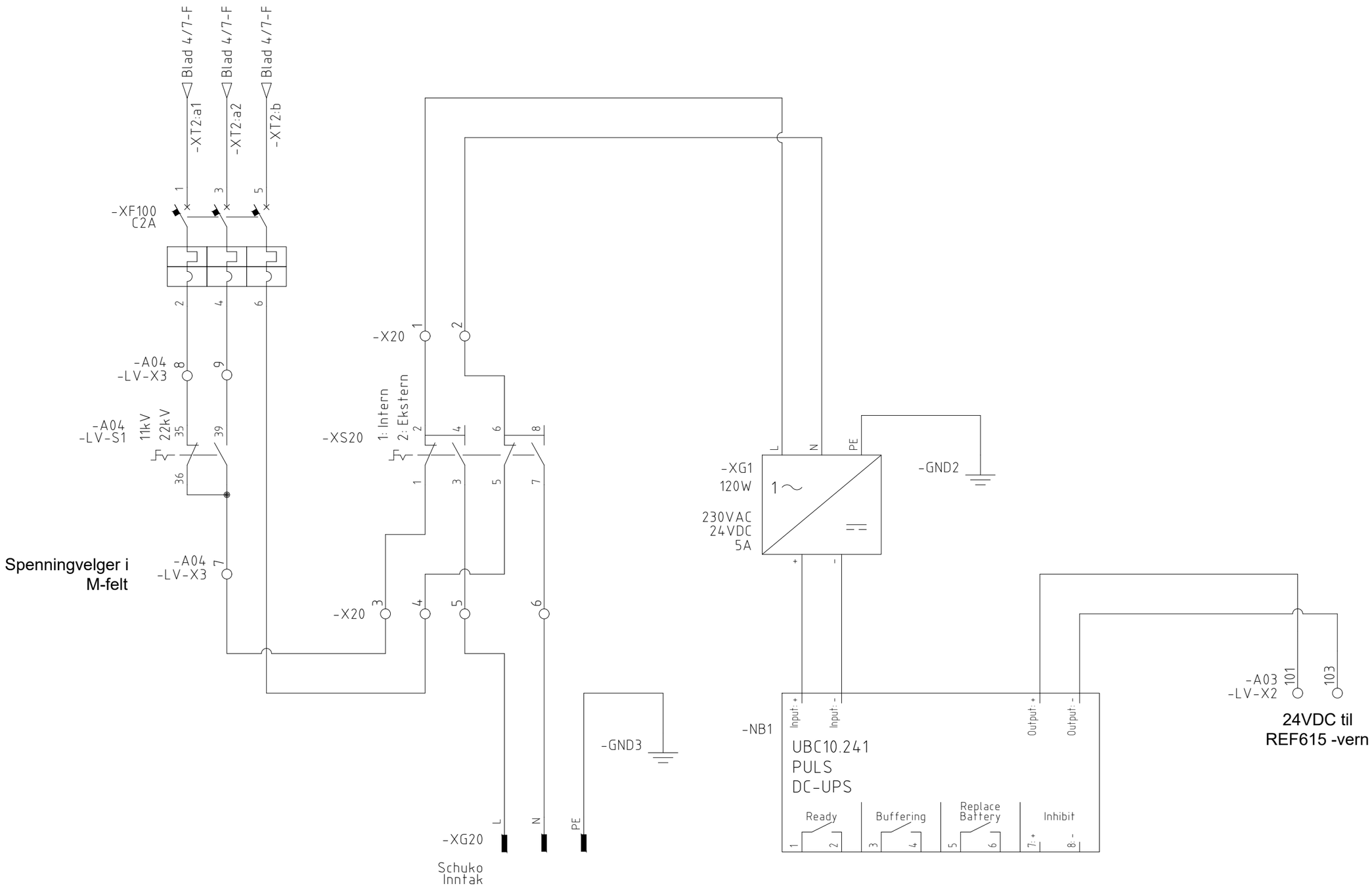
Revisjon	Beskrivelse	Signatur	Dato
A	Produksjon	JJ	16/2-24

Designer: JJ
Dato: 30.01.2024
Godkjent av:
Godkjent dato:

PCN-2023-00131
PowerCon XT HV-hus m/CCVM
22/11kV
Hovedstrømskjema

POWER CONNECTION NORDIC

Lokasjon (+):
Installasjon (=):
Blad: 4
Antall blad: 5
Prosjektnummer: 146/2062



Revisjon	Beskrivelse	Signatur	Dato
A	Produksjon	JJ	16/2-24

Designer: JJ
Dato: 30.01.2024
Godkjent av:
Godkjent dato:

PCN-2023-00131
PowerCon XT HV-hus m/CCVM
230V/24V forsyning
Hovedstrømskjema

POWER CONNECTION NORDIC

Lokasjon (+)
Installasjon (=)
Blad: 5
Antall blad: 5
Prosjektnummer: 146/2062

POWER CONNECTION NORDIC

Spesifikasjon

14.01.2025

Prosjekt nr:	2062
Ordre:	146
Serie nr:	PCN-2023-00131
Type/Beskrivelse:	PowerCon XT HV-hus m/CCVM felt
Artikkel nr:	-
Maskin nr:	-

El nr	Artikkel nr	Beskrivelse	Ant. Bulk	Fabrikat	Antall	Merking/Serienr.
	202960	Koblings-hus PowerCon XT HV-hus		PCNordic	1	
28 580 62	A270	Al-skilt elektriske ulykker 210x298x0,7mm gult/sort		Melbye	1	
28 580 05	A110	Al-skilt høyspenning livsfare 210x148x0,7mm gult/ sort		Melbye	1	
-	-	SafePlus CCV, med REF-615 vern, med KOLMA 06 Serial No: 202413908120002		ABB	1	-A01, -A02, -A03
-	-	SafePlus M, målefelt: *75-150A/5A* *11-22kV/110V* Serial No: 202413939610001		ABB	1	-A04
	9300150	RITZ SPG. TRAFO 22/11//230V 400VA		Ritz	1	-XT2 / 23/20514476
11 653 15	MSCE 250A 24 kV 25/95 P	Albuekontakt 250A 24kV 25-95mm² / 12 kV 95mm²		Meldby	0,667	
11 653 14	FMPCS-630-CZ	Rett skjøteplugg C-Z Berøringssikker kontakt 630 A		Meldby	2	
11 653 17	MSCEA 630A 24kV 25-95 P	T-kontakt 630A 24kV 25-95mm² / 12 kV 95mm²		Meldby	2,667	
10 671 14	10163158	TSLF 24KV 1X 95A/25		Nexans	27	
10 175 60	10255017	TXSI 24KV 1X 25 CU/16		Nexans	12	
10 119 27		RQ 90 TEC H07Z-K 95MM² G/G Koblingsledning		TECCON	4	
20 301 49	KRF95-10	Presskabelsko Cu 95mm² M10 KRF Kobber, SEN press		Melbye	8	

16 655 47	2CDS273001R0024	AUTOMAT S203M-C2		ABB	1	-XF100
	10864	Vegg montert inntak SCHUKO® 10864		Mennekes	1	-XG20
14 551 26	CG8 A221-600FT2	KAMBRYTER 1-2 2P/20A 1 hulls innfelt montering		Kraus & Naimer	1	-XS20
12 654 00	3042152185	A2C 2,5		Weidemuller	6	-X20
12 654 34	3042199192	AEB 35 SC/1		Weidemuller	4	-X20
12 694 10	3042151440	AEP 2C 2,5		Weidemuller	1	-X20
12 675 92	3035029246	SCHT 5, SKILTHOLDER		Weidemuller	1	-X20
12 698 43	3025541001	Dekafix rekkeklemmemerker 5-FWZ. Horisontal merking 1-10	50	Weidemuller	1	-X20
66 040 18	QS5.241	Strømforsyning 85-240V AC/24-28V DC 5A		Puls	1	-XG1
66 040 39	UBC10.241	DC-UPS modul/kontrollenh. med 5Ah batteri 24VDC/10A		Puls	1	-NB1
10 186 16	20075588	PFXP 500V 4G 1.5 mm² FR	50	Draka	5	
10 186 14	20075585	PFXP 500V 3G 2.5 mm² FR	50	Draka	3	
12 480 66		PAKKNIPPEL POLY.M/STR.A. PG 21 Schlemmer-Tec		ELIS ELEKTRO AS	5	
12 480 56		Kontramutter KP PG21 Polyamid		ELIS ELEKTRO AS	4	
	7DA.212320	T-håndtak for hengelås		Essentra	1	
	201999	Låsestang dører m/anslag (u/hull) 1150mm		Bossard	2	
	204037	Brakett for stangstyring, døranslag		PCNordic	4	
	135 MZ1-DB.002	MZ1-DB.002 Håndtak for låsing døranslag		Bossard	1	
	3216-610764-30	50x76 Hengsler m/bolter		Bossard	6	

Samsvarserklæring

Produsent:

POWER CONNECTION NORDIC

Hovedkontor: Lindeberg Næringsvei 14, 1067 Oslo. Fabrik: Leinskogen 4, 2360 Rudshøgda.
www.pcnordic.no post@pcnordic.no Sentralbord: +47 414 50 414

Prosjekt nr:	2062
Ordre:	146
Serie nr:	PCN-2023-00131
Type/Beskrivelse:	PowerCon XT HV-hus m/CCVM felt
Artikkel nr:	-
Maskin nr:	-

Undertegnede erklærer at utstyret/produktet oppfyller de gjeldene krav i Forskrift for elektrisk utstyr (FEU).

Tilleggsinformasjon:
Levering av komplett koblingsanlegg i solid kapsling for midlertidig elektrisk anlegg. iht. dokumentasjon, revisjon A.

Følgende direktiv gjelder:

[x] LDV (Lavspenningsdirektivet)	[ ] EMC (EMC-direktivet)	[ ] MD (Maskindirektivet)

Følgende normer gjelder/ligger til grunn:

[ ] NEK EN61439-2	[ ] EN 61000-6-2	[ ] EN 60204-1
[ ] NEK EN61439-3	[ ] EN 61000-6-4	
[x] NEK EN61439-4	[ ] EN 61000-6-5	

Sted/ Dato	År for påført CE-merke:	Firma:
Rudshøgda/ 15.01.2025	2025	Power Connection Nordic AS

Underskrivers navn:	Stilling:
John W. Johnsen	Elektroingeniør

POWER CONNECTION NORDIC

Sluttkontroll

Prosjekt nr:	2062
Ordre:	146
Serie nr:	PCN-2023-00131
Type/Beskrivelse:	PowerCon XT HV-hus m/CCVM felt
Artikkel nr:	-
Maskin nr:	-

Revisjon/dato:

Beskrivelse	Ikke aktuelt	Sluttkontroll	QA kontroll	Kommentar/avvik
Trafo				
Riktig trafo montert i riktig kiosk			X	
Tilstrekkelig innfesting av trafoen			X	
Ingen tegn til olje lekkasje	X			
Trafoens jordingspunkt er tilkoblet jord, riktig tverrsnitt			X	
Trafoens nullpunkt er tilkoblet jord (TN/TT) eller tilkoblet til nullpunktssikring (IT), riktig tverrsnitt	X			
Albuekontakt er jordet			X	
Spenningsvelgere på primærsiden er innstilt korrekt (høyeste spenningen vis ikke annet er spesifisert)	X			
Trinnvelgern på primærsiden er innstilt korrekt (0 regulering vis ikke annet er spesifisert)	X			
Trafonr og innstilte verdier er dokumentert med bilde.			X	
Høyspenningsanlegg				
Riktig høyspenningsanlegg er montert i riktig kiosk			X	
Tilstrekkelig innfesting av høyspenningsanlegg			X	
Trykkindekatoren står på grønt område			X	
Høyspenningsanleggs jordingspunkt er tilkoblet jord, riktig tverrsnitt			X	
Riktig strømtrafoer er montert iht. trafo størrelse	X			
Albue- / T-kontakt er jordet			X	
Samleskinner er korrekt montert og tildekket.	X			
Merking			X	
Vern er innstilt iht. trafostørrelse	X			

POWER CONNECTION NORDIC

Sluttkontroll

Veiledning for vern innstilling er festet på passende sted (enkle vern)	X			
Instruks ved strøm ulykke er festet på passende sted			X	
Serienr er dokumentert med bilde.			X	
Høyspent målerfelt				
Lasker i målerfelt er demontert for transport			X	
Serienr på strøm og spenningstrafoer er dokumentert med bilde.			X	
Utstyr og komponenter				
Riktige komponenter montert iht. tegning			X	
Rekkeklemmer/koblingsstykker dimensjonert riktig etter innkommende kabel/strl. sikring			X	
Dimensjonert riktig til samleskinne	X			
Endelokk samleskinne	X			
Kabel dimensjonert riktig etter ampere strl.			X	
Effektbrytere/lastbrytere				
Riktig bryter montert iht. tegning	X			
Brytere stilles minimum (ampere),N leder stilles fullt	X			
Riktig klemmer AL/CU, tverrsnitt	X			
Avdekking	X			
Vern effektbryter tilgjengelig gjennom dekking	X			
Kabel/lisse dimensjonert etter ampere strl.	X			
Jording				
Jordskinne/kabel riktig dimensjonert			X	
Forbindelse mellom jordskinner			X	
Riktig strl. jordklemmer/AL jording			X	
Riktig antall jordklemmer			X	
Jordforbindelse chassi overspenningsvern	X			
Jordforbindelse dører			X	
			X	

POWER CONNECTION NORDIC

Sluttkontroll

Måleranlegg (e-verk og instrument)				
Riktig kurs som blir målt	X			
Kun 1 leder gjennom trafo ved e-verk måling	X			
Riktig høyde måler, bunn måler 70-170cm	X			
Riktig tverrsnitt, 2,5mm trafo og 1,5mm spenning	X			
Trafoer montert riktig vei (P1 og P2, K og L)	X			
Koblet S1-blå, S2-fasefarge trafoer	X			
Avstand trafoer, 30mm fas til nabotrafo	X			
Dobbelisolert strømpe	X			
Beskrivelse	Ikke aktuelt	Sluttkontroll	QA kontroll	
Nettanalysator				
Riktig kurs som blir målt	X			
Trafoer montert riktig vei (P1 og P2, K og L)	X			
Skinner				
Dimensjonering	X			
Avstand skinner (20mm fas-fas, 10mm fas-gods minimum)	X			
Festeanordning skinner	X			
Isolasjon/avdekking	X			
Moment				
Moment faseskinne iht. Leverandørs tabell			X	
Moment effektbrytere/lastbrytere	X			
Moment koblingsstykker og fordelingsblokker	X			
Merking				
Komponenter merket			X	
Rekkeklemmer merket			X	
Effektbrytere merket	X			
Moment merker	X			
PCN merke, spenningsmerke			X	
Ordreskilt påsatt			X	
Testskilt påsatt			X	

POWER CONNECTION NORDIC

Sluttkontroll

Automatisk brannslokkesystem				
Lekkasjetest på deteksjonsrør, test alle koblinger med lekkasje tester.	X			
Les av barometret, vent 30min og kontroller at trykket er uendret.	X			
Kontroll at deteksjonsrør er tilstrekkelig festet med P-klemmer og strips, og at det ikke er fare for / beskyttet mot gnaging mot skarpe kanter.	X			
Kontroller at kule ventilen er vrid til ON, og at ventillås er montert og plombert.	X			
Testing				
Isolasjonsmåling				
Megging	X			
Jordkontinuitet				
Motstandsmåling	X			
Spenningstest				
Mål alle avganger			X	
Test styring			X	
Test av meldekontakter			X	
Programmering				
Programmering nettanalysator	X			
Programmering Jordfeilvarsler	X			

Dokumentasjon/Ferdigstillelse

Beskrivelse	Ikke aktuelt	Sluttkontroll	QA kontroll
Bilder med og uten dekking			X
Bilder serienr. / trafonr.			X
Rengjøring			X
Dokumentasjon vedlagt.			X

14/1-25

Dato/signatur sluttkontrollør
Power Connection Nordic AS

Dato/signatur QA
Revisjon A 12.01.2024

RITZ INSTRUMENT TRANSFORMERS GmbH

P r ü f p r o t o k o l l / T e s t R e p o r t

S p a n n u n g s w a n d l e r / V o l t a g e T r a n s f o r m e r

Besteller	Client	Berggard Amundsen & Co. AS
Bestellnummer	Client order No	PMY-5185102

Typ	Type	GBZA 24
Auftr.-Nr.	Order No	20844581.010
Fabr.-Nr.	Serial No	20514475...8
Norm	Standard	IEC 61869-3
Isolierstoffklasse	Class of insulation	E
Frequenz	Frequency	50 Hz
Iso.-Pegel	Ins. Level	24 / 50 / 125 kV
Ku		1×Un

Klemmen / Terminals	Klasse / Class	Leistung / Power	VAth	Übersetzung / Ratio
a1-b	3	400 VA	400 VA	11000 // 230
a2-b	3	400 VA	400 VA	22000 // 230

Bergener Ring 65-67
D-01458 Ottendorf-Okrilla
Tel.: +49 (0) 35205 62-111

Dieses Dokument ist ohne Unterschrift verbindlich.
This document is valid without signature.
26.01.2024

Prüfprotokoll / Test Report

Prüfung der Genauigkeit
Test for accuracy

Fabriknummer Serial No	Klemmen Terminals	k_r	S / VA	$\cos\varphi$	100 % U_r	
					ε / %	$\Delta\varphi$ / min
20514475	a1-b	$\frac{11000}{230}$	400	1	-1,124	-118,16
	a2-b	$\frac{22000}{230}$	400	1	1,036	-35,21

Messdatum / Measuring date: 26.01.2024

Fabriknummer Serial No	Klemmen Terminals	k_r	S / VA	$\cos\varphi$	100 % U_r	
					ε / %	$\Delta\varphi$ / min
20514476	a1-b	$\frac{11000}{230}$	400	1	-1,11	-117,81
	a2-b	$\frac{22000}{230}$	400	1	0,997	-34,33

Messdatum / Measuring date: 26.01.2024

Fabriknummer Serial No	Klemmen Terminals	k_r	S / VA	$\cos\varphi$	100 % U_r	
					ε / %	$\Delta\varphi$ / min
20514477	a1-b	$\frac{11000}{230}$	400	1	-1,099	-118,04
	a2-b	$\frac{22000}{230}$	400	1	1,042	-35,39

Messdatum / Measuring date: 26.01.2024

Fabriknummer Serial No	Klemmen Terminals	k_r	S / VA	$\cos\varphi$	100 % U_r	
					ε / %	$\Delta\varphi$ / min
20514478	a1-b	$\frac{11000}{230}$	400	1	-1,129	-119,31
	a2-b	$\frac{22000}{230}$	400	1	1,02	-35,8

Messdatum / Measuring date: 26.01.2024

Isolationsprüfung
High Voltage Power-Frequency Withstand Test

Fabriknummer / Serial No: 20514475...8

Steh-Wechselspannungsprüfung an den Primäranschlüssen **Power-frequency voltage withstand test on primary terminals**			
Windungsprüfung Induced voltage withstand test	Primär - Erde Primary - Ground	50kV 300 Hz, 20 sec	Erfolgreich Passed
Wicklungsprüfung Separate source withstand test	Primär - Erde Primary - Ground	50kV 50 Hz, 1 min	Erfolgreich Passed
Steh-Wechselspannungsprüfung an den Sekundäranschlüssen **Power-frequency voltage withstand test on secondary terminals**			
Wicklungsprüfung Separate source withstand test	Sekundär - Erde Secondary - Ground	3kV 50 Hz, 1 min	Erfolgreich Passed
Weitere Isolationsprüfungen **Further insulation tests**			
Teilentladungsmessung Partial discharge measurement		28,8kV: ≤ 20pC	Erfolgreich Passed

Prüfprotokoll / Test Report

Überprüfung der Kennzeichnungen und der Polarität
Verification of markings and polarity

Erfolgreich / Passed

ABB AS

Utstedt av	Dokument type
Electrification Products	Rutinetest rapport

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
0000638011-000010	**SafePlus**	**0000110751 , Power Connection Nordic AS**
Serienummer:	Konfigurasjon:	Levert til:
202413908120002	**C C V**	**Power Connection Nordic AS**
	Nominell spenning (Ur):	Kundens ref. Nr.:
	24 kV	**173 , Jan Arne Habostad**

Har gjennomgått rutinetester i henhold til paragraf 8 i ovenfor angitte IEC normer.
Rutinetesten består av:

1 **Spenningsprøving i henhold til IEC 62271-200, paragraf 8.2**
Test spenning:50 kV AC varighet 1 minutt.

2 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 8.3**
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 8.4.**
Motstandsmåling av hovedkrets har blitt utført.

4 **Gasstetthets kontroll av anlegg i henhold til 62271-200, paragraf 8.5**
Bryteranlegget er gasstetthetskontrollert.
Den relative lekkasjeraten for bryteranlegget, Frel, er mindre enn 0.1 % per år av fyletrykket 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 8.6.**
Anlegget har blitt sjekket visuelt mot ordre.

6 **Partiell utladningsmåling i henhold til IEC 62271-200, paragraf 8.101**
Utladinger har blitt målt i henhold til måleprosedyre som beskrevet i tillegg B.
Maksimale målte partielle utladninger er ved 1,1 U <= 50 pC

7 **Mekaniske koblinger er testet i henhold til IEC 62271-200, paragraf 8.102**
10 betjeninger inn og ut har blitt utført på alle brytere.
5 forsøk på å betjene mot mekaniske forriglinger er utført.
5 betjeninger inn og ut med elektriske hjelpeutrustninger har blitt utført ved de mest ugunstige grenseverdier på hjelpesperningen.

Kompaktanlegget har blitt testet og godkjent som beskrevet ovenfor uten anmerkninger

ABB AS
Electrification Products
Skien NO ,2024-03-06

Sander Kvernberg S. K
QA/QC Avdeling (Sign)

ABB Electrification Norway AS
Quality Control
P.O. Box 108, Sentrum
N-3701 Skien - Norway

ABB ELECTRIFICATION NORWAY AS

Prosjekt Data			
Serie Nr.	13900120081	Prosjektnavn	Power Connection Nordic
Prosjekt Nr.	1VDW638011 A0010	Kunde	Power Connection Nordic AS

Inspeksjon		
Dato: 06.03.2024	Navn: Sander Kvernberg	Inspeksjonstyper: [x] Funksjonstest [ ] Overhaling [ ] Årlig Inspeksjon [ ] Andre Inspeksjoner

Switchgear Informasjon						
SafePlus	Felt Type	Innhold	Nominelle Verdier	Nominelle Verdier	Enhets Type	Serie Nr.
CCV	A03 - Vakuum	Vern 1	Sensor 80A	Sensor 22kV	REF615	1VHR91798053

Prøveprotokoller Sensor	Fase	S/N	Amplitude Spenning	Fasevinkel Spenning	Amplitude Strøm	Fasevinkel Strøm
Vern 1	L1	1VLT5421058302	1,0203	-0,0383	1,0028	0,0667
	L2	1VLT5421058301	1,0121	-0,0250	0,9893	0,0683
	L3	1VLT5421058251	1,0218	-0,0233	0,9860	0,0650

Vern Funksjons Innstillinger	Ingen	Basis	Kundespesifiserte	Kommentarer
Innstillinger				Innstillinger i henhold til releplan

Vern Funksjon	Innstillinger	Operasjons Tid	Fase	Vern 1	Vern 2	Vern 3	Godkjent	Ikke i Bruk	Kommentarer
DPHLPDOC1	1,2xIn = 96A	1000ms	L1,L2,L3	1082ms			x		Trip tid testet 3 ganger
DPHLPDOC2								x	
DPHHPDOC1								x	
PHIPTOC1	6xIn = 480A	20ms	L1,L2,L3	91ms			x		Trip tid testet 3 ganger på 1,5xIn=120A
PHLPTOC1								x	
EFHPTOC1								x	
DEFHPDEF1								x	
DEFLPDEF1								x	

Fase	Nominell Verdi	Testet m/	Avlesning Vern 1	Avlesning Vern 2	Avlesning Vern 3	Godkjent	Ikke i Bruk	Kommentarer
L1							x	
L2							x	
L3							x	
L12	22 000 V	5000V	4979V			x		
L23	22 000 V	5000V	4983V			x		
L31	22 000 V	5000V	4979V			x		
							x	
							x	

Tilleggsfunksjoner	Spenningsdeling test	Brudd Skudd test	GIK reset				Godkjent	Ikke i Bruk	
GIK								x	

Tilleggsfunksjoner	Til RTU eller Rio	Signal Test	kommando te..				Godkjent	Ikke i Bruk	
Kommunikasjon	X	X	x				X		

Spesielle Merker	Enhet						Godkjent	Ikke i Bruk	
LED label	REF 615						x		

Dato / Signatur / Bedrift sign : S. K

06.03.24

ABB

ABB Electrification Norway AS
Quality Control
P.O. Box 108, Sentrum
N-3701 Skien - Norway

ABB 1390812000 2
A03

ROUTINE TEST REPORT

Product type:	REF615
Date tested:	09.01.2024
Serial No:	1VHR91798054
Order No:	HBFLDAAHNGC4BHA21G
FW Version:	5.1.23
Rated frequency:	50/60 Hz

This is to certify that the product above has been tested in accordance with the applicable procedures of ABB Oy during production.

The tests performed on the product were:

1. Insulation tests including
   - Dielectric test for binary/analog input module and power supply module at 2,2kV, 50 Hz, 1sec (IEC 60255-5 and IEC 60255-27) — PASSED
   - Dielectric test for communication module at 0,55kV, 50 Hz, 1sec (IEC 60255-5 and IEC 60255-27) — PASSED
2. Final product testing including the relevant tests depending on the hardware composition:
   - Visual inspection — PASSED
   - Current consumption test — PASSED
   - Display/LED/Push buttons — PASSED
   - Communication interfaces — PASSED
   - Binary inputs and binary outputs — PASSED
   - Analog inputs — PASSED
3. Product test run
   - Minimum 12h test run in heat cabinet in 55 degree Celsius — PASSED

At the time of shipment the product was in conformance to the specified requirements of the manufacturer.

Product in details

Unit type	Serial No	Slot	Type
PSM0003	1YM196894327	X100	2RCA025058A0001P
COM0031	1YF194102132	X000	2RCA023019A0001R
SIM0002	1YM196940578	X130	2RCA023106A0001F
BIO0005	1YM196881779	X110	2RCA025501A0001F
DIS0032	1YM196919254	XDIS	2RCA055916A0001C
BPL0001	1VH381013132	XBPL	2RCA006836A0001E
CPU0007	1YM196888414	XCPU	2RCA031146A0001F

Inspected by: Anne Haldin

Anne Haldin

ABB Oy

ABB Oy

Postal Address
ABB Oy
P.O.Box 699
FI-65101 Vaasa, Finland

Telephone
+358 10 224 000
Fax
+358 10 224 1094

A03 L1

Our reference: 963473
Your reference: 4561193253

ROUTINE TESTS REPORT / STÜCKPRÜFPROTOKOLL

COMBI SENSOR / KOMBISENSOR

Type/Typ: KEVCY 24 RE1
Upn: 22/√3 kV
Ipr: 80 A — Usr: 0.150 V at 50 Hz / Usr: 0.180 V at 60 Hz
Ith/Idyn: 25(3s)/63 kA
Cable length: 2.20 m

Standard: IEC 60044-7, IEC 60044-8
Kn: 10000/1 — ku: 1.9/8h — cl.: 0.5/3P
fr.: 50/60 Hz — Kpcr: 7.875 — cl.: 0.5/5P100
Icth: 630 A — Insulation level / Isolationspegel: 24/50/125 kV
S/N: 1VLT5423014540

ROUTINE TESTS/PRÜFUNGEN

1. Verification of terminal markings, dimensions and visual examination
   Prüfung der Anschlussbezeichnungen, Maß- und Sichtprüfung
2. Voltage test on secondary / Wicklungsprüfungen der Sekundärseite (0.5kV AC, 1min)
3. Measurement of the capacitive indicator / Prüfung der kapazitiven Teiler

C1	10 pF	C2	27 pF

4. Voltage test on primary / Wicklungsprüfungen der Primärseite - 50 kV/1 min
5. Partial discharge measurement / Teilentladungsprüfung

28.8 kV	<9 pC	16.6 kV	<1 pC

6. Test for accuracy Voltage sensor at / Richtigkeitsprüfung Spannungssensor für - 22/√3 kV

Upn (%)	5	80	100	190
εu (%)	0.10	0.00	0.00	-0.01
φu (min)	-0.7	0.1	0.0	-0.2

Correction factors / Korrekturfaktoren (Cfs)	Voltage amplitude / Spannung Amplitude (aU)	1.0203
	Voltage Phase error / Spannung Phase Fehler (pU)	-0.0383°
Cf aU' with optional cable extension/mit Optional Kabel-Verlängerung		1.0222 / 1.0245 / 1.0320

7. Test for accuracy Current sensor / Richtigkeitsprüfung Stromsensor 26.6 °C

Ipr (%)	5	20	100	Kpcr x 100
ε (%)	-0.03	-0.02	0.00	0.03
φ (min)	0.2	0.2	0.0	-0.1

Correction factors / Korrekturfaktoren (Cfs)	Current amplitude / Strom Amplitude (al)	1.0028
	Current Phase error / Strom Phase Fehler (pl)	+0.0667°
Cf al' with cable extension/mit Kabel-Verlängerung CE1.15 / CE8.00 / CE3.00		1.0028 / 1.0027 / 1.0025

Conclusion: Satisfactory/Erfolgreich
Test report accepted / Genehmigt:

ABB s.r.o.
PPMV Brno
619 00 Brno, Vídeňská 117
Řízení jakosti

Brno, the: 19.10.2023 — Ing. Radek Bártek — signature

Headquarters: **ABB s.r.o.** Vyskočilova 1561/4a 140 00 Prague 4
Mail Address: **ABB s.r.o.** Videnska 117 619 00 Brno
Phone: + 420 5 4715 2609
Fax: + 420 5 4715 2626

A03 L2

Our reference: 963473
Your reference: 4561193253

ROUTINE TESTS REPORT / STÜCKPRÜFPROTOKOLL

COMBI SENSOR / KOMBISENSOR

Type/Typ: KEVCY 24 RE1
Upn: 22/√3 kV
Ipr: 80 A — Usr: 0.150 V at 50 Hz / Usr: 0.180 V at 60 Hz
Ith/Idyn: 25(3s)/63 kA
Cable length: 2.20 m

Standard: IEC 60044-7, IEC 60044-8
Kn: 10000/1 — ku: 1.9/8h — cl.: 0.5/3P
fr.: 50/60 Hz — Kpcr: 7.875 — cl.: 0.5/5P100
Icth: 630 A — Insulation level / Isolationspegel: 24/50/125 kV
S/N: 1VLT5423014530

ROUTINE TESTS/PRÜFUNGEN

1. Verification of terminal markings, dimensions and visual examination
   Prüfung der Anschlussbezeichnungen, Maß- und Sichtprüfung
2. Voltage test on secondary / Wicklungsprüfungen der Sekundärseite (0.5kV AC, 1min)
3. Measurement of the capacitive indicator / Prüfung der kapazitiven Teiler

C1	10 pF	C2	24 pF

4. Voltage test on primary / Wicklungsprüfungen der Primärseite - 50 kV/1 min
5. Partial discharge measurement / Teilentladungsprüfung

28.8 kV	<1 pC	16.6 kV	<1 pC

6. Test for accuracy Voltage sensor at / Richtigkeitsprüfung Spannungssensor für - 22/√3 kV

Upn (%)	5	80	100	190
εu (%)	0.09	0.01	0.00	-0.01
φu (min)	-0.8	0.1	0.0	-0.2

Correction factors / Korrekturfaktoren (Cfs)	Voltage amplitude / Spannung Amplitude (aU)	1.0121
	Voltage Phase error / Spannung Phase Fehler (pU)	-0.0250°
Cf aU' with optional cable extension/mit Optional Kabel-Verlängerung		1.0140 / 1.0163 / 1.0236

7. Test for accuracy Current sensor / Richtigkeitsprüfung Stromsensor 26.6 °C

Ipr (%)	5	20	100	Kpcr x 100
ε (%)	-0.05	-0.03	0.00	0.03
φ (min)	0.4	0.3	0.0	-0.1

Correction factors / Korrekturfaktoren (Cfs)	Current amplitude / Strom Amplitude (al)	0.9893
	Current Phase error / Strom Phase Fehler (pl)	+0.0683°
Cf al' with cable extension/mit Kabel-Verlängerung CE1.15 / CE8.00 / CE3.00		0.9893 / 0.9892 / 0.9890

Conclusion: Satisfactory/Erfolgreich
Test report accepted / Genehmigt

ABB s.r.o.
PPMV Brno
619 00 Brno, Videňská 117
Řízení jakosti

Brno, the: 19.10.2023

Ing. Radek Bártek

signature

Headquarters: **ABB s.r.o.** Vyskocilova 1561/4a 140 00 Prague 4
Mail Address: **ABB s.r.o.** Videňská 117 619 00 Brno
Phone: + 420 5 4715 2609
Fax: + 420 5 4715 2626

A03 L3

Our reference: 963473
Your reference: 4561193253

ROUTINE TESTS REPORT / STÜCKPRÜFPROTOKOLL

COMBI SENSOR / KOMBISENSOR

Type/Typ: KEVCY 24 RE1
Upn: 22/√3 kV
Ipr: 60 A — Usr: 0.150 V at 50 Hz; Usr: 0.180 V at 60 Hz
Ith/Idyn: 25(3s)/63 kA
Cable length: 2.20 m

Standard: IEC 60044-7, IEC 60044-8
Kn: 10000/1 — ku: 1.9/8h — cl.: 0.5/3P
fr.: 50/60 Hz — Kpcr: 7.875 — cl.: 0.5/5P100
Icth: 630 A — Insulation level / Isolationspegel: 24/50/125 kV
S/N: 1VLT5423014531

ROUTINE TESTS/PRÜFUNGEN

1. Verification of terminal markings, dimensions and visual examination
   Prüfung der Anschlussbezeichnungen, Maß- und Sichtprüfung
2. Voltage test on secondary / Wicklungsprüfungen der Sekundärseite (0.5kV AC, 1min)
3. Measurement of the capacitive indicator / Prüfung der kapazitiven Teiler

C1	10 pF	C2	23 pF

4. Voltage test on primary / Wicklungsprüfungen der Primärseite - 50 kV/1 min
5. Partial discharge measurement / Teilentladungsprüfung

28.8 kV	<4 pC	16.6 kV	<1 pC

6. Test for accuracy Voltage sensor at / Richtigkeitsprüfung Spannungssensor für - 22/√3 kV

Upn (%)	5	80	100	190
εu (%)	0.10	0.01	0.00	0.00
φu (min)	-0.7	0.1	0.0	-0.2

Correction factors / Korrekturfaktoren (Cfs)		
	Voltage amplitude / Spannung Amplitude (aU)	1.0218
	Voltage Phase error / Spannung Phase Fehler (pU)	-0.0233°
Cf aU' with optional cable extension/mit Optional Kabel-Verlängerung		1.0236 / 1.0260 / 1.0335

7. Test for accuracy Current sensor / Richtigkeitsprüfung Stromsensor 26.6 °C

Ipr (%)	5	20	100	Kpcr x 100
ε (%)	-0.02	-0.01	0.00	0.05
φ (min)	0.6	0.2	0.0	-0.3

Correction factors / Korrekturfaktoren (Cfs)		
	Current amplitude / Strom Amplitude (aI)	0.9860
	Current Phase error / Strom Phase Fehler (pI)	+0.0650°
Cf aI' with cable extension/mit Kabel-Verlängerung CE1.15 / CE8.00 / CE3.00		0.9860 / 0.9859 / 0.9857

Conclusion: Satisfactory/Erfolgreich
Test report accepted / Genehmigt:

ABB s.r.o.
PPMV Brno
619 00 Brno, Videňská 117
Řízení jakosti

Brno, the: 19.10.2023

Ing. Radek Bártek

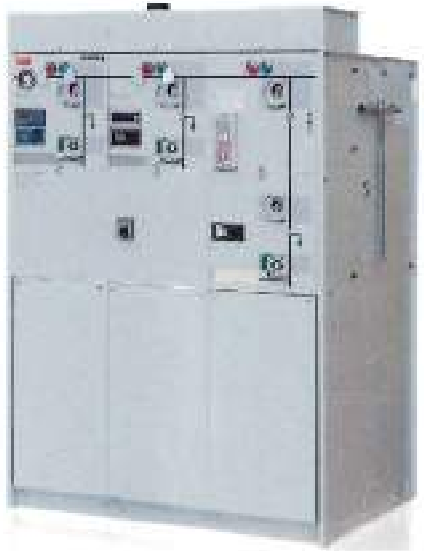
signature

Headquarters: **ABB s.r.o.** Vyskocilova 1561/4a 140 00 Prague 4
Mail Address: **ABB s.r.o.** Videnska 117 619 00 Brno
Phone: + 420 5 4715 2609
Fax: + 420 5 4715 2626

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

KUNDE	Power Connection Nordic AS
KUNDE REF	173
SALGSORDRE	638011
POSISJON NUMMER	0010

TYPE	SafePlus C C V_-M-
NOMINELLE VERDIER	24kV 630A 16kA BIL 125
FREKVENS	50Hz
MERKESTRØM SAMLESKINNER	630A
REVISJON	
UTGITT FOR GODKJENNING	10.01.2024
GODKJENT AV KUNDE	18.01.2024



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	CJ
Sjekket	GL
Godkjent	OWS
Dato	24.01.2024
Anleggsnavn	SafePlus C C V_-M-
Arbeidsordre id.	173
Kunde	Power Connection Nordic AS
Sluttkunde	Power Connection Nordic AS
Ansv. (Avdeling)	ABB AS ELDS Skien
Tittel	KRETSSKJEMA FORSIDE
Dokumentnr.	1VDW638011 A0010
Språk	NO
Side	1
Neste side	2

Innholdsfortegnelse

A4_ABB_SIDEN_TABLE_OF_CONTENTS_2.2

Laget	CJ
Kontr.	GI
Godkjent	GMS
Dato	24.01.2024
Kunde	Power Connection Norge AS
Sluttkunde	Power Connection Norge AS
	ABB AS ELDS Skien
Tittel	KNEI SKAGERAK / INNHOLDSFORTEGNELSE
Dokumentnr.	1VNWE36011 A0010
	Sideantall 173

Innholdsfortegnelse

FS_ABB_SKEM_TABLE_OF_CONTENTS_2.2

Laget	CJ	
Sjekket	GL	
Godkjent	OAS	
Dato	24.01.2024	

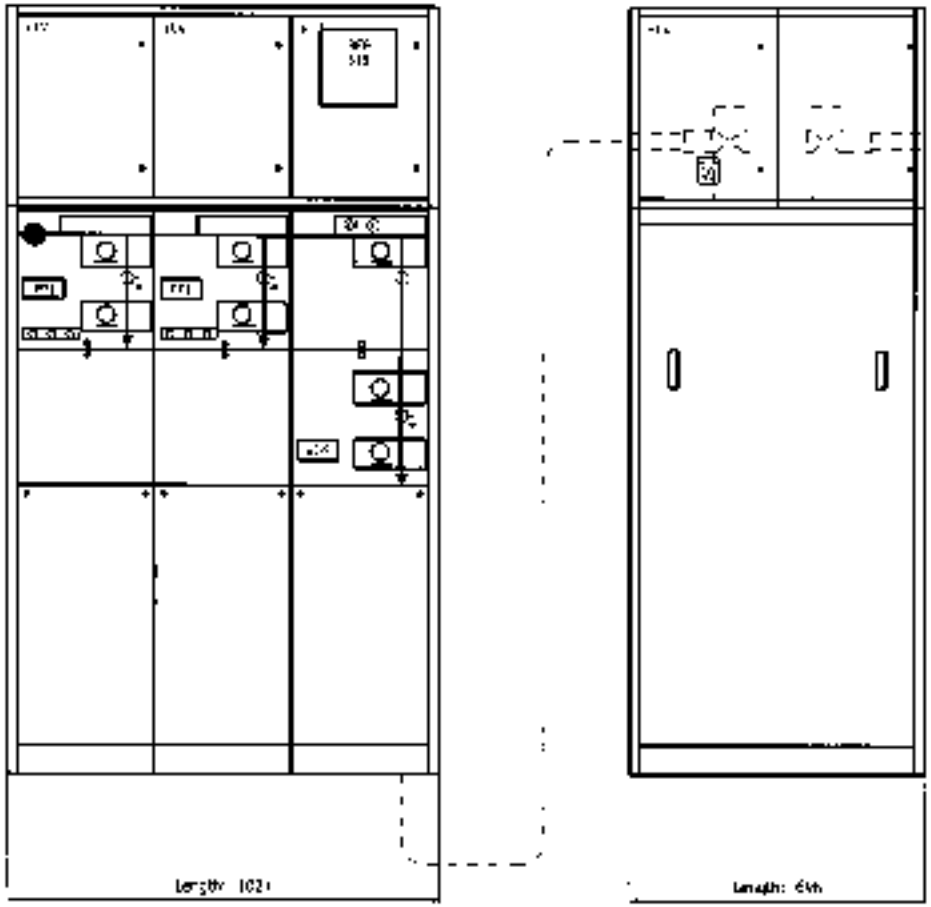
Power Conversion Norway AS

Power Conversion Norway AS

ABB

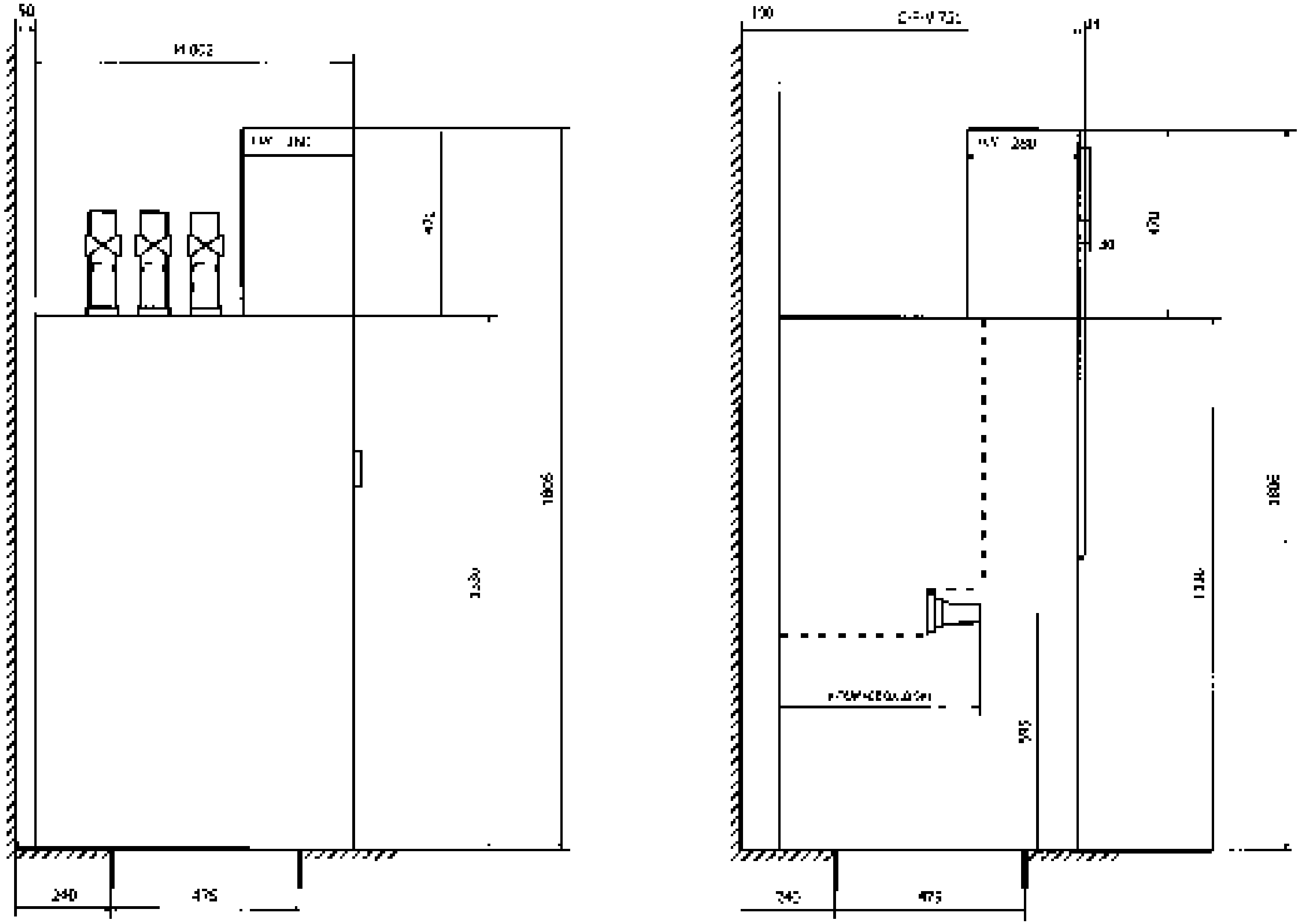
KRETSSKJEMA

INNHOLDSFORTEGNELSE

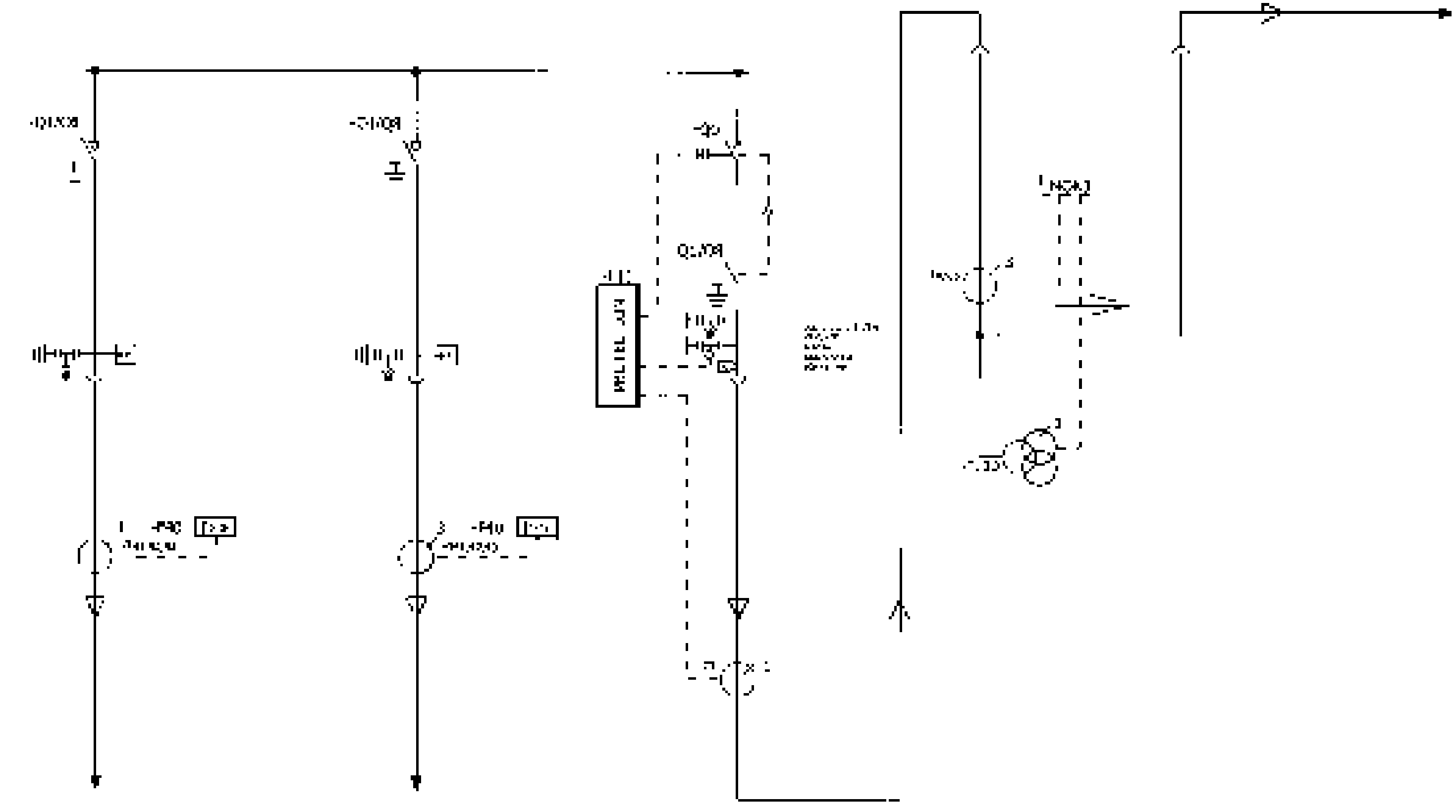


Felt	A01	A02	A03
Feltnavn	C		V
Tegningsnummer			

A04
M



Power Connection Nordic AS	
Power Connection Nordic AS	
ABB	
SIDE ARRANGEMENT	
DWS	24.11.2024



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Rele			REF615	
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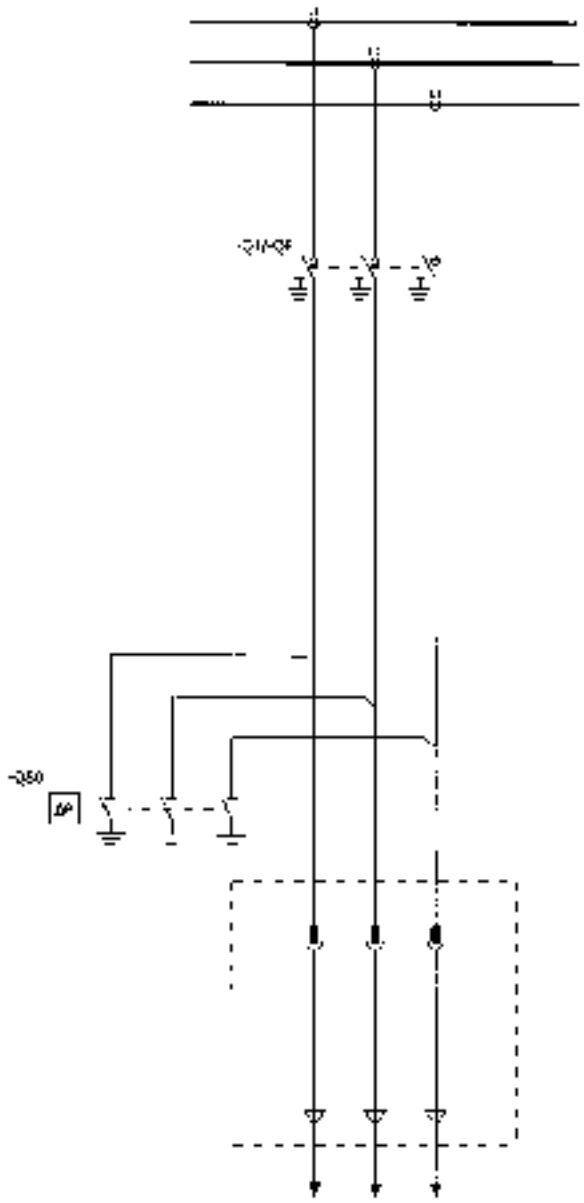
[illegible]	-	-	-	
[illegible]	[illegible]	[illegible]	-	
[illegible]	-	-	[illegible]	
[illegible]	-	-		[illegible]
[illegible]	-			[illegible]
Tegningsnummer	-	[illegible]		[illegible]

[illegible]	Power Connection Nordic AS	[illegible]	[illegible]
[illegible]	Power Connection Nordic AS	[illegible]	[illegible]
ABB	ABB AS [illegible]	ENLINJESKJEMA	[illegible]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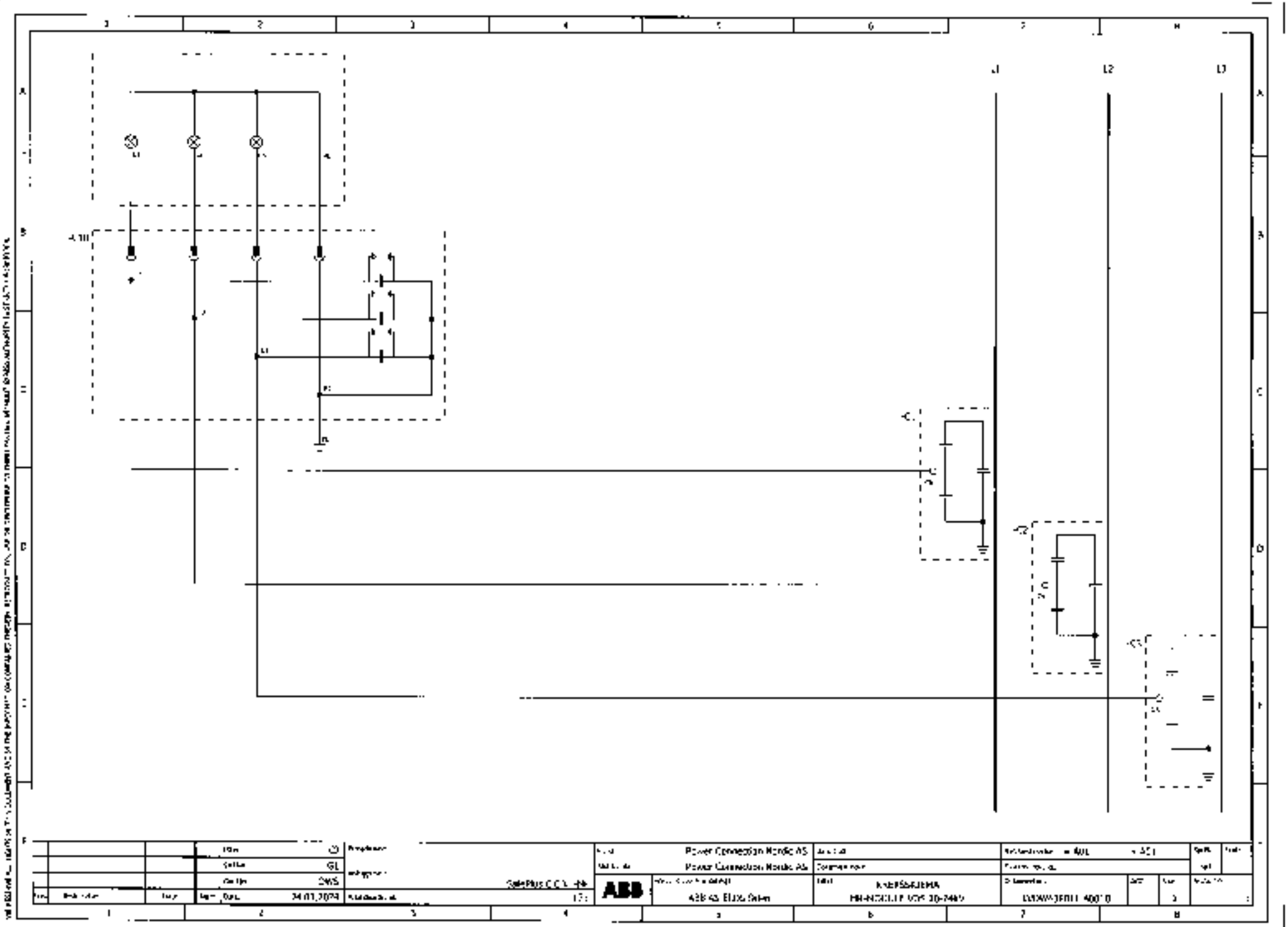
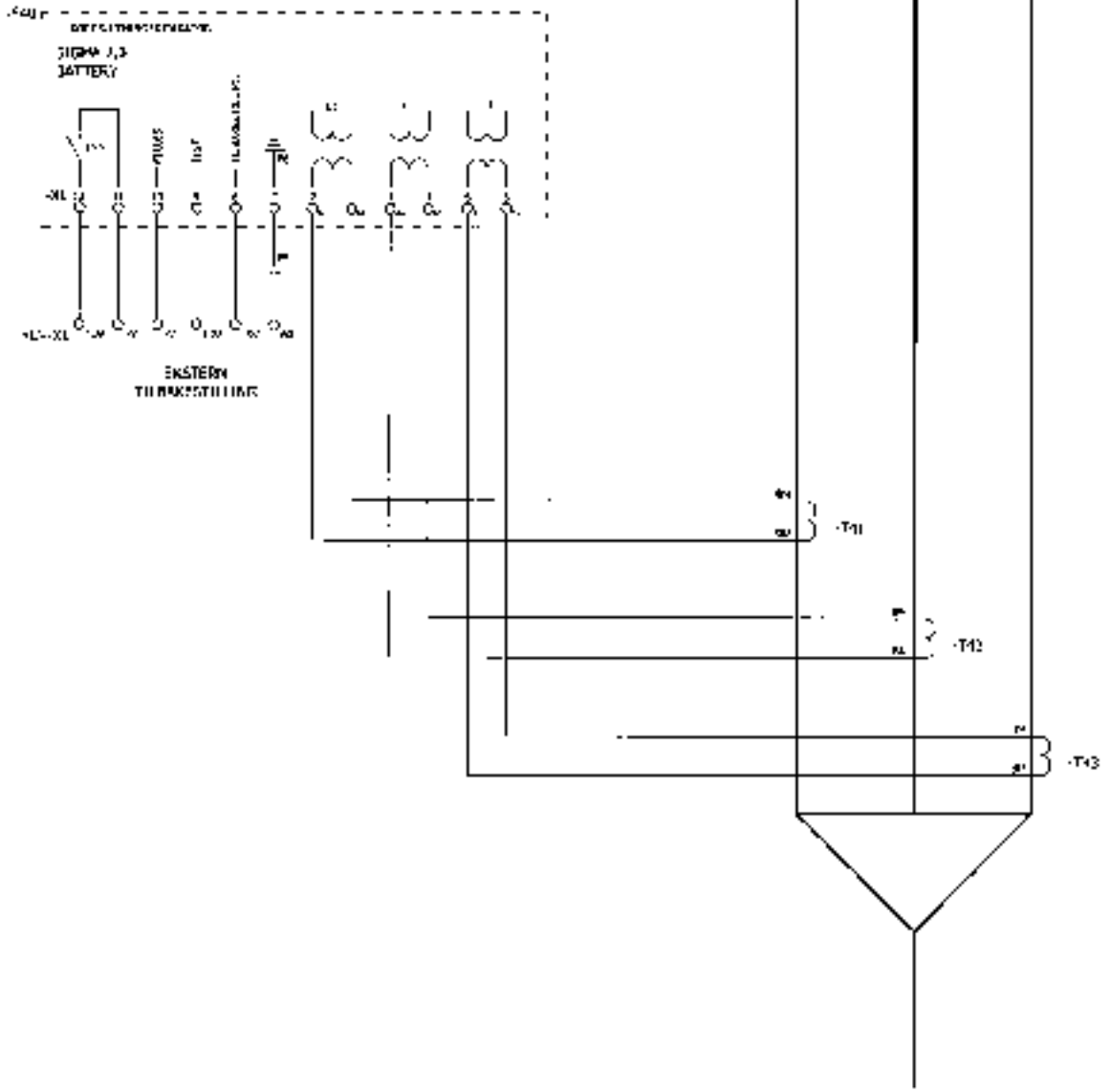
-Q50


L1
L2
L3


SIGMA 2,0
BATTERY
EKSTERN
-T11
-T12
-T13

Apparatliste

=A01 +A01

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pos
-Q1	NHP 2019998R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/2.6.C	ABB	
-Q2	NHP 2019998R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/2.7.D	ABB	
-Q3	NHP 2019998R0001		GJENNOMFØRING MED KAP. SPG IND 400 BOLT INTERFACE C	/2.8.E	ABB	
-Q10	NHP 2017[illegible]		SPENNINGSINDIKATOR [illegible] [illegible]	/2.1.B	KRAFTA	
-P40	3VAA[illegible]P0001	KORTSLUTNINGSINDIKATOR	KORTSLUTNINGSINDIKATOR SIGMA 2.0 ART NO: 37-[illegible]	/3.4.A	HORSTMANN	
-Q1/-Q5	NHP 1[illegible]R0001		LASTSKILLEBRYTER/JORDSLUTTER OFE 12/24	/2.3.B	ABB	
-Q1/-Q5	NHP 1[illegible]A0001		SWITCH MECHANISM [illegible] EARTHING SWITCH [illegible]	/2.3.B	ABB	
-Q40	NHP 2015839R0001		LYSBUEDEMPER 2 MODULE 12/24kV	/2.1.C	ABB	
-T41	3VAA[illegible]P0001		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. [illegible]	/3.7.A	HORSTMANN	
-T42	3VAA[illegible]P0001		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. [illegible]	/3.8.D	HORSTMANN	
-T43	3VAA[illegible]P0001		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. [illegible]	/3.8.D	HORSTMANN	

[illegible] CJ	Power Connection Nordic AS	KRETSSKJEMA	A01 +A01
[illegible] GL	Power Connection Nordic AS	APPARATLISTE	[illegible]
[illegible] DWS	ABB AS EPDS Skien	[illegible]	1
24.01.2024	ABB		

Apparatliste

=A01 +LV

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pos
-X1	[illegible]	A	VERKD 2,5 REKKEKLEMME 2,5mm	+A01 [illegible]	PHOENIX	

REKKEKLEMMELISTE

=A01+LV -X1

APPARAT NR	APPARAT BETEGNELSE	POTENSIAL/FARGE	LEDNINGS-LASK	TAG	POTENSIAL/FARGE	APPARAT BETEGNELSE	APPARAT NR	SIDE	KLEMMETYPE
					77	+A01-F40:41	10	+A01/3.4:C	MBKKB 2,5
					78	+A01-F40:41	11	+A01/3.3:7	MBKKB 2,5
					80			+A01/3.5:2	MBKKB 2,5
					107	+A01-F10:X1	8	+A01/3.5:C	MBKKB 2,5
					108	+A01-F10:X1	12	+A01/3.4:C	MBKKB 2,5
					110	+A01-F40:51	9	+A01/3.5:C	MBKKB 2,5

ABB

Power Connection Nordic AS

ABB AS [illegible]

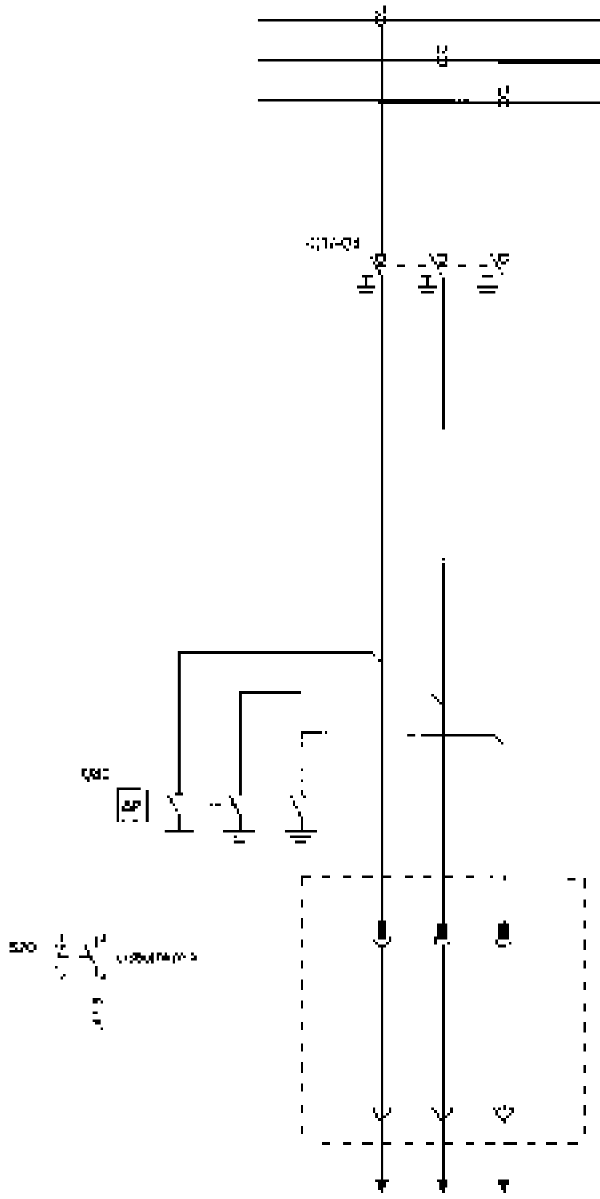
KRETSSKJEMA

REKKEKLEMMELISTE

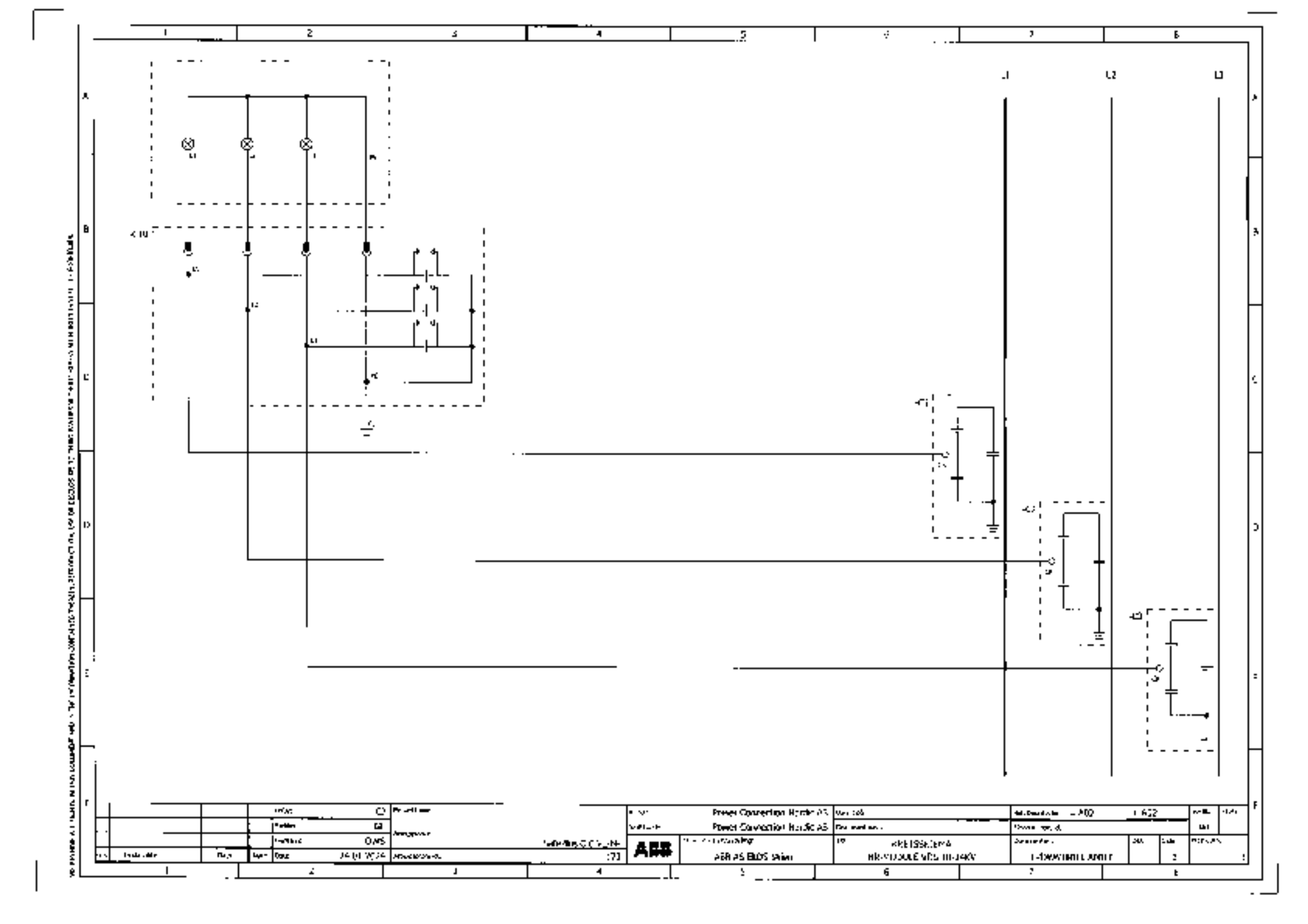
OWS

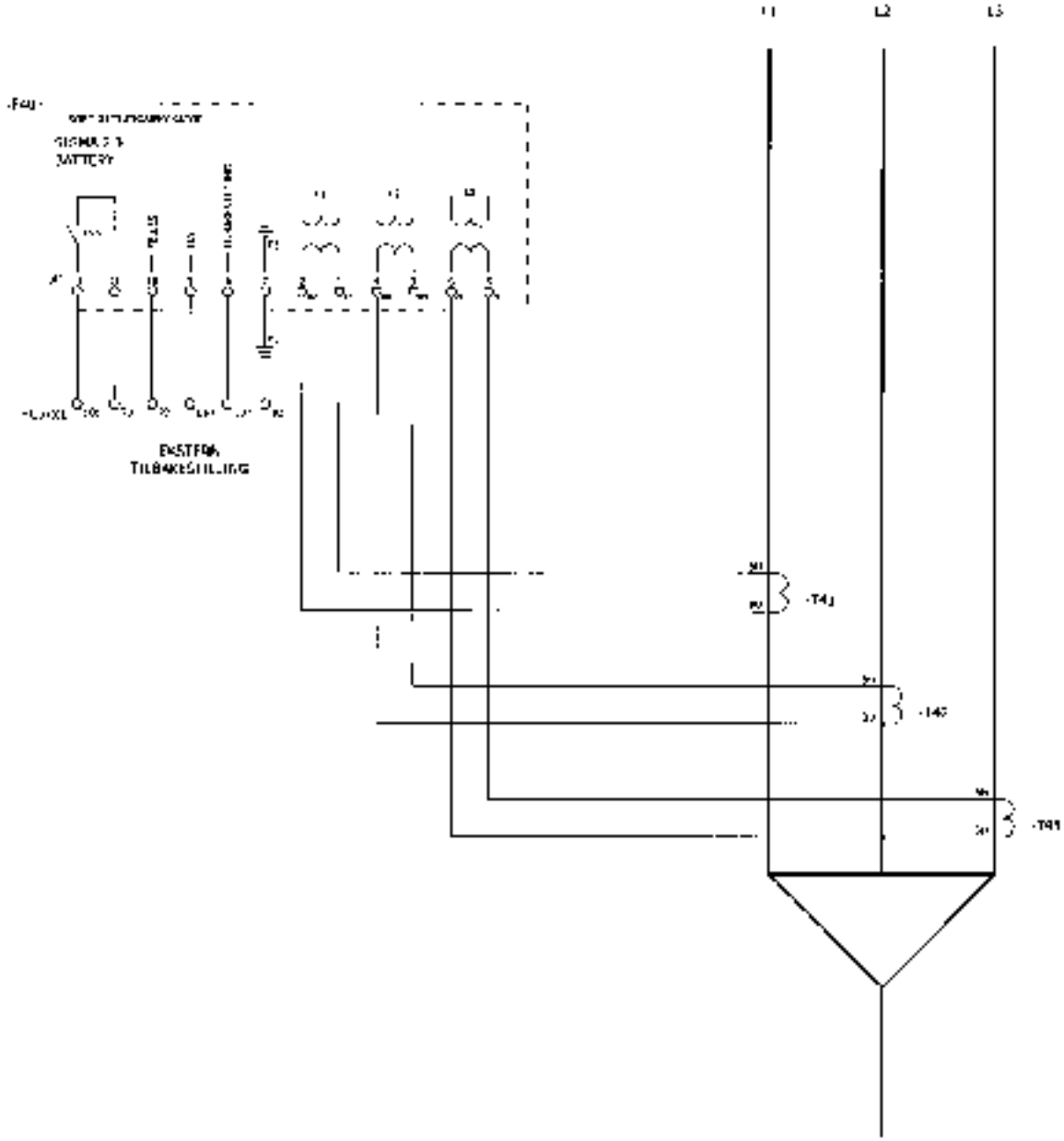
GL

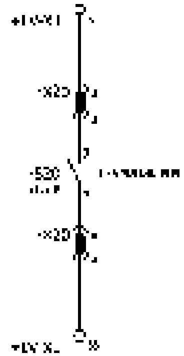
CJ



Power Connection Nordic AS	
Power Connection Nordic AS	
ABB	KRETSSKJEMA OVERSIKT C
1	




L1
L2
L3
-T41
-T42
-T43
EKSTERN
TILBAKESTILLING



Power Connection Nordic AS

21.01.2024

ABB AS ELDS

BRYTERELEMENT

Apparatliste

=A02 +A02

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pre
-Q1	NHP 2013...		GJENNOMFØRING MED KAP. SPG IND. 400 SOLT INTERFACE C	/2.6.C	ABB	
-Q2	NHP 201399R0001		GJENNOMFØRING MED KAP. SPG IND. 400 SOLT INTERFACE C	/2.7.C	ABB	
-Q3	NHP 2015...		GJENNOMFØRING MED KAP. SPG IND. 400 SOLT INTERFACE C	/2.8.F	ABB	
-F10	NHP 201701R0014		SPENNINGSINDIKATOR HR-MODUL LD-24kV C/F-CUBICLE	/2.1.E	NAKETA	
-F40	1VWA019775P0001	KORTSLUTNINGSINDIKATOR	KORTSLUTNINGSINDIKATOR SIGMA 2.0 ART.NO: 17-1111-[?]	/3.4.A	HORSTMANN	
-Q1-Q8	NHP 102...		LASTSKILLEBRYTER/JORDSLUTTER CFE 12/24	/1.2.B	ABB	
-Q1/-Q8	NHP 1013073000...		SWITCH MECHANISM SPRF EARTHING SWITCH ES	/1.1.B	ABB	
-Q80	NHP 20...		LYSBUEDREPER 2 MODULE 12/24kV	/1.1.D	ABB	
-S80	NEN 0...	LYSBUEDREPER	BRYTEREUDMENT [illegible]	/1.1.E	SHANGHAI [illegible]	
-T41	1WAA0...		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. 949-6025-30L	/3.7.C	HORSTMANN	
-T42	3WAA0...		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. 949-6025-30L	/3.8.D	HORSTMANN	
-T43	1WAA098725P0001		BUSHING TYPE CURRENT SENSOR FOR SHORT-CIRCUIT INDICATORS Order No. 949-6025-30L	/3.8.D	HORSTMANN	
-X20	VHC0138...		CONNECTOR WITH 2 CONTACT PINS MAL. 6.3mm FASTON	/3.6.B	FACT	

Power Connection Nordic AS

Power Connection Nordic AS

ABB

ABB AS, ELDS ...

KRETSSKJEMA

APPARATLISTE

1VDW...

Apparatliste

=A02 +LV

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Ant
-RJ	[illegible]	A	MERKE 4,5 REKKEKLEMME 2,5mm²	+A02-3.7:C;+A02/3.5:C +A02-4.5:A;+A02/4.6.1	PHOENIX	

Tegnet	GL	Power Connection Norge AS
Sjekket	GL	Power Connection Norge AS
Godkjent	DWS	ABB AS ELDS Skien
Rev. dato	21.11.2024	

ABB

KRETSSKJEMA
APPARATLISTE

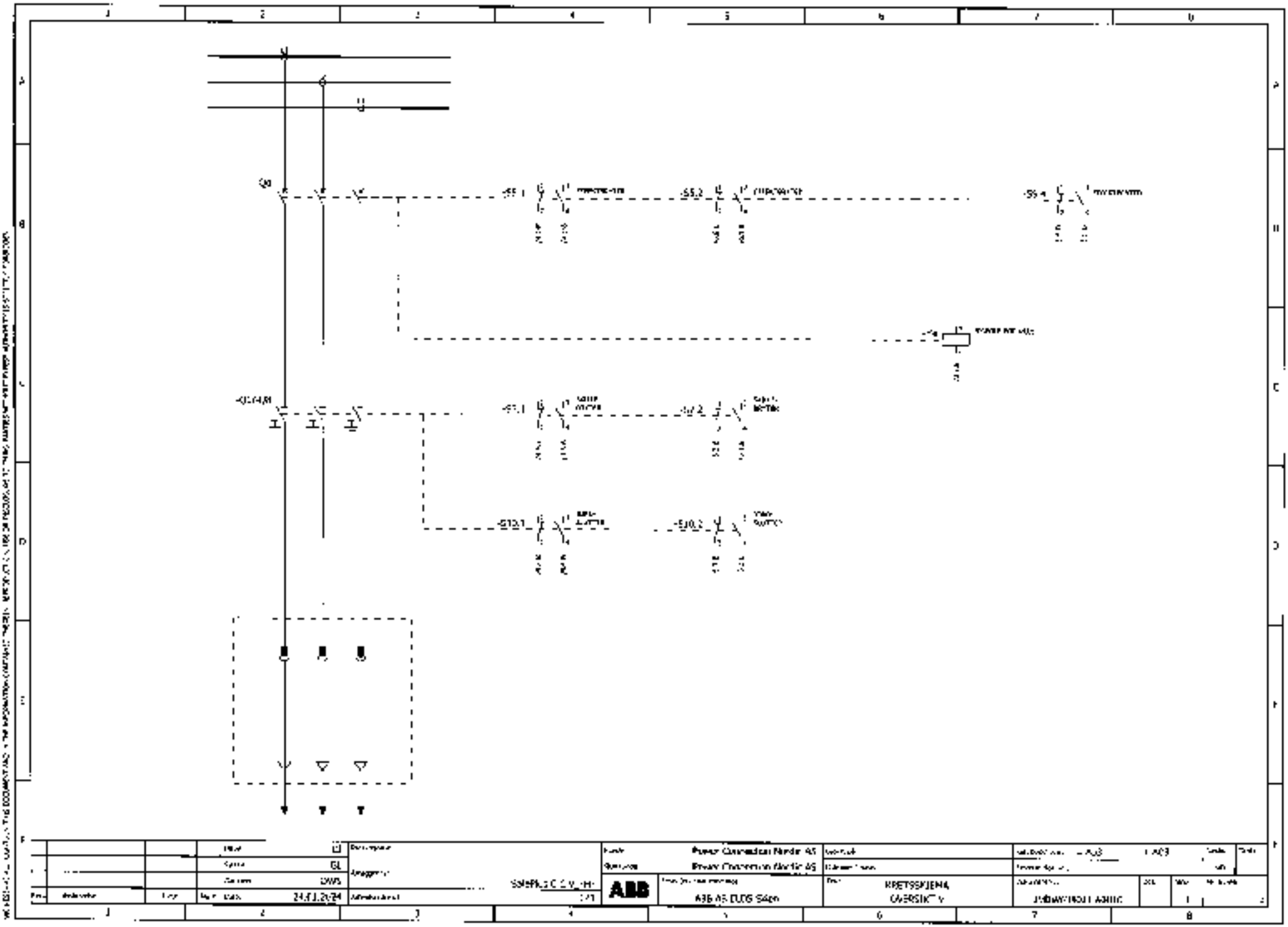
=A02 +LV

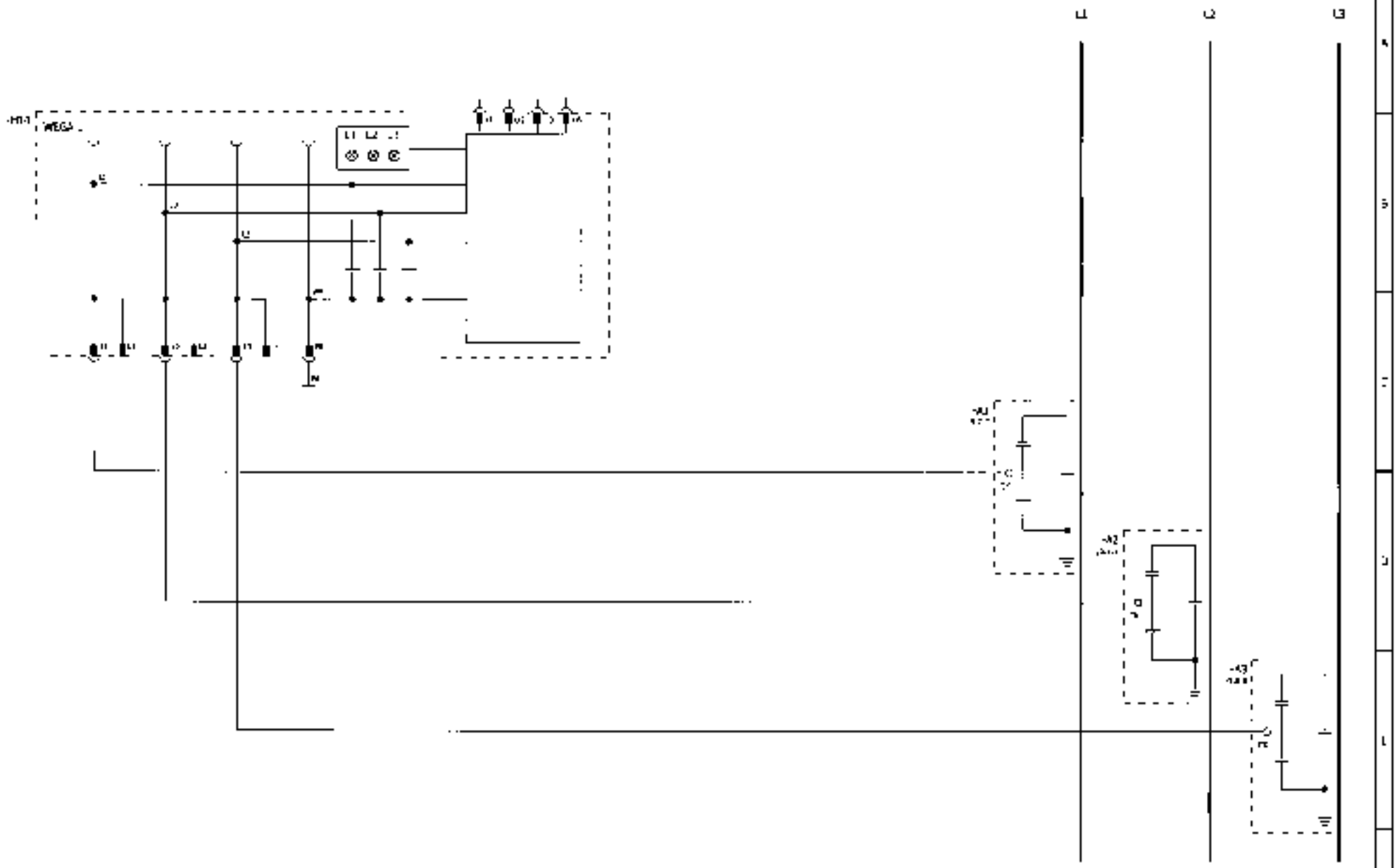
REKKEKLEMMELISTE

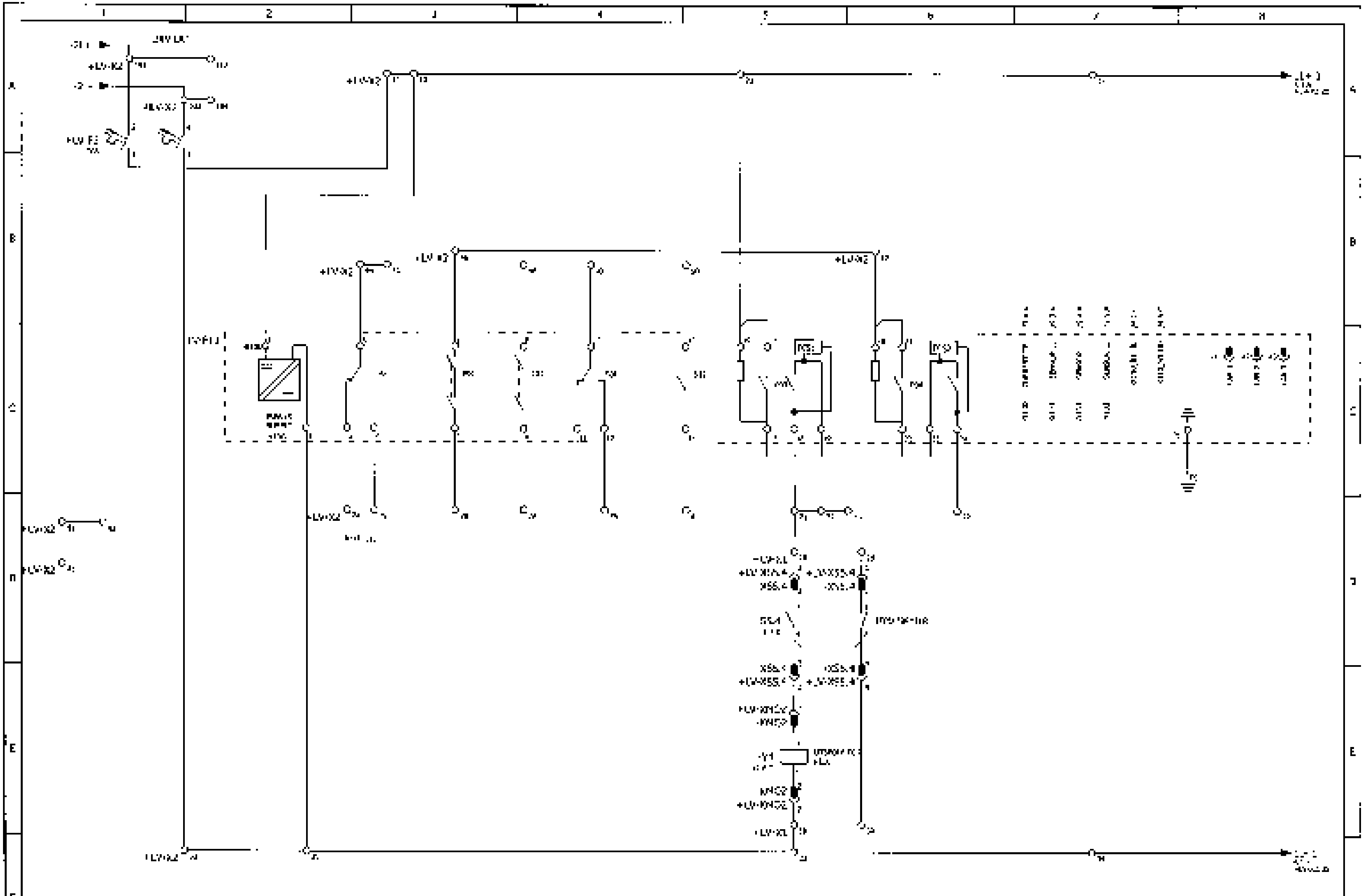
=A02+LV -X1

APPARAT TILKOBLING	POTENSIAL/ FARGE	LEDNINGS- LASK	LASK	Klemme	POTENSIAL/ FARGE	APPARAT BETEGNELSE	APPARAT NR	SIDE	KLEMMETYPE
				8		+A02-X20	3	+A02/14.6.A	MBKKB 2,5
				33		+A02-X20	4	+A02/14.6.C	MBKKB 2,5
				77		+A02-F40-X1	10	+A02/14.4.C	MBKKB 2,5
				78		+A02-F40-X1	11	+A02/14.4.F	MBKKB 2,5
				80				+A02/13.5.C	MBKKB 2,5
				107		+A02-F40-X1	8	+A02/13.5.C	MBKKB 2,5
				108		+A02-F40-X1	12	+A02/13.4.C	MBKKB 2,5
				110		+A02-F40-X1	9	+A02/13.4.C	MBKKB 2,5

Kunde	Power Connection Nordic AS
Sluttkunde	Power Connection Nordic AS
Utført av	ABB AS ELDS Skien
Tittel	KRETSSKJEMA REKKEKLEMMELISTE
Funksjonsnavn	=A02
Lokasjon	+LV
Dato	24.01.2024
Side	52

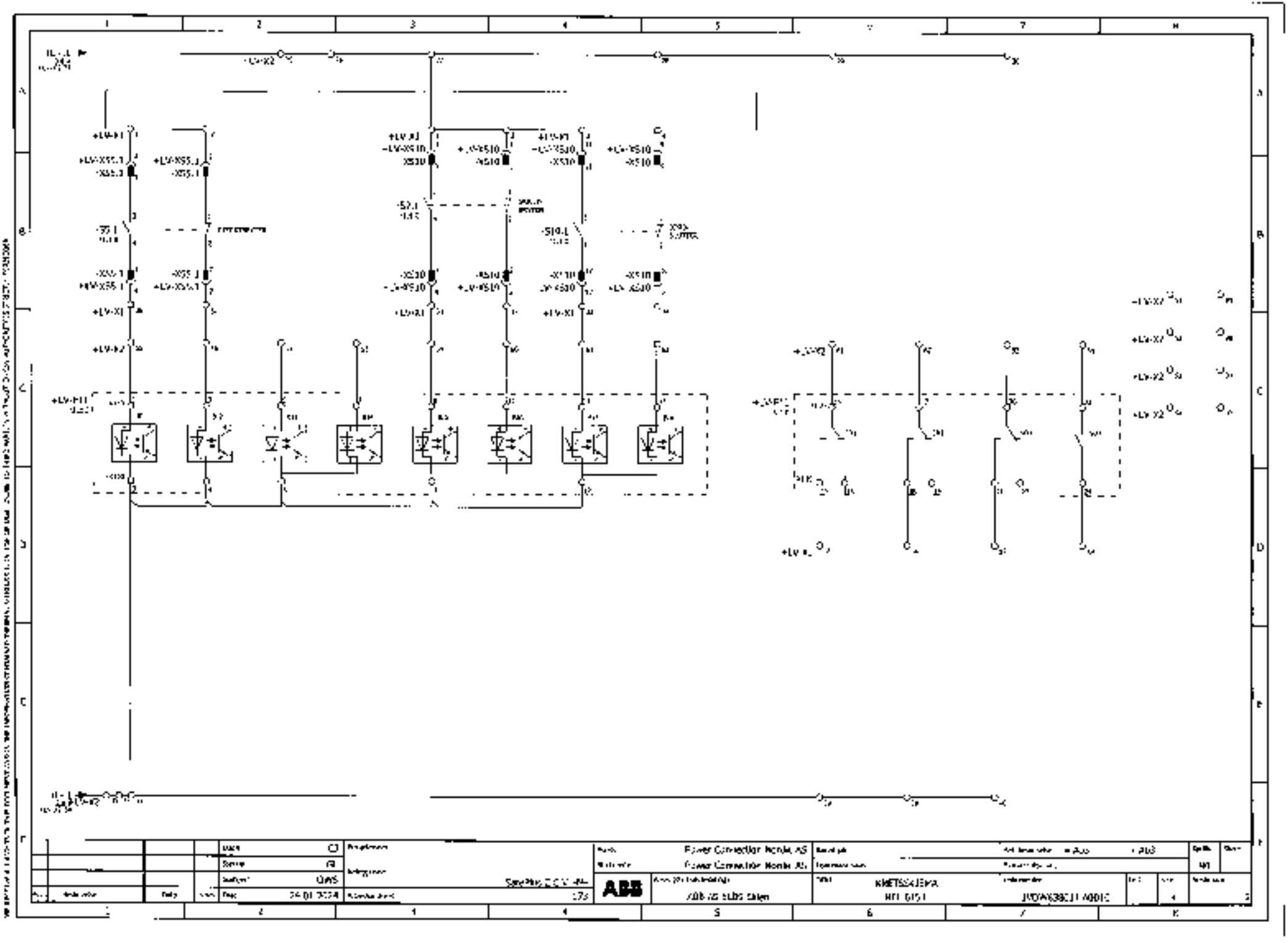


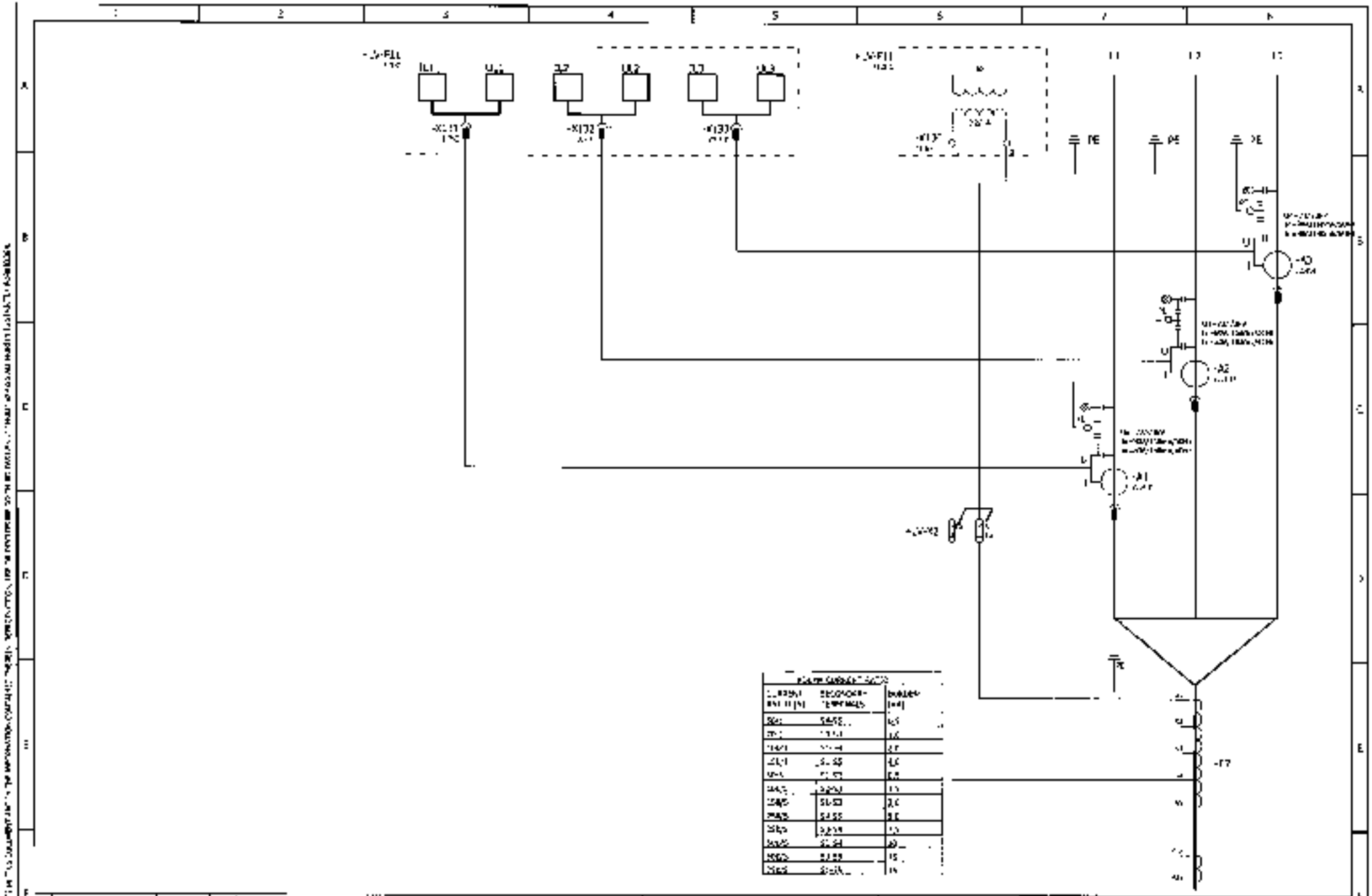

L1
L2
L3
WEGA 1

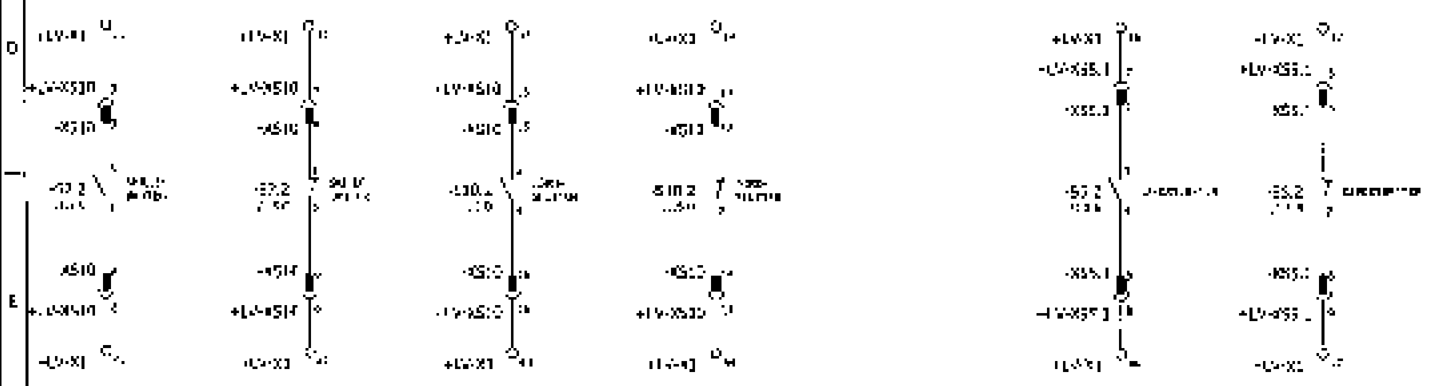


Power Connection Nordic AS		A03	+ A03		
Power Connection Nordic AS					
ABB	ABB AS 1105 Skien	KRETSSKJEMA REF 615 L			

Dato 29.02.2024







	Power Connection Module AS
	Power Connection Module AS
ABB	
Date	24.01.2024

Apparatliste

=A03 +A03

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pos
+A1	NHSN6400 16P0124		BUSHING WITH COMBI SENSOR KEVCY 24 RE 400 BOLT	/2.5:F	ABB	
+A2	NHSN6400 16P0124		BUSHING WITH COMBI SENSOR KEVCY 24 RE 400 BOLT	/2.5:D	ABB	
+A3	NHSN6400 16P0124		BUSHING WITH COMBI SENSOR KEVCY 24 RE 400 BOLT	/2.5:F	ABB	
+H1C	[illegible]		SPENNINGSINDIKATOR WEGA 1 [illegible]	/2.5:B	HORSTMANN	
+Q0	NHP 1021 [illegible]		EFFEKTBRYTER [illegible]	/2.2.B	ABB	
+Q0	NHP 10 [illegible]		BRYTERMEKANISME [illegible]	/2.2:B	ABB	
+Q1/-Q9	NHP [illegible]		SKILLEBRYTER GSEC [illegible]	/2.2.C	ABB	
+Q1/-Q9	NHP [illegible]		SWITCH MECHANISM 3PKS EARTHING SWITCH ES	/2.2:C	ABB	
+S5.1	NZN [illegible]	EFFEKTBRYTER	BRYTERELEMENT 1NO+1S	/2.4:B	SHANGHAI JIADING	
+S5.2	NZN [illegible]	EFFEKTBRYTER	BRYTERELEMENT 1NO+1S	/2.5:D	SHANGHAI JIADING	
+S5.4	NZN [illegible]	EFFEKTBRYTER	BRYTERELEMENT 1NO+1S	/2.7:B	SHANGHAI JIADING	
+S7.1	NZN [illegible]	SKILLE-BRYTER	BRYTERELEMENT 1NO+1S	/2.4:C	SHANGHAI JIADING	
+S7.2	NZN [illegible]	SKILLE-BRYTER	BRYTERELEMENT 1NO+1S	/2.5:C	SHANGHAI JIADING	

Power Connection North AS

Power Connection North AS

Dato 24.01.2024

SafePlus 2.0 [illegible]

ABB

ABB AS ELDS [illegible]

APPARATLISTE

=A03 +A03

Apparatliste

=A03 +A03

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Rev
-S10.1	[illegible]	20RD+ SLUTTER	BRYTERELEMENT 1NO+1S	[illegible]	SHANGHAI LIAZING	
-S10.2	[illegible]	20RD+ SLUTTER	BRYTERELEMENT 1NO+1S	/1.5.C	SHANGHAI LIAZING	
-T7	[illegible]		KAPASITIV SPENNINGSTRANSFORMATOR [illegible]	[illegible]	ABB	
-X55.1	[illegible]		MOLEX [illegible] MOLEX PLUG [illegible]	[illegible]	MOLEX	
-X510	[illegible]		MOLEX [illegible] MOLEX PLUG [illegible] FEMALE	[illegible]	MOLEX	
-Y4	[illegible]	[illegible]	SPOLE 24V DC	[illegible]	SAHAT	

Power Connection Norge AS

Power Connection Norge AS

ABB

KRETSSKJEMA

APPARATLISTE

=A03 +A03

Apparatliste

=A03 +LV

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pos
-F1	2CDS272001R0064	C6A	AUTOMATSIKRING S202M-C6 6A	+A03/3.1:A	ABB	
-F11	[illegible]		OVERSTRØMSRELE RELE 1 RELAY [illegible]	+A03/1.2:F	ABB	
-X1	NFSN722008P0001		REKKE 2,5 REKKEKLEMME 2,5mm2	+A03/3.5:D, +A03/3.5:F +A03/3.6:D, +A03/3.6:E +A03/4.1:A, +A03/4.1:B	PHOENIX	
-X0	GZN 5907598006C1	PE	JORDKL. REKKEKLEMME 6mm2	+A03/5.6:C	PHOENIX	
-X2	NFSN722008P0001		REKKE 2,5 REKKEKLEMME 2,5mm2	+A03/1.1:D, +A03/1.1:F +A03/1.2:D, +A03/1.2:F +A03/1.2:A, +A03/3.3:B	PHOENIX	
-X3	GZN 5902498006C1		UK 5N REKKEKLEMME 4mm2	+A03/1.1:A, +A03/3.2:A	PHOENIX	
-XM02	NFSN620014P0002		MINI-FIT MOLEX PLUG 2R MINI-FIT HOUSE FEMALE 2R	+A03/1.5:F	MOLEX	
-XS7.1	[illegible]		MOLEX 5557-16R MOLEX RECEPTACLE 16 FEMALE	+A03/4.1:B	MOLEX	
-XS4	NFSN620018P0024		MINI-FIT MOLEX PLUG 4R MINI-FIT HOUSE FEMALE 4R	+A03/1.8:D	MOLEX	
-XS10	[illegible]		MOLEX 5557-16R MOLEX RECEPTACLE 16 FEMALE	+A03/4.4:A	MOLEX	

Power Connection Nordic AS	KRETSSKJEMA APPARATLISTE	=A03 +LV
Power Connection Nordic AS	ABB AS ELDS Sevan	[illegible]
2024	SalaMax [illegible]	[illegible]

REKKEKLEMMELISTE

=A03+LV -X1

Klemme	1	2	3	4	5	7	11	12	13	14	16	17	25	26	31	33	32	34	36	37	41	42	43	44	46	47	58	59

KLEMMETYPE · SIDE · APPARAT NR. · APPARAT BETEGNELSE · INTERN LEDN. FARGE · LASK · LEDNINGS-LASK · EKSTERN LEDN. FARGE · APPARAT BETEGNELSE · APPARAT NR.

Firma	Power Connection Nordic AS
Utført av	Power Connection Nordic AS
Tittel	KRETSSKJEMA REKKEKLEMMELISTE
	A03 AS DLOS Stasjon
Dato	24.01.2024
	=A03 +LV
Tegningsnr.	NDNAS20013_40010
Rev.	173

REKKEKLEMMELISTE

=A03+LV -X2

Klemme	Klemmetype	Side	Apparat nr.	Apparat betegnelse	Lask	Apparat betegnelse (ut)	Apparat nr. (ut)
5	URTK/S	[illegible]	1	+F11-X120		-X21-T2	S4
6	URTK/S	[illegible]	2	+F11-X120		+A03-T2	S8
21	MBKKB 2,5	[illegible]	1	-Q1	•		
22	MBKKB 2,5	[illegible]	1	+F11-X100	•		
23	MBKKB 2,5	[illegible]	15	+F11-X101	•		
24	MBKKB 2,5	[illegible]			•		
25	MBKKB 2,5	[illegible]			•		
26	MBKKB 2,5	[illegible]			•		
27	MBKKB 2,5	[illegible]	3	-Q1	•		
28	MBKKB 2,5	[illegible]			•		
29	MBKKB 2,5	[illegible]			•		
30	MBKKB 2,5	[illegible]			•		
31	MBKKB 2,5	[illegible]	1	-Q5	•		
32	MBKKB 2,5	[illegible]	2	+F11-X100	•		
33	MBKKB 2,5	[illegible]	3A	-Q1	•		
34	MBKKB 2,5	[illegible]			•		
35	MBKKB 2,5	[illegible]			•		
36	MBKKB 2,5	[illegible]			•		
37	MBKKB 2,5	[illegible]	2	+F11-X110	•		
38	MBKKB 2,5	[illegible]			•		
39	MBKKB 2,5	[illegible]			•		
40	MBKKB 2,5	[illegible]			•		
41	MBKKB 2,5	[illegible]			•		
42	MBKKB 2,5	[illegible]			•		
43	MBKKB 2,5	[illegible]			-		
44	MBKKB 2,5	[illegible]	3	+F11-X130	•		
45	MBKKB 2,5	[illegible]			•		
46	MBKKB 2,5	[illegible]	6	+F11-X130	•		
47	MBKKB 2,5	[illegible]	30	+F11-X130	•		
48	MBKKB 2,5	[illegible]	8	+F11-X130	-		
49	MBKKB 2,5	[illegible]	10	+F11-X130	-		
50	MBKKB 2,5	[illegible]	11	+F11-X130	-		
51	MBKKB 2,5	[illegible]			-		
52	MBKKB 2,5	[illegible]			-		
53	MBKKB 2,5	[illegible]			-		

Kunde: Power Connection Nordic AS	Prosjekt: =A03 +LV	Side 63
Sluttkunde: Power Connection Nordic AS		
Konstr./Sted: ABB AS EUDS Skien	Tittel: KRETSSKJEMA REKKEKLEMMELISTE	
Dato: 24.01.2024		

REKKEKLEMMELISTE

=A03+LV -X2

Klemme nr.
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KLEMMETYPE · SIDE · APPARAT NR. · APPARAT BETEGNELSE · POTENSIAL/FARGE · LASK · LEDNINGS-LASK · POTENSIAL/FARGE · APPARAT BETEGNELSE · APPARAT NR.

Power Connection Norge AS

ABB

ABB AS ELDE Skien

KRETSSKJEMA

REKKEKLEMMELISTE

ABB AS

Utstedt av	Dokument type
Electrification Products	Rutinetest rapport

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
0000638011-000020	**SafePlus**	**0000110751 , Power Connection Nordic AS**
Serienummer:	Konfigurasjon	Levert til
202413939610001	**-M -**	**Power Connection Nordic AS**
	Nominell spenning (Ur)	Kundens ref. Nr.:
	24 kV	**173 , Jan Arne Habostad**

Har gjennomgått rutinetester i henhold til paragraf 8 i ovenfor angitte IEC normer.
Rutinetesten består av:

1 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 8.3**
Test spenning:50 kV 50Hz varighet 1 minutt.

2 **Testing av hjelpe og styrekretser i henhold til IEC 62271-200, paragraf 8.3**
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 8.4.**
NA

4 **Gasstetthets kontroll av anlegg i henhold til 62271-200, paragraf 8.5**
NA

5 **Design og visuell sjekk i henhold til IEC 62271-200, paragraf 8.6.**
Anlegget har blitt sjekket visuelt mot ordre.

6 **Partiell utladningsmåling i henhold til IEC 62271-200, paragraf 8.101**
NA

7 **Mekaniske koblinger er testet i henhold til IEC 62271-200, paragraf 8.102**
NA

Malefeltet har blitt testet og godkjent som beskrevet ovenfor uten anmerkninger

ABB AS
Electrification Products
Dato. 2024-04-17

Sander Kvernberg S.K
QA/QC Avdeling (Sign)

ABB Electrification Norway AS
Quality Control
P.O. Box 108, Sentrum
N-3701 Skien - Norway

Job No.: 974854

ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5124018343

Type: TPU 60.13 | Highest voltage: 24 kV | Year of production: 2024
Accuracy class: 0.2SFS5
Rated ratio: 75-150//5 A
Output: 1-5-1-5 VA | Icth: 180 A
Rated short-time thermal current: 21 kA [1s]
Rated dynamic current: 52.50 kA | 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 between sections and on secondary windings 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: 12.3.2024

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ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5124018343

Test Object TPU 60.13; 75-150/5 A, ext.120 %, 1-5-1-5 VA, cl.0.2FS5
Rated frequency 50 Hz
Date: 12.3.2024 Operator Radek Plch

Terminals	Class	PXR-SXR [A]	Burden [VA]	COS ψ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	1	120	0.112	1.24
S1-S2	0.2S	75/5	5	1	100	0.107	1.33
S1-S2	0.2S	75/5	5	1	20	0.086	4.803
S1-S2	0.2S	75/5	5	1	5	0.145	8.91
S1-S2	0.2S	75/5	5	1	1	0.169	0.906
S1-S2	0.2S	75/5	1	1	120	0.145	0.986
S1-S2	0.2S	75/5	1	1	100	0.144	1.144
S1-S2	0.2S	75/5	1	1	20	0.159	2.969
S1-S2	0.2S	75/5	1	1	5	0.172	3.587
S1-S2	0.2S	75/5	1	1	1	0.174	3.651
S1-S3	0.2S	150/5	5	1	120	0.061	0.52
S1-S3	0.2S	150/5	5	1	100	0.059	0.602
S1-S3	0.2S	150/5	5	1	20	0.06	2.023
S1-S3	0.2S	150/5	5	1	5	0.079	2.583
S1-S3	0.2S	150/5	5	1	1	0.082	3.127
S1-S3	0.2S	150/5	1	1	120	0.071	0.475
S1-S3	0.2S	150/5	1	1	100	0.071	0.557
S1-S3	0.2S	150/5	1	1	20	0.079	1.339
S1-S3	0.2S	150/5	1	1	5	0.083	1.961
S1-S3	0.2S	150/5	1	1	1	0.094	1.593

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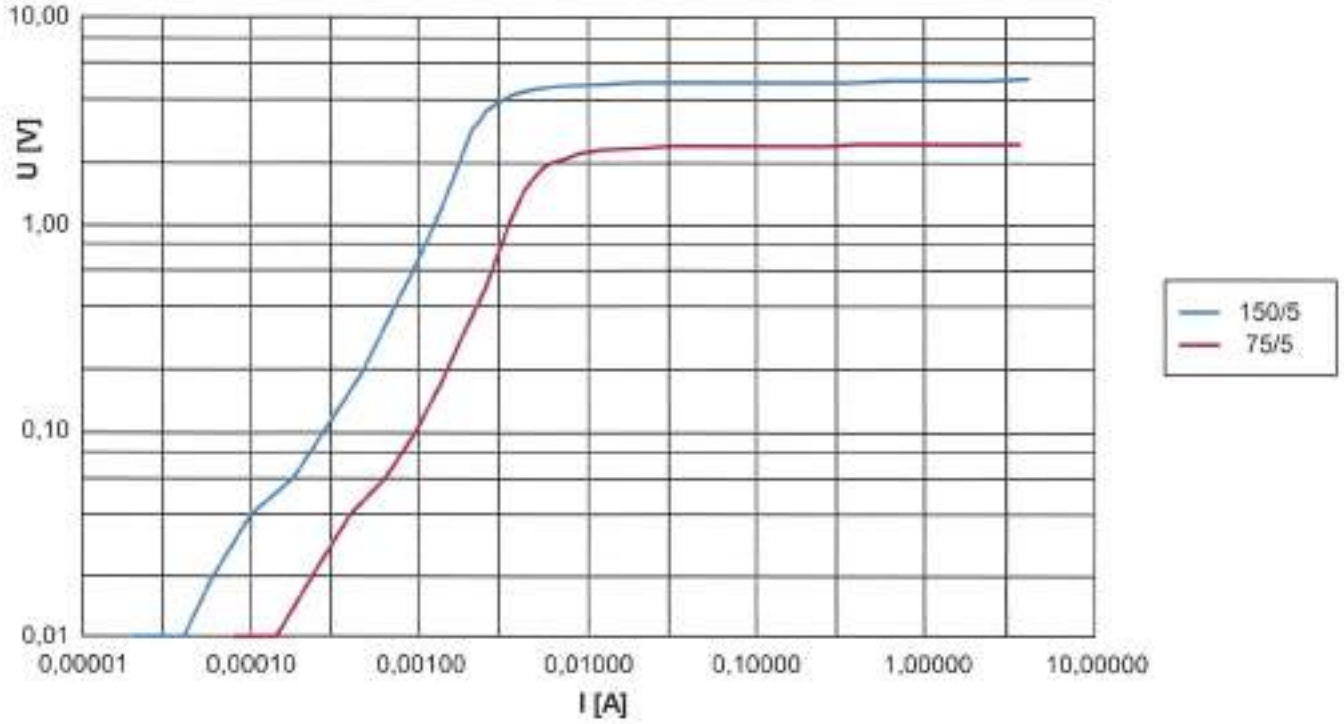
Job No.: 974854

EXCITATION CURVE

Production number: 1VLT5124018343



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	-	0.063	-	2.03	-	0.006	<5	1.893	-	-
1	150/5	0.2S	-	0.146	-	4.06	-	0.003	<5	2.934	-	-

Frekvence: 50 Hz
Operator: Radek Plch
Date: 12/03/2024

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Job No.: 974854

ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5124018344

Type: TPU 60.13 | Highest voltage: 24 kV | Year of production: 2024
Accuracy class: 0.2SFS5
Rated ratio: 75-150//5 A
Output: 1-5-1-5 VA | Icth: 180 A
Rated short-time thermal current: 21 kA [1s]
Rated dynamic current: 52.50 kA | 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 between sections and on secondary windings 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: 8.3.2024

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ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5124018344

Test Object: TPU 60.13; 75-150/5 A, ext 120 %, 1-5-1-5 VA; cl 0.2SFS5
Rated frequency: 50 Hz
Date: 8.3.2024 Operator: Stavik Jiri

Terminals	Class	PXR/SXR [A]	Burden [VA]	COS φ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	1	120	0.106	1.564
S1-S2	0.2S	75/5	5	1	100	0.103	1.506
S1-S2	0.2S	75/5	5	1	20	0.075	4.911
S1-S2	0.2S	75/5	5	1	5	0.125	10.308
S1-S2	0.2S	75/5	5	1	1	0.162	11.981
S1-S2	0.2S	75/5	1	1	120	0.142	0.963
S1-S2	0.2S	75/5	1	1	100	0.141	1.128
S1-S2	0.2S	75/5	1	1	20	0.149	3.268
S1-S2	0.2S	75/5	1	1	5	0.160	4.402
S1-S2	0.2S	75/5	1	1	1	0.172	4.569
S1-S3	0.2S	150/5	5	1	120	0.059	0.544
S1-S3	0.2S	150/5	5	1	100	0.057	0.6
S1-S3	0.2S	150/5	5	1	20	0.053	2.002
S1-S3	0.2S	150/5	5	1	5	0.074	3.517
S1-S3	0.2S	150/5	5	1	1	0.08	3.266
S1-S3	0.2S	150/5	1	1	120	0.068	0.469
S1-S3	0.2S	150/5	1	1	100	0.068	0.551
S1-S3	0.2S	150/5	1	1	20	0.073	1.51
S1-S3	0.2S	150/5	1	1	5	0.081	1.95
S1-S3	0.2S	150/5	1	1	1	0.082	2.021

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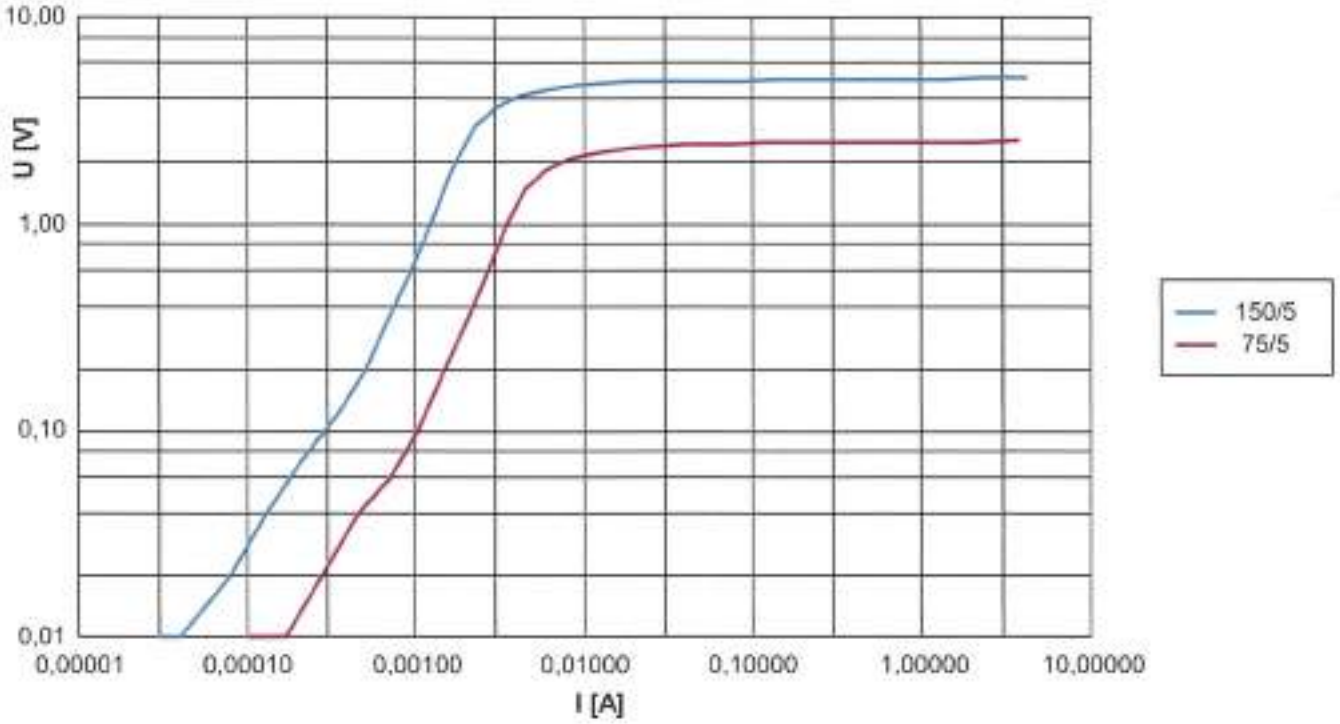
EXCITATION CURVE

Production number: 1VLT5124018344



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	-	0.068	-	1.98	-	0.007	<5	1.87	-	-
1	150/5	0.2S	-	0.158	-	3.98	-	0.004	<5	2.853	-	-

Frekvence: 50 Hz
Operator: Slavik Jiří
Date: 08/03/2024

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Job No.: 974654

ROUTINE TESTS REPORT

CURRENT TRANSFORMER

Production number: 1VLT5124018345

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: 2024

Icth: 180 A

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 between sections and on secondary windings 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: 15.3.2024

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Job No 974854

ACCURACY CLASS

CURRENT TRANSFORMER

Production number: 1VLT5124018345

Test Object: TPU 60 13, 75-150/5 A, ext 120 %; 1-5-1-5 VA; cl 0.2SFS5
Rated frequency: 50 Hz
Date: 15.3.2024 Operator: Žáček Zdeněk

Terminals	Class	FXR/SXR [A]	Burden [VA]	COS φ	Excitation [%]	Ratio Error [%]	Phase Angle [min]
S1-S2	0.2S	75/5	5	1	120	0.125	1.146
S1-S2	0.2S	75/5	5	1	100	0.122	1.163
S1-S2	0.2S	75/5	5	1	20	0.103	3.574
S1-S2	0.2S	75/5	5	1	5	0.141	6.784
S1-S2	0.2S	75/5	5	1	1	0.162	7.979
S1-S2	0.2S	75/5	1	1	120	0.152	0.767
S1-S2	0.2S	75/5	1	1	100	0.151	0.881
S1-S2	0.2S	75/5	1	1	20	0.159	2.239
S1-S2	0.2S	75/5	1	1	5	0.171	2.883
S1-S2	0.2S	75/5	1	1	1	0.173	3.019
S1-S3	0.2S	150/5	5	1	120	0.066	0.421
S1-S3	0.2S	150/5	5	1	100	0.065	0.476
S1-S3	0.2S	150/5	5	1	20	0.063	1.491
S1-S3	0.2S	150/5	5	1	5	0.077	2.305
S1-S3	0.2S	150/5	5	1	1	0.08	2.523
S1-S3	0.2S	150/5	1	1	120	0.074	0.367
S1-S3	0.2S	150/5	1	1	100	0.074	0.425
S1-S3	0.2S	150/5	1	1	20	0.078	1.003
S1-S3	0.2S	150/5	1	1	5	0.083	1.234
S1-S3	0.2S	150/5	1	1	1	0.083	1.31

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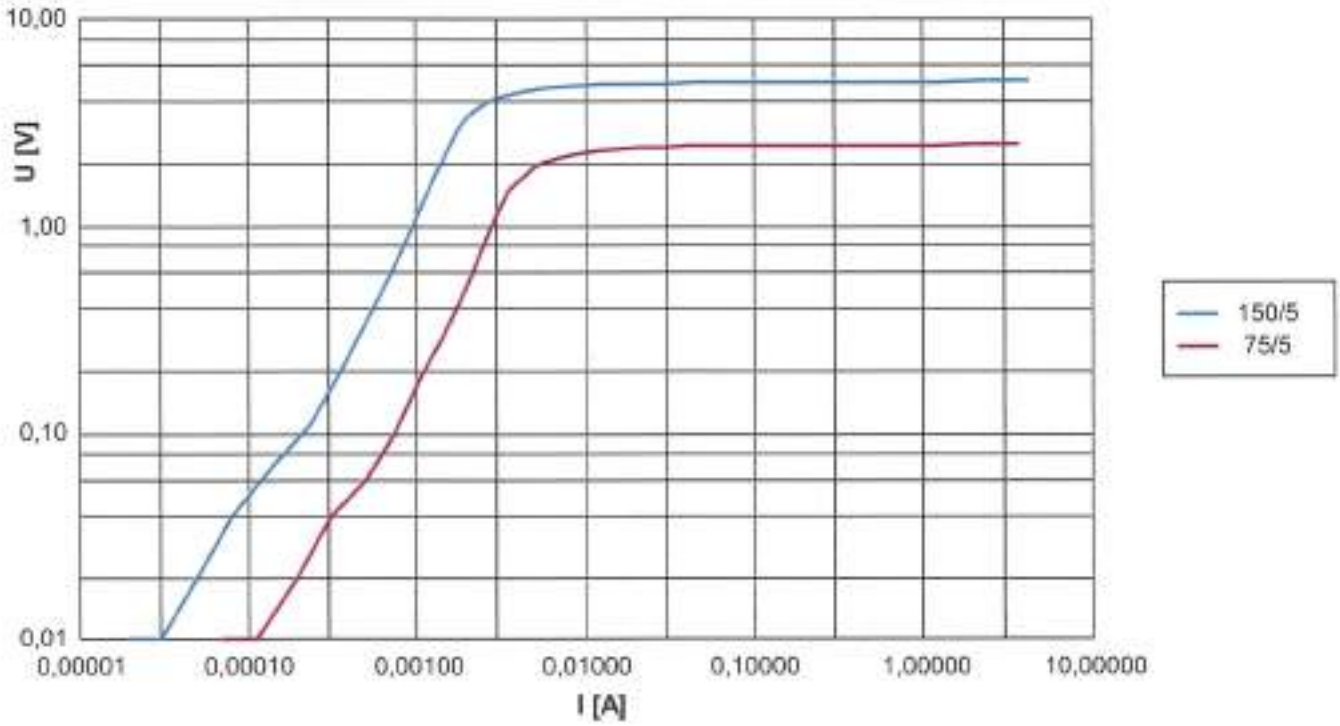
EXCITATION CURVE

Production number: 1VLT5124018345



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	-	0.065	-	2.05	-	0.006	<5	1.904	-	-
1	150/5	0.2S	-	0.147	-	4.11	-	0.003	<5	2.966	-	-

Frekvence: 50 Hz
Operator: Žáček Zdeněk
Date: 15/03/2024

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Job No.: 974854

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5224005916
Highest voltage: 24 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-5-0-5/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2024

TESTS:

1. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory
2. 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
3. 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
4. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
5. 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
6. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-5-0-5 VA/class 0.2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory

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

Brno, the: 12.03.2024

Ing. Radek Bártek

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Job No.: 974954

Measurements with Automatic Transformer Test Set. ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5224005916

Test Object: TJC 6 E4386916

Nominal Freq.: 50 Hz

Date: 12.03.2024 Operator: Michal Vrána

Winding No.	PXR/SXR(V)	Burden(VA)	COS β	% Un	ei(%)	di(min)	Burden of other windings (VA)
1	11000/√3/110/√3	5,00	1.00	120	-0.016	-5.700	0
1	11000/√3/110/√3	5,00	1.00	100	-0.025	-5.780	0
1	11000/√3/110/√3	5,00	1.00	80	-0.037	-5.790	0
1	11000/√3/110/√3	0,00	0.00	120	0.098	-1.360	0
1	11000/√3/110/√3	0,00	0.00	100	0.089	-1.376	0
1	11000/√3/110/√3	0,00	0.00	80	0.078	-1.419	0
2	22000/√3/110/√3	5,00	1.00	120	0.081	-2.180	0
2	22000/√3/110/√3	5,00	1.00	100	0.078	2.240	0
2	22000/√3/110/√3	5.00	1.00	80	0.072	-2.300	0
2	22000/√3/110/√3	0,00	0.00	120	0.127	-1.122	0
2	22000/√3/110/√3	0,00	0.00	100	0.124	-1.190	0
2	22000/√3/110/√3	0,00	0.00	80	0.118	-1.250	0
3	11000/√3/110/3	30.00	0.80	190	-0.885	5.600	0
3	11000/√3/110/3	30.00	0.80	100	-0.861	1.913	0
3	11000/√3/110/3	30.00	0.80	5	-1.227	2.220	0
3	11000/√3/110/3	0,00	0.00	100	0.441	20.600	0
3	11000/√3/110/3	0,00	0.00	5	0.101	15.510	0
3	11000/√3/110/3	0,00	0.00	2	0.001	13.940	0
4	22000/√3/110/3	30.00	0.80	190	-0.901	8.150	0
4	22000/√3/110/3	30.00	0.80	100	-0.889	5.920	0
4	22000/√3/110/3	30.00	0.80	5	-1.099	2.770	0
4	22000/√3/110/3	0.00	0.00	100	-0.425	24.800	0
4	22000/√3/110/3	0.00	0.00	5	-0.592	19.510	0
4	22000/√3/110/3	0.00	0.00	2	-0.643	13.210	0

Measurements:
ABB s.r.o.
Vadovická 1551-4a
140 00 Prague 4

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Phone: +420 5 4715 2271
Fax: +420 5 4715 2518

Job No.: 974854

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5224005917
Highest voltage: 24 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-5-0-5/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2024

TESTS:

1. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory
2. 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
3. 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
4. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
5. 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
6. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-5-0-5 VA/class 0,2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory

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

Brno, the: 12.03.2024

Ing. Radek Bártek

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Fax: + 420 5 4715 2626

Job No : 974854

Measurements with Automatic Transformer Test Set, ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5224005917

Test Object: TJC 8 E43953618

Nominal Freq : 50 Hz

Date: 12.03.2024 Operator: Michal Vrána

Winding No	PxR/SxR(V)	Burden(VA)	COS fi	% Un	ei(%)	di(min)	Burden of other windings (VA)
1	11000/√3/110/√3	5,00	1,00	120	-0,009	-5,270	0
1	11000/√3/110/√3	5,00	1,00	100	-0,015	-5,290	0
1	11000/√3/110/√3	5,00	1,00	80	-0,022	-5,290	0
1	11000/√3/110/√3	0,00	0,00	120	0,104	-0,867	0
1	11000/√3/110/√3	0,00	0,00	100	0,089	-0,894	0
1	11000/√3/110/√3	0,00	0,00	80	0,092	-0,920	0
2	22000/√3/110/√3	5,00	1,00	120	0,092	-1,805	0
2	22000/√3/110/√3	5,00	1,00	100	0,079	-1,844	0
2	22000/√3/110/√3	5,00	1,00	80	0,075	-1,876	0
2	22000/√3/110/√3	0,00	0,00	120	0,128	-0,756	0
2	22000/√3/110/√3	0,00	0,00	100	0,126	-0,799	0
2	22000/√3/110/√3	0,00	0,00	80	0,121	-0,830	0
3	11000/√3/110/3	30,00	0,80	120	-0,874	6,730	0
3	11000/√3/110/3	30,00	0,80	100	-0,844	2,040	0
3	11000/√3/110/3	30,00	0,80	5	-1,122	3,120	0
3	11000/√3/110/3	0,00	0,00	120	0,352	21,600	0
3	11000/√3/110/3	0,00	0,00	5	0,202	16,140	0
3	11000/√3/110/3	0,00	0,00	2	0,152	11,150	0
4	22000/√3/110/3	30,00	0,80	120	-0,896	10,290	0
4	22000/√3/110/3	30,00	0,80	100	-0,884	8,040	0
4	22000/√3/110/3	30,00	0,80	5	-1,044	4,620	0
4	22000/√3/110/3	0,00	0,00	100	-0,419	26,600	0
4	22000/√3/110/3	0,00	0,00	5	0,532	19,830	0
4	22000/√3/110/3	0,00	0,00	2	-0,045	14,420	0

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Fax: +420 234 322 282

Job No.: 974854

ROUTINE TESTS REPORT

VOLTAGE TRANSFORMER

Type: TJC 6
Production number: 1VLT5224005918
Highest voltage: 24 kV
Rated frequency: 50 Hz
Rated ratio: 11000/√3-22000/√3//110/√3/110/3 V
Output: 0-5-0-5/30-30 VA
Accuracy class: 0,2-0,2/3P-3P
Year of production: 2024

TESTS:

1. Verification of terminal marking acc. to IEC 61869-1 clause 7.3.6
   Conclusion: Satisfactory
2. 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
3. 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
4. Partial discharge measurment acc. to IEC 61869-3 clause 7.3.2 procedure A
   Conclusion: Satisfactory
5. 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
6. Tests for accuracy acc.to IEC 61869-3 clause 7.3.5.
   Winding: I: 0-5-0-5 VA/class 0,2-0,2
   Winding: II: 30-30 VA/class 3P-3P
   Winding: III: - VA/class -
   Conclusion: Satisfactory

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

Brno, the: 12.03.2024

Ing. Radek Bártek

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Measurements with Automatic Transformer Test Set, ZERA

VOLTAGE TRANSFORMER

Serial No.: 1VLT5224005918

Test Object: TJC 6-E43950618

Nominal Freq.: 50 Hz

Date: 12.03.2024 Operator: Jan Hlavac

Winding No	PXR/SXR(V)	Burden(VA)	COS β	% Un	ε(%)	δ(min)	Burden of other windings (VA)
1	11000/√3/110/√3	5.00	1.00	120	-0.090	-3.840	0
1	11000/√3/110/√3	5.00	1.00	100	-0.085	-3.900	0
1	11000/√3/110/√3	5.00	1.00	80	-0.092	-3.950	0
1	11000/√3/110/√3	0.00	0.00	120	0.033	0.550	0
1	11000/√3/110/√3	0.00	0.00	100	0.029	0.482	0
1	11000/√3/110/√3	0.00	0.00	80	0.023	0.411	0
2	22000/√3/110/√3	5.00	1.00	120	0.006	-0.022	0
2	22000/√3/110/√3	5.00	1.00	100	0.006	-0.207	0
2	22000/√3/110/√3	5.00	1.00	80	0.006	-0.339	0
2	22000/√3/110/√3	0.00	0.00	120	0.052	1.030	0
2	22000/√3/110/√3	0.00	0.00	100	0.054	0.847	0
2	22000/√3/110/√3	0.00	0.00	80	0.053	0.702	0
3	11000/√3/110/3	30.00	0.80	120	-0.928	7.960	0
3	11000/√3/110/3	30.00	0.80	100	-0.895	8.980	0
3	11000/√3/110/3	30.00	0.80	5	-1.251	4.350	0
3	11000/√3/110/3	0.00	0.00	100	0.300	22.530	0
3	11000/√3/110/3	0.00	0.00	5	0.144	17.450	0
3	11000/√3/110/3	0.00	0.00	2	0.087	13.060	0
4	22000/√3/110/3	30.00	0.80	190	-0.975	11.980	0
4	22000/√3/110/3	30.00	0.80	100	-0.943	9.000	0
4	22000/√3/110/3	30.00	0.80	5	-1.103	5.460	0
4	22000/√3/110/3	0.00	0.00	100	-0.459	27.400	0
4	22000/√3/110/3	0.00	0.00	5	0.535	20.400	0
4	22000/√3/110/3	0.00	0.00	2	-0.614	15.390	0

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

KUNDE	Power Connection Nordic AS
KUNDE REF	173
SALGSORDRE	638011
POSISJON NUMMER	0020

TYPE	SafePlus C C V_-M-
NOMINELLE VERDIER	24kV 630A 16kA BIL 125
FREKVENS	50Hz
MERKESTRØM SAMLESKINNER	630A
REVISJON	
UTGITT FOR GODKJENNING	10.01.2024
GODKJENT AV KUNDE	18.01.2024

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

Utfør: CJ		Power Connection Nordic AS			
Sjekket: GL		Power Connection Nordic AS			NO
Godkjent: OWS	SafePlus C C V_-M-	ABB AS ELDS Skien	KRETSSKJEMA FORSIDE	1VDW638011 A0020	Side 1 / 2
Dato: 16.04.2024	173				

Innholdsfortegnelse

[illegible] TABLE OF CONTENTS 2.2

KRETSSKJEMA

INNHOLDSFORTEGNELSE

16.01.2024

Innholdsfortegnelse

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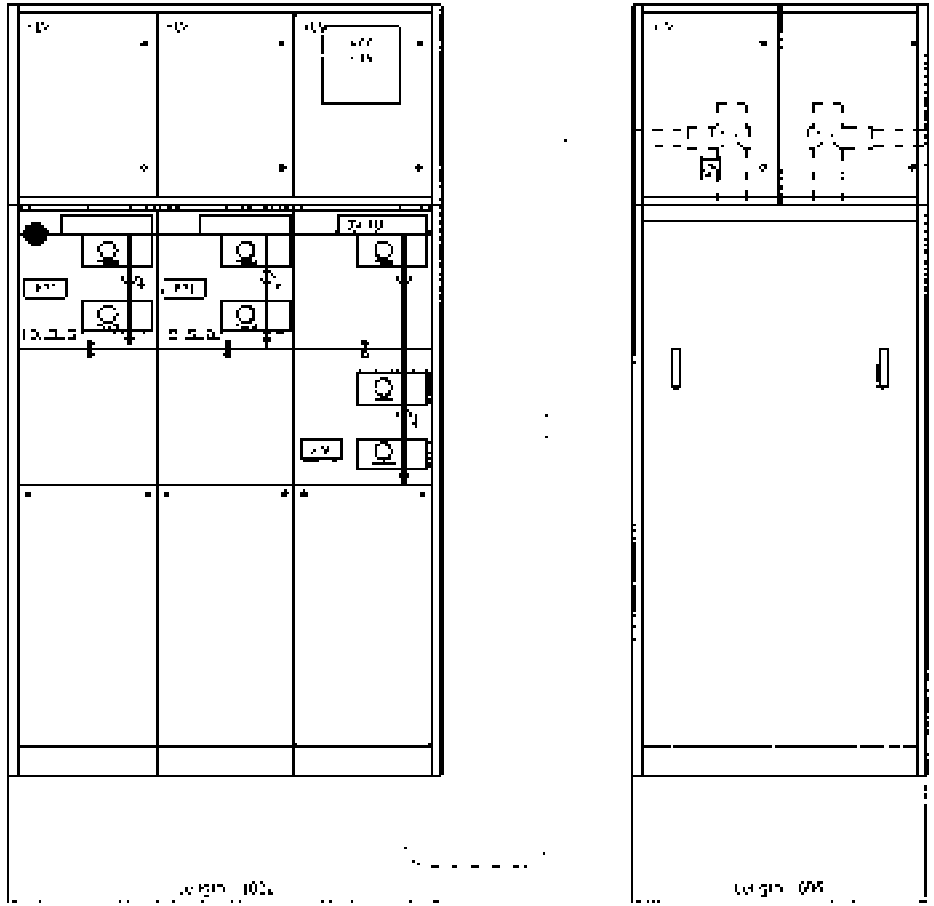

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Feltnavn	C	C	V
Tegningsnummer	[illegible]		

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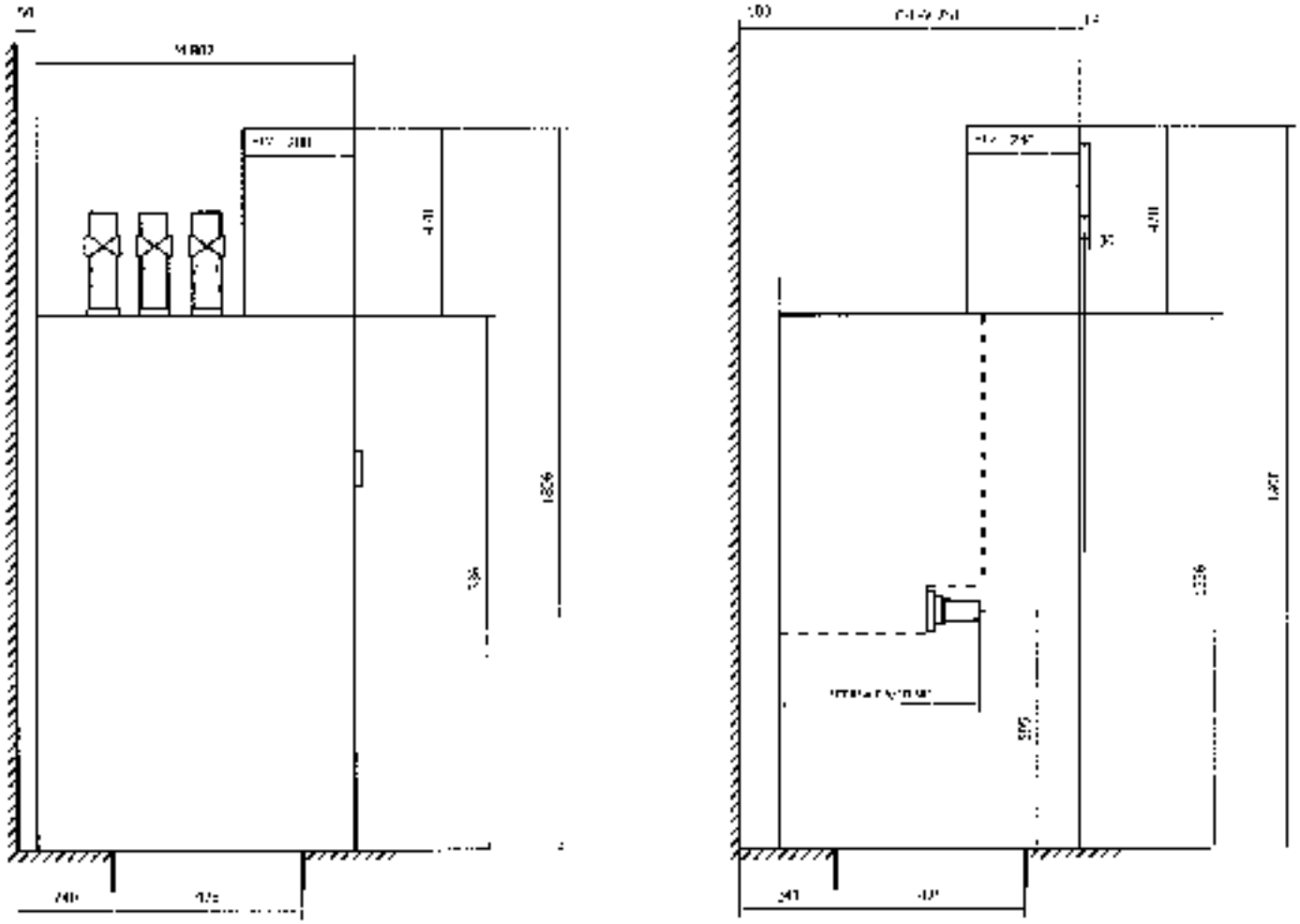
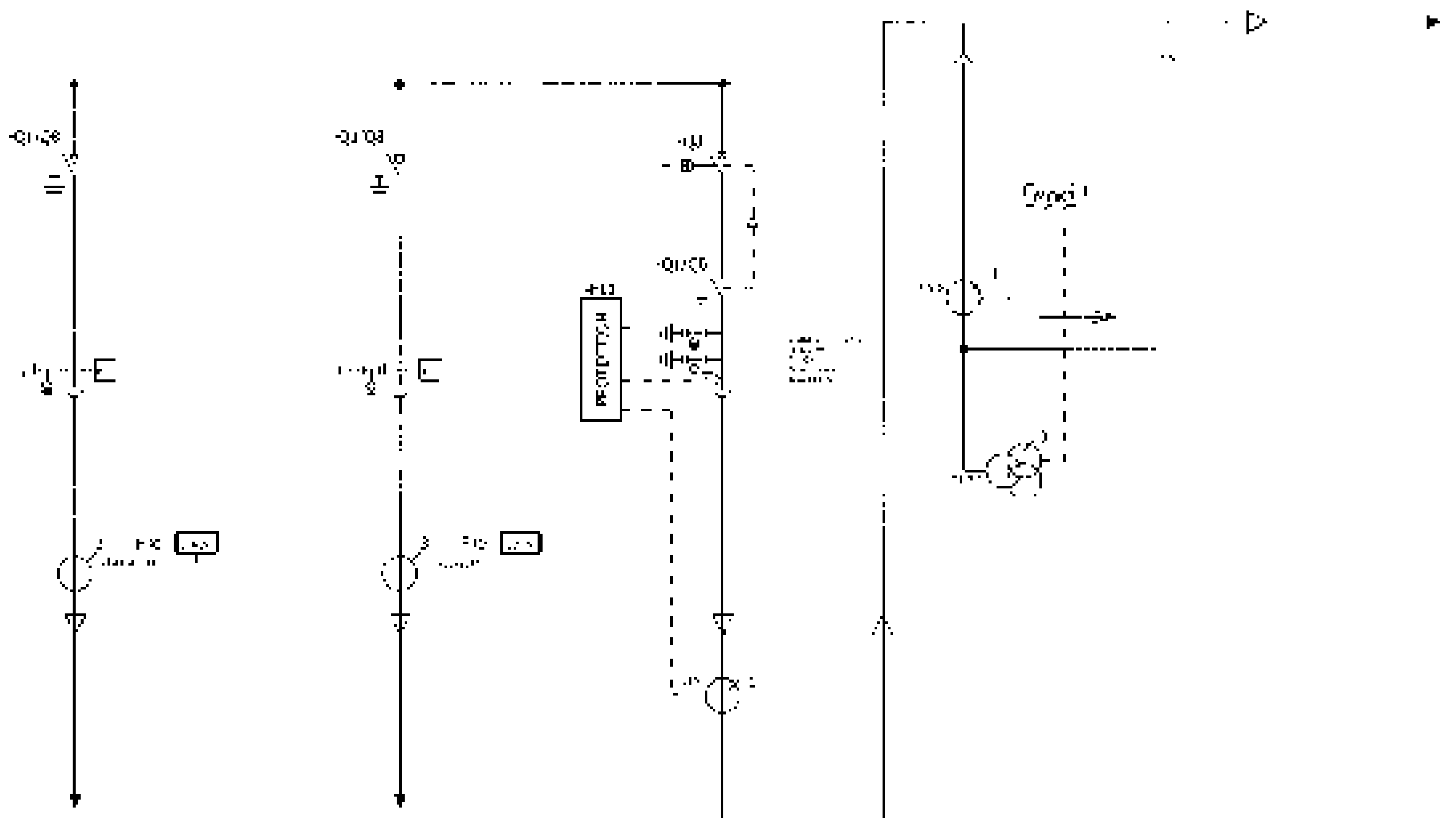
[illegible]

OVERSIKTSTEGNING
FRONTARRANGEMENT

ABB AS ELDS Skien

Dato: 16.01.2024





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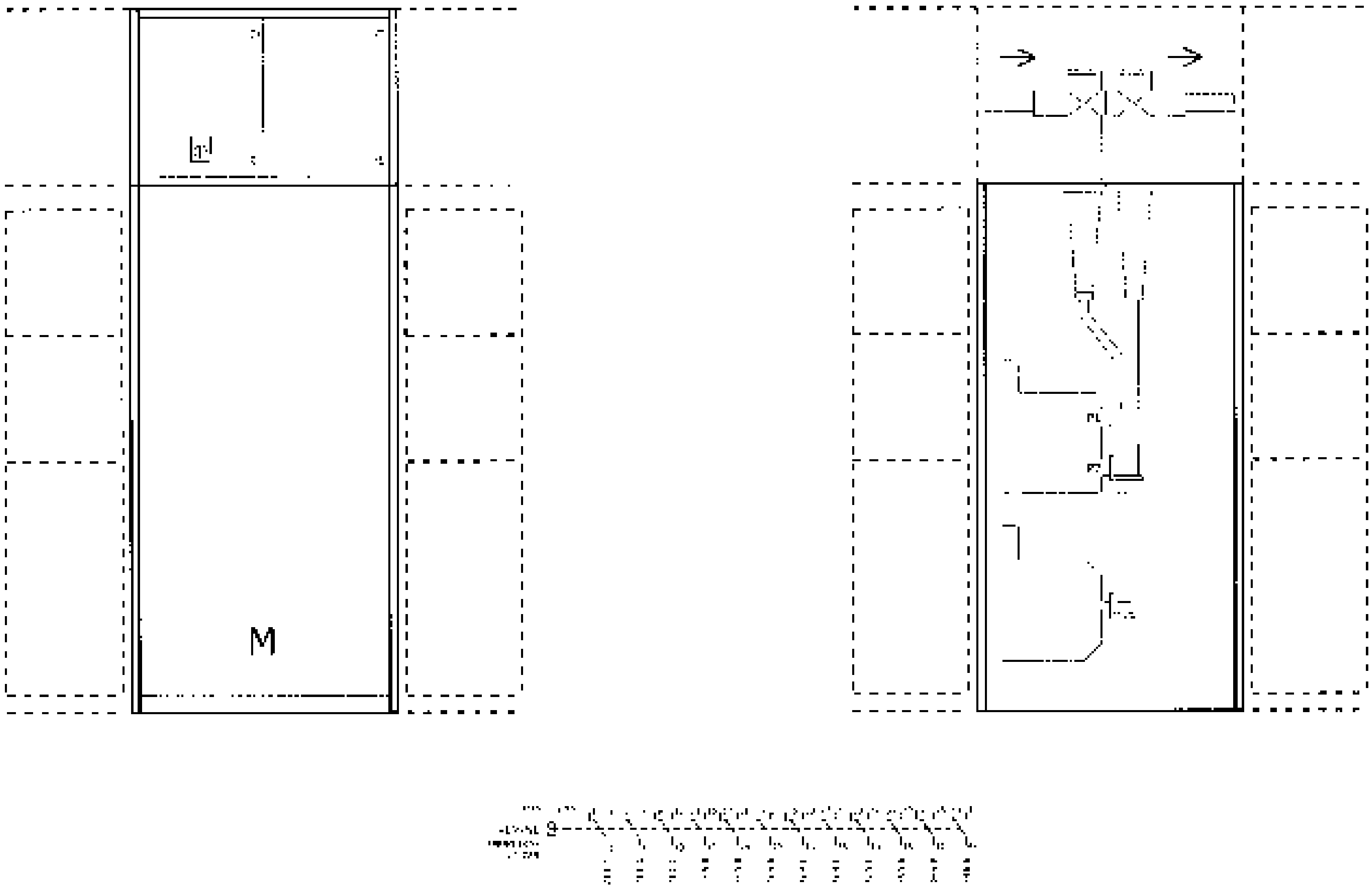
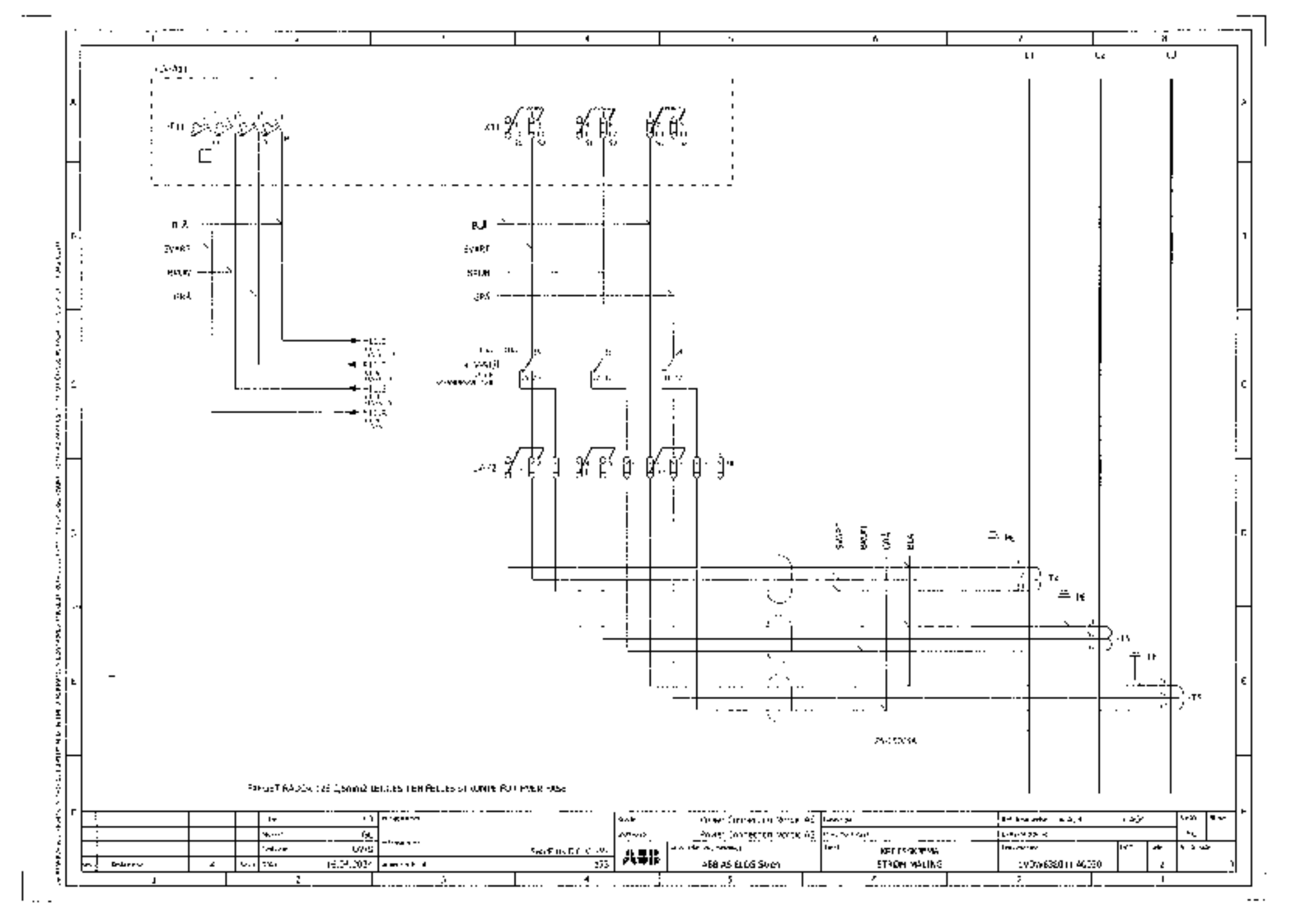
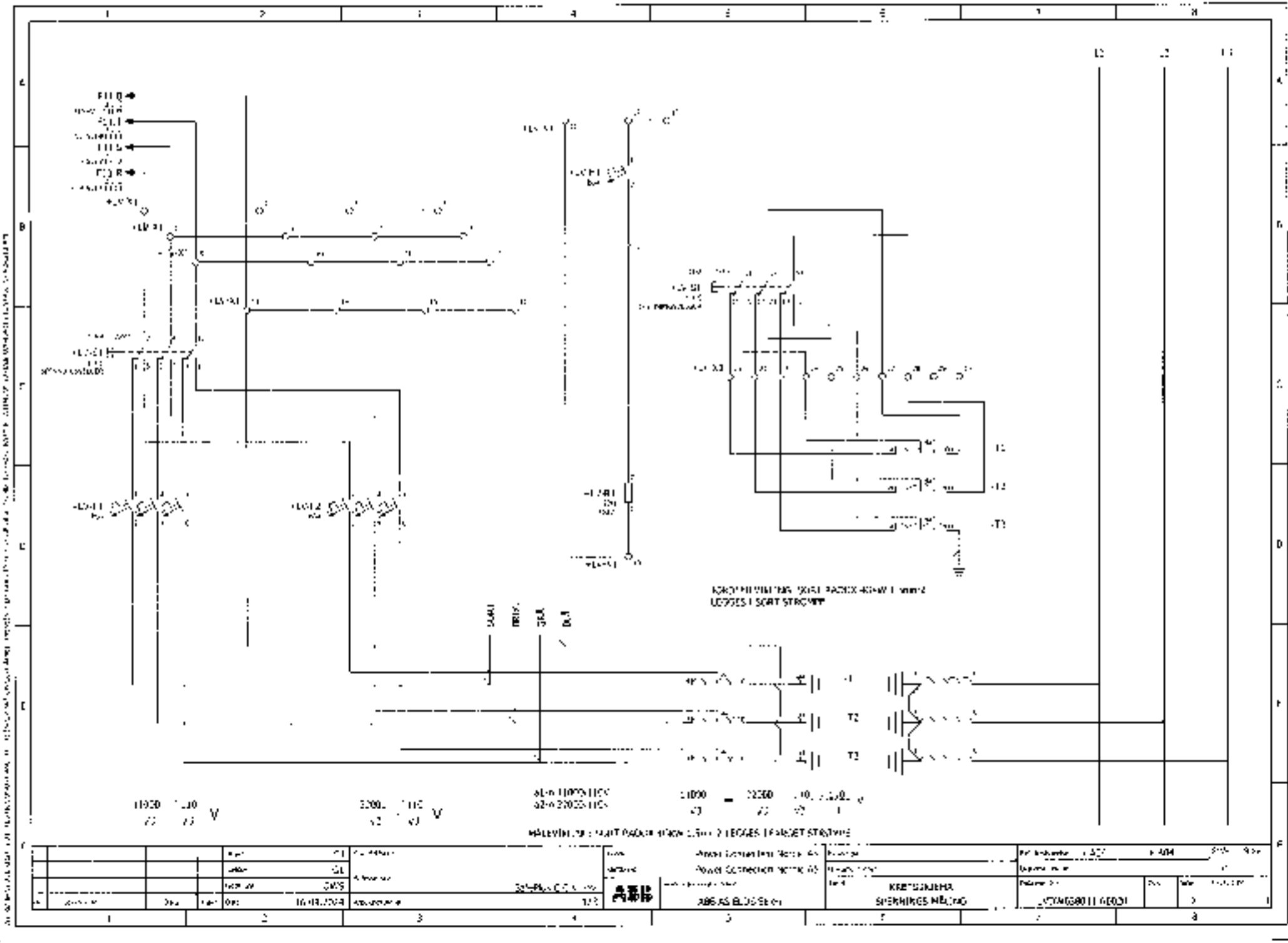
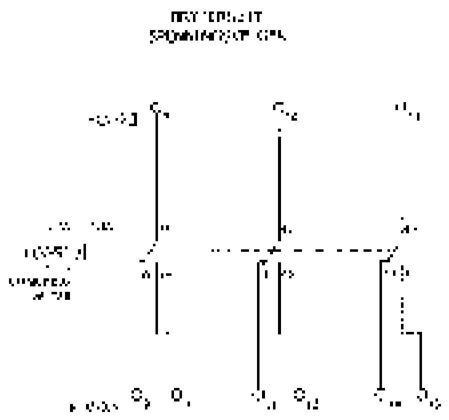


ABB

KRETSSKEMA
ÖVERSIKT







Power Connection Module

Power Connection Module

ABB

Sheet 4

Apparatliste

=A04 +A04

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Ant.
-T1	[illegible]1199260		SPENNINGSTRANSFORMATOR TJC6 12000 V3 / 22000 V3 / 110 V3 [illegible] [illegible]	/3.6 E	ABB	
-T2	[illegible]199260		SPENNINGSTRANSFORMATOR TJC6 12000 [illegible] [illegible]	/3.6 E	ABB	
-T3	[illegible]199260		SPENNINGSTRANSFORMATOR TJC6 12000 [illegible] 22000 [illegible] [illegible]	/3.6 E	ABB	
-T4	[illegible]199260		STROMTRANSFORMATOR TPU 60.13 75-150/5A [illegible] 15VA CL0,2S FS5	/3.7 E	ABB	
-T5	[illegible]199260		STROMTRANSFORMATOR TPU 60.13 75-150/5A [illegible] 15VA CL0,2S FS5	/3.7 E	ABB	
-T6	[illegible]199260		STROMTRANSFORMATOR TPU 60.13 75-150/5A [illegible] 15VA CL0,2S FS5	/3.7 E	ABB	

[illegible]	Apollo Connection Nordic AS	Prosjekt	=A04 +A04
[illegible]	Apollo Connection Nordic AS	[illegible]	
Tegnet: OWS	Dato: 16.04.2024	ABB AS EL.DS Skien	KAE [illegible] APPARATLISTE
[illegible]			1VDW005011 A0020

Apparatliste =A04 +LV

Komponentbetegnelse	Artikkelnummer	Funksjonstekst	Beskrivelse	Plassering	Fabrikat	Pos
-A11	[illegible]		[illegible]	+A04/2.1 A	MICRO MATIC NORGE AS	
-F1	2CDS273001R0065	16A	AUTOMATSIKRING S203M-B6 6A	+A04/2.1 D	ABB	
-F2	2CDS27[illegible]	6A	AUTOMATSIKRING S203M-[illegible]	+A04/[illegible] D	ABB	
-F3	2CDS2[illegible]	6A	AUTOMATSIKRING S20[illegible] 6A S201M-[illegible]	+A04/[illegible] B	ABB	
-R1	[illegible]	[illegible] 450V	MOTSTAND [illegible] 450V	+A04/3.4 D	[illegible]	
-S1	[illegible]	SPENNINGS VELGER	BRYTER MED [illegible] [illegible]	+A04/[illegible] E	KRAUS & NAIMER	
-X1	[illegible]		[illegible] REKKEKLEMME 4mm²	[illegible]	PHOENIX	
-X2	[illegible]	[illegible]	[illegible] REKKEKLEMME 4mm²	+A04/2.3 D, +A04/2.4 D, +A04/2.5 D	PHOENIX	
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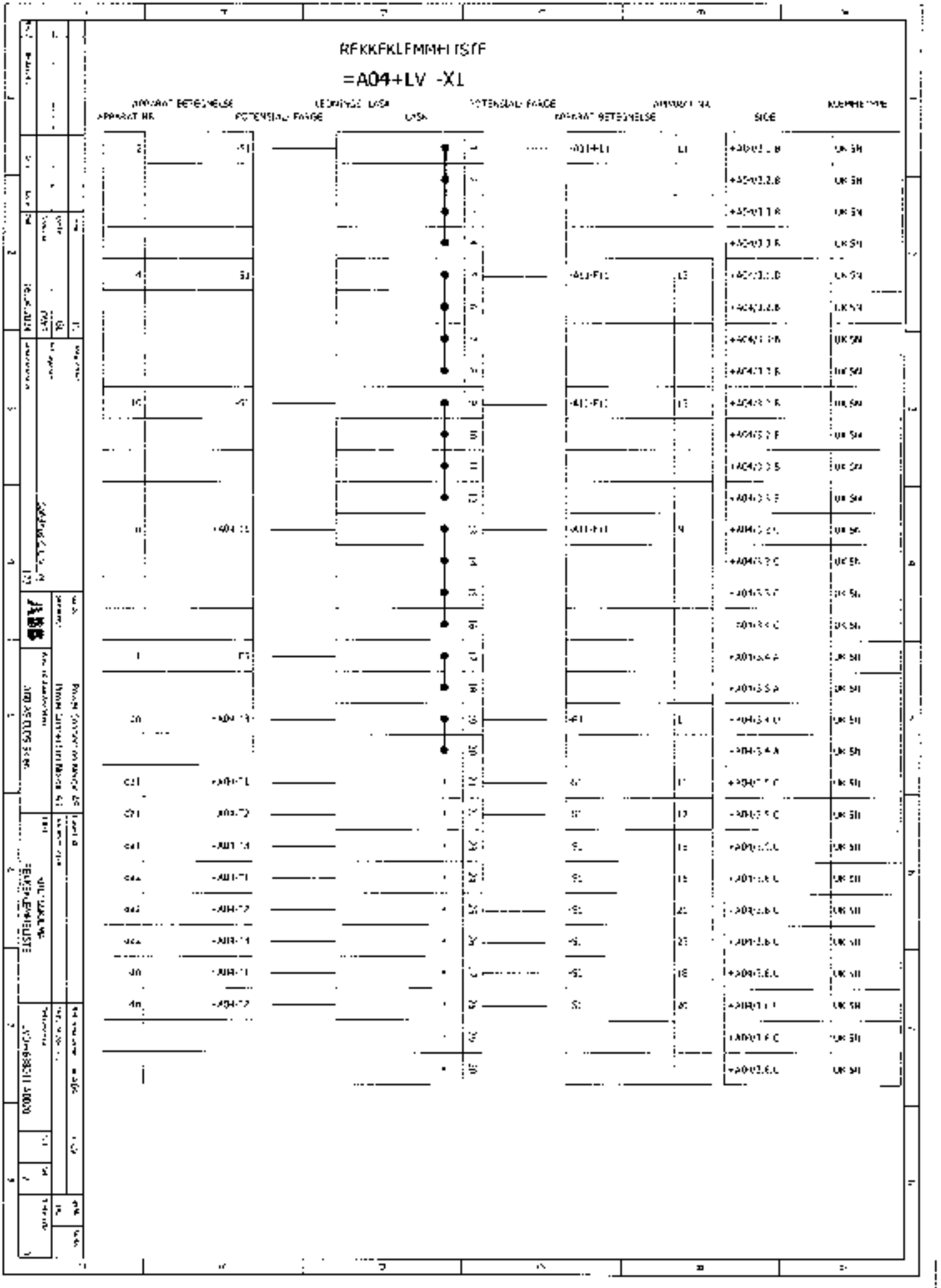

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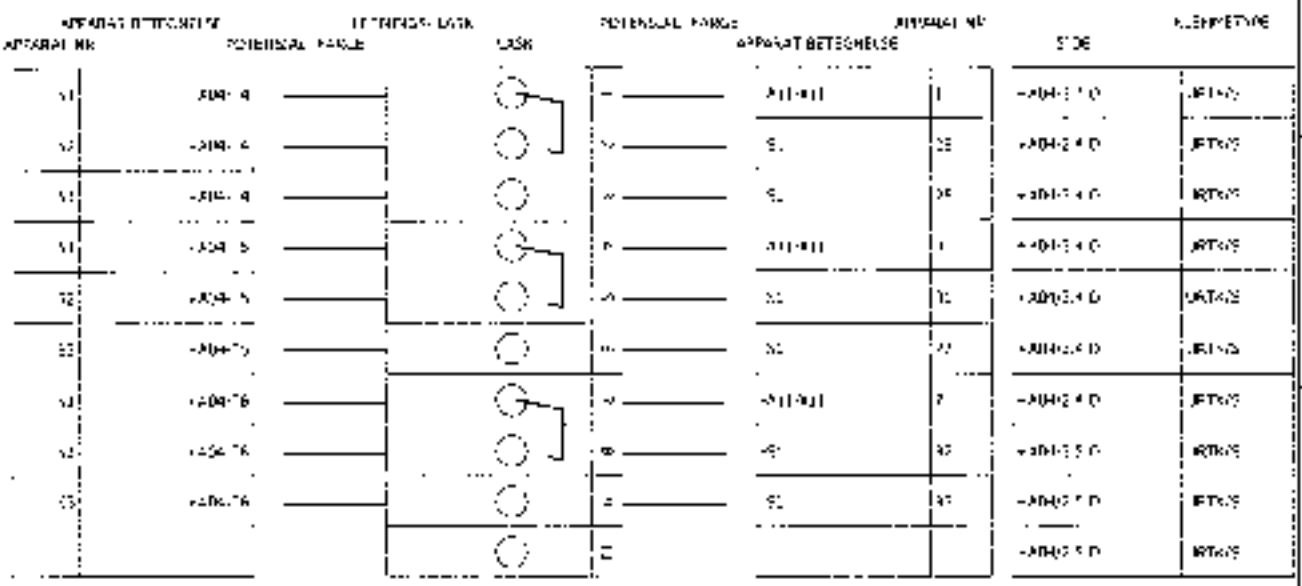


REKKEKLEMMELISTE

=A04+LV -X3

APPARAT BETEGNELSE / APPARAT NR	POTENSIAL FARGE	LEDNINGS LASK	LASK	KLEMME	POTENSIAL FARGE	APPARAT BETEGNELSE	APPARAT NR	SIDE	ELEMENTTYPE
			1	7		-S1	46	+A04/4.5.B	UK 5N
			1	4		-S1	55	+A04/4.5.C	UK 5N
			1	3		-S1	24	+A04/4.5.1	UK 5N
			1	10		-S1	32	+A04/4.5.B	UK 5N
			1	11		-S1	41	+A04/4.5.C	UK 5N
			1	12		-S1	42	+A04/4.[illegible]	UK 5N
			1	12		-S1	41	+A04/4.5.B	UK 5N
			1	13		-S	41	+A04/4.5.C	UK 5N
			1	15		-S	42	+A04/4.5.C	UK 5N

Power Connection Week 45

ARK 45 PLOS SYS

REKKEKLEMMELISTE

13.02.2024

Produktmanual

SafeRing / SafePlus 12-24kV
Montasje- og betjeningsveiledning

Power and productivity
for a better world™

INNHOLDSFORTEGNELSE

1. SIKKERHET

1.1 For din egen sikkerhet

- Følg monterings- og bruksanvisningen
- Monter anlegg kun innendørs i henhold til IEC 62271-1 cl.2.1. standard.
- Montering, drift og vedlikehold skal kun utføres av autoris ert personell
- Følg gjeldene standarder (IEC eller lokale), tilkoblingsvilkår fra kraftselskap og gjeldene HMS-regler.
- Les all informasjon i bruksanvisningen for anleggene
- Bruk hansker ved installasjon eller drift av anlegget.

1.2 Fagpersonell

All installasjon, igangsetting, drift og vedlikehold må utføres av kyndig personell med inngående kjennskap til anlegget.

Når det utføres vedlikeholdsarbeid, må forskrifter i det aktuelle landet bli strengt overholdt.

Vedlikeholdsarbeid må bare utføres på en profesjonell måte av kvalifisert personale som er kjent med egenskapene til produktet, og i samsvar med alle relevante IEC sikkerhets-forskrifter og andre tekniske standarder satt av myndigheter, også respektere andre overordnede instrukser. Det anbefales at ABBs servicepersonell bli kalt inn for å utføre service og reparasjonsarbeid.

1.3 Viktig informasjon

Vær spesielt oppmerksom på informasjonen som vises i manualen med følgende symbol:

Etter symbolet er fire forskjellige forklaringer som indikerer hvilke type skader som kan forårsakes, og bør tas hensyn til ved bruk av gitte forhåndsregler.

- **Fare** – varsler om de mest alvorlige og umiddelbare farer som kan føre til alvorlige personskade eller død.
- **Advarse**l – varsler om farlig bruk som kan medføre alvorlig personskade og død.
- **Forsiktig** – varsler om farlig bruk som kan medføre person skade og/eller skade på omgivelsene.
- **Merk** – identifiserer viktige prosedyrer eller krav som ved brudd på prosedyrer eller krav kan føre til skade på produktet eller omgivelsene.

Advarsel

Sørge for at de angitte elektriske karakteristikker ikke overskrides i henhold til anleggets drifts. Ha manualen tilgjengelig for alt personell som er involvert i installasjon, drift og vedlikehold. Brukeren er ansvarlig for alle forhold angående sikkerhet på arbeidsplassen og riktig bruk av anlegg.

Advarsel

Følg alltid instruksjonene i manualen og respektere reglene for god teknisk praksis (GEP)! Farlige spenninger kan føre til alvorlige personskader eller død. Følg sikkerhetsreglene som er gjeldene for ditt område.

Kontakt oss

Hvis du har ytterligere spørsmål om denne manualen, vil vårt service team gjerne hjelpe. Se baksiden av manualen for kontaktinformasjon.

SafeRing 3-kurs enhet unit CCV

2.Generell beskrivelse

SafeRing og SafePlus er et SF_6-isolert ringkabelanlegg og kompaktanlegg for applikasjoner i mellomspennings distribusjonsnett. SafeRing og SafePlus tilbyr en forseglet rustfri ståltank som inneholder alle beveglige komponenter og koblingsfunksjoner. Transformatoren er beskyttet enten med en bryter sikring kombinasjon eller en vakuum effektbryter.

Enhetene leveres fra fabrikk klare for installasjon.

SafeRing kan leveres som en to-, tre- eller fire-kurs enhet i standardkonfigurasjoner med ekstrautstyr i henhold til kundespesifikasjoner.

Tilgjengelige konfigurasjoner:
DeF, CCF, CCC, CCCF, CCFF, Dev, CCV, CCCC, CCCV, CCVV.

SafePlus har en unik fleksibilitet grunnet sin utvidbarhet og mulige kombinasjoner av fullt modulære og semi-modulære konfigurasjoner, med maksimalt 5 moduler i en SF_6-tank.

Rutinemessige tester utføres på alle enheter / moduler før utsendelse.

Tilgjengelige moduler er:
C - Lastskillebryter
F – Sikringslastskillebryter
D – Direkte kabeltilkobling
De –Direkte kabeltilkobling med jordslutter
V – Vakuum effektbryter
Sl – Seksjonsfelt med lastskillebryter
Sv –Seksjonsfelt med effektbryter. i kombinasjon med Br stigefelt
Be – Felt for samleskinnejording
M – Målefelt
V20, V25 – Vakuum effektbryter 20/25kA
Sv20, Sv25 – Seksjonsfelt med effektbryter 20/25kA

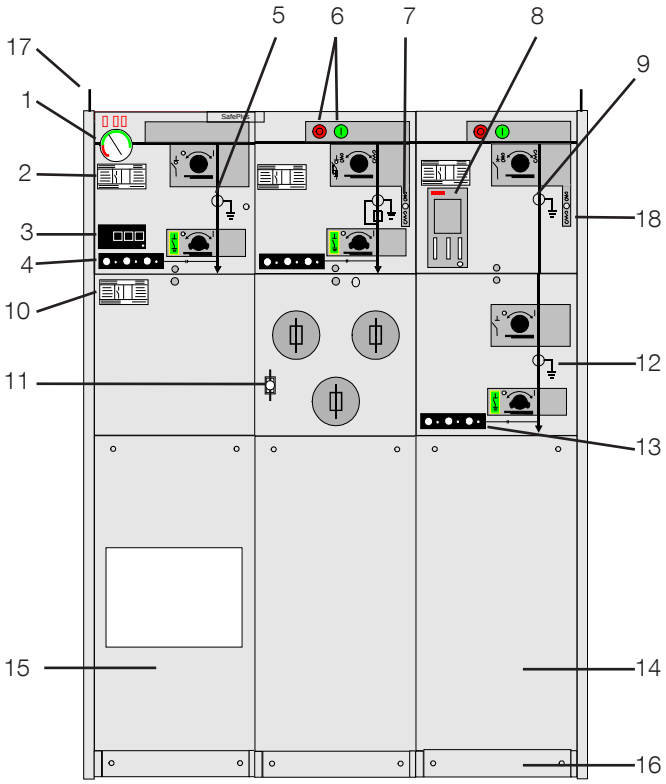
SafeRing / SafePlus med bryter sikring kombinasjon i samsvar med IEC 62271-105

For denne enheten vil transformatoren være beskyttet av sikringer i kombinasjon med en lastskillebryter. Lastskillebryteren bryter når sikringen brytes, da vil fjær med lagret mekanisk energi frigjøres.

SafeRing / SafePlus med vakuumbryter i samsvar med IEC62271-100

For denne enheten vil transformatoren være beskyttet av vakuumbryter kombinert med vern. Ytterligere informasjon finner du i produktkatalogen for SafeRing og SafePlus, 1VDD006104 GB.

2.1 YTRE MONTERING



Øvre frontdeksel

1. Trykkindikator
2. Typeskilt med serienummer
3. Kortslutningsindikator
4. Kapasitiv spenningsindikering
5. Lastskillebryter/jordslutters bryterposisjon
6. Trykknapper for betjening inn/ut
7. Fjærindikator spent/uspent
8. Vern
9. Bryterposisjon

Nedre frontdeksel

10. Typeskilt
11. Tilstandsindikator for sikringen
12. Lastskillebryter/jordslutters bryterposisjon
13. Kapasitiv spenningsindikator

Kabelromsdeksel

14. Standard
15. Med vindu
16. Støtte (kan fjernes)

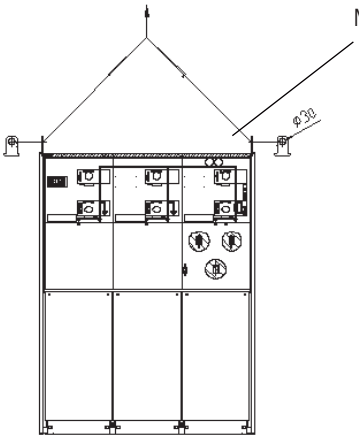
Sidedeksel

17. Løfteører
18. Betjeningsspak (som standard festet på anleggets høyre sidevegg)

3. TRANSPORT OG HÅNDTERING

Enhetene leveres fra fabrikk klare for installasjon

Vekttabell			
Maksimal vekt for standard SafeRing			
2-kurs DeV	300 kg	2-kurs DeF	300 kg
3-kurs CCV	450 kg	3-kurs CCF	450 kg
4-kurs CCCV	600 kg	4-kurs CCCF	600 kg
4-kurs CCVV	600 kg	4-kurs CCFF	600 kg
3-kurs CCC	450 kg		
4-kurs CCCC	600 kg		
SafePlus			
Standard 1-kurs		150 kg	
2-, 3- og 4-kurs		som for SafeRing	
5-kurs		750 kg	
M - målefelt inkl. transformatorer		250 kg	
Mt - tariff målefelt inkl. transformatorer		350 kg	



Vekten er uten ekstra utstyr, med unntak for transformatorer for M- og MT-moduler.

SafeRing / SafePlus er utstyrt med løfteører, men kan også flyttes på en pall med en gaffeltruck. Sørg for å at sikkerheten ivaretas.

Merk

Bruk kun godkjent løfteutstyr. Maksimal vinkel for løftestropp er 60 grader. Se figur!

3.1 KONTROLL VED MOTTAK

Ved mottak av SafeRing / SafePlus sjekk at levert utstyr ikke er blitt skadet under transport. Hvis skader har oppstått, må det dokumenteres og varsles umiddelbart til ABB.

Etter utpakking skal følgene kontrolleres:

1. Betjeningsspak – 1 stk. skal være inkludert, normal festet på høyresiden.
2. Sjekk at viseren på trykkindikatoren er i det grønne området.
3. Foreta en funksjonstest på de bevegelige delene.
4. Visuell kontroll av produktet.
   Eventuelle feil eller mangler må rapporteres umiddelbart til ABB.

3.2 LAGRING

SafeRing / SafePlus må lagres under tak på et tørt sted før det er installert og satt i drift.

4. TEKNISKE DATA

4.1 TEKNISKE DATA SAFERING

SafeRing		C-modul		F-modul		V-modul	
		Lastskillebryter	Jordslutter	Sikringslast-skillebryter	Jordslutter	Vakuum effektbryter	Jordslutter
Merkespenning	kV	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24
Isolasjonsnivå: prøvespenning	kV	28[6]/38/50	28[6]/38/50	28[6]/38/50	28[6]/38/50	28[6]/38/50	28[6]/38/50
Støtholdespenning	kV	95/95/125	95/95/125	95/95/125	95/95/125	95/95/125	95/95/125
Merkestrøm	A	630/630/630		200[1]		200/200/200	
Bryteevne:							
aktiv strøm	A	630/630/630					
ringlast	A	670/670/670					
kabel uten belastning	A	141/141/141					
transformator, tomgang	A			20/20/20			
jordfeil	A	205/160/160					
jordfeil kabel ladestrøm	A	117/91/91					
kortslutning	kA			se [2]		16/16/16	
Innkoplingsevne	kA	52,5/40/40	52,5/40/40	se [2]	12,5/12,5/12,5	40/40/40	40/40/40
Termisk grensestrøm 0,5 sek [3]	kA					16/16/16	
Termisk grensestrøm 1 sek [4]	kA				5/5/5	16/16/16	
Termisk grensestrøm 3 sek [5]	kA	21/16/16	21/16/16				16/16/16

[1] Avhenger av sikringens merkestrøm [2] Avhenger av sikringen [3] Maksimale verdier for gjennomføringer type A (200 serie plugg)
[4] Maksimale verdier for gjennomføringer type B (400 serie plugg) [5] Maksimale verdier for gjennomføringer type C (400 series boltet)
[6] GOST versjon er tilgjengelig med isolasjonsnivå 42kV

4.2 TEKNISKE DATA SAFEPLUS

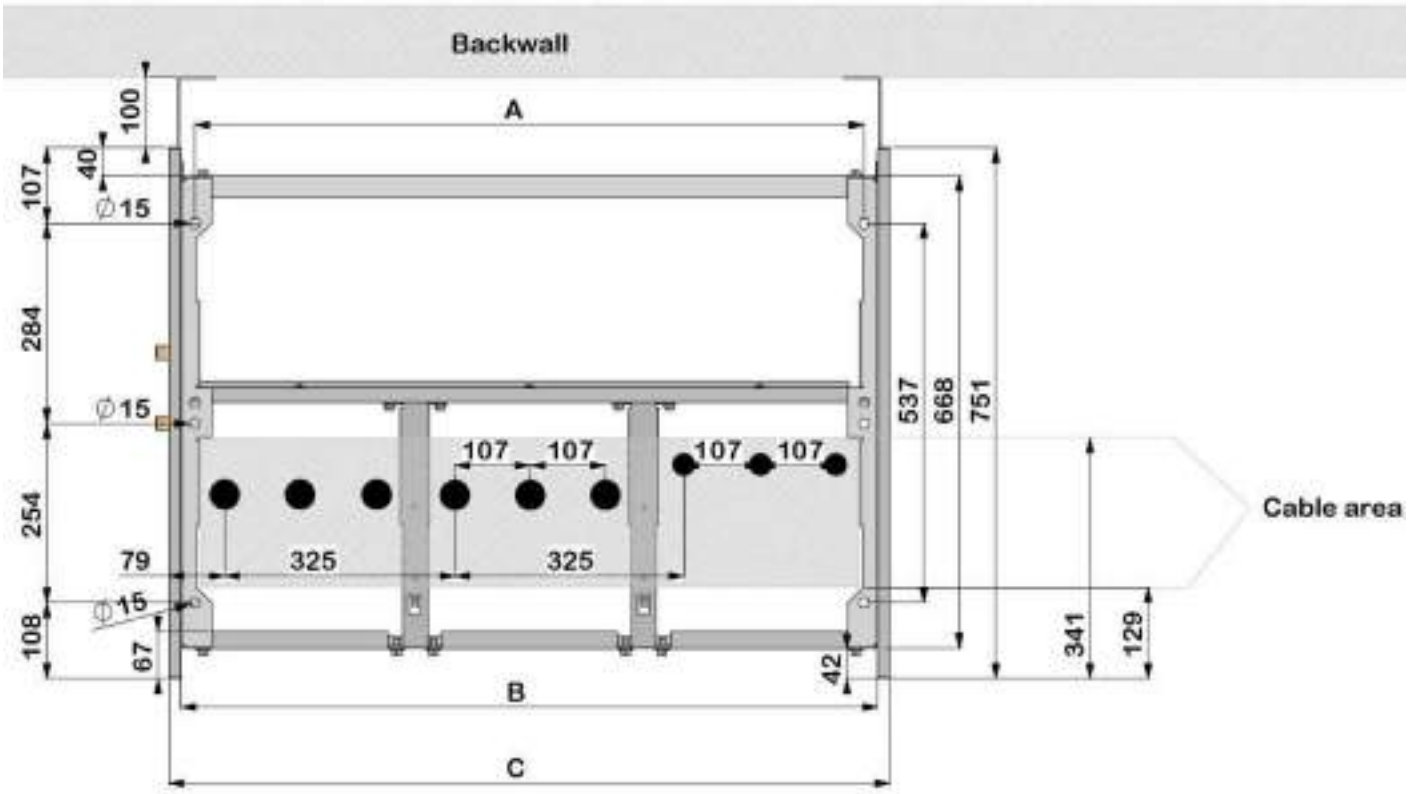
SafePlus		C-modul		F-modul		V-modul		V20 / V25 modul	
		Lastskille-bryter	Jordslutter	Sikringslast-skillebryter	Jordslutter	Vakuum effektbryter	Jordslutter	Vakuum effektbryter	Jordslutter
Merkespenning	kV	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24	12/17,5/24	12/24	12/24
Isolasjonsnivå: prøvespenning	kV	28[1]/38/50	28[1]/38/50	28[1]/38/50	28[1]/38/50	28[1]/38/50	28[1]/38/50	28[1]/50	28[1]/50
Støtholdespenning	kV	95/95/125	95/95/125	95/95/125	95/95/125	95/95/125	95/95/125	95/125	95/125
Merkestrøm	A	630/630/630		200 [2]		630/630/630		630/630	
Bryteevne:									
aktiv strøm	A	650/650/650							
kabel uten belastning	A	140/140/140							
transformator, tomgang	A			20/20/20					
jordfeil	A	205/160/160							
jordfeil kabel ladestrøm	A	117/91/91							
kortslutning	kA			se [3]		21/16/16		25/20	25/20
Innkoplingsevne	kA	65/52,5[4]/52,5	62,5/52,5[4]/50	se [3]	12,5/12,5/12,5	52,5/40/40	52,5/40/40	65/50	62,5/50
Termisk grensestrøm 0,5 sek [5]	kA					16/16/16			
Termisk grensestrøm 1 sek [6]	kA	25/-/-	25/-/-		5/5/5	16/16/16		25/21	25/21
Termisk grensestrøm 3 sek [7]	kA	25/21[4]/21	25/21[4]/21			21/16/16	21/16/16	25/21	25/21

[1] GOST versjon er tilgjengelig med isolasjonsnivå 42kV [2] Avhenger av sikringens merkestrøm [3] Avhenger av sikringen
[4] Tested at 15,2 kV [5] Maksimale verdier for gjennomføringer type A (200 serie plugg) [6] Maksimale verdier for gjennomføringer type B (400 serie plugg)
[7] Maksimale verdier for gjennomføringer type C (400 series boltet)

5. INSTALLASJON

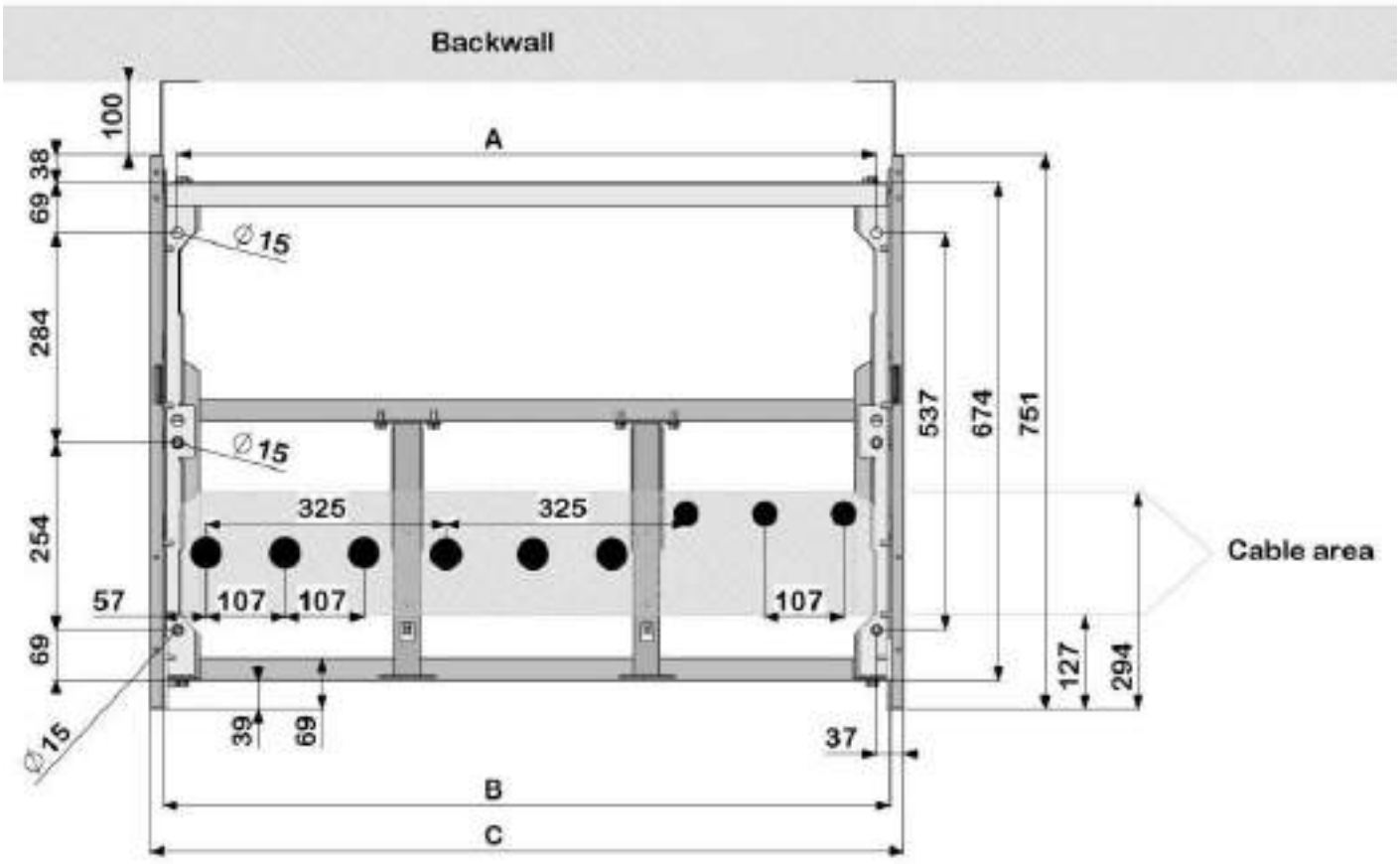
Gulvet må være godt planert og enheten må festes ved hjelp av forankringsbolter i samsvar med tegninger for antall moduler eller enheter.
Toleransen for ujevnhet er maksimalt 1 mm/m.

5.1 STANDARD 3-KURS ANLEGG



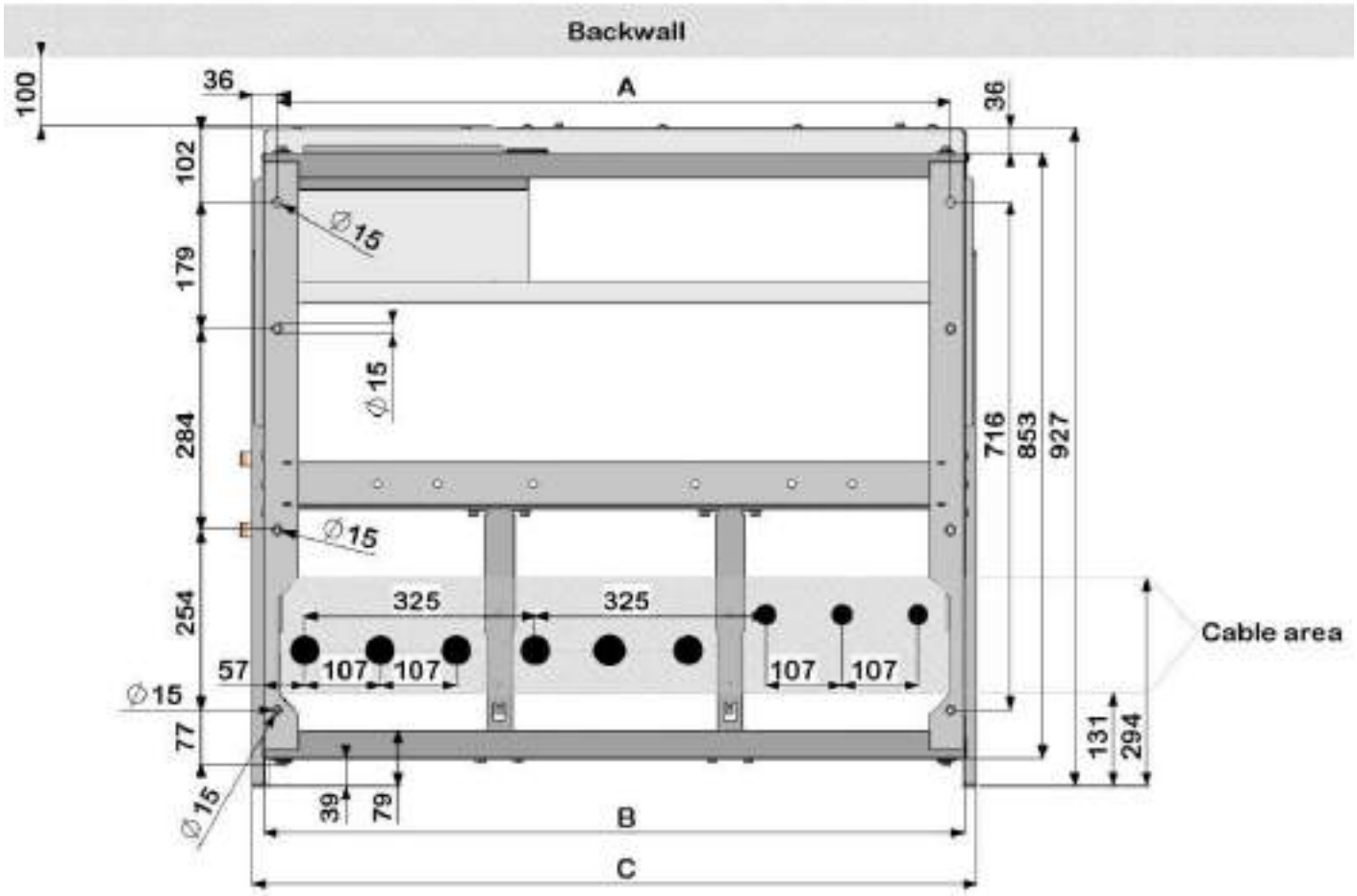
Anlegg	A	B	C
1-kurs	298	337	371
2-kurs	623	662	696
3-kurs	948	987	1021
4-kurs	1273	1312	1346
5-kurs	1598	1637	1671

5.2 3-KURS ANLEGG MED SOKKEL (AFL)

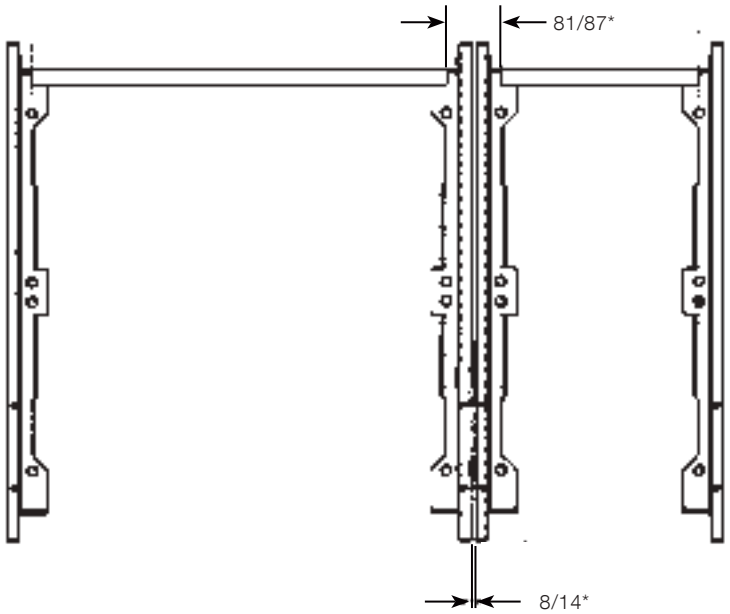


Anlegg	A	B	C
1-kurs	NA	NA	NA
2-kurs	623	662	696
3-kurs	948	987	1021
4-kurs	1272	1312	1346
5-kurs	1597	1637	1671

5.3 3-KURS ANLEGG MED SOKKEL (AFLR)

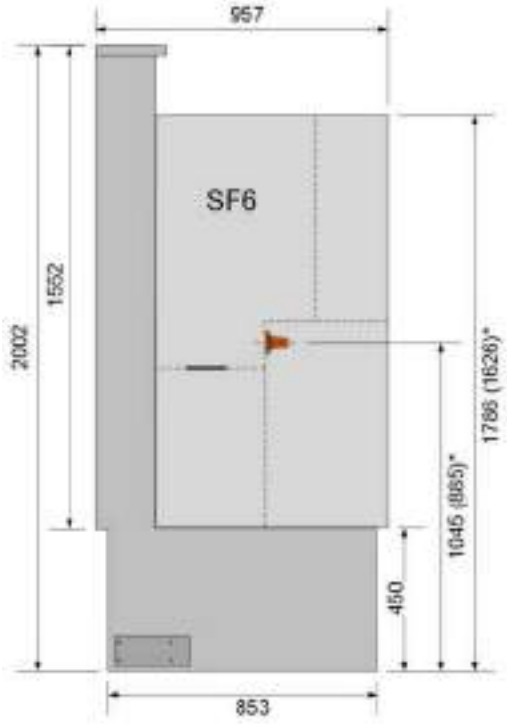


Anlegg	A	B	C
1-kurs	NA	NA	NA
2-kurs	623	662	696
3-kurs	948	987	1021
4-kurs	1273	1312	1346
5-kurs	1598	1637	1671

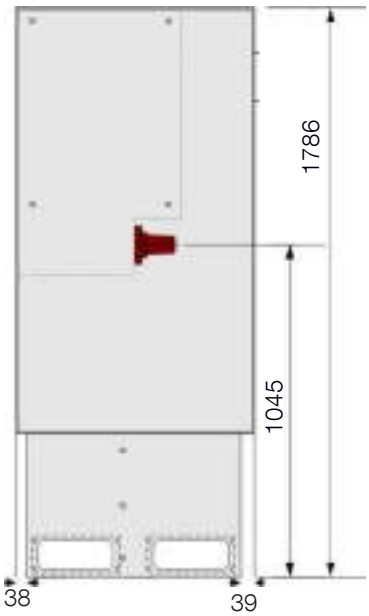


Avstanden mellom to anlegg som koples sammen ved bruk av ekstern samleskinne eller sideskjøt.

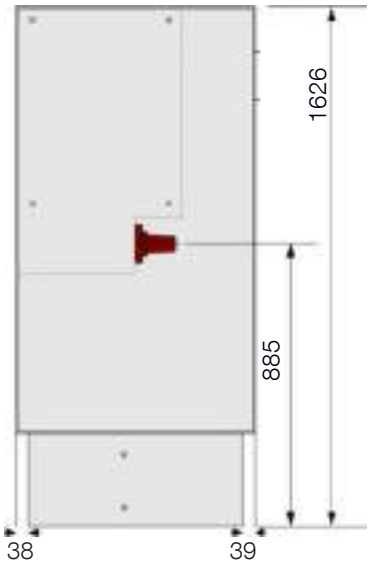
*) Ekstern samleskinne: 8 mm / 81 mm
Sideskjøt: 14 mm / 87 mm



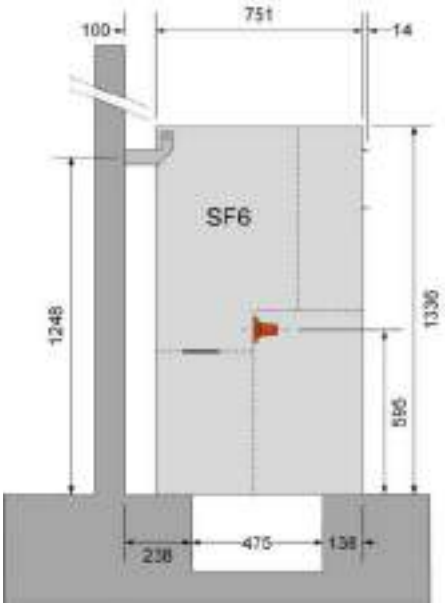
AFLR sokkel
* Dimensjoner for 290 mm sokkel



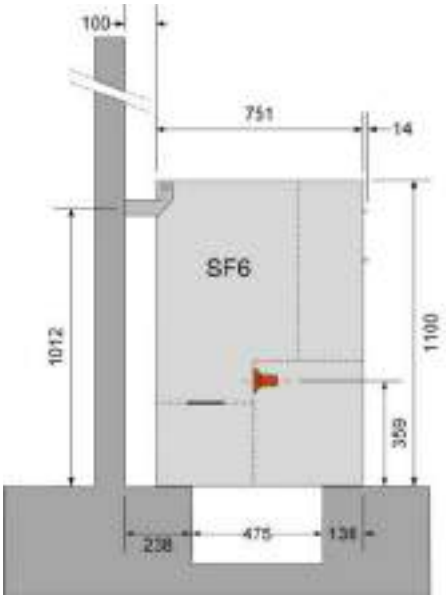
Sokkel, høyde 450 mm



Sokkel, høyde 290 mm



Standard anlegg installert over kabelgrøft



Anlegg av lav type installert over kabelgrøft

6. DIMENSJONER

Høyde (mm)		Standard anlegg					Lav type anlegg		
		Ikke lysbuesikkert anlegg uten sokkel	Ikke lysbuesikkert anlegg med 290 mm sokkel	Ikke lysbuesikkert anlegg med 450 mm sokke	IAC AFLR med 290 mm sokkel	IAC AFLR med 450 mm sokkel	Ikke lysbuesikkert anlegg uten sokkel	Ikke lysbuesikkert anlegg med 290 mm sokkel	Ikke lysbuesikkert anlegg med 450 mm sokke
Uten LS-topp eller kabelinnføringstopp	Standard	1336	1626	1786	2002	2002	1100	1390	1550
	Topptilkobling uten blindhetter	1466	1756	1916	2002	2002	1230	1520	1680
	Topptilkobling med blindhetter	1561	1851	2011	2002	2002	1325	1615	1775
	Ekstern samleskinne topp	1591	1881	2041	2002	2041	1355	1645	1805
	Samleskinneavdekning	1651	1941	2101	2002	2101	1415	1705	1865
Med kabelinnføringstopp (124 mm)	Standard	1460	1750	1910	2002	2002	1224	1514	1674
	Topptilkobling uten blindhetter	1466	1756	1916	2002	2002	1230	1520	1680
	Topptilkobling med blindhetter	1561	1851	2011	2002	2011	1325	1615	1775
	Ekstern samleskinne topp	1591	1881	2041	2002	2041	1355	1645	1805
	Samleskinneavdekning	1651	1941	2101	2002	2101	1415	1705	1865
Med LS-topp (470 mm) *)	Standard	1806	2096	2256	2096	2256	1570	1860	2020
	Topptilkobling uten blindhetter	1806	2096	2256	2096	2256	1570	1860	2020
	Topptilkobling med blindhetter	1806	2096	2256	2096	2256	1570	1860	2020
	Ekstern samleskinne topp	1806	2096	2256	2096	2256	1570	1860	2020
	Samleskinneavdekning	1806	2096	2256	2096	2256	1570	1860	2020
Med LS-topp (700 mm) *)	Standard	2036	2326	2486	2326	2489	1800	2090	2250
	Topptilkobling uten blindhetter	2036	2326	2486	2326	2486	1800	2090	2250
	Topptilkobling med blindhetter	2036	2326	2486	2326	2486	1800	2090	2250
	Ekstern samleskinne topp	2036	2326	2486	2326	2486	1800	2090	2250
	Samleskinneavdekning	2036	2326	2486	2326	2486	1800	2090	2250

*) For V-module12kV/25kA and 24kV/20kA med LS-topp vil den totale høyden øke med 100 mm.

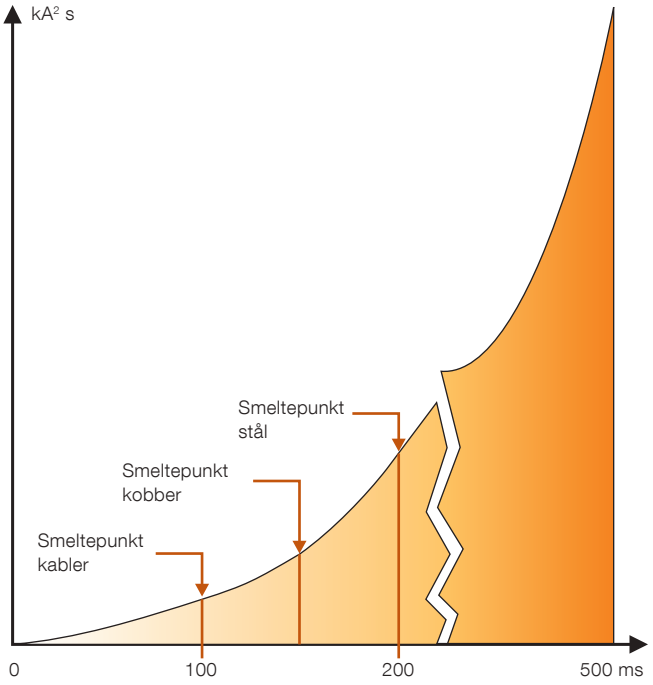
7. LYSBUEKLASSIFISERING (IAC)

Ved utvikling av alle ABB's produkter har man fokus på personsikkerthet. Dette er grunnen til at Safering/Safeplus-porteføgen er utvilket og testet for flere scenarier i forhold til å tåle en lysbue som er på samme nivå som maksimale kortsluningsstrømmer. Tester viser at kapslingen til Safering/Safeplus kan beskytte personell selv om de oppholder seg i nærheten når det oppstår en lysbue.

Årsaker og virkninger av lysbue

En lysbue er en høyst usannsynlig feil, selv om den teoretisk kan være et resultat av flere faktorer som f.eks:

- Isolasjonsfeil som følge av defekte komponenter. Årsakene kan være negative miljøfaktorer som f.eks sterkt forurenset atmosfære.
- Mangelfull opplæring av personell som har ansvaret for installasjon av anleggene, som medfører feil på kabelene.
- Brudd eller manipulering av forriglingene.
- Overoppheting av kontaktflatene, f.eks når tilkoplingene ikke er tilstrekkelig trukket til.
- Kortslutning forårsaket av dyr som har kommet seg inn i kabelrommet.



Lysbuens varighet og skade

Energien som skapes av en lysbue har følgende konsekvenser:

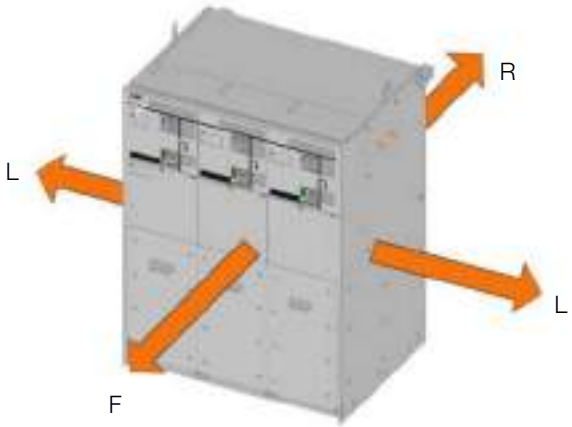
- Økt trykk i tanken.
- Temperaturøkning.
- Ytre påvirkning på kapsling.
- Anlegget blir utsatt for mekanisk stress.
- Smelting, dekomponering og fordampning av materiale.

Testet ihht IEC standard 62271-200

SafeRing/SafePlus-anleggenes evne til å tåle en lysbue er dokumentert av typetesten ihht IEC 62271-200:

Tilgjengelighet: A, B eller C (anlegg)
A=Kun autorisert personell
B=Tilgjengelig for alle
C=Begrenset av installasjonen

F-Front=Klassifisert for forsiden
L-Lateral=Klassifisert for sidene
R-Rear=Klassifisert for baksiden



Alle testobjektene besto testene med følgende testkriterier ihht standaren:

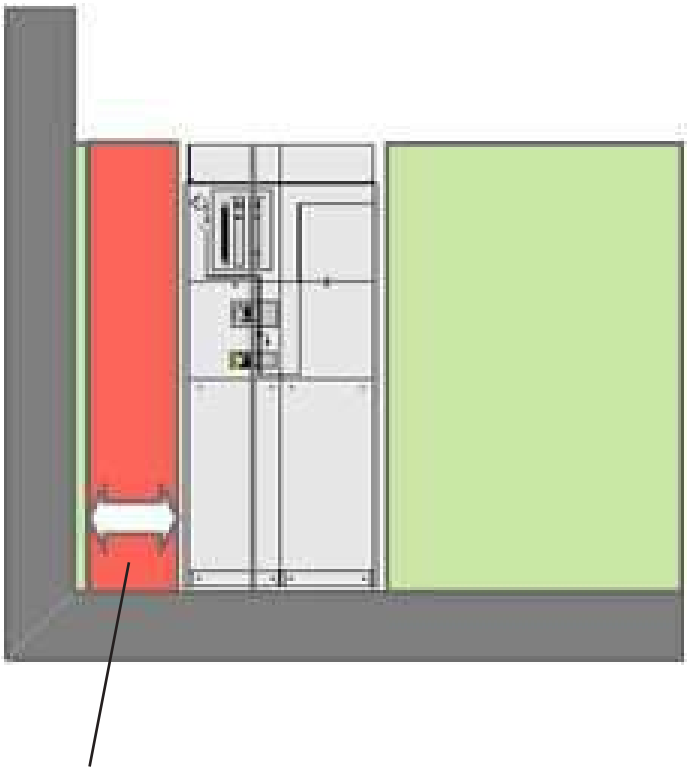
- Korrekt sikrede dører og deksler åpnes ikke
- Ingen fragmentering av kapslingen skjer innen normert tid for testen. Projisering av små deler opptil 60g aksepteres.
- Lysbuen forårsaker ingen hull i kapslingen opptil en høyde av 2 m
- Indikatorer antennes ikke på grunn av effekten av varme gasser
- Kapslingen forblir koblet til sitt jordingspunkt

Når du installerer ringkabelanlegg eller kompaktanlegg med lysbueklassifisering AFL med ventilasjon bakover, gjelder følgende:

- Anlegget må være utstyrt med lysbuesikkert kabelrom
- Takhøyden skal være minimum 2400 mm
- Avstanden fra enhetens bakside og veggen skal være minimum 100 mm
- Refleksjonplaten med høyde 650 mm skal være montert
- Om avstanden fra baksiden av anlegget til bakveggen er større enn 100mm, må området bak anlegget være avsperret

Advarsel

Avstand fra sidevegg: 0-20 mm. Om anlegget er plassert mer enn 20 mm fra sidevegg, må refleksjonplate installeres på begge sider. For å enkelt kunne installere platene, anbefales det å sette anlegget minimum 300 mm fra sidevegg.

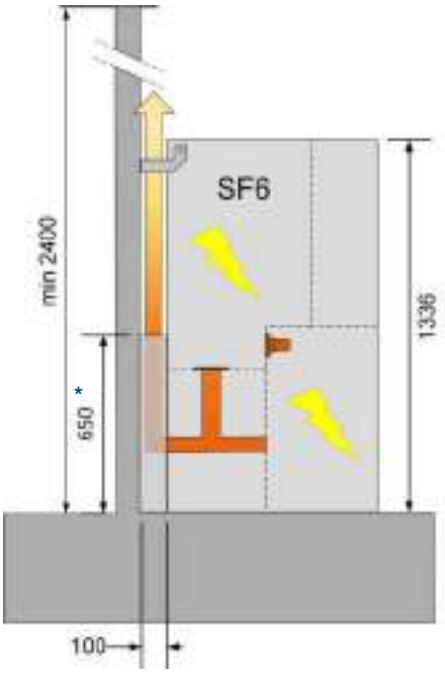


20 - 300 mm

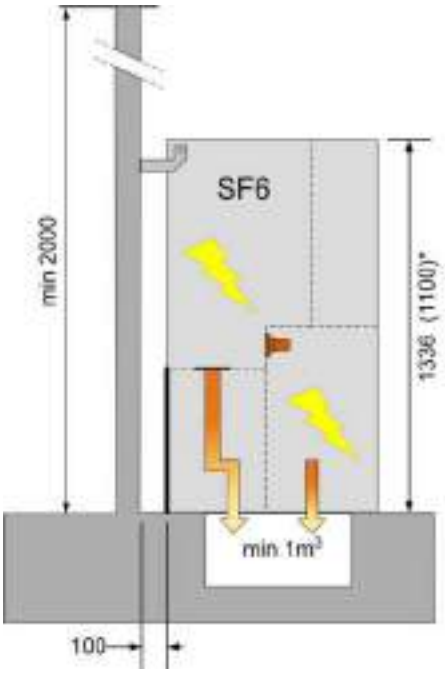
Rødt område er ikke anbefalt plassering, installasjon er lovlig, om refleksjonsplater lar seg montere til vegg.

For installasjon av anlegg med lysbueklassifisering AFL med utblåsning nedover gjelder følgende:

- Anlegget må være utstyrt med lysbuesikkert kabelrom
- Takhøyden skal være minimum 2000 mm
- Avstanden fra enhetens bakside og veggen skal være minimum 100 mm
- Kabelrommets bakplate skal være montert
- Lengden på kabelgrøften må være 2000 mm, med en åpning på minimum 0.5 m^2
- Minimumsdimensjoner for kabelgrøften er 230 x 355 mm



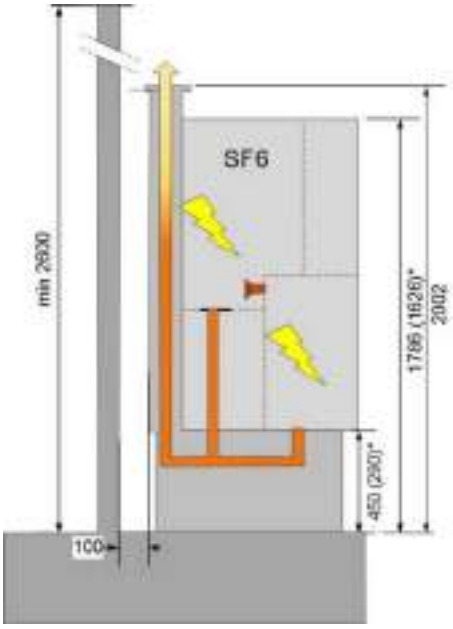
* Refleksjonsplate
Høyde på plate for målefelt er 1317 mm



* 1100 mm versjon er tilgjengelig

For installasjon av anlegg med lysbueklassifisering AFLR med ventilasjon oppover gjennom utblåsningskanal, gjelder følgende:

- Anlegget må være utstyrt med lysbuesikkert kabelrom
- Enheten kan monteres frittstående
- Takhøyden skal være minimum 2600 mm
- Avstanden fra enhetens bakside og veggen skal være minimum 100 mm



*) 290 mm sokkel er tilgjengelig

8. KABELROMMET

FORSIKTIG
Ved forriglet kabelrom, kan dekselet åpne/lukkes kun når jordslutter er inn

MERK
Verktøy som trengs for installering og vedlikehold er spesifisert i verktøylisten i kapittel 20.6.

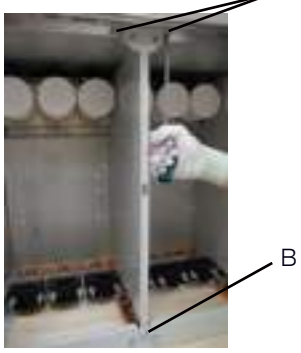
8.1 STANDARD KABELROM

Fjerning av kabeldekselet:

1. Løsne skruene på kabeldekselet, trekk ut og løft dekselet av.

2. Fjerning av bunnlist.

3. Bunnlist fjernet.



4.Skillevegg kan fjernes ved å skru opp Ax2 og B.

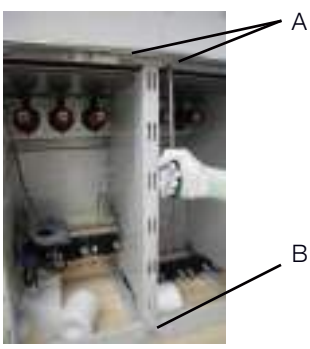
8.2 LYSBUESIKKERT KABELROM

Fjerning av kabeldekselet:

1. Løft opp håndtak, trekk ut og løft av dekselet.

2. Fjerning av bunnlist.

3. Bunnlist fjernet.



4. Skillevegg kan fjernes ved å skru opp Ax2 og B.

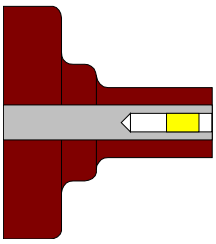
8.3 KABELTILKOBLING

Safering / Safeplus er utstyrt med eksterne gjennomføringer som oppfyller DIN47636T1 & T2 / EDF HN 525-61 for terminering av kabler.

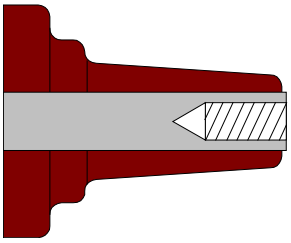
Alle gjennomføringer er i samme høyde fra gulvet og er beskyttet av kabeldekselet.

Safering / Safeplus kan leveres med følgende gjennomføringer:

	Type modul			
Gjennomføringer	C	F	V	D, De, V20/V25
Interface A		X	X	
Interface B	X	X	X	X



Interface A med plugg
200 serie, In = 200A



Interface C med
M16 x 2 metriks gjenger
400 series In = 630A

Kabeltilkoblinger

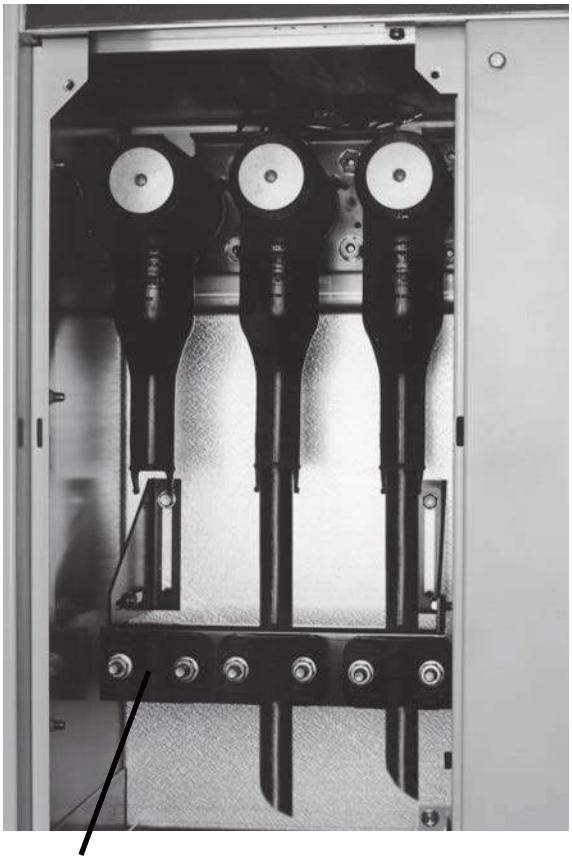
Tilkoblinger fra følgende produsenter anbefales:
ABB Kabeldon
Südkabel
Tyco Electronics Raychem
Power Systems
3M
Euromold
NKT cables

Vennligst se leverandørdokumentasjon for flere detaljer.

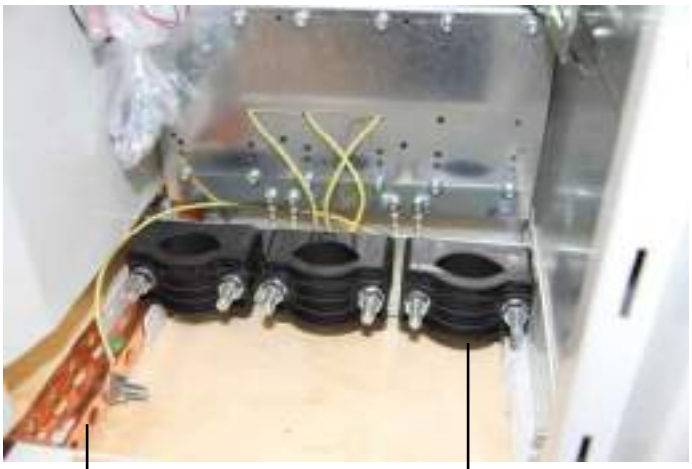
FARE

Produsentens monteringsveiledning skal følges. Sørg for å smøre gjennomføringene grundig med silikonen som følger med. Bruk kun isolerte kabeltilkoblinger.

Der kablene ikke er tilkoblet, må jordslutter låses i inne-posisjon eller gjennomføringen må være utstyrt med blindhetter før anlegget spenningssettes.



Kabelklammer med justerbart kabelfestejern (tilleggsutstyr).



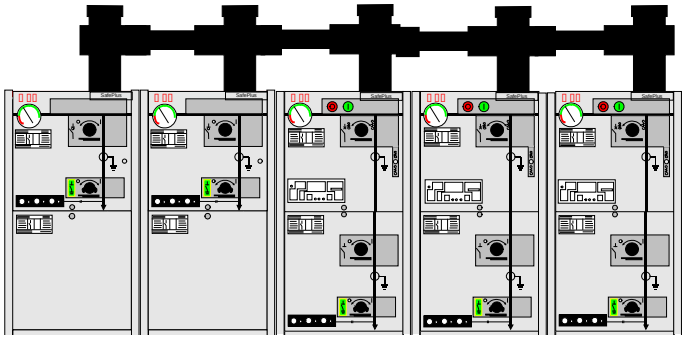
Jording

Kabelklemme (tilleggsutstyr)

9. UTVIDELSE AV ANLEGG

9.1 EKSTERN SAMLESKINNE

Safering og Safeplus kan utstyres med en ekstern samleskinne. Se egen bruksanvisning: 1VDD006006 GB.



9.2 UTVIDELSE MED SIDESKJØT

Safering og Safeplus kan utstyres med en sideskjøt. Se egen bruksanvisning: 1VDD006106 GB.

10. STRØM- OG SPENNINGSTRANSFORMATORER

Safering og Safeplus kan utstyres med strøm- og/eller spennigstransforrmatorer.
Se installasjons- og vedlikeholdsmanual: 1VLM000610.

11. MOTORDRIFT

Brytere, vakuum effektbrytere og jordslutter opereres av mekanismer som ligger bak frontpanelet. Mekanismene for alle brytere betjenes manuelt med betjeningsspaken (standard), eller utstyrt med motordrift (tilleggsutstyr).
Jordsluttere kan bare betjenes manuelt.

Motordrift kan ettermonteres. Bruk håndbøkene:

Alle enheter leveres med tegninger som viser de elektriske kretser.

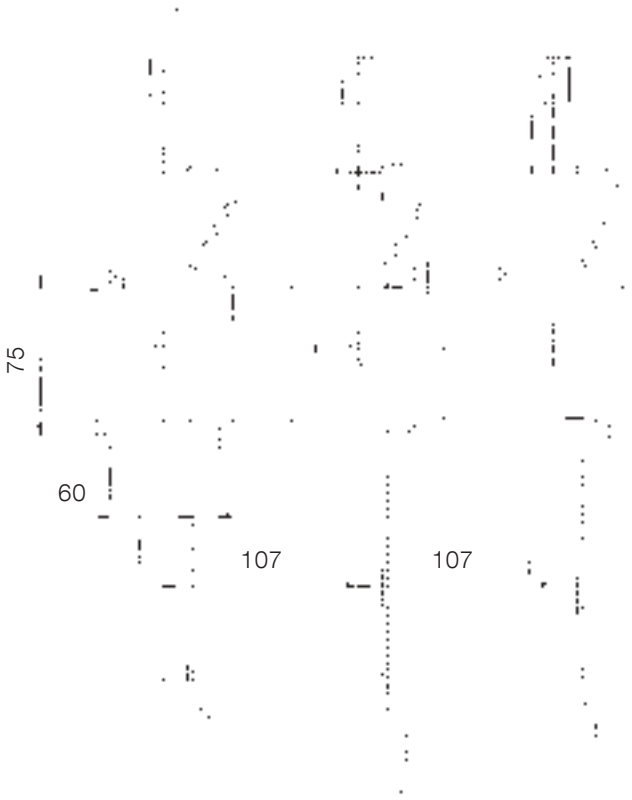
Installasjonsinstruksjoner dekker følgende moduler:

3PKE mekanisme for lastskillebryter (C-modul)
1VDD200001

3PKSE mekanisme for lastskillebryter (C-modul)
1VDD200002

3PAE mekanisme for sikringslastskillebryter (F-modul)
1VDD200003

2PA mekanisme for effektbryter (V-modul)
1VDD200004



Montering av strømtransformatorer:
Kabelskjermen ledes tilbake gjennom hullet i midten og er jordet, slik som vist i figuren.

12. VERN OG STRØMTRANSFORMATORER

Et beskyttelsesvern er montert i hver effektbryter. Kablene fra beskyttelsesvernet til strømtransformatoren er montert ved fabrikken, og enden er i kabelrommet, klare for tilkobling strømtransformatoren(e).

FORSIKTIG
Før montering:
Kontroller at strømtransformatorer er av korrekt type, med den riktig omsetning, for distribusjon-transformatorens merkestrøm og for justeringsområdet på vernet (se vernets manual).

Hver strømtransformator må monteres på sin høyspentkabel før kabelkontakten er montert.

Etter at strømtransformatorerene er montert i kabelrommet, kobles kabler fra vernet til strømtransformatorene. Se vedlagt kretsskjema for aktuell ordre.

Safering / Safeplus effektbrytere leveres med selvdrevne overstrøms-og jordfeilbeskyttelse eksempelvis ABB REJ 603 V.1,5.

Vern med hjelpespenninger

SafePlus kan leveres med avanserte vern:
- REF615 (høyt LS-skap med hengslet dør)
- REF630 (høyt LS-skap med hengslet dør)
- REF611 (høyt LS-skap med hengslet dør)
- REF620 (høyt LS-skap med hengslet dør)

Separate håndbøker med eksempler på innstillinger er utarbeidet for hvert av disse vernene.

13. TRYKKINDIKATOR

Safering / Safeplus leveres vanligvis med en trykkindikator i form av et manometer. I tillegg er det mulig å tilpasse anordningen til et elektrisk signal hvis trykket er lavt. Dette krever ekstra spenningsforsyning.

13.1 GASSTRYKK

SafeRing / SafePlus inneholder SF6-gass med et nominelt trykk på 1,4 bar ved 20° C.

SafeRing / SafePlus er "forseglet for livet" og utstyrt med en temperaturkompensert trykkmåler.

Viser i grønt område - Enheten har tilfredsstillingde trykk.
Viser i rødt område - Trykket er ikke tilfreddsstillende

ADVARSEL

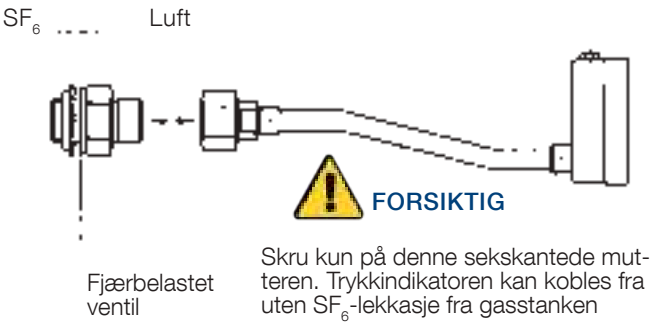
Drift når trykket er for lavt (viser i rødt område:
Om viseren er i det røde området kan ikke anlegget være i drift (påsatt spenning). SF6-gass skal fylles som anvist in instruksjonsmanualen og tabellen under før spenning kan påsettes.
For nærmere beskrivelse, se instruksjonsmanual 1VDD201603.

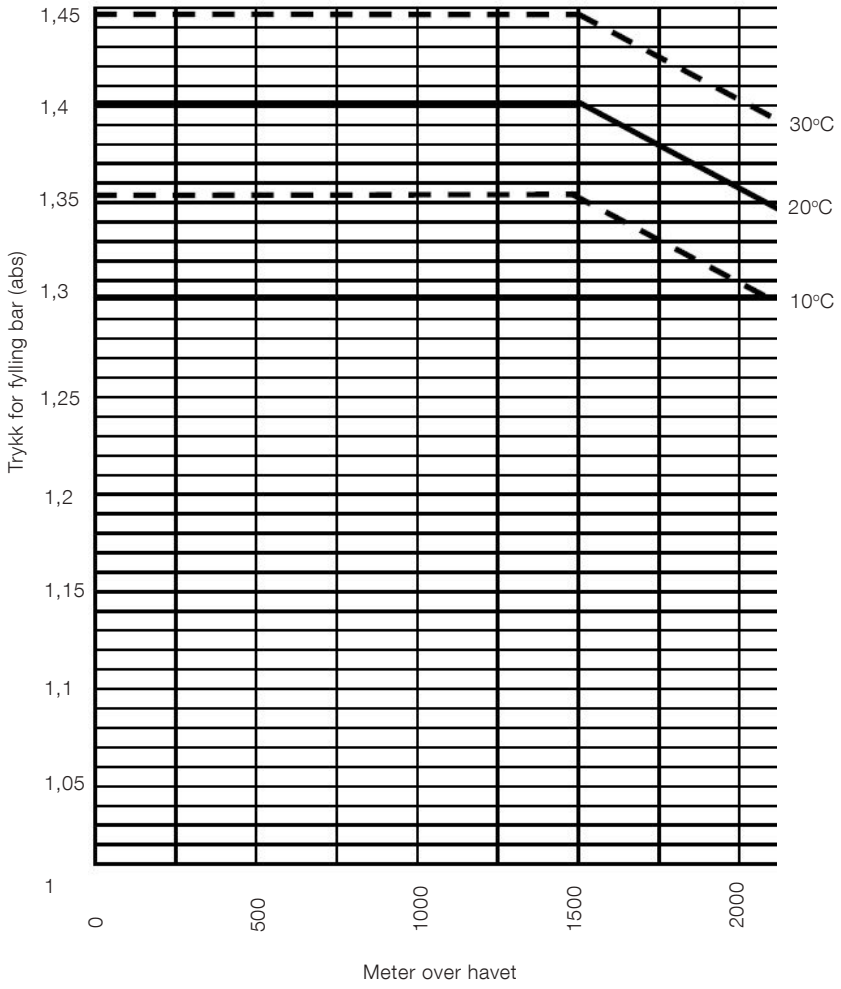
ADVARSEL

Etterfylling av SF_6-gass i Safering / Safeplus er risikofylt! Utføres kun av kvalifisert personell!

Følgende utstyr er nødvendig: SF6-gass flaske med trykkmåler og reduksjonsventil, flaske for bytte av SF6 / luftblanding, adapter og trykkmåler. Det er viktig at trykkmåleanordningen viser absolutt trykk. (1,4 bar) Hvis måleinstrumentet har overtrykksindikering, og indikerer overtrykk, ta kontakt med ABB for instruksjoner (NHP 408025).

1. Fjern frontdekselet og om mulig toppdekselet. Skru trykkindikatoren ved å skru ut mutteren som vist på figuren til høyre.
2. Fest adapteren til ventilen. Tiltrekningsmomentet er maks 45 Nm.
3. Før tilkobling av slangen fra gassflasken til adapteren, må luften i slangen fjernes ved å kjøre SF_6-gass gjennom slangen. SF_6-gassen skal gjenvinnes.
4. 4.Når gassen strømmer inn i gasstanken, skal trykkmåleren observeres. Når den viser 1,4 bar absolutt ved omgivelsestemperatur 20° Celsius, skal fyllingen stoppe. Se tabell for fyllingstrykk på neste side.
5. Fjern fylleslangen og koble trykkenheten til for å sjekke trykket i gasstanken.
6. Når trykket er riktig (1,4 bar absolutt), fjern adapteren, sjekk at forseglingen mellom trykkindikatoren og ventilen er ren, og skru manometeret til gasstanken med tiltrekkingsmoment maks 45 Nm som vist nedenfor.





SF_6-gass temperatur °C	Trykk for fylling (abs) mbar
0	1305
5	1328
10	1352
15	1376
20	1400
25	1424
30	1448
35	1472
40	1496

13.2 ATMOSFÆRETRYKK

Maksimal høyde over havet for montering uten å redusere gasstrykket er 1500 meter. I intervallet fra 1500 til 2500 meter, kan gasstrykket reduseres i henhold til figur på forrige side. For installasjoner over 2500 meter, ta kontakt med ABB for instruksjoner.

13.2.1 JUSTERING AV GASSSTRYKK VED LAVT ATMOSFÆRETRYKK

Fjern frontdekselet for å få tilgang til toppen av manometeret. På toppen av manometeret, er en skrue. Åpne skruen forsiktig til viseren begynner å bevege seg. Når viseren stopper, skru til skruen. Når trykket er utjevnet, og med mindre det er en lekkasje (som er meget usannsynlig) vil viseren innstille seg på riktig nivå.

Skrue for å justere trykkeT

14. DRIFT AV BRYTERE

14.1 DRIFTSFORHOLD

Normale omgivelsesforhold

Safering / Safeplus er generelt utstyrt for drift / tjeneste i normale innendørsforhold i samsvar med IEC 62271-1.

Følgende begrensninger gjelder:

Omgivelsestemperatur

Maks. temperatur	+40°C
Maks. temperatur (24-timers gjennomsnitt)	+35°C
Min. temperatur	- 25°C

Luftfuktighet

Maks. gjennomsnittlig relativ luftfuktighet målt over 24 timer	95%
Maks. gjennomsnittlig relativ luftfuktighet målt over en måned	90%

Spesielle forhold

I samsvar med IEC 62271-1, skal produsenten og sluttbruker enes om spesielle driftsforhold som avviker fra drift under normale forhold.

Produsenten / leverandøren må konsulteres på forhånd dersom spesielt vanskelige driftsforhold er involvert. Når Safering / Safeplus er installert mer enn 1500 meter over havet, vil det atmosfæriske trykket bli lavere og overtrykket inne i tanken må reduseres.

Flytransport

Enheter / moduler fraktet med flyfrakt leveres med redusert overtrykk. For etterfylling, se prosedyre for etterfylling av SF_6-gass.

Bruk av røntgenforskrifter

En av de fysiske egenskaper av vakuumisolasjon er muligheten for røntgen utslipp når kontakt-gapet er åpent. Den angitte testen er utført av Physikalisch-Technische Bundesanstalt (PTB) i Braunschweig viser at den lokale dosering utgang 1. Sv / t i en avstand på 10 cm fra overflaten ikke overskrides ved nominell spenning.

Resultatene er som følger:

- Testing av bryterenheten eller vakuumavbrudds VDE 0671 del 100 eller IEC 62271-100 på det aktuelle isolasjonsnivået kan kun utføres av kvalifisert personell se bestemmelsene i EU enkel standard (Fastsettelse 96/29 / Euratom av senatet fra 13. mai 1996 (ABI.L 159 fra 29. juni 1996)).
- Bruk av isolasjonsnivå spesifisert for omkoplingsanordningen etter VDE 0671 del 100 eller IEC 62271-100 er helt trygt.
- Høyere spenninger enn isolasjonsnivået eller DC testspenning spesifisert i VDE eller IEC-standarder må ikke brukes.
- Avhengig av avstanden mellom kontaktene opprettholdes.
- Riktige mekaniske funksjoner og kraftoverføring.
- Sikkerhetsavstander må opprettholdes.

ADVARSEL
KONTROLL OG OVERVÅKNING AV GASSEN

Safering / Safeplus er et trykktett system som normalt ikke krever spesielle inspeksjoner. Men gasstrykket på manometeret bør alltid kontrolleres før bruk.

14.2 GENERAL WARNINGS AND PRECAUTIONS

FARE
Ikke gå på toppen av anlegget!

FARE
Anleggets dører skal alltid være lukket under drift
.

ADVARSEL
Drift og alle typer arbeid må utføres av kvalifisert og spesialisert personell som er kjent med Safering / Safeplus og følg alle sikkerhetsregler i samsvar med IEC standarder og andre forskrifter, samt eventuelle lokale arbeidsreglement og instruksjoner.

MERK
Nødvendig verktøy for installasjon og vedlikehold av anlegget er beskrevet i verktøylisten under kapittel 20.6.

14.3 IDRIFTSSETTELSE

14.3.1 FORBEREDENDE ARBEID

Før tilkobling til mellomspenningsnettet

Følgende arbeid skal utføres i forberedelsene til å sette i drift:

- Sjekk den generelle tilstanden til anlegget for eventuelle skader og defekter.
- Inspiser koblingsenheter, kabelgjennomføringer, isolerende deler, etc.
- Sjekk lakken for eventuelle skader/riper og, hvor nødvendig, male over riper for å unngå korrosjon.
- Fjern alle rester av materialer, fremmedlegemer og verktøy fra anlegget.
- Om nødvendig, rengjør anlegget og fjern alle spor av fett eller smuss
- Monter alle deksler fjernet under montering og testprosedyrer.
- Slå hjelpe- og styrespenning på.
- Gjennomføre testoperasjoner på bryterenhetene enten manuelt eller ved hjelp av elektrisk styring, samtidig observere posisjonsindikatorer.
- Sjekk at de mekaniske og elektriske forriglingene virker, uten bruke av makt.
- Undersøk SF_6-gasstrykket i tanken. Det må være på grønt nivå før oppstart.
- Instruere lokale operatører om de grunnleggende funksjoner for riktig bruk av anlegg.

Andre sjekkpunkter

Avhengig av fordelingen av ansvar, kan det også være nødvendig å sjekke følgende utstyr i nærheten av bryter: --

- Strømførende kabler
- Hjelpekabler
- Hjelpestrømkilde
- Separatstyringsenhet
- Jordingssystem
- Bryterinstallasjonslokalets utstyr
- Rommets fysiske karakteristikker:
  - Trykkmotstand ved lysbuefeil
  - Ventilasjon
  - Temperatur
  - Luftfuktighet

14.4 OPPSTART

Instruksjon

- Følg alle gjeldene sikkerhetsforskrifter.
- Sjekk at alle brytere er i **åpen** posisjon
- Sett på strømkilde.
- Koble inn brytere trinnvis, observer at signalene og indikatorene er korrekte.
- Om nødvendig, sjekk at lederne er i fase når det er flere innkommende tilførselsledninger og koblingsfelt.
- Utfør alle målinger og sjekk at alle funksjoner som er avhengige av høyspent strømforsyning er tilkoblet.
- Sjekk anlegget for uregelmessigheter..

15. DRIFT

Alle brytere kan betjenes med den medfølgende betjenings-håndtak.
Intern mekanisk forrigling mellom lastskillebryter/skillebryter og tilhørende jordslutter forhindrer feilbetjening. For detaljert forriglingsbeskrivelse, se egen oversikt for hver modul i katalogen 1VDD006104 GB.

Driften av skillebryter / effektbryter og jordslutter kan bli ytterligere forriglet ved hjelp av en hengelås.

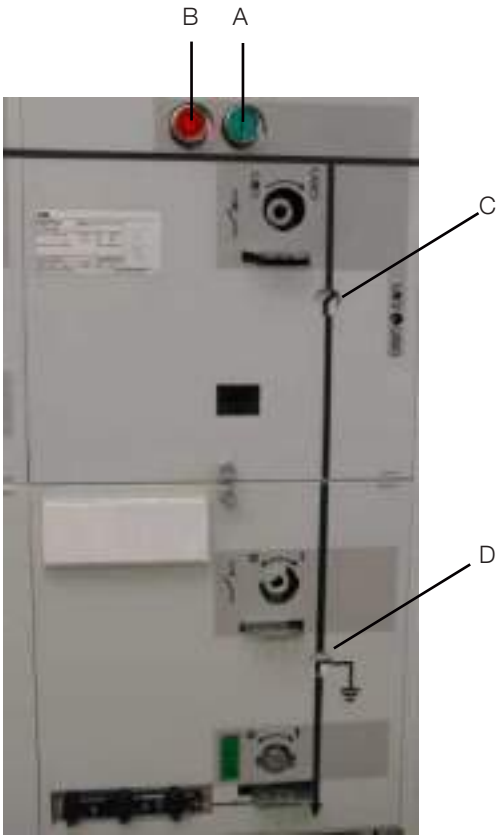
Jordslutteren drives av en kipp-mekanisme som sikrer rask lukking. Jordbryteren blir lukket ved å vri betjeningshåndtak med klokken. Vri betjeningshåndtaket mot urviseren for å åpne bryteren.

15.1 BETJENING AV LASTBRYTER

Skillebryter:
Lukke: Vri betjeningshåndtaket med klokken.
Åpne: Vri betjeningshåndtaket mot klokken.

Jordslutter:
Lukke: Vri betjeningshåndtaket med klokken.
Åpne: Vri betjeningshåndtaket mot klokken.

15.2 BETJENING AV EFFEKTBRYTER



Mekaniske stillingsindikeringer:

A: Grønn trykknapp lukker bryteren
B: Red trykknapp åpner bryteren
C: Mekanisk stillingsindikering, bryter åpen
D: Mekanisk stillingsindikering, jordslutter stengt

Vakuumbryter:

Lade fjærer: Vri betjeningshåndtak med klokken for å lade lukke- og åpningsfjæren.
Lukk: Trykk på den grønne knappen (A)
Åpne: Trykk på den røde knappen (B)

Skillebryteren i V-modulen kan bare åpnes etter at effektbryter er åpnet. Effektbryteren kan kobles inn/ut uavhengig av skillebryterens posisjon.

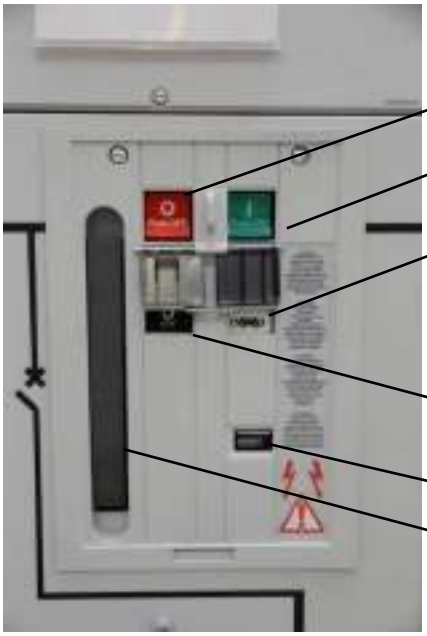
Skillebryter:

Lukk: Vri betjeningshåndtak med klokken.
Åpne: Vri betjeningshåndtak mot klokken.

Jordslutter:

Lukk: Vri betjeningshåndtak med klokken.
Åpent: Vri betjeningshåndtak mot klokken.

15.3 BETJENING AV VAKUUM EFFEKTBRYTER - 12kV/25kA, 24kV/20kA



Trykk-knapp - vakuum effektbryter (OFF)

Trykk-knapp - vakuum effektbryter (ON)

Indikator-
fjær spent/uspent

Vakuum effektbryter stillingsindikering

Teller

Spak for lading av fjær

Før betjening av vakuum effektbryter, sjekk at fjæren er ladet. Når fjæren ikke er ladet, kan den lades ved hjelp av ladearmen. Fjæren er fulladet når indikatoren gul.
(gult symbol, ca 10 operasjoner som trengs for å lade fjæren fullt).

FORSIKTIG
Hvis vakuumbryter er utstyrt med motordrift (valgfritt) er det ikke nødvendig å lade fjæren for hånd. Motoren starter lading av fjæren automatisk så snart hjelpespenningen er slått på.

Lukk: Trykk grønn (ON) -knappen

Åpne: Trykk rød (OFF) -knapp

Merk: Skillebryteren og vakuum effektbryteren er forriglet.

Betjening av skillebryter og jordslutter, se forrige side.

15.4 BETJENING AV SIKRINGSLASTSKILLEBRYTER

ADVARSEL
For riktig funksjon av F-modul, er det nødvendig å bruke sikringer som er for riktig beskyttelsesnivå av distribusjonstransformatoren, se sikrings utvalget i tabellen.

Sikringslastskillebryter:
Oppspenning av fjær: Vri betjeningshåndtak med klokken for å lade fjæren.
Lukk: Trykk på den grønne knappen (A)
Åpne: Trykk på den røde knappen (B)

Sikringslastskillebryteren kan bli utløst av sikringen om det oppstår en kortslutning, jordfeil eller en stor strøm.

15.5 MONTERING OG UTSKIFTING AV SIKRINGER

En rød indikator under sikringssymbolet på det nedre front-panelet indikerer at minst en sikring er utløst. Sikringene erstattes som vist under av illustrasjoner. Sikringene må inn-monteres etter levering.

Når du installerer sikringer for første gang, følg rekkefølgen av illustrasjoner 2-9
.

1. Indikator for utløst sikring.

2. Lukk jordslutter ved å vri betjeningshåndtak urviseren.

3. Fjern sikringsdekslet.
4. Vipp ut sikringspanelet for å få tilgang til sikringsbeholdere.

7. Demontering/Festing av sikringene til sikringsholderen utføres ved hjelp av kontaktskruen
   - Sikringen må monteres med slagstiften ut for at sikringen skal fungere korrekt -

5. Bruk betjeningshåndtaket og vri mot klokken for å åpne sikringsbeholdere.

8.Vri håndtaket på sikringsdekselet med klokken for å lukke og forsegle sikringsrøret .Bruk betjeningshåndtaket.

6. Trekk ut ved hjelp av sikringshåndtaket. Sikringene er godt festet i sikringsholderen.

9. Lukk sikringspanelet .
   Anlegget er klar til bruk.

15.6 SIKRINGSTABELL

15.6.1 SIKRINGSTABELL - CEF

100%	Transformator (kVA)																Sikringens merke-spenning
U_n (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	
3	16	25	25	40	40	50	50	80	100	125	160	160					
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			7,2 kV
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	
11	6	6	10	16	16	25	25	25	25	40	50	50	63	80	100	125	12 kV
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	
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	17,5 kV
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	
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	24 kV
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

- Tabellen er basert på bruk av sikringer type ABB CEF
- Normale driftsforhold uten overbelastninger
- Omgivelsestemperatur -25°C - +40°C

120%	Transformator (kVA)																Sikringens merke-spenning
U_n (kV)	25	50	75	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	
3	16	25	25	40	40	50	63	80	100	125	160						
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				7,2 kV
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		
11	6	6	10	16	16	25	25	25	25	40	50	50	80	80	100	125	12 kV
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	
15	6	6	10	10	16	16	16	25	25	25	40	40	50	63	80	100	17,5 kV
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	
22	6	6	6	6	10	10	16	16	16	25	25	25	40	50	50	63	24 kV
24	6	6	6	6	10	10	16	16	16	25	25	25	40	40	50	63	

- Tabellen er basert på bruk av sikringer type ABB CEF
- Normale driftsforhold med overbelastninger på 20%
- Omgivelsestemperatur -25°C - +40°C

15.6.2 SIKRINGSTABELL - CEF-S

Transformator (kV)	Transformator (kVA)												Sikringens merke-spenning (kV)	Sikringens lengde „e“ (mm)	Katalognummer CEF-S	Katalognummer CEF-S-TCU
	25	50	75	100	125	160	200	250	315	400	500	630				
	Sikringens merkestrøm In (A)															
3	16	25	40	50									6/12	292		
3.3	16	25	40	50	50											
4.15	16	20	40	40	50										10A:1YMB531011M0001	10A:1YMB531861M0001
5	10	20	25	40	40	50									16A:1YMB531011M0002	16A:1YMB531861M0002
5.5	10	20	20	40	40	40	50								20A:1YMB531011M0003	20A:1YMB531861M0003
6	10	16	20	25	40	40	50								25A:1YMB531011M0004	25A:1YMB531861M0004
6.6	10*	16	20	25	40	40	50	50							40A:1YMB531011M0005	40A:1YMB531861M0005
10	10*	10	16	20	20	25	40	40	50						50A:1YMB531011M0006	50A:1YMB531861M0006
11	10*	10	16	20	20	25	40	40	40	50						
12	10*	10	16	16	20	20	25	40	40	50						
13.8	10*	10*	16	16	16	20	20	40	40	40			10/24	442		
15	10*	10*	10	16	16	20	20	25	40	40					10A:1YMB531012M0001	10A:1YMB531862M0001
17.5	10*	10*	10	16	16	20	20	20	40	40	40				16A:1YMB531012M0002	16A:1YMB531862M0002
20	10*	10*	10*	10	16	16	20	20	25	40	40				20A:1YMB531012M0003	20A:1YMB531862M0003
22	10*	10*	10*	10	16	16	20	20	20	40	40	40			25A:1YMB531012M0004	25A:1YMB531862M0004
24	10*	10*	10*	10	16	16	16	20	20	25	40	40			40A:1YMB531012M0005	40A:1YMB531862M0005
Sikringsstørrelse på LS-siden (A)	40	80	125	160	160	200	250	250	300	400	400	800				

Tabellen ble beregnet i henhold til standarder IEC 60787 og IEC 62271-105. Følgende arbeidsforhold ble antatt:

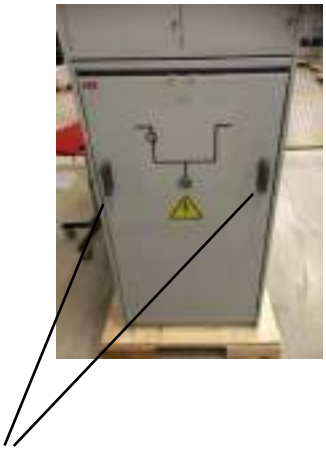
- Maksimal langvarig transformator overbelastning - 120%
- Magnetiseringsstrøm startstrømmen for transformatorer opp og inkludert 630KVA - 12 x I løpet 100ms
- Magnetiseringsstrøm startstrøm for transformatorer ovenfor 630KVA - 10 x I løpet 100ms,
- Standard omgivelses arbeidsforhold for Safering / Safeplus anlegg (viktigste: omgivelsestemperatur -25 °C til 40 °C)

Tabellen ovenfor beskriver merkestrøm av en sikring for en gitt linjespenning og transformator merkeefffekt. For forskjellige kriterier, er ikke tabellen gjeldende.

16. LUFTISOLERT MÅLEFELT

FARE!
Pass på at det ikke er spenning i strømskinnene og kabeltilkoblinger, og at risikoen for gjeninnkobling elimineres i alle enheter.

BlokkeringsbraketteR
Vri 90° tfor å åpne



2. Bruk håndtakene for å løfte døren først opp (vertikalt), og trekk dør ut (horisontalt).

1. Fremre dør låst:
1.1 Hengelås: Fjern hengelås, deretter vri blokkeringsbraketter 90°.

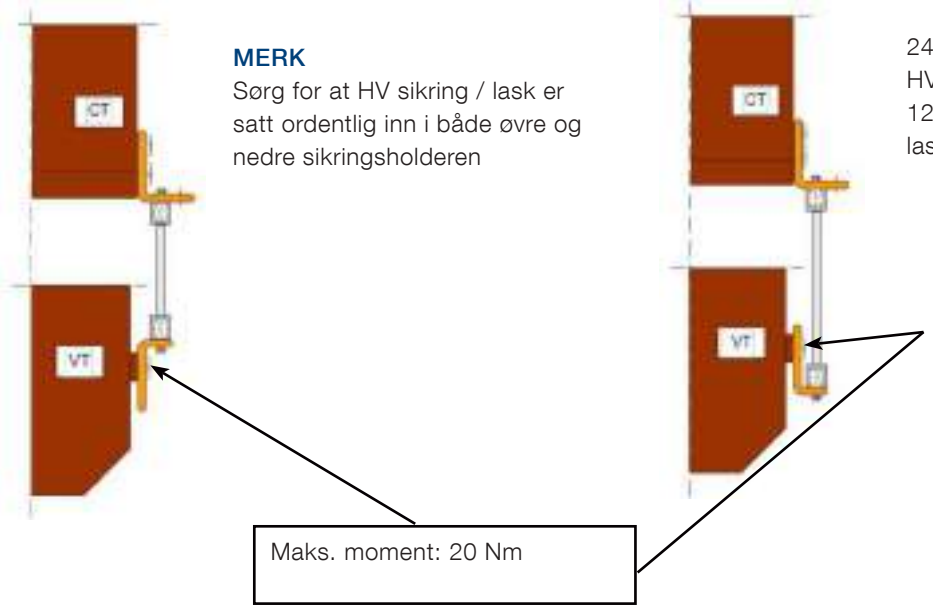
1.2 Nøkkellås: Lås opp døren ved hjelp av nøkkelen for paneldøren.

3. Fjern plastdekselet som er plassert bak frontdekselet.

4. Pay attention to label placed inside every metering module

FARE
Følg gjeldende forskrifter for arbeid på mellom-spenningsanlegg.
Kontroller alltid at spenningsnivået er null før oppstart av arbeid inne i M-modulen

12kV med
HV sikring



MERK
Sørg for at HV sikring / lask er satt ordentlig inn i både øvre og nedre sikringsholderen

24kV med
HV sikring,
12 og 24kV med
lask

17. KAPASITIVE SPENNINGSINDIKATORER

Hver modul av anleggene er utstyrt med en kapasitiv spenningsindikator i overensstemmelse med enten IEC 61958 (VPIS) eller IEC 61243-5 (VDS).

17.1 SPENNINGSINDIKATORER VPIS

VPIS indikatorer brukes for å indikere tilstedeværelse av mellomspenning.

ADVARSEL

Indikasjonen for VPIS alene er ikke tilstrekkelig til å konkludere med at systemet er spenningsløst.

Når anlegget er spenningssatt indikeres dette med et blinkende lys med hyppigheten av repetisjon på minst 1 Hz.

MERK

Ved meget sterkt lys kan det være nødvendig å øke synligheten av indikatoren.

DRIFTSTEMPERATUR

–25° til +50°C.

FASESAMMENLIGNING OG TESTING AV VPIS

Hver fase av den integrerte VPIS har et koblingspunkt på frontpanelet, som kan brukes til å utføre fasesammenligning.

GRENSEVERDIER FOR SPENNING TILSTEDE INDIKATOR

Indikasjonen tilsvarende „spenning til stede“ vises når selve linje-til-jord-spenningen er mellom 45% av nominell spenning og nominell spenning. Indikasjonen motsvarende til „spenning til stede“ vises ikke når selve linje-til-jord-spenningen er mindre enn 10% av nominell spenning.

Capacitive voltage indicator type HR

17.2 SPENNINGSINDIKATORER VDS

VDS brukes for å påvise tilstedeværelse eller fravær av mellomspenning i henhold til IEC 61243-5.
VDS er basert på et HR-system, systemet består av en fast enhet, som er installert i et anlegg, kombinert med en mobil enhet for visuelt å påvise tilstedeværelse eller fravær av spenning og fase balanse.

Tilstanden til spenningen, er visuelt angitt med minst 1 Hz repetisjonsfrekvens. Blinkende lysindikasjon som impuls frekvens må være mellom 1 Hz og 3 Hz med en impuls / pause forhold på 4 til 1.
Spenningsindikatorene som er anbefalt er VIM1 typen som brukes som en mobil enhet og VIM3 type, brukes som en fast og mobil enhet, laget av Maxeta.
Spenningsindikatorene har en maksimal driftsspenning på 90 V og en maksimal strøm på 2,5 uA ved 50Hz.

DRIFTSTEMPERATUR

–25°C til +50°C.

FASESAMMENLIGNER

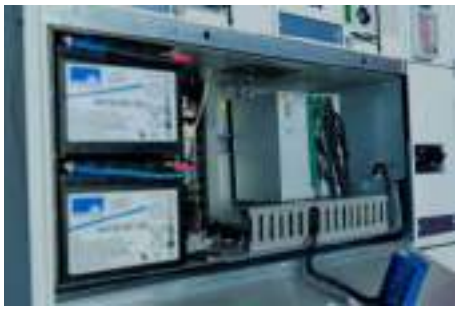
Fasesammenligneren oppdager balansen eller ubalanse av fasene mellom grenseflaten og / eller prøvepunkter .
Fasesammenligneren av VDS er PCM- HR typen, laget av Maxeta, består av en 1,4 m lang prøvekabel.

GRENSEVERDIER FOR SPENNINGSINDIKERING

Når linje-til-jordspenningen er mellom 45% og 120% av nominell spnning, må „spenning tilstede“ indikeres. „Spenning tilstede“ må ikke indikeres når linje-til-jordspenningen er mindre enn 10% av nominell spenning. i.

17.3 SPENNINGSINDIKATORER VDS LRM

Med VDS-LRM system kan følgende angis:
-Overspenninger
-Nominell merkespenning
-Jordfeil
-Ingen spenning / død krets
-Internovervåkning av målekabel
Indikasjon gjøres visuelt på skjermen.
Kontakt produsenten av produktet for detaljert beskrivelse og manualer.



18. TILLEGGSUTSTYR

Tilgang til lavspentutstyr fås ved å fjerne det øverste front-panelet. En shunt-bryter-spole (AC eller DC) kan monteres på transformator bryteren og motorstyringer.

18.1 SEPARAT STYRINGS- OG OVERVÅKNINGSENHET

SafeRing kan utstyres med en separat styrings- og over-våkingsenhet. (Se bilde til venstre)

Løsningen kan leveres og ettermonteres.

Safeplus kan utstyres likt, men trenger et ekstra lavspennings-skap på toppen av koblingsanlegget.

19. KABELTESTING

Kabeltesting og kabelfeillokalisering er utført på tre måter:

1. Direkte på testpunktet om de er montert på enheten
2.1 Direkte på kabelkontaktene med kabel tilkoblet.
2.2 På kabelkontakten når den er frakoblet.

FORSIKTIG

Kabeltester skal utføres i overensstemmelse med kabelprodusentens anbefalte praksis.

FARE

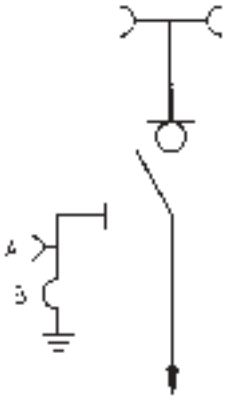
Husk at kabelen har to ender. Begge ender av kabelen må være koblet ut. Dette gjøres vanligvis ved å åpne skillebryteren tilkoblet til kabelen.
Den frie enden til den testede kabelen må sikres mot tilfeldig tilgang
.

FORSIKTIG

– Noen ganger er kabeltesting gjennom samleskinnen foretrukket. På denne måten kan flere kabler testes samtidig. Dette er gjennomførbart, men husk følgende begrensninger:
– - DC og VLF spenninger må ikke påtrykkes spenningstransformatorer og overspenningsavledere.

19.1 PROSEDYRE FOR KABELTESTING VED BRUK AV TESTPUNKT

1. Åpne skillebryteren
2. Kontroller spenningsnivåer/status
3. Om det ikke er påvist spenning, lukk jordslutter
4. Koble til testutstyret på toppen av testpunktene (B).
5. Fjern jordtriangelet og utfør testen. Overhold maksimale testspennings nivåer gitt i tabellen under
6. Sett på jordtriangelet. Tiltrekningsmoment: 25 Nm.
7. Koble fra testutstyrett.



Maksimale kabeltestspenninger ved testing av kabler ved hjelp av kabeltestpunkter

Merkespenning på anlegget	Ur (kV rms)	12kV	17,5kV	24kV	Time
Isolasjonsnivå: prøvespenning	Uct(ac) (kV rms)	12kV	17,5kV	24kV	15 min.
DC kabeltestspenning	Uct(dc) (kV peak)	24kV	34,8kV	40kV	15 min.
VLF kabeltestspenning (Sinus-bølge, 0,1Hz)	Uct(VLF) (kV rms)	18kV	26,1kV	28kV	15 min.
VLF kabeltestspenning (Cosinus-rektangulær, 0,1Hz)	Uct(VLF) (kV peak)	25,5kV	36,9kV	40kV	15 min.

19.2 PROSEDYRE FOR TESTING DIREKTE PÅ KABELTILKOBLINGEN MED KABEL TILKOBLET ANLEGGET

Merk: Test kan utføres med spenningssatt samleskinne.

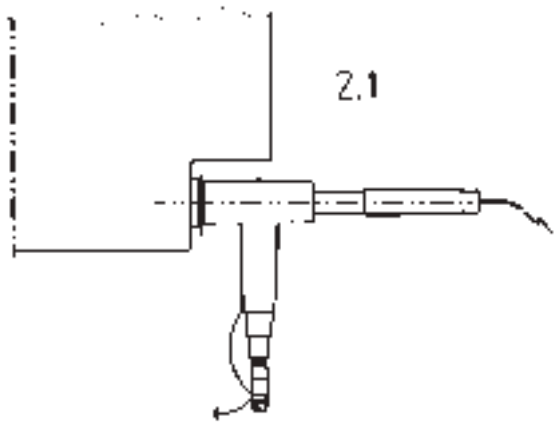
1. Åpne skillebryteren.
2. Kontroller spenningsnivåer/status.
3. Om det ikke er påvist spenning, lukk jordslutter.
4. Åpne kabelrommet.
5. Koble til testutstyr til kabelen. Kabelen skal fortsatt være tilkoblet.
6. Åpne jordslutter, og utfør testen. Overhold maksimale testspenningsnivåer gitt i tabellen under.
7. Lukk jordslutteren.
8. Koble fra testutstyret.
9. Sett på isolasjonsplugg for endeavslutningen
10. Monter på kabeldør.

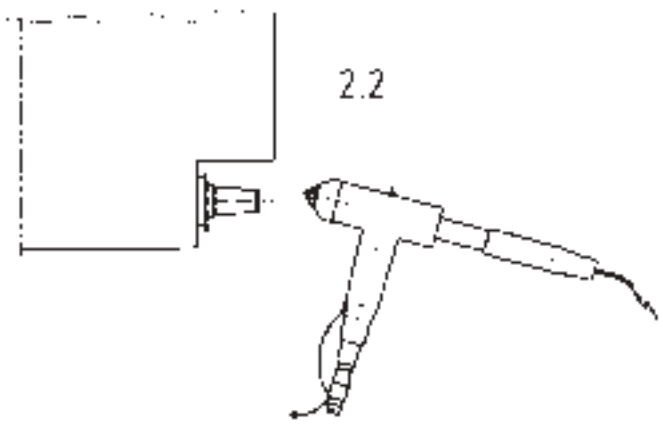
.

19.3 PROSEDYRE FOR TESTING DIREKTE PÅ KABELTILKOBLINGEN MED KABELEN IKKE KOBLET TIL ANLEGGET

Merk: Test kan utføres med spenningssatt samleskinne.

1. Åpne skillebryteren
2. Kontroller spenningsnivåer/status
3. Om det ikke er påvist spenning, lukk jordslutter.
4. Åpne kabelrommet.
5. Demonter kabelkontaken fra anlegget.
6. Koble til testutstyr til kabelen. Overhold maksimale testspenningsnivåer gitt fra produsent av kabler og kabeltil koblinger. Når kabelen er fra koblet i begge ender, er kabeltestingen uavhengig av anlegget. Prosedyre og testverdier avhenger av kabel, kabeltilkobling og testutstyr. Testprosedyre og metoder skal følge anbefalinger og begrensninger knyttet til kablene, kabeltilkoblinger og testutstyr.
7. Koble fra testutstyret.
8. Monter kabelkontaken til anlegget.
9. Monter på kabeldør.





Maksimale kabeltestspenninger ved testing direkte på kabelkontakten med kabelen koblet til bryter

Rated voltage of the switchgear	Ur (kV rms)	12kV	17,5kV	24kV	Tid
Power frequency cable test voltage	Uct(ac) (kV rms)	12kV	17,5kV	24kV	15 min.
DC cable test voltage	Uct(dc) (kV peak)	24kV	34,8kV	48kV	15 min.
VLF cable test voltage (Sine-wave, 0,1Hz)	Uct(VLF) (kV rms)	18kV	26,1kV	36kV	15 min.
VLF cable test voltage (Cosine-rectangular, 0,1Hz	Uct(VLF) (kV peak)	25,5kV	36,9kV	51kV	15 min.

20 SERVICE OG VEDLIKEHOLD
20.1 GENERELLE ADVARSLER OG FORHOLDSREGLER

ADVARSEL
Vær oppmerksom på følgende sikkerhetsanvisninger:

Klargjør anlegget for sikker montering:

1. Tilrettelegg alltid for trygge arbeidsforhold.
2. Forsikre deg om at nasjonale sikkerhetsforskrifter følges.
3. Sørg for at alle kretser, hjelpekretser og separate styringsenheter er frakoblet.

NØDVENDIG VERKTØY
– Se verktøyliste kapittel 20.6
– Støvsuger
– Tørkekluter
– Mildt alkalisk rengjøringsmiddel
– Rent vann til rengjøring av anlegget
– Silikonvæske
– - I spesielle tilfeller kan isolerende overflater dekkes med et tynt lag av silkonvæske, DC200/100CS eller liknende
– Bruksanvisninger
– Testutstyr

VEDLIKEHOLDSINSTRUKSJONER
Vedlikehold for å bevare problemfri drift og oppnå lengst mulig levetid på anlegg. Det består av følgende aktiviteter:
– Visuell Inspeksjon
– Vedlikehold
– Reparasjoner

Tidsintervallene for vedlikeholdsarbeid som skal utføres avhenger av driftsforhold, virkemåte, maksimalt tillatte koblinger, omgivelsestemperatur, forurensning, etc.
Vedlikeholdsintervaller og tiltak gitt i tabellen under kapittel 20.2 er anbefalt for Safering / Safeplus under normale driftsforhold.

ANDRE VIKTIGE BRUKSANVISNINGER
Driften av alle vern bør kontrolleres i henhold til produsentens instruksjoner.
Alle komponenter i SF_6-tanken er vedlikeholdsfrie for den erklærte levealder til produktet. Tanken er laget av rustfritt stål

20.2 VEDLIKEHOLDSINTERVALLER
Vi anbefaler å utføre vedlikeholdsarbeid på følgende intervaller:

Aktivitet	Kapittel	Tidsintervaller i år
Inspeksjon	20.3	5 [1]
Service	20.4	Etter behov [2]
Reparasjoner	20.5	Etter behov

[1] Ved spesielt krevende driftsfohold anbefales kortere tidsintervaller.
[2] Avhengig av resultatet av inspeksjonen.

Andre tjenester kan være nødvendig, som når maks antall operasjoner er nådd, vennligst kontakt ABB for å bestille inspeksjon.

MERK
Under unormale driftsforhold (inkludert ugunstige klimatiske forhold) og / eller spesielle miljøforhold (blant annet, sterk forurensning, fuktig/salt luft), kan inspeksjon med kortere tidsintervaller være nødvendig.

20.3 INSPEKSJON
GENERELLE ASPEKTER
Der det er nødvendig, må arbeidsområdet stenges av og sikres mot utilsiktet gjeninnkobling før inspeksjon, i henhold til „Forskrift om sikkerhet“ spesifisert av IEC-standarder og tilsvarende nasjonale standarder. Koblingsenhetens tilstand må overvåkes av regelmessige inspeksjoner.
Under normale driftsforhold bør inspeksjoner utføres en gang hvert femte år av kvalifisert personell.

INSTRUKSJONER
– Utfør følgende kontroller:
– Visuell sjekk av smuss, korrosjon og fuktighet.
– Sjekk etter spor av skader på isolasjonsmateriale.
– Om det er testpunkter:
  – Visuelt sjekk av kontaktpunkter.
  – Er det tegn til korrosjon eller støv bør området rengjøres.
– Sjekk gasstrykket der det er mulig. Følg instruksene gitt i kapitelet for instruksjoner vedrørende gass.
– Hvis korrosjon er observert på mekanismer, motorer eller annet tilbehør kan du kontakte ABB for å vurdere om det er behov for å bli erstattet.
– Sjekk at det ikke er noe tegn til varmeskader .

MERK

Skulle partielle utladninger forekomme som et resultat av kondensering, er anvendelsen av en tynn silikonfilm over aktuell overflate ofte effektiv som en midlertidig løsning. Kontakt ABB sin serviceavdeling for å få råd om en permanent løsning på dette uvanlige problemet.

TILTAK

Hvis noen irregulære forhold blir oppdaget, må det gjøres nødvendige service- eller reparasjonstiltak.

20.4 SERVICE INSTRUKSJONER

Dersom inspeksjon avdekker behov for servicetiltak , gjør som følger:

1. Rengjør alle deler (f.eks motorer og mekanismer) med en støvsuger og visuelt inspisere dem. Rengjør flatene generelt:
   - Rengjør med en myk, tørr klut.
2. Utfør en lukke / åpne operasjon på alle skillebrytere og effektbrytere, sikringsbrytere og jordsluttere.
3. Koble hjelpestyrespenning, men sørg for at ingen eksterne signaler kan aktivere komponentene. Utfør en elektrisk operasjonssekvens på alle motorstyringer og brytermekanismer.
4. For gassfylling, se kapittelet om gass og gassfylling.
5. Fjerne all rust fra skadede områder på stålplater og andre ståldeler for hånd, f.eks med en stålbørste.

20.5 REPARASJON

MERK

Hvis anlegg er skadet, ta kontakt med ABB for å vurdere nødvendige reparasjoner. Noen avanserte reparasjoner / operasjoner skal utføres av ABBs servicepersonell.

Utfør reparasjonsarbeidet umiddelbart etter at en defekt har blitt oppdaget.

FORSIKTIG

Følg vedlikeholdsinstruksjonene i håndbøkene for de relevante komponentene.

20.6 VERKTØYLISTE SAFERING/SAFEPLUS

MERK

Verktøylisten inneholder ikke verktøy som trengs for arbeid med, håndtering eller testing av HS- eller LS-kabel.

Verktøyene som er merket med X i kolonne „Obligatorisk“ er nødvendige for installasjon og regelmessig vedlikehold av anlegget som beskrevet i kapittel 20.

Verktøy	Obligatorisk
Drillverktøy	
14,4 Volt drill med batteri LSV 034	
Ekstra 14,4V batteri	
Lader - DC18RA	
Borkassett Ø 1 -13 mm	
Bits-sett 59/S31	
Førstehjelp minikit	
Gjengetapp M4	
Gjengetapp M5	
Gjengetapp M6	
Gjengetapp M16	
Overgang fra 7mm 6-kant til 1/4“	
Overgang fra 7mm 6-kant til 3/8“	
Overgang fra 7mm 6-kant til 1/2“	
1/2“ forlenger, L = 10“ (25 cm)	
1/2“ Langpipe - 17 mm	
1/2“ Langpipe - 19 mm	
1/2“ Langpipe - 22 mm	
Håndverktøy	
1/2“ Lang skralle L = 42 cm	X
1/2“ Pipesett - Inneholder:	
1/2“ skralle L = 24 cm	
1/2“ forlenger, L = 1 3/4“ (4,5 cm)	
1/2“ forlenger, L = 2 1/2“ (6 cm)	
1/2“ forlenger, L = 6“ (15 cm)	X
1/2“ universalledd L = 7 cm	
10 mm 1/2“ pipe	X
11 mm 1/2“ pipe	
12 mm 1/2“ pipe	
13 mm 1/2“ pipe	X
14 mm 1/2“ pipe	X
15 mm 1/2“ pipe	
16 mm 1/2“ pipe	
17 mm 1/2“ pipe	X
18 mm 1/2“ pipe	
19 mm 1/2“ pipe	X
21 mm 1/2“ pipe	X
22 mm 1/2“ pipe	X
24 mm 1/2“ pipe	X
27 mm 1/2“ pipe	
30 mm 1/2“ pipe	
32 mm 1/2“ pipe	

Verktøy	Required
Skiftenøkkel 10“	
Sideavbiter - ergo	X
Vannpumpetang	X
Universaltang	
Bits-sett med skrutrekkerhåndtak	X
3/8“ Lang skralle L = 50 cm	X
3/8“ Pipesett - Inneholder:	
3/8“ skralle L = 24 cm	
3/8“ forlenger, L = 3“ (7,5 cm)	
3/8“ bitsholder	
8 mm 3/8“ pipe	
10 mm 3/8“ pipe	
11 mm 3/8“ pipe	
12 mm 3/8“ pipe	
13 mm 3/8“ pipe	
14 mm 3/8“ pipe	
15 mm 3/8“ pipe	
17 mm 3/8“ pipe	
19 mm 3/8“ pipe	
Bits PH 1	X
Bits PH 2	X
Bits FT 4	
Bits FT 5,5	
Bits PZ 1	
Bits PZ 2	X
Bits HEX 5	X
Bits HEX 6	
Bits TX 10	
Bits TX 15	
Bits TX 20	X
Bits TX 25	X
Bits TX 30	X
7 mm kombinasjonsnøkkel	X
8 mm kombinasjonsnøkkel	
10 mm kombinasjonsnøkkel	X
11 mm kombinasjonsnøkkel	
12 mm kombinasjonsnøkkel	
13 mm kombinasjonsnøkkel	X
14 mm kombinasjonsnøkkel	X
15 mm kombinasjonsnøkkel	
16 mm kombinasjonsnøkkel	
17 mm kombinasjonsnøkkel	
18 mm kombinasjonsnøkkel	
19 mm kombinasjonsnøkkel	
Skrutrekker - Flat 1,2 x 8 x150	
Skrutrekker - Flat 1,2 x 6,5 x100	
Skrutrekker - Flat 0,5 x 3 x75	X
Skrutrekker - Flat 1,2 x 5,5 x38	
Skrutrekker - Stjerne PZ 2 - 38	
Skrutrekker - Stjerne PZ 2 - 75	
Unbrakosett 1,5 - 10 mm	

Ekstra verktøy/utstyr	
Hodelykt - LED	
Liten lykt - LED	
Verktøy på boks 5-56	
Permanent Marker	
Små strips L=203 x 2,5mm	
Store strips L=375 x 7,6mm	
Multimeter - UT58B	
Elektrikertape - Tesaflex 53948	
Arbeidshansker	
Specialist Cloth	
Scotch-Brite	
Blå engangshansker - Nitrile powder free	
Snekkerhammer 12 oz	
Skruetvinge 300 x 100 mm	
Baufil nr. 10 12““ 300 mm	
Ekstra baufil blader bi-metal 24T	
Flatfil	
Rundfil	
Kniv	

21. MILJØSERTIFISERING

21.1 PRODUKTETS LEVETID

Produktet er utviklet i samsvar med de krav som er gitt av IEC 62271-200. Produktet har en forventet levetid på 30 år (IEC 62271-200 vedlegg GG).

Anlegget er gasstett med en forventet lekkasje rate på mindre enn 0,1% per år. Med henvisning til referanse-trykket på 1,4 bar, vil anlegget være gasstettt og ha et gasstrykk bedre enn 1,3 bar * gjennom hele levetiden
*) ved 20°C.

21.2 REsirkulering

Råmateriale	Vekt (kg)	% of total vekt	Resirkuler-bart	Miljøeffekter og resirkulering/gjenbruksprosess
Jern	132,80	42,53	Ja	Gjenbrukbart materiale
Rustfritt stål	83,20	24,93	Ja	Gjenbrukbart materiale
Kobber	43,98	14,09	Ja	Gjenbrukbart materiale
Messing	2,30	0,74	Ja	Gjenbrukbart materiale
Aluminium	8,55	2,74	Ja	Gjenbrukbart materiale
sink	3,90	1,25	Ja	Gjenbrukbart materiale
Silver	0,075	0,024	Ja	Elektrolyse, gjenbrukbart materiale
Termoplast	5,07	1,63	Ja	Høyverdig energitilsetningsstoff i søppelforbrenning
Epoxy inkl. 60% kvarts	26,75	8,35	Ja	Males til pulver og brukes som høyverdig energitilsetningsstoff i sementmølle
Gummi	1,35	0,42	Ja	Høyverdig energitilsetningsstoff i søppelforbrenning
Dielektrisk olje	0,21	0,066	Ja	Gjenvinne eller bruke som høyverdig energi tilsetningsstoff i søppelfor-brenning
SF_6 gas	3,24	1,04	Ja	ABB AS i Skien gjenvinner brukt SF_6 gass
Total resirkulerbare materialer	311,42	97,81		
Uspesifisert*	9,00		Nei	* Klistremerker, film folier, pulverlakkering, skruer, muttere, fett .....
Total vekt **	320	100		
Emballasjefolie	0,20		Ja	Høyverdig energitilsetningsstoff i søppelforbrenning
palle	21,50		Ja	Gjenbruk eller bruk som energitilskudd i søppelforbrenningsanlegg

**) Alle tall er fra CCF 3-kurs anlegg med sikringsrør

21.3 END-OF-LIFE

ABB AS, Electrification Products division, er forpliktet til beskyttelse av miljøet og holder seg til ISO 14001 standarder. Det er vår plikt å legge til rette for resirkulering av våre produkter.

Det finnes ingen eksplisitte krav til hvordan anlegget skal håndteres ved etter levetiden. ABBs resirkuleringstjeneste er i henhold til IEC 1634 utgave 1 995 § 6: «End-of-life av SF_6-fylt utstyr» og i særdeleshet 6.5.2.a: «Lav nedbrytbarhet»: «Ingen spesielle tiltak er nødvendig, ikke resirkulerbare deler kastes i henhold til lokale reguleringer

Vi anbefaler også ABB hjemmeside: http://www.abb.com/sf6

ABB AS, Electrification Products division i Skien har utstyr til å gjenvinne SF_6-gass.

Kontakt oss

For mer informasjon kontakt
ABB AS
Electrification Products division
P.O. Box 108, Sentrum
N-3701 Skien, Norway
Phone: +47 35 58 20 00
www.abb.com

1VDD005976 NO juni 2016

Power and productivity
for a better world™

HORSTMANN
GERMANY

Instructions for Use

Wega 1
Wega 1 V
Wega 2
Wega 2 V

104101-5522V3

October 2022

Contents

General notes

Before using this device, carefully read and understand the contents of this document and keep it for future reference.

The content reflects the most accurate information at the date of printing. We reserve the right to make technical changes at any time and without prior notice as necessary in the framework of on-going developments. This release of the document becomes invalid when a new issue of this document is released.

Installation, connection and commissioning of the devices must be carried out by an electrician observing the 'Five Safety Rules' according to EN 50110.

Important terms

The terms listed below serve to ensure safety for life and limb and also determine the service life of the equipment.

DANGER!

.. indicates a hazardous situation which, if not avoided, could lead to death or serious injury.

WARNING!

... indicates a hazardous situation which, if not avoided, may lead to death or serious injury.

CAUTION!

... indicates a hazardous situation which, if not avoided, may lead to wounds and minor injuries.

NOTICE!

... is used for application purposes and does not refer to personal injuries.

CE Declaration of conformity

This device is in conformity with the requirements of the EC Electromagnetic Compatibility (EMC) Directive in their current form.

If required, the CE Declaration of Conformity may be requested from the following address:

HORSTMANN
GERMANY

Dipl.-Ing. H. Horstmann GmbH | Humboldtstraße 2-10 | 42579 Heiligenhaus

Phone: +49 2056/976-0 | Fax: +49 2056/976-140 | www.horstmanngmbh.com

General safety notes

DANGER!

- Only electrically skilled or instructed persons may install the integrated voltage detecting systems Wega and use them to detect the presence or absence of voltage.
- When installing the device, the 'Five Safety Rules' of electrical engineering as defined by the standard EN 50110 must be observed:
  - Disconnect completely
  - Secure against re-connection
  - Verify that the installation is dead
  - Carry out earthing and short-circuiting
  - Provide protection against all adjacent live parts
- For a reliable and safe 'voltage present' indication according to IEC 61243-5 and IEC 62271-213, it must be ensured that the Wega is only used within its rated voltage and frequency and that it has been matched with the entire system.
- The Wega is a part of the entire voltage detection system (incl. cable and e.g. coupling capacitance), meaning that the system manufacturer or operator is responsible for the correct interpretation and thus the function of the entire voltage detection system.
- The system manufacturer specifies the rated voltage of the switchgear and the permissible nominal or nominal voltage range, which must also be considered for the voltage testing system.
- Varify the absence of voltage at all poles before accessing the high voltage parts.
- The Wega does not differentiate between the state „Voltage not present" (U < 0.1 x Un) and the state „ Activated AND earthed" (U = 0 V).
- Damaged devices which do not have a guaranteed level of functional efficiency or safety or which do not have clearly legible labels must not be used.
- The user is obliged to check that the device is in a faultless condition prior to each use.
- Wega may only be used for the purpose for which it has been designed as described in the present Instructions for Use.
- Any warranty claim is void in the case of damages caused by non-observance of this Instructions for Use. Horstmann GmbH is not liable for any consequential damage arising from or relating to this non-observance.
- Only use the integrated voltage detecting systems Wega for indoor applications.

CAUTION!

- In the case of adverse lighting conditions the visual display should be either darkened or illuminated additionally.
- Keep and transport the integrated voltage detecting system Wega in a clean and dry place. All damages are to be avoided.

NOTICE!

- When performing cable tests or DC tests on switchgear or cable sections equipped with a Wega, we recommend short-circuiting the measuring sockets with the earth socket if the triple line-to-earth operating voltage is exceeded. The short-circuiting can be done via short laboratory cables (max. 25 cm) or alternatively with the 4-pole Wega short-circuit plug (part no. 51-9904-001).
  With correct C2 design of the Wega and exceeding the triple line-to-earth operating voltage (measuring voltage > 60 V), it can be assumed that internal surge arresters in the Wega will ignite to protect the electronics. The ignition of the surge arresters in cable tests can be prevented by earthing the measuring sockets.

1 Intended use

The Wega is an integrated voltage detecting system. The device determines and displays the operating conditions of the medium-voltage systems according to EN 50110-1.

The Wega complies with the requirements for Voltage Detecting and Indicating Systems (VDIS) in accordance with IEC 62271-213. The voltage detecting systems are capacitively coupled to live parts.

2 Device description

2.1 Scope of delivery

Complete Wega unit:

- Wega 1 voltage detecting system (base type).
- Instructions for Use.
- Optional:
  - 1 set of connection leads (prefabrication according to agreement)
  - For any additional accessories, see product catalogue

NOTICE!

Requires perfectly coordinated components:

- Coupling capacitor (on the side of the switchgear) either in a bushing or a post-type insulator.
- Connection leads between the Wega and the coupling capacitor.

The switchgear manufacturer or operator is responsible for the proper coordination of the system.

2.2 System structure

The Wega is part of an integrated voltage detecting and indication system in accordance with IEC 62271-213. The drawing below shows the Wega within the complete system.

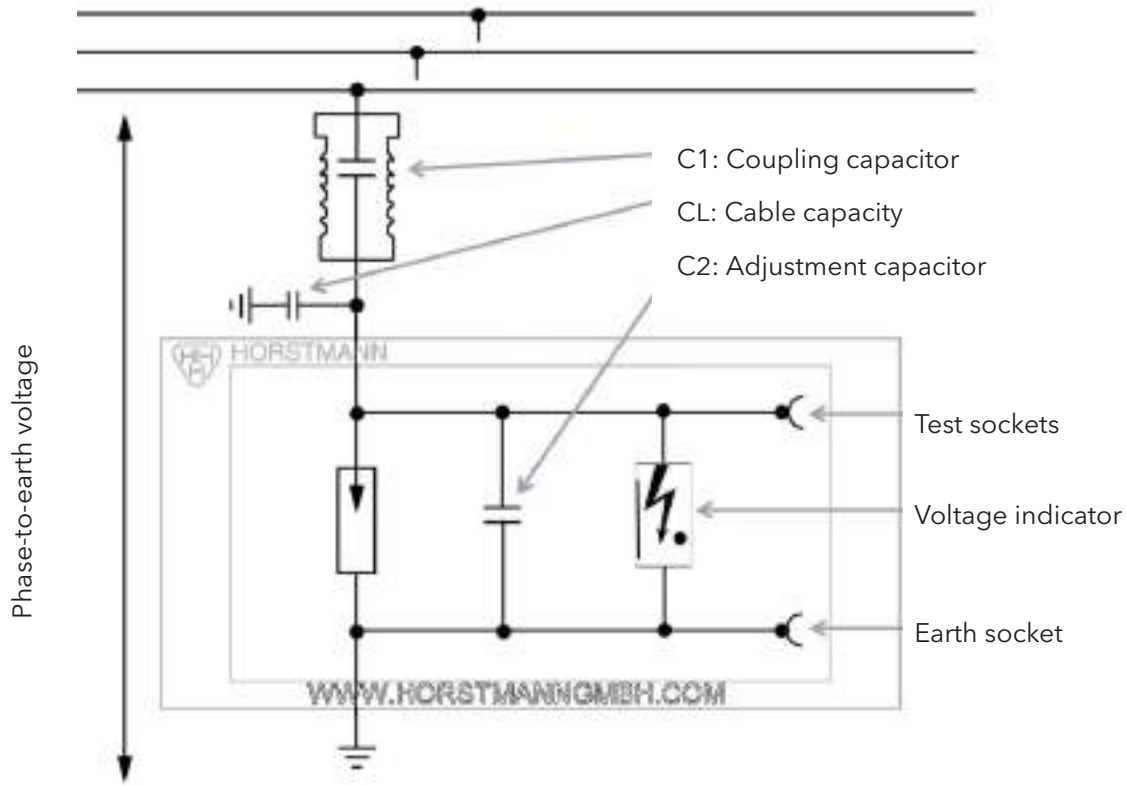


Fig. 2.1: Schematic illustration of the Wega as part of an integrated voltage detecting and indicating system

2.3 Connections and controls

2.3.1 Front Wega 1 / Wega 1 V

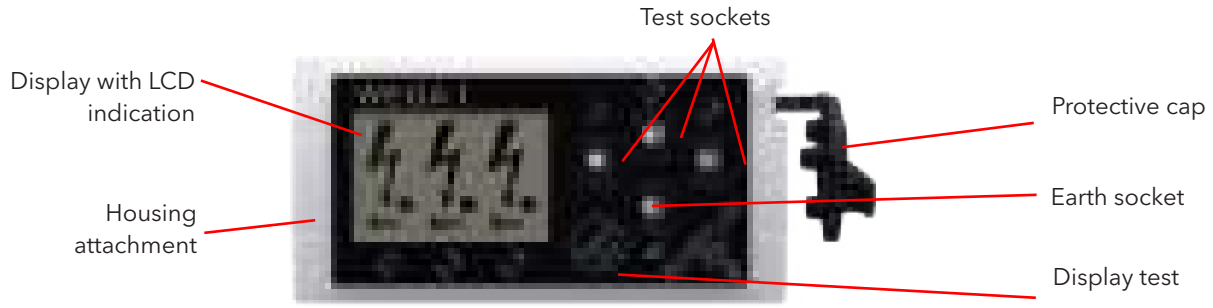


Fig. 2.2: Front Wega 1 / Wega 1 V with indications and controls

2.3.2 Front Wega 2 / Wega 2 V

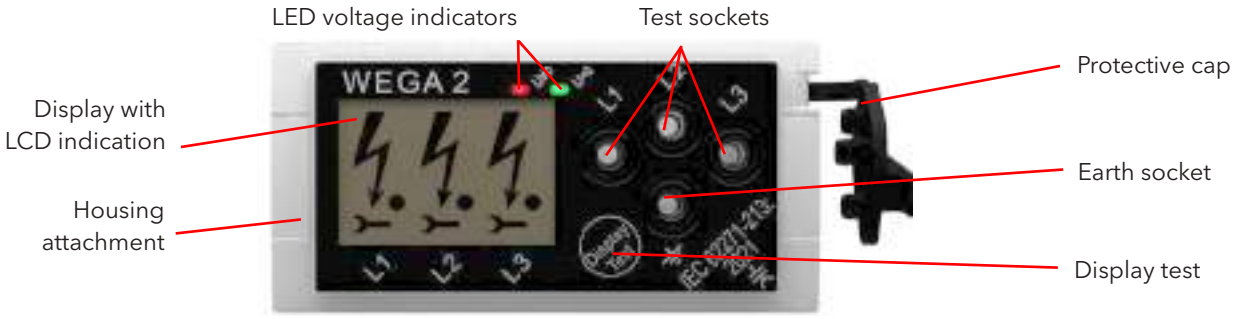


Fig. 2.3: Front Wega 2 / Wega 2 V with indications and controls

2.3.3 Back Wega 1

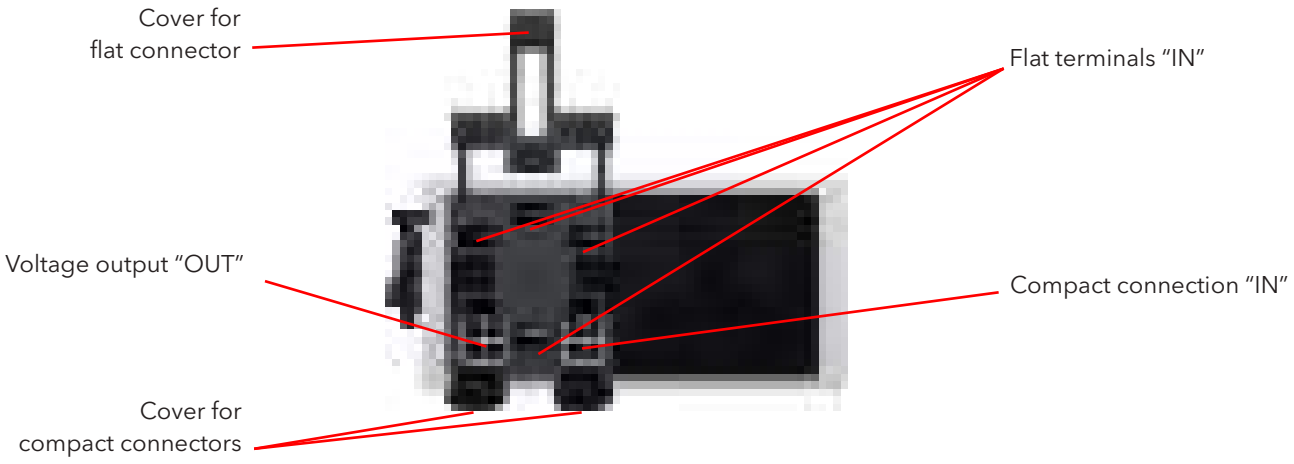


Fig. 2.4: Wega 1 rear with connections and controls

NOTICE!
Close with covers the connections that are not required!
- "IN": Voltage input from a bushing or an insulator.
- "OUT": Voltage signal for short-circuit indicators such as Sigma or ComPass.

2.3.4 Back Wega 1 V

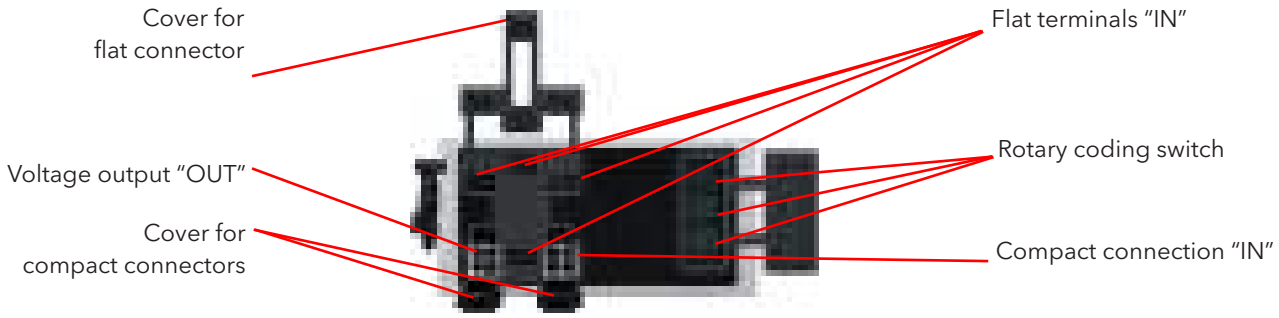


Fig. 2.5: Wega 1 V rear with connections

NOTICE!
Close with covers the connections that are not required!
- "IN": Voltage input from a bushing or an insulator.
- "OUT": Voltage signal for short-circuit indicators such as Sigma or ComPass.

2.3.5 Back Wega 2

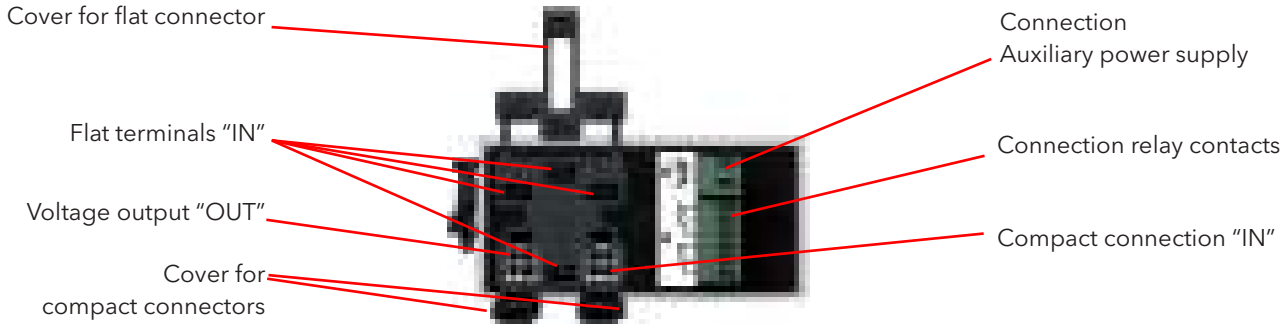


Fig. 2.6: Wega 2 rear with connections

NOTICE!
Close with covers the connections that are not required!
- "IN": Voltage input from a bushing or an insulator.
- "OUT": Voltage signal for short-circuit indicators such as Sigma or ComPass.

2.3.6 Back Wega 2 V

Fig. 2.7: Wega 2 V rear with connections and controls

NOTICE!
Close with covers the connections that are not required!
- "IN": Voltage input from a bushing or an insulator.
- "OUT": Voltage signal for short-circuit indicators such as Sigma or ComPass.

2.4 Dimensional drawings

The cut-out dimensions 92+0.8 mm x 45+0.6 mm in accordance with DIN 61554 apply to all versions of the Wega.

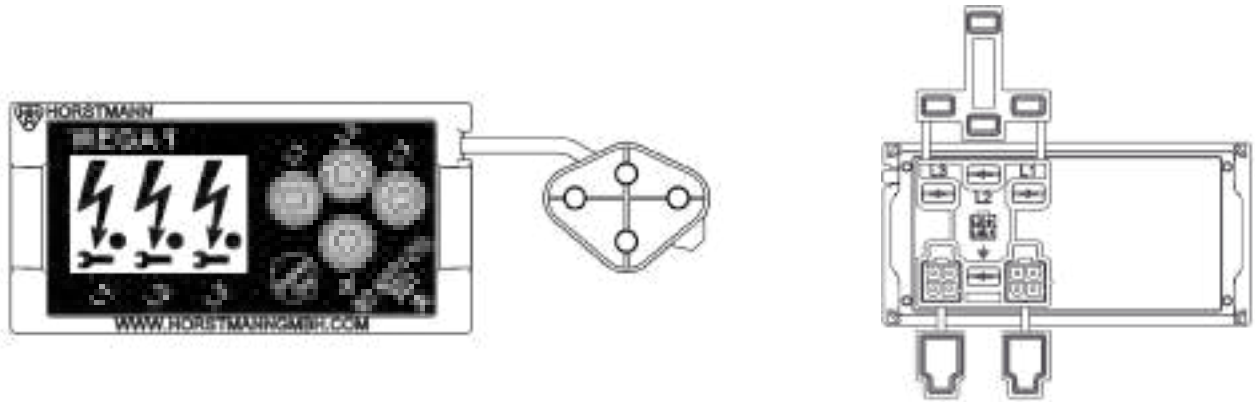


Fig. 2.8: Dimensional drawing of Wega 1

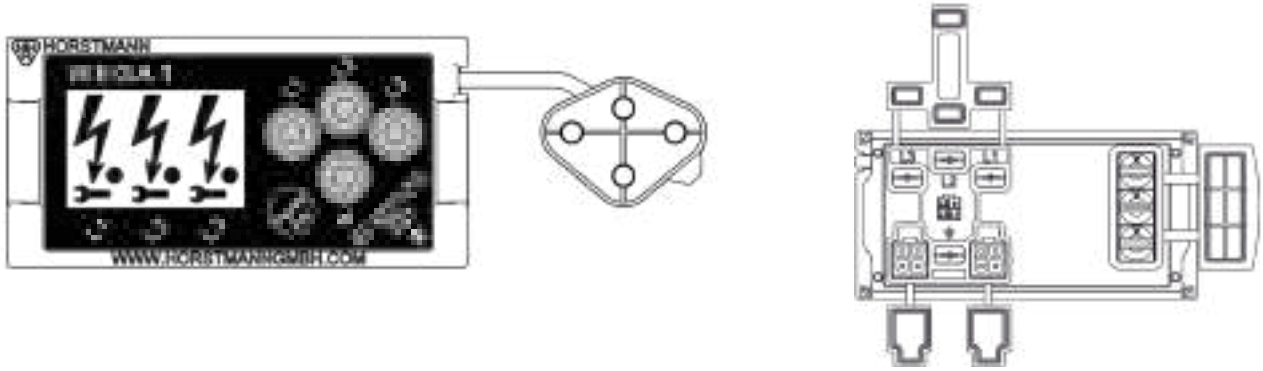


Fig. 2.9: Dimensional drawing of Wega 1 V

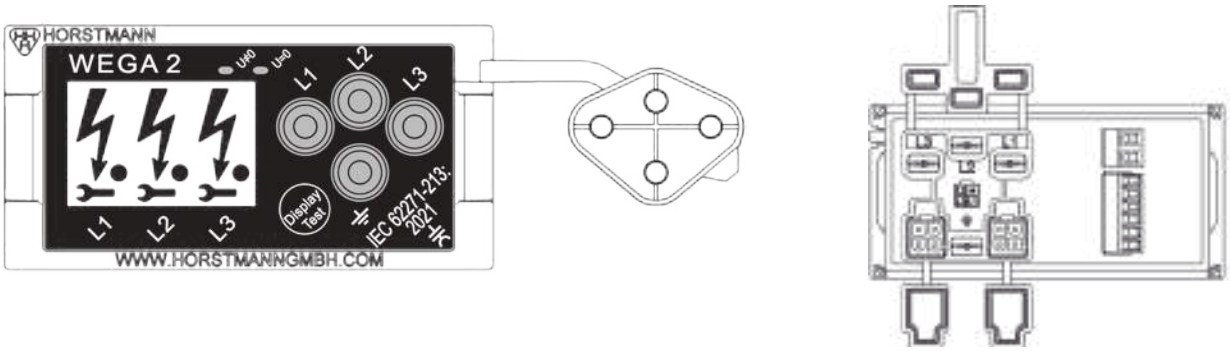


Fig. 2.10: Dimensional drawing of Wega 2

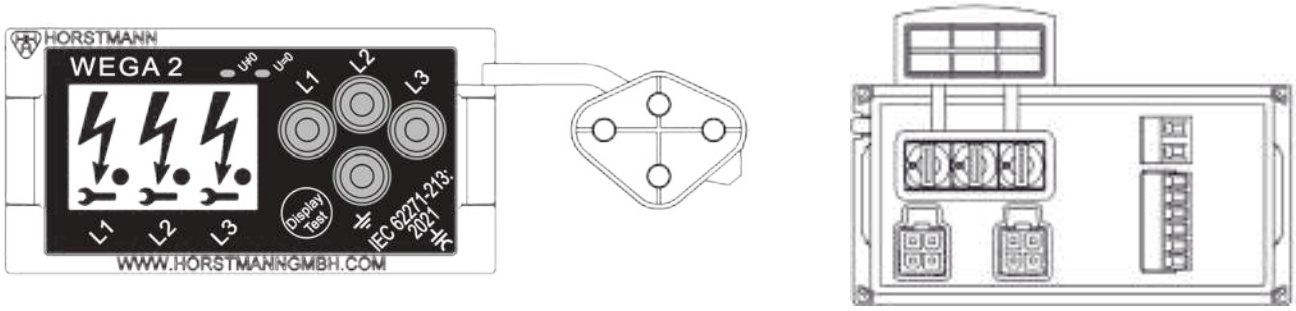


Fig. 2.11: Dimensional drawing of Wega 2 V

3 Device function

3.1 Functional principle

The Wega determines the status of the switchgear in which it is installed and checks whether voltage is present or not by showing the information on the display. In addition, a voltage detection, a maintenance test or a phase comparison can be performed with a suitable test instrument (e.g. Horstmann Orion 3.1 or Orion M1) by connecting it to the test sockets.

WARNING!

The Wega does not differentiate between the state "Voltage not present" (U < 0.1 x Un) and the state "Activated AND earthed" (U = 0 V).

3.2 Electrical connection

The Wega does not differentiate between the state "Voltage not present" (U < 0.1 x Un) and the state " Activated AND earthed" (U = 0 V).

3.3 Display indication

Indication	Definition
	*Voltage present* Threshold value for voltage presence indication: 0.1 – 0.45 x Un. Installation note: The voltage signal is too low when operating the system at nominal voltage. The cause is usually the selected adjustment capacitor which is too large or the operation of the switchgear at a nominal voltage that is lower than originally envisaged.
	*Voltage present and passed maintenance test* The current flowing through the display unit meets the current monitoring requirements of IEC 61243-5 (section 5.28) and IEC 62271-213 (section 11.4.2). A maintenance test is not necessary due to the continuous monitoring.
	*Voltage present and integrated maintenance test passed; voltage signal, nonetheless, is too high* Installation note: Voltage signal too high. The cause is usually the selected adjustment capacitor which is too small, an earth fault or the operation of the switchgear at a nominal voltage that is higher than originally envisaged.
	*Voltage not present* When the system is switched off at all poles, all symbols are switched off. Voltage applied <0.1 x Un.

Tab. 3.1: Displayed symbols

3.4 Functional test

A functional test can be done while the unit is fixed in the installation and is either energized (indication of arrow or arrow and dot symbols) or the unit is de-energized.

3.4.1 Energised state

There are two possibilities to perform the functional test in the energised state:

1. Function test by short-circuiting one of the three testing sockets with the earth socket. Displayed symbol (L1, L2 or L3) disappears. After the test, the short-circuit bridge must be removed again.
2. Functional test using the "Function tester for Wega"
   - Plug in the connecting leads of the function tester to one of the three test sockets and the earth socket of the Wega 1. Switch on the function tester.
   - The appropriate arrow and dot symbols appear (see Tab. 3.1). The wrench tool symbol is not activated.

3.4.2 De-energised state

For the function test in de-energised state, press the "Display test" button. All symbols of the LCD display are activated for a short time.

DANGER!

- If the specified indication does not appear:
  → The Wega is defect. Do not use this device for the voltage detection!
- Attach the protective cap after the functional test!

3.5 Active zero voltage indicator

Wega 2 / Wega 2 V only: This is activated if the system switches to the voltage-free state. The indication occurs with a green flashing LED on the front plate above the LCD display. This indication is activated permanently if at least one of the three voltages is not present.

3.6 Voltage detection

The Wega is suitable for continuous operation. After installation of the Wega in the switchgear, a continuous voltage detection is performed.

The voltage state is displayed for each phase via the LCD indication (s. Tab. 3.1).

Wega 2/ Wega 2 V only: In addition, if voltage is present on at least one of the tree phases, this is indicated by a continuously lit red LED on the front of the unit.

3.7 Phase comparison

Perform a phase comparison using a phase comparator for LRM systems available as an option in accordance with IEC 62271-215 or IEC 61243-5 (for example, Horstmann Orion 3.1 or Orion M1). Connect the phase comparator's connecting leads to one of the three test sockets and the earth socket. The test sockets are accessible once the protective cap has been removed.

- The corresponding indication of the Wega may be weaker or may even go off.
- Put on protective cap after phase comparison!

3.8 Remote signals (Wega 2 or Wega 2 V only)

The remote signals are brought out via a 6-pin plug-in terminal block on the rear side of the Wega (see Fig. 2.6 and Fig. 2.7).

- The relay "voltage present" is switched on, if the voltage of at least one of the three phases is greater than 0,45 * Un.
- The relay "voltage not present" is switched on, if the voltage of at least one of the three phases is lower than 0,1 * Un.

Each of the two relays has one Form C change over contacts, comprising a common connection (COM - Common), a normally close contact (NC - normally closed) and a normally open contact (NO - normally open).
The relay contact are galvanically isolated from the measuring voltage and the auxiliary power supply.
The following relay functions arise depending on the level of the measuring voltage:

Auxiliary power supply	**Network state medium voltage**	**Relay U = 0 (voltage not present)**	**Relay U ≠ 0 (voltage present)**	**LED green (U = 0)**	**LED red (U ≠ 0)**
present (Vaux ≠ 0)	Voltage present on L1, L2 and L3	off 	on 	off 	on 
	At least one 'Voltage present' and at least one 'Voltage not present'	on 	on 	on 	on 
	Voltage not present on L1, L2 and L3	on 	off 	blink 	off 
not present (Vaux = 0)		off 	off 	off 	off 

Tab. 3.2: Relays positions

Explanatory notes for the table:

For reasons of clarity, not all possible combinations of measuring voltages and auxiliary power supply are given. The relay's contact position of the de-energized state (relay off) are depicted on the rear side of the integrated voltage detecting system Wega 2/ Wega 2 V.

3.9 Auxiliary power supply monitoring (Wega 2 or Wega 2 V only)

The absence of auxiliary power supply can be detected by the following features:

- Both relays (U = 0 and U ≠ 0) are switched off at the same time.
- Both LEDs (green and red LED on the front side) are switched off at the same time.

The auxiliary power supply must be checked in both cases.

3.10 Detection of a malfunction (Wega 2 or Wega 2 V only)

If there is a malfunction of the Wega, it can be detected by the following steps:

- Both relays (U = 0 and U ≠ 0) are switched off at the same time and
- Both LEDs (green and red LED on the front side) flash at the same time.

The LCD indication "Voltage present" and "Voltage not present" operate independently of this malfunction.

Fault correction: The auxiliary power supply for the Wega 2/Wega 2 V must be switched off and switched on again after approx. 10 s. If the malfunction is not corrected following this, the Wega 2/Wega 2 V must be taken out of operation and replaced. It is important to ensure that the device is no longer used as a voltage detecting system.

4 Installation

DANGER!
Verify that the system is de-energized for installation and dismantling!

4.1 Electrical connection

The connection cables are provided by the respective switchgear manufacturer. The Wega can be connected to the switchgear with a connection cable equipped with flat plugs or compact plugs. Optionally, a short-circuit direction and earth fault direction indicator (e.g. ComPass B or Sigma D series) can be connected (s. Fig. 4.1, "OUT"). Use the connecting lead sets from the manufacturer for this purpose. The connecting lead sets are available in different lengths.

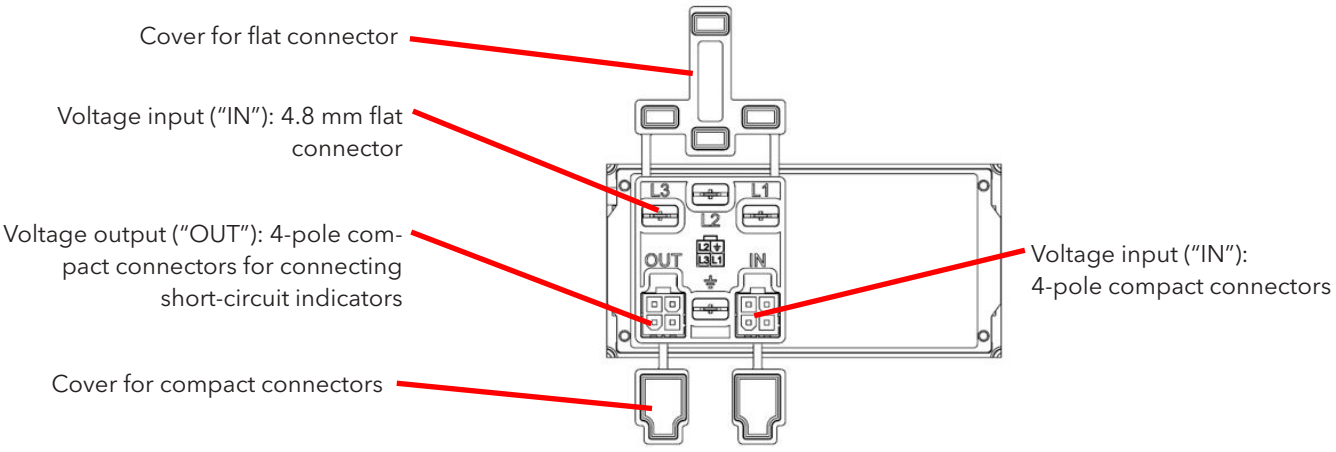


Fig. 4.1: Connections, using Wega 1 as example

DANGER!

- Expose the required connection by removing the cover.
- Keep the connections closed which are not needed!
- The input compact connection and the flat connector connection option are connected in parallel.

4.1.1 Connecting the flat connectors

The connection to the switchgear is made via 4 flat connectors 4.8 x 0.8 mm (s. Fig. 4.1).
Plug the flat connector receptacles onto the flat connectors (L1, L2, L3 and ⏚ earth symbol). Slide the sealing grommets available on the cable side into the openings on the device side.

NOTICE!
Observe the correct phase assignment when plugging in flat connectors!

4.1.2 Connecting the 4-pole compact connectors

The connection to the switchgear is made via a 4-pole compact connector (s. Fig. 4.1, "IN").

CAUTION!
Prevent slipping-out by engaging the ratchet mount.

DANGER!
The compact connector "OUT" must not be used for the voltage input!

Use the connecting lead sets from the manufacturer for this purpose. The connecting lead sets are available in different lengths.

Optionally, a short-circuit direction and earth fault direction indicator (e.g. ComPass B or Sigma D series) can be connected to the 4-pin compact connector "OUT". Use the connecting lead sets from the manufacturer for this purpose. The connecting lead sets are available in different lengths.

4.1.3 Relay connection (Wega 2 or Wega 2 V only)

6-pin terminal block (X4):

- U ≠ 0 make or break contacts of the "voltage present" relay
- U = 0 make or break contacts of the "voltage not present" relay

4.1.4 Application note Relay (Wega 2 or Wega 2 V only)

Example 1: Detecting of the status: "Voltage not present" for one, two or all three phases

Task: The "voltage not present" state is to be signalled remotely with a contact (maker contact, normally open contact) if the voltage fails on at least one phase.

Solution: Use of change over contact "U = 0" (maker contact, normally open contact).

The connections for the remote signalling relays must be connected as follows:

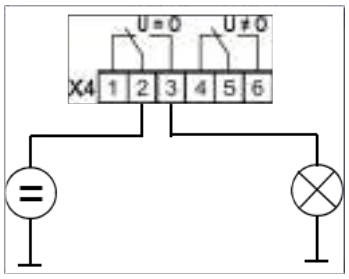


Fig. 4.2: Application example 1

NOTICE!
The change over contacts show the de-energized state of the relays.

- If "voltage not present" has been detected on at least one phase, the lamp lights up.
- If the auxiliary power supply for the Wega 2 fails, the lamp does not light up.

Example 2: Detecting of the status: "Voltage not present" only in the event of a failure of all three phases

Task: The state "voltage not present" for all three phases is to be signalled remotely with a contact (normally open contact)

Solution: Series connection of the change over contacts "U = 0" and "U ≠ 0".

The connections for the remote signalling relays must be connected as follows:

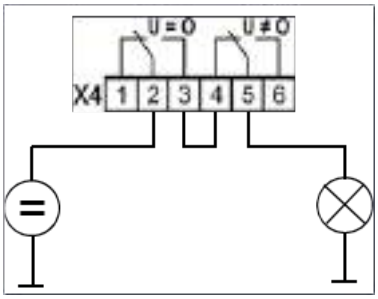


Fig. 4.3: Application example 2

NOTICE!
The change over contacts show the idle state of the relays.
- Only if "voltage not present" has been detected for all three phases, the lamp lights up.
- If the auxiliary power supply for the Wega 2 fails, the lamp does not light up.

4.1.5 Auxiliary power supply (Wega 2 or Wega 2 V only)

The auxiliary power supply must be connected to the 2-pin terminal block. The auxiliary power supply must be in the range:

• 24–230 V (AC or DC).

4.2 Mechanical installation

1. For Wega 1 V and Wega 2 V, the C2 value must be set phase-selectively via the rotary coding switches on the rear of the unit before mechanical installation. See Section 5.1.
2. Insert the Wega into the prepared DIN cut-out (92 mm x 45 mm) in the front of the switchgear. Note the installation depth.

Connected lead	Minimum installation depth
Flat connectors with single-core cables	35 mm
4-pole compact connectors with single-core leads, angle 0°	70 mm
4-pole compact connectors with single-core leads, angle 90°	38 mm
4-pole compact connectors with coaxial leads	80 mm

Tab. 4.1: Installation depth

3. Press in the slider elements on both sides.

4.3 Disassembly

To disassemble, insert a flat-blade screwdriver into a gap in one of the two fixings and turn. The unit then detaches from the cut-out.

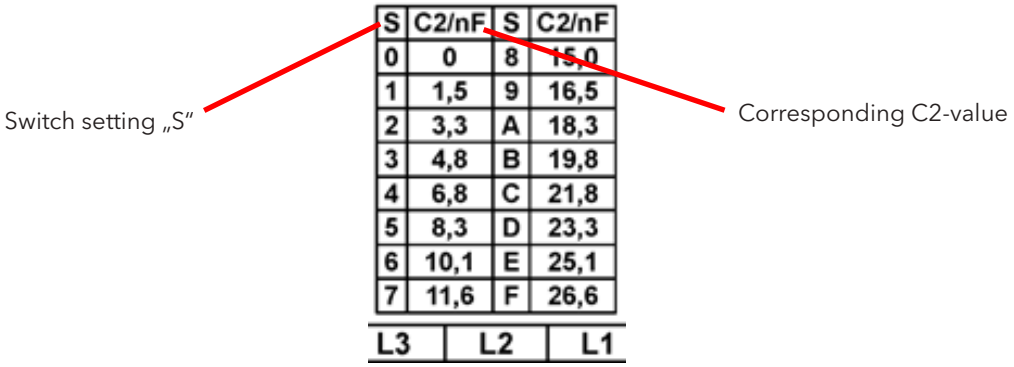
5 Setup

An adjustment capacitor must be determined prior to commissioning in order to customize the Wega to different switchgear, coupling capacitors, nominal voltages or cable lengths.

5.1 Setup of Wega 1 V and 2 V

For initial setup of the Wega 1 V and Wega2 V versions the C2 values need to be adjusted first before installation into cut-out, with the operating voltage applied. Perform the following steps:

- The connections from the bushings should be plugged into the Wega. The operating voltage of the system should be applied.
- Expose the shaft with the rotary coding switches and make sure that all rotary coding switches are set to the "0" indication.
- Place a tool, e.g. a flat-blade screwdriver, on the groove of one of the rotary switches and turn the unit that way that the indication of the Wega can be observed.
- At the beginning all indication symbols should be visible on the display. The interface current should be checked if the tool symbols are not shown on the display. Then possibly tuning with an additional C2 value may not be possible.
- Step by step – turn the switch – anti-clockwise. Alter the switch position until the tool symbol is no longer shown on the display.
- Record the value of the rotary switch setting and change the settings of the other switches to the same value. The set C2 capacitor values can be read from the attached information sign.



S	C2/nF	S	C2/nF
0	0	8	15,0
1	1,5	9	16,5
2	3,3	A	18,3
3	4,8	B	19,8
4	6,8	C	21,8
5	8,3	D	23,3
6	10,1	E	25,1
7	11,6	F	26,6
L3		L2	L1

Fig. 5.1: Example of an assignment table of the switch position and the corresponding C2 values

- Check the setting (s. 5.2)!

5.2 Checking the correct setting

After installation, it is recommended to check the correct setting. A switchgear, in which the Wega is installed, must be run at the intended nominal voltage for this purpose.

5.3 Optical check of the indication

The settings are correct if:

- The arrow and dot symbols are visible on all three phases L1, L2 and L3.

An incorrect setting exists if:

- The over voltage indication (tool symbols) is visible (note: adjustment capacitance is too low).
- The dot symbols are not visible (note: adjustment capacitance is too high).
- The arrow symbols are difficult to see (note: adjustment capacitance is far too high).

5.4 Checking the LRM interface via measurement techniques

Connect a suitable interface tester for interfaces at the LRM interface L1 in accordance with IEC 62271-215 or IEC 61243- (for example, Horstmann Orion 3.1 or Orion M1).

The interface tester with current measurement function must display the following test result:

The power from the interface must be equal to or higher than 3.2 µA (50 Hz).
This test must be repeated with the interfaces for phases L2 and L3.

If deviations occur during the optical check of the indicator or during checks of the LRM interfaces via measurement techniques, the tuning of the Wega to the switchgear (selection of the adaptation capacitor) must be checked.

6 Maintenance

6.1 Servicing

Ensure that the Wega is kept in a clean and dry state. Otherwise, the device is maintenance-free. The device contains no batteries or any other parts which need to be replaced by the user.

6.2 Maintenance test

The maintenance test on voltage detecting and indicating systems shall be performed in accordance with IEC 62271-213. The interval periods of maintenance tests are defined by the national regulations of the respective places of use, e.g. in Germany the interval period for maintenance test is every 6 years at the latest.

The Wega is equipped with a feature that permanently monitors the current through the indicating unit. Thus, the Wega complies with the requirements regarding the current monitoring in accordance with IEC 62271-213 (section 11.4.2). A maintenance test is not necessary in general due to the permanent monitoring.

NOTICE!
As the LCD indication may have a different contrast depending on the viewing angle, the following must be observed: The maintenance test is passed if, when viewed from a perpendicular angle the dot symbol has the same contrast as the corresponding arrow symbol!

7 Disposal

At the end of its service life, the Wega must be disposed of in accordance with the legal regulations of the respective place of use.

8 Technical data

Electrical data

Nominal voltage	From 1 kV (nominal voltage of the switchgear)
Nominal frequency	50 / 60 Hz
Power supply	The LCD indication is powered by the measuring voltage
Interface	Test socket for each phase and one earth socket, compliant with LRM
Indication	LCD indication (display) with black symbols for: • Voltage present • Maintenance test passed • Over-voltage
Voltage-limiting predetermined breaking point	90 V ± 20% (The effects of tripping the voltage-limiting predetermined breaking point must be checked against the switchgear's protection concept.)
Operating temperature	-40 °C to +75 °C
Operating time	Suitable for permanent operation
Auxiliary power supply (only Wega 2 / Wega 2 V)	24 V – 230 V (AC or DC)

Relay characteristics (only for Wega 2 and Wega 2 V)

Type	32.21-4000, changeover contact, switching capabilities DC 3A/30V 0.35A/110V 0.2A/220V
Contact	Permanent contact
Shock resistance	20 G
Vibration resistance	10 G
Power supply	Integrated universal power supply Power input: approx. 0.5 W

Mechanical data

Cut-out on the system side	$92^{+0.8}$ mm x $45^{+0.6}$ mm
Housing material	Polycarbonate
Measuring and earth socket	LRM system, the distance between the sockets is 14 mm, the socket has an inner diameter of 4 mm
Type of protection	IP54 (applies only with the fitted protective cap for the interface and with closed covers for unused connections on the rear.)

	Total weight	Dimensions (W x H x D) (installation housing for panel cut-out 96 mm x 48 mm in accordance with DIN IEC 61554)	Installation depth (from the front panel)
Wega1	130 g	96 mm x 48 mm x 34 mm	20 mm
Wega 1 V	125 g	96 mm x 48 mm x 34 mm	20 mm
Wega 2	220 g	96 mm x 48 mm x 62 mm	48 mm
Wega 2 V	215 g	96 mm x 48 mm x 62 mm	48 mm

HORSTMANN
GERMANY

Instructions for Use

SIGMA 2.0
SIGMA 2.0 1250 A
SIGMA 2.0 AC/DC
SIGMA 2.0 AC/DC 1250 A

104101-0419
May 2020

Contents

General notes!

Before using this device, carefully read and understand the contents of this document and keep it for future reference.

The content of these Instructions for Use reflects the current state of the art at the date of printing. We reserve the right to make technical changes at any time and without prior notice as necessary in the framework of on-going developments. This technical documentation becomes invalid when a new issue appears.

For better understanding we use Sigma for all versions in this document. If there is any difference between the Sigma 2.0, Sigma 2.0 1250 A, Sigma 2.0 AC/DC and the Sigma AC/DC 1250 A we write the complete name of the product.

Important terms

The following defined terms are used to save life and limb. In addition to that, they influence the service life of the device.

DANGER!
... indicates a hazardous situation which, if not avoided, will lead to death or serious injury.

WARNING!
... indicates a hazardous situation which, if not avoided, may lead to death or serious injury.

CAUTION!
... indicates a hazardous situation which, if not avoided, may lead to wounds and minor injuries.

NOTICE!
... is used for application purposes and does not refer to personal injuries.

CE Declaration of conformity

This device is in conformity with the requirements of the EC Electromagnetic Compatibility (EMC) Directive and EC Low Voltage Directive (LVD) in their current form.

If required, the CE Declaration of Conformity may be obtained from the following address:

HORSTMANN
GERMANY
Dipl.-Ing. H. Horstmann GmbH • Humboldtstraße 2 • 42579 Heiligenhaus, Germany
Tel.: +49 2056/976-0 • Fax: +49 2056/976-140 • www.horstmanngmbh.com

Abbreviations	Definition
I>>	Short-circuit trip current
t>>	Short-circuit response time
tReset	Time reset
Contact type	Selection: normally open/normally closed
Relay type	Selection: permanent/momentary contact
U_{aux}	Auxiliary supply
U_{aux}R	Reset with return of auxiliary voltage

Tab. 1.1: Abbreviations

1 Intended use

Sigma 2.0 is a short-circuit fault indicator. It is designed to detect, display and remotely indicate phase selective short-circuits in medium voltage distribution networks.

It is designed for operation in radial or open ring networks. Besides the device can be operated in ring networks with double-sided feeds either with automatic or manual reclosure.

Moreover, a load current dependent short-circuit trip value instead of a fixed setting can be activated.

In order to facilitate commissioning the short-circuit trip value I>> can be set to a low value which enables a function test with commercially available relay testers.

1.1 Differences between Sigma versions

Sigma 2.0 and Sigma 2.0 AC/DC differ only in the power supply section.

The Sigma 2.0 1250 A and the Sigma 2.0 AC/DC 1250 A are designed for use in primary substations of medium voltage networks.

Sigma 2.0/Sigma 2.0 1250 A

- Current sensor powered
- Internal back-up battery (non-rechargeable) for the flashing LEDs after a fault

Sigma 2.0 AC/DC / Sigma 2.0 AC/DC 1250 A

- Requires auxiliary power supply
- Internal rechargeable capacitor
- Capacitors can be charged via current sensor >5 A load current, charging time min. 17 h
- Without auxiliary supply, maximum LED flashing duration: 4 h

2 Device description

2.1 Scope of delivery

A complete set includes:

- 1 x display unit in plug-in housing for panel mount
- 3 x closed bushing-type current sensors for installations on bushings of gas-insulated MV switchgears
  alternatively:
  - 3 x split-core type current sensors for installations on insulated cables

2.2 Display unit

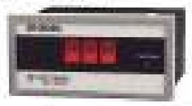


Fig. 2.1: Display unit Sigma 2.0/Sigma 2.0 1250 A

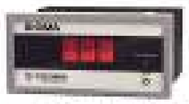
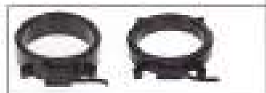


Fig. 2.2: Display unit Sigma 2.0 AC/DC/Sigma 2.0 AC/DC 1250 A

- Plug-in housing for panel-mount: 96 x 48 x 96 mm (W x H x D)

2.3 Current sensors

	Description
	Single-phase, closed bushing-type current sensor. Installations on bushings in gas-insulated switchgears. Version and installation varies depending on the switchgear.
	Single-phase, split-core cable-type current sensor for cable diameters of 10–65 mm
	Single-phase, split-core cable-type current sensor for cable diameters of up to 55 mm
	Sigma 2.0 1250 A/Sigma 2.0 AC/DC 1250 A: Single phase, split-core cable-type current sensor for cable/bushing diameters up to 78 mm Order No.: 49-6024-131

Tab. 2.1: Phase current sensors

DANGER!
Make sure current sensors are mounted only on fully insulated i. e. touch-safe conductors.

3 Installation

DANGER!

- The Sigma may only be used for the purpose stated in this manual.
- Installation, connection and commissioning of the devices must be carried out by an electrician observing the "Five Safety Rules" according to DIN VDE 0105 (EN 50110).
- Assembly and/or fitting and disassembly and/or stripping work on the current sensors and their wiring must be carried out on the disconnected and earthed medium voltage switchgear in a powered down (voltage-free) state.
- If current sensors remain in the switchgear without being connected to the indicator, the leads must be applied to suitable insulated terminals ensuring that such leads are short-circuited.

3.1 Installation of the plug-in housing

Insert the plug-in housing into a prepared DIN size cut-out with the dimensions 92$^{+0.8}$ x 45$^{+0.6}$ mm on the front of the switchgear panel and lock in place using four integrated spring clips (self-holding). Provide a minimum installation depth of 107 mm with connected leads. The leads must be designed with tightened cable ties in such a way that the device can be unplugged from the front of the switchgear panel and the connector can be removed from the connecting terminal plates.

If you need to dismount the device, remove the front frame and front plate pushing the retainer spring clips towards the centre of the device (Order No. of Disassembly Clip: 49-0000-016).

Fig. 3.1: Disassembly clip

3.2 Current sensor installation

DANGER!
Installation, connection and commissioning of the devices must be carried out by an electrician observing the "Five Safety Rules" according to DIN VDE 0105 (EN 50110):
1. Disconnect completely
2. Secure against re-connection
3. Verify absence of operating voltage
4. Carry out earthing and short circuiting
5. Provide protection against all adjacent live parts

DANGER!

- The installation is only permitted on contact-safe, fully-insulated medium-voltage cables!
- Disconnect and earth the relevant medium-voltage cable prior to installation!
- Disconnect auxiliary supply!

General mounting instructions

- Mount current sensors with correct orientation. The imprinted directional arrow B↓ points in the direction of the ground (away from the system).
- The shield of every individual phase has to be routed back through the yoke and connected to earth potential (compensation for shield currents). Extend the shields according to professional standards if required. It is recommended to isolate the concentric neutral wires in order to avoid any unintended contact with earth potential above the yoke.

Fig. 3.2: Installation of single-phase current sensors

Example 1 of mounting the current sensor

Recommended shield concept

- Route shields L1/L2/L3 back through each current sensor to earth potential.
- The shield wire should be isolated before routed back through the current sensor to avoid unintentional earth contact.

Fig. 3.3: Installation of current sensors

Example 2 of mounting the current sensor

For connection to double cables, the current sensors on the secondary side must be connected in parallel.

Additional terminals must be used to connect the sensors in parallel.

Shield concept

- Route shields L1/L2/L3 back through each current sensor to earth potential.
- The shield wire should be isolated before routed back through the current sensor to avoid unintentional earth contact.

Fig. 3.4: Installation of current sensors

3.3 Electrical connection

3.3.1 Terminal strip

The terminal strip is located on the rear of the device. Perform electrical connection according to the following terminal reference list (see also circuit diagram on the top side of the device, numerical arrangement from right to left). Use ferrules of L = 6 mm/0.75 mm². The maximum permissible tightening torque is 0.4 Nm. (Use ferrules of L = 8 mm/0.75 mm² max. if the version with plug-in terminal block is used).

3.3.2 Terminal assignment

Fig. 3.5: Terminal strip Sigma 2.0

Fig. 3.6: Terminal strip Sigma 2.0 AC/DC

Terminal strip X1:

Terminal	Designation	Description
1	I1 (BN)	L1 Current sensor (brown)
2	I1 (BU)	L1 Current sensor (blue)
3	I2 (BN)	L2 Current sensor (brown)
4	I2 (BU)	L2 Current sensor (blue)
5	I3 (BN)	L3 Current sensor (brown)
6	I3 (BU)	L3 Current sensor (blue)
7	⏚	Earth
8	Reset	Input for external reset contact (1 s < t < 5 s)
9	Test	Input for external test contact (1 s < t < 5 s)
10	Common	Common contact for Test/Reset
11/12	I>>	Remote signal relay I>> short-circuit
13/14		AC/DC versions only: not used
15	24–230 V +/~	AC/DC versions only: auxiliary supply
16	24–230 V -/~	AC/DC versions only: auxiliary supply

Tab. 3.1: Terminal assignment

CAUTION!
For safe operation of the Sigma 2.0 AC/DC, the ground terminal (terminal 7) must be provided with a Functional earth. The cable should be connected to the system housing by a short route. Length: recommended 30 cm, max. 1 m

3.4 Auxiliary voltage

Sigma 2.0 AC/DC (1250 A) requires auxiliary voltage for full functionality.

3.5 Connection of Test/Reset relay contacts

- Use potential-free contacts, e. g. as used for instrumentation and process control, coupling relays or tracers.
- Use separate potential-free contacts for each individual indication unit.
- If the functions of several devices shall be operated in parallel, the triggering disconnecting elements (relay outputs, coupling relays etc.) are to be operated in parallel.
- Operational earth or other "GND" potentials are inappropriate as common reference potential.
- Use a momentary contact for activation (momentary time 1 s < 5 s), but not a permanent contact.

4 Operator control

4.1 Front panel

Fig. 4.1: Front panel

After removal of front frame and front plate DIP switches are accessible. For exact positions and functions see chapter 6.2.

5 Function of the device

5.1 Operating principle

The current sensors measure the individual phase currents and detect short-circuits. These faults are evaluated in the display unit, visually indicated and provided as a remote signal via a relay.

Short-circuits are phase selectively indicated via ultra-bright LEDs with a viewing angle of 180 degrees.

The ⏻ LED signals the presence of the auxiliary voltage (AC/DC versions only).

5.2 Short-circuit I>>

When the phase current exceeds the preset trip current for the programmed response time, or when the phase current exceeds the previously flowing operating current by a defined factor (load dependent auto-adjustment), the LED of the fault-affected phase, either L1, L2 and/or L3, as well as the red LED for "I>>", will start flashing. Additionally, the relay contact for "short-circuit remote signal" will be activated for remote signalling.

The response characteristic can be adjusted by DIP switch (see also chapter 6.2), by selecting either fixed ratings or the load-dependent auto-adjustment.

5.2.1 Short-circuit, auto-adjustment

"Auto-setting" is enabled using the DIP switch positions 1.1 – 1.3.

In "I>> = auto-setting (400 A–2,000 A)" mode the load current is continuously measured, and as a function of these measurements, the trip current is adjusted automatically. In case of load currents in the range of ≤100 A the trip current is adjusted to 400 A. For load currents >100 A the trip current is automatically adjusted to a level of four times the load current, however, the maximum settable trip current is limited to 2,000 A.

An increase in load current for longer than 60 seconds will automatically initiate a readjustment of the trip current to the higher level whereas a decrease in load current will reduce the trip current only after expiration of a 72 hour holding period. The holding time serves to avoid misalignments in case of temporary disconnections or low loads at night-time or weekends. Independent on the auxiliary energy supply, the energy required for continuous measurement and self-adjustment is supplied from the current sensors.

The short-circuit response delay is adjusted by DIP switch position 1.4.

5.3 Ring function/double flashing

Whenever a current above the trip level is sensed, a single flashing LED with relay tripping (permanent or momentary contact) is generated. The appearance of a second fault on the same phase after >100 ms switches a single flashing LED to double flashing. With a permanent contact, the relay, after re-excitation, is disengaged for 1 s and then re-engaged. The relay is re-engaged every time another fault is detected. The ring function of the device remains active until it is reset.

This ring function allows for a safe fault indication by one-sided inclosure even in case of two-sided fed networks/ring networks.

5.4 Remote signalling

For remote signalling a potential-free relay contact is available. Use DIP switch positions 1.7 and 1.8 to configure NC/NO or permanent/momentary contact.

5.5 Reset

Local fault indication and remote fault signalling can be reset via:

- automatically after a preset time (1/2/4/8 h) adjustable in the device by DIP switch positions 1.5 and 1.6,
- by remote control using a potential-free remote reset contact (1 s) terminals 8/10,
- manually by Test/Reset button,
- with return of auxiliary voltage (AC/DC versions only).

6 Device configuration and commissioning

6.1 Device configuration

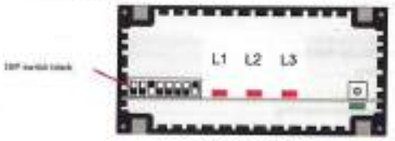


Fig. 6.1: Interior view

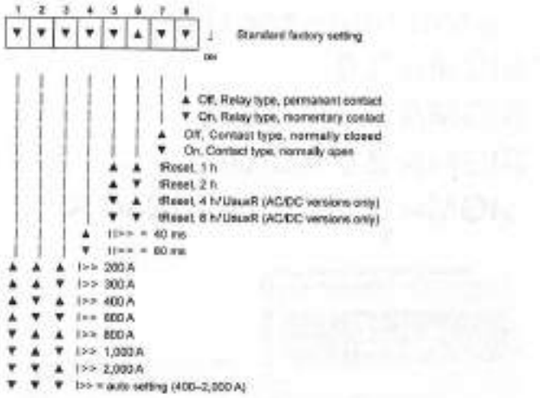
The device is delivered with a standard factory setting (see also Appendix A). If any changes are required make sure that the indicator is configured before being put into operation. Use the DIP switches for configuration. Remove the front frame and the front plate to get access to the DIP switches.

NOTICE!
Shortly push the test button to save and activate a new configuration. If not done it will be taken over after 1 hour.

6.2 DIP switch assignment and configuration

DIP switch block: Short-circuit trip currents or auto setting

Switch pos. 1.1/1.2/1.3	I>> Short-circuit trip currents or auto setting
Switch pos. 1.4	t>> Short-circuit response delay setting
Switch pos. 1.5/1.6	tReset, automatic time reset
Switch pos. 1.7	Contact type: normally closed/normally open
Switch pos. 1.8	Relay type: permanent contact/momentary contact



6.3 Test

6.3.1 Function test

During commissioning LED and relay functions can be checked easily:

- Manually via Test/Reset button (see Fig. 4.1):
  After pressing the Test/Reset button an LED and relay test is carried out. All LEDs flash simultaneously and the relay output is activated. If the relay is configured as momentary contact the relay will disengage after 1s.
  After pressing the Test/Reset button for a second time all LEDs stop flashing and the relay will disengage.
- Remotely via Test-contact (1s), terminals 9/10.
  The sequence is identical to the manual test.

6.3.2 Current sensor test mode

The Sigma 2.0 includes a special test mode in order to test the complete signal chain from the current sensors to the display unit and a remote control system connected to the relay outputs.

In this test mode the short-circuit trip value I>> is reduced to 10 A which is a current that can be generated with commercially available relay testers, e.g. a Megger SVERKER 760 or Omicron CMC356.

Sequence of current sensor testing procedure:

1. Connect relay tester to the current sensor that shall be checked at the Sigma 2.0.
2. Press the Test/Reset button for about 5 seconds to activate the test mode. The activated status is indicated by the three triple flashing lights of the 3-phase LEDs (L1, L2, L3) of the Sigma 2.0.
   The response values for testing purposes are reduced to 10 A/100 ms.
3. The relay tester transmits a current pulse through the current sensor. If the test is completed successfully, the indication will go off on each of the three channels where upon the energised channel is indicated by triple flashing. In addition to that, the associated relay contact is switched.

NOTICE!
- The relay contact design (N/C or N/O contact, permanent or momentary contact) corresponds to the configuration of the device.
- If all three channels shall be tested separately, then restart the test mode by pressing the test button for about 5 seconds each time a testing sequence has been completed.
- The test mode is finished either automatically after 15 minutes or manually via test button. The LEDs stop flashing and the relay is disengaged.

7 Technical data

Mechanical data:	
DIN plug-in housing	96 x 48 x 96 mm (W x H x D)
Installation depth	88 mm, 98 mm with connection series
DIN cut-out on system side	92 +0.8 x 45 +0.6 mm
Weight indication unit	210 g
Temperature range	-30 to +70 °C
Protection class	IP40
Electrical data:	
Power supply	
Sigma 2.0 (1250 A)	Current sensor powered Back-up: Lithium battery 6 V/1.0 Ah, shelf life 20 years, >5000 h total flashing time
Sigma 2.0 AC/DC (1250 A)	Auxiliary supply: 24–230 V AC/DC +10 %/-20 % Back-up: Capacitor with max. 4 h back-up time Capacitor charging time: 30 min from aux. voltage, 17 h from >5 A load current
Thermal load capability of current sensors Sigma 2.0/Sigma 2.0 AC/DC	0 A – 630 A continuous 630 A – 2,000 A 10 s 21 kA 3 s 25 kA 1 s
Thermal load capability of current sensors Sigma 2.0 1250 A/ Sigma 2.0 AC/DC 1250 A	0 A – 1250 A continuous 1250 A – 2000 A 10 s 21 kA 1 s
Short-circuit trip value (I>>)	200, 300, 400, 600, 800, 1,000, 2,000 A fixed or auto-setting Auto-setting as a function of the operating current (Ie): Ie ≤100 A/I>> =400 A, Ie >100 A/I>> = 4 x Ie, I>> max = 2,000
Response time (I>>)	40, 60 ms
Accuracy	5 % (0 – 630 A) 10 % (>630 A)
Signal inputs	2 inputs (Test/Reset) for connection to potential-free relay outputs
Indication	3 red LED phase-selective (L1, L2, L3)
Flashing interval	2 s
Remote signal	1 relay short-circuit indication (I>>), potential-free relay contact (NO/NC), permanent contact (until reset)/momentary contact (1 s), adjustable by DIP switch
	Contact capacity: 230 V AC/1 A/62.5 VA max. 220 V DC/1 A/60 W max.
	Insulation voltage resistance: 1.5 kV, 1 minute
Reset	Automatic time reset after 1, 2, 4 or 8 h, via external contact reset, via Test/Reset button or with return of auxiliary voltage (AC/DC versions only)
Test	Via external contact test or via Test/Reset button

Appendix A: List of DIP switch settings

Enter part number and serial number: _____

Both can be found on the name plate on the display unit.

DIP switch block 1			Standard factory setting (under lined)	Customer settings
DIP 1.1	DIP 1.2	DIP 1.3	I>> Short-circuit	
▲ on	▲ off	▲ off	I>> = 200 A	
▲ on	▲ off	▼ on	I>> = 300 A	
▲ on	▼ on	▲ off	I>> = 400 A	
▲ on	▼ on	▼ on	I>> = 600 A	
▼ on	▲ on	▲ off	I>> = 800 A	
▼ on	▲ on	▼ on	I>> = 1,000 A	
▼ on	▼ on	▲ on	I>> = 2,000 A	
▼ on	▼ on	▼ on	I>> = auto setting (400–2,000 A)	
		DIP 1.4	t>> Short-circuit response delay	
		▲ off	t>> = 40 ms	
		▼ on	t>> = 80 ms	
	DIP 1.5	DIP 1.6	Automatic time reset	
	▲ off	▲ off	tReset, 1 h	
	▲ off	▼ on	tReset, 2 h	
	▼ on	▲ off	tReset, 4 h/UauxR (AC/DC versions only)	
	▼ on	▼ on	tReset, 8 h/UauxR (AC/DC versions only)	
		DIP 1.7	Contact type	
		▲ off	Normally closed (NC)	
		▼ on	Normally open (NO)	
		DIP 1.8	Relay type	
		▲ on	Permanent contact	
		▼ on	Momentary contact	

Identifikasjon av stoffet/stoffblandingen og av selskapet/foretaket

1.1 Produktidentifikator

Produktnavn: Svovelheksafluorid

Handelsnavn: Sulphur hexafluoride 3.0 Chemical, Sulphur hexafluoride 3.6, Sulphur hexafluoride 4.5, Sulphur hexafluoride 5.0

Tilleggsidentifikasjon

Kjemisk navn: Svovelheksafluorid

Kjemisk formel:	SF6
EU-identifikasjonsnummer	-
CAS-nr.	2551-62-4
EU-nummer	219-854-2
REACH-registreringsnr.	01-2119458769-17

1.2 Relevante, identifiserte bruksområder for stoffet eller blandingen, og bruksmåter det advares mot

Identifisert bruk: For industriell og profesjonell bruk i henhold til gjennomført risikoanalyse.
Isolerende materiale.
Brukes som mellomstoff (transportert, isolert på stedet).
Brukes til produksjon av elektroniske komponenter
Bruk av gass alene eller i blandinger, til kalibrering av analyseutstyr.
Bruk av gass til behandling av metall
Tilsatt i blandinger med gass, i trykkbeholdere

Bruk som blir frarådd For forbruker.

1.3 Opplysninger om leverandøren av sikkerhetsdatabladet

Leverandør

Linde Gas AS
Postboks 13 Nydalen
N-0409 Oslo Norway

telefon: +4723177200

E-post: sds.ren@linde.com

1.4 Nødtelefonnr.: +47 22 59 13 00 (24h - Giftinformasjonssentralen)

Avsnitt 2: Fareidentifikasjon

2.1 Klassifisering av stoffet/blandingen

Klassifisering ifølge EU-forskrift nr. 1272/2008, med endringer.

Fysiske Farer

Gasser under trykk	Flytende gass	H280: Inneholder gass under trykk; kan eksplodere ved oppvarming.

2.2 Etikettelementer

Signalord: Advarsel

Fareerklæring(er): H280: Inneholder gass under trykk; kan eksplodere ved oppvarming.

Anbefalt Forholdsregel

Forebygging: Ingen.

Svar: Ingen.

Lagring: P403: Oppbevares på et godt ventilert sted.

Avhending: Ingen.

Tilleggsinformasjon om etiketter

EIGA-0783: Inneholder fluorerte drivhusgasser
EIGA-As: Kvelende i høye konsentrasjoner.

2.3 Andre farer: Kontakt med fordampende væske kan forårsake frostskader eller frysing av huden.

Avsnitt 3: Sammensetning/opplysninger om bestanddeler

3.1 Stoff

Kjemisk navn	Svovelheksafluorid
EU-identifikasjonsnummer:	-
CAS-nr.:	2551-62-4
EU-nummer:	219-854-2
REACH-registreringsnr.:	01-2119458769-17
Renhet:	100% Stoffets renhet i dette kapittelet brukes kun til klassifisering og representerer ikke den faktiske renheten til stoffet slik det leveres. Rådfør deg med annen dokumentasjon for disse opplysningene.
Handelsnavn:	Sulphur hexafluoride 3.0 Chemical, Sulphur hexafluoride 3.6, Sulphur hexafluoride 4.5, Sulphur hexafluoride 5.0

Avsnitt 4: Førstehjelpstiltak

Generelt: Høye konsentrasjoner kan forårsake kvelning. Symptomene kan omfatte lammelse/bevisstløshet. Kvelning kan oppstå uten forvarsel. Flytt den skadede ut i frisk luft. Benytt pusteutstyr med egen luftbeholder. Hold pasienten varm og i ro. Tilkall lege. Benytt kunstig åndedrett hvis pusten opphører.

4.1 Beskrivelse av førstehjelpstiltak

Innånding: Høye konsentrasjoner kan forårsake kvelning. Symptomene kan omfatte lammelse/bevisstløshet. Kvelning kan oppstå uten forvarsel. Flytt den skadede ut i frisk luft. Benytt pusteutstyr med egen luftbeholder. Hold pasienten varm og i ro. Tilkall lege. Benytt kunstig åndedrett hvis pusten opphører.

Øyekontakt: Skyll straks øyet med vann. Fjern eventuelle kontaktlinser dersom dette enkelt lar seg gjøre. Fortsett skyllingen. Skyll grundig med vann i minst 15 minutter. Søk legehjelp umiddelbart. Skyll 15 minutter til hvis legehjelp ikke straks er tilgjengelig.

Hudkontakt: Kontakt med fordampende væske kan forårsake frostskader eller frysing av huden.

Inntak/svelging: Inntak gjennom munnen er ikke ansett for å være en potensiell eksponeringsvei.

4.2 Viktigste symptomer og virkninger, både akutte og forsinkede: Åndedrettsstans Kontakt med den flytende gassen kan føre til skader (forfrysninger) på grunn av rask avkjøling ved fordampning.

4.3 Indikasjon på om øyeblikkelig legehjelp eller spesiell behandling er nødvendig

Farer: Åndedrettsstans Kontakt med den flytende gassen kan føre til skader (forfrysninger) på grunn av rask avkjøling ved fordampning.

Behandling: Varm opp frostskadede legemsdeler med lunkent vann. Ikke gni på det skadede området. Søk legehjelp umiddelbart.

Avsnitt 5: Brannslokkingstiltak

Generelle Brannfarer: Beholderne kan eksplodere ved oppvarming.

5.1 Brannslokkingsmidler

Egnete brannslokkingsmedier: Stoffet vil ikke brenne. Ved brann i omgivelsene: bruk egnet brannslukningsmiddel.

Uegnete brannslokkingsmedier: Ingen.

5.2 Spesielle farer forbundet med stoffet eller blandingen: Brann eller overdreven varme kan danne skadelige nedbrytingsprodukter.

Farlige forbrenningsprodukter:	Ved brann kan følgende giftige og/ eller korrosive damper bli dannet ved termisk spalting : Hydrogenfluorid ; Sulfurdioksid

5.3 Råd til brannmenn

Særlige brannslokkingstiltak:	Ved brann: Stopp lekkasje dersom dette kan gjøres på en sikker måte. Fortsett å spraye vann fra den beskyttede posisjonen inntil gassflaska forblir kald. Bruk slukningsmidler til å begrense brannen. Isoler kilden til brannen eller la den brenne ut.
Spesielt verneutstyr for brannmenn:	Brannmannskapene må bruke standard verneutstyr med flammehemmende jakke, hjelm med ansiktsvern, hansker, gummistøvler og røykdykkerapparat i lukkede rom. Retningslinje: EN 469 Vernetøy for brannmannskap. Ytelseskrav til vernetøy for brannslukning. EN 15090 Fottøy for brannmannskaper. EN 659 Vernehansker for brannvesen. EN 443 Hjelmer for brannslukning i bygninger og andre byggverk. EN 137 Åndedrettsvern — Selvforsynt pusteutstyr med åpent kretsløp og luft under trykk — Krav, prøving, merking.

Avsnitt 6: Tiltak ved utilsiktet utslipp

6.1 Personlige forholdsregler, verneutstyr og nødprosedyrer:	Evakuér området. Sikre tilstrekkelig luftventilasjon. Unngå at det kommer ned i kloakksystemet, kjeller og groper, eller andre steder hvor en oppkonsentrering kan være farlig. Bær pusteutstyr med egen luftflaske ved entring av området hvis det ikke er bevist at det er trygt. EN 137 Åndedrettsvern — Selvforsynt pusteutstyr med åpent kretsløp og luft under trykk — Krav, prøving, merking.
6.2 Miljøverntiltak:	Forhindre ytterligere lekkasje eller søl dersom det er forsvarlig.
6.3 Metoder og materiell for avgrensning og opprenskning av utslipp:	Sikre tilstrekkelig luftventilasjon.
6.4 Referanse til andre avsnitt:	Se avsnitt 8 og 13.

Avsnitt 7: Håndtering og lagring:

7.1 Forholdsregler for sikker håndtering::

Kun erfarne personer som har mottatt korrekt opplæring skal håndtere gass under trykk. Bruk kun korrekt, spesifisert utstyr, som er egnet til dette produktet, tilførselstrykket og temperaturen. Se leverandørens håndteringsanvisninger. Stoffet må håndteres i forhold til gjennomarbeidede hygiene- og sikkerhetsprosedyrer. Beskytt beholderne mot fysisk skade, og ikke dra, rull, skyv eller slipp dem. Ikke fjern eller gjør uleselig etiketter som er gitt av leverandøren, til identifisering av beholderens innhold. Når beholderne skal flyttes, må det brukes korrekt utstyr, f.eks. tralle, håndtruck, gaffeltruck, osv., selv for korte avstander. Sylindrene skal til enhver tid være sikret i vertikal stilling. Steng alle ventiler når de ikke er i bruk. Sikre tilstrekkelig luftventilasjon. Tilbakeslag av vann inn i beholderen må forhindres. Tillat ikke tilbakeslag inn i beholderen. Unngå tilbakeslag av vann, syrer og alkalier. Oppbevar beholderen i et godt ventilert rom og med en temperatur på under 50°C. Vurder relevante lover, forskrifter og lokale regelverk i forbindelse med lagring av beholdere. Det må ikke spises, drikkes eller røykes under bruk. Oppbevares i samsvar med lokale/regionale/nasjonale/internasjonale forskrifter. Bruk aldri åpen flamme eller elektrisk oppvarming for å øke trykket i en gassbeholder. Behold ventilhetten på plass inntil gassflasken er forsvarlig sikret mot å velte. Deretter tas flasken i bruk. Skadede ventiler må rapporteres til leverandøren øyeblikkelig Steng beholderens ventil etter bruk og når den er tom ,selv om beholderen fortsatt er tilknyttet forbruksutstyr. Forsøk aldri å modifisere eller reparere beholderens ventiler eller sikkerhetsavblåsingsutstyr. Når blindmutter følger med beholderen skal denne monteres på ventilen umiddelbart etter frakobling fra forbruksutstyr. Oppbevar beholderens ventilåpninger rene og frie for forurensninger, spesielt olje og vann. Hvis det er vanskelig å bruke beholderens ventil, skal bruken avbrytes og leverandøren kontaktes. Prøv aldri å overføre gasser fra én beholder til en annen. Flaskeventilbeskyttere eller hetter skal være på plass.

7.2 Betingelser for sikker lagring, inklusive eventuelle uforenligheter:

Beholdere bør ikke lagres under forhold som kan medføre korrosjon. Oppbevarte beholdere må kontrolleres jevnlig for generell tilstand og lekkasje. Flaskeventilbeskyttere eller hetter skal være på plass. Beholdere skal lagres på områder der det ikke er brannfare. Varmekilder og tennkilder må unngås. Oppbevares unna brennbart materiale.

7.3 Spesifikk sluttbruk:

Ingen.

Eksponeringskontroll/personbeskyttelse

8.1 Kontrollparametre

Yrkesmessige Eksponeringsgrenser

Kjemisk navn	Type	Eksponeringsgrenser	Kilde
Svovelheksafluorid	TWA	2,5 mg/m3	EU. Indikative eksponeringsgrenseverdier i direktivene 91/322/EØF, 2000/39/EU, 2006/15/EU, 2009/161/EU, 2017/164/EU, med endringer (12 2009)
	NORMEN	1.000 ppm 6.000 mg/m3	Forskrift (Nr 1358 av 2011) om tiltaksverdier og grenseverdier for fysiske og kjemiske faktorer i arbeidsmiljøet samt smitterisikogrupper for biologiske faktorer (forskrift om tiltaks- og grenseverdier) (12 2011)
	TWA	2,5 mg/m3	EU. Indikative eksponeringsgrenseverdier i direktivene 91/322/EØF, 2000/39/EU, 2006/15/EU, 2009/161/EU, 2017/164/EU, med endringer (12 2009)

DNEL-verdier

Kritiske komponenter	Type	Verdi	Merknader
Svovelheksafluorid	Arbeidere - Innånding, Lokal, langvarig	2535 mg/m3	-
	Arbeidere - Innånding, Systemisk, langvarig	2535 mg/m3	-

PNEC-verdier

Kritiske komponenter	Type	Verdi	Merknader
Svovelheksafluorid	Vannmiljø (intermitterende utslipp)	1,5 mg/l	-
	Vannmiljø (ferskvann)	0,15 mg/l	-

8.2 Forebyggende tiltak

Egnede konstruksjonsmessige kontrolltiltak: Vurder et arbeidstillatelsessystem, f.eks. til vedlikeholdsarbeid. Sikre tilstrekkelig luftventilasjon. Gassdetektorer bør brukes når gasser som fortrenger oksygen kan bli sluppet til friluft. Sørg for tilstrekkelig ventilasjon, inkl. lokal avtrekksventilasjon, for å sikre at fastsatte eksponeringsgrenser ikke overskrides. Systemer under trykk må jevnlig kontrolleres for lekkasje. Bruk helst permanent lekkasjesikre sammenføyninger (f.eks. sveiste rør). Det må ikke spises, drikkes eller røykes under bruk.

Individuelle vernetiltak, som personlig verneutstyr

Generelle opplysninger:	Det skal utføres og dokumenteres en risikovurdering i hvert arbeidsområde, for å vurdere risikoene som er knyttet til bruken av produktet og for å velge det PVU som passer til den aktuelle risikoen. Følgende anbefalinger skal vurderes. Pusteutstyr med egen luftflaske skal være lett tilgjengelig i tilfelle uhell. Personlig verneutstyr for kroppen må velges etter oppgaven som skal utføres og de medførte risikoene.
Øye-/ansiktsvern:	Øyevern, briller eller ansiktsskjerm i henhold til EN166 må brukes for å unngå eksponering for væskesprut. Bruk øyevern i henhold til EN 166 når det brukes gasser. Retningslinje: EN 166 Øyevern.
Hudvern	
Håndvern:	Bruk arbeidshansker ved håndtering av beholderne. Retningslinje: EN 388 Vernehansker mot mekanisk påførte skader
Kroppsvern:	Ingen spesielle forholdsregler.
Andre:	Bruk vernesko ved håndtering av beholdere. Retningslinje: ISO 20345 Personlig verneutstyr - Vernesko.
Respirasjonsvern:	Ikke påkrevet.
Temperaturfarer:	Ingen forholdsregler er nødvendig.
Hygienetiltak:	Ut over bruk av gjennomarbeidede hygiene- og sikkerhetsprosedyrer er ingen sikkerhetstiltak påkrevd. Det må ikke spises, drikkes eller røykes under bruk.
Miljømessig forebyggende tiltak:	Hvis du ønsker mer informasjon om avhending, kan du se avsnitt 13.

Avsnitt 9: Fysiske og kjemiske egenskaper

9.1 Opplysninger om grunnleggende fysiske og kjemiske egenskaper

Utseende	
Fysisk tilstand:	Gass
Form:	Flytende gass
Farge:	Fargeløs
Lukt:	Luktfri
Luktterskel:	Luktegrensen er subjektiv og lukt kan ikke advare bruker om overeksponering.
pH-verdi:	Ikke anvendelig.
Smeltepunkt:	-50,8 °C
Kokepunkt:	-63,8 °C
Sublimeringspunkt:	Ikke anvendelig.

Kritisk temperatur (°C):	45,5 °C
Flammepunkt:	Gjelder ikke gasser og gassblandinger
Fordampningshastighet:	Gjelder ikke gasser og gassblandinger
Brennbarhet (faststoff, gass):	Ikke-brennbar gass
Eksplosjonsgrense, øvre (%):	Ikke anvendelig.
Eksplosjonsgrense, nedre (%):	Ikke anvendelig.
Damptrykk:	2.367 kPa (25 °C) Ingen data, støttende studie 21 bar (20 °C)
Damptetthet (luft=1):	5
Relativ tetthet:	1,88 (-50 °C)
Løselighet(er)	
Vannløselighet:	31 mg/l
Fordelingskoeffisient n-oktanol/vann:	1,68
Selvantennelsestemperatur:	Ikke anvendelig.
dekomponeringstemperatur:	Nedbryting forekommer ved høy temperatur med oksygen tilstede og utslipp av irriterende nedbrytingsprodukter. sulfuryl- og tionylfluorider er hovednedbrytingsproduktene. Frigjør toksiske damper av hydrogenfluorid og svoveloksider når det varmes opp til nedbrytning.
Viskositet	
Kinetisk viskositet:	Data ikke tilgjengelig.
Dynamisk viskositet:	0,016 mPa.s (25 °C)
Eksplosjonsegenskaper:	Ikke aktuelt
Oksideringsegenskaper:	Ikke anvendelig.

9.2 ANDRE OPPLYSNINGER:	Gass/damp tyngre enn luft. Kan samles på innestengte steder, spesielt ved eller under bakkenivå.
Molekylvekt:	146,06 g/mol (SF6)

Avsnitt 10: Stabilitet og reaktivitet

10.1 Reaktivitet:	Ingen reaktivitetsfare unntatt virkningene som beskrives i underavsnittet nedenfor.
10.2 Kjemisk Stabilitet:	Stabil under normale forhold.
10.3 Mulighet for Farlige Reaksjoner:	Ingen.
10.4 Forhold som må Unngås:	Ingen.
10.5 Materialer å Unngå:	Ingen reaksjon med noen vanlige materialer i tørr eller våt tilstand.

10.6 Farlige Spaltningsprodukter: Farlige spaltingsprodukter vil ikke forekomme ved normal lagring og normal bruk.

Avsnitt 11: Toksikologiske opplysninger

Generelle opplysninger: Ingen.

11.1 Toksikologiske opplysninger

Akutt toksisitet - Svelging
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Akutt toksisitet - Hudkontakt
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Akutt toksisitet - Innånding
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Toksisitet ved gjentatt inntak
Svovelheksafluorid NOAEL (No observed adverse effect level) - ingen påviste negative virkningsnivå (Rotte(Hunnkjønn, hannkjønn), Innånding): 302.687 mg/m3 Innånding
Eksperimentelt resultat, Hovedstudie

Etsing/Irritasjon på Huden
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Alvorlig Øyeskade/-Irritasjon
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Åndedrett- eller Hudsensibilisering
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Mutagenisitet på Kimceller
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Kreftfremkallende evne
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Reproduksjonstoksisitet
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Toksisitet for Bestemte Målorganer - Enkelt Eksponering
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Toksisitet for Bestemte Målorganer - Gjentatt Eksponering
Produkt Klassifiseringskriteriene er ikke oppfylt, basert på tilgjengelige data.

Aspirasjonsfare

Produkt Gjelder ikke gasser og gassblandinger.

Avsnitt 12: Økologiske opplysninger

12.1 Toksisitet

Akutt toksisitet

Produkt Ingen økologisk skade forårsakes av dette produktet.

Akutt toksisitet - Fisk

Svovelheksafluorid LC 50 (forskjellige, 96 t): 236 mg/l Merknader: QSAR QSAR, nøkkelstudie

Akutt toksisitet - Vannlevende, Virvelløse Dyr

Svovelheksafluorid LC 50 (Daphnid, 48 t): 247 mg/l (Static) Merknader: QSAR QSAR, nøkkelstudie

Toksisitet til mikroorganismer

Svovelheksafluorid EC 50 (Alge, 96 t): 151 mg/l

Økologisk tilleggsinformasjon

Ingen.

12.2 Stabilitet og nedbrytbarhet

Produkt Gjelder ikke gasser og gassblandinger.

12.3 Potensial for Bioakkumulering

Produkt Produktet det er snakk om, forventes å være bionedbrytbart, og forventes ikke å forekomme i vannmiljøer over lengre tid.

12.4 Mobilitet i jord

Produkt På grunn av høy flyktighet er det lite sannsynlig at produktet skal forårsake jord- eller vannforurensning.

Svovelheksafluorid Henrys lov-konstanten: 25.347 MPa

12.5 Resultater av PBT- og vPvB-vurderinger

Produkt Ikke klassifisert som persistent, svært persistent, bioakkumulerende eller toksisk.

12.6 Andre Skadelige Virkninger:

Potensial for global oppvarming

Potensiale for global oppvarming: 22.800
Inneholder fluorerte drivhusgasser Kan bidra til drivhuseffekten ved utslipp av store mengder. For GWP-verdien for blanding og mengder, se beholderetiketten.

Svovelheksafluorid

EU. F-gasser som er underlagt utslippsgrenser/rapportering (vedlegg I, II), forskrift 517/2014/EU om fluorerte drivhusgasser
- Potensiale for global oppvarming: 22800 Vedlegg 1: Fluorerte drivhusgasser det refereres til i punkt 1 i artikkel 2, del 3: Andre perfluorerte sammensetninger og blandinger av dette

Avsnitt 13: Instrukser om deponering

13.1 Avfallsbehandlingsmetoder

Generelle opplysninger: Unngå utslipp til atmosfæren. Må ikke slippes ut der det fare for at en akkumulering kan bli farlig. Henvend deg til framstiller/leverandør for informasjon om gjenvinning

Metoder til fjerning: Se EIGA-reglene for praksis (dok. 30 "Avhending av gasser", kan lastes ned på http://www.eiga.org) for flere opplysninger om egnede avhendingsmetoder. Kasser beholderen kun via gassleverandøren. Utslipp, behandling eller avhending kan være underlagt nasjonale og lokale lover og forskrifter.

Europeiske avfallskoder
Beholder: 16 05 05: 16 05 05: Andre gasser i trykkbeholdere enn de som er nevnt i 16 05 04.

Avsnitt 14: Transportopplysninger

ADR

14.1 UN-nummer:	UN 1080
14.2 Korrekt Transportnavn, UN:	SVOVELHEKSAFLUORID
14.3 Transportfareklasse(r)	
Klasse:	2
Etikett(er):	2.2
ADR-farenr.:	20
Tunnelrestriksjonskode:	(C/E)
14.4 Emballasjegruppe:	–
14.5 Miljøfarer:	Ikke anvendelig

14.6 Spesielle forholdsregler for brukeren: –

RID

14.1 UN-nummer:	UN 1080
14.2 Korrekt Transportnavn, UN	SVOVELHEKSAFLUORID
14.3 Transportfareklasse(r)	
Klasse:	2
Etikett(er):	2.2
14.4 Emballasjegruppe:	–
14.5 Miljøfarer:	Ikke anvendelig
14.6 Spesielle forholdsregler for brukeren:	–

IMDG

14.1 UN-nummer:	UN 1080
14.2 Korrekt Transportnavn, UN:	SULPHUR HEXAFLUORIDE
14.3 Transportfareklasse(r)	
Klasse:	2.2
Etikett(er):	2.2
EmS No.:	F-C, S-V
14.4 Emballasjegruppe:	–
14.5 Miljøfarer:	Ikke anvendelig
14.6 Spesielle forholdsregler for brukeren:	–

IATA

14.1 UN-nummer:	UN 1080
14.2 Korrekt teknisk navn:	Sulphur hexafluoride
14.3 Transportfareklasse(r):	
Klasse:	2.2
Etikett(er):	2.2
14.4 Emballasjegruppe:	–
14.5 Miljøfarer:	Ikke anvendelig
14.6 Spesielle forholdsregler for brukeren:	–
ANDRE OPPLYSNINGER	
Passasjer- og transportfly:	Tillatt.
Kun lastefly:	Tillatt.

14.7 Transport i bulk, ifølge vedlegg II i MARPOL og IBC-koden: Ikke anvendelig

Tilleggsidentifikasjon: Unngå transport i kjøretøy hvor lasten ikke er separat fra førerhuset. Sørg for at sjåføren er kjent med de potensielle farene med lasten og vet hva som skal gjøres ved ulykker eller nødsituasjoner. Sikre lasten før transporten starter. Sjekk at flaskeventilen er stengt og ikke lekker. Flaskeventilbeskyttere eller hetter skal være på plass. Sikre tilstrekkelig luftventilasjon.

Opplysninger om bestemmelser

15.1 Sikkerhets-, helse- og miljøforskrifter/-lovverk som er spesifikke for stoffet eller blandingen:

EU-forskrifter

EU. Direktiv 2012/18/EU (SEVESO III) om farer for storulykke som omfatter farlige stoffer, med endringer:
Ikke anvendelig

Nasjonale forskrifter

Rådsdirektiv 89/391/EØF om introduksjon av tiltak for å fremme forbedringer innen sikkerhet og helse for arbeidere på arbeidsplassen Direktiv 89/686/EØF om personlig verneutstyr Kun produkter som oppfyller matvareforskriftene 95/2/EU og 2008/84/EU og er merket deretter, kan brukes som tilsetning i mat.
Dette sikkerhetsdatabladet er utarbeidet for å overholde forskrift (EU) 2015/830.

15.2 Vurdering av kjemisk sikkerhet: CSA er utført.

Avsnitt 16: Andre opplysninger

Revisjonsinformasjon: Ikke relevant.

Referanser til litteratur og datakilder:

Ulike datakilder er brukt til å utarbeide dette sikkerhetsdatabladet, de omfatter men er ikke begrenset til:
Råd for registrering av toksiske stoffer og sykdommer (ATSDR) http://www.atsdr.cdc.gov/
European Chemical Agency: Råd om utarbeiding av sikkerhetsdatablad.
European Chemical Agency: Informasjon om registrerte stoffer http://apps.echa.europa.eu/registered/registered-sub.aspx#search
European Industrial Gases Association (EIGA) dok. 169 Klassifiserings- og merkeguide.
Internasjonalt program om kjemikaliesikkerhet (http://www.inchem.org/)
ISO 10156:2010 Gasser og gassblandinger - Bestemmelse av brannpotensialet og oksideringsevnen for utvalget av sylinderventiluttak.
Matheson Gas Data Book, 7. utgave.
National Institute for Standards and Technology (NIST) Standard referansedatabasenumer 69
ESIS (europeisk informasjonssystem for kjemiske stoffer - European chemical Substances 5 Information System)-plattformen i tidligere European Chemicals Bureau (ECB) ESIS (http://ecb.jrc.ec.europa.eu/esis/).
European Chemical Industry Council (CEFIC) ERICards.
USAs National Library of Medicines datanettverk for toksikologi TOXNET (http://toxnet.nlm.nih.gov/index.html)
Threshold Limit Values (terskelgrenseverdi - TLV) fra daværende American Conference of Governmental Industrial Hygienists (ACGIH).
Informasjon fra leverandører, spesifikk for stoffet.
Opplysningene i dette dokumentet var etter vår kjennskap korrekt på utgivelsestidspunktet.

Innholdet I H-setningene I avsnitt 2 og 3

H280 Inneholder gass under trykk; kan eksplodere ved oppvarming.

Klassifisering ifølge EU-forskrift nr. 1272/2008, med endringer.

Press. Gas Liq. Gas, H280

ANDRE OPPLYSNINGER:

Før dette produktet tas i bruk i en ny prossess eller eksperiment, må en grundig studie av materialkompatibilitet og sikkerhet være utført. Sikre tilstrekkelig luftventilasjon. Se til at alle nasjonale/lokale bestemmelser blir fulgt opp. Det tas ikke ansvar for evt. skade eller uhell som kan oppstå som følge av bruk av dette dokumentet.

Utarbeidet: 27.03.2020

Ansvarsfraskrivelse:

Disse opplysningene er gitt uten noen form for garantier. Opplysningene er korrekt i følge vår overbevisning. Disse opplysningene bør brukes som grunnlag for uavhengige vurderinger av metoderfor å sikre arbeidsmiljøet og miljøet generelt.

X-VOLT® Al TSLF

Cable for fixed installations.

BASED ON: HD 620-10K

100% Green Energy Cable Production

E_{ca}

APPLICATION

X-VOLT® TSLF is a halogen free cable for fixed installations.
Suitable for transport and distribution of electric power in medium voltage networks.
This cable is suitable for indoor, outdoor and buried installations.

CONSTRUCTION

Conductor
Aluminium, class 2 according to EN 60228 and IEC 60228.
Hygroscopic tapes applied to achieve longitudinal watertightness on the conductor.
Conductor screen
Cross-linked semiconductor screen applied over conductor in a triple-extrusion process.
Insulation
Cross-linked polyethylene insulation type DIX8 according to HD 620-1; natural colour.
Cross-linked in catenary line with nitrogen atmosphere.
Insulation screen
Cross-linked semiconductor screen applied over insulation in a triple-extrusion process. Bonded to the insulation layer.
Longitudinal water-blocking
Hygroscopic tape completely covering the screen.
Metallic screen
Metallic screen with copper wires, applied over the semi-conducting swellable tape.
Radial water-blocking barrier
Made up of an aluminium foil/polymer laminate bonded to the outer sheath.
Outer sheath
Polyethylene type DMP 17 according to HD 620-1.
Black colour (with conductive covering).

CHARACTERISTICS

Electrical performance
Maximum voltage: 12kV, 24kV and 36kV.

Thermal performance
Maximum conductor temperature: 90°C.
Maximum short-circuit temperature: 250°C (max. 5 s).
Minimum service temperature: -15°C.

Fire performance
Reaction to fire CPR: E_{ca} according to EN 50575.
Halogen free according to EN 60754-1 / IEC 60754-1.
Low corrosive gases emission according to EN 60754-2 / IEC 60754-2.

Mechanical performance
Minimum bending radius: 15x cable diameter.
Abrasion resistant.
Tear resistant.

Environmental performance
Water resistance: AD8 Submersion.

Installation conditions
Open Air.
Buried.
In conduit.

STANDARDS / COMPLIANCE

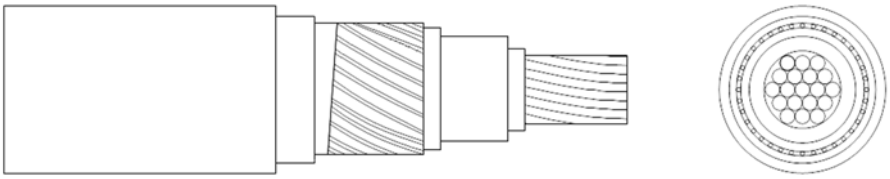
Based on
HD 620-10K

CPR (Construction Products Regulation)
E_{ca}

sales@topcable.com | www.topcable.com

X-VOLT® AI TSLF

DIMENSIONS & ADMISSIBLE INTENSITIES



X-VOLT® TSLF 12kV

Cross-section (mm²)	Conductor Diameter (mm)	Insulation Diameter (mm)	Metallic Screen (mm²)	Sheath Thickness (mm)	External Diameter (mm)	Weight (Kg/Km)	R20°C (Ω/km)	X (Ω/km)	C (µF/km)	Open air (A) [1]		Buried (A) [2]	
										Trefoil	Flat spaced	Trefoil	Flat spaced
1 x 400	22,9	30,9	35	2,2	38,7	1.965	0,0778	0,092	0,524	700	800	498	494
1 x 500	26,3	35,2	35	2,3	43,3	2.360	0,0605	0,090	0,607	808	955	574	572
1 x 630	29,8	38,7	35	2,4	46,9	2.825	0,0469	0,088	0,674	931	1.092	652	647
1 x 800	34,0	43,7	50	2,6	52,6	3.605	0,0367	0,086	0,771	1.077	1.253	743	736

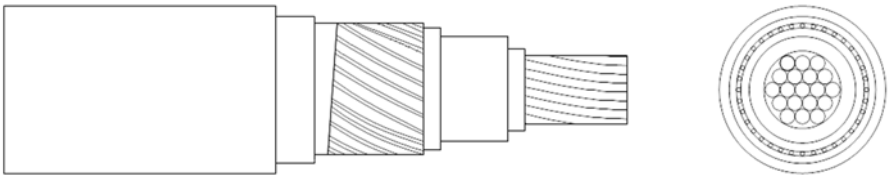
X-VOLT® TSLF 24kV

Cross-section (mm²)	Conductor Diameter (mm)	Insulation Diameter (mm)	Metallic Screen (mm²)	Sheath Thickness (mm)	External Diameter (mm)	Weight (Kg/Km)	R20°C (Ω/km)	X (Ω/km)	C (µF/km)	Open air (A) [1]		Buried (A) [2]	
										Trefoil	Flat spaced	Trefoil	Flat spaced
1 x 50	8,10	20,1	16	1,8	27,1	695	0,641	0,134	0,164	191	231	160	165
1 x 95	11,1	23,1	25	1,9	30,3	945	0,320	0,122	0,202	291	352	232	240
1 x 150	13,9	25,9	25	2,0	33,3	1.180	0,206	0,114	0,236	383	458	295	303
1 x 240	18,0	30,0	35	2,2	37,8	1.660	0,125	0,106	0,286	522	617	389	395
1 x 300	20,6	32,6	35	2,2	40,4	1.875	0,100	0,102	0,316	600	704	438	443
1 x 400	22,9	35,1	35	2,3	43,1	2.230	0,0778	0,100	0,360	700	800	498	494
1 x 500	26,3	39,4	35	2,4	47,6	2.660	0,0605	0,096	0,398	808	955	574	572
1 x 630	29,8	42,0	50	2,5	50,7	3.200	0,0469	0,094	0,439	931	1.092	652	647
1 x 800	34,0	47,9	50	2,8	57,2	3.970	0,0367	0,091	0,499	1.077	1.253	743	736
3 x 1 x 50	8,1	20,1	16	1,8	58,2	2.110	0,641	0,134	0,165	191	-	160	-
3 x 1 x 95	11,1	23,1	25	1,9	65,1	2.860	0,320	0,122	0,202	291	-	232	-
3 x 1 x 150	13,9	25,9	25	2,0	71,6	3.565	0,206	0,114	0,236	383	-	295	-
3 x 1 x 240	18,0	30,0	35	2,2	81,3	5.020	0,125	0,106	0,286	522	-	389	-
3 x 1 x 300	20,6	32,6	35	2,2	86,9	5.680	0,100	0,102	0,316	600	-	438	-
3 x 1 x 400	22,9	35,1	35	2,3	92,4	6.745	0,0778	0,100	0,360	700	-	498	-
3 x 1 x 630	29,8	42,0	50	2,5	109,0	9.685	0,0469	0,094	0,439	931	-	652	-

[1] Open air installation according to IEC 60502-2: three single-core cables in trefoil or flat spaced formation and ambient temperature of 25 °C; protected from direct sun radiation and with adequate ventilation (supported by cleats and hangers or on perforated tray).
[2] Buried installation according to IEC 60502-2: three single-core cables in trefoil or flat spaced formation direct buried at a depth of 0,7 m, ground temperature of 15 °C and soil thermal resistivity of 1,5 K·m/W.
Reactance (X) is calculated at 50 Hz and for three single-core cables (in triangle or trefoil formation).
Capacitance values (C) are calculated in base to dimensional items of the cables that are in this specification.

X-VOLT® Al TSLF

DIMENSIONS & ADMISSIBLE INTENSITIES



X-VOLT® TSLF 36kV

Cross-section (mm^2)	Conductor Diameter (mm)	Insulation Diameter (mm)	Metallic Screen (mm^2)	Sheath Thickness (mm)	External Diameter (mm)	Weight (Kg/Km)	R20°C (Ω/km)	X (Ω/km)	C (µF/km)	Open air (A) [1]		Buried (A) [2]	
										Trefoil	Flat spaced	Trefoil	Flat spaced
1 x 95	11,1	28,1	25	2,1	35,7	1.210	0,320	0,132	0,154	291	352	232	240
1 x 150	13,9	30,9	35	2,2	38,8	1.545	0,206	0,124	0,179	383	458	295	303
1 x 240	18,0	35,0	35	2,3	43,1	1.965	0,125	0,114	0,216	522	617	389	395
1 x 300	20,6	37,6	35	2,4	45,8	2.225	0,100	0,109	0,235	600	704	438	443
1 x 400	22,9	41,1	35	2,5	48,4	2.590	0,0778	0,107	0,265	700	800	498	494
1 x 500	26,3	44,4	35	2,6	53,1	3.060	0,0605	0,103	0,291	808	955	574	572
1 x 630	29,8	47,0	50	2,7	56,1	3.615	0,0469	0,100	0,320	931	1.092	652	647
1 x 800	34,0	52,9	50	3,0	62,6	4.445	0,0367	0,097	0,362	1.077	1.253	743	736
3 x 1 x 95	11,1	28,1	25	2,1	76,7	3.655	0,320	0,132	0,154	291	-	232	-
3 x 1 x 150	13,9	30,9	35	2,2	83,3	4.675	0,206	0,124	0,179	383	-	295	-
3 x 1 x 240	18,0	35,0	35	2,3	92,5	5.945	0,125	0,114	0,216	522	-	389	-
3 x 1 x 300	20,6	37,6	35	2,4	98,5	6.730	0,100	0,109	0,235	600		438	-
3 x 1 x 400	22,9	41,1	35	2,5	104,0	7.845	0,0778	0,107	0,265	700	-	498	-

[1] Open air installation according to IEC 60502-2: three single-core cables in trefoil or flat spaced formation and ambient temperature of 25 °C; protected from direct sun radiation and with adequate ventilation (supported by cleats and hangers or on perforated tray).
[2] Buried installation according to IEC 60502-2: three single-core cables in trefoil or flat spaced formation direct buried at a depth of 0,7 m, ground temperature of 15 °C and soil thermal resistivity of 1,5 K·m/W.
Reactance (X) is calculated at 50 Hz and for three single-core cables (in triangle or trefoil formation).
Capacitance values (C) are calculated in base to dimensional items of the cables that are in this specification.

X-VOLT® Al TSLF

SHORT-CIRCUIT CURRENT-CARRYING CAPACITIES

Time (s)	0,1	0,2	0,3	0,5	1	1,5	2	2,5	3
A/mm²	299	211	173	134	94	77	67	60	55

CORRECTION FACTORS FOR AIR TEMPERATURE

Air T. (°C)	20	25	30	35	40	45	50	55	60
Factor	1,04	1	0,96	0,92	0,88	0,84	0,79	0,73	0,68

CORRECTION FACTORS FOR GROUND TEMPERATURE

Ground T. (°C)	10	15	20	25	30	35	40	45	50
Factor	1,03	1	0,96	0,92	0,89	0,86	0,82	0,77	0,73

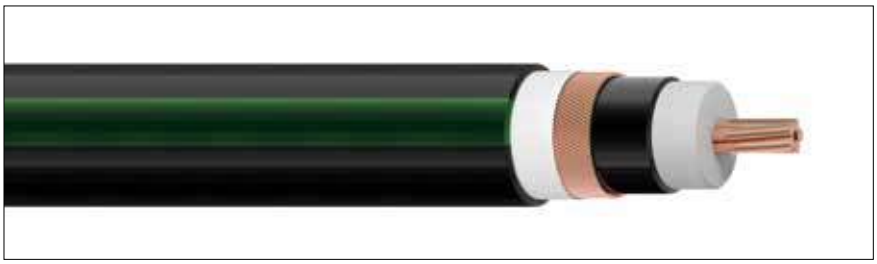
CORRECTION FACTORS FOR THERMAL RESISTIVITY OF THE GROUND IN CABLES DIRECTLY BURIED

Moisture degree of soil	Very Damp	Slightly Damp	Slightly dry	Dry	Very dry	Very dry
Thermal resist. (K·m/W)	**0,8**	**1**	**1,5**	**2**	**2,5**	**3**
50 mm²	1,26	1,16	1	0,89	0,81	0,74
95 mm²	1,28	1,18	1	0,89	0,80	0,74
120 mm²	1,28	1,18	1	0,88	0,80	0,74
150 mm²	1,28	1,18	1	0,88	0,80	0,74
185 mm²	1,29	1,18	1	0,88	0,80	0,74
240 mm²	1,29	1,18	1	0,88	0,80	0,73
300 mm²	1,30	1,19	1	0,88	0,80	0,73
400 mm²	1,30	1,19	1	0,88	0,79	0,73

Other correction factors (for grouping cables, for harmonic currents), that are not in this specification, can be applied. Further information can be found in IEC 60502-2.

TXSI 24kV

PEX-isolert høyspenningskabel med halogenfri kappe



HALOGENFRI

Bruksområde:
Energiverkets distribusjonsnett.

Konstruksjon:
Leder: Flertrådet, rund kobberleder med indre halvleder.

Isolasjon: PEX
Isolasjonsskjerm: Ekstrudert, fastvulket, tverrbundet, ledende materiale.
Skjerm: Konsentrisk leder av kobbertråder

Ytre kappe: Halogenfritt materiale
Farge: Sort med to grønne striper
Normer: HD 620
Maks. leder temp.: 90°C

Tverrsnitt mm²	El.nummer	Skjerm mm²	Leder			Ytre diameter ca. mm	Vekt ca. kg/1000 m	Std. lengde m
			Matr.	Form*	Dia. ca. mm			
1x25 Cu	10 043 95	16	Al	FR	8,1	30	890	1000

*FR= Flertrådet, rund
Med forbehold om endringer
* Nominelt avvik kan forekomme, toleranse +/-3%

Med forbehold om endringer

General Cable Nordic AS • Pb 113,1541 Vestby
Tlf. 64 95 59 00 • Faks 64 95 59 10 • www.generalcable.no

General Cable

Offer Nº
Order Nº
Page Nº

Medium & High Voltage Cables	Units	Item1
Product identification and Features		
Cable code		12381K1NGPA
Cable type		TXSI
Standard		HD-620 10K
Nominal voltage	kV	12/20 (24)
Nº of cores x C.S.A.	mm²	1 x 25
Construction and Dimensions		
Conductor material		Copper
Shape		Circular
Class / Standard		2 / IEC 60228
Nominal diameter	mm	5,80
W.B. conductor		YES
Swellable semi-conducting tape over conductor		NO
Conductor screen material		Extruded semi-conducting layer
Nominal radial thickness	mm	0,5
Insulation material		XLPE
Nominal radial thickness / Minimum at any point	mm	5,5 / --
Diameter over insulation	mm	17,8
Insulation screen material (non metallic)		Extruded semi-conducting layer
Nominal radial thickness	mm	0,4
Swellable semi-conducting tape under metallic screen		NO
Insulation screen (metallic)		CWS
Nº of wires x Diameter	N x mm	60x0,583
C.S.A. (Cu wires)	mm²	16
W.B. metallic screen (swellable yarn)		NO
Swellable tape over metallic screen		YES
Aluminium / Copolymer tape		NO
Outer sheath material		LSZH polyolefin
Nominal radial thickness / Minimum at any point	mm	1,7 / --
Colour		BLACK + 2 Green stripes at 180º
SMC skin layer over outer sheath (0,3mm aprox)		NO
Nominal overall diameter	mm	24,5
Nominal total weight	kg/km	845
Minimum bending radius (after installation)	mm	305
Electrical Data		
Maximum conductor DC resistance, at 20 ºC	Ohm/km	0,727
Star reactance per phase, at 50 Hz	Ohm/km	0,154
Capacitance per phase	µF/km	0,136
Charging current per phase, at Uo, 50 Hz	A/km	0,597
Maximum permanent current rating (*)	A	174 / 169
Maximum conductor temperature in service / in short-circuit	ºC	90 / 250
Maximum adiabatic short-circuit current rating (0.1/0.5/1.0 s)	kA	11,3 / 5,05 / 3,57

(*) In air, at 25 ºC / Buried, at 15 ºC - 1,0 ºK·m/W - 0,7 m
3 single-core cables in trefoil touching formation

Signed by : R. Roig
Date : 18/11/2015

N/A = Not Applicable

Nominal values subject to the usual manufacturer tolerances

N° 3347j - Part number: **CFRAP114561V**

Montasjeveiledning

Produktnavn: **Albuekontakt 250A 24kV 25-95mm² / 12 kV 95mm²**

El. nr.: **1165315**

Type: MSCE 250A 24 kV 25/95 P

Test norm: CENELEC HD 629.1 S2, IEC 61238-1 class A

Berøringssikker albuekontakt for enleder PEX kabel. Leveres i pakke á 3 albuekontakter. Pakken er inkludert mekanisk kabelsko + kontaktpinne.

Elnummer	Ledertype	Spenningsnivå	Tverrsnitt	Min-Max PEX diameter	Merkestrøm
1165315	Kobber eller aluminium	12 kV	95 mm²	17,2-25 mm	250 A
		24 kV	25-95 mm²	17,2-25 mm	

Innholdsliste:

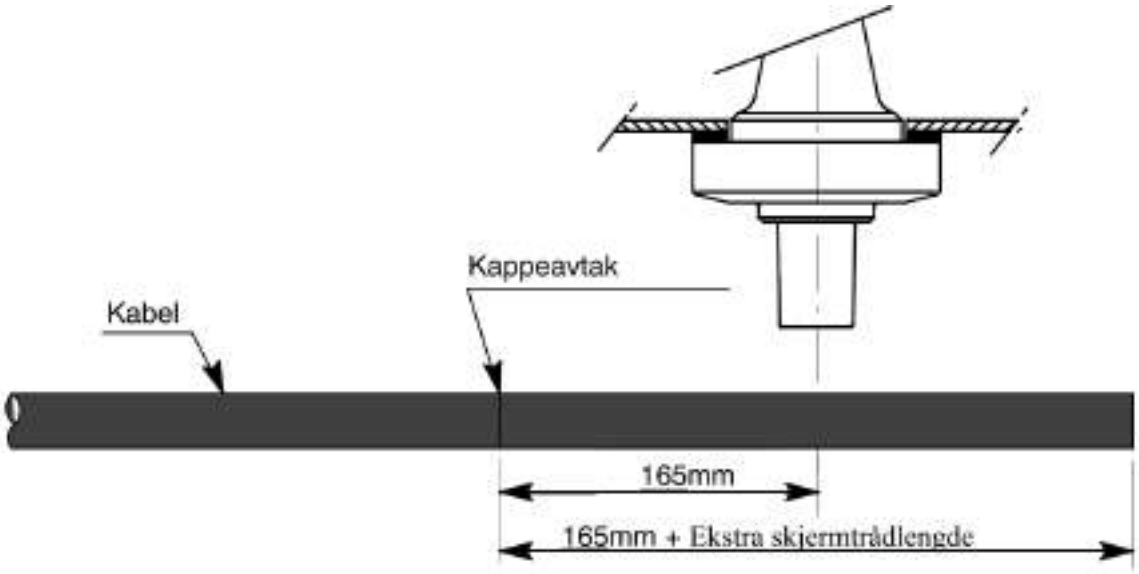
Beskrivelse	Antall
Berøringssikker kontakt – ankel	3
Adapter	3
Skrukabelsko for kabelleder + kontaktpinne	3
Fleksible jordingskabler	3
Torx T25 nøkkel	1
Sett med tilbehør • Mastik ME25/0,17 • Silikonfett • PVC Tape M20/5	 3 3 1
Sett med berøringssikker merking	1
PVC hansker	3
Sett med festebøyler	1
Endehette	3
Montasjeveiledning 1165315 / N° 3347j	1

Korrekt bruk eller installasjon av dette produktet krever ferdighetene og ekspertisene til en fagarbeider. Det er brukerens ansvar å sjekke at kabeltilbehøret passer til formålet sitt. Komponentene i denne pakken må kontrolleres før bruk. Fagarbeideren skal følge montasjeveiledningen og må bruke egnet utstyr og verktøy.

N° 3347j- Part number: **CFRAP114561V**

1. Generelt

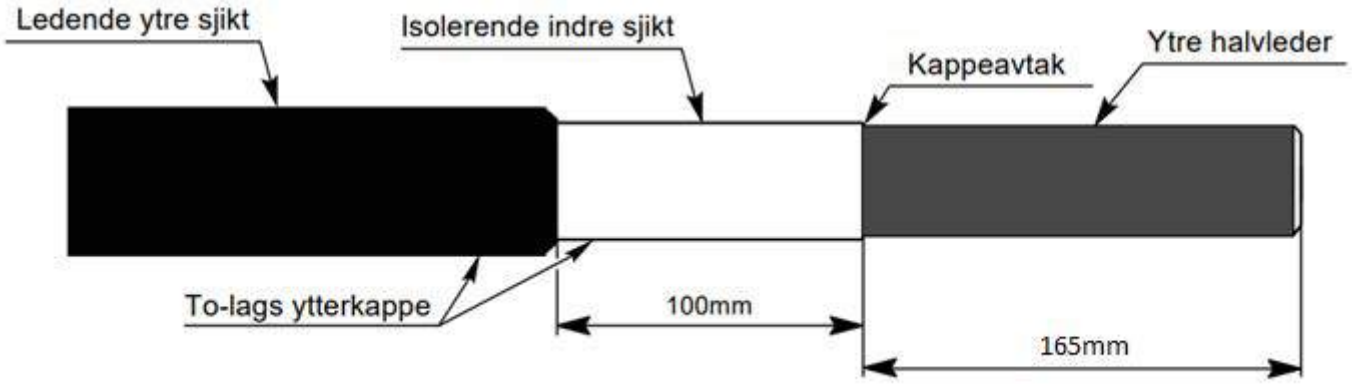
Mål opp kabelen med overlapp og nødvendig lengde på skjermtrådene ut fra senterlinjen.
Fjern ytterkappen 165mm fra senterlinjen som vist på skisse.



OBS ! **Ved bruk av TSLF-kabel må følgende utføres i tillegg til standard kabelpreparering** **OBS !**

Fjern 100 mm av det ledende ytre sjiktet av ytterkappen slik at det isolerende indre sjiktet blir blottlagt

Benytt det samme verktøyet som ved fjerning av ytre halvleder på PEX isolasjonen



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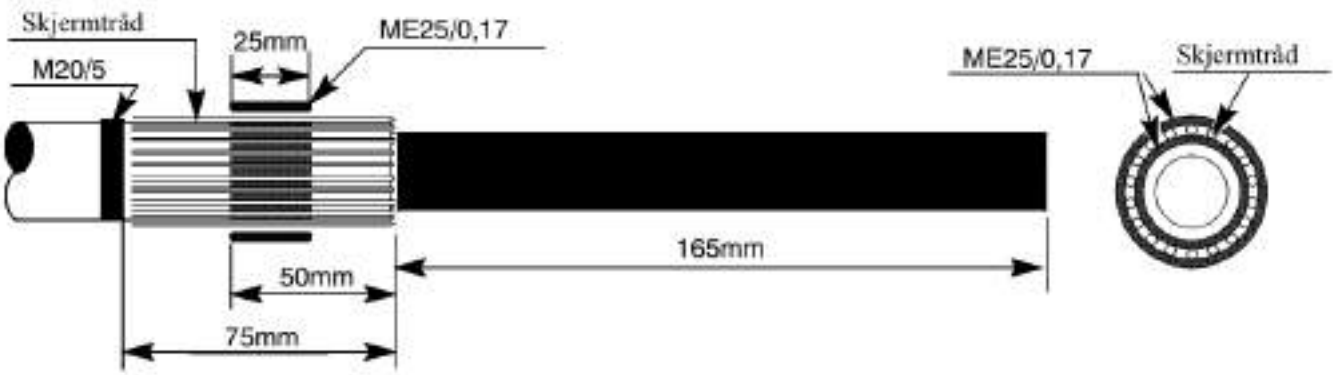
N° 3347j- Part number: **CFRAP114561V**

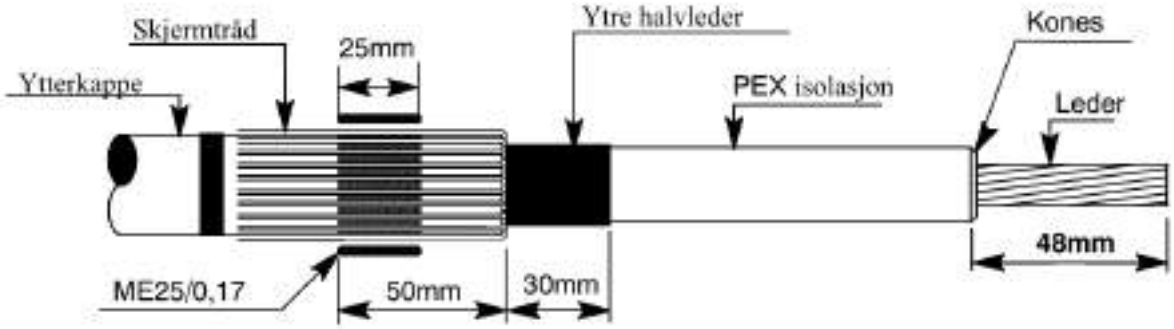
2. Klargjøring av kabelen 1/2

- Fjern ytterkappen 165mm.
- Legg en runde med PVC tape (M20/5) 75mm fra kappeavtaket.
- Legg en runde med mastik (ME25/0,17) rundt ytterkappen 50mm fra kappeavtaket.
- Brett skjermtrådene tilbake langs ytterkappen uten at noen skjermtråd krysser hverandre.
- Fest skjermtrådene med PVC tape (M20/5) midlertidig.
- Legg en ny runde mastik (ME25/0,17) over skjermtrådene der tidligere mastik ble lagt.
- Klem til med hånden slik at mastikken flyter inn mellom skjermtrådene.



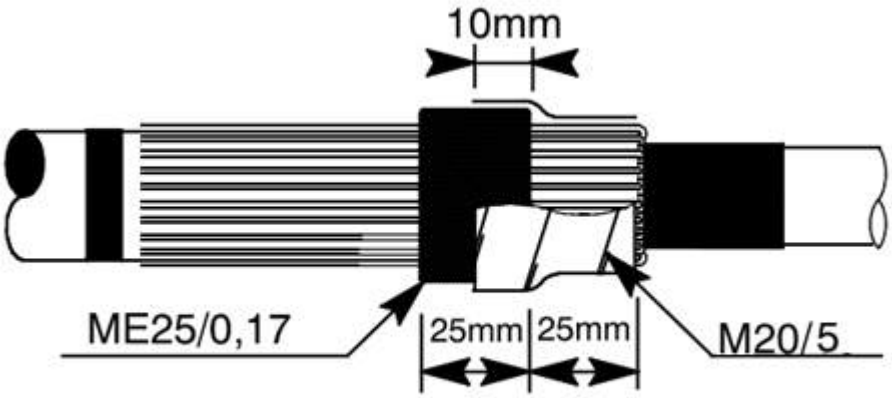
3. Klargjøring av kabelen 2/2

- Fjern det ytre halvledende sjiktet til 30mm fra kappeavtaket.
- Fjern faseisolasjonen 48mm.
- Kon enden på isolasjonen slik at silikonfett forenkler påføring av isolasjonshuset.



OBS! Vær nøye med kanten på halvlederen og ikke skad isolasjonen.

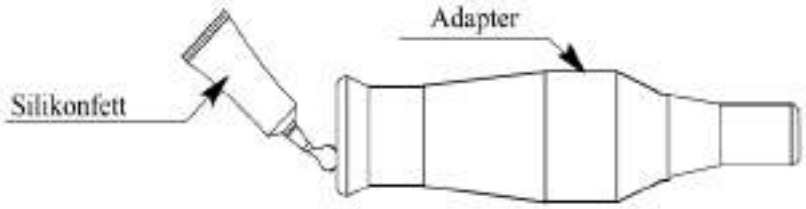
- Vikle et lag med PVC tape (M20/5), start 10mm på mastik (ME25/0,17) til kappeavtaket.

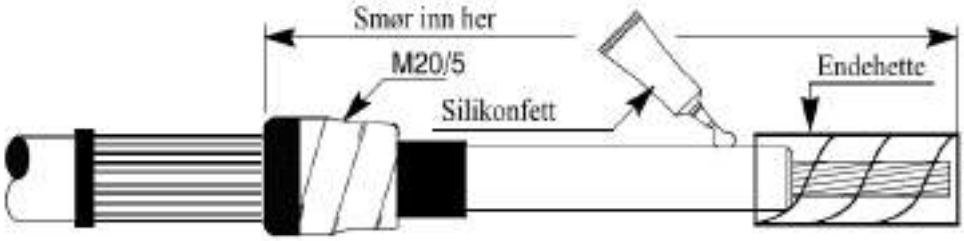


4. Montering av adapter

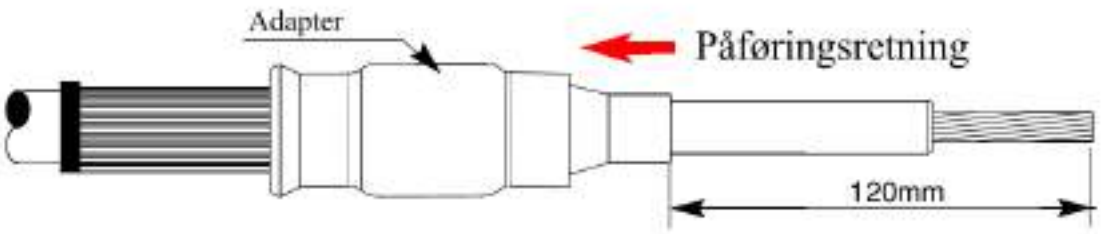
Bruk kun silikonfett som følger med i pakken og er godkjent av Prysmian.

- Påfør beskyttende endehette (liten plast pose) fra enden av lederen og innover slik at den overlapper PEX isolasjonen (beskytter mot rift på innsiden av adapter).
- Smør med silikonfett, se figur.
- Påfør silikonfett på innsiden av adapter.





- Skyv på adapter, se figur.

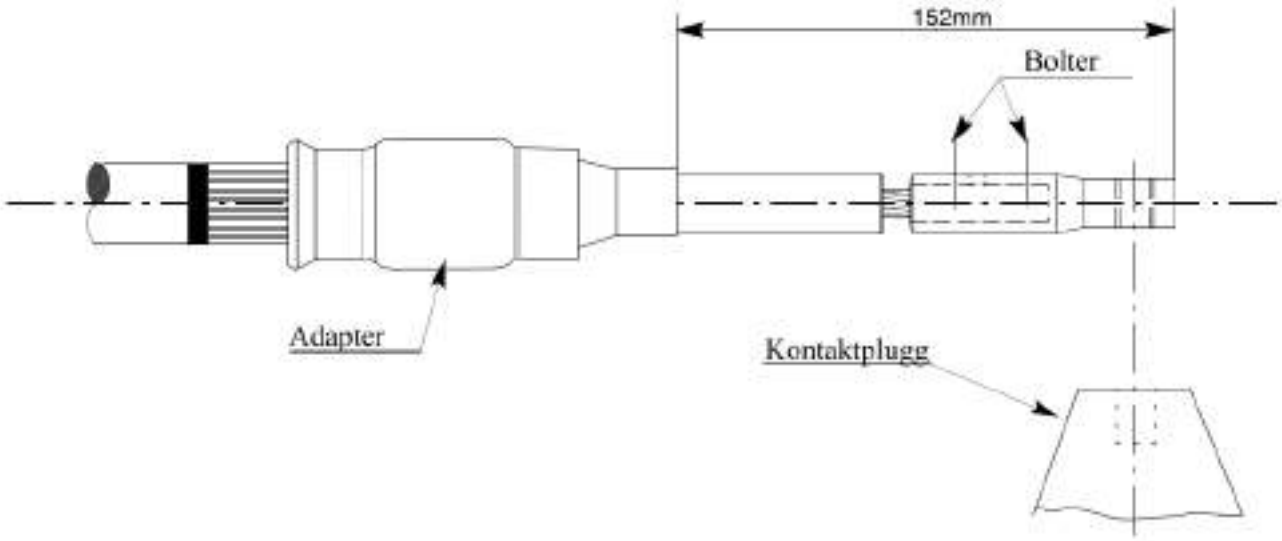


5. Montering av skrukabelsko

- For at lederen skal være sentrert inne i kabelskoen, bruk den aktuelle sentreringsringen (hvis aktuelt, se tabellen nedenfor).
- Det anbefales å bruke et holdeverktøy når boltene skal skrues.
- Sett på kabelskoen og vri den slik at den flate siden kommer i rett posisjon.
- Stram skruene manuelt til de kommer i kontakt med lederen, følg sekvensen som er angitt i bruksanvisningen og bruk den unbrakonøkkel som er angitt i tabellen nedenfor. Fortsett å stramme skruene til de knekker.

Kabelsko (mm²)	**Tverrsnitt (mm²)**		**Sentreringsring (farge)**	**Unbrakonøkkel (mm)** (uten forlenger)
	Rund flertrådet	Rund flertrådet kompakt		
25-95	25-35	25-35	Svart	5
	50-95	50-95	N/A	

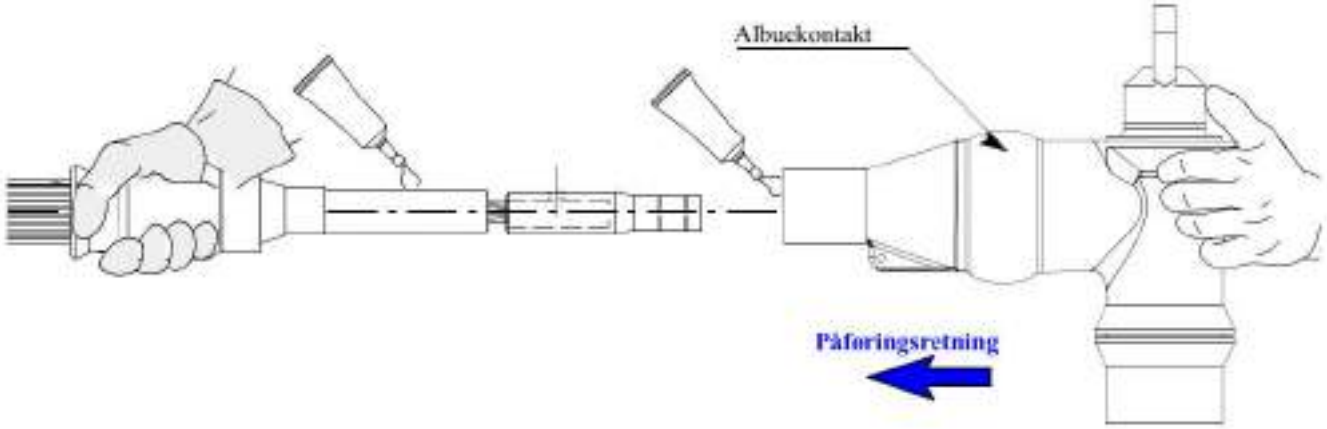
- Kontroller avstanden 152mm som vist på figur.
- Juster adapteren om det er nødvendig.

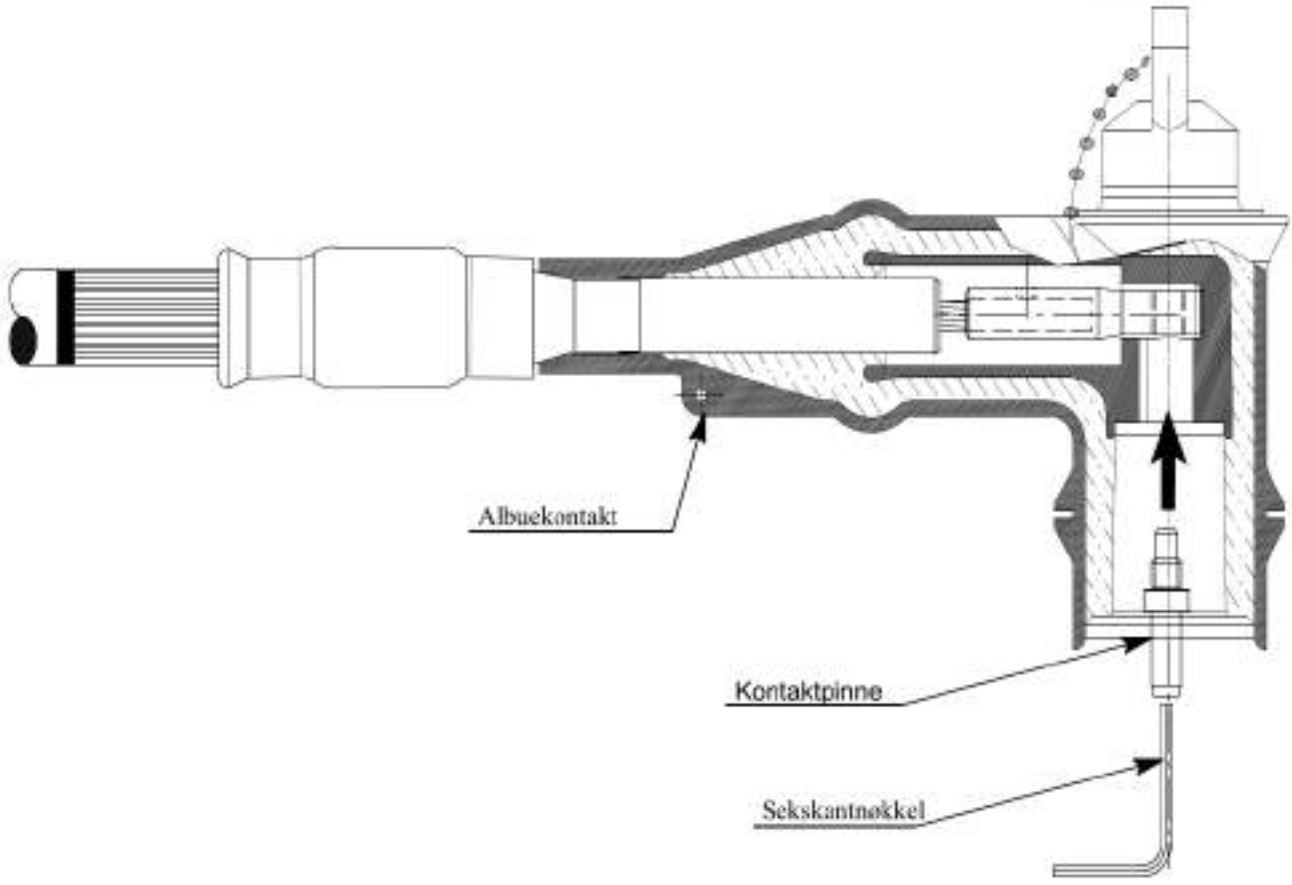


6. Montering av albuekontakt

Bruk kun silikonfett som følger med i pakken og er godkjent av Prysmian.

- Smør på silikonfett på kabelen som vist på figur.
- Sjekk innsiden av albuekontakten er rent og smør denne inn med silikonfett.
- Skyv albuekontakten inn på kabelenden til det bunner i kabelskoen.
- Kontroller avstanden mellom albuekontakten og adapteren: ca. 1mm

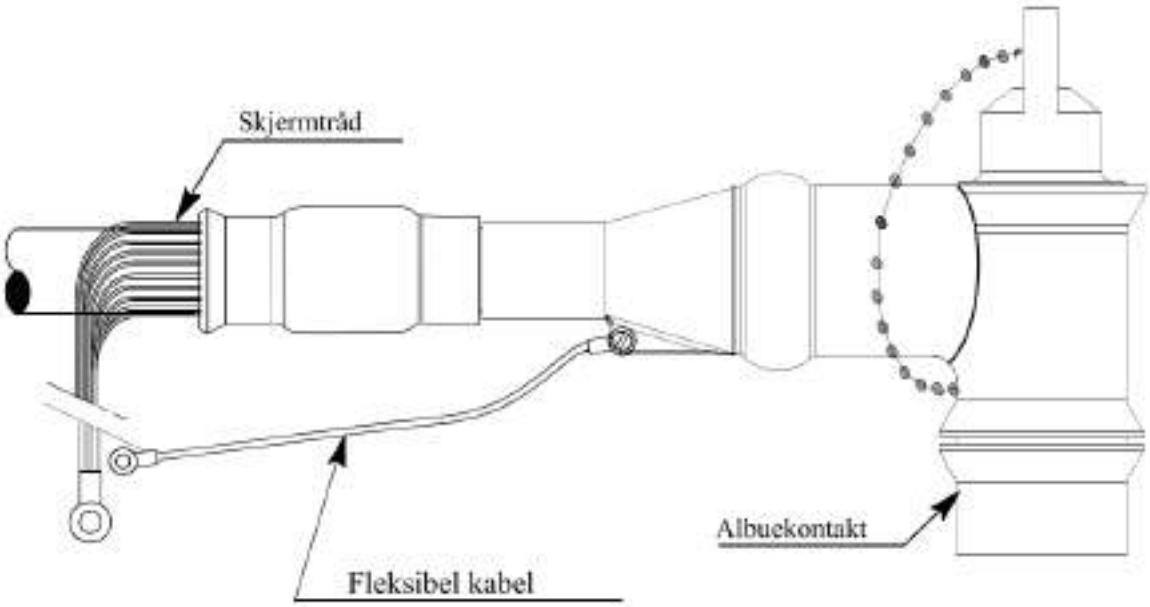




- Skru forsiktig inn kontaktpinnen med sekskantnøkkel.
- Skal **KUN** skrus/dras lett til for hånd.
- Trekk eventuelt opp adapteren slik at den kommer helt i kontakt med albuekontakten.

7. Ekvipotensial utjevning

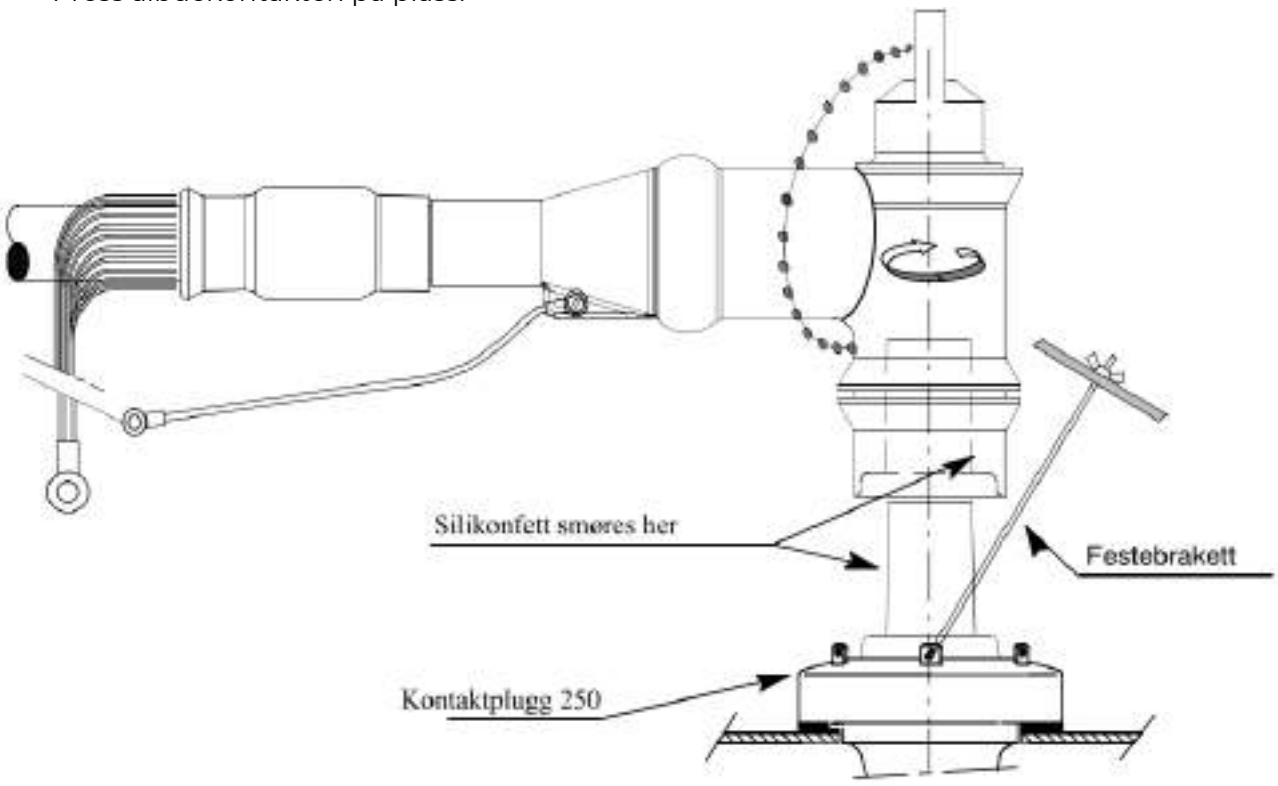
- Fjern PVC tapen på enden av skjermtråden.
- Lag utjevningsforbindelse mellom albuekontakten og skjermtråden med den fleksible kabelen som følger med i pakken.



8. Tilkobling til bryteranlegg eller transformator (må utføres spenningsløst)

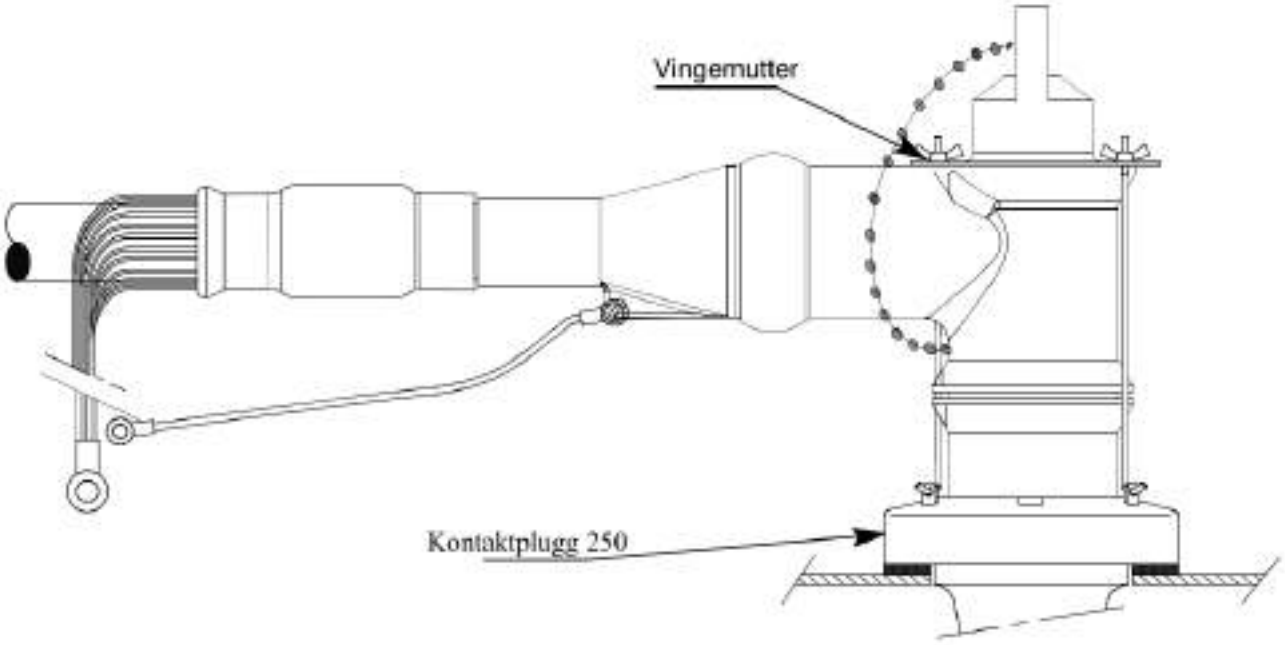
Bruk kun silikonfett som følger med i pakken og er godkjent av Prysmian.

- Vær nøye med rengjøring av kontaktpluggen og smør den lett med silikonfett kun på utsiden.
- Sjekk innsiden av albuekontakten er rent og smør denne inn med silikonfett.
- Press albuekontakten på plass.



9. Feste av albuekontakten

- Sett på festebraketten på albuekontakten og fest i innretningen på siden av kontaktpluggen.
- Stram festebrakketen med vingemutrene.



- Fest berøringssikker merket synlig.

10. Beskyttelse ved frakobling

- Når albuekontaktene er frakoblet på grunn av vedlikehold, anbefales det å benytte egnet kabeltilbehør for beskyttelse.

Du er nå ferdig med montasjen.

N° 2880H - Part number: **CFRAP112903G**

Montasjeveiledning

Produktnavn:	**T-kontakt 630A 24kV 25-95mm² / 12 kV 95mm²** **T-kontakt 630A 24kV 95-240mm² / 12 kV 150-240mm²**
El. nr.:	**1165317, 1165318**
Type:	MSCEA 630A 24kV 25-95 P MSCEA 630A 24kV 95-240 P
Test norm:	CENELEC HD 629.1 S2, IEC 61238-1 class A

Berøringssikker T-kontakt for enleder PEX kabel. Leveres i pakke av 3 kontakter med mekanisk kabelsko.

Elnummer	Ledertype	Spenningsnivå	Tverrsnitt	Min-Max PEX diameter	Merkestrøm
1165317	Kobber eller aluminium	12 kV	95 mm²	16,1-26,3 mm	630 A
		24 kV	25-95 mm²	16,1-26,3 mm	
1165318	Kobber eller aluminium	12 kV	150-240 mm²	22,7-33 mm	630 A
		24 kV	95-240 mm²	22,7-33 mm	

Innholdsliste:

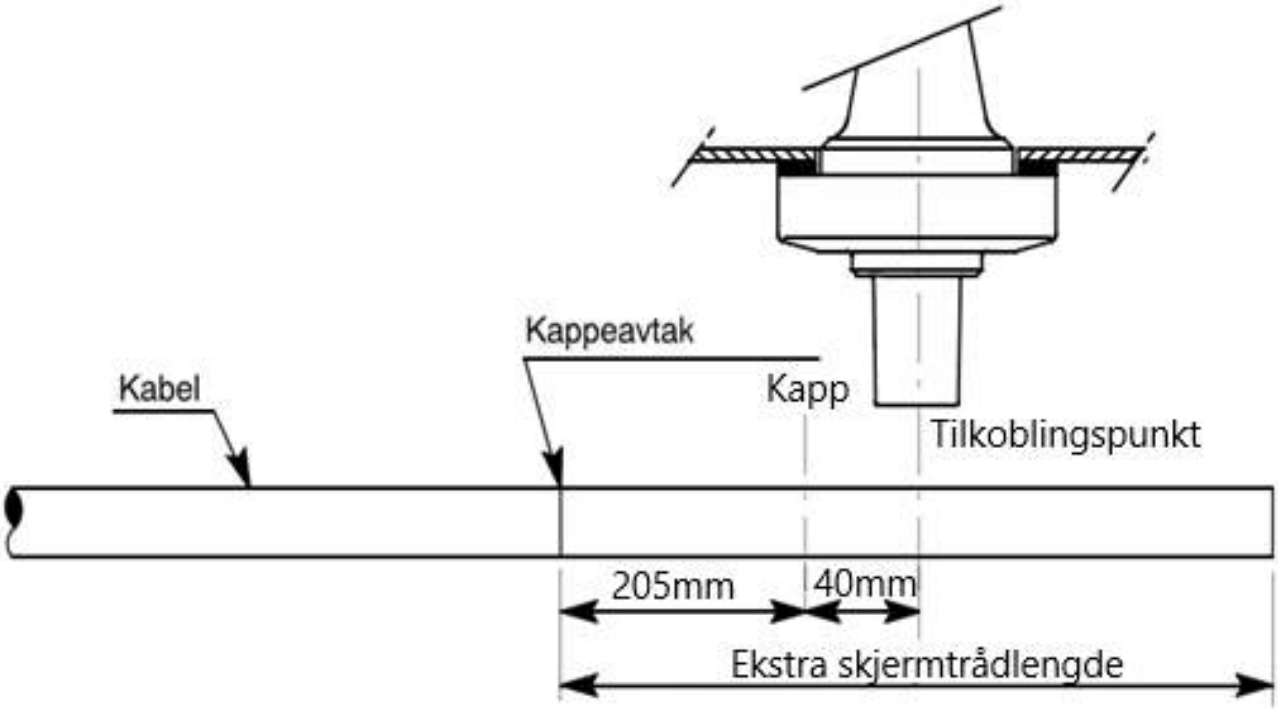
Beskrivelse	Antall
Berøringssikker T-kontakt	3
Sett med tilbehør for berøringssikker T-kontakt	
• Kontaktbolt	3
• Isolert bak plugg	3
• Endehette for T-kontakt	3
• Silikonfett	3
Sett med tilbehør for adapter	
• Adapter	3
• PVC hansker	3
• Silikonfett	6
Skrukabelsko for kabelleder	3
Fleksible jordingskabler	3
Sett med tilbehør	
• Mastik ME25/0,17	3
• PVC Tape E20/10	1
• Nylon tråd	3
Sett med berøringssikker merking	1
PVC hansker	3
Endehette	3
Montasjeveiledning 1165317/1165318 / N° 2880H	1

N° 2880H - Part number: **CFRAP112903G**

1. Generelt

Mål opp kabelen med overlapp og nødvendig lengde på skjermtrådene ut fra senterlinjen/tilkoblingspunkt.

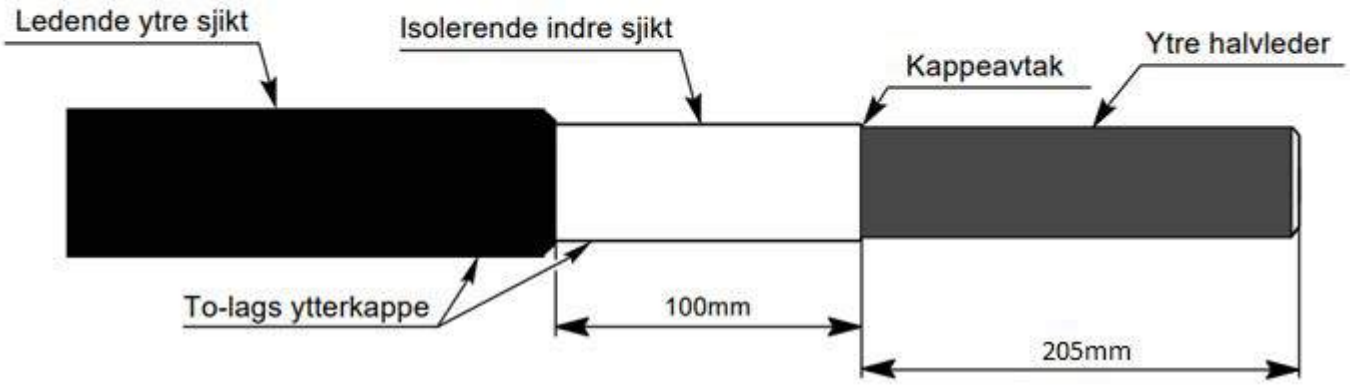
Fjern ytterkappen 205mm som vist på skisse. Kabelskoen tilkoblingspunkt bygger på 40mm i tillegg etter målet 205mm.



OBS ! **Ved bruk av TSLF-kabel må følgende utføres i tillegg til standard kabelpreparering** **OBS !**

Fjern 100 mm av det ledende ytre sjiktet av ytterkappen slik at det isolerende indre sjiktet blir blottlagt

Benytt det samme verktøyet som ved fjerning av ytre halvleder på PEX isolasjonen



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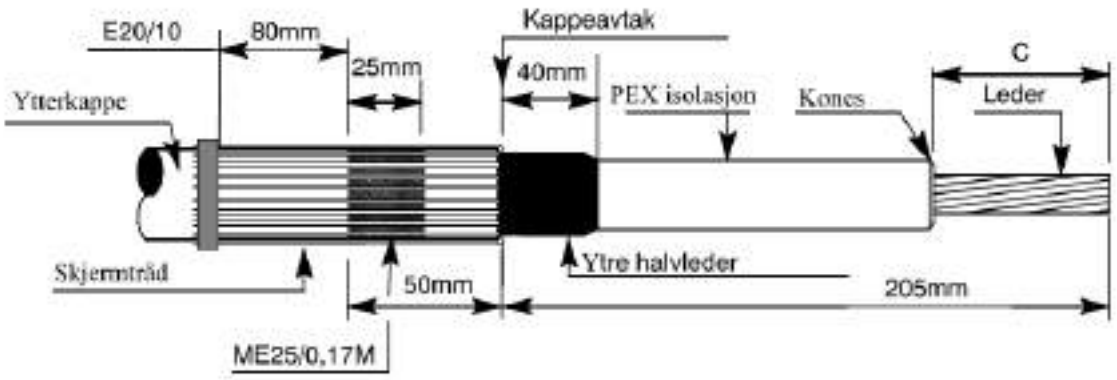
N° 2880H - Part number: **CFRAP112903G**

2. Klargjøring av kabelen 1/2

- Fjern ytterkappen 205mm.
- Legg en runde med mastik (ME25/0,17) rundt ytterkappen 50mm fra kappeavtaket.
- Brett skjermtrådene tilbake langs ytterkappen uten at noen skjermtråd krysser hverandre.
- Fest skjermtrådene med PVC tape (E20/10) 130mm fra kappeavtaket eller 80mm fra mastik (ME25/0,17).
- Fjern det ytre halvledende sjiktet til 40mm fra kappeavtaket.
- Fjern faseisolasjonen i henhold til mål C – se tabell.

Kabelsko (mm²)	Tverrsnitt (mm²)		Mål C for avmantling (mm)
	Rund flertrådet	Rund flertrådet kompakt	
(El.nr: 1165317) 25-95	25-50	25-70	55
	70-95	95	
(El.nr: 1165318) 95-240	95	95-120	70
	120-150	150-185	
	185-240	240	65

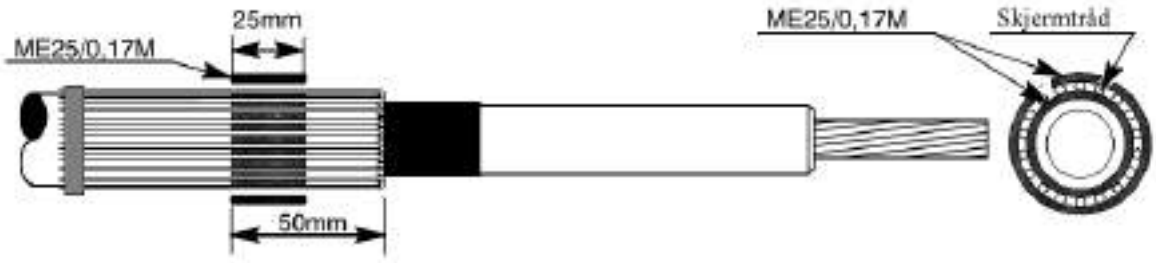
- Kon enden på isolasjonen slik at silikonfett forenkler påføring av isolasjonshuset.



OBS! Vær nøye med kanten på halvlederen og ikke skad isolasjonen.

3. Klargjøring av kabelen 2/2

- Legg en ny runde mastik (ME25/0,17) over skjermtrådene der tidligere mastik ble lagt.
- Klem til med hånden slik at mastikken flyter inn mellom skjermtrådene.



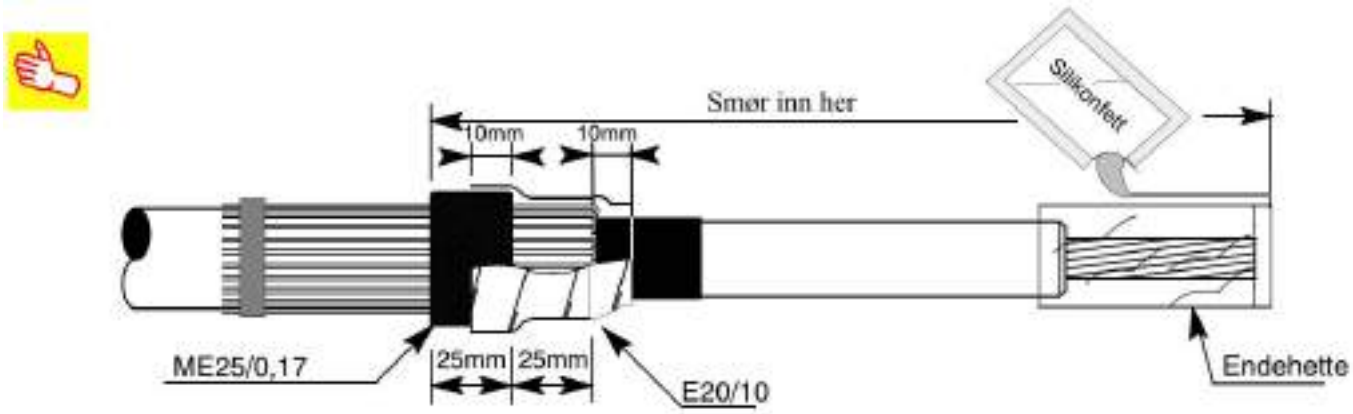
N° 2880H - Part number: **CFRAP112903G**

4. Montering av adapter

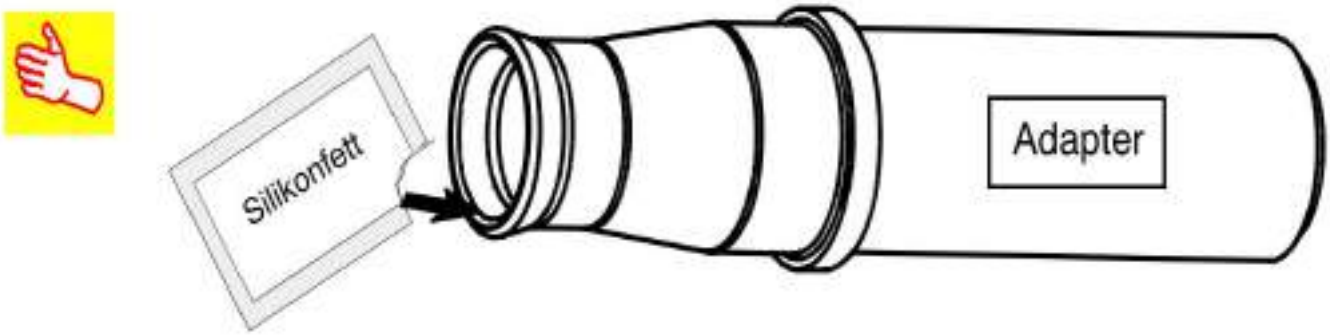
- Vikle et lag med PVC tape (E20/10) fra ytre halvleder og inn på mastik som vist på tegning
- Påfør beskyttende endehette (liten plast pose) fra enden av lederen og innover slik at den overlapper PEX isolasjonen (beskytter mot rift på innsiden av adapter).

Bruk kun silikonfett som følger med i pakken og er godkjent av Prysmian.

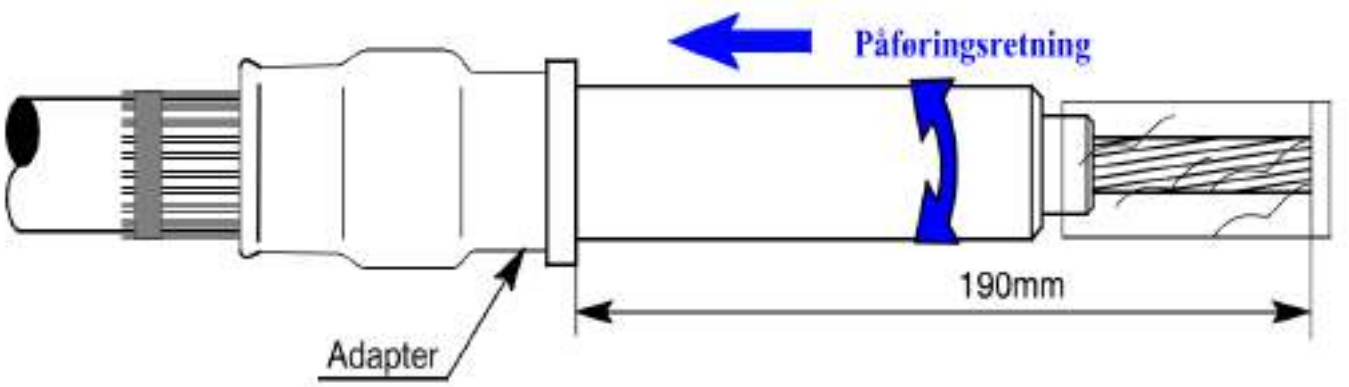
- Smør med silikonfett, se figur.



- Påfør silikonfett på innsiden av adapter.



- Skyv på adapter, se figur.



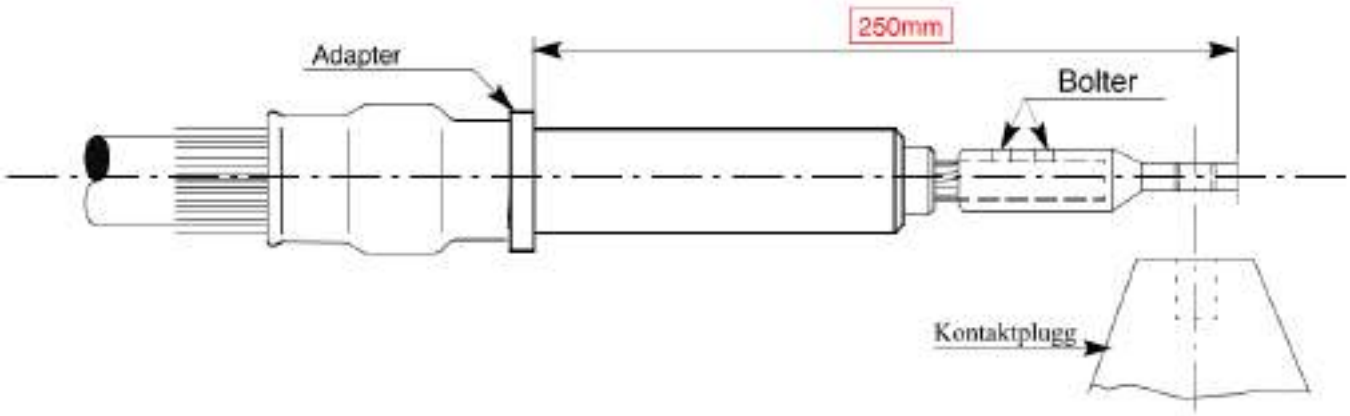
N° 2880H - Part number: **CFRAP112903G**

5. Montering av skrukabelsko

- For at lederen skal være sentrert inne i kabelskoen, bruk den aktuelle sentreringsringen (hvis aktuelt, se tabellen nedenfor).
- Det anbefales å bruke et holdeverktøy når boltene skal skrues.
- Sett på kabelskoen og vri den slik at den flate siden kommer i rett posisjon.
- Stram skruene manuelt til de kommer i kontakt med lederen, følg sekvensen som er angitt i bruksanvisningen og bruk en unbrakonøkkel som er angitt i tabellen nedenfor. Fortsett å stramme skruene til de knekker.

Kabelsko (mm²)	Tverrsnitt (mm²)		Sentreringsring (farge)	Unbrakonøkkel (mm) (uten forlenger)
	Rund flertrådet	Rund flertrådet kompakt		
(El.nr: 1165317) 25-95	25-50	25-70	Grå	5
	70-95	95	Svart	
(El.nr: 1165318) 95-240	95	95-120	Svart	6
	120-150	150-185	Hvit	
	185-240	240	N/A	

- Sett på endelokk i skruehullene.
- Kontroller avstanden 250mm som vist på figur.
- Juster adapteren om det er nødvendig.

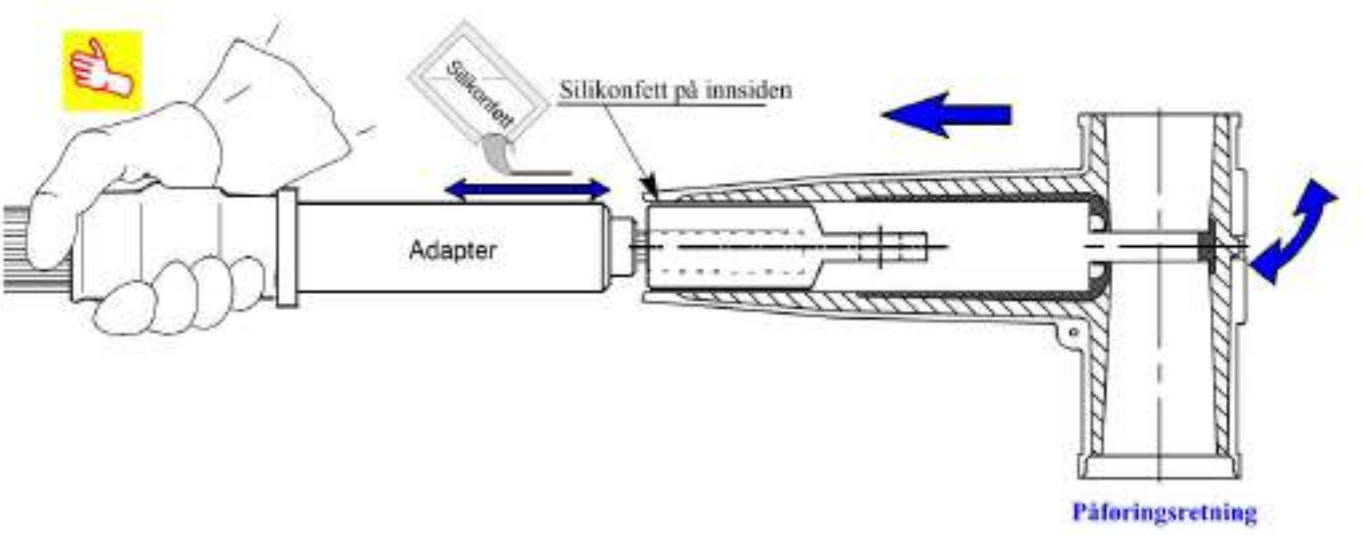


N° 2880H - Part number: **CFRAP112903G**

6. Montering av isolasjonshus (berøringssikker T-kontakt)

Bruk kun silikonfett som følger med i pakken og er godkjent av Prysmian.

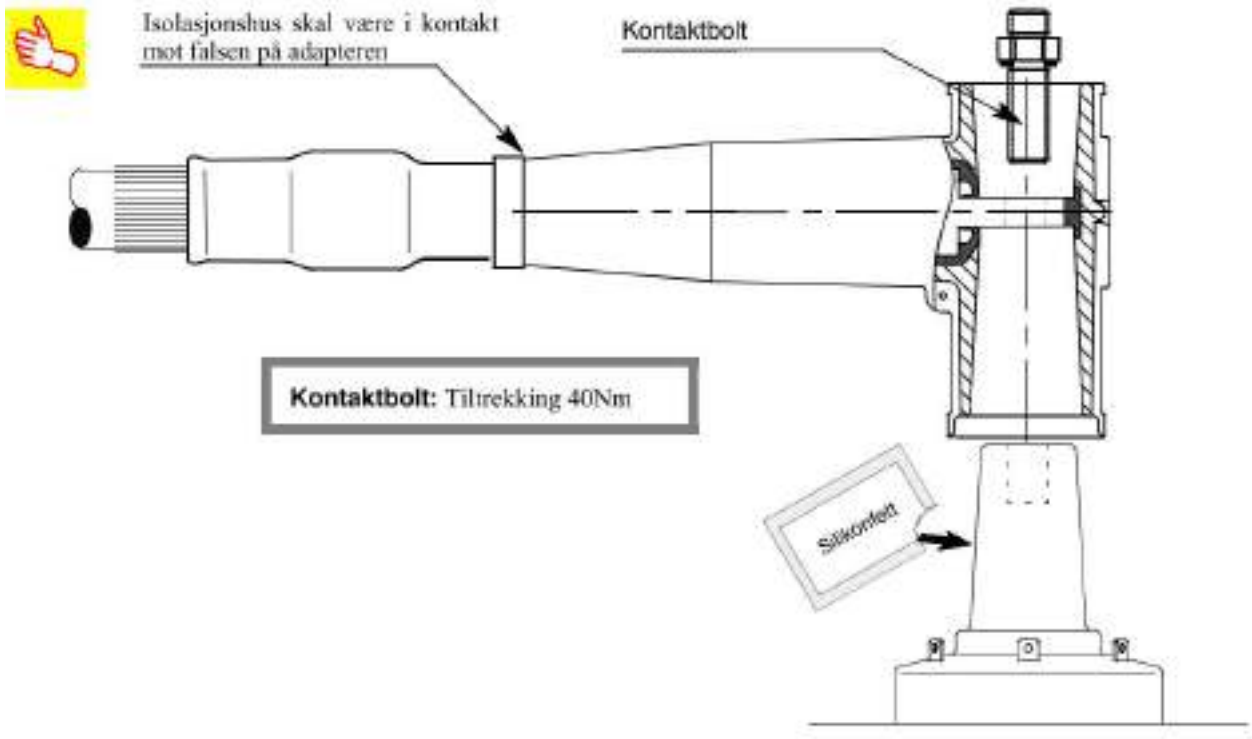
- Smør på silikonfett på midten av adapteren og utover som vist på figur.
- Sjekk innsiden av isolasjonshuset er rent og smør denne inn med silikonfett.
- Skyv isolasjonshuset inn på kabelenden til det bunner i kabelskoen.
- Hold fast adapteret når isolasjonshuset påføres.



7. Tilkobling av T-kontakt

- Rengjør kontaktpluggen forsiktig og smør den (silikonfett levert i settet).
- Sjekk at isolasjonshuset er kommet i posisjon ved at isolasjonshusets nedre kant støter mot falsen på adapter (hvis nødvendig, juster adapteren så det blir kontakt).
- Kontaktbolt skal skrues til med 40Nm.

Montering av isolasjonshuset skal alltid være på kontaktpluggens akse



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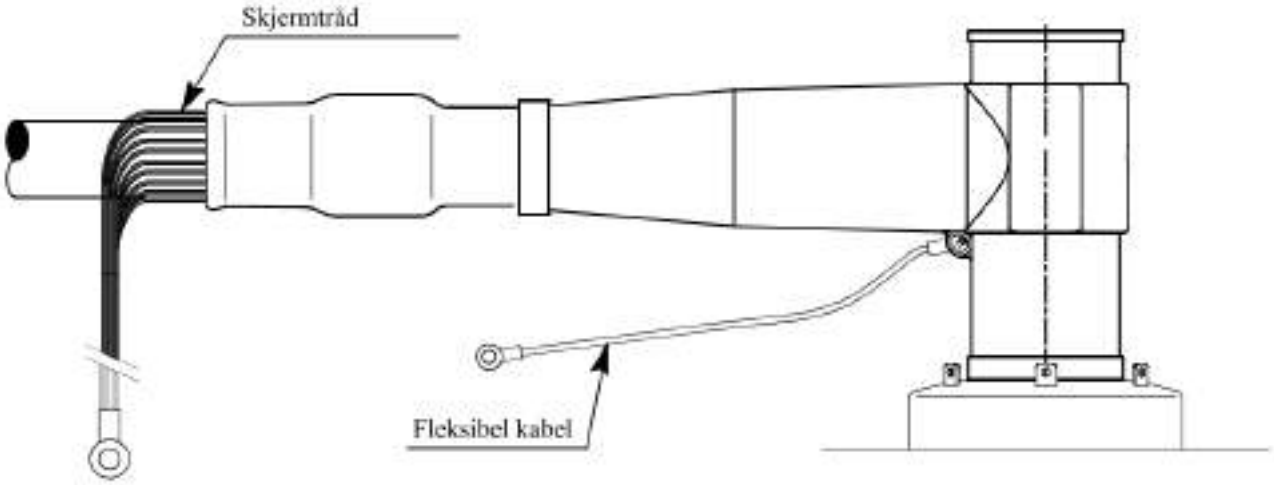
N° 2880H - Part number: **CFRAP112903G**

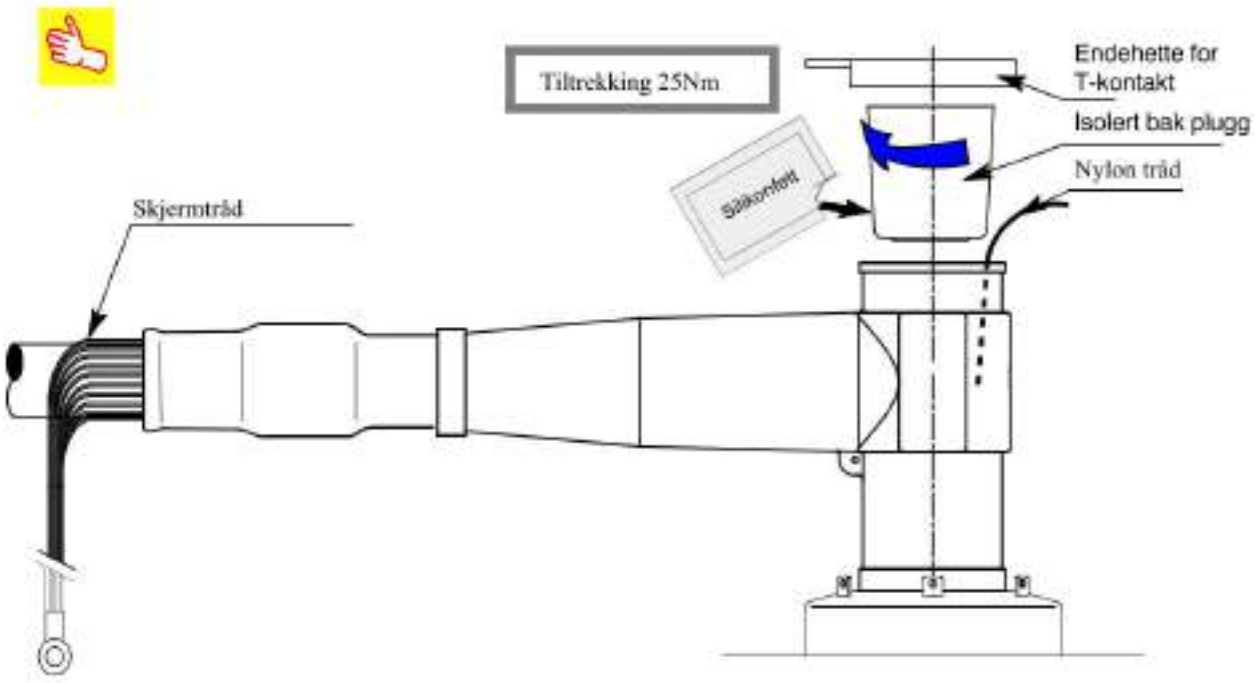
8. Ekvipotensial utjevning

- Lag utjevningsforbindelse mellom isolasjonshuset og skjermtråden med den fleksible kabelen som følger med i pakken.



9. Montering av isolert bak plugg

- Rengjør isolerte bak pluggen forsiktig og smør den (silikonfett levert i settet).
- Plugg inn den isolerte bak pluggen ved hjelp av nylon tråd – fjern denne når isolerte bak pluggen er på plass.
- Isolerte bak pluggen skal skrues til med 25Nm.
- Sett på endehette for T-kontakt.



- Fest berøringssikker merket synlig.

Du er nå ferdig med montasjen.

www.prysmiangroup.com

INSET

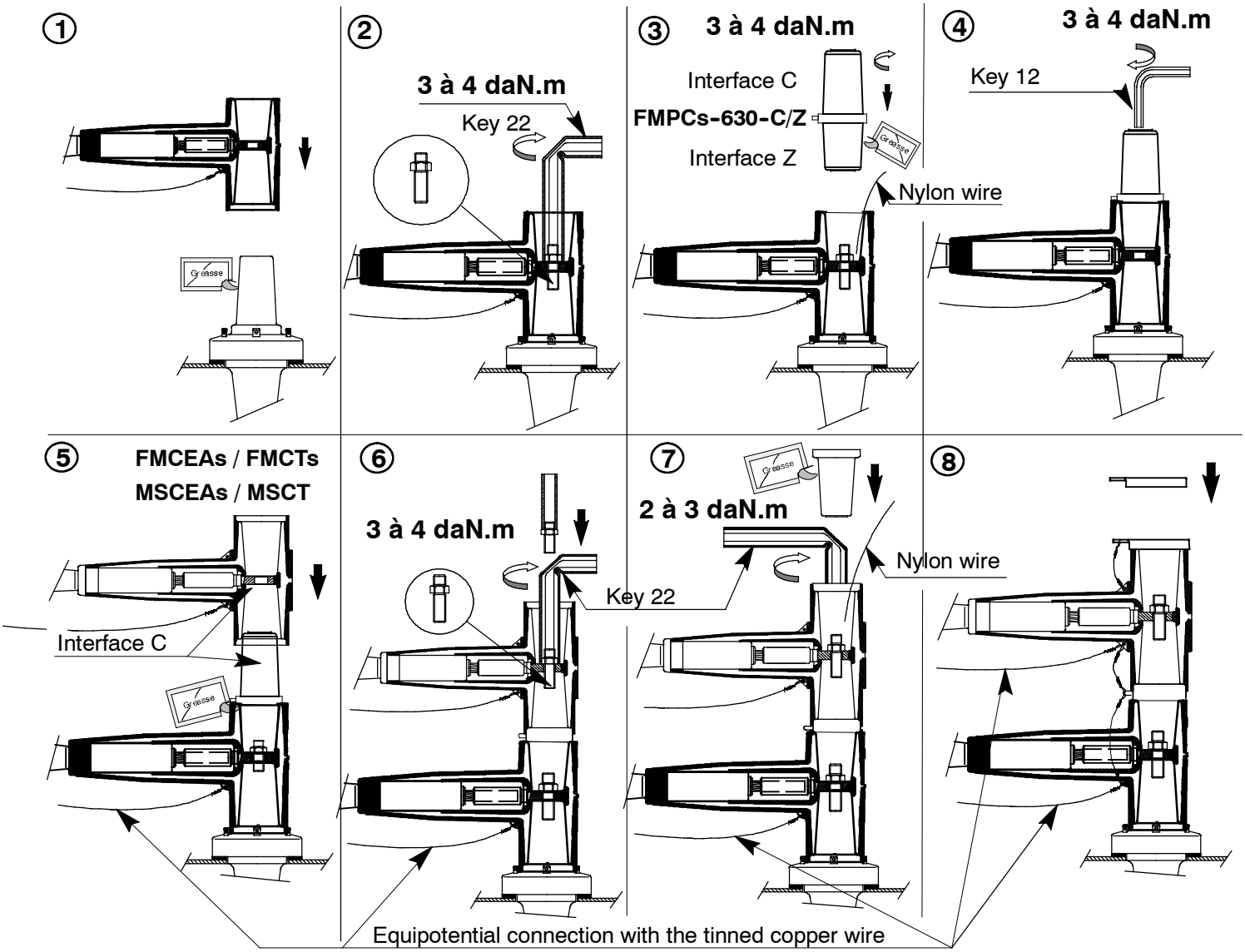
N° 3492 B

N° Article : **115 023 Y**

FMPCS-630-C/Z

STRAIGHT CONNECTING PLUG

DERIVATION ON SEPARABLE CONNECTOR



Prysmian Câbles et Systèmes France

Usine de CORNIMONT
Z.I. Le plein de Xoulces
88310 CORNIMONT
FRANCE
Fax : +33 (0)3.29.23.49.00

Indice	Date	Rédigé	Vérifié
a	21/11/18	M. Berne	P. Perrin
b	16/05/22	N. Marchal	S.Pierrat

MENNEKES
MY POWER CONNECTION

Inlet SCHUKO®

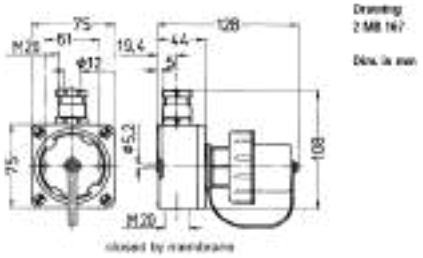
Part no. 10864

- screw terminals
- with combined PE-conductor acc. to german and french-belgian standard
- with bayonet ring
- protective cap attached by a strap

Technical specifications

Ampere	16 A
Poles	2 p+E
Voltage	230 V
Connection technology	Screw terminals
Contact	standard
Protection type	IP 68
Shutter	false
Weight	226 g
Declaration of Conformity	VDE, EAC

Drawing



PRODUCT-DETAILS

S203M-C2

Miniature Circuit Breaker - 3P - C - 2 A

General Information

Extended Product Type	S203M-C2
Product ID	2CDS273001R0024
EAN	4016779550383
Catalog Description	Miniature Circuit Breaker - 3P - C - 2 A
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.

ABB EcoSolutions

ABB EcoSolutions	Yes
EcoSolutions Profile	9AKK108469A3798
Circular Design Principles Recyclability	Design for Closing Resource Loops - Standard EN45555 - 90.6 %

Rate	
Offered with Extended Lifetime	Product Durability
Offered with Takeback Services	Take Back for Recycling
End of Life Instructions	9AKK108468A3132
Environmental Product Declaration - EPD	9AKK108467A7833

Technical

Standards	IEC/EN 60898-1 CSA 22.2 No. 235 IEC/EN 60947-2 UL 1077
Tripping Characteristic	C
Rated Operational Voltage	acc. to IEC 60898-1 400 V AC acc. to IEC 60898-1 400 V acc. to IEC 60947-2 440 V AC
Operational Voltage	Maximum (Incl. Tolerance) 440 V AC Minimum 12 V AC Minimum 12 V DC
Rated Insulation Voltage (U_i)	acc. to IEC/EN 60664-1 440 V
Rated Impulse Withstand Voltage (U_{imp})	4 kV at 2000 m 5 kV at Sea Level 6.2 kV
Dielectric Test Voltage	50/60 Hz-1 min: 2 kV
Input Voltage Type	AC/DC
Rated Current (I_n)	2 A
Rated Short-Circuit Capacity	(AC) 10 kA (230 V AC) 10 kA (400 V AC) 10 kA (400 V) 10 kA
Rated Ultimate Short-Circuit Breaking Capacity (I_{cu})	(230 V AC) 25 kA (400 V AC) 15 kA (440 V AC) 15 kA (230 V) 25 kA (400 V) 15 kA
Rated Conditional Short-Circuit Current (I_{nc})	(230 V) 15 kA (400 V) 25 kA
Rated Service Short-Circuit Breaking Capacity (I_{cs})	(230 V AC) 7.5 kA
Frequency (f)	50 Hz
Rated Frequency (f)	50 / 60 Hz
Power Loss	5.4 W at Rated Operating Conditions per Pole 1.8 W
Power Supply Connection	Arbitrary
Contact Position Indication	Red ON / Green OFF
Energy Limiting Class	3
Electrical Endurance	20000 AC cycle
Mechanical Endurance	20000 cycle
Number of Protected Poles	3
Number of Poles	3P
Overvoltage Category	III
Tightening Torque	2.8 N·m

Screw Terminal Type	Failsafe Bi-directional Cylinder-lift Terminal
Actuator Marking	I / O
Actuator Material	Insulation Group II, Black, Sealable
Housing Material	Insulation Group II, RAL 7035
Mounting on DIN Rail	TH35-15 (35 x 15 mm Mounting Rail) acc. to IEC 60715 TH35-7.5 (35 x 7.5 mm Mounting Rail) acc. to IEC 60715
Mounting Position	any
Recommended Screw Driver	Pozidriv 2
Accessories Available	Yes
Connecting Capacity	Busbar 10 / 10 mm² Flexible with Ferrule 0.75 ... 25 mm² Flexible 0.75 ... 25 mm² Flexible 0.75 ... 25 mm² Rigid 0.75 ... 35 mm² Rigid 0.75 ... 35 mm² Stranded 0.75 ... 35 mm²
Installation Size	acc. to DIN 43880 1
Terminal Type	Screw Terminals

Material Compliance

RoHS Information	2CDK400003K0203
RoHS Status	Following EU Directive 2011/65/EU and Amendment 2015/863 July 22, 2019
RoHS Date	20161001
REACH Declaration	9AKK107492A1906
REACH Information	True - contains substances > 0.1 mass percentage
REACH Date	20240821
Conflict Minerals Reporting Template (CMRT)	9AKK108468A3363

Environmental

Ambient Air Temperature	Operation -25 ... +55 °C Storage -40 ... +70 °C
Reference Ambient Air Temperature	30 °C
Degree of Protection	IP20 IP40 Enclosure with Cover IP40
Pollution Degree	3
Environmental Conditions	28 cycles with 55 °C / 90-96 % and 25 °C / 95-100 %
Resistance to Vibrations	20 Cycles with Load 0.8 In: 5g 5 ... 150 ... 5 Hz
Resistance to Shock acc. to IEC 60068-2-27	25g 2 shocks 13 ms

Technical UL/CSA

Maximum Operating Voltage UL/CSA	125 V DC 480Y/277 V AC
Interrupting Rating acc. to UL1077	(125 V DC) 10 kA (277 V AC) 6 kA (480Y / 277 V AC) 6 kA
Connecting Capacity	Busbar 14-8 AWG

UL/CSA	Conductor 14-4 AWG
Tightening Torque UL/CSA	18 in·lb

Dimensions

Width in Number of Modular Spacings	3.0
Product Net Width	52.5 mm
Product Net Height	88 mm
Product Net Depth / Length	69 mm
Product Net Weight	0.375 kg
Pole Net Weight	0.125 kg
Built-In Depth (t_2)	69 mm
Dimension Diagram	2CDC022007F0010

Ordering

Package Level 1 Units	carton 1 piece
Package Level 1 Gross Weight	0.4 kg
E-Number (Finland)	3210808
E-Number (Norway)	1665547
E-Number (Sweden)	2101237

Certificates and Declarations

Declaration of Conformity - CE	2CDK403001D0607
Declaration of Conformity - UKCA	9AKK108467A5053
I^2t Characteristic	9AKK107992A5102
Certification Agency	EN IEC

Installation

Instructions and Manuals	2CDS207104P0002

Popular Downloads

Data Sheet, Technical Information	9AKK107046A0423
I^2t Characteristic	9AKK107992A5102

Classifications

ETIM 8	EC000042 - Miniature circuit breaker (MCB)
ETIM 9	EC000042 - Miniature circuit breaker (MCB)
WEEE Category	5. Small Equipment (No External Dimension More Than 50 cm)
WEEE B2C / B2B	Business To Business

CN8	8536 20 10
UNSPSC	39121603
eClass	V11.0 : 27141901
IDEA Granular Category Code (IGCC)	4897 >> Miniature circuit breakers
Object Classification Code	F

Accessories

Identifier	Description	Type	Quantity	Unit Of Measure
2CDS200922R0001	Signal / Auxiliary Contact	S2C-S/H6R	1	piece
2CDS200912R0001	Auxiliary Contact	S2C-H6R	1	piece
2CDS200970R0031	Auxiliary Contact	S2C-H01	1	piece
2CDS200970R0032	Auxiliary Contact	S2C-H10	1	piece
2CDS200936R0001	Auxiliary Contact	S2C-H11L	1	piece
2CDS200936R0002	Auxiliary Contact	S2C-H20L	1	piece
2CDS200936R0003	Auxiliary Contact	S2C-H02L	1	piece
2CDS200946R0001	Auxiliary Contact	S2C-H6-11R	1	piece
2CDS200946R0002	Auxiliary Contact	S2C-H6-20R	1	piece
2CDS200946R0003	Auxiliary Contact	S2C-H6-02R	1	piece
2CDS200909R0001	Shunt Trip	S2C-A1	1	piece
2CDS200909R0002	Shunt Trip	S2C-A2	1	piece
2CSS200911R0001	Undervoltage Release	S2C-UA 12 DC	1	piece
2CSS200911R0002	Undervoltage Release	S2C-UA 24 AC	1	piece
2CSS200911R0003	Undervoltage Release	S2C-UA 48 AC	1	piece
2CSS200911R0004	Undervoltage Release	S2C-UA 110 AC	1	piece
2CSS200911R0005	Undervoltage Release	S2C-UA 230 AC	1	piece
2CSS200911R0006	Undervoltage Release	S2C-UA 400 AC	1	piece
2CSS200911R0007	Undervoltage Release	S2C-UA 24 DC	1	piece
2CSS200911R0008	Undervoltage Release	S2C-UA 48 DC	1	piece
2CSS200911R0009	Undervoltage Release	S2C-UA 110 DC	1	piece
2CSS200911R0010	Undervoltage Release	S2C-UA 230 DC	1	piece
GHS2001901R0003	Mechanical Accessories	S2C-DH	1	piece
2CSS200998R0001	Mechanical tripping device	S2C-BP	1	piece
2CSS200999R0001	Plug-in base	S2C-EST	1	piece
2CDS200918R0001	Hand Operated Neutral	S2C-NT	1	piece
2CCA880100R0001	Sensor	CMS-100PS	1	piece
2CCA880101R0001	Sensor	CMS-101PS	1	piece
2CCA880102R0001	Sensor	CMS-102PS	1	piece

Categories

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

Medium Voltage Products and Systems → Service → Spares and Consumables → Parts → All Spare Parts (Relays-SWG-CB)

PULS

DIMENSION **Q-Series**

QS5.241, QS5.241-A1

24V, 5A, SINGLE PHASE INPUT

POWER SUPPLY

- AC 100-240V Wide-range Input
- Width only 40mm
- Efficiency up to 92.7%
- 150% (180W) Peak Load Capability
- Easy Fuse Tripping due to High Overload Current
- Active Power Factor Correction (PFC)
- DC Input from 88 to 360Vdc
- Negligible low Inrush Current Surge
- Short-term Operation down to 60Vac and up to 300Vac
- Full Power Between -25°C and +60°C
- DC-OK Relay Contact
- Quick-connect Spring-clamp Terminals
- 3 Year Warranty

PRODUCT DESCRIPTION

The most outstanding features of this Dimension Q-Series DIN rail power supply are the high efficiency and the small size, which are achieved by a synchronous rectification and further novel design details. The Q-Series is part of the Dimension family, existing alongside the lower featured C-Series.

With short-term peak power capability of 150% and built-in large sized output capacitors, these features help start motors, charge capacitors and absorb reverse energy and often allow a unit of a lower wattage class to be used.

High immunity to transients and power surges as well as low electromagnetic emission makes usage in nearly every environment possible.

The integrated output power manager, a wide range input voltage design and virtually no input inrush current make installation and usage simple. Diagnostics are easy due to the dry DC-OK contact, a green DC-OK LED and red overload LED.

Unique quick-connect spring-clamp terminals allow a safe and fast installation and a large international approval package for a variety of applications makes this unit suitable for nearly every situation.

SHORT-FORM DATA

Output voltage	DC 24V	
Adjustment range	24 - 28V	
Output current	5 – 4.5A	continuous
	7.5 – 6.7A	for typ. 4s
Output power	120W	continuous
	180W	for typ. 4s
Output ripple	< 50mVpp	20Hz to 20MHz
Input voltage	AC 100-240V	+10/-15%
Mains frequency	50-60Hz	±6%
AC Input current	1.10 / 0.62A	at 120 / 230Vac
Power factor	0.99 / 0.91	at 120 / 230Vac
AC Inrush current	typ. 9 / 11A peak	at 120 / 230Vac
Efficiency	91.6 / 92.7%	at 120 / 230Vac
Losses	11.0 / 9.4W	at 120 / 230Vac
Temperature range	-25°C to +70°C	operational
Derating	3W/°C	+60 to +70°C
Hold-up time	typ. 34 / 65ms	at 120 / 230Vac
Dimensions	40x124x117mm	WxHxD

ORDER NUMBERS

Power Supply	**QS5.241**	24-28V Standard unit
	QS5.241-A1	ATEX approved unit
Accessory	ZM1.WALL	Wall mount bracket
	ZM12.SIDE	Side mount bracket
	YR2.DIODE	Redundancy module
	UF20.241	Buffer unit

MAIN APPROVALS

For details and the complete approval list, see chapter 19.

UL 508 | UL 60950-1 | Class I Div 2

Marine | Marine

INDEX

TERMINOLOGY AND ABREVIATIONS

PE and ⏚ symbol	PE is the abbreviation for **P**rotective **E**arth and has the same meaning as the symbol ⏚.
Earth, Ground	This document uses the term "earth" which is the same as the U.S. term "ground".
t.b.d.	To be defined, value or description will follow later.
AC 230V	A figure displayed with the AC or DC before the value represents a nominal voltage with standard tolerances (usually ±15%) included. E.g.: DC 12V describes a 12V battery disregarding whether it is full (13.7V) or flat (10V)
230Vac	A figure with the unit (Vac) at the end is a momentary figure without any additional tolerances included.
50Hz vs. 60Hz	As long as not otherwise stated, AC 230V parameters are valid at 50Hz mains frequency.
may	A key word indicate flexibility of choice with no implied preference.
shall	A key word indicate a mandatory requirement.
should	A key word indicate flexibility of choice with a strongly preferred implementation.

1. INTENDED USE

This device is designed for installation in an enclosure and is intended for commercial use, such as in industrial control, process control, monitoring and measurement equipment or the like.

Do not use this device in equipment, where malfunctioning may cause severe personal injury or threaten human life without additional appropriate safety devices, that are suited for the end application.

If this device is used in a manner outside of its specification, the protection provided by the device may be impaired.

2. INSTALLATION INSTRUCTIONS

⚠ WARNING **Risk of electrical shock, fire, personal injury or death.**

- Turn power off before working on the device. Protect against inadvertent re-powering.
- Do not open, modify or repair the device.
- Use caution to prevent any foreign objects from entering the housing.
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not touch during power-on and immediately after power-off. Hot surfaces may cause burns.

Obey the following installation instructions:

This device may only be installed and put into operation by qualified personnel.

This device does not contain serviceable parts. The tripping of an internal fuse is caused by an internal defect.

If damage or malfunction should occur during installation or operation, immediately turn power off and send unit to the factory for inspection.

Install device in an enclosure providing protection against electrical, mechanical and fire hazards. Install the device onto a DIN rail according to EN 60715 with the input terminals on the bottom of the device. Other mounting orientations require a reduction in output current.

Make sure that the wiring is correct by following all local and national codes. Use appropriate copper cables that are designed for a minimum operating temperature of 60°C for ambient temperatures up to +45°C, 75°C for ambient temperatures up to +60°C and 90°C for ambient temperatures up to +70°C.

Use ferrules for wires on the input terminals. Ensure that all strands of a stranded wire enter the terminal connection.

The device is designed for pollution degree 2 areas in controlled environments. No condensation or frost is allowed.

The enclosure of the device provides a degree of protection of IP20. The enclosure does not provide protection against spilled liquids.

The device is designed for overvoltage category II zones. Below 2000m altitude the device is tested for impulse withstand voltages up to 4kV, which corresponds to OVC III according to IEC 60664-1. The device is designed as “Class of Protection” I equipment according to IEC 61140. Do not use without a proper PE (Protective Earth) connection.

The device is suitable to be supplied from TN, TT or IT mains networks. The continuous voltage between the input terminal and the PE potential must not exceed 264Vac.

The input can also be powered from batteries or similar DC sources. The continuous voltage between the supply voltage and the PE/ground potential must not exceed 375Vdc.

A disconnecting means shall be provided for the input of the device.

The device is designed for convection cooling and does not require an external fan. Do not obstruct airflow and do not cover ventilation grid!

The device is designed for altitudes up to 5000m (16400ft). Above 2000m (6560ft) a reduction in output current is required.

Keep the following minimum installation clearances: 40mm on top, 20mm on the bottom, 5mm left and right side. Increase the 5mm to 15mm in case the adjacent device is a heat source. When the device is permanently loaded with less than 50%, the 5mm can be reduced to zero.

The device is designed, tested and approved for branch circuits up to 30A (UL) and 32A (IEC) without additional protection device. If an external fuse is utilized, do not use circuit breakers smaller than 6A B- or 3A C-Characteristic to avoid a nuisance tripping of the circuit breaker.

The maximum surrounding air temperature is +70°C (+158°F). The operational temperature is the same as the ambient or surrounding air temperature and is defined 2cm below the device.

The device is designed to operate in areas between 5% and 95% relative humidity.

Installation Instructions for Hazardous Location Areas

The device is suitable for use in Class I Division 2 Groups A, B, C, D locations.

Substitution of components may impair suitability for this environment.

Do not disconnect the device or operate the voltage adjustment unless power has been switched off or the area is known to be non-hazardous.

3. AC-INPUT

AC input	nom.	AC 100-240V	suitable for TN-, TT- and IT mains networks
AC input range		85-264Vac	continuous operation
		60-85Vac	full power for 200ms, no damage between 0 and 85Vac
	min.	264-300Vac	< 500ms
Allowed voltage L or N to earth	max.	264Vac	continuous, IEC 62103
Input frequency	nom.	50–60Hz	±6%
Turn-on voltage	typ.	82Vac	steady-state value, see Fig. 3-1
Shut-down voltage	typ.	78Vac	steady-state value, see Fig. 3-1
	typ.	58Vac	dynamic value

		AC 100V	**AC 120V**	**AC 230V**	
Input current	typ.	1.34A	1.10A	0.62A	at 24V, 5A, see Fig. 3-3
Power factor *)	typ.	0.99	0.99	0.91	at 24V, 5A, see Fig. 3-4
Crest factor **)	typ.	1.48	1.55	1.71	at 24V, 5A
Start-up delay	typ.	120ms	110ms	85ms	see Fig. 3-2
Rise time	typ.	18ms	18ms	18ms	0mF, 24V, 5A, see Fig. 3-2
	typ.	38ms	38ms	38ms	5mF, 24V, 5A, see Fig. 3-2
Turn-on overshoot	max.	100mV	100mV	100mV	see Fig. 3-2

*) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.
**) The crest factor is the mathematical ratio of the peak value to RMS value of the input current waveform.

Fig. 3-1 **Input voltage range**

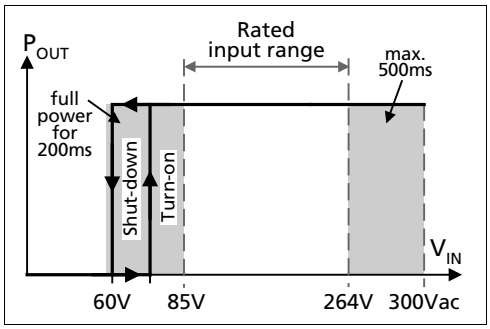


Fig. 3-2 **Turn-on behaviour, definitions**

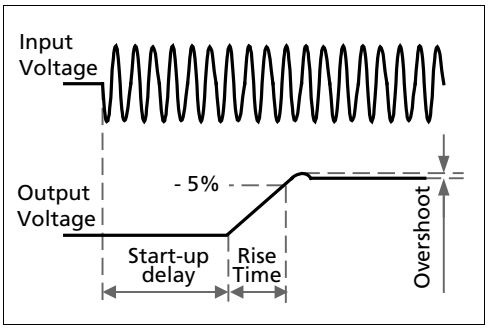


Fig. 3-3 **Input current vs. output load at 24V**

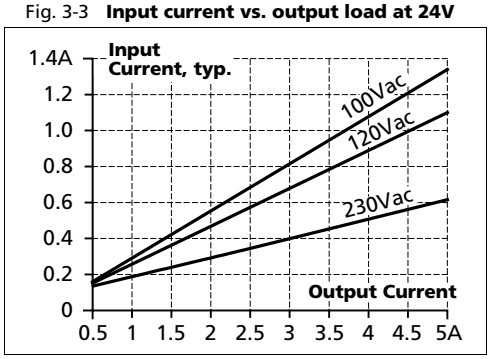
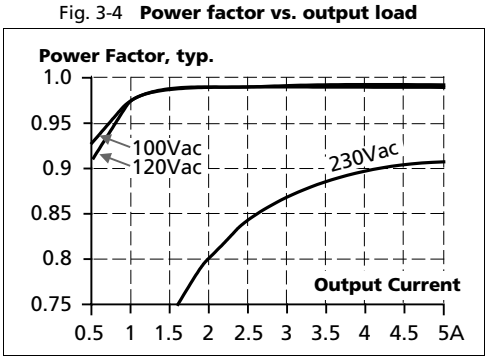


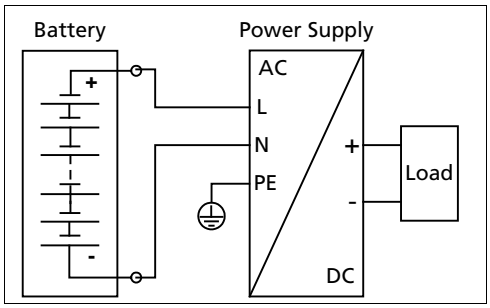
Fig. 3-4 **Power factor vs. output load**



4. DC-INPUT

DC input	nom.	DC 110-300V	±20%
DC input range		88-360Vdc	continuous operation
DC input current	typ.	1.19A / 0.44A	110Vdc / 300Vdc, at 24V, 5A
Allowed Voltage L/N to Earth	max.	375Vdc	IEC 62103
Turn-on voltage	typ.	80Vdc	steady state value
Shut-down voltage	typ.	76Vdc	steady state value

Fig. 4-1 **Wiring for DC Input**



Instructions for DC use:

a) Use a battery or similar DC source.
   For other sources contact PULS
b) Connect +pole to L and –pole to N.
c) Connect the PE terminal to an earth wire or to the machine ground.

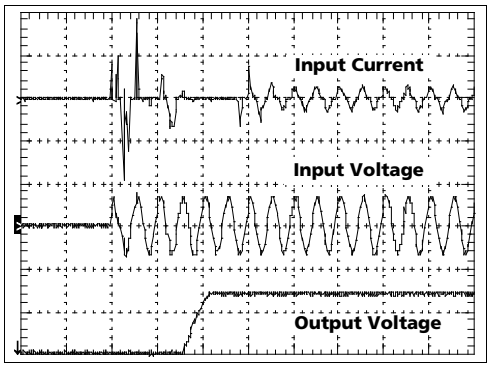
5. INPUT INRUSH CURRENT

An active inrush limitation circuit limits the input inrush current after turn-on of the input voltage and after short input voltage interruptions.

The charging current into EMI suppression capacitors is disregarded in the first microseconds after switch-on.

		AC 100V	**AC 120V**	**AC 230V**	
Inrush current	max.	$15A_{peak}$	$15A_{peak}$	$15A_{peak}$	over entire temperature range
	typ.	$8A_{peak}$	$9A_{peak}$	$11A_{peak}$	over entire temperature range
Inrush energy	max.	$1A^2s$	$1A^2s$	$1A^2s$	over entire temperature range

Fig. 5-1 **Input inrush current, typical behaviour**



Input: 230Vac
Output: 24V, 5A
Ambient: 25°C
Upper curve: Input current 5A / DIV
Middle curve: Input voltage 500V / DIV
Lower curve: Output voltage 20V / DIV
Time basis: 40ms / DIV

6. OUTPUT

Output voltage	nom.	24V	
Adjustment range		24-28V	guaranteed
	max.	30V ***)	at clockwise end position of potentiometer
Factory setting	typ.	24.1V	±0.2%, at full load, cold unit
Line regulation	max.	20mV	60-300Vac
Load regulation	max.	100mV	static value, 0A → 5A
Ripple and noise voltage	max.	50mVpp	20Hz to 20MHz, 50Ohm
Output current	nom.	5A	continuously available at 24V, see Fig. 6-1
	nom.	4.5A	continuously available at 28V, see Fig. 6-1
	nom.	7.5A *)	short term available BonusPower® *), at 24V, for typical 4s, see Fig. 6-1
	nom.	6.7A *)	short term available BonusPower® *), at 28V, for typical 4s, see Fig. 6-1
Output power	nom.	120W / 126W	continuously available at 24V / 28V
	nom.	180W / 188W *)	short term available BonusPower® *) at 24V / 28V
BonusPower® time	typ.	4s	duration until the output voltage dips, see Fig. 6-2
	min.	3s	
	max.	5s	
BonusPower® recovery time	typ.	7s	overload free time to reset power manager, see Fig. 6-3
Overload behaviour		cont. current	
Short-circuit current	min.	4A **)	continuous, load impedance 200mOhm, see Fig. 6-1
	max.	7A **)	continuous, load impedance 200mOhm, see Fig. 6-1
	min.	8A **)	during BonusPower® *), load impedance 200mOhm
	max.	13A **)	during BonusPower® *), load impedance 200mOhm
	max.	7A **)	continuous, load impedance <10mOhm, see Fig. 6-1
Output capacitance	typ.	3 500µF	included inside the power supply

*) BonusPower®, short term power capability (up to typ. 4s)
The power supply is designed to support loads with a higher short-term power requirement without damage or shutdown. The short-term duration is hardware controlled by an output power manager. This BonusPower® is repeatedly available. Detailed information can be found in chapter 23.1. If the power supply is loaded longer with the BonusPower® than shown in the Bonus-time diagram (see Fig. 6-2), the max. output power is automatically reduced to 120/126W.

**) Discharge current of output capacitors is not included.

***) This is the maximum output voltage which can occur at the clockwise end position of the potentiometer due to tolerances. It is not guaranteed value which can be achieved. The typical value is about 28.6V.

Peak current capability (up to several milliseconds)

The power supply can deliver a peak current which is higher than the specified short-term current. This helps to start current demanding loads or to safely operate subsequent circuit breakers.

The extra current is supplied by the output capacitors inside the power supply. During this event, the capacitors will be discharged and causes a voltage dip on the output. Detailed curves can be found in chapter 23.2.

Peak current voltage dips	typ.	from 24V to 20V	at 10A for 50ms, resistive load
	typ.	from 24V to 20V	at 20A for 2ms, resistive load
	typ.	from 24V to 16V	at 20A for 5ms, resistive load

Fig. 6-1 **Output voltage vs. output current, typ.**

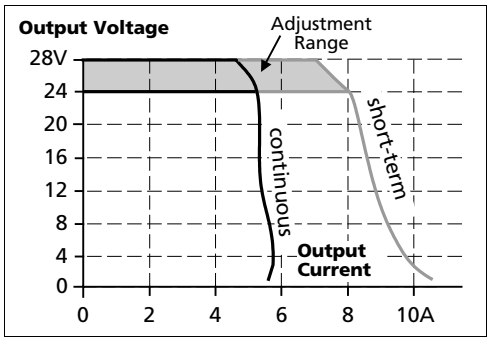


Fig. 6-2 **Bonus time vs. output power**

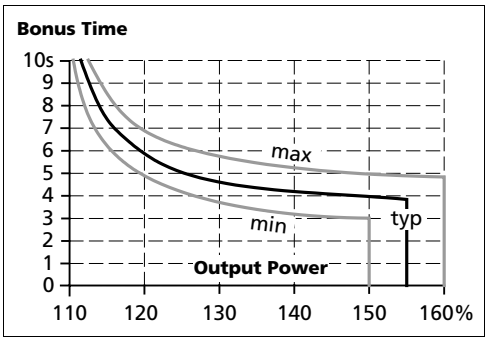
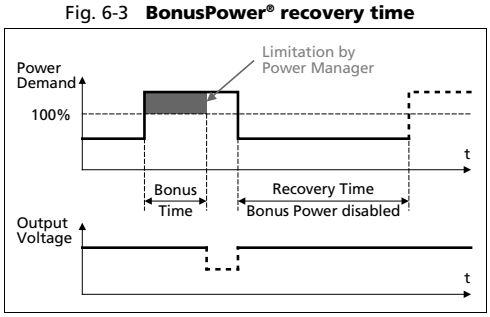


Fig. 6-3 **BonusPower® recovery time**



The BonusPower® is available as soon as power comes on and immediately after the end of an output short circuit or output overload.

Fig. 6-4 **BonusPower® after input turn-on**

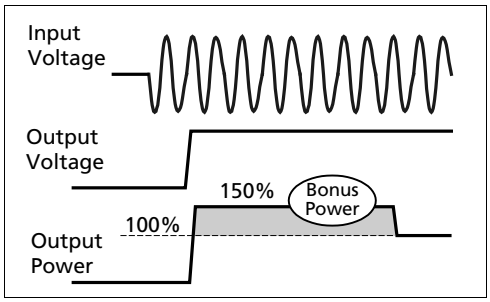
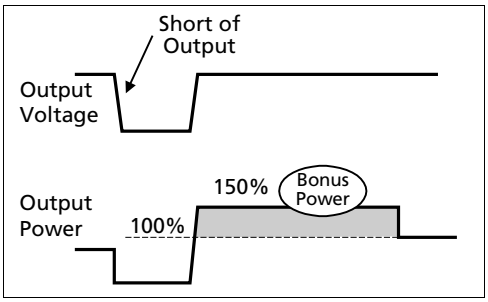


Fig. 6-5 **BonusPower® after output short**



7. HOLD-UP TIME

		AC 100V	AC 120V	AC 230V	
Hold-up Time	typ.	66ms	66ms	127ms	at 24V, 2.5A, see Fig. 7-1
	typ.	34ms	34ms	65ms	at 24V, 5A, see Fig. 7-1

Fig. 7-1 **Hold-up time vs. input voltage**

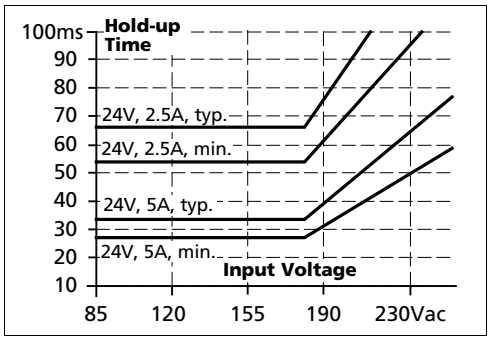
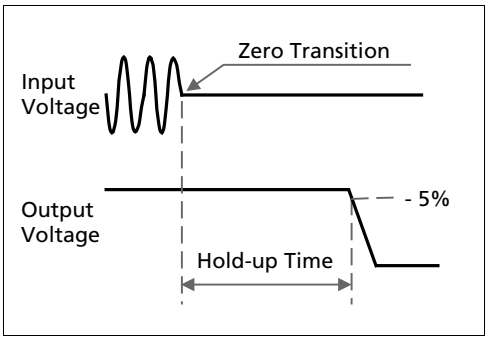


Fig. 7-2 **Shut-down behaviour, definitions**

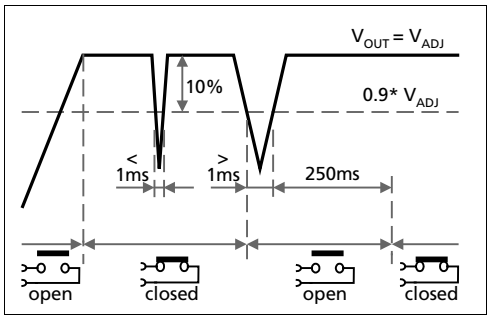


8. DC-OK RELAY CONTACT

This feature monitors the output voltage, which is produced by the power supply itself. It is independent of a back-fed voltage from a unit connected in parallel to the power supply output.

Contact closes	As soon as the output voltage reaches the adjusted output voltage level.		
Contact opens	As soon as the output voltage dips more than 10% below the adjusted output voltage. Short dips will be extended to a signal length of 250ms. Dips shorter than 1ms will be ignored.		
Contact re-closes	As soon as the output voltage exceeds 90% of the adjusted voltage.		
Contact ratings	max	60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A	resistive load
	min	1mA at 5Vdc	min. permissible load
Isolation voltage	See dielectric strength table in chapter 18.		

Fig. 8-1 **DC-OK relay contact behavior**



Note: The DC-OK feature requires that the output voltage reaches the nominal (=adjusted) level after turn-on in order to function according to specification. If this level cannot be achieved, the overload LED will be on and the DC-OK contact will be open. The overload signal will only shut off as soon as the adjusted voltage is reached. This is an important condition to consider particularly, if the load is a battery, the power supply is used in parallel or the power supply is used for N+1 redundant system.

9. EFFICIENCY AND POWER LOSSES

		AC 100V	AC 120V	AC 230V	
Efficiency	typ.	90.5%	91.6%	92.7%	at 24V, 5A
Average efficiency *)	typ.	89.8%	90.5%	90.3%	25% at 1.25A, 25% at 2.5A, 25% at 3.75A. 25% at 5A
Power losses	typ.	3.7W	3.8W	4.3W	at 24V, 0A
	typ.	12.6W	11.0W	9.4W	at 24V, 5A

*) The average efficiency is an assumption for a typical application where the power supply is loaded with 25% of the nominal load for 25% of the time, 50% of the nominal load for another 25% of the time, 75% of the nominal load for another 25% of the time and with 100% of the nominal load for the rest of the time.

Fig. 9-1 **Efficiency vs. output current at 24V, typ**

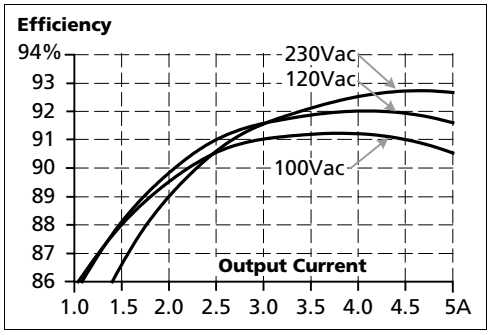


Fig. 9-2 **Losses vs. output current at 24V, typ.**

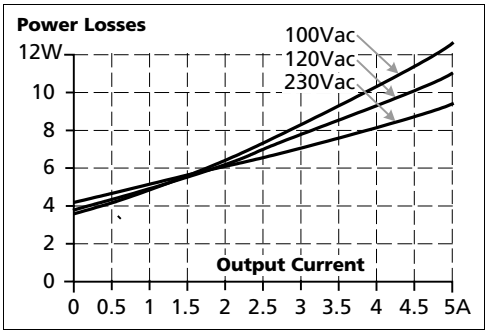


Fig. 9-3 **Efficiency vs. input voltage at 24V, 5A, typ.**

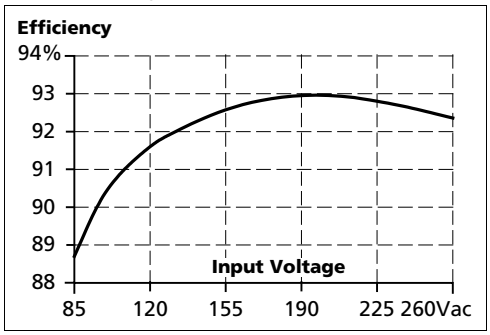
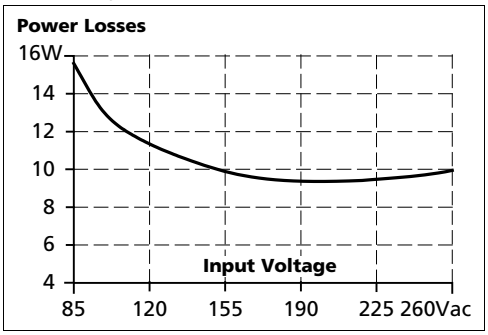


Fig. 9-4 **Losses vs. input voltage at 24V, 5A, typ.**



10. LIFETIME EXPECTANCY AND MTBF

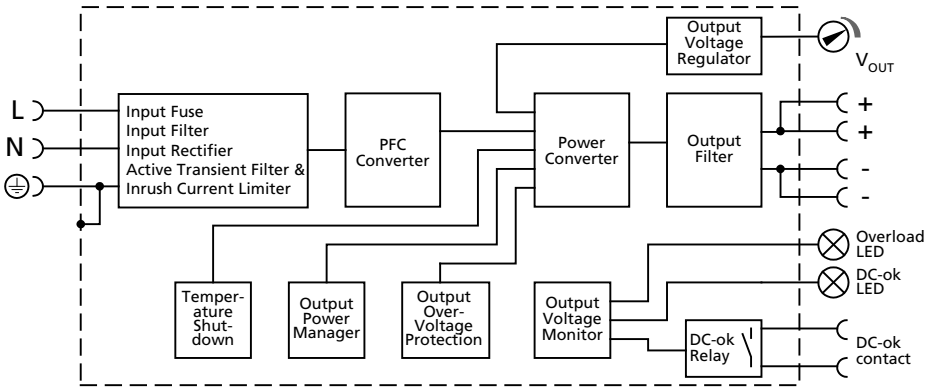
	AC 100V	AC 120V	AC 230V	
Lifetime expectancy *)	63 000h	70 000h	89 000h	at 24V, 5A and 40°C
	112 000h	116 000h	116 000h	at 24V, 2.5A and 40°C
	178 000h*)	197 000h*)	252 000h*)	at 24V, 5A and 25°C
MTBF **) SN 29500, IEC 61709	787 000h	812 000h	831 000h	at 24V, 5A and 40°C
	1 374 000h	1 409 000h	1 338 000h	at 24V, 5A and 25°C
MTBF **) MIL HDBK 217F	352 000h	375 000h	391 000h	at 24V, 5A and 40°C; Ground Benign GB40
	482 000h	509 000h	536 000h	at 24V, 5A and 25°C; Ground Benign GB25

*) The **Lifetime expectancy** shown in the table indicates the minimum operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours and is calculated according to the capacitor's manufacturer specification. The manufacturer of the electrolytic capacitors only guarantees a maximum life of up to 15 years (131 400h). Any number exceeding this value is a calculated theoretical lifetime which can be used to compare devices.

) **MTBF stands for **M**ean **T**ime **B**etween **F**ailure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product. The MTBF figure is a statistical representation of the likelihood of a device to fail. A MTBF figure of e.g. 1 000 000h means that statistically one unit will fail every 100 hours if 10 000 units are installed in the field. However, it can not be determined if the failed unit has been running for 50 000h or only for 100h.

11. FUNCTIONAL DIAGRAM

Fig. 11-1 **Functional diagram**



12. TERMINALS AND WIRING

Bi-stable, quick-connect spring clamp terminals. IP20 Finger safe construction. Suitable for field- and factory installation. Shipped in open position.

	Input	**Output**	**DC-OK-Signal**
Type	spring-clamp terminals	spring-clamp terminals	spring-clamp terminals
Solid wire	0.5-6mm²	0.3-4mm²	0.3-4mm²
Stranded wire	0.5-4mm²	0.3-2.5mm²	0.3-2.5mm²
American Wire Gauge	20-10 AWG	26-12 AWG	26-12 AWG
Wire stripping length	10mm / 0.4inch	6mm / 0.25inch	6mm / 0.25inch
Screwdriver	not applicable	not applicable	not applicable
Recommended tightening torque	not applicable	not applicable	not applicable
Pull-out force	10AWG:80N, 12AWG:60N, 14AWG:50N, 16AWG:40N (according to UL486E)		

Instructions:

a) Use appropriate copper cables that are designed for minimum operating temperatures of:
60°C for ambient up to 45°C and
75°C for ambient up to 60°C minimum
90°C for ambient up to 70°C minimum.

b) Follow national installation codes and installation regulations!

c) Ensure that all strands of a stranded wire enter the terminal connection!

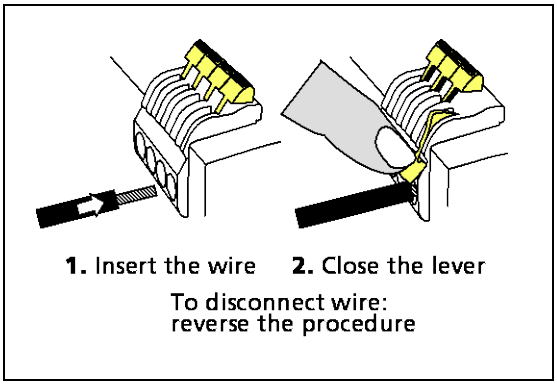
d) Up to two stranded wires with the same cross section are permitted in one connection point (except PE wire).

e) Do not use the unit without PE connection.

f) Unused terminal compartments should be securely tightened.

g) Ferrules are allowed.

Fig. 12-1 **Connecting a wire**



13. FRONT SIDE AND USER ELEMENTS

Fig. 13-1 **Front side**

A **Input Terminals** (Quick-connect spring-clamp terminals)
- **N, L** Line input
- ⏚ PE (Protective Earth) input

B **Output Terminals** (Quick-connect spring-clamp terminals, two pins per pole)
- **+** Positive output
- **–** Negative (return) output

C **DC-OK Relay Contact** (Quick-connect spring-clamp terminals)
The DC-OK relay contact is synchronized with the DC-OK LED.
See chapter 8 for details.

D **Output voltage potentiometer**
Multi turn potentiometer;
Open the flap to adjust the output voltage. Factory set: 24.1V

E **DC-OK LED** (green)
On, when the output voltage is >90% of the adjusted output voltage

F **Overload LED** (red)
On, when the voltage on the output terminals is <90% of the adjusted output voltage, or in case of a short circuit in the output.
Input voltage is required
Flashing, when the unit has switched off due to over-temperature.

Indicators, LEDs

	Overload LED	DC-OK LED	DC-OK Contact
Normal mode	OFF	ON	Closed
During BonusPower®	OFF	ON	Closed
Overload (V_{OUT} < 90%)	ON	OFF	Open
Output short circuit	ON	OFF	Open
Temperature Shutdown	Intermitted	OFF	Open
No input power	OFF	OFF	Open

14. EMC

The power supply is suitable for applications in industrial environment as well as in residential, commercial and light industry environment without any restrictions.

The CE mark indicates conformance with the EMC directive, the low-voltage directive (LVD) and the RoHS directive. A detailed EMC report is available on request.

EMC Immunity	According generic standards: EN 61000-6-1 and EN 61000-6-2			
Electrostatic discharge	EN 61000-4-2	contact discharge air discharge	8kV 15kV	Criterion A Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-2.7GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	input lines output lines DC-OK signal (coupling clamp)	4kV 2kV 1kV	Criterion A Criterion A Criterion A
Surge voltage on input	EN 61000-4-5	L → N L → PE, N → PE	2kV 4kV	Criterion A Criterion A
Surge voltage on output	EN 61000-4-5	+ → - + / - → PE	1kV 1kV	Criterion A Criterion A
Surge voltage on DC-OK	EN 61000-4-5	DC-OK signal → PE	1kV	Criterion A
Conducted disturbance	EN 61000-4-6	0.15-80MHz	10V	Criterion A
Mains voltage dips	EN 61000-4-11	0% of 100Vac 40% of 100Vac 70% of 100Vac 0% of 200Vac 40% of 200Vac 70% of 200Vac	0Vac, 20ms 40Vac, 200ms 70Vac, 500ms 0Vac, 20ms 80Vac, 200ms 140Vac, 500ms	Criterion A Criterion C Criterion A Criterion A Criterion A Criterion A
Voltage interruptions	EN 61000-4-11	0% of 200Vac (=0V)	5000ms	Criterion C
Voltage sags	SEMI F47	dips on the input voltage according to SEMI F47 standard		
		80% of 120Vac (96Vac) 70% of 120Vac (84Vac) 50% of 120Vac (60Vac)	1000ms 500ms 200ms	Criterion A Criterion A Criterion A
Powerful transients	VDE 0160	over entire load range	750V, 1.3ms	Criterion A

Criterions:

A: Power supply shows normal operation behavior within the defined limits.

C: Temporary loss of function is possible. Power supply may shut down and restarts by itself. No damage or hazards for the power supply will occur.

EMC Emission	According generic standards: EN 61000-6-3 and EN 61000-6-4	
Conducted emission input lines	EN 55011, EN 55032, FCC Part 15, CISPR 11, CISPR 32	Class B
Conducted emission output lines **)	IEC/CISPR 16-1-2, IEC/CISPR 16-2-1	limits for DC power port according EN 61000-6-3 fulfilled
Radiated emission	EN 55011, EN 55032	Class B
Harmonic input current	EN 61000-3-2	fulfilled for class A equipment
Voltage fluctuations, flicker	EN 61000-3-3	fulfilled *)

This device complies with FCC Part 15 rules.

Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*) tested with constant current loads, non pulsing

**) for information only, not mandatory for EN 61000-6-3

Switching Frequencies	The power supply has three converters with three different switching frequencies included. Two are nearly constant. The other one is input voltage and load dependent.	
Switching frequency 1	110kHz	nearly constant
Switching frequency 2	400kHz	nearly constant
Switching frequency 3	65kHz to 280kHz	input voltage and load dependent

15. ENVIRONMENT

Operational temperature *)	-25°C to +70°C (-13°F to 158°F)	reduce output power according Fig. 15-1
Storage temperature	-40 to +85°C (-40°F to 185°F)	for storage and transportation
Output de-rating	3W/°C	60-70°C (140°F to 158°F)
Humidity **)	5 to 95% r.H.	IEC 60068-2-30
Vibration sinusoidal	2-17.8Hz: ±1.6mm; 17.8-500Hz: 2g 2 hours / axis	IEC 60068-2-6
Shock	30g 6ms, 20g 11ms 3 bumps / direction, 18 bumps in total	IEC 60068-2-27
Altitude	0 to 2000m (0 to 6 560ft)	without any restrictions
	2000 to 6000m (6 560 to 20 000ft)	reduce output power or ambient temperature, see Fig. 15-2 IEC 62103, EN 50178, overvoltage category II
Altitude de-rating	7.5W/1000m or 5°C/1000m	> 2000m (6500ft), see Fig. 15-2
Over-voltage category	III	IEC 62103, EN 50178, altitudes up to 2000m
	II	altitudes from 2000m to 6000m
Degree of pollution	2	IEC 62103, EN 50178, not conductive

*) Operational temperature is the same as the ambient temperature and is defined as the air temperature 2cm below the unit.
**) Do not energize while condensation is present

Fig. 15-1 **Output current vs. ambient temp.**

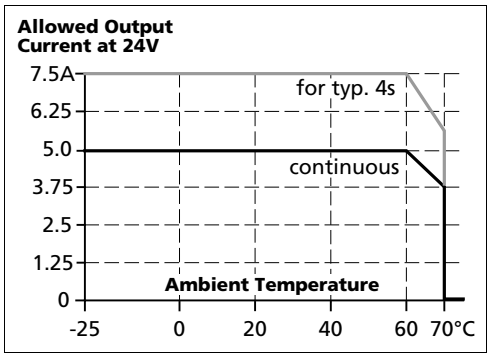
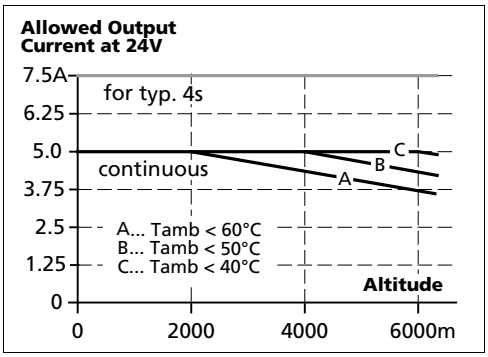


Fig. 15-2 **Output current vs. altitude**



16. PROTECTION FEATURES

Output protection	Electronically protected against overload, no-load and short-circuits *)	
Output over-voltage protection	typ. 32Vdc max. 36Vdc	In case of an internal power supply defect, a redundant circuit limits the maximum output voltage. The output shuts down and automatically attempts to restart.
Degree of protection	IP 20	EN/IEC 60529
Penetration protection	> 3.5mm	e.g. screws, small parts
Over-temperature protection	yes	Output shutdown with automatic restart
Input transient protection	MOV (Metal Oxide Varistor)	
Internal input fuse	T3.15A H.B.C.	not user replaceable

*) In case of a protection event, audible noise may occur.

17. SAFETY FEATURES

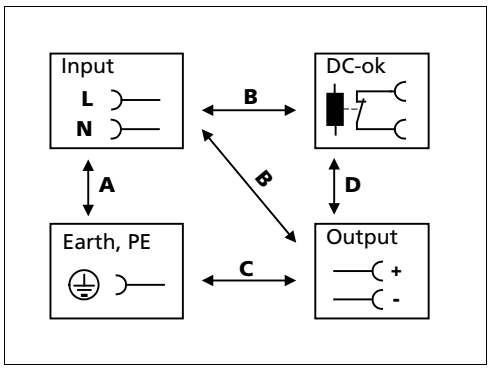
Input / output separation *)	SELV	IEC/EN 60950-1
	PELV	IEC/EN 60204-1, EN 50178, IEC 62103, IEC 60364-4-41
Class of protection	I	PE (Protective Earth) connection required
Isolation resistance	> 100MOhm	input to output, 500Vdc
PE resistance	< 0.1Ohm	
Touch current (leakage current)	typ. 0.11mA / 0.28mA	100Vac, 50Hz, TN-, TT-mains / IT-mains
	typ. 0.16mA / 0.4mA	120Vac, 60Hz, TN-, TT-mains / IT-mains
	typ. 0.27mA / 0.68mA	230Vac, 50Hz, TN-, TT-mains / IT-mains
	< 0.14mA / 0.33mA	110Vac, 50Hz, TN-, TT-mains / IT-mains
	< 0.22mA / 0.49mA	132Vac, 60Hz, TN-, TT-mains / IT-mains
	< 0.40mA / 0.88mA	264Vac, 50Hz, TN-, TT-mains / IT-mains

*) double or reinforced insulation

18. DIELECTRIC STRENGTH

The output voltage is floating and has no ohmic connection to the ground. Type and factory tests are conducted by the manufacturer. Field tests may be conducted in the field using the appropriate test equipment which applies the voltage with a slow ramp (2s up and 2s down). Connect all input-terminals together as well as all output poles before conducting the test. When testing, set the cut-off current settings to the value in the table below.

Fig. 18-1 **Dielectric strength**



		A	B	C	D
Type test	60s	2500Vac	3000Vac	500Vac	500Vac
Factory test	5s	2500Vac	2500Vac	500Vac	500Vac
Field test	5s	2000Vac	2000Vac	500Vac	500Vac
Cut-off current setting		> 10mA	> 10mA	> 20mA	> 1mA

To fulfil the PELV requirements according to EN60204-1 § 6.4.1, we recommend that either the + pole, the – pole or any other part of the output circuit shall be connected to the protective earth system. This helps to avoid situations in which a load starts unexpectedly or cannot be switched off when unnoticed earth faults occur.

19. APPROVED, FULFILLED OR TESTED STANDARDS

UL 508	c UL us LISTED	UL Certificate Listed equipment for category NMTR - Industrial Control Equipment Applicable for US and Canada E-File: E198865
IEC 61010-2-201	Safety ✓	Manufacturer's Declaration Electrical Equipment for Measurement, Control and Laboratory Use - Particular requirements for control equipment
IEC 60950-1	CB Report	CB Scheme Certificate General safety requirements for Information Technology Equipment (ITE)
UL 60950-1	c RU us	UL Certificate Recognized component for category QQGQ - Information Technology Equipment (ITE) Applicable for US and Canada E-File: E137006
ATEX (QS5.241-A1)	Ex	Agency Certificate (Bureau Veritas) EN 60079-0 Explosive atmospheres - General requirements EN 60079-7, EN 60079-15 Equipment protection by type of protection "e" and "n" Certificate: EPS 09 ATEX 1 236 X Temperature Code: T4 Type of Protection: ec nC
IECEx (QS5.241-A1)	IECEx	IECEx Certificate IEC 60079-0 Explosive atmospheres - General requirements IEC 60079-7, IEC 60079-15 Equipment protection by type of protection "e" and "n" Certificate: IECEx EPS 12.0031X Temperature Code: T4 Type of Protection: ec nC
Marine (QS5.241)	DNV	DNV Certificate DNV Type approved product Certificate: TAA00002JT Temperature: Class D Humidity: Class B Vibration: Class C EMC: Class A Enclosure: Class A
Marine (QS5.241-A1)	DNV	DNV Certificate DNV Type approved product Certificate: TAA00002YX Temperature: Class D Humidity: Class B Vibration: Class C EMC: Class A Enclosure: Class A
Marine	ABS	ABS Design Assessment Certificate ABS (American Bureau of Shipment) assessed product Certificate: 17-HG1599236-PDA
SEMI F47	SEMI F47	Test Report Voltage Sag Immunity for Semiconductor Processing Equipment Tested for AC 120V and 208V L-L or L-N mains voltages, nominal output voltage and nominal output load

IEC 60068-2-60	Corrosion IEC 60068-2-60 Method 4 ✓	Manufacturer's Declaration (Online Document) IEC 60068-2-60 - Environmental Tests, Flowing Mixed Gas Corrosion Test Test Ke - Method 4 H2S: 10ppb NO2: 200ppb Cl2: 10ppb SO2: 200ppb Test Duration: 3 weeks, which simulates a service life of 10 years
ISA-71.04 G3	Corrosion G3-ISA-71.04 ✓	Manufacturer's Declaration (Online Document) Airborne Contaminants Corrosion Test Severity Level: G3 Harsh H2S: 100ppb NOx: 1250ppb Cl2: 20ppb SO2: 300ppb Test Duration: 3 weeks, which simulates a service life of at years.
VDMA 24364	LABS VDMA 24364-C1-L/W	Paint Wetting Impairment Substances Test (or LABS-Test) Tested for Zone 2 and test class C1 according to VDMA 24364-C1-L/W for solvents and water-based paints

20. REGULATORY PRODUCT COMPLIANCE

EU Declaration of Conformity	CE	The CE mark indicates conformance with the - EMC directive - Low-voltage directive (LVD) (QS5.241) - RoHS directive - ATEX directive (QS5.241-A1)
REACH Directive	REACH ✓	Manufacturer's Statement EU-Directive regarding the Registration, Evaluation, Authorization and Restriction of Chemicals
WEEE Directive		Manufacturer's Statement EU-Regulation on Waste Electrical and Electronic Equipment Registered in Germany as business to business (B2B) products.
EAC TR Registration	EAC	Registration for the Eurasian Customs Union market (Russia, Kazakhstan, Belarus) 8504408200, 8504409000

21. PHYSICAL DIMENSIONS AND WEIGHT

Weight	620g / 1.37lb
DIN rail	Use 35mm DIN rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm. The DIN rail depth must be added to the unit depth (117mm) to calculate the total required installation depth.
Installation Clearances	See chapter 2

Fig. 21-1 **Front view**

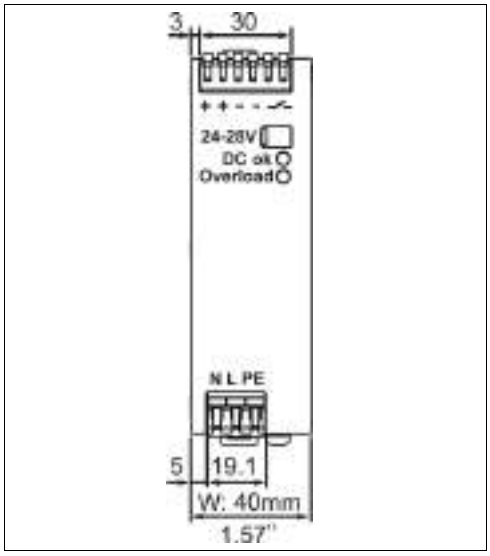
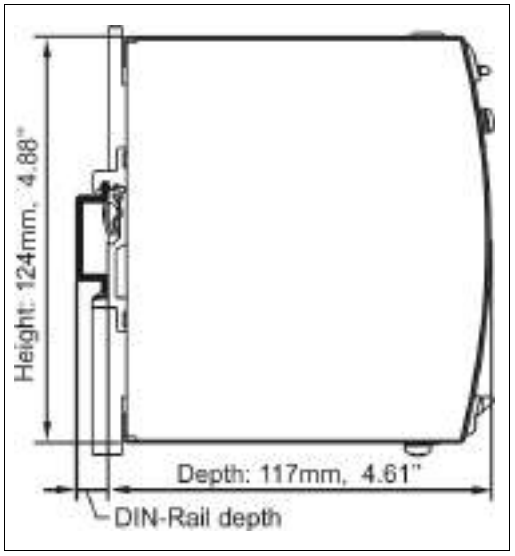


Fig. 21-2 **Side view**



22. ACCESSORIES

22.1. ZM1.WALL - WALL MOUNTING BRACKET

This bracket is used to mount the power supply onto a flat surface without utilizing a DIN rail.

22.2. ZM12.SIDE - SIDE MOUNTING BRACKET

This bracket is used to mount Dimension units sideways with or without utilizing a DIN rail. The two aluminum brackets and the black plastic slider of the unit must be detached, so that the steel brackets can be mounted.

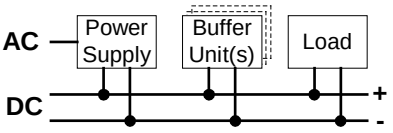
For sideway DIN rail mounting, the removed aluminum brackets and the black plastic slider need to be mounted on the steel bracket.

Side mounting with DIN rail brackets

Side mounting without DIN rail brackets

22.3. UF20.241 BUFFER MODULE

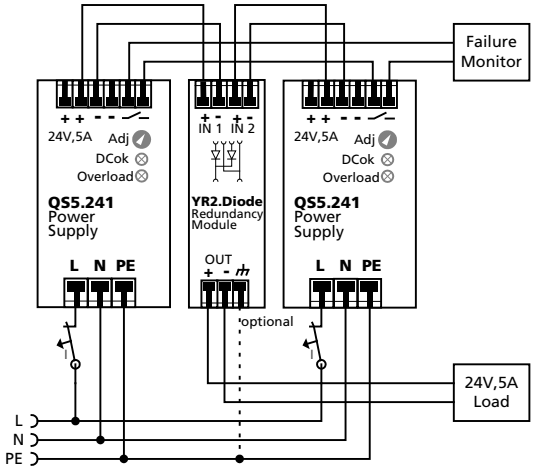
This buffer unit is a supplementary device for DC 24V power supplies. It delivers power to bridge typical mains failures or extends the hold-up time after turn-off of the AC power. In times when the power supply provides sufficient voltages, the buffer unit stores energy in integrated electrolytic capacitors. In case of mains voltage fault, this energy is released again in a regulated process. One buffer module can deliver 20A additional current.



The buffer unit does not require any control wiring. It can be added in parallel to the load circuit at any given point. Buffer units can be added in parallel to increase the output ampacity or the hold-up time.

22.4. YR2.DIODE REDUNDANCY MODULE

The YR2.DIODE is a dual redundancy module, which has two diodes as decoupling devices included. It can be used for various purposes. The most popular application is to configure highly reliable and true redundant power supply systems. Another interesting application is the separation of sensitive loads from non-sensitive loads. This avoids the distortion of the power quality for the sensitive loads which can cause controller failures.



23. APPLICATION NOTES

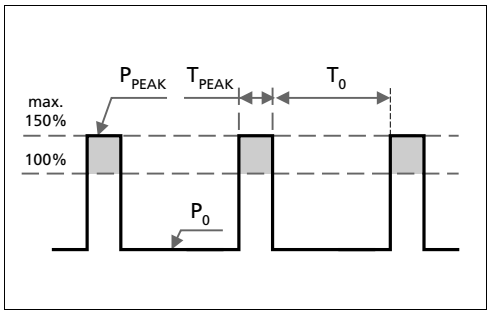
23.1. REPETITIVE PULSE LOADING

Typically, a load current is not constant and varies over time. This power supply is designed to support loads with a higher short-term power demand (=BonusPower®). The short-term duration is hardware controlled by an output power manager and is available on a repeated basis. If the BonusPower® load lasts longer than the hardware controller allows it, the output voltage will dip and the next BonusPower® is available after the BonusPower® recovery time (see chapter 6) has elapsed.

To avoid this, the following rules must be met:

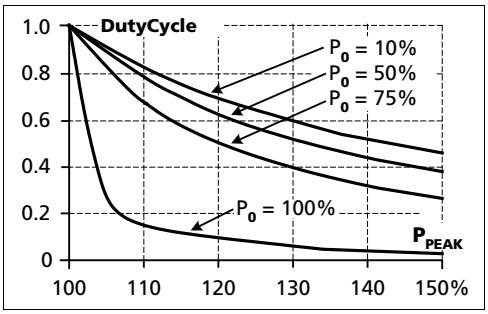
a) The power demand of the pulse must be below 150% of the nominal output power.
b) The duration of the pulse power must be shorter than the allowed BonusPower® time. (see output section)
c) The average (R.M.S.) output current must be below the specified continuous output current.
If the R.M.S. current is higher, the unit will respond with a thermal shut-down after a period. Use the maximum duty cycle curve (Fig. 23-2) to check if the average output current is below the nominal current.

Fig. 23-1 **Repetitive pulse loads, definitions**



P_0 Base load (W)
P_{PEAK} Pulse load (above 100%)
T_0 Duration between pulses (s)
T_{PEAK} Pulse duration (s)

Fig. 23-2 **Max. duty cycle curve**



$$\text{DutyCycle} = \frac{T_{peak}}{T_{peak} + T_0}$$

$$T_0 = \frac{T_{peak} - (\text{DutyCycle} \times T_{peak})}{\text{DutyCycle}}$$

Example: A load is powered continuously with 60W (= 50% of the rated output load). From time to time a peak power of 180W (= 150% of the rated output load) is needed for 1 second.

The question is: How often can this pulse be supplied without overloading the power supply?

- Make a vertical line at P_{PEAK} = 150% and a horizontal line where the vertical line crosses the P_0 = 50% curve. Read the max. duty cycle from the duty cycle-axis (= 0.37)
- Calculate the required pause (base load) length T_0:
- Result: The required pause length = 1.7s
- Max. repetition rate = pulse +pause length = **2.7s**

$$T_0 = \frac{T_{peak} - (\text{DutyCycle} \times T_{peak})}{\text{DutyCycle}} = \frac{1s - (0.37 \times 1s)}{0.37} = \mathbf{1.7s}$$

More examples for pulse load compatibility:

P_{PEAK}	P_0	T_{PEAK}	T_0
180W	120W	1s	>25s
180W	0W	1s	>1.3s
150W	60W	1s	> 0.75s

P_{PEAK}	P_0	T_{PEAK}	T_0
180W	60W	0.1s	>0.16s
180W	60W	1s	>1.6s
180W	60W	3s	>4.9s

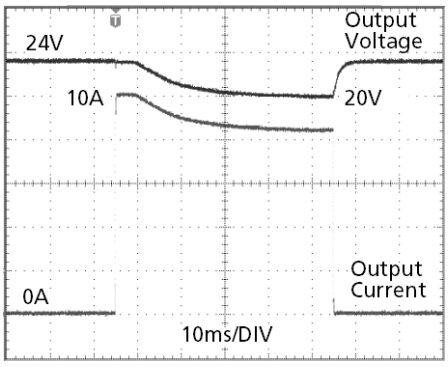
23.2. PEAK CURRENT CAPABILITY

Solenoids, contactors and pneumatic modules often have a steady state coil and a pick-up coil. The inrush current demand of the pick-up coil is several times higher than the steady-state current and usually exceeds the nominal output current (including the Power Boost). The same situation applies when starting a capacitive load.

Branch circuits are often protected with circuit breakers or fuses. In case of a short or an overload in the branch circuit, the fuse needs a certain amount of over-current to trip or to blow. The peak current capability ensures the safe operation of subsequent circuit breakers.

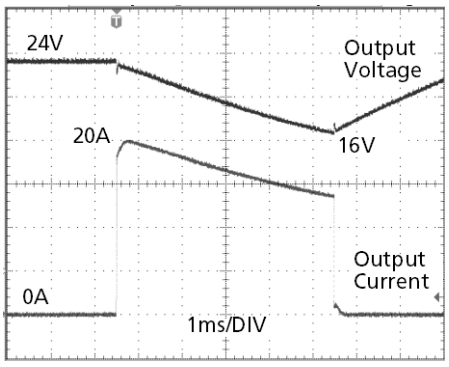
Assuming the input voltage is turned on before such an event, the built-in large sized output capacitors inside the power supply can deliver extra current. Discharging this capacitor causes a voltage dip on the output. The following two examples show typical voltage dips:

Fig. 23-3 **Peak load with 2x the nominal current for 50ms, typ.**



Peak load 10A (resistive) for 50ms
Output voltage dips from 24V to 20V.

Fig. 23-4 **Peak load with 4x the nominal current for 5ms, typ.**



Peak load 20A (resistive) for 5ms
Output voltage dips from 24V to 16V.

Please note: The DC-OK relay triggers when the voltage dips more than 10% for longer than 1ms.

23.3. BACK-FEEDING LOADS

Loads such as decelerating motors and inductors can feed voltage back to the power supply. This feature is also called return voltage immunity or resistance against Back- E.M.F. (Electro Magnetic Force).

This power supply is resistant and does not show malfunctioning when a load feeds back voltage to the power supply. It does not matter whether the power supply is on or off.

The maximum allowed feed-back-voltage is 35Vdc. The absorbing energy can be calculated according to the built-in large sized output capacitor which is specified in chapter 6.

23.4. EXTERNAL INPUT PROTECTION

The unit is tested and approved for branch circuits up to 30A (UL) and 32A (IEC). An external protection is only required if the supplying branch has an ampacity greater than this. Check also local codes and local requirements. In some countries local regulations might apply.

If an external fuse is necessary or utilized, minimum requirements need to be considered to avoid nuisance tripping of the circuit breaker. A minimum value of 6A B- or 3A C-Characteristic breaker should be used

23.5. CHARGING OF BATTERIES

The power supply can be used to charge lead-acid or maintenance free batteries. (Two 12V batteries in series)

Instructions for charging batteries:

a) Set output voltage (measured at no load and at the battery end of the cable) very precisely to the end-of-charge voltage.

End-of-charge voltage	27.8V	27.5V	27.15V	26.8V
Battery temperature	10°C	20°C	30°C	40°C

b) Use a 10A circuit breaker (or blocking diode) between the power supply and the battery.

c) Ensure that the output current of the power supply is below the allowed charging current of the battery.

d) Use only matched batteries when putting 12V types in series.

e) The return current to the power supply (battery discharge current) is typ. 2.5mA when the power supply is switched off (except in case a blocking diode is utilized).

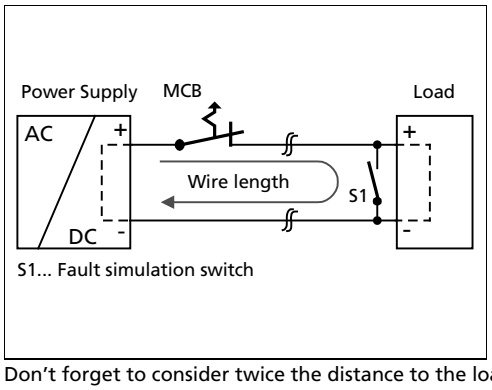
23.6. OUTPUT CIRCUIT BREAKERS

Standard miniature circuit breakers (MCB's or UL1077 circuit breakers) are commonly used for AC-supply systems and may also be used on 24V branches.

MCB's are designed to protect wires and circuits. If the ampere value and the characteristics of the MCB are adapted to the wire size that is used, the wiring is considered as thermally safe regardless of whether the MCB opens or not.

To avoid voltage dips and under-voltage situations in adjacent 24V branches which are supplied by the same source, a fast (magnetic) tripping of the MCB is desired. A quick shutdown within 10ms is necessary corresponding roughly to the ride-through time of PLC's. This requires power supplies with high current reserves and large output capacitors. Furthermore, the impedance of the faulty branch must be sufficiently small in order for the current to actually flow. The best current reserve in the power supply does not help if Ohm's law does not permit current flow. The following table has typical test results showing which B- and C-Characteristic MCBs magnetically trip depending on the wire cross section and wire length.

Fig. 23-5 **Test circuit**



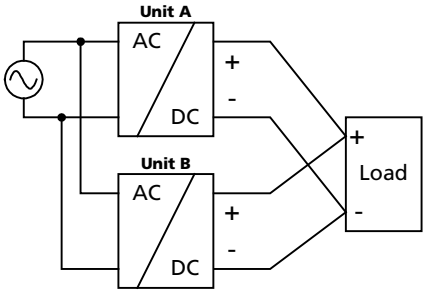
S1... Fault simulation switch

Maximal wire length*) for a fast (magnetic) tripping:

	0.75mm²	**1.0mm²**	**1.5mm²**	**2.5mm²**
C-2A	15m	20m	26m	48m
C-3A	9m	14m	22m	33m
C-4A	4m	5m	7m	10m
C-6A	-	1m	1m	1m
B-6A	4m	7m	9m	11m

*) Don't forget to consider twice the distance to the load (or cable length) when calculating the total wire length (+ and – wire).

23.7. PARALLEL USE TO INCREASE OUTPUT POWER



Power supplies from the same series (Q-Series) can be paralleled to increase the output power. The output voltage shall be adjusted to the same value (±100mV) with the same load conditions on all units, or the units can be left with the factory settings.

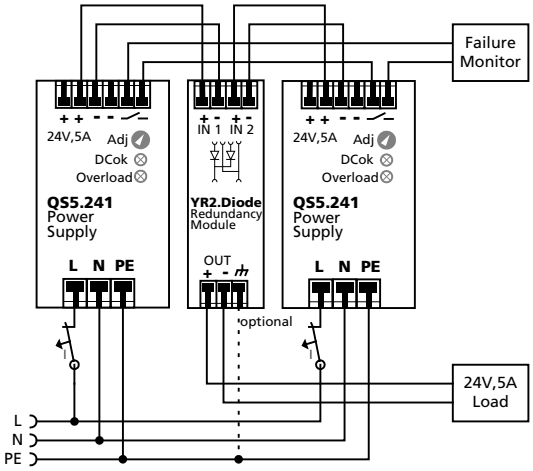
If more than three units are connected in parallel, a fuse or circuit breaker with a rating of 10A is required on each output. Alternatively, a diode or redundancy module can also be utilized.

Keep an installation clearance of 15mm (left / right) between two power supplies and avoid installing the power supplies on top of each other. Do not use power supplies in parallel in mounting orientations other than the standard mounting orientation (input terminals on bottom and output terminals on the top of the unit) or in any other condition where a derating of the output current is required (e.g. altitude, above 60°C, …).

Pay attention that leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.

23.8. PARALLEL USE FOR REDUNDANCY

Power supplies can be paralleled for redundancy to gain higher system availability. Redundant systems require a certain amount of extra power to support the load in case one power supply unit fails. The simplest way is to put two power supplies in parallel. This is called a 1+1 redundancy. In case one power supply unit fails, the other one is automatically able to support the load current without any interruption. Redundant systems for a higher power demand are usually built in a N+1 method. E.g. five power supplies, each rated for 5A are paralleled to build a 20A redundant system. For N+1 redundancy the same restrictions apply as for increasing the output power, see also section 23.7.



Please note: This simple way to build a redundant system does not cover failures such as an internal short circuit in the secondary side of the power supply. In such a case, the defective unit becomes a load for the other power supplies and the output voltage can not be maintained any more. This can be avoided by utilizing decoupling diodes which are included in the redundancy module YR2.DIODE.

Recommendations for building redundant power systems:

a) Use separate input fuses for each power supply.
b) Monitor the individual power supply units. Therefore, use the DC-OK relay contact of the QS5 power supply.
c) It is desirable to set the output voltages of all units to the same value (± 100mV) or leave it at the factory setting.

23.9. DAISY CHAINING OF OUTPUTS

Daisy chaining (jumping from one power supply output to the next) is allowed as long as the average output current through one terminal pin does not exceed 13A. If the current is higher, use a separate distribution terminal block as shown in Fig. 23-7.

Fig. 23-6 Daisy chaining of outputs

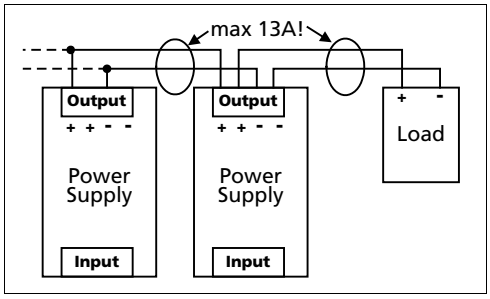
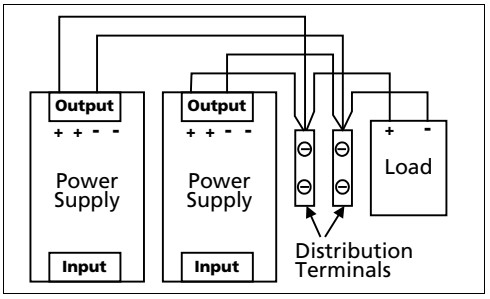
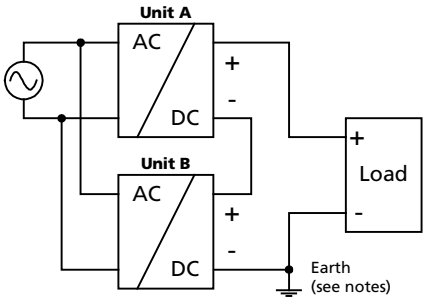


Fig. 23-7 Using distribution terminals



23.10. SERIES OPERATION



Power supplies of the same type can be connected in series for higher output voltages. It is possible to connect as many units in series as needed, providing the sum of the output voltage does not exceed 150Vdc. Voltages with a potential above 60Vdc are not SELV anymore and can be dangerous. Such voltages must be installed with a protection against touching.

Earthing of the output is required when the sum of the output voltage is above 60Vdc.

Avoid return voltage (e.g. from a decelerating motor or battery) which is applied to the output terminals.

Keep an installation clearance of 15mm (left / right) between two power supplies and avoid installing the power supplies on top of each other. Do not use power supplies in series in mounting orientations other than the standard mounting orientation (input terminals on bottom and output terminals on the top of the unit).

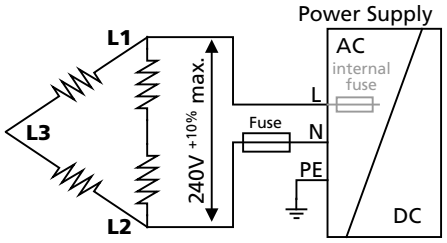
Pay attention that leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.

23.11. INDUCTIVE AND CAPACITIVE LOADS

The unit is designed to supply any kind of loads, including unlimited capacitive and inductive loads.

23.12. OPERATION ON TWO PHASES

The power supply can also be used on two-phases of a three-phase-system. Such a phase-to-phase connection is allowed as long as the supplying voltage is below 240V+10%. Use a fuse or a circuit breaker to protect the N input. The N input is internally not protected and is in this case connected to a hot wire. Appropriate fuses or circuit breakers are specified in section 23.4 “External Input Protection”.



23.13. USE IN A TIGHTLY SEALED ENCLOSURE

When the power supply is installed in a tightly sealed enclosure, the temperature inside the enclosure will be higher than outside. In such situations, the inside temperature defines the ambient temperature for the power supply.

The following measurement results can be used as a reference to estimate the temperature rise inside the enclosure.

The power supply is placed in the middle of the box, no other heat producing items are inside the box

Enclosure:	Rittal Typ IP66 Box PK 9516 100, plastic, 110x180x165mm
Load:	24V, 4A; (=80%) load is placed outside the box
Input:	230Vac
Temperature inside enclosure:	44.3°C (in the middle of the right side of the power supply with a distance of 2cm)
Temperature outside enclosure:	23.3°C
Temperature rise:	21.0K

23.14. MOUNTING ORIENTATIONS

Mounting orientations other than input terminals on the bottom and output on the top require a reduction in continuous output power or a limitation in the maximum allowed ambient temperature. The amount of reduction influences the lifetime expectancy of the power supply. Therefore, two different derating curves for continuous operation can be found below:

Curve A1 Recommended output current.
Curve A2 Max allowed output current (results in approximately half the lifetime expectancy of A1).

Fig. 23-8
Mounting Orientation A
(Standard orientation)

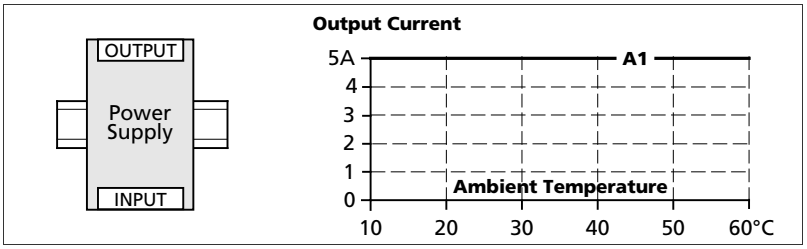


Fig. 23-9
Mounting Orientation B
(Upside down)

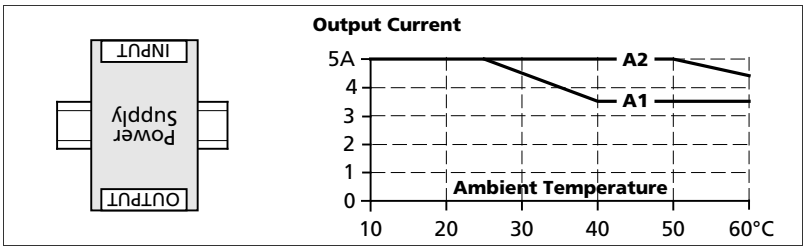


Fig. 23-10
Mounting Orientation C
(Table-top mounting)

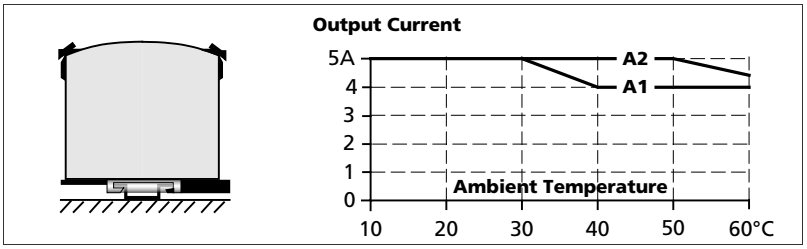


Fig. 23-11
Mounting Orientation D
(Horizontal cw)

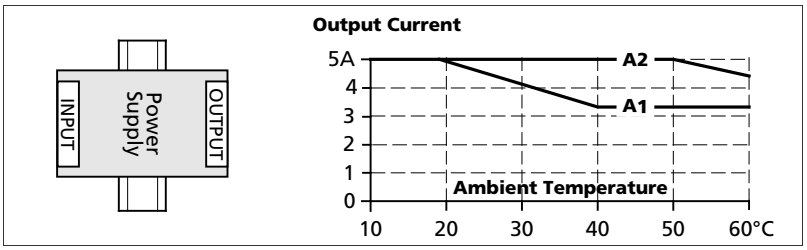
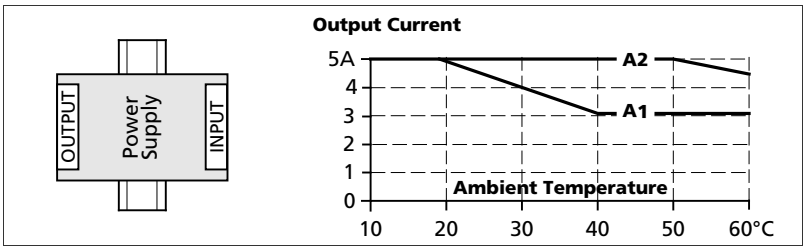


Fig. 23-12
Mounting Orientation E
(Horizontal ccw)



PULS

DIMENSION **U-Series**

UBC10.241, UBC10.241-N1

24V, 10A, DC-UPS

DC-UPS WITH INTEGRATED BATTERY

- Compact and Easy to Install
- Longest Buffer Time in Class
- Easy Battery Access
- Stable Output Voltage in Buffer Mode
- Superior Battery Management for Longest Battery Life
- Temperature Compensated Battery Charging
- Comprehensive Diagnostics and Monitoring Functions
- Replace Battery Signal Included
- Electronically Overload and Short Circuit Protected
- 50% Power Reserves
- Selectable Buffer Time Limiter

1. GENERAL DESCRIPTION

This uninterruptible power supply (UPS) controller UBC10.241 with integrated battery is a compact addition to standard 24V power supplies to bridge power failures or voltage fluctuations. Expensive downtimes, long restart cycles and loss of data can be avoided.

The DC-UPS includes a professional battery management system which charges and monitors the battery to achieve the longest battery service life as well as many diagnostic functions that ensure a reliable operation of the entire system.

A unique feature of the UBC10.241 is that only one 12V battery is required to buffer the 24V output. This makes matching batteries unnecessary and allows a precise battery charging and testing.

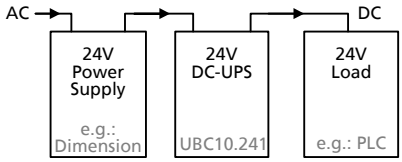
The UBC10.241 has one integrated 12V 5Ah high current VRLA battery, which is easy to change.

In addition to the UBC10.241, a separate UPS controller (UB10.241) which requires an external 12V battery is available when a longer buffer time is required.

2. SHORT-FORM DATA

Input voltage	nom. 24Vdc	
range	22.5-30Vdc	
Output current	min. 15A	Normal mode
	min. 10A	Buffer mode
Output voltage	typ. 0.23V lower as input voltage	Normal mode
	22.25V	Buffer mode, 10A
Integrated battery	12V 5Ah	VRLA lead acid
Temperature range	0 to 40°C	Operational
Dimensions	123x124x119mm	WxHxD
Buffer time	typ. 16'15"	At 5A load
	typ. 6'15"	At 10A load

Typical setup of a DC-UPS system with the UBC10.241:



3. ORDER NUMBERS

DC-UPS	**UBC10.241**	Standard unit
	UBC10.241-N1	Battery not assembled
Accessories	**UZB12.051**	Battery 12V 5Ah

4. MARKINGS

c UL US LISTED IND. CONT. EQ. UL 508

c TÜV US UL 60950-1

c TÜV US Class I Div 2

c SP US 182790

GL Marine

CE EMC, LVD

Dez. 2019 / Rev. 1.3 DS-UBC10.241-EN

All parameters are specified at an input voltage of 24V, 10A output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. It is assumed that the input power source can deliver a sufficient output current.

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INTENDED USE

The unit shall only be installed and put into operation by qualified personnel.

This unit is designed for installation in an enclosure and is intended for general use, such as in industrial control, office, communication, and instrumentation equipment. Do not use this device in aircraft, trains and nuclear equipment, where malfunctioning of the power supply may cause severe personal injury or threaten human life.

TERMINOLOGY AND ABREVIATIONS

DC-UPS	Uninterruptible power supply with DC-Input.
Normal mode	Describes a condition where the battery is charged, the input voltage is in range and the output is loaded within the allowed limits.
Buffer mode	Describes a condition where the input voltage is below the transfer threshold level, the unit is running on battery (buffering) and the output is loaded within the allowed limits.
Charging mode	Describes a condition where the battery is being charged, the input voltage is in range and the output is loaded within the allowed limits.
Inhibit mode	Describes a condition where buffering is disabled on purpose by using the inhibit input of the DC-UPS. (e.g. for service actions, or to save battery capacity)
Buffer time	Same as the term "hold-up time".
T.b.d.	To be defined, value or description will follow later.

DISCLAIMER

The information presented in this document is believed to be accurate and reliable and may change without notice.

Some parts of this unit are patent by PULS (US patent No 091662,063, Des. 424,529, …).

5. INPUT

Input voltage	nom.	DC 24V	
Input voltage ranges	nom.	22.5 to 30Vdc	Continuous operation, see Fig. 5-1
		30 to 35Vdc	Temporarily allowed, no damage to the DC-UPS *)
		35Vdc	Absolute maximum input voltage with no damage to the DC-UPS
		0 to 22.5Vdc	The DC-UPS switches into buffer mode and delivers output voltage from the battery if the input was above the turn-on level before and all other buffer conditions are fulfilled.
Allowed input voltage ripple	max.	1.5Vpp	Bandwidth <400Hz
		1Vpp	Bandwidth 400Hz to 1kHz
Allowed voltage between input and earth (ground)	max.	60Vdc or 42.4Vac	
Turn-on voltage	typ.	22.8Vdc	The output does not switch on if the input voltage does not exceed this level.
	max.	23Vdc	
Input current **)	typ.	120mA	Internal current consumption
	typ.	1.1A	Current consumption for battery charging in constant current mode at 24V input See Fig. 8-2 ***)
External capacitors on the input		No limitation	

*) The DC-UPS shows "Check Wiring" with the red LED and buffering is not possible

**) The total input current is the sum of the output current, the current which is required to charge the battery during the charging process and the current which is needed to supply the DC-UPS itself. See also Fig. 5-2. This calculation does not apply in overload situations where the DC-UPS limits the output current, therefore see Fig. 5-3.

***) Please note: This is the input current and not the current which flows into the battery during charging. The battery current can be found in chapter 8.

Fig. 5-1 **Input voltage range**

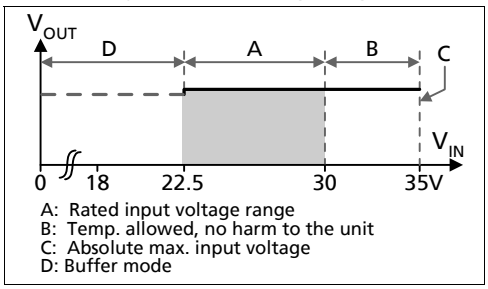
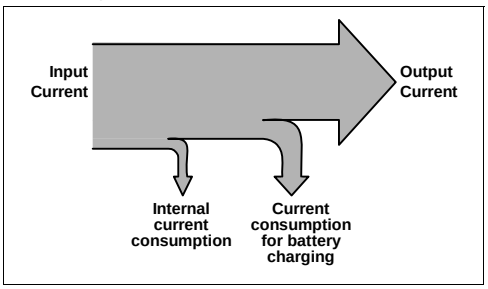


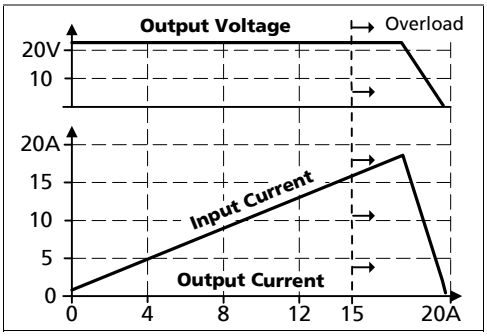
Fig. 5-2 **Input current, definitions**



Electronic output current limitation

The DC-UPS is equipped with an electronic output current limitation. This current limitation works in a switching mode which reduces the power losses and heat generation to a minimum. As a result, the output voltage drops since there is not enough current to support the load. A positive effect of the current limitation in switching mode is that the input current goes down despite an increase in the output current resulting in less stress for the supplying source.

Fig. 5-3 **Input current and output voltage vs. output current, typ. (battery fully charged)**



All parameters are specified at an input voltage of 24V, 10A output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. It is assumed that the input power source can deliver a sufficient output current.

6. OUTPUT IN NORMAL MODE

Output voltage in normal mode	nom.	DC 24V	The output voltage follows the input voltage reduced by the input to output voltage drop.
Voltage drop between input and output	max.	0.3V	At 10A output current, see Fig. 6-1 for typical values
	max.	0.45V	At 15A output current, see Fig. 6-1 for typical values
Ripple and noise voltage	max.	20mVpp	20Hz to 20MHz, 50Ohm *)
Output current	nom.	15A	Continuously allowed
Output power	nom.	360W	Continuously allowed
Short-circuit current	min.	17.9A	Load impedance 100mOhm, see Fig. 6-2 for typical values
	max.	21A	Load impedance 100mOhm, see Fig. 6-2 for typical values
Capacitive and inductive loads		No limitation	

*) This figure shows the ripple and noise voltage which is generated by the DC-UPS. The ripple and noise voltage might be higher if the supplying source has a higher ripple and noise voltage.

Fig. 6-1 **Input to output voltage drop, typ.**

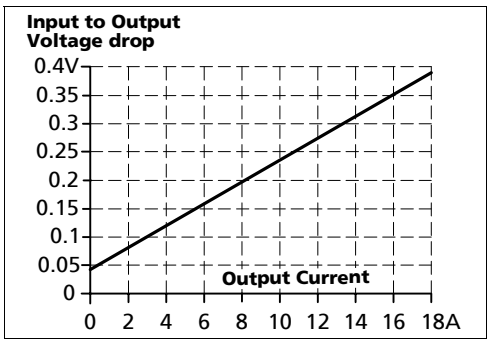
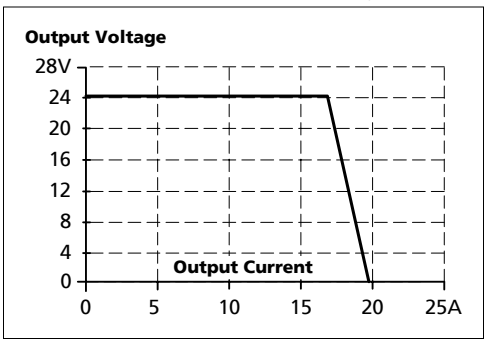


Fig. 6-2 **Output voltage vs. output current in normal mode at 24V input, typ.**



7. OUTPUT IN BUFFER MODE

If the input voltage falls below a certain value (transfer threshold level), the DC-UPS starts buffering without any interruption or voltage dips. Buffering is possible even if the battery is not fully charged.

Output voltage in buffer mode	nom.	DC 24V	Output voltage is stabilized and independent from battery voltage
		22.45V	±1%, at no load,
		22.25V	±1%, at 10A output current
Transfer threshold for buffering	typ.	80mV higher than the output voltage in buffer mode	
Ripple and noise voltage	max.	20mVpp	20Hz to 20MHz, 50Ohm
Output current	nom.	10A	Continuously allowed
		15A	< 5s with full output voltage *)
Short-circuit current	min.	17.9A	Load impedance 100mOhm **)
	max.	21A	Load impedance 100mOhm **)

*) If the output current is in the range between 10A and 15A for longer than 5s, a hardware controlled reduction of the maximal output current to 10A occurs. If the 10A are not sufficient to maintain the 24V, buffering stops after another 5s. The buffering is possible again as soon as the input voltage recovers.

**) If the nominal output voltage cannot be maintained in buffer mode, the DC-UPS switches off after 5s to save battery capacity.

Fig. 7-1 **Buffering transition, definitions**

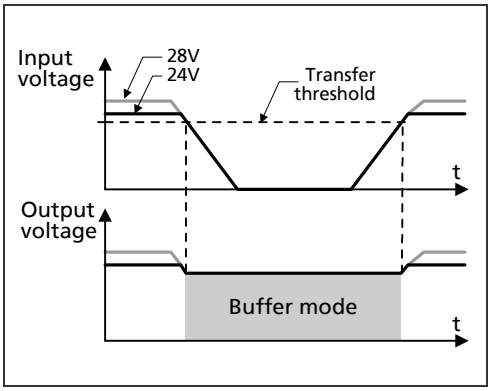


Fig. 7-2 **Transfer behavior, typ.**

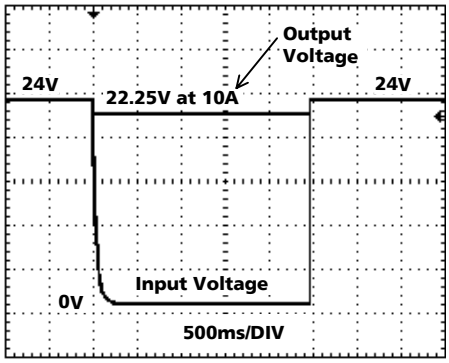


Fig. 7-3 **Available output current in buffer mode**

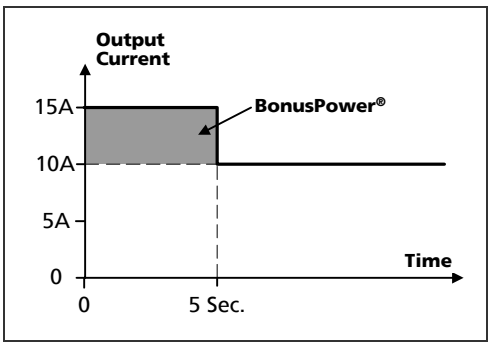
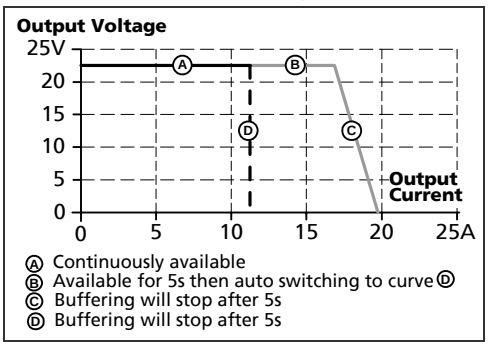


Fig. 7-4 **Output voltage vs. output current in buffer mode, typ.**



8. BATTERY

The required 12V VRLA battery is included with this unit. For more details on battery requirements see chapter 26.

Battery voltage	nom.	DC 12V	Maintenance-free 12V VRLA lead acid battery.
Battery voltage range		9.0 – 15.0V	Continuously allowed, except deep discharge protection
	max.	35Vdc	Absolute maximum voltage with no damage to the unit.
	typ.	7.4V	Above this voltage level battery charging is possible
Allowed battery capacity	nom.	5Ah	High-current version
Battery charging method		CC-CV	Constant current, constant voltage mode
Battery charging current	nom.	1.5A	CC-mode, Independent from battery size
	max.	1.7A	Corresponding 24V input current see Fig. 8-2
End-of-charge-voltage (CV-mode)	typ.	13.1 - 14V	Automatic setting according to ambient temperature
Battery charging time	typ.	3h *)	
Battery discharging current **)	typ.	21A	Buffer mode, 10A output current, 11.5V on the battery terminal of the DC-UPS, see Fig. 8-1 for other parameters
	typ.	0.3A	Buffer mode, 0A output current
	max.	50µA	At no input, buffering had switched off, all LEDs are off
	typ.	270mA	At no input, buffering had switched off, yellow LED shows "buffer time expired" (max. 15 minutes)
Deep discharge protection ***)	typ.	10.5V	At 0A output current
	typ.	9.0V	At 10A output current

*) The charging time depends on the duration and load current of the last buffer event. The numbers in the table represent a fully discharged battery. A typical figure for a buffer current of 10A is 2h 20Min. for a 5Ah highcurrent battery. Above 40°C charging time can be longer.

**) The current between the battery and the DC-UPS is more than twice the output current. This is caused by boosting the 12V battery voltage to a 24V level.

***) To ensure longest battery lifetime, the DC-UPS has a battery deep discharge protection feature included. The DC-UPS stops buffering when the voltage on the battery terminals of the DC-UPS falls below a certain value.

Fig. 8-1 **Battery discharging current vs. output current, typ.**

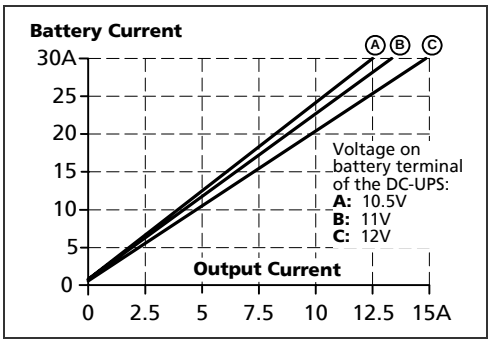
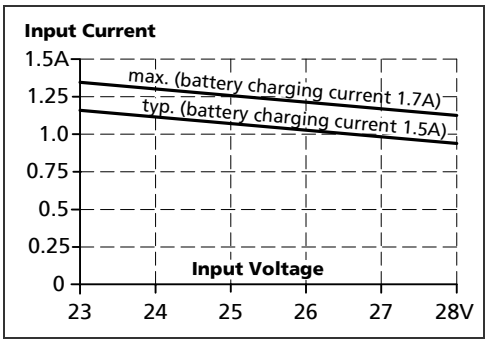


Fig. 8-2 **Required input current vs. input voltage for battery charging**



9. BUFFER TIME

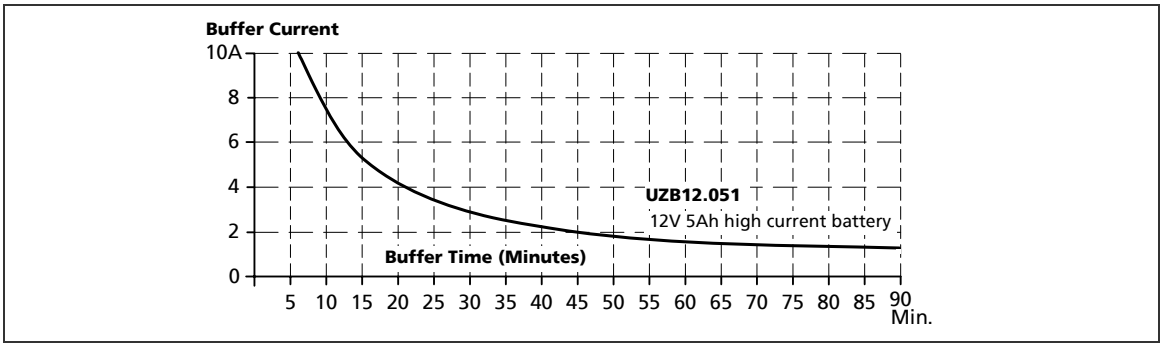
The buffer time depends on the capacity and performance of the battery as well as the load current. The diagram below shows the typical buffer times of the standard battery.

Buffer time with 5Ah high-current battery	min.	13’24’’	At 5A output current *)
	min.	4’54’’	At 10A output current *)
	typ.	16’15’’	At 5A output current, see Fig. 9-1 **)
	typ.	6’15’’	At 10A output current, see Fig. 9-1 **)

*) Minimum value includes 20% aging and requires a fully charged (min. 24h) battery.

**) Typical value includes 10% aging and requires a fully charged (min. 24h) battery.

Fig. 9-1 **Buffer time vs. output current with a 5Ah high current battery**



10. Efficiency and Power Losses

Efficiency	typ.	97.8%	Normal mode, 10A output current, battery fully charged
Power losses	typ.	2.9W	Normal mode, 0A output current, battery fully charged
	typ.	5.5W	Normal mode, 10A output current, battery fully charged
	typ.	5.0W	During battery charging, 0A output current

Fig. 10-1 **Efficiency at 24V, typ.**

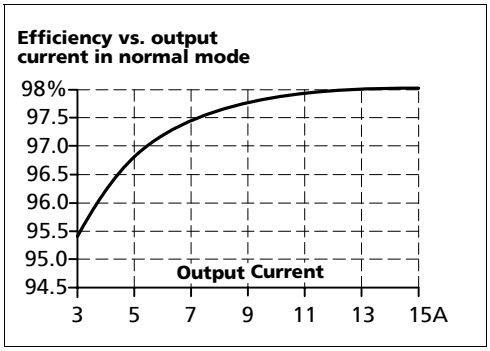
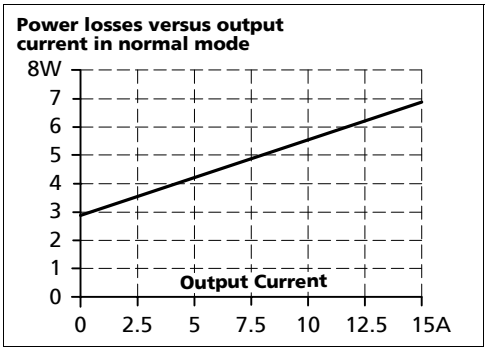
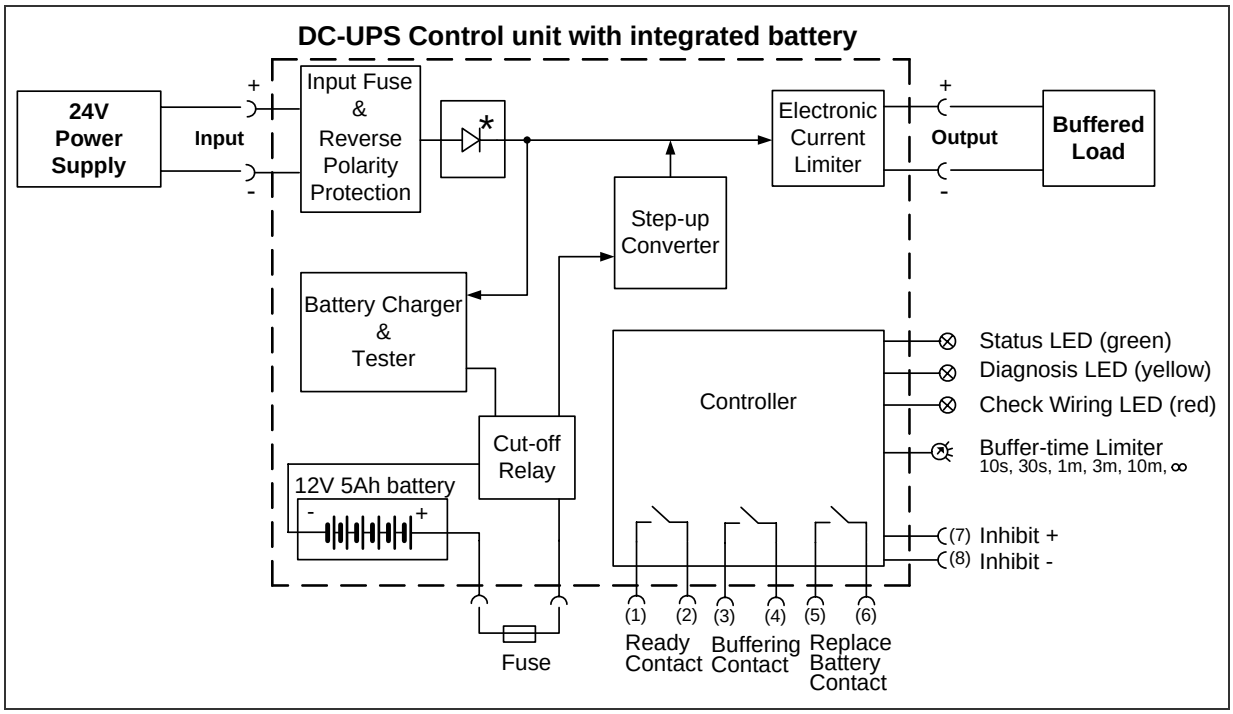


Fig. 10-2 **Losses at 24V, typ.**



11. Functional Diagram

Fig. 11-1 **Functional diagram**



*) Return current protection; This feature utilizes a Mosfet instead of a diode in order to minimize the voltage drop and power losses.

All parameters are specified at an input voltage of 24V, 10A output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. It is assumed that the input power source can deliver a sufficient output current.

12. CHECK WIRING AND BATTERY QUALITY TESTS

The DC-UPS is equipped with an automatic "Check Wiring" and "Battery Quality" test.

"Check Wiring" test:
Under normal circumstances, an incorrect or bad connection from the battery to the DC-UPS or a missing (or blown) battery fuse would not be recognized by the UPS when operating in normal mode. Only when back up is required would the unit not be able to buffer. Therefore, a "check wiring" test is included in the DC-UPS. This connection is tested every 10 seconds by loading the battery and analyzing the response from the battery. If the resistance is too high, or the battery voltage is not in range, the unit displays "Check Wiring" with the red LED. At the same time the green "Ready" LED will turn off.

"State of Health" (SoH) test:
The battery has a limited service life and needs to be replaced in a fixed interval which is defined by the specified service life (acc. to the Eurobat guideline), based on the surrounding temperature and the number of charging/discharging cycles. If the battery is used longer than the specified service life, the battery capacity will degrade. Details can be found in chapter 28.1. SoH test can not determine a gradual loss in capacity. However, it can detect a battery failure within the specified service life of the battery. Therefore a SoH-test is included in the DC-UPS.

The SoH test consists of different types of tests:

- During charging:
  If the battery does not reach the ready status (see chapter 14) within 30h, it is considered to be defective. The reason could be a broken cell inside the battery.
- During operation:
  Once the battery is fully charged, a voltage drop test and a load test is performed alternately every 8 hours. Three of the tests must consecutively produce negative results to indicate a battery problem.

A battery problem is indicated with the yellow LED (replace battery pattern) and the relay contact "Replace Battery". Please note that it can take up to 50 hours until a battery problem is reported. This should avoid nuisance error messages as any urgent battery problems will be reported by the "Check Wiring" test and create a warning signal. The battery tests require up to 50h uninterrupted operation. Any interruptions in the normal operation of the DC-UPS may result in the "Replace Battery" test cycle to start over.

When "Replace battery" is indicated, it is recommended to replace battery as soon as possible.

13. Relay Contacts and Inhibit Input

The DC-UPS is equipped with relay contacts and signal inputs for remote monitoring and controlling of the unit.

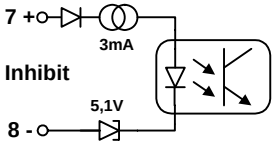
Relay contacts:

Ready:	Contact is closed when battery is charged more than 85%, no wiring failure are recognized, input voltage is sufficient and inhibit signal is not active.
Buffering:	Contact is closed when unit is buffering.
Replace Battery:	Contact is closed when the unit is powered from the input and the battery quality test (SOH test) reports a negative result.

Relay contact ratings	max	60Vdc 0.3A, 30Vdc 1A, 30Vac 0.5A resistive load
	min	1mA at 5Vdc min.
Isolation voltage	max	500Vac, signal port to power port

Signal input:

Inhibit: The inhibit input disables buffering. In normal mode, a static signal is required. In buffer mode, a pulse with a minimum length of 250ms is required to stop buffering. The inhibit is stored and can be reset by cycling the input voltage. See also section 28.1 for application notes.



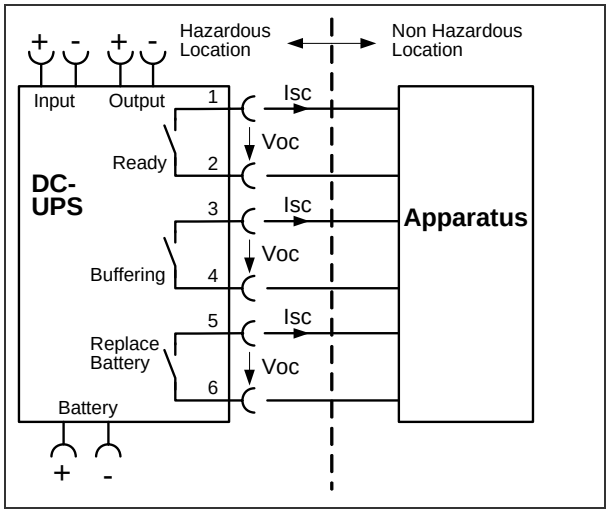
Signal voltage	max.	35Vdc
Signal current	max.	6mA, current limited
Inhibit threshold	min.	6Vdc, buffering is disabled above this threshold level
	max.	10Vdc
Isolation	nom.	500Vac, signal port to power port

Restriction apply when using the signal and relay contacts in a Haz-Loc environment:

The Buffering, Ready and Replace Battery contact is intended to be used for a separately investigated nonincendive field wiring and/or field wiring apparatus. The DC-UPS may be located in a Class I, Division 2 (Group A, B, C or D) hazardous (classified) location. Associated apparatus must be installed in accordance with its manufacturer's control drawing and Article 504 of the National Electrical Code (ANSI/NFPA 70) for installation in the United States, or Section 18 of the Canadian Electrical Code for Installations in Canada.
Selected associated apparatus must be third part listed as providing nonincendive field circuits for the application, and have Voc not exceeding Vmax, Isc not exceeding Imax.

Non associated nonincendive field wiring apparatures shall not be connected in parallel unless this is permitted by the associated nonincendive field wiring apparatures approval.

Fig. 13-1 **Contact control drawing for use in Haz-Loc environments**

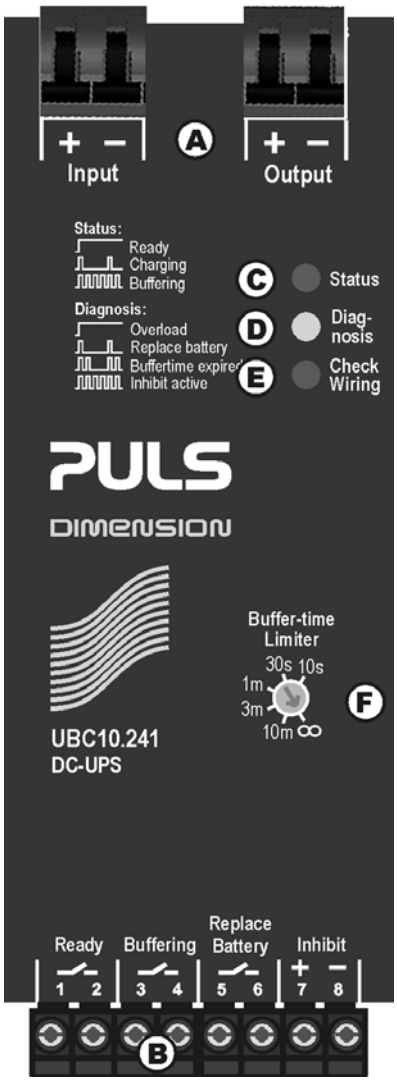


Selected barriers must have entity parameters such that
Voc ≤ V max, Isc ≤ I max,
Ca ≥ Ci + Ccable, La ≥ Li + Lcable.
For Ccable and Lcable, if the capacitance per foot or the inductance per foot is not known, then the following values shall be used: Ccable = 60pF/foot and Lcable = 0.2µH/foot.

Contact current: I max = 50mA
Contact voltage: V max. = 35V (DC or AC)
Max. associated circuit capacitance Ci = 0
Max. associated circuit inductance Li = 0
No polarity requirement

14. Front Side and User Elements

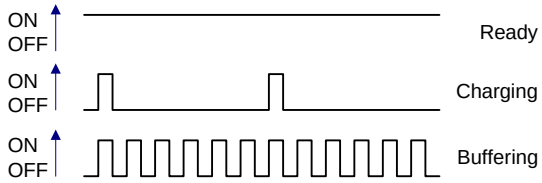
Main unit shown below without battery compartment.



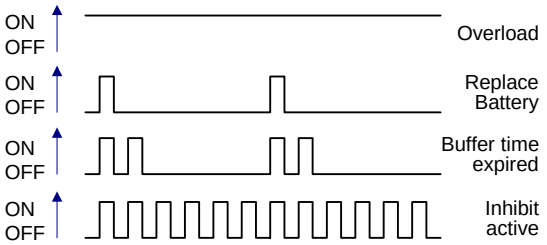
A Power Port
Quick-connect spring-clamp terminals, connection for input voltage and output voltage.

B Signal Port
Plug connector with screw terminals, inserted from the bottom. Connections for the Ready, Buffering, Replace Battery relay contacts and for the Inhibit input. See details in chapter 13.

C Green Status LED
Ready: Battery is charged > 85%, no wiring failures are recognized, input voltage is sufficient and inhibit signal is not active.
Charging: Battery is charging and the battery capacity is below 85%.
Buffering: Unit is in buffer mode.
Flashing pattern of the green status LED:



D Yellow Diagnosis LED
Overload: Output has switched off due to long overload in buffer mode or due to high temperatures.
Replace battery: Indicates a battery which failed the battery quality test (SoH test). Battery should be replaced as soon as possible.
Buffer-time expired: Output has switched off due to settings of Buffer-timer Limiter. This signal will be displayed for 15 minutes.
Inhibit active: Indicates that buffering is disabled due to an active inhibit signal.
Flashing pattern of the yellow diagnostic LED:



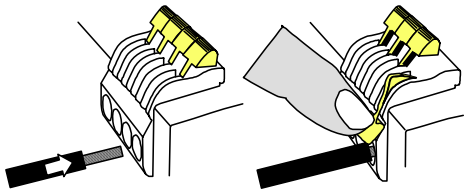
E Red Check Wiring LED
This LED indicates a failure in the installation (e.g. too low input voltage), wiring, battery or battery fuse.

F Buffer-time Limiter:
User accessible dial which limits the maximum buffer time in a buffer event to save battery energy. When the battery begins to recharge after a discharging event, the process is completed much faster since only the energy which was taken out of the battery needs to be "refilled". The following times can be selected: 10 seconds, 30 seconds, 1 minute, 3 minutes, 10 minutes or infinity (until battery is discharged) which allows buffering until the deep discharge protection stops buffering.

15. Terminals and Wiring

	Power terminals	Signal terminals
Type	Bi-stable, quick-connect spring-clamp terminals. IP20 Finger-touch-proof. Suitable for field- and factory installation. Shipped in open position.	Plug connector with screw terminal. Finger-touch-proof construction with captive screws for 3.5mm slotted screwdriver. Suitable for field- and factory installation. Shipped in open position. To meet GL requirements, unused terminal compartments should be closed.
Solid wire	0.5-6mm²	0.2-1.5mm²
Stranded wire	0.5-4mm²	0.2-1.5mm²
AWG	20-10AWG	22-14AWG
Ferrules	Allowed, but not required	Allowed, but not required
Pull-out force	10AWG:80N, 12AWG:60N, 14AWG:50N, 16AWG:40N according to UL486E	Not applicable
Tightening torque	Not applicable	0.4Nm, 3.5lb.in
Wire stripping length	10mm / 0.4inch	6mm / 0.24inch

Fig. 15-1 **Spring-clamp terminals, connecting a wire**



1. Insert the wire **2.** Close the lever

To disconnect wire:
reverse the procedure

Instructions:

a) Use appropriate copper cables, that are designed for an operating temperature of 60°C

b) Follow national installation codes and regulations!

c) Ensure that all strands of a stranded wire enter the terminal connection!

d) Up to two stranded wires with the same cross section are permitted in one connection point

16. Reliability

Lifetime expectancy	min.	137 400h	At 10A output current, 40°C
	min.	> 15 years	At 5A output current, 40°C
	min.	> 15 years	At 10A output current, 25°C
MTBF SN 29500, IEC 61709		886 000h	At 10A output current, 40°C
		1 482 000h	At 10A output current, 25°C
MTBF MIL HDBK 217F		397 900	At 10A output current , 40°C, ground benign GB40
		545 000	At 10A output current , 25°C, ground benign GB25

The **Lifetime expectancy** shown in the table indicates the operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours. Lifetime expectancy is calculated according to the capacitor's manufacturer specification. The prediction model allows a calculation of up to 15 years from date of shipment.

MTBF stands for **M**ean **T**ime **B**etween **F**ailure, which is calculated according to statistical device failures and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product.

All values except battery.

17. EMC

The unit is suitable for applications in industrial environment as well as in residential, commercial and light industry environment without any restrictions. CE mark is in conformance with EMC guideline 89/336/EC and 93/68/EC and the low-voltage directive (LVD) 73/23/EC, 93/68/EC.

A detailed EMC Report is available on request.

EMC Immunity	EN 61000-6-1, EN 61000-6-2		Generic standards	
Electrostatic discharge	EN 61000-4-2	Contact discharge Air discharge	8kV 15kV	Criterion A*) Criterion A *)
Electromagnetic RF field	EN 61000-4-3	80MHz-1GHz	10V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	Out- and input lines Signal lines **)	2kV 2kV	Criterion A Criterion A
Surge voltage	EN 61000-4-5	Output + → - Input + → - + / - → housing	500V 500V 500V	Criterion A Criterion A Criterion A
Conducted disturbance	EN 61000-4-6	0,15-80MHz	10V	Criterion A

*) DIN-Rail earthed
**) Tested with coupling clamp

EMC Emission	EN 61000-6-3, EN 61000-6-4		Generic standards
Conducted emission	EN 55022	Input lines	Class B *)
	EN 55022	Output lines	Class B *)
Radiated emission	EN 55011, EN 55022		Class B

This device complies with FCC Part 15 rules.
Operation is subjected to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*) Informative measurement with voltage probe

Switching frequencies	The DC-UPS has three converters with three different switching frequencies included.	
Switching frequency of boost converter	100kHz	Constant frequency
Switching frequency of electronic output current limitation	78kHz	Constant frequency
Switching frequency of battery charger	19.5kHz	Constant frequency

18. ENVIRONMENT

Operational temperature	0°C to +40°C (32°F to 104°F)	Full output power
Storage temperature	-20°C to +50°C (-4°F to 122°F)	Storage and transportation
Humidity	5 to 95% r.H.	IEC 60068-2-30 Do not energize while condensation is present
Vibration sinusoidal	2-17.8Hz: ±1.6mm; 17.8-500Hz: 1g *)	IEC 60068-2-6
Shock	15g 6ms, 10g 11ms *)	IEC 60068-2-27
Altitude	0 to 6000m	Approvals apply only up to 2000m
Over-voltage category	III	EN 50178
	II	EN 50178 above 2000m altitude
Degree of pollution	2	EN 50178, not conductive

*) Use wall mounting accessory for higher values.

Fig. 18-1 **Normal Mode: Output current vs. ambient temperature**

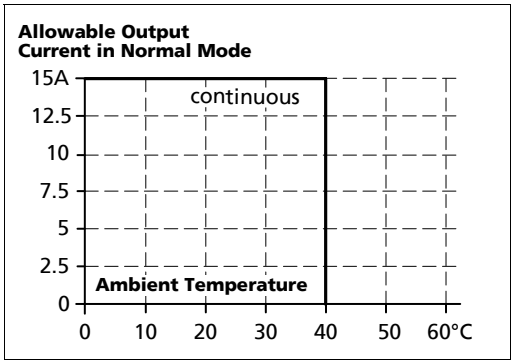
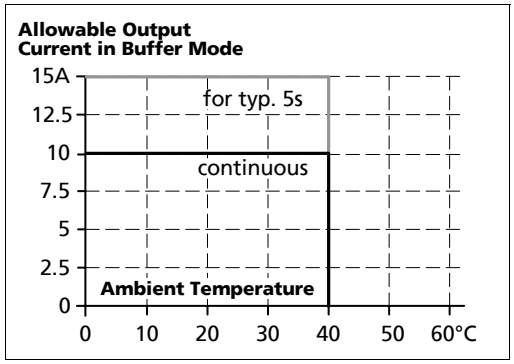


Fig. 18-2 **Buffer Mode: Output current vs. ambient temperature**



The ambient temperature is defined 2cm below the unit.

19. PROTECTION FEATURES

Output protection	Electronically protected against overload, no-load and short-circuits	
Output over-voltage protection in buffer mode	typ. 32Vdc max. 35Vdc	In case of an internal defect, a redundant circuitry limits the maximum output voltage. The output automatically shuts-down and makes restart attempts.
Degree of protection	IP20	EN/IEC 60529
Penetration protection	> 3.5mm	E.g. screws, small parts
Reverse battery polarity protection	yes	Max. –35Vdc;
Wrong battery voltage protection	yes	Max. +35Vdc (e.g. 24V battery instead of 12V battery)
Battery deep discharge protection	yes	The limit is battery current dependent
Over temperature protection	yes	Output shut-down with automatic restart
Input over-voltage protection	yes	Max. 35Vdc, no harm or defect of the unit
Internal input fuse	25A, blade type	No user accessible part, no service part

20. SAFETY

Output voltage	SELV	IEC/EN 60950-1
	PELV	EN 60204-1, EN 50178, IEC 60364-4-41
	Max. allowed voltage between any input, output or signal pin and ground: 60Vdc or 42.4Vac	
Class of protection	III	PE (Protective Earth) connection is not required
Isolation resistance	> 5MOhm	Power port to housing, 500Vdc
Dielectric strength	500Vac	Power port to signal port
	500Vac	Power port / signal port to housing
Touch current (leakage current)	The leakage current which is produced by the DC-UPS itself depends on the input voltage ripple and need to be investigated in the final application. For a smooth DC input voltage, the produced leakage current is less than 100µA.	

21. APPROVALS

UL 508	18WM c UL us LISTED IND. CONT. EQ.	LISTED E198865 listed for use in U.S.A. (UL 508) and Canada (C22.2 No. 14-95) Industrial Control Equipment
UL 60950-1	c UL us	RECOGNIZED E137006 recognized for the use in U.S.A. (UL 60950-1) and Canada (C22.2 No. 60950) Information Technology Equipment, Level 5
UL 1604	c UL us	RECOGNIZED E246877 recognized for use in U.S.A. (UL 1604) and Canada (C22.2 No. 213-M1987) Hazardous Location Class I Div 2 T4 Groups A,B,C,D and Class I Zone 2 Groups IIA, IIB and IIC
	The unit is suitable for use in Class I Division 2 Groups A, B, C, D locations as well as for Class I Zone 2 Groups IIA, IIB and IIC locations. Substitution of components may impair suitability for Class I Division 2 environment. Do not disconnect equipment unless power has been switched off. Wiring must be in accordance with Class I, Division 2 wiring methods of the National Electrical Code, NFPA 70, and in accordance with other local or national codes.	
CSA	c SA us 182790	CSA approval for Canada CAN/CSA C22.2 No 107-1; CAN/ CSA 60950-1-03; UL60950-1
IEC 60950-1	IECEE CB SCHEME	CB Scheme, Information Technology Equipment
Marine	GL ABS	GL (Germanischer Lloyd) classified and ABS (American Bureau for Shipping) PDA for marine and offshore applications. Environmental category: A, EMC2

22. FULFILLED STANDARDS

EN/IEC 60204-1	Safety of Electrical Equipment of Machines
EN/IEC 61131	Programmable Controllers
EN 50178, IEC 62103	Electronic Equipment in Power Installations

23. USED SUBSTANCES

The unit does not release any silicone and is suitable for the use in paint shops.

The unit conforms to the RoHS directive 2002/96/EC.

Electrolytic capacitors included in this unit do not use electrolytes such as Quaternary Ammonium Salt Systems.

Plastic housings and other molded plastic materials are free of halogens.

The materials used in our production process do not include the following toxic chemicals:
Polychlorinated Biphenyl (PCB), Pentachlorophenol (PCP), Polychlorinated naphthalene (PCN), Polybrominated Biphenyl (PBB), Polybrominated Biphenyl Oxide (PBO), Polybrominated Diphenyl Ether (PBDE), Polychlorinated Diphenyl Ether (PCDE), Polybrominated Diphenyl Oxide (PBDO), Cadmium, Asbestos, Mercury, Silica

24. PHYSICAL DIMENSIONS AND WEIGHT

Width	123mm / 4.84''	
Height	124mm / 4.88''	Plus height of signal connector plug and Spare fuse
Depth	119mm / 4.69''	Plus depth of DIN-rail
Weight	2850g / 6.28lb	
DIN-Rail	Use 35mm heavy duty DIN-rails according to EN 60715 or EN 50022. The DIN-rail height must be added to the depth (119mm) to calculate the total required installation depth.	

Electronic files with mechanical data can be downloaded at www.pulspower.com

Fig. 24-1 **Side view**

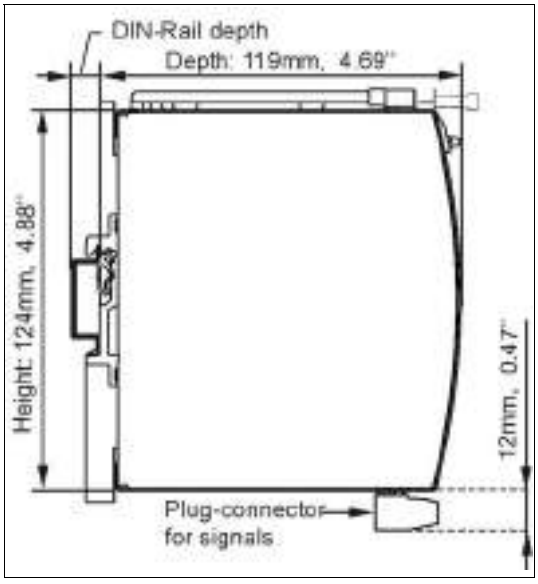
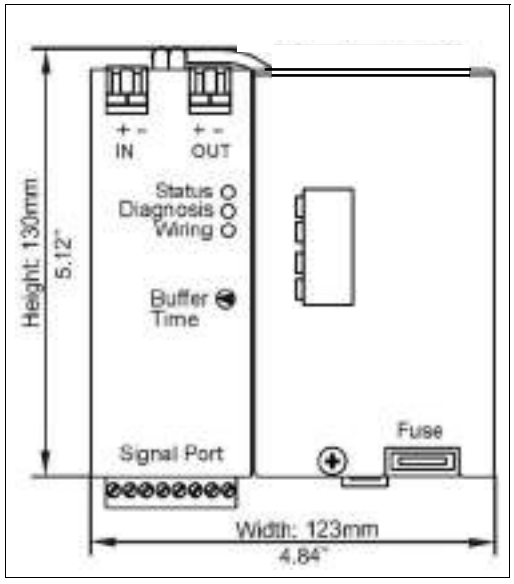


Fig. 24-2 **Front view**



25. INSTALLATION NOTES

Mounting:
The power terminals shall be located on top of the unit. An appropriate electrical and fire end-product enclosure should be considered in the end use application.

Do not install unit in airtight housings or cabinets. The site in which the unit is located must have sufficient ventilation acc. to EN50272-2.

Cooling: Convection cooled, no forced air cooling required. Do not obstruct air flow!

Installation clearances: 40mm on top, 20mm on the bottom, 5mm on the left and right side are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance are recommended.

Risk of electrical shock, fire, personal injury or death!
Turn power off and disconnect battery fuse before working on the DC-UPS. Protect against inadvertent re-powering. Make sure the wiring is correct by following all local and national codes. Do not open, modify or repair the unit, except replacement of the battery. Use caution to prevent any foreign objects from entering into the housing.
Do not use in wet locations or in areas where moisture or condensation can be expected.

Service parts:
The DC-UPS contains an integrated battery which must be changed on a periodic basis, see chapter 26 and. 28.1.

The tripping of an internal fuse is caused by an internal fault. If damage or malfunctioning should occur during operation, immediately turn power off and send unit to the factory for inspection! For Troubleshooting see 28.4.

Wiring and installation instructions:

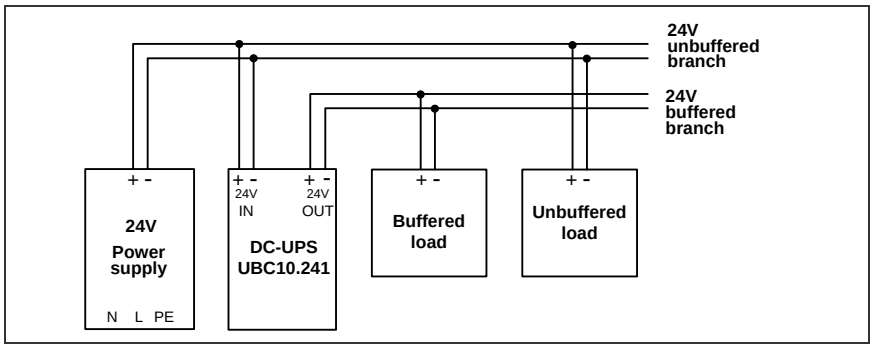
(1) It is recommended to install the DC-UPS in a place where the integrated battery will not be heated up by adjacent equipment. The unit is equipped with a fuseholder and a 30A battery fuse type ATO® 257 030 (Littelfuse). The battery fuse protects the wires between the battery and the DC-UPS. It also allows the disconnection of the battery from the DC-UPS which is recommended when working on the battery or DC-UPS. Disconnect battery fuse before connecting the battery.

(2) Connect the power supply to the input terminals of the DC-UPS.

(3) Connect the buffered load to the output terminals of the DC-UPS. The output is decoupled from the input allowing load circuits to be easily split into buffered and non buffered sections. Noncritical loads can be connected directly to the power supply and will not be buffered. The energy of the battery can then be used in the circuits which require buffering.

(4) Plug-in the fuse when the wiring is finished.

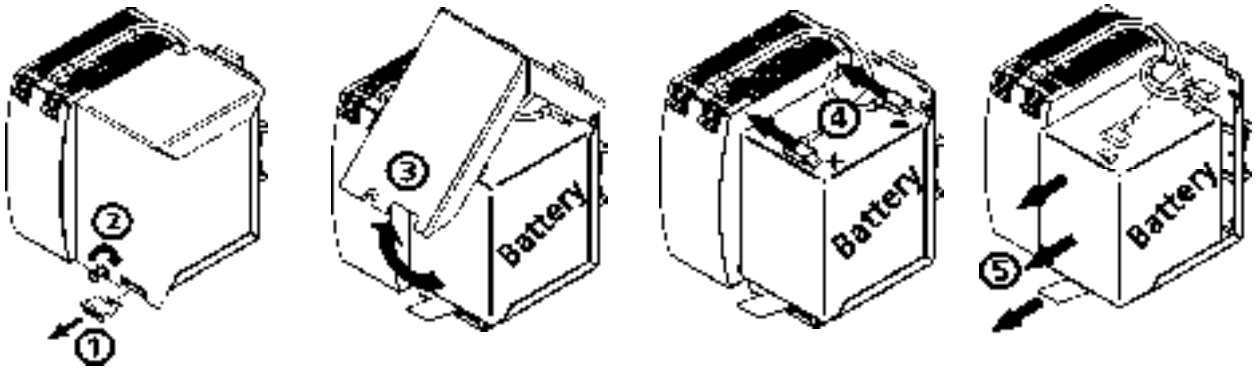
Fig. 25-1 **Typical wiring diagram**



26. REPLACEMENT OF THE BATTERY

The integrated battery should be replaced on a periodic basis, see chapter 28.1 for additional information.
The replacement should be done by qualified personnel trained on battery handling.
Caution! The terminals on the battery are always alive, therefore do not place items or tools on the battery!

How to replace the battery:



Step 1: Remove the fuse before working on the unit.

Step 2: Loosen the captive cover screw.

Step 3: Remove the battery-cover.

Step 4: Disconnect the cables from the battery terminals.

Step 5: Remove the battery by pulling on the strap.

Step 6: Install the new battery.

Step 7: Connect the red cable (+) to the red positive (+) terminal of the battery.

Step 8: Connect the black cable (-) to the black negative (-) terminal of the battery.

Step 9: Close the cover.

Step 10: Tighten the screw.

Step 11: Plug-in the fuse.

Disposal of batteries

Batteries marked with the recycling symbol should be recycled through a competent agency.

Replacement battery

See chapter 27 for information on the UZB12.051 or you can use a battery which meets the following requirements:

Battery type	nom.	12V, 4 to 6Ah	VRLA lead-acid maintenance free battery
Design life	min.	3 to 5 years	According to EUROBAT guideline
Dimensions	nom.	70x106x90mm	WxHxD *)
Pole connection		6.35mm/ 0.25Inch	Blade type; Fast-on
Approvals		UL, VdS	For applications which require UL or VdS
Allowed discharge current	min.	29A	Continuous

*) Max. case height of 102mm

27. ACCESSORIES

Battery

The integrated battery should be replaced on a periodic basis, see chapter 28.1.

As replacement the UZB12.051 can be used.

	UZB12.051	
Battery type	Highcurrent version 12V, 5Ah	VRLA lead-acid maintenance free battery
Design life	3 to 5 years	According to EUROBAT guideline
Dimensions	70x106x90mm	Width x total height x depth
Pole connection	6.35mm/ 0.25Inch	Blade type; Fast-on
Weight	2kg/ 4.41lb	
Order number	UZB12.051	Battery for UBC10.241

Fig. 27-1 **UZB12.051**

Wall mounting bracket

Type ZM1.UBC10 is under preparation, please consult PULS.

28. APPLICATION NOTES

28.1. BATTERY REPLACEMENT INTERVALS

Batteries have a limited life time. They degrade slowly beginning from the production and need to be replaced periodically. The design life figures can be found in the individual datasheets of the batteries and usually is specified according to the Eurobat guideline or according to the manufacturer's specifications.

The design life is the estimated life based on laboratory condition, and is quoted at 20°C using the manufacturer's recommended float voltage condition. According to the Eurobat guideline, design lives have been structured into the following different groups:

3 - 5 years: This group of batteries is very popular in standby applications and in small emergency equipment. This represents a 4 years design life with a production tolerance of ±1 year.

6 - 9 years: This group of batteries is usually used when an improved life is required. This represents a 7.5 years design life with a production tolerance of ±1.5 years.

10 - 12 years: This group of batteries is used when in applications where longest life and highest safety level are required. This represents a 11 years design life with a production tolerance of ±1 year.

A battery failure within the specified design life of the battery usually results in a complete loss of the battery function (broken cell, defect connection, …) and will be detected and reported by the periodical battery tests which are included in the UBC10.241 DC-UPS control unit.

If the operational parameters differ from those which are specified for the design life, an earlier change of the battery might be necessary. The "real life" is called service life and is defined as the point at which the cell's actual capacity has reached 80% of its nominal capacity. At the end of the service life the capacity degrades much faster, so that a further use of the battery is not recommended.

Temperature effect:

The temperature has the most impact in the service life. The hotter the temperature, the earlier the wear-out phase of the battery begins. The wear-out results in a degradation of battery capacity. See Fig. 28-1 for details.

Effect of discharging cycles

The number as well as the depth of discharging cycles is limited. A replacement of the battery might be necessary earlier than the calculated service life if the battery exceeds the numbers and values of Fig. 28-2.

Other effects which shorten the service life

- Overcharging and deep discharging shortens the service life and should be avoided. Thanks to the single battery concept of the UBC10.241, the end-of-charge voltage is precisely set automatically avoiding unnecessary aging effects.
- Charge retention is important to get the longest battery life. Stored batteries which are not fully charged age faster then charged batteries. Batteries which are not in use should be recharged at least once a year.
- Excessive float charge ripple across the battery has an effect of reducing life and performance. The UBC10.241 does not produce such a ripple voltage. This effect can be ignored when the battery is charged with the UBC10.241.

Guidelines for a long battery service life:

- Place the DC-UPS in a cool location: E.g. near the bottom of the control cabinet.
- Do not place the DC-UPS near heat generating devices.
- Do not store discharged batteries.
- Do not discharge the battery more than necessary. Set buffer time limiter to the required buffer time.
  The depth of discharge reduces the service life of the battery and limits the number of cycles. See Fig. 28-2.

Example for calculating the service life and the required replacement cycle:

Parameters for the example:

- A 5Ah battery with a design life of 3-5 years is used (e.g. Yuasa battery which is used for type UZB12.051)
- The average ambient temperature is 30°C
- One buffer event consumes approx. 25% of the achievable buffer time.
- One buffer event per day

Calculation:

Ambient temperature influence:
According to Fig. 28-1 curve A, a 2 years service life can be expected for an ambient temperature of 30°C.

Number of discharging cycles: 2 years * 365 cycles = 730cycles in 2 years.
According to Fig. 28-2, curve C has to be used (only 25% of battery capacity is required). 730 cycles have only a negligible influence in a battery degradation and can be ignored.

Result:
The battery shall be replaced after 2 years.
Please note that the battery degrading begins from the production date (check date code on the battery) which may shorten the replacement intervals.

Fig. 28-1 **Service life versus ambient temperatures, typ *)**

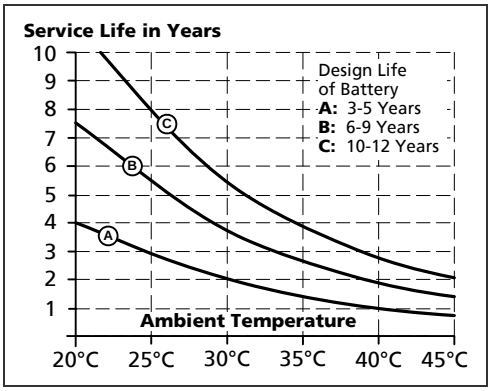
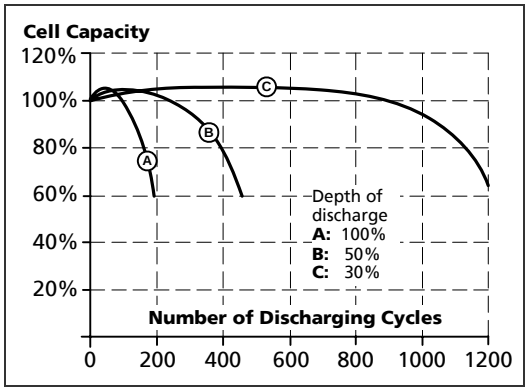


Fig. 28-2 **Cell capacity degradation vs. discharging cycles *)**



*) datasheet figures from battery manufacturer

28.2. PARALLEL AND SERIAL USE

Do not use the DC-UPS in parallel to increase the output power. However, two units of the DC-UPS can be paralleled for 1+1 redundancy to gain a higher system reliability.

Do not use batteries in parallel, since the battery quality test might create an error message.

Do not connect two or more units in series for higher output voltages.

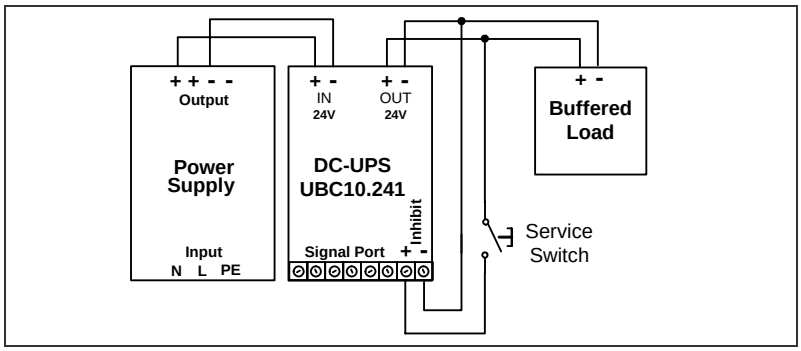
Do not connect two or more units in a row to get longer hold-up times.

28.3. USING THE INHIBIT INPUT

The inhibit input disables buffering. In normal mode, a static signal is required. In buffer mode, a pulse with a minimum length of 250ms is required to stop buffering. The inhibit is stored and can be reset by cycling the input voltage.

For service purposes, the inhibit input can also be used to connect a service switch. Therefore, the inhibit signal can be supplied from the output of the DC-UPS.

Fig. 28-3 **Wiring example for inhibit input**



28.4. TROUBLESHOOTING

The LEDs on the front of the unit and relay contacts indicate the status of the DC-UPS. Please see also chapter 14.

The following guidelines provide instructions for fixing the most common failures and problems. Always start with the most likely and easiest-to-check condition. Some of the suggestions may require special safety precautions. See notes in section 25 first.

"Check wiring" LED is on	Check correct wiring between the battery and the DC-UPS Check battery fuse. Is the battery fuse inserted or blown? Check battery voltage (must be typically between 7.4V and 15.1V) Check input voltage (must be typically between 22.8V and 30V) Check battery polarity
DC-UPS did not buffer	Inhibit input was set Battery did not have enough time to be charged and is still below the deep discharge protection limit.
DC-UPS stopped buffering	Buffer time limiter stopped buffering → set buffer time limiter to a higher value Deep discharge protection stopped buffering → allow sufficient time for charging the battery Output was overloaded or short circuit → reduce load
Output has shut down	Cycle the input power to reset the DC-UPS Let DC-UPS cool down, over temperature protection might have triggered.
DC-UPS constantly switches between normal mode and buffer mode	The supplying source on the input is too small and can not deliver sufficient current → Use a larger power supply or reduce the output load The input voltage is same as transfer threshold. → Increase input voltage