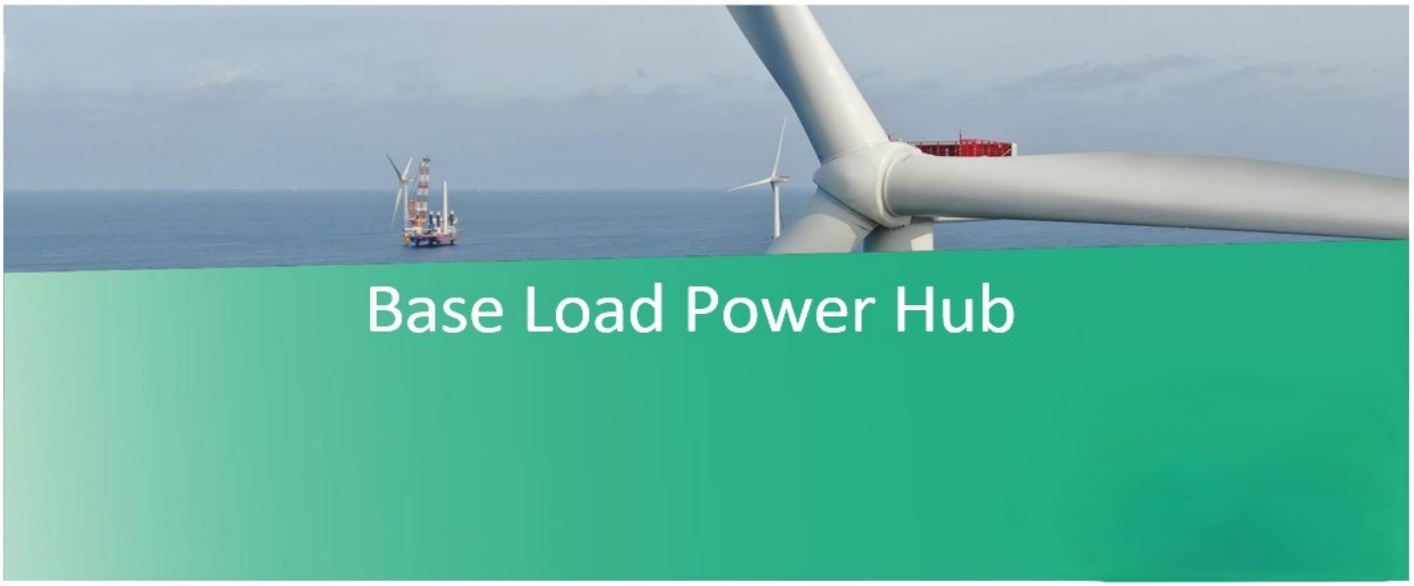
CROSSWIND

ROSETTI MARINO

PROVERUS

PROJECT **123A90 - HOLLANDSE KUST NOORD WIND PARK**
BLPH Project



COMMISSIONING DOSSIER (ONSHORE)

SYSTEM	82 Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00 MV 6.6 kV Switchboard (SG-100D1)

CROSSWIND

123A90 - HOLLANDSE KUST NOORD WIND PARK
BLPH Project

COMMISSIONING DOSSIER INDEX

ROSETTI MARINO

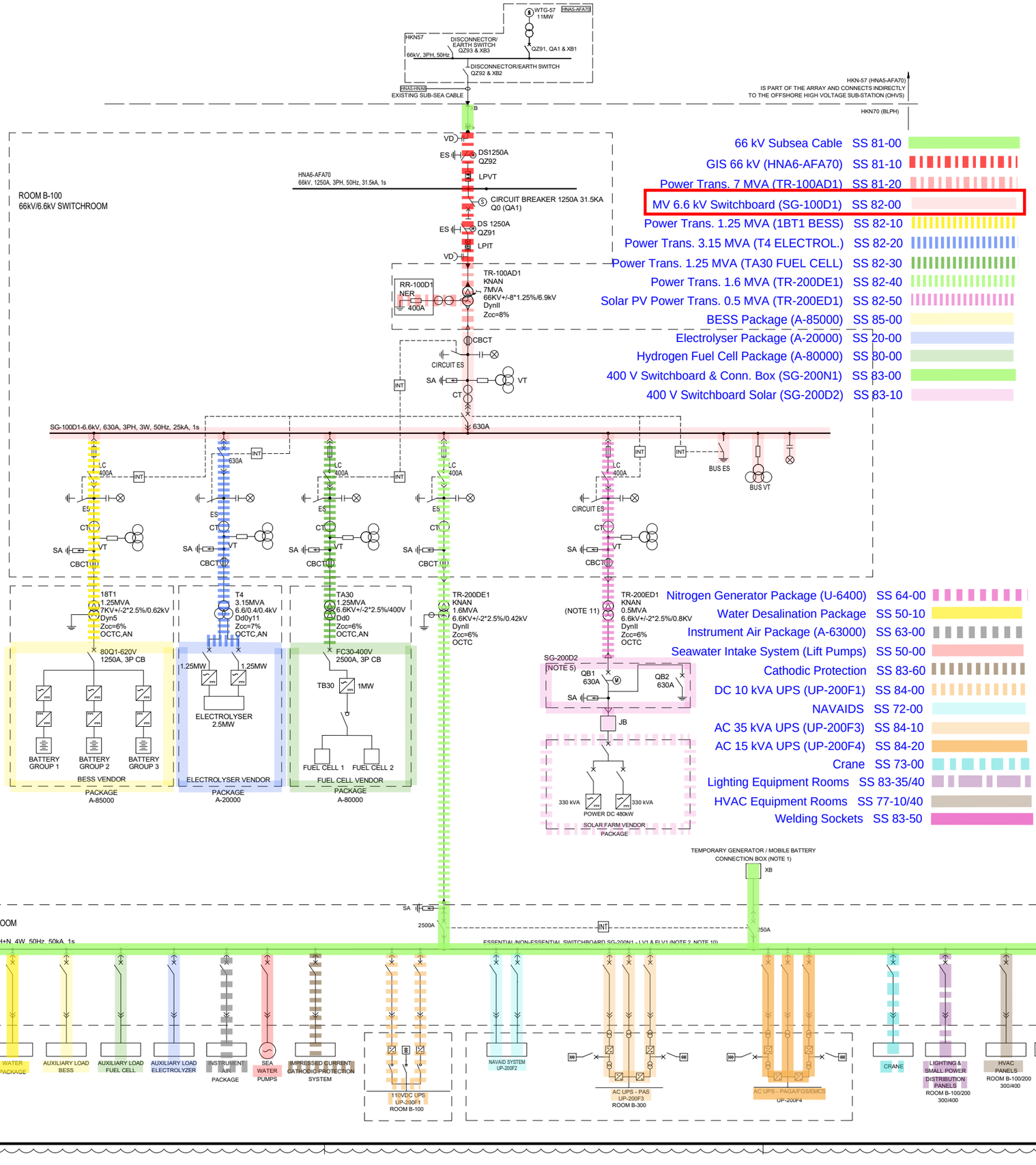
Sub System N°:	82-00	**Tick as appropriate**	ONSHORE	OK
Description:	MV 6.6 kV Switchboard (SG-100D1)		OFFSHORE	

1. *SUB-SYSTEM DEFINITION*	OK
1.1 Sub-System Description / Boundary Limit Drawings	
2. *READY FOR OPERATION CERTIFICATE*	OK
2.1 Achievement Of Ready for Operation Certificate (RFO)	
2.2 Exception Punch Lists (per discipline)	
2.3 “As-Commissioned” P&ID’s / SLD’s / D&ID’s / C&E’s	
3. *CONSOLIDATED PUNCH LISTS*	OK
3.1 Cleared and Residual Items (sorted by discipline)	
4. *FUNCTIONAL TESTS SHEETS*	OK
4.1 Electrical functional test sheets index	
4.2 Electrical “As-Commissioned” interconnection diagrams	
4.3 Instrumentation Functional Test Sheets Index	
4.4 Instrumentation “As-Commissioned” interconnection diagrams	
4.5 Telecommunication Functional Test Sheets Index	
4.6 Telecommunication “As-Commissioned” I.C.D. / TSLD’s	
5. *SITE / OPERATIONAL:*	OK
5.1 Operational Test Procedure	
5.2 Operational Test Certificates	
6. *PIPING AND VESSEL PREPARATION*	NA
6.1 Final Mechanical / Vessel Inspection Checks Index	
6.2 Leak Test / Drying / Inerting Test Sheets Index	
6.3 Chemical Loading & First Fill records Index	
6.4 Chemical Cleaning Reports and Records Index	
6.5 Lubrication Schedule	
7. *VENDORS*	OK
7.1 Vendor Package Summary Index	
7.2 SAT Procedure with associated punch list and reference (Front Page)	
7.3 Vendor Spares & Special Tools lists references	
7.4 Vendor Data / Operations / Maintenance Manuals References	
8. *LIST OF MODIFICATIONS*	NA
8.1 List of changes initiated during the WORKSITE Commissioning phase pertaining to the relevant Sub-System will be incorporated in this section with relevant references (with location and position of blinds/spades, isolation LO & LC valves, list of electrical isolation status, and remaining inhibits and overrides)	
9. *SUPPORTING DOCUMENTS*	NA
9.1 Other supporting documents (as applicable)	

	Contractor Commissioning Site Leader	Company Commissioning Site Leader
Name	Anthony Iveson	Martin Taylor
Date	2025-04-29	2025-04-29
Signature	PROVERLIS Digitaly signed by Anthony Iveson 2025-04-29T11:23:21.217Z	PROVERLIS Digitaly signed by Martin Taylor 2025-04-29T11:50:16.828Z

Section 1 SUB-SYSTEM DEFINITION

DRAWING NO. 123A90-DDL-EL-DG-20158 REV. 01



SYMBOL LEGEND:

- VOLTAGE DETECTOR
- EARTHING SWITCH DISCONNECTOR
- MOTORIZED EARTHING SWITCH
- CIRCUIT BREAKER
- FUSE
- CONTACTOR
- THREE-PHASE TRANSFORMER WITH TAP CHANGER
- THREE-PHASE TRANSFORMER
- CURRENT TRANSFORMER
- THREE-PHASE TRANSFORMER, WITH THREE WINDINGS
- NEUTRAL EARTHING RESISTOR
- SURGE ARRESTER
- CORE BALANCE CURRENT TRANSFORMER
- SURGE ARRESTOR FOR T-CONNECTOR (N.1 FOR EACH PHASE)
- VOLTAGE & CURRENT TRANSFORMER (3Ø X 2) (LPIT TYPE)
- VOLTAGE TRANSFORMER (3Ø X 2) (LPVT TYPE)
- VOLTAGE TRANSFORMER
- CABLE BOX
- T-CONNECTOR CABLE TERMINATION
- CABLE AIR TERMINATION

OLTC	= ON LOAD TAP CHANGER
OCTC	= OPEN CIRCUIT TAP CHANGER
KNAN	= NON-MINERAL OIL NATURAL AIR COOLED
AN	= AIR NATURAL
XB	= CABLE BOX
QZ	= DISCONNECT SWITCH & EARTH SWITCH
QA	= CIRCUIT BREAKER
LC	= LATCHED FUSED CONTACTOR (400A)
INT	= INTERLOCK SYSTEM
SA	= SURGE ARRESTER
CBCT	= CORE BALANCE CURRENT TRANSFORMER
ES	=EARTHING SWITCH
VD	=VOLTAGE DETECTOR
LCP	=LOCAL CONTROL PANEL
LPVT	=LOW POWER VOLTAGE TRANSFORMER
LPCT	=LOW POWER CURRENT TRANSFORMER
LPIT	=LOW POWER INSTRUMENT TRANSFORMER
JB	=JUNCTION BOX

NOTES:

1. TEMPORARY POWER SUPPLY CONNECTION BOX LOCATED ON OUTSIDE WALL OF LV SWITCHROOM / CONTAINER.
2. LOAD DEFINITION 'ESSENTIAL' / 'NON-ESSENTIAL' IS SHOWN IN THE LOAD LIST. THE CCS, EMCS AND 'SMART' SWITCHGEAR WILL OPEN / CLOSE CIRCUIT BREAKERS AS REQUIRED.
3. A COMBINED CCS/EMCS SYSTEM COMPRISES A MICROPROCESSOR BASED SYSTEM, ASSOCIATED SOFTWARE AND REQUIRED PERIPHERALS FOR MONITORING AND CONTROLLING OF ELECTRICAL POWER NETWORK. ALL ELECTRICAL EQUIPMENT AND PACKAGE UNITS SHALL BE CONNECTED TO THE CENTRAL CONTROL SYSTEM .
4. IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM SUPPLIED BY COMPANY.
5. THE SOLAR FARM IN-FEED POWER CIRCUIT BREAKERS PANEL IS LOCATED INSIDE THE LV SWITCHGEAR ROOM B-200.
6. DELETED.
7. DELETED.
8. DELETED.
9. CROSSWIND SHALL BE ABLE TO CONTROL THE BLPH 66KV MOTORISED CIRCUIT BREAKER Q0 (QA1) & MOTORISED ELECTRICAL DISCONNECTOR / EARTH SWITCH (QZ92, TYPE B) USING THEIR 'HV-SCADA' SYSTEM. THIS BACK-UP / REDUNDANT CONTROL SHALL BE ADDITIONAL TO THAT PROVIDED BY THE CCS AND BE OF HIGHER PRIORITY OVER A SEPARATE FIBRE OPTIC CABLE (FOC). THE CCS OPERATOR AND 'HV-SCADA' SHALL BOTH BE KEPT FULLY AWARE OF EQUIPMENT STATUS AT ALL TIMES. INTERTRIPPING, INHIBITS & INTERLOCKING FOR BLPH 66KV EQUIPMENT SHALL BE AS PER THE WIND FARM.
10. THE LOADS IN THE LOW VOLTAGE SWITCHGEAR AND THE CURRENT VALUES OF THE CIRCUIT BREAKERS ARE ONLY INDICATIVE.
11. NEUTRAL POINT OF TR-200ED1 SHALL NOT BE GROUNDED AS REQUIRED BY SOLAR FARM SUPPLIER IN 123A90-PML-PM-TQ-00040.

REFERENCES:

1. 123A90-DDL-EL-DG-20014 ELECTRICAL CONTROL, PROTECTION AND METERING DIAGRAMS
2. 123A90-DDL-EL-DG-20015 ELECTRICAL SINGLE LINE DIAGRAM 6.6kV SYSTEMS
3. 123A90-DDL-EL-DG-20159 ELECTRICAL SINGLE LINE DIAGRAMS LV SYSTEM
4. 123A90-DDL-EL-DG-20160 ELECTRICAL SINGLE LINE DIAGRAMS AC UPS SYSTEMS
5. 123A90-DDL-EL-DG-20161 ELECTRICAL SINGLE LINE DIAGRAMS DC UPS SYSTEMS
6. 123A90-DDL-EL-DG-20185 ELECTRICAL SINGLE LINE DIAGRAM HV SYSTEMS
7. 123A90-DDL-EL-DL-20104 ELECTRICAL EQUIPMENT LAYOUT - HV SWITCHROOM
8. 123A90-DDL-EL-DL-20105 ELECTRICAL EQUIPMENT LAYOUT - LV SWITCHROOM
9. 123A90-DDL-EL-LIS-20016 ELECTRICAL LOAD LIST and BALANCE -CCS MODE CHARGING-
10. 123A90-DDL-EL-RE-20152 ELECTRICAL EQUIPMENT SIZING CCALCULATION REPORT
11. 123A90-DDL-EL-RE-20170 ELECTRICAL SYSTEM STUDY REPORT - LOAD FLOW
12. 123A90-DDL-EL-RE-20171 ELECTRICAL SYSTEM STUDY REPORT - SHORT CIRCUIT
13. 123A90-DDL-EL-RE-20172 ELECTRICAL SYSTEM STUDY REPORT - ARC FLASH ENERGY CALCULATION
14. 123A90-DDL-EL-RE-20173 ELECTRICAL SYSTEM STUDY REPORT - HARMONICS

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
01	26/03/2024	GPA	LMA/AMA	LMA/MDO	ISSUE FOR REVIEW (IFR)
00	02/11/2023	DSF	CB/AMA	OYFO/MDO	ISSUE FOR REVIEW (IFR)

CROSSWIND

ROSETTI MARINO

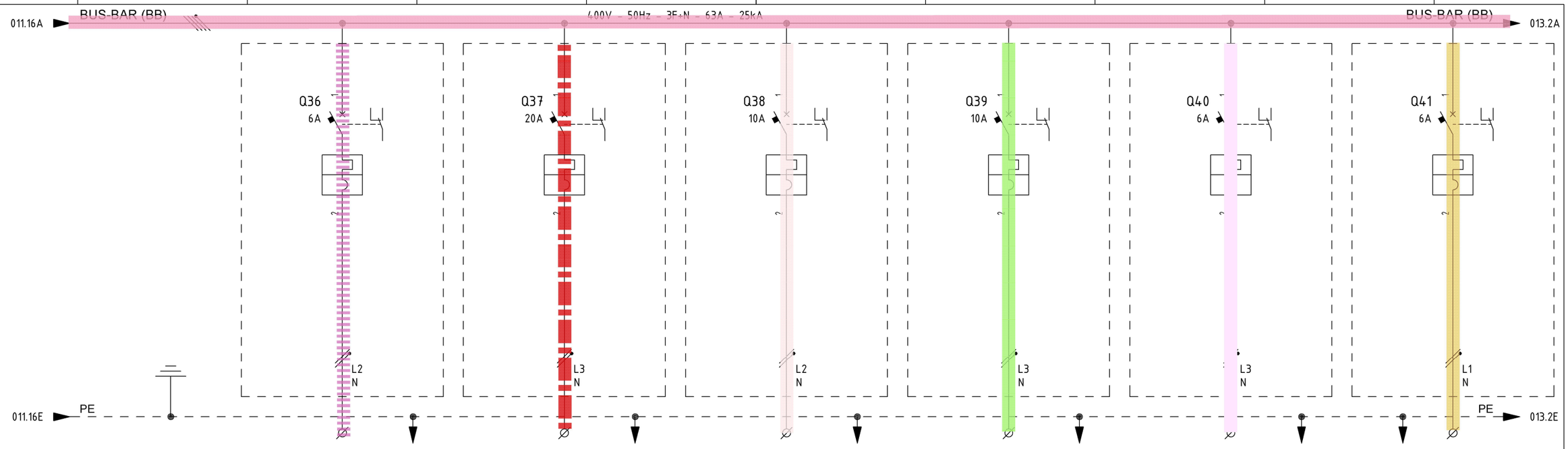
TITLE :

OVERALL/KEY SINGLE LINE DIAGRAM

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK			SCALE N/A
DRAWN GPA	CHECKED LMA/AMA	APPROVED LMA/MDO	DATE 26/03/2023
A1	DRAWING NO. 123A90-DDL-EL-DG-20158	SHEET 001	REV. 01

01

File Name : 123A90-DDL-EL-DG-20158_REV01.dwg



ITEM			1	CP-200E2	CP-100E1	SG-100D1	SG-200N1	SG-200D2	UP-200F3
UTILITY			2	AUXILIARY TRAFO SOLARE 0.5MVA	AUXILIARY GIS	AUXILIARY 6.6KV SWITCHBOARD	AUXILIARY LV SWITCHBOARD	AUXILIARY LV SWITCHBOARD 800/460V	AC UPS PAS AUXILIARY
CUBICLE			3	+03	+03	+03	+03	+03	+03
RATED POWER | RATED CURRENT			4/5	0.5 KW | 2.72 A	3 KW | 16.3 A	1 KW | 5.43 A	1 KW | 5.43 A	0.5 KW | 2.72 A	0.2 KW | 0.82 A
TYPICAL FUNCTIONAL			6	-	-	-	-	-	-
CIRCUIT BREAKER (ABB)	TYPE		7	S302P-C6	S302P-C20	S302P-C10	S302P-C10	S302P-C6	S302P-C6
	VERSION		8	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE
	TRIP UNITS		9	In=6A - Curve C	In=20A - Curve C	In=10A - Curve C	In=10A - Curve C	In=6A - Curve C	In=6A - Curve C
	Icu	KA	10	25kA	25kA	25kA	25kA	25kA	25kA
OVERLOAD	L	Range A	11	-	-	-	-	-	-
		Range t	12	-	-	-	-	-	-
SEL. SHORT-CIRCUIT	S	Range A	13	-	-	-	-	-	-
		Range t	14	-	-	-	-	-	-
INST. SHORT-CIRCUIT	I	Range A	15	-	-	-	-	-	-
		Range t	16	-	-	-	-	-	-
EARTH FAULT PROTECTION	G	Range A	17	-	-	-	-	-	-
		Range t	18	-	-	-	-	-	-
CONTACTOR (ABB)			19	-	-	-	-	-	-
THERMAL OVERLOAD RELAY (ABB)			20	-	-	-	-	-	-
SURGE ARRESTERS (DHENN)			21	-	-	-	-	-	-
TOROIDAL CURRENT TRANSFORMER (FRER)			22	-	-	-	-	-	-
FUSE HOLDER (ABB)			23	-	-	-	-	-	-
TWILIGHT SWITCH (ABB)			24	-	-	-	-	-	-
VOLTMETER (FRER)			25	-	-	-	-	-	-
CURRENT TRANSFORMER FOR MEASURE (FRER)	TYPE		26	-	-	-	-	-	-
	PERFORMANCE/CLASS		27	-	-	-	-	-	-
VOLTAGE TRANSFORMER FOR MEASURE (FRER)	TYPE		28	-	-	-	-	-	-
	PERFORMANCE/CLASS		29	-	-	-	-	-	-
POWER TERM. BLOCK (CABUR)		Type/mm²	30	SCREW / 4	SCREW / 6	SCREW / 4	SCREW / 4	SCREW / 4	SCREW / 4
POWER CONDUCTOR		mm²	31	3G2.5	3G6	3G2.5	3G2.5	3G2.5	3G2.5

SUBSYSTEM 82-50 | SUBSYSTEM 81-10 | SUBSYSTEM 82-00 | SUBSYSTEM 83-00 | SUBSYSTEM 83-10 | SUBSYSTEM 84-10

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	05/07/2024	Santinelli	Flamminio	Sigismondi	Accepted for construction (AFC)
2	24/04/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)
1	15/03/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)
0	08/02/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)

=

+

DWG n° : 231298/SD/13

Item n° : PF1002888/101

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : "DP-200N1"

SINGLE LINE DIAGRAM

Single Line Drawing

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00013

SHEET 012

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00013 Rev. 03

AEGPS_DOC_REV01
CAE EPLAN Electric P8
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+REC1
UP-200F1 A

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1
THERMOSTAT 100º

-PR2-TH2
THERMOSTAT 90º

-PR1-TH1
THERMOSTAT 100º

-PR1-TH2
THERMOSTAT 90º

SS:8400

Charger
100A 12Pulses

-Z1
0/450V

-X1
L1
70 mm²
4G16 mm2
unamoured cable

MAINS
3x400Vac 50Hz -50kA

L1;L2;L3;PE

-Q1
50A

-T1
110V/100A
019.6KVA

-PR2
TPC

-PR1
TPC

-A320
INTERFACE

-R2
100mV
130A

-C1
3x6800µF
160V
Filtering 1%

-F1
NH00
125A

-V21
100A

-Q2
160A

-R3
100mV
130A

-Q3
160A

BATTERY
110Vdc
-X3
+/-
70 mm²

Battery
symmetry
-X31
+/-
4 mm²

-A10
BATTERY SIMMETRY
FAULT

-L+/-
2P 125A
BUS BAR
110 VDC

+BP
BATTERY PROTECTION

+BAT

2 (1x25) mm2
Int

-F100
Plastic
box 80*80

-SD1
-SD2

-Q10
50A-C
-X2 1+/1-
16 mm²
3G16 mm2
amoured cable
SS 8110
(+REC1-A1 /1.4) / SD1

CP-100F1
DC CONTROL 66kV G/S
LINE A-5.2KW

-Q11
20A-C
-X2 2+/2-
16 mm²
3G16 mm2
amoured cable
SS 8110
(+REC2-A1 /1.4) / SD2

CP-100F1
DC CONTROL 66kV G/S
LINE B-2KW

-Q12
16A-C
-X2 3+/3-
16 mm²
3G16 mm2
amoured cable
SS 8200

SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE A-1KW

-Q13
16A-C
-X2 4+/4-
16 mm²
3G16 mm2
amoured cable
SS 8200

SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE B-1KW

-Q14
50A-C
-X2 5+/5-
16 mm²
SPARE 5,5KW

-Q15
20A-C
-X2 6+/6-
16 mm²
SPARE 2KW

-Q16
16A-C
-X2 7+/7-
16 mm²
SPARE 1KW

-F10/F11
DEHNguard

-A21
EARTH +/-

-A1
GCAU
CONTROL UNIT

-A5.1
Relays

-CR1-X5

-A71

-A300
DISPLAY

-A310
KEY PAD

-A73
MODBUS-TCP/IP

-A8
Isolated

-KF
PSR-SCP- 24DC / SIL3

SD1 / (+BAT-SD1 /1.8)

AUXILIARY SUPPLY
230Vac-50Hz

-X7
L/N
6 mm²
3G2.5 mm2
unamoured cable

-Q6
02A-C

-H3

-Q7
02A-C

-THF4
0/60ºC

-E50
100W

-Z2
400V

-X8
4 mm²
CHARGERS
INTERCONNECTION

2,5 mm²

INTERCONNECTION
-X6
50 mm²
PH4 35 mm²

-A8
(+REC1-CR1-J13:1 /1.4)

+REC2
UP-200F1 B

-M1/2
220-240 Vca
50-60Hz
FAN
-PR2-TH1
THERMOSTAT 100º
-PR2-TH2
THERMOSTAT 90º
-PR1-TH1
THERMOSTAT 100º
-PR1-TH2
THERMOSTAT 90º
Charger
100A 12Pulses
-Z1
0/450V
-X1
L1
70 mm²
4G16 mm2
unamoured cable
MAINS
3x400Vac 50Hz -50kA
L1;L2;L3;PE
-Q1
50A
-T1
110V/100A
019.6KVA
-PR2
TPC
-PR1
TPC
-A320
INTERFACE
-R2
100mV
130A
-C1
3x6800µF
160V
Filtering 1%
-F1
NH00
125A
-V21
100A
-Q2
160A
-A1
GCAU
CONTROL UNIT
-A5.1
Relays
-CR1-X5
-A71
-A300
DISPLAY
-A310
KEY PAD
-A73
MODBUS-TCP/IP
-A8
Isolated
AUXILIARY SUPPLY
230Vac-50Hz
-X7
L/N
6 mm²
-Q6
02A-C
-H3
-Q7
02A-C
-THF4
0/60ºC
-E50
100W
-X8
4 mm²
CHARGERS
INTERCONNECTION
-X6
50 mm²
INTERCONNECTION
-A8
(+REC2-CR1-J13:1 /1.4)

2,5 mm²
Int

SD2 / (+BAT-SD2 /1.8)

A8 / (+REC2-X8 /1.4)

Battery
symmetry
-X31
+/-
4 mm²

-A10
BATTERY SIMMETRY
FAULT

2,5 mm²
Int

ES5214.64

				Date	21/03/2024	3W POWER S.P.A.	AEG POWER SOLUTIONS	Single-line	1724000372-EL-DG-00006
				Editor	EBM	Hollandse Kust Noord (HKN) wind farm		System	
				Checked	JOP				
Stat	Alteration	Date	Name	Standard					ES521464 en

= System
+ 8 / 47
& EFA
A3
Sheet 1
Sheets 1

Section 2 READY FOR OPERATION

Section 2.1 Achievement Of Ready for Operation Certificate (RFO)

ROSETTI MARINO

123A90 - HOLLANDSE KUST NOORD WIND PARK
BLPH Project

CROSSWIND

Ready For Operation (RFO) Certificate

COMPLETE	●	PARTIAL	

Revision:	1		Issued on:	2025-04-26	
System:	82	/	Main Power Distribution Medium Voltage 6.6 kV		
SubSystem:	82-00	/	MV 6.6 kV Switchboard (SG-100D1)		

We hereby confirm that all Mechanical Completion (MC) and Pre-Commissioning/Commissioning (Pre-Comm./Comm.) activities for the above-mentioned System/Sub-System have been successfully completed in accordance with project specifications, relevant standards and contractual requirements. The System/Sub-System has been tested and verified to ensure readiness for operation. Issuance of this Certificate shall not release CONTRACTOR from any of his obligations, responsibilities or liabilities under the CONTRACT.

Mechanical Completion: All required MC activities have been completed and approved
Pre-Commissioning & Commissioning: All required Pre-Comm. and Comm. activities and OTPs have been completed and approved (Status Index attached)
Punch List: All Punch items categorized as A and B have been cleared (PL report attached)
Documentation: As-built documentation and Commissioning dossier has been completed, reviewed and approved

PUNCH LIST	PENDING POINTS
Note: All Category "A" and "B" Items must be cleared prior to issuance of the Ready For Operation (RFO) Certificate	B: 3

REMARKS:

	CONTRACTOR Commissioning Manager	**COMPANY** Commissioning Lead
Name	Anthony Iveson	Martin Taylor
Date	2025-04-26	2025-04-29
Signature	PROVERLIS Digitaly signed by Anthony Iveson 2025-04-26T10:02:32.670Z	PROVERLIS Digitaly signed by Martin Taylor 2025-04-29T07:31:45.949Z

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00 & process: COMM

Electrical	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
DP-200N1-Q38	AUX 6,6KV - DP-200N1-Q38	ONSHORE	C10002937	FTR-2	100	2024-10-29	RFO 1
UP-200F1-Q12	DC CONTROL 6,6KV LINE A - UP-200F1-Q12	ONSHORE	C10002935	FTR-2	100	2024-11-08	RFO 1
UP-200F1-Q13	DC CONTROL 6,6KV LINE B - UP-200F1-Q13	ONSHORE	C10002936	FTR-2	100	2024-11-08	RFO 1

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00 & process: COMM

Instrumental	82-00 MV 6.6 kV Switchboard (SG-100D1)

ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
82-XS-001	OPEN SOLAR INCOMING CIRCUIT BREAKERS	ONSHORE	C10003828	FJ01D	100	2025-04-04	RFO 1
82-XS-002	OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003827	FJ01D	100	2025-04-04	RFO 1
82-XS-003	OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003826	FJ01D	100	2025-04-04	RFO 1

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00 & process: COMM

Miscellaneous	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems	ONSHORE	C10004623	5300	100	2025-04-26	-
		OFFSHORE	C10004945	5300	0	-	-

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Electrical

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30000096	B	SG-100D1	Voltimeter broken. To be repiaced on column A5		New Voltimeter Installed.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000097	B	SG-100D1	Track to be repiaced in TV compartment - column A5		Track replaced.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000098	B	SG-100D1	Segregation plates to be installed		Installation	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000099	B	SG-100D1	Missing fuses 250A — column A4		Installed.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000104	B	SG-100D1	All documentation shall be re-issued and approval in final revision after mark-up during FAT		all documents marked up during FAT , has been re isssue - as built rev	SLinari 2024-08-02	SLinari 2024-12-05	SLinari 2024-12-05	2024-12-05
C30000108	B	SG-100D1 C10000864	Damage on roof for columns: A1/A3/A5/A7 (see attached pictures)	change roof	Problem fixed.	SLinari 2024-08-22	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000751	B	84104-CEL C10000568	Core identification tags are wrong on both terminations	.		Pschintu 2024-11-22	2025-02-19	AAndreani 2025-02-19	2025-02-19
C30000753	B	83119-CEL C10000638	Missing core identification tags by SG-100D1 side	.		Pschintu 2024-11-22	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30000762	B	83005-CEC C10002112	Core identification tags are wrong or missing on both sides	.		Pschintu 2024-11-22	2025-02-26	Gtangianu 2025-02-26	2025-02-26

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Electrical

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30000763	B	82013-CEC C10002111	Missing core identification tags on both sides	.		Pschintu 2024-11-22	2025-02-26	Gtangianu 2025-02-26	2025-02-26
C30000764	B	83006-CEC C10002113	Missing cable SS tags on external routing	.		Pschintu 2024-11-22	2025-02-26	Pschintu 2025-02-26	2025-02-26
C30000765	B	83006-CEC C10002113	Core identification tags are missing inside SG-200N1	.		Pschintu 2024-11-22	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30000956	B	82013-CEC C10002111	Cable must be dressed properly inside and outside SG-100D1 panel	.		Pschintu 2024-11-26	2025-04-11	Gtangianu 2025-04-11	2025-04-11
C30004336	B	SG-100D1	Cracked screen on EXETHERM display (see attached picture)			DMusgrove 2025-04-28			

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Instrumental

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30001047	B	C-SG-100D1-001/B400-SIS-001 C10000189	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30001048	B	C-SG-100D1-001/B400-SIS-001 C10000189	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-01-30	APolo 2025-01-30	2025-01-30
C30001049	B	C-SG-100D1-003/B400-SIS-001 C10000191	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29			
C30001050	B	C-SG-100D1-002/B400-SIS-001 C10000190	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29			
C30001051	B	C-SG-100D1-003/B400-SIS-001 C10000191	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-02-26	Pschintu 2025-02-26	2025-02-26
C30001052	B	C-SG-100D1-002/B400-SIS-001 C10000190	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-02-26	Pschintu 2025-02-26	2025-02-26

Section 2.2 Exception Punch Lists (per discipline)

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Instrumental

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30001049	B	C-SG-100D1-003/B400-SIS-001 C10000191	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29			
C30001050	B	C-SG-100D1-002/B400-SIS-001 C10000190	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29			

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

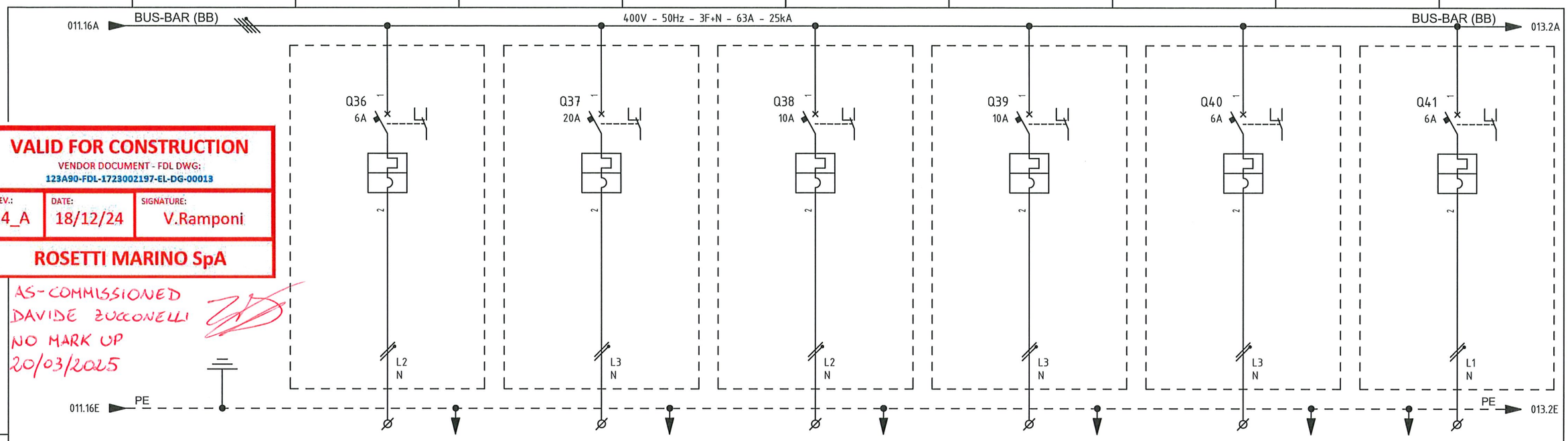
PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Electrical

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30004336	B	SG-100D1	Cracked screen on EXETHERM display (see attached picture)			DMusgrove 2025-04-28			

Section 2.3 “As-Commissioned” P&ID's / SLD's / D&ID's / C&E's



VALID FOR CONSTRUCTION
VENDOR DOCUMENT - FDL DWG:
123A90-FDL-1723002197-EL-DG-00013

REV.:	DATE:	SIGNATURE:
4_A	18/12/24	V.Ramponi

ROSETTI MARINO SpA

AS-COMMISSIONED
DAVIDE ZUCCONELLI
NO MARK UP
20/03/2025

ITEM			1	CP-200E2	CP-100E1	SG-100D1	SG-200N1	SG-200D2	UP-200F3
UTILITY			2	AUXILIARY TRAFO SOLARE 0.5MVA	AUXILIARY GIS	AUXILIARY 6.6KV SWITCHBOARD	AUXILIARY LV SWITCHBOARD	AUXILIARY LV SWITCHBOARD 800/460V	AC UPS PAS AUXILIARY
CUBICLE			3	+03	+03	+03	+03	+03	+03
RATED POWER | RATED CURRENT			4/5	0.5 KW | 2.72 A	3 KW | 16.3 A	1 KW | 5.43 A	1 KW | 5.43 A	0.5 KW | 2.72 A	0.2 KW | 0.82 A
TYPICAL FUNCTIONAL			6	-	-	-	-	-	-
CIRCUIT BREAKER (ABB)	TYPE		7	S302P-C6	S302P-C20	S302P-C10	S302P-C10	S302P-C6	S302P-C6
	VERSION		8	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE	2P / MINIATURE
	TRIP UNITS		9	In=6A - Curve C	In=20A - Curve C	In=10A - Curve C	In=10A - Curve C	In=6A - Curve C	In=6A - Curve C
	Icu	KA	10	25kA	25kA	25kA	25kA	25kA	25kA
OVERLOAD	L	Range A	11	-	-	-	-	-	-
		Range t	12	-	-	-	-	-	-
SEL. SHORT-CIRCUIT	S	Range A	13	-	-	-	-	-	-
		Range t	14	-	-	-	-	-	-
INST. SHORT-CIRCUIT	I	Range A	15	-	-	-	-	-	-
		Range t	16	-	-	-	-	-	-
EARTH FAULT PROTECTION	G	Range A	17	-	-	-	-	-	-
		Range t	18	-	-	-	-	-	-
CONTACTOR (ABB)			19	-	-	-	-	-	-
THERMAL OVERLOAD RELAY (ABB)			20	-	-	-	-	-	-
SURGE ARRESTERS (DHENN)			21	-	-	-	-	-	-
TOROIDAL CURRENT TRANSFORMER (FRER)			22	-	-	-	-	-	-
FUSE HOLDER (ABB)			23	-	-	-	-	-	-
TWILIGHT SWITCH (ABB)			24	-	-	-	-	-	-
VOLTMETER (FRER)			25	-	-	-	-	-	-
CURRENT TRANSFORMER FOR MEASURE (FRER)	TYPE		26	-	-	-	-	-	-
	PERFORMANCE/CLASS		27	-	-	-	-	-	-
VOLTAGE TRANSFORMER FOR MEASURE (FRER)	TYPE		28	-	-	-	-	-	-
	PERFORMANCE/CLASS		29	-	-	-	-	-	-
POWER TERM. BLOCK (CABUR)		Type/mm²	30	SCREW / 4	SCREW / 6	SCREW / 4	SCREW / 4	SCREW / 4	SCREW / 4
POWER CONDUCTOR		mm²	31	3G2.5	3G6	3G2.5	3G2.5	3G2.5	3G2.5

=
+

DWG n° : 231298/SD/13
Item n° : PF1002888/101

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
4	18/09/2024	Santinelli	Flamminio	Sigismondi	As Built (ASB)
3	05/07/2024	Santinelli	Flamminio	Sigismondi	Accepted for construction (AFC)
2	24/04/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)
1	15/03/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)
0	08/02/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)

TITLE : "DP-200N1"
SINGLE LINE DIAGRAM
Single Line Drawing

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00013

SHEET 012

REV. 04

File Name : 1723002197-EL-DG-00013 Rev. 04

F.to UNI A3: 420mmx297mm

AEGPS_DOC_REV01
CAE EPLAN Electric P8
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1 2 3 4 5 6 7 8

+REC1
UP-200F1 A

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1 THERMOSTAT 100º
-PR2-TH2 THERMOSTAT 90º
-PR1-TH1 THERMOSTAT 100º
-PR1-TH2 THERMOSTAT 90º

Charger
100A 12Pulses

-Z1 0/450V
-X1 L1
MAINS 3x400Vac 50Hz -50kA
70 mm²
4G16 mm2
unamoured cable
L1;L2;L3;PE
-Q1
50A
-T1
110V/100A
019.6KVA
-PR2
-PR1
-R2 100mV 130A
-C1 3x6800µF 160V Filtering 1%
-F1 NH00 125A
-V21 100A
-Q2 160A
-R3 100mV 130A
-Q3 160A

BATTERY 110Vdc
-X3 +/-
70 mm²
Battery symmetry
-X31 +/-
4 mm²

-A10 BATTERY SIMMETRY FAULT

-L+/-
2P 125A BUS BAR 110 VDC

+BP BATTERY PROTECTION
2 (1x25) mm2
-F100 Plastic box 80*80
+BAT
-SD1
-SD2

-PR2-A2 TPC
-A320 INTERFACE
-PR1-A2 TPC

SD1 / (+BAT-SD1 /1.8)

-A1 GCAU CONTROL UNIT
-A5.1 Relays
-CR1-X5
-A71
-A300 DISPLAY
-A73 MODBUS-TCP/IP
-A8 Isolated
-A310 KEY PAD
-KF PSR-SCP- 24DC / SIL3

FOR COMM. PURPOSE ONLY
DC / DC
-Z2 400V

-Q10 50A-C
-Q11 20A-C
-Q12 16A-C
-Q13 16A-C
-Q14 50A-C
-Q15 20A-C
-Q16 16A-C

-X2 1+/1 16 mm² 3G16 mm2 amoured cable (+REC1-A1 /1.4) / SD1
CP-100F1 DC CONTROL 66kV G/S LINE A-5.2KW
-X2 2+/2 16 mm² 3G16 mm2 amoured cable (+REC2-A1 /1.4) / SD2
CP-100F1 DC CONTROL 66kV G/S LINE B-2KW
-X2 3+/3 16 mm² 3G16 mm2 amoured cable
SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE A-1KW
-X2 4+/4 16 mm² 3G16 mm2 amoured cable
SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE B-1KW
-X2 5+/5 16 mm² SPARE 5,5KW
-X2 6+/6 16 mm² SPARE 2KW
-X2 7+/7 16 mm² SPARE 1KW

-F10/F11 DEHNguard
-A21 EARTH +/-

AUXILIARY SUPPLY 230Vac-50Hz
-X7 L/N
6 mm²
3G2.5 mm2
unamoured cable
-Q6 02A-C
-H3
-Q7 02A-C
-THF4 0/60ºC
-E50 100W

-X8 4 mm² CHARGERS INTERCONNECTION
2,5 mm²
INTERCONNECTION -X6 50 mm²
PH4 35 mm²

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
25/03/2025

+REC2
UP-200F1 B
-M1/2 220-240 Vca 50-60Hz FAN
-PR2-TH1 THERMOSTAT 100º
-PR2-TH2 THERMOSTAT 90º
-PR1-TH1 THERMOSTAT 100º
-PR1-TH2 THERMOSTAT 90º
Charger 100A 12Pulses
-Z1 0/450V
-X1 L1
MAINS 3x400Vac 50Hz -50kA
70 mm²
4G16 mm2
unamoured cable
L1;L2;L3;PE
-Q1 50A
-T1 110V/100A 019.6KVA
-PR2 -PR1
-R2 100mV 130A
-C1 3x6800µF 160V Filtering 1%
-F1 NH00 125A
-V21 100A
-Q2 160A
-PR2-A2 TPC
-A320 INTERFACE
-PR1-A2 TPC
SD2 / (+BAT-SD2 /1.8)
-A1 GCAU CONTROL UNIT
-A5.1 Relays
-CR1-X5
-A71
-A300 DISPLAY
-A73 MODBUS-TCP/IP
-A8 Isolated
-A310 KEY PAD
A8 / (+REC2-X8 /1.4)
AUXILIARY SUPPLY 230Vac-50Hz
-X7 L/N 6 mm²
-Q6 02A-C
-H3
-Q7 02A-C
-THF4 0/60ºC
-E50 100W
-X8 4 mm² CHARGERS INTERCONNECTION
-A8 (+REC1-CR1-J13:1 /1.4)
2,5 mm²
INTERCONNECTION -X6 50 mm²
-A10 BATTERY SIMMETRY FAULT
Battery symmetry -X31 +/- 4 mm²
-F10/F11 DEHNguard
-A21 EARTH +/-
2,5 mm²

VALID FOR CONSTRUCTION
VENDOR DOCUMENT - FDL DWG:
123A90-FDL-1724000372-EL-DG-00008

REV.:	DATE:	SIGNATURE:
3_A	15/11/24	G.Randi

ROSETTI MARINO SpA

ES521464

				Date	21/03/2024	3W POWER S.P.A.	
				Editor	EBM	Hollandse Kust Noord (HKN) wind farm	
				Checked	JOP		
Stat	Alteration	Date	Name	Standard			

AEG POWER SOLUTIONS

Single-line System

1724000372-EL-DG-00006

ES521464 en

= System
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& EFA

A3

8 / 47
Sheet 1
Sheets 1

Section 3 CONSOLIDATED PUNCH LISTS

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM	82	Main Power Distribution Medium Voltage 6.6 kV
SUBSYSTEM	82-00	MV 6.6 kV Switchboard (SG-100D1)

Electrical

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30000096	B	SG-100D1	Voltimeter broken. To be repiaced on column A5		New Voltimeter Installed.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000097	B	SG-100D1	Track to be repiaced in TV compartment - column A5		Track replaced.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000098	B	SG-100D1	Segregation plates to be installed		Installation	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000099	B	SG-100D1	Missing fuses 250A — column A4		Installed.	SLinari 2024-08-02	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000104	B	SG-100D1	All documentation shall be re-issued and approval in final revision after mark-up during FAT		all documents marked up during FAT , has been re isssue - as built rev	SLinari 2024-08-02	SLinari 2024-12-05	SLinari 2024-12-05	2024-12-05
C30000108	B	SG-100D1 C10000864	Damage on roof for columns: A1/A3/A5/A7 (see attached pictures)	change roof	Problem fixed.	SLinari 2024-08-22	Vendor 2024-10-02	SLinari 2024-10-02	2024-10-02
C30000751	B	84104-CEL C10000568	Core identification tags are wrong on both terminations	.		Pschintu 2024-11-22	2025-02-19	AAndreani 2025-02-19	2025-02-19
C30000753	B	83119-CEL C10000638	Missing core identification tags by SG-100D1 side	.		Pschintu 2024-11-22	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30000762	B	83005-CEC C10002112	Core identification tags are wrong or missing on both sides	.		Pschintu 2024-11-22	2025-02-26	Gtangianu 2025-02-26	2025-02-26

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM 82 Main Power Distribution Medium Voltage 6.6 kV

SUBSYSTEM 82-00 MV 6.6 kV Switchboard (SG-100D1)

Electrical

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30000763	B	82013-CEC C10002111	Missing core identification tags on both sides	.		Pschintu 2024-11-22	2025-02-26	Gtangianu 2025-02-26	2025-02-26
C30000764	B	83006-CEC C10002113	Missing cable SS tags on external routing	.		Pschintu 2024-11-22	2025-02-26	Pschintu 2025-02-26	2025-02-26
C30000765	B	83006-CEC C10002113	Core identification tags are missing inside SG-200N1	.		Pschintu 2024-11-22	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30000956	B	82013-CEC C10002111	Cable must be dressed properly inside and outside SG-100D1 panel	.		Pschintu 2024-11-26	2025-04-11	Gtangianu 2025-04-11	2025-04-11
C30004336	B	SG-100D1	Cracked screen on EXETHERM display (see attached picture)		Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been	DMusgrove 2025-04-28	Alveson 2025-07-21	Alveson 2025-07-21	2025-07-21

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

PUNCH LIST REPORT

SYSTEM 82 Main Power Distribution Medium Voltage 6.6 kV

SUBSYSTEM 82-00 MV 6.6 kV Switchboard (SG-100D1)

Instrumental

CODE	CAT	ITEM	DEFECT DESCRIPTION	CORRECTIVE ACTION	PERFORMED ACTION	ISSUED	CARRIED	CHECKED	APPROVED
C30001047	B	C-SG-100D1-001/B400-SIS-001 C10000189	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29	2025-02-04	Pschintu 2025-02-04	2025-02-04
C30001048	B	C-SG-100D1-001/B400-SIS-001 C10000189	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-01-30	APolo 2025-01-30	2025-01-30
C30001049	B	C-SG-100D1-003/B400-SIS-001 C10000191	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29	2025-05-22	Gtangianu 2025-05-22	2025-05-22
C30001050	B	C-SG-100D1-002/B400-SIS-001 C10000190	Missing core identification tag by SG-100D1 side	.		Pschintu 2024-11-29	2025-05-22	Gtangianu 2025-05-22	2025-05-22
C30001051	B	C-SG-100D1-003/B400-SIS-001 C10000191	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-02-26	Pschintu 2025-02-26	2025-02-26
C30001052	B	C-SG-100D1-002/B400-SIS-001 C10000190	Missing cable tag all along the route	.		Pschintu 2024-11-29	2025-02-26	Pschintu 2025-02-26	2025-02-26

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000096

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Voltimeter broken. To be repiaced on column A5

Name: Stefano Linari

Date: 2024-10-08

Signature:

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority: B PL B

3.4 Activity code: MC Mechanical Completion

3.5 Action by

Name: Stefano Linari

Date: 2024-08-02

Signature: --- Proverlis ---
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

New Voltimeter Installed.

Name: Vendor Crosswind

Date: 2024-10-02

Signature:

5 - CLEARANCE CHECK

NEW VOLTMETRO INSTALLED (SEE ATTACHED BELOW)

Name: Stefano Linari

Date: 2024-10-08

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000096

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task

1.4 Discipline Electrical

1.2 Item SG-100D1 — MV 6,6kV Switchgear

1.3 Subsystem 82-00 — MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Voltimeter broken. To be repiaced on column A5

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority B PL B

3.4 Activity code MC Mechanical Completion

3.5 Action by

Name Stefano Linari

Date 2024-08-02

Signature — Proverlis — Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

Name SIMONE VERDOLINI

M.E.S. S.p.A.
Via Vittorio, 14 - 60035 JESI
☎ 0731/211034 - Fax 0731/211055
Cod. Fisc. e P.IVA 00155630429

Date 29/03/24

Signature

5 - CLEARANCE CHECK

NEW VOLTMETRO INSTALLED

Name ROSETTI MARINO SpA
Stefano Linari
Quality Control Dept.

Date 29/03/24

Signature

6- CLEARANCE APPROVAL

Name

Date

Signature

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000097

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Track to be repiaced in TV compartment - column A5

Name: Stefano Linari

Date: 2024-10-08

Signature:

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority: B PL B

3.4 Activity code: MC Mechanical Completion

3.5 Action by

Name: Stefano Linari

Date: 2024-08-02

Signature: --- Proverlis ---
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

Track replaced.

Name: Vendor Crosswind

Date: 2024-10-02

Signature:

5 - CLEARANCE CHECK

TRACK REPLACED (SEE ATTACHED)

Name: Stefano Linari

Date: 2024-10-08

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000097

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task

1.4 Discipline Electrical

1.2 Item SG-100D1 — MV 6,6kV Switchgear

1.3 Subsystem 82-00 — MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Track to be replaced in TV compartment - column A5

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority B PL B

3.4 Activity code MC Mechanical Completion

3.5 Action by

Name Stefano Linari

Date 2024-08-02

Signature

— Proverlis —
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

Name SIMONE SAFFI

Via G. Di Vittorio, 14 – 60035 JESI
☎ 0731/211034 – Fax 0731/211055
Cod. Fisc. e P.IVA 0015563 042 8

Date 30/08/24

Signature

5 - CLEARANCE CHECK

TRACK REPLACED (see picture)

Name ROSETTI MARINO SpA
Stefano Linari
Quality Control Dept.

Date 30/08/24

Signature

6- CLEARANCE APPROVAL

Name

Date

Signature



ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000098

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Segregation plates to be installed

Name: Stefano Linari
Date: 2024-10-08
Signature:

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority: B PL B

3.4 Activity code: MC Mechanical Completion

3.5 Action by

Name: Stefano Linari
Date: 2024-08-02
Signature: --- Proverlis ---
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

Installation

Name: Vendor Crosswind
Date: 2024-10-02
Signature:

5 - CLEARANCE CHECK

INSTALLED

Name: Stefano Linari
Date: 2024-10-08
Signature:

6- CLEARANCE APPROVAL

Name:
Date:
Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000098

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task

1.4 Discipline Electrical

1.2 Item SG-100D1

MV 6,6kV Switchgear

1.3 Subsystem 82-00

MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Segregation plates to be installed

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority B PL B

Name Stefano Linari

3.4 Activity code MC Mechanical Completion

Date 2024-08-02

3.5 Action by

Signature --- Proverlis ---
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

Name SIMONE VERDOLINI

Date 29/08/24

Signature

IMES A.M.E.S.A. S.p.A.
Via G. Di Vittorio, 14 – 60035 JESI
T 0731/211034 – Fax 0731/211035
Cod. Fisc. e P.IVA 00155630429

5 - CLEARANCE CHECK

INSTALLED

Name ROSETTI MARINO SpA
Stefano Linari
Quality Control Dept.

Date 29/08/24

Signature

6- CLEARANCE APPROVAL

Name

Date

Signature

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000099

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Missing fuses 250A — column A4

Name: Stefano Linari
Date: 2024-10-10
Signature:

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Stefano Linari
3.4 Activity code	MC Mechanical Completion	Date	2024-08-02
3.5 Action by		Signature	--- Proverlis --- Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

Installed.

Name: Vendor Crosswind
Date: 2024-10-02
Signature:

5 - CLEARANCE CHECK

installed (see below)

Name: Stefano Linari
Date: 2024-10-10
Signature:

6- CLEARANCE APPROVAL

Name:
Date:
Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000099

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task

1.4 Discipline Electrical

1.2 Item SG-100D1 — MV 6,6kV Switchgear

1.3 Subsystem 82-00 — MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Missing fuses 250A — column A4

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority B PL B

3.4 Activity code MC Mechanical Completion

3.5 Action by

Name Stefano Linari

Date 2024-08-02

Signature — Proverlis — Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

Name SIMONE [illegible]

Date 29/03/24

Signature

5 - CLEARANCE CHECK

INSTALLED (see pictures)

Name ROSETTI MARINO SpA
Stefano Linari
Quality Control Dept.

Date 29/03/24

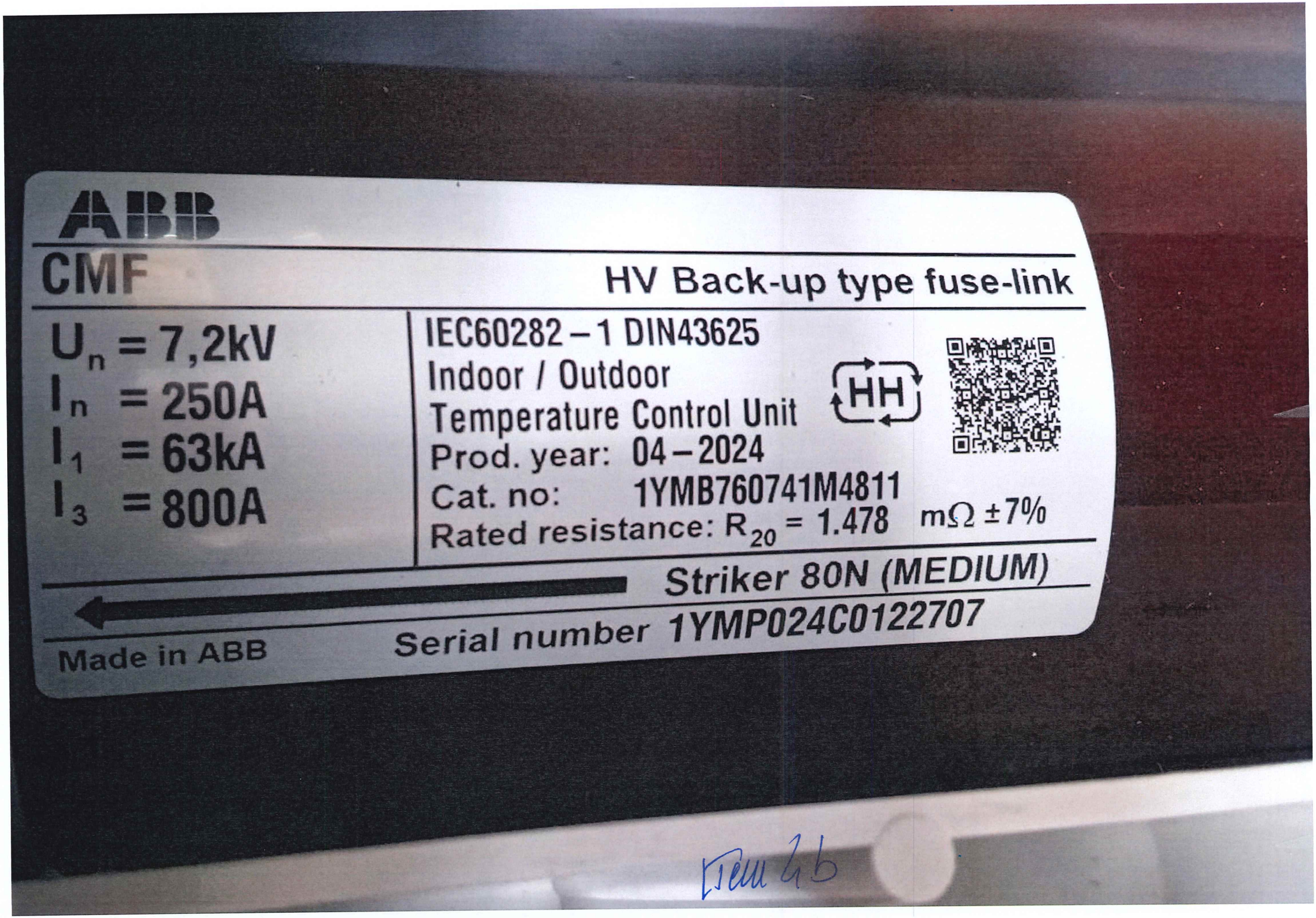
Signature

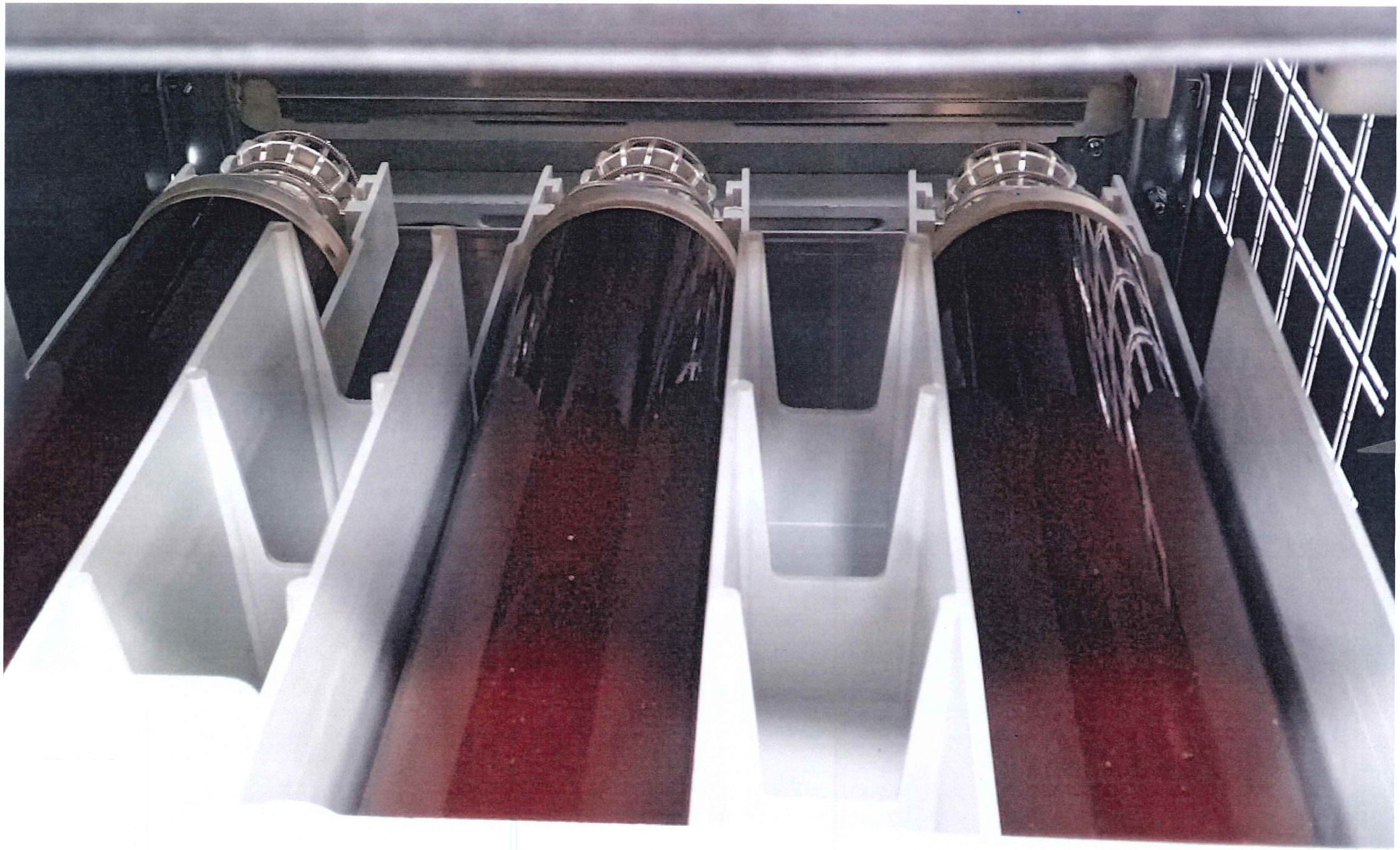
6- CLEARANCE APPROVAL

Name

Date

Signature


ABB
CMF
HV Back-up type fuse-link
U_n = 7,2kV
I_n = 250A
I_1 = 63kA
I_3 = 800A
IEC60282 – 1 DIN43625
Indoor / Outdoor
Temperature Control Unit
HH
Prod. year: 04 – 2024
Cat. no: 1YMB760741M4811
Rated resistance: R_{20} = 1.478 mΩ ±7%
Striker 80N (MEDIUM)
Made in ABB
Serial number 1YMP024C0122707



Пил. 42

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000104

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

All documentation shall be re-issued and approval in final revision after mark-up during FAT

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Stefano Linari
3.4 Activity code	MC Mechanical Completion	Date	2024-08-02
3.5 Action by		Signature	--- Proverlis --- Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

all documents marked up during FAT , has been re isssue - as built rev

Name VENDOR IMESA

Date 2024-12-05

Signature

5 - CLEARANCE CHECK

all documents marked up during FAT , has been re isssue - as built rev

Name Stefano Linari

Date 2024-12-05

Signature

6- CLEARANCE APPROVAL

Name

Date

Signature

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000108

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000864	CPX04	1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear	
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Damage on roof for columns: A1/A3/A5/A7 (see attached pictures)

Name: Stefano Linari

Date: 2024-10-10

Signature:

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal: change roof

3.2 Material required:

3.3 Priority: B PL B

3.4 Activity code: VEND Vendor

3.5 Action by:

Name: Stefano Linari

Date: 2024-08-22

Signature: --- Proverlis ---
Duplicata issued from database information
Signature is on original form

4 - PERFORMED ACTION

Problem fixed.

Name: Vendor Crosswind

Date: 2024-10-02

Signature:

5 - CLEARANCE CHECK

fixed

Name: Stefano Linari

Date: 2024-10-10

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000108

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000864	CPX04	1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear	
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Damage on roof for columns: A1/A3/A5/A7 (see attached pictures)

Name

Date

Signature

3 - DEFECT ASSESSMENT

change roof

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Stefano Linari
3.4 Activity code	VEND Vendor	Date	2024-08-22
3.5 Action by		Signature	— Proverlis — Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

Name

Date 29/08/24

Signature

IMESA S.p.A.
Via G. Di Vittorio, 14 - 60035 JESI
Tel. 0731/211034 - Fax 0731/211055
Cod. Fisc. e P.IVA 00155630429

5 - CLEARANCE CHECK

Problem Fixed
Accepted by IMESA (see pictures)

Name ROSETTI MARINO SpA
Stefano Linari
Quality Control Dept.

Date 29/08/24

Signature

6- CLEARANCE APPROVAL

Name

Date

Signature



ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000751

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000568	1.4 Discipline	Electrical
1.2 Item	84104-CEL		DC UPS DB / DC Control for 6,6 kV Switchgear Line-B
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Core identification tags are wrong on both terminations

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Andrea Andreani

Date: 2025-02-19

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000753

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000638	1.4 Discipline	Electrical
1.2 Item	83119-CEL		Lighting & Small Power DB BoP / Auxiliary 6.6kV Switchboard
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Missing core identification tags by SG-100D1 side

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-04

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000762

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10002112	1.4 Discipline	Electrical
1.2 Item	83005-CEC	LV Switchgear / 6.6KV HV Switchgear	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Core identification tags are wrong or missing on both sides

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

Changed.

Name: Giovanni Tangianu

Date: 2025-02-26

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000763

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10002111	1.4 Discipline	Electrical
1.2 Item	82013-CEC		6.6KV HV Switchgear / LV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Missing core identification tags on both sides

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

Installed.

Name: Giovanni Tangianu

Date: 2025-02-26

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000764

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10002113	1.4 Discipline	Electrical
1.2 Item	83006-CEC	LV Switchgear / 6.6KV HV Switchgear	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing cable SS tags on external routing

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-26

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000765

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10002113	1.4 Discipline	Electrical
1.2 Item	83006-CEC		LV Switchgear / 6.6KV HV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Core identification tags are missing inside SG-200N1

Name: Paolo Schintu

Date: 2024-11-22

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-22
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-04

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30000956

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10002111	1.4 Discipline	Electrical
1.2 Item	82013-CEC		6.6KV HV Switchgear / LV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Cable must be dressed properly inside and outside SG-100D1 panel

Name: Paolo Schintu
Date: 2024-11-26
Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-26
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:
Date:
Signature:

5 - CLEARANCE CHECK

Done.

Name: Giovanni Tangianu
Date: 2025-04-11
Signature:

6- CLEARANCE APPROVAL

Name:
Date:
Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001047

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000189	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-001/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing core identification tag by SG-100D1 side

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-04

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001048

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000189	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-001/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing cable tag all along the route

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Alessio Polo

Date: 2025-01-30

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001049

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000191	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-003/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing core identification tag by SG-100D1 side

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

Installed.

Name: Giovanni Tangianu

Date: 2025-05-22

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001050

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000190	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-002/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing core identification tag by SG-100D1 side

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

Installed.

Name: Giovanni Tangianu

Date: 2025-05-22

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001051

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000191	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-003/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing cable tag all along the route

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-26

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30001052

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task	C10000190	1.4 Discipline	Instrumental
1.2 Item	C-SG-100D1-002/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	
1.3 Subsystem	82-00	MV 6.6 kV Switchboard (SG-100D1)	

2 - OBSERVATION

Missing cable tag all along the route

Name: Paolo Schintu

Date: 2024-11-29

Signature:

3 - DEFECT ASSESSMENT

.

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	Paolo Schintu
3.4 Activity code	MC Mechanical Completion	Date	2024-11-29
3.5 Action by	RM_CONSTR RM	Signature	

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name:

Date:

Signature:

5 - CLEARANCE CHECK

DONE

Name: Paolo Schintu

Date: 2025-02-26

Signature:

6- CLEARANCE APPROVAL

Name:

Date:

Signature:

ROSETTI MARINO
CROSSWIND

PUNCH ITEM ENTRY / CLEARANCE FORM

C30004336

PROVERLIS

1 -ELEMENT IDENTIFICATION

1.1 Task		1.4 Discipline	Electrical
1.2 Item	SG-100D1		MV 6,6kV Switchgear
1.3 Subsystem	82-00		MV 6.6 kV Switchboard (SG-100D1)

2 - OBSERVATION

Cracked screen on EXETHERM display (see attached picture)

Name

Date

Signature

3 - DEFECT ASSESSMENT

3.1 Corrective action proposal

3.2 Material required

3.3 Priority	B PL B	Name	David Musgrove
3.4 Activity code	COMM Commissioning	Date	2025-04-28
3.5 Action by	VND Vendor	Signature	--- Proverlis --- Duplicata issued from database information Signature is on original form

4 - PERFORMED ACTION

Exertherm HMI module installed on 6.6kV SWGR SG-100D1 unit A5 has been replaced and tested with positive result on 11-July-2025.

Name Anthony Iveson

Date 2025-07-21

Signature

5 - CLEARANCE CHECK

See attached photo of new HMI module installed on SG-100D1 unit A5.

Name Anthony Iveson

Date 2025-07-21

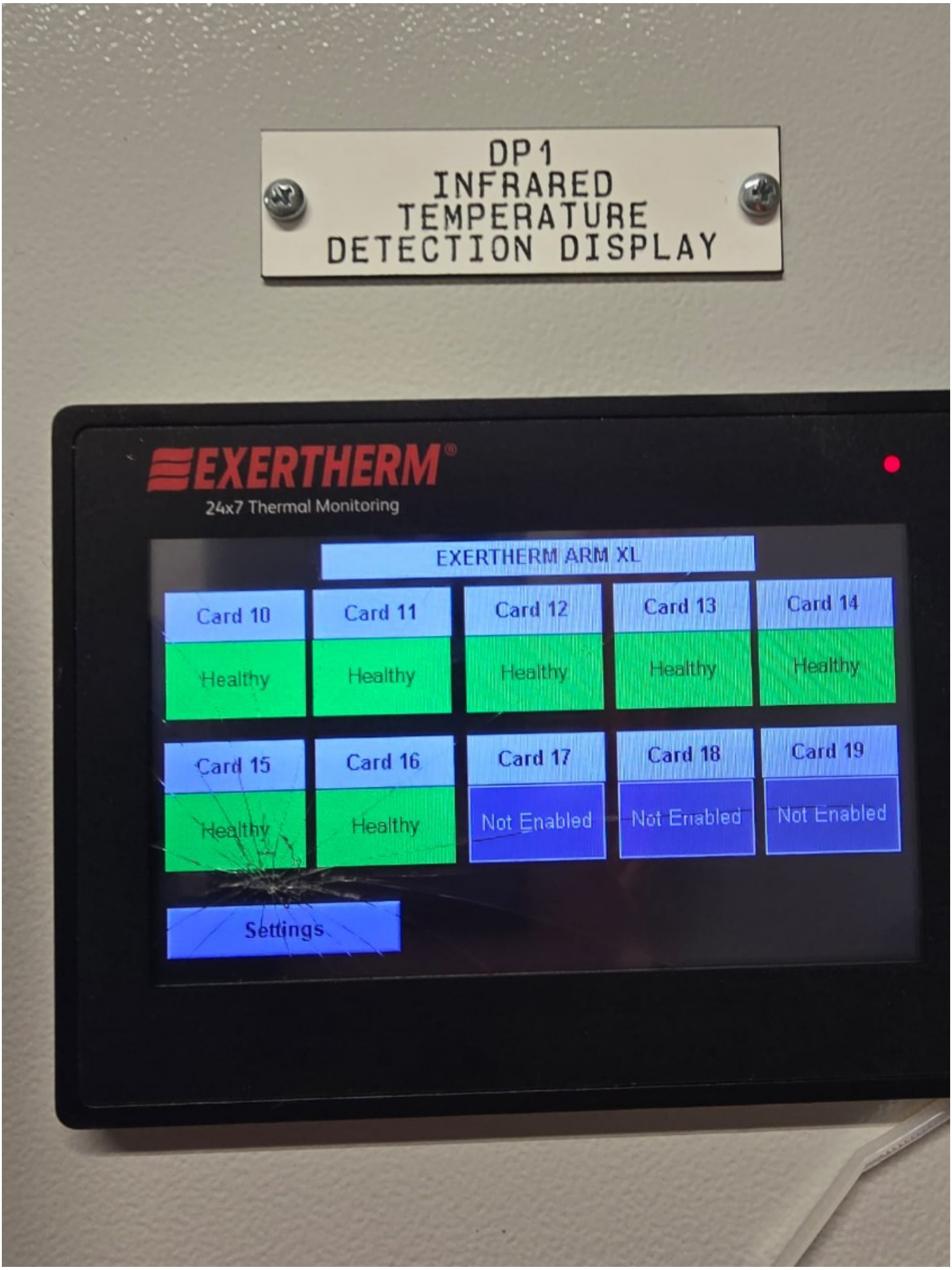
Signature

6- CLEARANCE APPROVAL

Name

Date 2025-07-21

Signature


DP1
INFRARED
TEMPERATURE
DETECTION DISPLAY
EXERTHERM
24x7 Thermal Monitoring
EXERTHERM ARM XL
Card 10
Healthy
Card 11
Healthy
Card 12
Healthy
Card 13
Healthy
Card 14
Healthy
Card 15
Healthy
Card 16
Healthy
Card 17
Not Enabled
Card 18
Not Enabled
Card 19
Not Enabled
Settings


New Exertherm module installed and tested on 11-July-2025
DANGER
MEASURING
IMESA

Section 4 FUNCTIONAL TESTS SHEETS

Section 4.1 Electrical functional test sheets index

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00 & process: COMM & discipline : E

Electrical	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
DP-200N1-Q38	AUX 6,6KV - DP-200N1-Q38	ONSHORE	C10002937	FTR-2	100	2024-10-29	RFO 1
UP-200F1-Q12	DC CONTROL 6,6KV LINE A - UP-200F1-Q12	ONSHORE	C10002935	FTR-2	100	2024-11-08	RFO 1
UP-200F1-Q13	DC CONTROL 6,6KV LINE B - UP-200F1-Q13	ONSHORE	C10002936	FTR-2	100	2024-11-08	RFO 1

ITEM	Tag	UP-200F1-Q12	: DC CONTROL 6,6KV LINE A - UP-200F1-Q12		Dwg	1724000372-EL-DG-00008	
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)		Module		
TASK	code	C10002935	Location	Onshore Activities	User	Rosetti Marino Quality Control	
FORM	Process	PRE-COMM	Activity FTS	Discipline Electrical	Form	FTR-2	Protection Relay

FTR2 - Protection relay
Record sheet

RELAY DATA

Manufacturer:	ABB	Serial N°:	NA	Relay type:	NA
Auxiliary supply:	NA	Location:	B100	Cubicle:	NA
Switchboard:	UP-200F1				

Current transformers

Tag	Number of	Ratio	Location

Voltage transformers

Tag	Number of	Ratio	Location

Test result (refer to manufacturer's procedure)

ANSI function	Setting	Injection	Trip value	Time delay Setting	Time delay Trip value
I	16A	NA	NA	FIXED	NA

Testing & measurement instruments used

Type	Serial n°	Calibration certificate	Validity
FLUKE 1663	5380144	7727/24	08/07/2025

Comments:

Page 1/1	Performed by	☐ WITNESS ☉ REVIEW	☐ WITNESS ☐ REVIEW
Company	RM COMM	RM COMM	CPY NOT PRESENT
Name	Davide Zucconelli	Kristian Castellani	Witness waived
Date	2024-11-08	2024-11-08	2024-11-08
Signature	PROVERLIS Digitaly signed by Davide Zucconelli 2024-11-08T10:29:18.241Z	PROVERLIS Digitaly signed by Kristian Castellani 2024-11-08T15:08:23.307Z	PROVERLIS Digitaly signed by Witness waived 2024-11-08T16:25:39.613Z

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+REC1
UP-200F1 A

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1
THERMOSTAT 100º

-PR2-TH2
THERMOSTAT 90º

-PR1-TH1
THERMOSTAT 100º

-PR1-TH2
THERMOSTAT 90º

Charger
100A 12Pulses

-Z1
0/450V

-X1
L1
70 mm²
4G16 mm2
unamoured cable

MAINS
3x400Vac 50Hz -50kA

L1;L2;3;PE

-Q1
50A

-T1
110V/100A
019.6KVA

-PR2
TPC

-PR1
TPC

-A320
INTERFACE

-R2
100mV
130A

-C1
3x6800µF
160V
Filtering 1%

-F1
NH00
125A

-V21
100A

-Q2
160A

-R3
100mV
130A

-Q3
160A

BATTERY
110Vdc
-X3
+/-
70 mm²

Battery
symmetry
-X31
+/-
4 mm²

-A10
BATTERY SIMMETRY
FAULT

+BP
BATTERY PROTECTION

2 (1x25) mm2

-F100
Plastic
box 80*80

+BAT

-L+/-
2P 125A
BUS BAR
110 VDC

-Q10
50A-C
-X2 1+/1
16 mm²
3G16 mm2
amoured cable
(+REC1-A1 /1.4) / SD1

-SD1

CP-100F1
DC CONTROL 66kV G/S
LINE A-5.2KW

-Q11
20A-C
-X2 2+/2
16 mm²
3G16 mm2
amoured cable
(+REC2-A1 /1.4) / SD2

-SD2

CP-100F1
DC CONTROL 66kV G/S
LINE B-2KW

-Q12
16A-C
-X2 3+/3
16 mm²
3G16 mm2
amoured cable

SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE A-1KW

-Q13
16A-C
-X2 4+/4
16 mm²
3G16 mm2
amoured cable

SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE B-1KW

-Q14
50A-C
-X2 5+/5
16 mm²

SPARE 5,5KW

-Q15
20A-C
-X2 6+/6
16 mm²

SPARE 2KW

-Q16
16A-C
-X2 7+/7
16 mm²

SPARE 1KW

-F10/F11
DEHNguard

-A21
EARTH +/-

-A1
GCAU
CONTROL UNIT

-A5.1
Relays

-CR1-X5

-A71

-A300
DISPLAY

-A310
KEY PAD

-A73
MODBUS-TCP/IP

-A8
Isolated

SD1 / (+BAT-SD1 /1.8)

-KF
PSR-SCP- 24DC / SIL3

-Z2
400V

INTERCONNECTION
50 mm²
-X6
PH4 35 mm²

-X8
4 mm²
CHARGERS
INTERCONNECTION
2,5 mm²

AUXILIARY SUPPLY
230Vac-50Hz

-X7
L/N
6 mm²
3G2.5 mm2
unamoured cable

-Q6
02A-C

-Q7
02A-C

-H3

-THF4
0/60ºC

-E50
100W

+REC2
UP-200F1 B

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1
THERMOSTAT 100º

-PR2-TH2
THERMOSTAT 90º

-PR1-TH1
THERMOSTAT 100º

-PR1-TH2
THERMOSTAT 90º

-A8
(+REC1-CR1-J13:1 /1.4)

Charger
100A 12Pulses

-Z1
0/450V

-X1
L1
70 mm²
4G16 mm2
unamoured cable

MAINS
3x400Vac 50Hz -50kA

L1;L2;L3;PE

-Q1
50A

-T1
110V/100A
019.6KVA

-PR2
TPC

-PR1
TPC

-A320
INTERFACE

-R2
100mV
130A

-C1
3x6800µF
160V
Filtering 1%

-F1
NH00
125A

-V21
100A

-Q2
160A

2,5 mm²

-A1
GCAU
CONTROL UNIT

-A5.1
Relays

-CR1-X5

-A71

-A300
DISPLAY

-A310
KEY PAD

-A73
MODBUS-TCP/IP

-A8
Isolated

SD2 / (+BAT-SD2 /1.8)

A8 / (+REC2-X8 /1.4)

-A10
BATTERY SIMMETRY
FAULT

Battery
symmetry
-X31
+/-
4 mm²

AUXILIARY SUPPLY
230Vac-50Hz

-X7
L/N
6 mm²

-Q6
02A-C

-Q7
02A-C

-H3

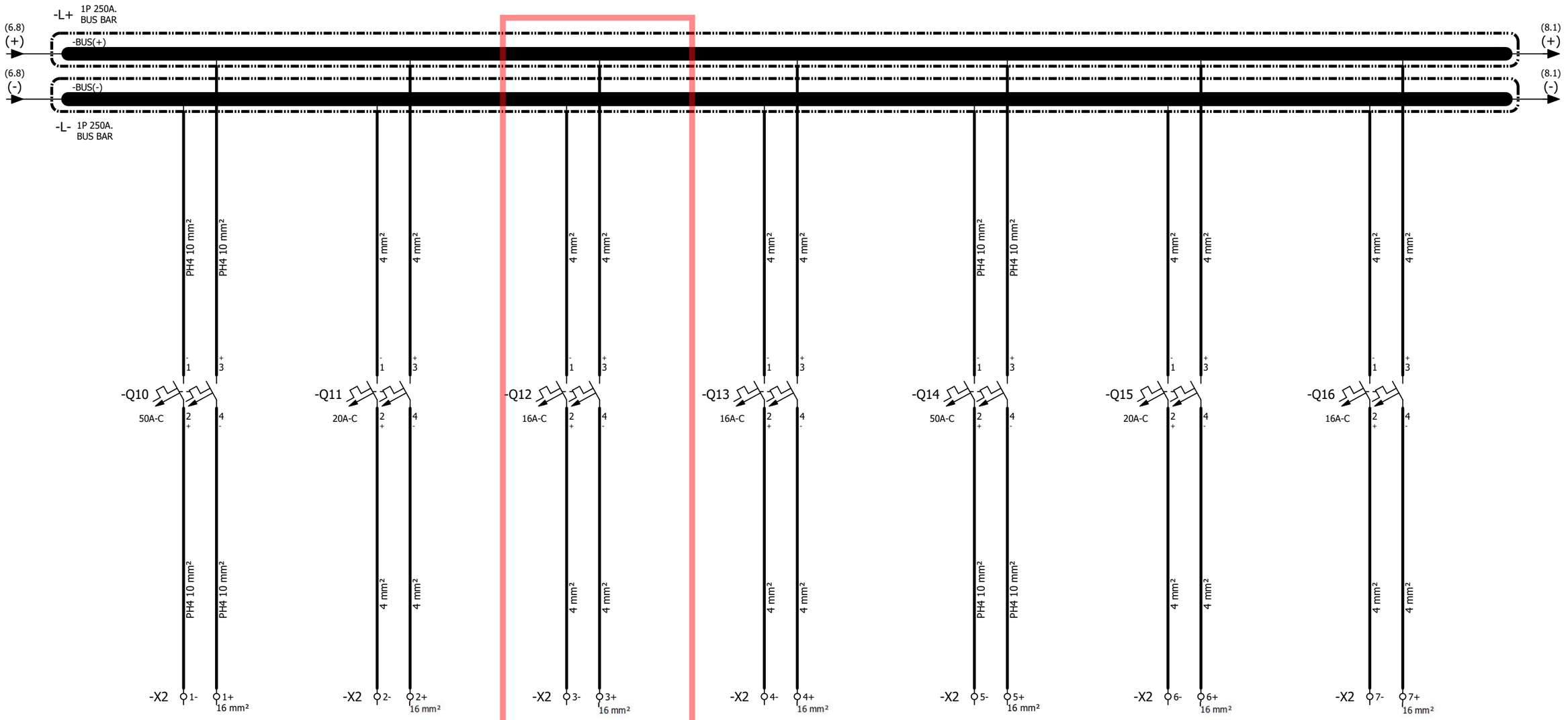
-THF4
0/60ºC

-E50
100W

ES21464

				Date	21/03/2024	3W POWER S.P.A.	AEG POWER SOLUTIONS	Single-line	1724000372-EL-DG-00006	= System
				Editor	EBM	Hollandse Kust Noord (HKN) wind farm				+ 8 / 47
				Checked	JOP			System		& EFA
Stat	Alteration	Date	Name	Standard					ES521464 en	A3 Sheet / Sheets 1

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	-Q10	-Q11	-Q12	-Q13	-Q14	-Q15	-Q16
SUPPLIED FROM	-Q10	-Q11	-Q12	-Q13	-Q14	-Q15	-Q16
RATING	50A-C	20A-C	16A-C	16A-C	50A-C	20A-C	16A-C
MAXIMUM CROSS-SECTION	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
AUXILIARY CONTACT	98 96 95 (/8.5)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)
FUNCTION	CP-100F1 DC CONTROL 66kV G/S LINE A-5.2KW	CP-100F1 DC CONTROL 66kV G/S LINE B-2KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE A-1KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE B-1KW	SPARE 5,5KW	SPARE 2KW	SPARE 1KW

ES521464

				Date	21/03/2024	3W POWER S.P.A.	AEG POWER SOLUTIONS	Distribution Rectifier 1 System	= System
				Editor	EBM	Hollandse Kust Noord (HKN) wind farm			+ REC1 20 / 49
				Checked	JOP				& EFS Sheet 7
Stat	Alteration	Date	Name	Standard				ES521464 en	A3 Sheets 13

S300P
Data sheet



System pro *M* compact®
S300P miniature circuit breakers comply with IEC/EN 60947-2, IEC/EN 60898-1, UL 1077 and CSA 22.2 No. 235, protecting the installation in commercial and industrial applications by supporting a breaking capacity of 25 kA.

—
01

—
01
S300P
Miniature Circuit Breaker

S300P MCB is designed to be used in installations where high breaking capacities are required to protect against short-circuits and overloads.

S300P is compliant to the product standards
IEC/EN 60947-2
IEC/EN 60898-1
UL 1077
CSA 22.2 No.235
and features the following main technical characteristics:

- Rated nominal current: 0.2 A ... 63 A
- Characteristic: B, C, D, K, Z
- Pole variant: 1, 2, 3, 4, 1+N, 3+N
- Rated breaking capacity I_{cu}: 25 kA; 100 kA (≤ 6 A)
- Rated operational voltage U_e: 240/415 V AC
- Rated impulse withstand voltage U_{imp}: 6 kV

Application benefits

- Integrated trip indicator for clear signalization of tripping events on site
- Dual DIN-Rail release for fast and easy installation
- Fully compatible with whole range of System pro *M* compact® accessories supporting lots of different functions
- Quick and easy product identification by QR-code along with direct access to the ABB product database
- Terminals equipped with fail safe feature to avoid improper installation
- Supply possible from top or bottom and in parallel with cables and busbars thanks to terminals composed by two different openings
- Excellent technical performance to ensure safety and protection of installation and personal
- Certified quality and compliance according to worldwide product standards

S300P
Technical data



S300P

		S300P
General Data	Standards	IEC/EN 60947-2, IEC/EN 60898-1, UL 1077, CSA 22.2 No. 235
	Poles	1P, 2P, 3P, 4P, 1+N, 3+N
	Tripping characteristics	B, C, D, K, Z
	Rated current I_n	6…63 A (B-curve), 0.5…63 A (C-, D-, Z-curve), 0.2…63 A (K-curve)
	Rated frequency f	50 / 60 Hz, DC
	Rated insulation voltage U_i acc. to IEC/EN 60664-1	500 V AC
	Overvoltage category	IV
	Pollution degree	3
Data acc. to IEC/EN 60947-2	Tripping Characteristics	B, C, D, K, Z
	Rated operational voltage U_e	1P, 1+N: 240 V AC, 72 V DC 2P: 415 V AC, 125 V DC 3P, 3+N, 4P: 415 V AC
	Max. power frequency recovery voltage U_{max}	1P, 1+N: 264 V AC, 72 V DC 2P, 3P, 3+N, 4P: 462 V AC, 125 V DC
	Min. operating voltage	12 V AC – 12 V DC
	Rated ultimate short-circuit breaking capacity I_{cu}	25 kA; 100 kA (≤ 6 A)
	Rated service short-circuit breaking capacity I_{cs}	12.5 kA (≤ 25 A); 10 kA (32-40 A); 7.5 kA (>40 A)
	Rated impulse withstand voltage U_{imp} (1.2/50 µs)	6 kV
	Reference temperature for tripping characteristics	55 °C (B-, C-, D-curve), 40 °C (K-, Z-curve)
	Electrical endurance	I_n < 32 A: 20,000 ops. (AC), I_n ≥ 32 A: 10,000 ops. (AC); 1,500 ops. (DC)
Data acc. to IEC/EN 60898-1	Tripping Characteristics	B, C, D
	Rated operational voltage U_n	1P: 240/415 V AC, 72 V DC 1+N: 240 V AC, 72 V DC 2P: 415 V AC, 125 V DC 3P, 3P+N, 4P: 415 V AC
	Max. power frequency recovery voltage U_{max}	1P, 1+N: 264 V AC, 72 V DC 2P, 3P, 3+N, 4P: 457 V AC, 125 V DC
	Min. operating voltage	12 V AC – 12 V DC
	Rated short-circuit capacity I_{cn}	25 kA (≤ 25 A), 20 kA (32 - 40 A), 15 kA (> 40 A)
	Dielectric test voltage	2.0 kV (50/60 Hz, 1 min)
	Reference temperature for tripping characteristics	30 °C
	Electrical endurance	I_n < 32 A: 20,000 ops. (AC), I_n ≥ 32 A: 10,000 ops. (AC); 1,000 ops. (DC)
Data acc. to UL1077 / CSA 22.2 No. 235	Tripping Characteristics	B, C, D, K, Z
	Rated voltage	1P: 277 V AC, 60 V DC 2...4P: 480Y/277 V AC, 125 V DC (2 poles in series)
	Rated interrupting capacity	10 kA
	Application Suppl. prot., for general use.	TC2, OL0, SC:U1
	Reference temperature for tripping characteristics	40 °C
	Electrical endurance	6,000 ops., 1 cycle (1s.-ON, 9s.-OFF)

S300P
Mechanical data

		S300P
Mechanical Data	Housing	Insulation group I, RAL 7035
	Toggle	Insulation group II, black, sealable
	Contact position indication	Real CPI (green OFF / red ON)
	Trip position indicator	TPI (grey NO TRIP / orange TRIP)
	Protection degree acc. to DIN EN 60529	IP20, IP40 in enclosure with cover
	Mechanical endurance	20,000 ops.
	Shock resistance acc. to IEC/EN 60068-2-27	25 g - 2 shocks - 13 ms
	Vibration resistance acc. to IEC/EN 60068-2-6	5 g - 20 cycles at 5 ... 150 ... 5 Hz at 0.8 I_n
	Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30	28 cycles with 55 °C/90-96 % and 25 °C/95-100 %
	Ambient temperature	-40 ... +70 °C
	Storage temperature	-50 ... +70 °C
Installation	Terminal	Failsafe bi-directional cylinder-lift terminal
	Cross-section of conductors (top/bottom)	solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 14 – 4 AWG
	Cross-section of busbars (top/bottom)	10 mm² / 10 mm² 14 – 8 AWG
	Torque	2.8 Nm; 18 in-lbs.
	Screw driver	No. 2 Pozidrive
	Mounting	on DIN rail 35 mm, acc. to EN 60715 by dual DIN-rail release
	Mounting position	any
	Supply	any
Dimensions and weight	Mounting dimensions acc. to DIN 43880	1
	Pole dimensions (H x D x W)	88 x 69 x 17.5 mm
	Pole weight approx.	124 g
Combination with auxiliary elements	Auxiliary contact	Yes
	Bottom fixed auiliary contact	Yes
	Signal contact	Yes
	Shunt trip	Yes
	Undervoltage release	Yes
	Motor operating device	Yes
Standards	IEC/EN 60947-2	
	IEC/EN 60898-1	
	UL 1077	
	CSA 22.2. No.235	
	GB/T 14048.2	
	GB/T 10963.1	

Approvals

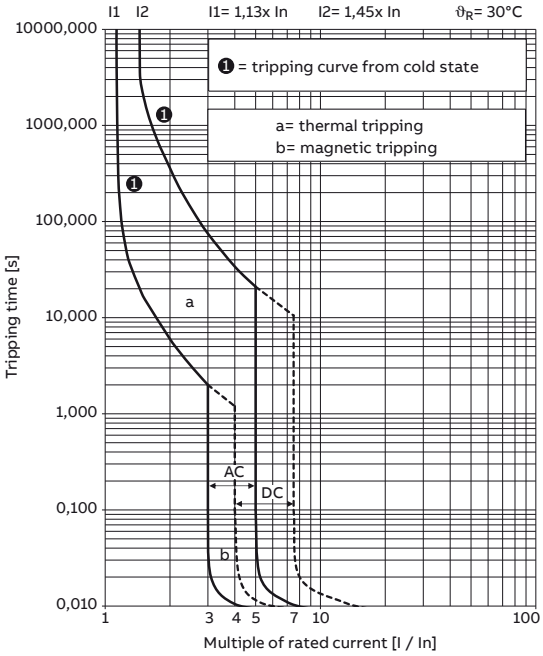
- VDE - DE
- UL 1077 - US
- CSA 22.2 No.235 - CA
- CCC - PRC
- EAC - RU
- KEMA - NL
- IMQ - IT
- SII - IL
- S+ - CH
- ÖVE - AT
- NF - FR
- EZU - CZ
- ANCE - MX
- KC - KR
- UKCA - UK
- DNV - NO
- GL - DE
- LRS - UK
- RINA - IT

Miniature Circuit breakers S300P

Tripping characteristics

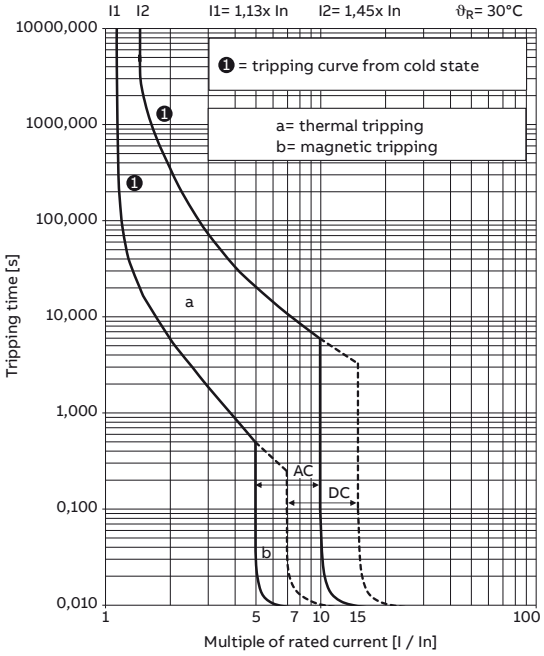
MCB Type S300P - B (3 ... 5 x I_n AC)

Tripping Characteristic IEC/EN 60898-1



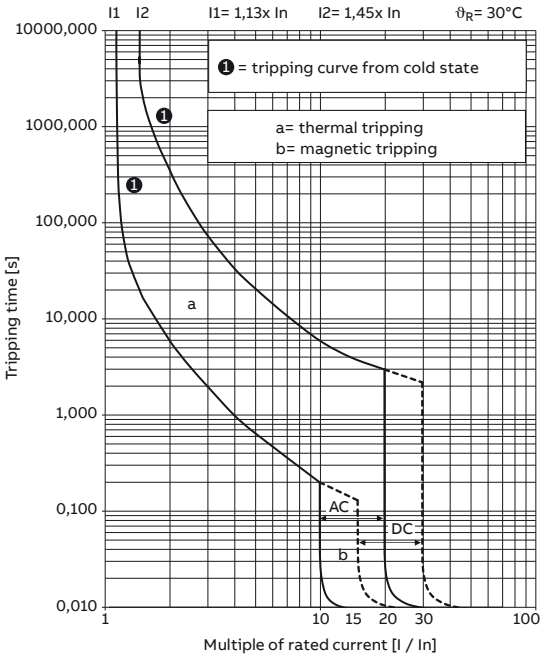
MCB Type S300P - C (5 ... 10 x I_n AC)

Tripping Characteristic IEC/EN 60898-1

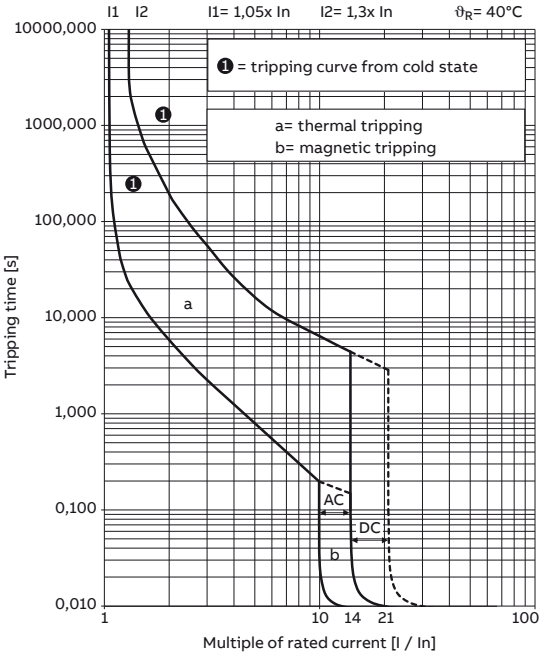


MCB Type S300P - D (10 ... 20 x I_n AC)

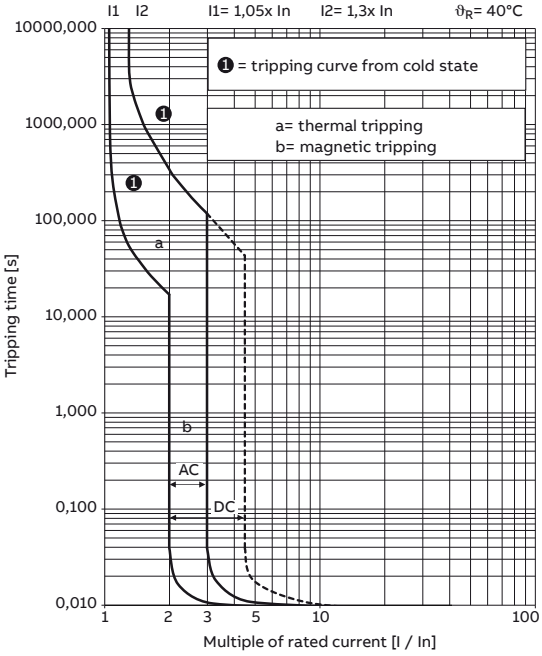
Tripping Characteristic IEC/EN 60898-1



MCB Type S300P - K (10 ... 14 x I_n AC)
Tripping Characteristic IEC/EN 60947-2



MCB Type S300P - Z (2 ... 3 x I_n AC)
Tripping Characteristic IEC/EN 60947-2



Tripping characteristics S300P

Acc. to	Tripping characteristics	Rated current	Thermal release [2]			Electromagnetic release [1]		
			Currents:		Tripping time	Currents:		Tripping time
			conventional non-tripping current	conventional tripping current		hold current surges	trip at least at	
IEC/EN 60898-1	B	06 to 63 A	1.13 · I_n		> 1 h	3 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		5 · I_n	< 0.1 s
	C	0.5 to 63 A	1.13 · I_n		> 1 h	5 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		10 · I_n	< 0.1 s
	D	0.5 to 63 A	1.13 · I_n		> 1 h	10 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		20 · I_n	< 0.1 s
IEC/EN 60947-2	K	0.2 to 63 A	1.05 · I_n		> 1 h	10 · I_n		> 0.2 s
				1.3 · I_n	< 1 h [3]		14 · I_n	< 0.2 s
	Z	0.5 to 63 A	1.05 · I_n		> 1 h	2 · I_n		> 0.2 s
				1.3 · I_n	< 1 h [3]		3 · I_n	< 0.2 s

[1] The indicated electromagnetic tripping values apply to a frequency range of 16 2/3... 60 Hz. For different network frequencies or direct current the values change according to the multipler in the table below
[2] The thermal releases are calibrated to a nominal reference ambient temperature; for Z and K, the value is 40 °C, for B, C and D is 30 °C. In the case of higher ambient temperatures, the current values fall by ca. 6 % for each 10 K temperature rise.
[3] As from operating temperature (after I_1 > 1 h or, as applicable, 2 h).

	AC			DC
	100 Hz	200 Hz	400 Hz	
Multiplier	1.1	1.2	1.5	1.5

The thermal tripping performance is independent from the network frequency.

Miniature Circuit breakers S300P

Derating

For installations of miniature circuit breakers at other temperatures than the reference value and installations of several miniature circuit breakers directly side by side, derating factors have to be considered.

Deviating ambient temperature

The rated value of the current of a miniature circuit breaker refers to a temperature of 40 °C for circuit-breakers with characteristics K and Z and 30 °C for characteristics B, C and D. The following table contains the derating of load capability of S300P MCBs with temperature from -40 °C to 70 °C for the curves B, C, D, K, and Z.

Tripping characteristic	Rated Current I_n (A)	Max. Operating currents depending on the ambient temperature T (°C)											
		-40	-30	-20	-10	0	10	20	30	40	50	60	70
B. C and D	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
	1	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9
	1.6	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4
	2	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.8
	3	3.6	3.5	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
	4	4.8	4.7	4.6	4.5	4.4	4.2	4.1	4.0	3.9	3.8	3.6	3.5
	6	7.3	7.1	6.9	6.7	6.5	6.4	6.2	6.0	5.8	5.6	5.5	5.3
	8	9.7	9.4	9.2	9.0	8.7	8.5	8.2	8.0	7.8	7.5	7.3	7.0
	10	12.1	11.8	11.5	11.2	10.9	10.6	10.3	10.0	9.7	9.4	9.1	8.8
	13	15.5	15.5	15.0	14.5	14.0	14.0	13.5	13.0	12.5	12.0	12.0	11.5
	16	19.5	19.0	18.5	18.0	17.5	17.0	16.5	16.0	15.5	15.0	14.5	14.0
	20	24.0	23.5	23.0	22.5	22.0	21.0	20.5	20.0	19.5	19.0	18.0	17.5
	25	30.5	29.5	29.0	28.0	27.5	26.5	26.0	25.0	24.5	23.5	23.0	22.0
	32	38.5	38.0	37.0	36.0	35.0	34.0	33.0	32.0	31.0	30.0	29.0	28.0
	40	48.5	47.0	46.0	45.0	43.5	42.5	41.0	40.0	39.0	37.5	36.5	35.0
	50	60.5	59.0	57.5	56.0	54.5	53.0	51.5	50.0	48.5	47.0	45.5	44.0
	63	76.0	74.5	72.5	70.5	68.5	67.0	65.0	63.0	61.0	59.0	57.5	55.5
K and Z	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4
	0.75	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7
	1	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9
	1.6	2.1	2.1	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4
	2	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8
	3	4.0	3.9	3.7	3.6	3.5	3.3	3.2	3.1	3.0	2.9	2.8	2.7
	4	5.3	5.2	5.0	4.8	4.6	4.5	4.3	4.1	4.0	3.9	3.7	3.6
	6	8.0	7.7	7.5	7.2	6.9	6.7	6.5	6.2	6.0	5.8	5.6	5.4
	8	10.7	10.3	9.9	9.6	9.3	8.9	8.6	8.3	8.0	7.7	7.4	7.1
	10	13.4	12.9	12.4	12.0	11.6	11.2	10.8	10.4	10.0	9.6	9.3	8.9
	13	17.5	17.0	16.0	15.5	15.0	14.5	14.0	13.5	13.0	12.5	12.0	11.5
	16	21.5	20.5	20.0	19.0	18.5	18.0	17.0	16.5	16.0	15.5	15.0	14.5
	20	26.5	26.0	25.0	24.0	23.0	22.5	21.5	20.5	20.0	19.5	18.5	18.0
	25	33.5	32.0	31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.5
	32	43.0	41.5	40.0	38.5	37.0	35.5	34.5	33.0	32.0	31.0	29.5	28.5
	40	53.5	51.5	49.5	48.0	46.5	44.5	43.0	41.5	40.0	38.5	37.0	35.5
	50	67.0	64.5	62.0	60.0	58.0	56.0	54.0	52.0	50.0	48.0	46.5	44.5
	63	84.5	81.0	78.5	75.5	73.0	70.5	67.5	65.5	63.0	60.5	58.5	56.5

Influence of adjacent devices

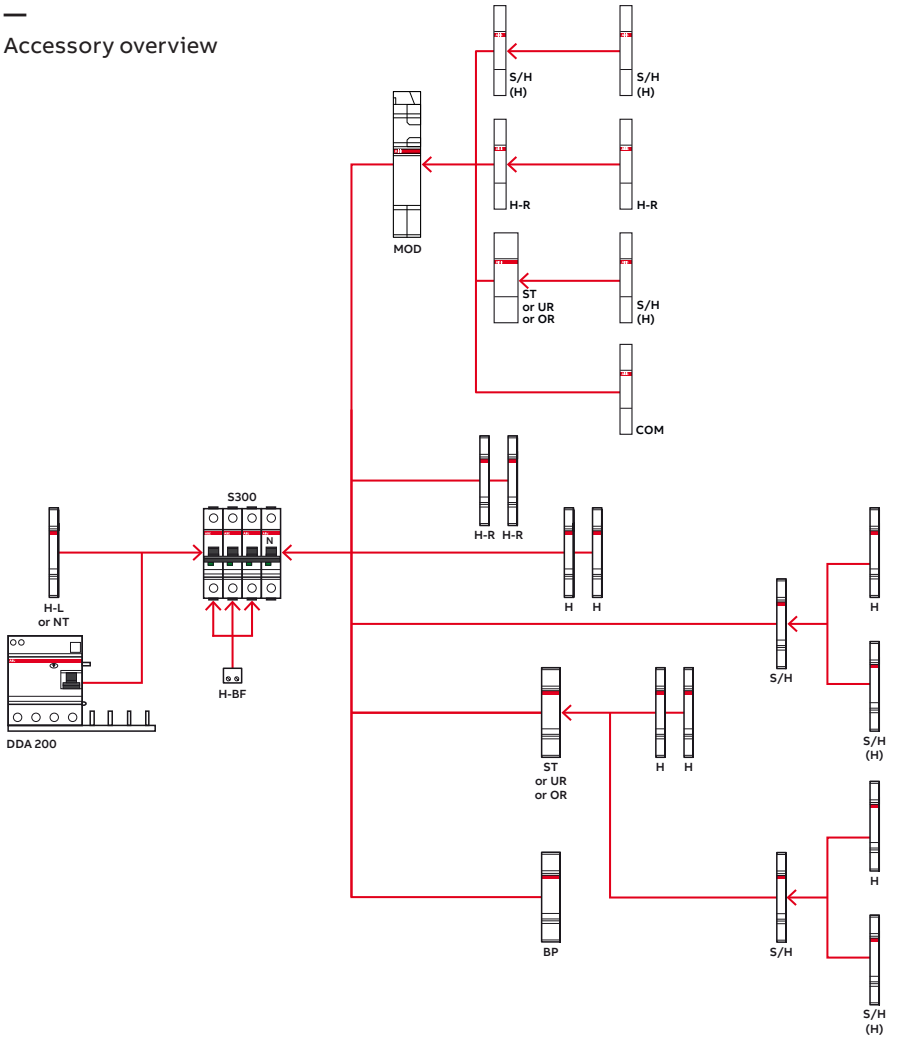
If several miniature circuit breakers are installed directly side by side with high load on all poles, a correction factor must be applied to the rated current (see table). If distance pieces are used, the factor is not to be considered.

No. of adjacent devices	Factor F
1	1
2.3	0.9
4.5	0.8
≥ 6	0.75

Miniature Circuit breakers S300P

Accessories and dimensional drawings

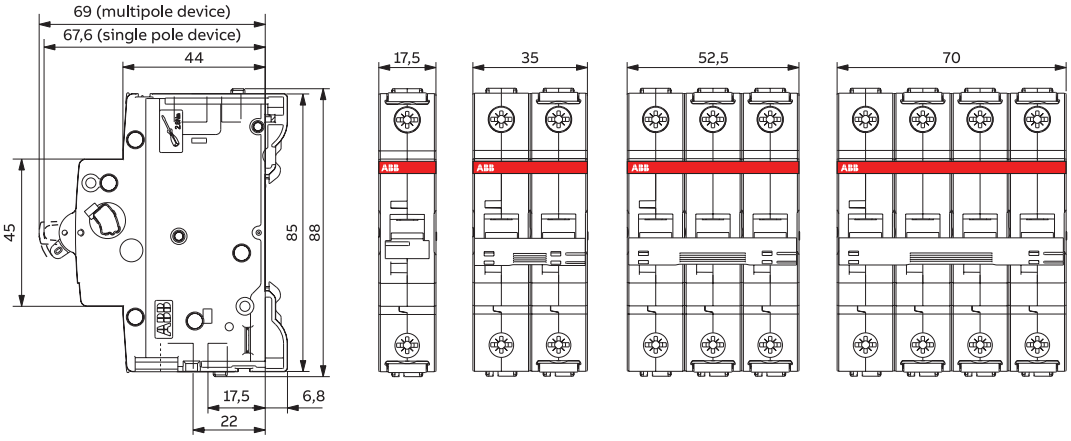
Accessory overview



H	Auxiliary contact (change-over contact)	S2C-H6R	H-L	Auxiliary contact	S2C-H..L
H-R	Auxiliary contact	S2C-H6-..R	H-BF	Auxiliary contact for bottom fitting (1 per pole)	S2C-H01 S2C-H10
S/H	Signal/Auxiliary contact used as auxiliary contact	S2C-S/H6R	BP	Mechanical tripping device	S2C-BP
			NT	Neutral disconnector	S2C-NT..
ST	Shunt trip	S3C-A..	MOD (1)	Motor operating device	S3C-MOD
UR	Undervoltage release	S2C-UA	COM	ModBus Interface	eMOD/AR ModBus
OR	Overvoltage release	S2C-OVP			
DDA 200	RCD-block	DDA 20..			

(1) In case of using S300 with DDA 200, MOD does not operate in case of earth-voltage fault

Dimensional drawing



Miniature Circuit breakers S300P

B characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	6	9080583	S301P-B6	2CDS381001R0065	0.124	10
	8	9086011	S301P-B8	2CDS381001R0085	0.124	10
	10	9080521	S301P-B10	2CDS381001R0105	0.124	10
	13	9080484	S301P-B13	2CDS381001R0135	0.124	10
	16	9080439	S301P-B16	2CDS381001R0165	0.124	10
	20	9080392	S301P-B20	2CDS381001R0205	0.124	10
	25	9080347	S301P-B25	2CDS381001R0255	0.124	10
	32	9080255	S301P-B32	2CDS381001R0325	0.124	10
	40	9080187	S301P-B40	2CDS381001R0405	0.124	10
	50	9080064	S301P-B50	2CDS381001R0505	0.124	10
	63	9079938	S301P-B63	2CDS381001R0635	0.124	10
2	6	9078993	S302P-B6	2CDS382001R0065	0.248	5
	8	9086059	S302P-B8	2CDS382001R0085	0.248	5
	10	9078931	S302P-B10	2CDS382001R0105	0.248	5
	13	9078894	S302P-B13	2CDS382001R0135	0.248	5
	16	9078849	S302P-B16	2CDS382001R0165	0.248	5
	20	9078801	S302P-B20	2CDS382001R0205	0.248	5
	25	9078757	S302P-B25	2CDS382001R0255	0.248	5
	32	9078665	S302P-B32	2CDS382001R0325	0.248	5
	40	9078597	S302P-B40	2CDS382001R0405	0.248	5
	50	9078474	S302P-B50	2CDS382001R0505	0.248	5
	63	9078344	S302P-B63	2CDS382001R0635	0.248	5
3	6	9078191	S303P-B6	2CDS383001R0065	0.372	1
	8	9086073	S303P-B8	2CDS383001R0085	0.372	1
	10	9078139	S303P-B10	2CDS383001R0105	0.372	1
	13	9078092	S303P-B13	2CDS383001R0135	0.372	1
	16	9078047	S303P-B16	2CDS383001R0165	0.372	1
	20	9078009	S303P-B20	2CDS383001R0205	0.372	1
	25	9077958	S303P-B25	2CDS383001R0255	0.372	1
	32	9077866	S303P-B32	2CDS383001R0325	0.372	1
	40	9077798	S303P-B40	2CDS383001R0405	0.372	1
	50	9077675	S303P-B50	2CDS383001R0505	0.372	1
	63	9077545	S303P-B63	2CDS383001R0635	0.372	1

Miniature Circuit breakers S300P

B characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	6	9076593	S304P-B6	2CDS384001R0065	0.496	1
	8	9086110	S304P-B8	2CDS384001R0085	0.496	1
	10	9076531	S304P-B10	2CDS384001R0105	0.496	1
	13	9076494	S304P-B13	2CDS384001R0135	0.496	1
	16	9076449	S304P-B16	2CDS384001R0165	0.496	1
	20	9135559	S304P-B20	2CDS384001R0205	0.496	1
	25	9076357	S304P-B25	2CDS384001R0255	0.496	1
	32	9076265	S304P-B32	2CDS384001R0325	0.496	1
	40	9076197	S304P-B40	2CDS384001R0405	0.496	1
	50	9076074	S304P-B50	2CDS384001R0505	0.496	1
	63	9075947	S304P-B63	2CDS384001R0635	0.496	1
1+N	6	9079785	S301P-B6NA	2CDS381103R0065	0.248	5
	8	9086035	S301P-B8NA	2CDS381103R0085	0.248	5
	10	9079730	S301P-B10NA	2CDS381103R0105	0.248	5
	13	9079693	S301P-B13NA	2CDS381103R0135	0.248	5
	16	9079648	S301P-B16NA	2CDS381103R0165	0.248	5
	20	9079600	S301P-B20NA	2CDS381103R0205	0.248	5
	25	9079556	S301P-B25NA	2CDS381103R0255	0.248	5
	32	9079464	S301P-B32NA	2CDS381103R0325	0.248	5
	40	9079396	S301P-B40NA	2CDS381103R0405	0.248	5
	50	9079273	S301P-B50NA	2CDS381103R0505	0.248	5
	63	9079143	S301P-B63NA	2CDS381103R0635	0.248	5
3+N	6	9077392	S303P-B6NA	2CDS383103R0065	0.496	1
	8	9086097	S303P-B8NA	2CDS383103R0085	0.496	1
	10	9077330	S303P-B10NA	2CDS383103R0105	0.496	1
	13	9077293	S303P-B13NA	2CDS383103R0135	0.496	1
	16	9077248	S303P-B16NA	2CDS383103R0165	0.496	1
	20	9135641	S303P-B20NA	2CDS383103R0205	0.496	1
	25	9077156	S303P-B25NA	2CDS383103R0255	0.496	1
	32	9077064	S303P-B32NA	2CDS383103R0325	0.496	1
	40	9076999	S303P-B40NA	2CDS383103R0405	0.496	1
	50	9076876	S303P-B50NA	2CDS383103R0505	0.496	1
	63	9076746	S303P-B63NA	2CDS383103R0635	0.496	1

Miniature Circuit breakers S300P

C characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9079891	S301P-C0.5	2CDS381001R0984	0.124	10
	1	9080675	S301P-C1	2CDS381001R0014	0.124	10
	1.6	9079914	S301P-C1.6	2CDS381001R0974	0.124	10
	2	9080651	S301P-C2	2CDS381001R0024	0.124	10
	3	9080637	S301P-C3	2CDS381001R0034	0.124	10
	4	9080613	S301P-C4	2CDS381001R0044	0.124	10
	6	9080590	S301P-C6	2CDS381001R0064	0.124	10
	8	9080569	S301P-C8	2CDS381001R0084	0.124	10
	10	9080538	S301P-C10	2CDS381001R0104	0.124	10
	13	9080491	S301P-C13	2CDS381001R0134	0.124	10
	16	9080446	S301P-C16	2CDS381001R0164	0.124	10
	20	9080408	S301P-C20	2CDS381001R0204	0.124	10
	25	9080354	S301P-C25	2CDS381001R0254	0.124	10
	32	9080262	S301P-C32	2CDS381001R0324	0.124	10
	40	9080194	S301P-C40	2CDS381001R0404	0.124	10
	50	9080071	S301P-C50	2CDS381001R0504	0.124	10
	63	9079945	S301P-C63	2CDS381001R0634	0.124	10
2	0.5	9078306	S302P-C0.5	2CDS382001R0984	0.248	5
	1	9079082	S302P-C1	2CDS382001R0014	0.248	5
	1.6	9078320	S302P-C1.6	2CDS382001R0974	0.248	5
	2	9079068	S302P-C2	2CDS382001R0024	0.248	5
	3	9079044	S302P-C3	2CDS382001R0034	0.248	5
	4	9079020	S302P-C4	2CDS382001R0044	0.248	5
	6	9079006	S302P-C6	2CDS382001R0064	0.248	5
	8	9078979	S302P-C8	2CDS382001R0084	0.248	5
	10	9078948	S302P-C10	2CDS382001R0104	0.248	5
	13	9078900	S302P-C13	2CDS382001R0134	0.248	5
	16	9078856	S302P-C16	2CDS382001R0164	0.248	5
	20	9078818	S302P-C20	2CDS382001R0204	0.248	5
	25	9078764	S302P-C25	2CDS382001R0254	0.248	5
	32	9078672	S302P-C32	2CDS382001R0324	0.248	5
	40	9078603	S302P-C40	2CDS382001R0404	0.248	5
	50	9078481	S302P-C50	2CDS382001R0504	0.248	5
	63	9078351	S302P-C63	2CDS382001R0634	0.248	5
3	0.5	9077507	S303P-C0.5	2CDS383001R0984	0.372	1
	1	9078283	S303P-C1	2CDS383001R0014	0.372	1
	1.6	9077521	S303P-C1.6	2CDS383001R0974	0.372	1
	2	9078269	S303P-C2	2CDS383001R0024	0.372	1
	3	9078245	S303P-C3	2CDS383001R0034	0.372	1
	4	9078221	S303P-C4	2CDS383001R0044	0.372	1
	6	9078207	S303P-C6	2CDS383001R0064	0.372	1
	8	9078177	S303P-C8	2CDS383001R0084	0.372	1
	10	9078146	S303P-C10	2CDS383001R0104	0.372	1
	13	9078108	S303P-C13	2CDS383001R0134	0.372	1
	16	9078054	S303P-C16	2CDS383001R0164	0.372	1
	20	9078016	S303P-C20	2CDS383001R0204	0.372	1
	25	9077965	S303P-C25	2CDS383001R0254	0.372	1
	32	9077873	S303P-C32	2CDS383001R0324	0.372	1
	40	9077804	S303P-C40	2CDS383001R0404	0.372	1
	50	9077682	S303P-C50	2CDS383001R0504	0.372	1
	63	9077552	S303P-C63	2CDS383001R0634	0.372	1

Miniature Circuit breakers S300P

C characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9135511	S304P-C0.5	2CDS384001R0984	0.496	1
	1	9076685	S304P-C1	2CDS384001R0014	0.496	1
	1.6	9075923	S304P-C1.6	2CDS384001R0974	0.496	1
	2	9076661	S304P-C2	2CDS384001R0024	0.496	1
	3	9076647	S304P-C3	2CDS384001R0034	0.496	1
	4	9076623	S304P-C4	2CDS384001R0044	0.496	1
	6	9135573	S304P-C6	2CDS384001R0064	0.496	1
	8	9076579	S304P-C8	2CDS384001R0084	0.496	1
	10	9076548	S304P-C10	2CDS384001R0104	0.496	1
	13	9135566	S304P-C13	2CDS384001R0134	0.496	1
	16	9076456	S304P-C16	2CDS384001R0164	0.496	1
	20	9076418	S304P-C20	2CDS384001R0204	0.496	1
	25	9076364	S304P-C25	2CDS384001R0254	0.496	1
	32	9076272	S304P-C32	2CDS384001R0324	0.496	1
	40	9135689	S304P-C40	2CDS384001R0404	0.496	1
	50	9076081	S304P-C50	2CDS384001R0504	0.496	1
	63	9075954	S304P-C63	2CDS384001R0634	0.496	1
1+N	0.5	9079105	S301P-C0.5NA	2CDS381103R0984	0.248	5
	1	9079877	S301P-C1NA	2CDS381103R0014	0.248	5
	1.6	9079129	S301P-C1.6NA	2CDS381103R0974	0.248	5
	2	9079853	S301P-C2NA	2CDS381103R0024	0.248	5
	3	9079839	S301P-C3NA	2CDS381103R0034	0.248	5
	4	9079815	S301P-C4NA	2CDS381103R0044	0.248	5
	6	9079792	S301P-C6NA	2CDS381103R0064	0.248	5
	8	9079778	S301P-C8NA	2CDS381103R0084	0.248	5
	10	9079747	S301P-C10NA	2CDS381103R0104	0.248	5
	13	9079709	S301P-C13NA	2CDS381103R0134	0.248	5
	16	9079655	S301P-C16NA	2CDS381103R0164	0.248	5
	20	9079617	S301P-C20NA	2CDS381103R0204	0.248	5
	25	9079563	S301P-C25NA	2CDS381103R0254	0.248	5
	32	9079471	S301P-C32NA	2CDS381103R0324	0.248	5
	40	9079402	S301P-C40NA	2CDS381103R0404	0.248	5
	50	9079280	S301P-C50NA	2CDS381103R0504	0.248	5
	63	9079150	S301P-C63NA	2CDS381103R0634	0.248	5
3+N	0.5	9135580	S303P-C0.5NA	2CDS383103R0984	0.496	1
	1	9077484	S303P-C1NA	2CDS383103R0014	0.496	1
	1.6	9076722	S303P-C1.6NA	2CDS383103R0974	0.496	1
	2	9077460	S303P-C2NA	2CDS383103R0024	0.496	1
	3	9077446	S303P-C3NA	2CDS383103R0034	0.496	1
	4	9077422	S303P-C4NA	2CDS383103R0044	0.496	1
	6	9077408	S303P-C6NA	2CDS383103R0064	0.496	1
	8	9077378	S303P-C8NA	2CDS383103R0084	0.496	1
	10	9077347	S303P-C10NA	2CDS383103R0104	0.496	1
	13	9135658	S303P-C13NA	2CDS383103R0134	0.496	1
	16	9077255	S303P-C16NA	2CDS383103R0164	0.496	1
	20	9077217	S303P-C20NA	2CDS383103R0204	0.496	1
	25	9077163	S303P-C25NA	2CDS383103R0254	0.496	1
	32	9077071	S303P-C32NA	2CDS383103R0324	0.496	1
	40	9135627	S303P-C40NA	2CDS383103R0404	0.496	1
	50	9076883	S303P-C50NA	2CDS383103R0504	0.496	1
	63	9076753	S303P-C63NA	2CDS383103R0634	0.496	1

Miniature Circuit breakers S300P

D characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9079907	S301P-D0.5	2CDS381001R0981	0.124	10
	1	9080682	S301P-D1	2CDS381001R0011	0.124	10
	1.6	9079921	S301P-D1.6	2CDS381001R0971	0.124	10
	2	9080668	S301P-D2	2CDS381001R0021	0.124	10
	3	9080644	S301P-D3	2CDS381001R0031	0.124	10
	4	9080620	S301P-D4	2CDS381001R0041	0.124	10
	6	9080606	S301P-D6	2CDS381001R0061	0.124	10
	8	9080576	S301P-D8	2CDS381001R0081	0.124	10
	10	9080545	S301P-D10	2CDS381001R0101	0.124	10
	13	9080507	S301P-D13	2CDS381001R0131	0.124	10
	16	9080453	S301P-D16	2CDS381001R0161	0.124	10
	20	9080415	S301P-D20	2CDS381001R0201	0.124	10
	25	9080361	S301P-D25	2CDS381001R0251	0.124	10
	32	9080279	S301P-D32	2CDS381001R0321	0.124	10
	40	9080200	S301P-D40	2CDS381001R0401	0.124	10
	50	9080088	S301P-D50	2CDS381001R0501	0.124	10
	63	9079952	S301P-D63	2CDS381001R0631	0.124	10
2	0.5	9078313	S302P-D0.5	2CDS382001R0981	0.248	5
	1	9079099	S302P-D1	2CDS382001R0011	0.248	5
	1.6	9078337	S302P-D1.6	2CDS382001R0971	0.248	5
	2	9079075	S302P-D2	2CDS382001R0021	0.248	5
	3	9079051	S302P-D3	2CDS382001R0031	0.248	5
	4	9079037	S302P-D4	2CDS382001R0041	0.248	5
	6	9079013	S302P-D6	2CDS382001R0061	0.248	5
	8	9078986	S302P-D8	2CDS382001R0081	0.248	5
	10	9078955	S302P-D10	2CDS382001R0101	0.248	5
	13	9078917	S302P-D13	2CDS382001R0131	0.248	5
	16	9078863	S302P-D16	2CDS382001R0161	0.248	5
	20	9078825	S302P-D20	2CDS382001R0201	0.248	5
	25	9078771	S302P-D25	2CDS382001R0251	0.248	5
	32	9078689	S302P-D32	2CDS382001R0321	0.248	5
	40	9078610	S302P-D40	2CDS382001R0401	0.248	5
	50	9078498	S302P-D50	2CDS382001R0501	0.248	5
	63	9078368	S302P-D63	2CDS382001R0631	0.248	5
3	0.5	9077514	S303P-D0.5	2CDS383001R0981	0.372	1
	1	9078290	S303P-D1	2CDS383001R0011	0.372	1
	1.6	9077538	S303P-D1.6	2CDS383001R0971	0.372	1
	2	9078276	S303P-D2	2CDS383001R0021	0.372	1
	3	9078252	S303P-D3	2CDS383001R0031	0.372	1
	4	9078238	S303P-D4	2CDS383001R0041	0.372	1
	6	9078214	S303P-D6	2CDS383001R0061	0.372	1
	8	9078184	S303P-D8	2CDS383001R0081	0.372	1
	10	9078153	S303P-D10	2CDS383001R0101	0.372	1
	13	9078115	S303P-D13	2CDS383001R0131	0.372	1
	16	9078061	S303P-D16	2CDS383001R0161	0.372	1
	20	9078023	S303P-D20	2CDS383001R0201	0.372	1
	25	9077972	S303P-D25	2CDS383001R0251	0.372	1
	32	9077880	S303P-D32	2CDS383001R0321	0.372	1
	40	9077811	S303P-D40	2CDS383001R0401	0.372	1
	50	9077699	S303P-D50	2CDS383001R0501	0.372	1
	63	9077569	S303P-D63	2CDS383001R0631	0.372	1

Miniature Circuit breakers S300P

D characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9075916	S304P-D0.5	2CDS384001R0981	0.496	1
	1	9076692	S304P-D1	2CDS384001R0011	0.496	1
	1.6	9075930	S304P-D1.6	2CDS384001R0971	0.496	1
	2	9076678	S304P-D2	2CDS384001R0021	0.496	1
	3	9076654	S304P-D3	2CDS384001R0031	0.496	1
	4	9076630	S304P-D4	2CDS384001R0041	0.496	1
	6	9076616	S304P-D6	2CDS384001R0061	0.496	1
	8	9076586	S304P-D8	2CDS384001R0081	0.496	1
	10	9076555	S304P-D10	2CDS384001R0101	0.496	1
	13	9076517	S304P-D13	2CDS384001R0131	0.496	1
	16	9076463	S304P-D16	2CDS384001R0161	0.496	1
	20	9076425	S304P-D20	2CDS384001R0201	0.496	1
	25	9076371	S304P-D25	2CDS384001R0251	0.496	1
	32	9076289	S304P-D32	2CDS384001R0321	0.496	1
	40	9076210	S304P-D40	2CDS384001R0401	0.496	1
	50	9076098	S304P-D50	2CDS384001R0501	0.496	1
	63	9075961	S304P-D63	2CDS384001R0631	0.496	1
1+N	0.5	9079112	S301P-D0.5NA	2CDS381103R0981	0.248	5
	1	9079884	S301P-D1NA	2CDS381103R0011	0.248	5
	1.6	9079136	S301P-D1.6NA	2CDS381103R0971	0.248	5
	2	9079860	S301P-D2NA	2CDS381103R0021	0.248	5
	3	9079846	S301P-D3NA	2CDS381103R0031	0.248	5
	4	9079822	S301P-D4NA	2CDS381103R0041	0.248	5
	6	9079808	S301P-D6NA	2CDS381103R0061	0.248	5
	8	9085717	S301P-D8NA	2CDS381103R0081	0.248	5
	10	9079754	S301P-D10NA	2CDS381103R0101	0.248	5
	13	9079716	S301P-D13NA	2CDS381103R0131	0.248	5
	16	9079662	S301P-D16NA	2CDS381103R0161	0.248	5
	20	9079624	S301P-D20NA	2CDS381103R0201	0.248	5
	25	9079570	S301P-D25NA	2CDS381103R0251	0.248	5
	32	9079488	S301P-D32NA	2CDS381103R0321	0.248	5
	40	9079419	S301P-D40NA	2CDS381103R0401	0.248	5
	50	9079297	S301P-D50NA	2CDS381103R0501	0.248	5
	63	9079167	S301P-D63NA	2CDS381103R0631	0.248	5
3+N	0.5	9076715	S303P-D0.5NA	2CDS383103R0981	0.496	1
	1	9077491	S303P-D1NA	2CDS383103R0011	0.496	1
	1.6	9076739	S303P-D1.6NA	2CDS383103R0971	0.496	1
	2	9077477	S303P-D2NA	2CDS383103R0021	0.496	1
	3	9077453	S303P-D3NA	2CDS383103R0031	0.496	1
	4	9077439	S303P-D4NA	2CDS383103R0041	0.496	1
	6	9077415	S303P-D6NA	2CDS383103R0061	0.496	1
	8	9077385	S303P-D8NA	2CDS383103R0081	0.496	1
	10	9077354	S303P-D10NA	2CDS383103R0101	0.496	1
	13	9077316	S303P-D13NA	2CDS383103R0131	0.496	1
	16	9077262	S303P-D16NA	2CDS383103R0161	0.496	1
	20	9077224	S303P-D20NA	2CDS383103R0201	0.496	1
	25	9077170	S303P-D25NA	2CDS383103R0251	0.496	1
	32	9077088	S303P-D32NA	2CDS383103R0321	0.496	1
	40	9077019	S303P-D40NA	2CDS383103R0401	0.496	1
	50	9076890	S303P-D50NA	2CDS383103R0501	0.496	1
	63	9076760	S303P-D63NA	2CDS383103R0631	0.496	1

Miniature Circuit breakers S300P

K characteristic



S 301



S 302

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.2	9080552	S301P-K0.2	2CDS381001R0087	0.124	10
	0.3	9080514	S301P-K0.3	2CDS381001R0117	0.124	10
	0.5	9080477	S301P-K0.5	2CDS381001R0157	0.124	10
	0.75	9080422	S301P-K0.75	2CDS381001R0187	0.124	10
	1	9080385	S301P-K1	2CDS381001R0217	0.124	10
	1.6	9080330	S301P-K1.6	2CDS381001R0257	0.124	10
	2	9080316	S301P-K2	2CDS381001R0277	0.124	10
	3	9080293	S301P-K3	2CDS381001R0317	0.124	10
	4	9080248	S301P-K4	2CDS381001R0337	0.124	10
	6	9080224	S301P-K6	2CDS381001R0377	0.124	10
	8	9080170	S301P-K8	2CDS381001R0407	0.124	10
	10	9080156	S301P-K10	2CDS381001R0427	0.124	10
	13	9080132	S301P-K13	2CDS381001R0447	0.124	10
	16	9080125	S301P-K16	2CDS381001R0467	0.124	10
	20	9080101	S301P-K20	2CDS381001R0487	0.124	10
	25	9080057	S301P-K25	2CDS381001R0517	0.124	10
	32	9080033	S301P-K32	2CDS381001R0537	0.124	10
	40	9080019	S301P-K40	2CDS381001R0557	0.124	10
	50	9079990	S301P-K50	2CDS381001R0577	0.124	10
	63	9079976	S301P-K63	2CDS381001R0607	0.124	10
2	0.2	9078962	S302P-K0.2	2CDS382001R0087	0.248	5
	0.3	9078924	S302P-K0.3	2CDS382001R0117	0.248	5
	0.5	9078887	S302P-K0.5	2CDS382001R0157	0.248	5
	0.75	9078832	S302P-K0.75	2CDS382001R0187	0.248	5
	1	9078795	S302P-K1	2CDS382001R0217	0.248	5
	1.6	9078740	S302P-K1.6	2CDS382001R0257	0.248	5
	2	9078726	S302P-K2	2CDS382001R0277	0.248	5
	3	9078702	S302P-K3	2CDS382001R0317	0.248	5
	4	9078658	S302P-K4	2CDS382001R0337	0.248	5
	6	9078634	S302P-K6	2CDS382001R0377	0.248	5
	8	9078580	S302P-K8	2CDS382001R0407	0.248	5
	10	9078566	S302P-K10	2CDS382001R0427	0.248	5
	13	9078542	S302P-K13	2CDS382001R0447	0.248	5
	16	9078535	S302P-K16	2CDS382001R0467	0.248	5
	20	9078511	S302P-K20	2CDS382001R0487	0.248	5
	25	9078467	S302P-K25	2CDS382001R0517	0.248	5
	32	9078443	S302P-K32	2CDS382001R0537	0.248	5
	40	9078429	S302P-K40	2CDS382001R0557	0.248	5
	50	9078405	S302P-K50	2CDS382001R0577	0.248	5
	63	9078382	S302P-K63	2CDS382001R0607	0.248	5

Miniature Circuit breakers S300P

K characteristic



S 303



S 304

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
3	0.2	9078160	S303P-K0.2	2CDS383001R0087	0.372	1
	0.3	9078122	S303P-K0.3	2CDS383001R0117	0.372	1
	0.5	9078085	S303P-K0.5	2CDS383001R0157	0.372	1
	0.75	9078030	S303P-K0.75	2CDS383001R0187	0.372	1
	1	9077996	S303P-K1	2CDS383001R0217	0.372	1
	1.6	9077941	S303P-K1.6	2CDS383001R0257	0.372	1
	2	9077927	S303P-K2	2CDS383001R0277	0.372	1
	3	9077903	S303P-K3	2CDS383001R0317	0.372	1
	4	9077859	S303P-K4	2CDS383001R0337	0.372	1
	6	9077835	S303P-K6	2CDS383001R0377	0.372	1
	8	9077781	S303P-K8	2CDS383001R0407	0.372	1
	10	9077767	S303P-K10	2CDS383001R0427	0.372	1
	13	9077743	S303P-K13	2CDS383001R0447	0.372	1
	16	9077736	S303P-K16	2CDS383001R0467	0.372	1
	20	9077712	S303P-K20	2CDS383001R0487	0.372	1
	25	9077668	S303P-K25	2CDS383001R0517	0.372	1
	32	9077644	S303P-K32	2CDS383001R0537	0.372	1
	40	9077620	S303P-K40	2CDS383001R0557	0.372	1
	50	9077606	S303P-K50	2CDS383001R0577	0.372	1
	63	9077583	S303P-K63	2CDS383001R0607	0.372	1
4	0.2	9076562	S304P-K0.2	2CDS384001R0087	0.496	1
	0.3	9076524	S304P-K0.3	2CDS384001R0117	0.496	1
	0.5	9076487	S304P-K0.5	2CDS384001R0157	0.496	1
	0.75	9076432	S304P-K0.75	2CDS384001R0187	0.496	1
	1	9076395	S304P-K1	2CDS384001R0217	0.496	1
	1.6	9076340	S304P-K1.6	2CDS384001R0257	0.496	1
	2	9076326	S304P-K2	2CDS384001R0277	0.496	1
	3	9135542	S304P-K3	2CDS384001R0317	0.496	1
	4	9076258	S304P-K4	2CDS384001R0337	0.496	1
	6	9076234	S304P-K6	2CDS384001R0377	0.496	1
	8	9076180	S304P-K8	2CDS384001R0407	0.496	1
	10	9076166	S304P-K10	2CDS384001R0427	0.496	1
	13	9076142	S304P-K13	2CDS384001R0447	0.496	1
	16	9076135	S304P-K16	2CDS384001R0467	0.496	1
	20	9076111	S304P-K20	2CDS384001R0487	0.496	1
	25	9076067	S304P-K25	2CDS384001R0517	0.496	1
	32	9076043	S304P-K32	2CDS384001R0537	0.496	1
	40	9076029	S304P-K40	2CDS384001R0557	0.496	1
	50	9135528	S304P-K50	2CDS384001R0577	0.496	1
	63	9075985	S304P-K63	2CDS384001R0607	0.496	1

Miniature Circuit breakers S300P

K characteristic



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1+N	0.2	9079761	S301P-K0.2NA	2CDS381103R0087	0.248	5
	0.3	9079723	S301P-K0.3NA	2CDS381103R0117	0.248	5
	0.5	9079686	S301P-K0.5NA	2CDS381103R0157	0.248	5
	0.75	9079631	S301P-K0.75NA	2CDS381103R0187	0.248	5
	1	9079594	S301P-K1NA	2CDS381103R0217	0.248	5
	1.6	9079549	S301P-K1.6NA	2CDS381103R0257	0.248	5
	2	9079525	S301P-K2NA	2CDS381103R0277	0.248	5
	3	9079501	S301P-K3NA	2CDS381103R0317	0.248	5
	4	9079457	S301P-K4NA	2CDS381103R0337	0.248	5
	6	9079433	S301P-K6NA	2CDS381103R0377	0.248	5
	8	9079389	S301P-K8NA	2CDS381103R0407	0.248	5
	10	9079365	S301P-K10NA	2CDS381103R0427	0.248	5
	13	9079341	S301P-K13NA	2CDS381103R0447	0.248	5
	16	9079334	S301P-K16NA	2CDS381103R0467	0.248	5
	20	9079310	S301P-K20NA	2CDS381103R0487	0.248	5
	25	9079266	S301P-K25NA	2CDS381103R0517	0.248	5
	32	9079242	S301P-K32NA	2CDS381103R0537	0.248	5
	40	9079228	S301P-K40NA	2CDS381103R0557	0.248	5
	50	9135665	S301P-K50NA	2CDS381103R0577	0.248	5
	63	9079181	S301P-K63NA	2CDS381103R0607	0.248	5
3+N	0.2	9077361	S303P-K0.2NA	2CDS383103R0087	0.496	1
	0.3	9077323	S303P-K0.3NA	2CDS383103R0117	0.496	1
	0.5	9077286	S303P-K0.5NA	2CDS383103R0157	0.496	1
	0.75	9077231	S303P-K0.75NA	2CDS383103R0187	0.496	1
	1	9077194	S303P-K1NA	2CDS383103R0217	0.496	1
	1.6	9077149	S303P-K1.6NA	2CDS383103R0257	0.496	1
	2	9077125	S303P-K2NA	2CDS383103R0277	0.496	1
	3	9135634	S303P-K3NA	2CDS383103R0317	0.496	1
	4	9077057	S303P-K4NA	2CDS383103R0337	0.496	1
	6	9077033	S303P-K6NA	2CDS383103R0377	0.496	1
	8	9076982	S303P-K8NA	2CDS383103R0407	0.496	1
	10	9076968	S303P-K10NA	2CDS383103R0427	0.496	1
	13	9076944	S303P-K13NA	2CDS383103R0447	0.496	1
	16	9076937	S303P-K16NA	2CDS383103R0467	0.496	1
	20	9076913	S303P-K20NA	2CDS383103R0487	0.496	1
	25	9076869	S303P-K25NA	2CDS383103R0517	0.496	1
	32	9076845	S303P-K32NA	2CDS383103R0537	0.496	1
	40	9076821	S303P-K40NA	2CDS383103R0557	0.496	1
	50	9135597	S303P-K50NA	2CDS383103R0577	0.496	1
	63	9076784	S303P-K63NA	2CDS383103R0607	0.496	1

Miniature Circuit breakers S300P

Z characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9080460	S301P-Z0.5	2CDS381001R0158	0.124	10
	1	9080378	S301P-Z1	2CDS381001R0218	0.124	10
	1.6	9080323	S301P-Z1.6	2CDS381001R0258	0.124	10
	2	9080309	S301P-Z2	2CDS381001R0278	0.124	10
	3	9080286	S301P-Z3	2CDS381001R0318	0.124	10
	4	9080231	S301P-Z4	2CDS381001R0338	0.124	10
	6	9080217	S301P-Z6	2CDS381001R0378	0.124	10
	8	9080163	S301P-Z8	2CDS381001R0408	0.124	10
	10	9080149	S301P-Z10	2CDS381001R0428	0.124	10
	16	9080118	S301P-Z16	2CDS381001R0468	0.124	10
	20	9080095	S301P-Z20	2CDS381001R0488	0.124	10
	25	9080040	S301P-Z25	2CDS381001R0518	0.124	10
	32	9080026	S301P-Z32	2CDS381001R0538	0.124	10
	40	9080002	S301P-Z40	2CDS381001R0558	0.124	10
	50	9079983	S301P-Z50	2CDS381001R0578	0.124	10
	63	9079969	S301P-Z63	2CDS381001R0608	0.124	10
2	0.5	9078870	S302P-Z0.5	2CDS382001R0158	0.248	5
	1	9078788	S302P-Z1	2CDS382001R0218	0.248	5
	1.6	9078733	S302P-Z1.6	2CDS382001R0258	0.248	5
	2	9078719	S302P-Z2	2CDS382001R0278	0.248	5
	3	9078696	S302P-Z3	2CDS382001R0318	0.248	5
	4	9078641	S302P-Z4	2CDS382001R0338	0.248	5
	6	9078627	S302P-Z6	2CDS382001R0378	0.248	5
	8	9078573	S302P-Z8	2CDS382001R0408	0.248	5
	10	9078559	S302P-Z10	2CDS382001R0428	0.248	5
	16	9078528	S302P-Z16	2CDS382001R0468	0.248	5
	20	9078504	S302P-Z20	2CDS382001R0488	0.248	5
	25	9078450	S302P-Z25	2CDS382001R0518	0.248	5
	32	9078436	S302P-Z32	2CDS382001R0538	0.248	5
	40	9078412	S302P-Z40	2CDS382001R0558	0.248	5
	50	9078399	S302P-Z50	2CDS382001R0578	0.248	5
	63	9078375	S302P-Z63	2CDS382001R0608	0.248	5
3	0.5	9078078	S303P-Z0.5	2CDS383001R0158	0.372	1
	1	9077989	S303P-Z1	2CDS383001R0218	0.372	1
	1.6	9077934	S303P-Z1.6	2CDS383001R0258	0.372	1
	2	9077910	S303P-Z2	2CDS383001R0278	0.372	1
	3	9077897	S303P-Z3	2CDS383001R0318	0.372	1
	4	9077842	S303P-Z4	2CDS383001R0338	0.372	1
	6	9077828	S303P-Z6	2CDS383001R0378	0.372	1
	8	9077774	S303P-Z8	2CDS383001R0408	0.372	1
	10	9077750	S303P-Z10	2CDS383001R0428	0.372	1
	16	9077729	S303P-Z16	2CDS383001R0468	0.372	1
	20	9077705	S303P-Z20	2CDS383001R0488	0.372	1
	25	9077651	S303P-Z25	2CDS383001R0518	0.372	1
	32	9077637	S303P-Z32	2CDS383001R0538	0.372	1
	40	9077613	S303P-Z40	2CDS383001R0558	0.372	1
	50	9077590	S303P-Z50	2CDS383001R0578	0.372	1
	63	9077576	S303P-Z63	2CDS383001R0608	0.372	1

Miniature Circuit breakers S300P

Z characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9076470	S304P-Z0.5	2CDS384001R0158	0.496	1
	1	9076388	S304P-Z1	2CDS384001R0218	0.496	1
	1.6	9076333	S304P-Z1.6	2CDS384001R0258	0.496	1
	2	9076319	S304P-Z2	2CDS384001R0278	0.496	1
	3	9076296	S304P-Z3	2CDS384001R0318	0.496	1
	4	9076241	S304P-Z4	2CDS384001R0338	0.496	1
	6	9076227	S304P-Z6	2CDS384001R0378	0.496	1
	8	9076173	S304P-Z8	2CDS384001R0408	0.496	1
	10	9076159	S304P-Z10	2CDS384001R0428	0.496	1
	16	9076128	S304P-Z16	2CDS384001R0468	0.496	1
	20	9135535	S304P-Z20	2CDS384001R0488	0.496	1
	25	9076050	S304P-Z25	2CDS384001R0518	0.496	1
	32	9076036	S304P-Z32	2CDS384001R0538	0.496	1
	40	9076012	S304P-Z40	2CDS384001R0558	0.496	1
	50	9075992	S304P-Z50	2CDS384001R0578	0.496	1
	63	9075978	S304P-Z63	2CDS384001R0608	0.496	1
1+N	0.5	9079679	S301P-Z0.5NA	2CDS381103R0158	0.248	5
	1	9079587	S301P-Z1NA	2CDS381103R0218	0.248	5
	1.6	9079532	S301P-Z1.6NA	2CDS381103R0258	0.248	5
	2	9079518	S301P-Z2NA	2CDS381103R0278	0.248	5
	3	9079495	S301P-Z3NA	2CDS381103R0318	0.248	5
	4	9079440	S301P-Z4NA	2CDS381103R0338	0.248	5
	6	9079426	S301P-Z6NA	2CDS381103R0378	0.248	5
	8	9079372	S301P-Z8NA	2CDS381103R0408	0.248	5
	10	9079358	S301P-Z10NA	2CDS381103R0428	0.248	5
	16	9079327	S301P-Z16NA	2CDS381103R0468	0.248	5
	20	9135672	S301P-Z20NA	2CDS381103R0488	0.248	5
	25	9079259	S301P-Z25NA	2CDS381103R0518	0.248	5
	32	9079235	S301P-Z32NA	2CDS381103R0538	0.248	5
	40	9079211	S301P-Z40NA	2CDS381103R0558	0.248	5
	50	9079198	S301P-Z50NA	2CDS381103R0578	0.248	5
	63	9079174	S301P-Z63NA	2CDS381103R0608	0.248	5
3+N	0.5	9077279	S303P-Z0.5NA	2CDS383103R0158	0.496	1
	1	9077187	S303P-Z1NA	2CDS383103R0218	0.496	1
	1.6	9077132	S303P-Z1.6NA	2CDS383103R0258	0.496	1
	2	9077118	S303P-Z2NA	2CDS383103R0278	0.496	1
	3	9077095	S303P-Z3NA	2CDS383103R0318	0.496	1
	4	9077040	S303P-Z4NA	2CDS383103R0338	0.496	1
	6	9077026	S303P-Z6NA	2CDS383103R0378	0.496	1
	8	9076975	S303P-Z8NA	2CDS383103R0408	0.496	1
	10	9076951	S303P-Z10NA	2CDS383103R0428	0.496	1
	16	9076920	S303P-Z16NA	2CDS383103R0468	0.496	1
	20	9135610	S303P-Z20NA	2CDS383103R0488	0.496	1
	25	9076852	S303P-Z25NA	2CDS383103R0518	0.496	1
	32	9076838	S303P-Z32NA	2CDS383103R0538	0.496	1
	40	9076814	S303P-Z40NA	2CDS383103R0558	0.496	1
	50	9076791	S303P-Z50NA	2CDS383103R0578	0.496	1
	63	9076777	S303P-Z63NA	2CDS383103R0608	0.496	1

ABB S.p.A.
Electrification
Smart Building

www.abb.com/lowvoltage

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9AKK107992A4964 Rev. F - 04.2024

ITEM	Tag	UP-200F1-Q13	: DC CONTROL 6,6KV LINE B - UP-200F1-Q13			Dwg	1724000372-EL-DG-00008
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)			Module	
TASK	code	C10002936		Location	Onshore Activities	User	Rosetti Marino Quality Control
FORM	Process	PRE-COMM	Activity FTS	Discipline	Electrical	Form	FTR-2 Protection Relay

FTR2 - Protection relay
Record sheet

RELAY DATA

Manufacturer:	ABB	Serial N°:	NA	Relay type:	NA
Auxiliary supply:	NA	Location:	B100	Cubicle:	NA
Switchboard:	UP-200F1				

Current transformers

Tag	Number of	Ratio	Location

Voltage transformers

Tag	Number of	Ratio	Location

Test result (refer to manufacturer's procedure)

ANSI function	Setting	Injection	Trip value	Time delay Setting	Time delay Trip value
I	16A	NA	NA	FIXED	NA

Testing & measurement instruments used

Type	Serial n°	Calibration certificate	Validity
FLUKE 1663	5380144	7727/24	08/07/2025

Comments:

Page 1/1	Performed by	☐ WITNESS ☑ REVIEW	☐ WITNESS ☐ REVIEW
Company	RM COMM	RM COMM	CPY NOT PRESENT
Name	Davide Zucconelli	Kristian Castellani	Witness waived
Date	2024-11-08	2024-11-08	2024-11-08
Signature	PROVERLIS Digitaly signed by Davide Zucconelli 2024-11-08T10:29:55.457Z	PROVERLIS Digitaly signed by Kristian Castellani 2024-11-08T15:09:36.271Z	PROVERLIS Digitaly signed by Witness waived 2024-11-08T16:25:56.380Z

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+REC1
UP-200F1 A

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1
THERMOSTAT 100º

-PR2-TH2
THERMOSTAT 90º

-PR1-TH1
THERMOSTAT 100º

-PR1-TH2
THERMOSTAT 90º

Charger
100A 12Pulses

-Z1
0/450V

-X1
L1
70 mm²
4G16 mm2
unamoured cable

MAINS
3x400Vac 50Hz -50kA

L1;L2;L3;PE

-Q1
50A

-T1
110V/100A
019.6KVA

-PR2
TPC

-PR1
TPC

-A320
INTERFACE

-R2
100mV
130A

-C1
3x6800µF
160V
Filtering 1%

-F1
NH00
125A

-V21
100A

-Q2
160A

-R3
100mV
130A

-Q3
160A

BATTERY
110Vdc
-X3
+/-
70 mm²

Battery
symmetry
-X31
+/-
4 mm²

-A10
BATTERY SIMMETRY
FAULT

+BP
BATTERY PROTECTION

2 (1x25) mm2

-F100
Plastic
box 80*80

+BAT

-L+/-
2P 125A
BUS BAR
110 VDC

-Q10
CP-100F1
DC CONTROL 66kV G/S
LINE A-5.2KW
-X2 1+/1
16 mm²
50A-C
3G16 mm2
amoured cable
(+REC1-A1 /1.4) / SD1

-SD1

-Q11
CP-100F1
DC CONTROL 66kV G/S
LINE B-2KW
-X2 2+/2
16 mm²
20A-C
3G16 mm2
amoured cable
(+REC2-A1 /1.4) / SD2

-SD2

-Q12
SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE A-1KW
-X2 3+/3
16 mm²
16A-C
3G16 mm2
amoured cable

-Q13
SG-100D1
DC CONTROL 6,6kV
SWITCHGEAR LINE B-1KW
-X2 4+/4
16 mm²
16A-C
3G16 mm2
amoured cable

-Q14
SPARE 5,5KW
-X2 5+/5
16 mm²
50A-C

-Q15
SPARE 2KW
-X2 6+/6
16 mm²
20A-C

-Q16
SPARE 1KW
-X2 7+/7
16 mm²
16A-C

-F10/F11
DEHNguard

-A21
EARTH +/-

-Z2
400V

-KF
PSR-SCP- 24DC / SIL3

-A1
GCAU
CONTROL UNIT

-A5.1
Relays

-CR1-X5

SD1 / (+BAT-SD1 /1.8)

-A71

-A300
DISPLAY

-A73
MODBUS-TCP/IP

-A8
Isolated

-A310
KEY PAD

-X8
4 mm²
CHARGERS
INTERCONNECTION

2,5 mm²

INTERCONNECTION
-X6
50 mm²
PH4 35 mm²

AUXILIARY SUPPLY
230Vac-50Hz

-X7
L/N
6 mm²
3G2.5 mm2
unamoured cable

-Q6
02A-C

-H3

-Q7
02A-C

-THF4
0/60ºC

-E50
100W

+REC2
UP-200F1 B

-M1/2
220-240 Vca
50-60Hz
FAN

-PR2-TH1
THERMOSTAT 100º

-PR2-TH2
THERMOSTAT 90º

-PR1-TH1
THERMOSTAT 100º

-PR1-TH2
THERMOSTAT 90º

-A8
(+REC1-CR1-J13:1 /1.4)

Charger
100A 12Pulses

-Z1
0/450V

-X1
L1
70 mm²
4G16 mm2
unamoured cable

MAINS
3x400Vac 50Hz -50kA

L1;L2;L3;PE

-Q1
50A

-T1
110V/100A
019.6KVA

-PR2
TPC

-PR1
TPC

-A320
INTERFACE

-R2
100mV
130A

-C1
3x6800µF
160V
Filtering 1%

-F1
NH00
125A

-V21
100A

-Q2
160A

2,5 mm²

SD2 / (+BAT-SD2 /1.8)

-A1
GCAU
CONTROL UNIT

-A5.1
Relays

-CR1-X5

-A71

-A300
DISPLAY

-A73
MODBUS-TCP/IP

-A8
Isolated

-A310
KEY PAD

A8 / (+REC2-X8 /1.4)

Battery
symmetry
-X31
+/-
4 mm²

-A10
BATTERY SIMMETRY
FAULT

AUXILIARY SUPPLY
230Vac-50Hz

-X7
L/N
6 mm²

-Q6
02A-C

-H3

-Q7
02A-C

-THF4
0/60ºC

-E50
100W

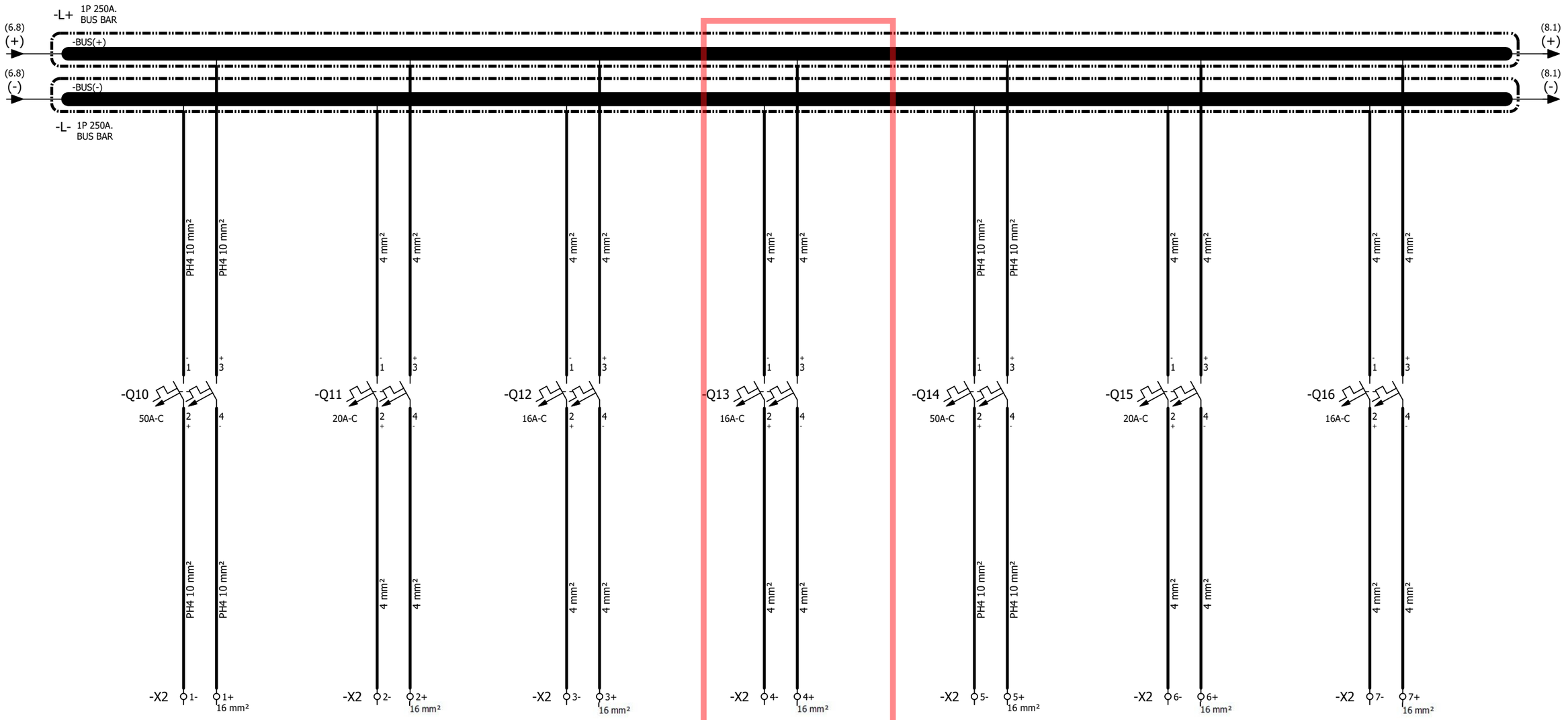
ES21464

				Date	21/03/2024	3W POWER S.P.A.	Single-line	1724000372-EL-DG-00006
				Editor	EBM	Hollandse Kust Noord (HKN) wind farm	System	
				Checked	JOP			
Stat	Alteration	Date	Name	Standard				

AEG POWER SOLUTIONS

= System
+ 8 / 47
& EFA
ES521464 en
A3
Sheet 1
Sheets 1

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	-Q10	-Q11	-Q12	-Q13	-Q14	-Q15	-Q16
SUPPLIED FROM	-Q10	-Q11	-Q12	-Q13	-Q14	-Q15	-Q16
RATING	50A-C	20A-C	16A-C	16A-C	50A-C	20A-C	16A-C
MAXIMUM CROSS-SECTION	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
AUXILIARY CONTACT	98 96 95 (/8.5)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)
FUNCTION	CP-100F1 DC CONTROL 66kV G/S LINE A-5.2KW	CP-100F1 DC CONTROL 66kV G/S LINE B-2KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE A-1KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE B-1KW	SPARE 5,5KW	SPARE 2KW	SPARE 1KW

S300P
Data sheet



System pro *M* compact®
S300P miniature circuit breakers comply with IEC/EN 60947-2, IEC/EN 60898-1, UL 1077 and CSA 22.2 No. 235, protecting the installation in commercial and industrial applications by supporting a breaking capacity of 25 kA.

—
01

—
01
S300P
Miniature Circuit Breaker

S300P MCB is designed to be used in installations where high breaking capacities are required to protect against short-circuits and overloads.

S300P is compliant to the product standards
IEC/EN 60947-2
IEC/EN 60898-1
UL 1077
CSA 22.2 No.235
and features the following main technical characteristics:

- Rated nominal current: 0.2 A ... 63 A
- Characteristic: B, C, D, K, Z
- Pole variant: 1, 2, 3, 4, 1+N, 3+N
- Rated breaking capacity I_{cu}: 25 kA; 100 kA (≤ 6 A)
- Rated operational voltage U_e: 240/415 V AC
- Rated impulse withstand voltage U_{imp}: 6 kV

Application benefits

- Integrated trip indicator for clear signalization of tripping events on site
- Dual DIN-Rail release for fast and easy installation
- Fully compatible with whole range of System pro *M* compact® accessories supporting lots of different functions
- Quick and easy product identification by QR-code along with direct access to the ABB product database
- Terminals equipped with fail safe feature to avoid improper installation
- Supply possible from top or bottom and in parallel with cables and busbars thanks to terminals composed by two different openings
- Excellent technical performance to ensure safety and protection of installation and personal
- Certified quality and compliance according to worldwide product standards

S300P
Technical data



S300P

		S300P
General Data	Standards	IEC/EN 60947-2, IEC/EN 60898-1, UL 1077, CSA 22.2 No. 235
	Poles	1P, 2P, 3P, 4P, 1+N, 3+N
	Tripping characteristics	B, C, D, K, Z
	Rated current I_n	6…63 A (B-curve), 0.5…63 A (C-, D-, Z-curve), 0.2…63 A (K-curve)
	Rated frequency f	50 / 60 Hz, DC
	Rated insulation voltage U_i acc. to IEC/EN 60664-1	500 V AC
	Overvoltage category	IV
	Pollution degree	3
Data acc. to IEC/EN 60947-2	Tripping Characteristics	B, C, D, K, Z
	Rated operational voltage U_e	1P, 1+N: 240 V AC, 72 V DC 2P: 415 V AC, 125 V DC 3P, 3+N, 4P: 415 V AC
	Max. power frequency recovery voltage U_{max}	1P, 1+N: 264 V AC, 72 V DC 2P, 3P, 3+N, 4P: 462 V AC, 125 V DC
	Min. operating voltage	12 V AC – 12 V DC
	Rated ultimate short-circuit breaking capacity I_{cu}	25 kA; 100 kA (≤ 6 A)
	Rated service short-circuit breaking capacity I_{cs}	12.5 kA (≤ 25 A); 10 kA (32-40 A); 7.5 kA (>40 A)
	Rated impulse withstand voltage U_{imp} (1.2/50 µs)	6 kV
	Reference temperature for tripping characteristics	55 °C (B-, C-, D-curve), 40 °C (K-, Z-curve)
	Electrical endurance	I_n < 32 A: 20,000 ops. (AC), I_n ≥ 32 A: 10,000 ops. (AC); 1,500 ops. (DC)
Data acc. to IEC/EN 60898-1	Tripping Characteristics	B, C, D
	Rated operational voltage U_n	1P: 240/415 V AC, 72 V DC 1+N: 240 V AC, 72 V DC 2P: 415 V AC, 125 V DC 3P, 3P+N, 4P: 415 V AC
	Max. power frequency recovery voltage U_{max}	1P, 1+N: 264 V AC, 72 V DC 2P, 3P, 3+N, 4P: 457 V AC, 125 V DC
	Min. operating voltage	12 V AC – 12 V DC
	Rated short-circuit capacity I_{cn}	25 kA (≤ 25 A), 20 kA (32 - 40 A), 15 kA (> 40 A)
	Dielectric test voltage	2.0 kV (50/60 Hz, 1 min)
	Reference temperature for tripping characteristics	30 °C
	Electrical endurance	I_n < 32 A: 20,000 ops. (AC), I_n ≥ 32 A: 10,000 ops. (AC); 1,000 ops. (DC)
Data acc. to UL1077 / CSA 22.2 No. 235	Tripping Characteristics	B, C, D, K, Z
	Rated voltage	1P: 277 V AC, 60 V DC 2...4P: 480Y/277 V AC, 125 V DC (2 poles in series)
	Rated interrupting capacity	10 kA
	Application Suppl. prot., for general use.	TC2, OL0, SC:U1
	Reference temperature for tripping characteristics	40 °C
	Electrical endurance	6,000 ops., 1 cycle (1s.-ON, 9s.-OFF)

S300P
Mechanical data

		S300P
Mechanical Data	Housing	Insulation group I, RAL 7035
	Toggle	Insulation group II, black, sealable
	Contact position indication	Real CPI (green OFF / red ON)
	Trip position indicator	TPI (grey NO TRIP / orange TRIP)
	Protection degree acc. to DIN EN 60529	IP20, IP40 in enclosure with cover
	Mechanical endurance	20,000 ops.
	Shock resistance acc. to IEC/EN 60068-2-27	25 g - 2 shocks - 13 ms
	Vibration resistance acc. to IEC/EN 60068-2-6	5 g - 20 cycles at 5 ... 150 ... 5 Hz at 0.8 I_n
	Environmental conditions (damp heat cyclic) acc. to IEC/EN 60068-2-30	28 cycles with 55 °C/90-96 % and 25 °C/95-100 %
	Ambient temperature	-40 ... +70 °C
	Storage temperature	-50 ... +70 °C
Installation	Terminal	Failsafe bi-directional cylinder-lift terminal
	Cross-section of conductors (top/bottom)	solid, stranded: 35 mm² / 35 mm² flexible: 25 mm² / 25 mm² 14 – 4 AWG
	Cross-section of busbars (top/bottom)	10 mm² / 10 mm² 14 – 8 AWG
	Torque	2.8 Nm; 18 in-lbs.
	Screw driver	No. 2 Pozidrive
	Mounting	on DIN rail 35 mm, acc. to EN 60715 by dual DIN-rail release
	Mounting position	any
	Supply	any
Dimensions and weight	Mounting dimensions acc. to DIN 43880	1
	Pole dimensions (H x D x W)	88 x 69 x 17.5 mm
	Pole weight approx.	124 g
Combination with auxiliary elements	Auxiliary contact	Yes
	Bottom fixed auiliary contact	Yes
	Signal contact	Yes
	Shunt trip	Yes
	Undervoltage release	Yes
	Motor operating device	Yes
Standards	IEC/EN 60947-2	
	IEC/EN 60898-1	
	UL 1077	
	CSA 22.2. No.235	
	GB/T 14048.2	
	GB/T 10963.1	

Approvals

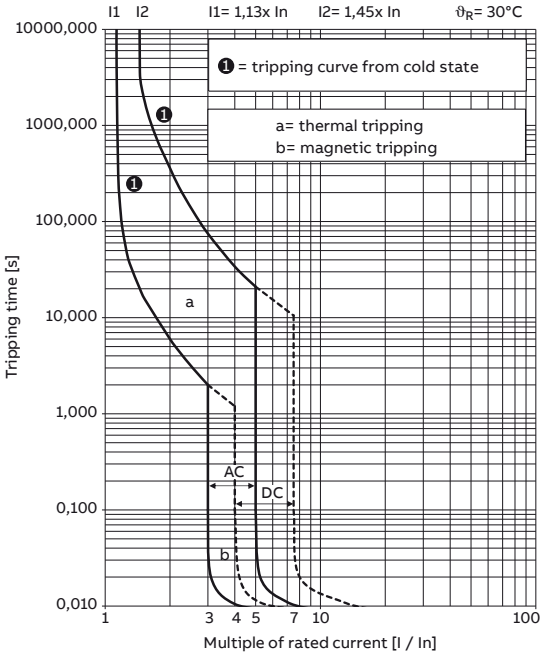
- VDE - DE
- UL 1077 - US
- CSA 22.2 No.235 - CA
- CCC - PRC
- EAC - RU
- KEMA - NL
- IMQ - IT
- SII - IL
- S+ - CH
- ÖVE - AT
- NF - FR
- EZU - CZ
- ANCE - MX
- KC - KR
- UKCA - UK
- DNV - NO
- GL - DE
- LRS - UK
- RINA - IT

Miniature Circuit breakers S300P

Tripping characteristics

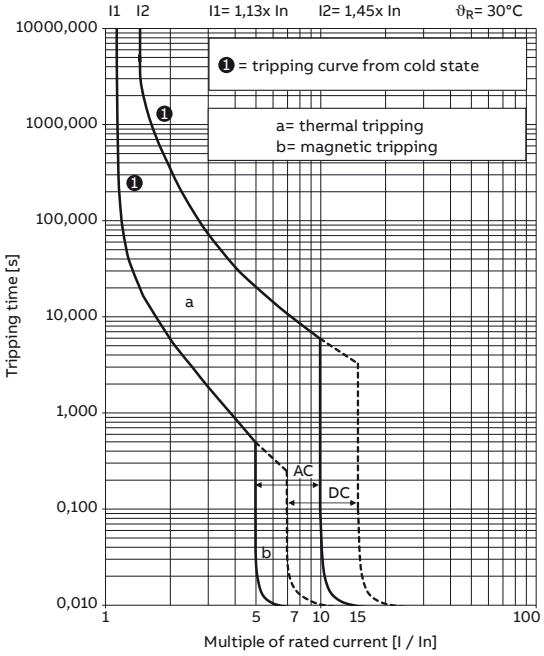
MCB Type S300P - B (3 ... 5 x I_n AC)

Tripping Characteristic IEC/EN 60898-1



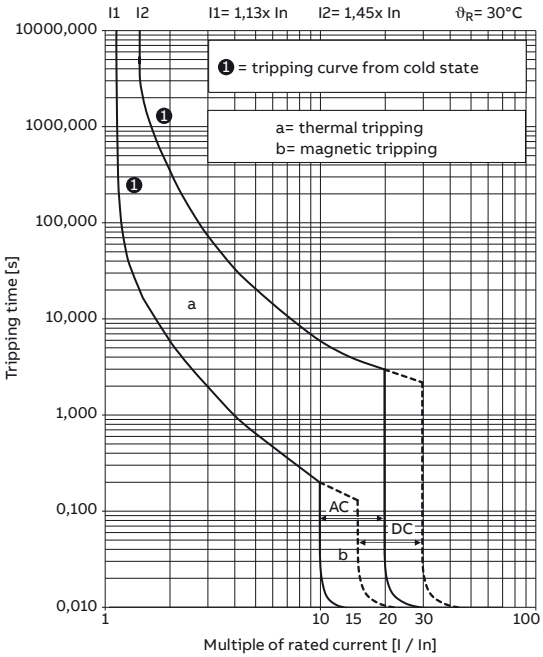
MCB Type S300P - C (5 ... 10 x I_n AC)

Tripping Characteristic IEC/EN 60898-1

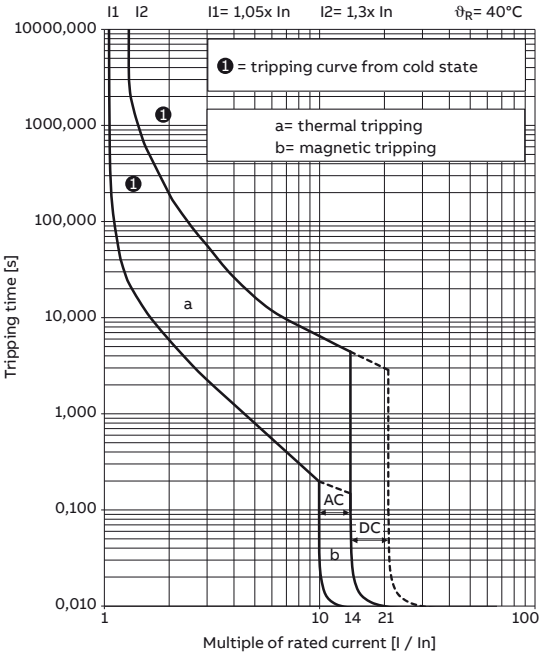


MCB Type S300P - D (10 ... 20 x I_n AC)

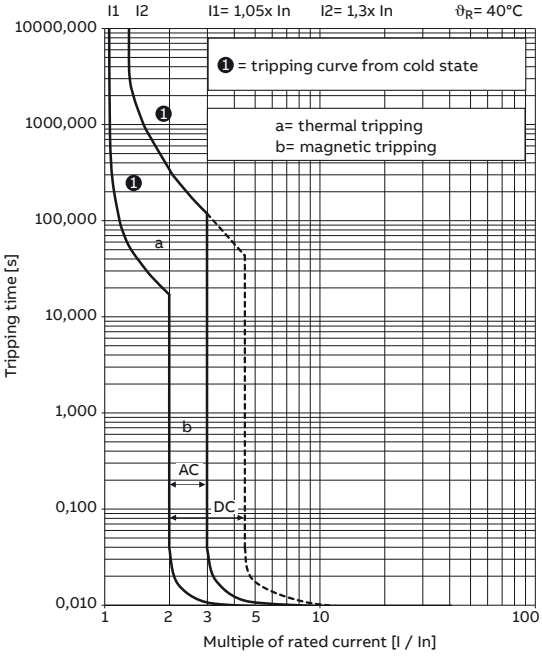
Tripping Characteristic IEC/EN 60898-1



MCB Type S300P - K (10 ... 14 x I_n AC)
Tripping Characteristic IEC/EN 60947-2



MCB Type S300P - Z (2 ... 3 x I_n AC)
Tripping Characteristic IEC/EN 60947-2



Tripping characteristics S300P

Acc. to	Tripping characteristics	Rated current	Thermal release [2]			Electromagnetic release [1]		
			Currents:		Tripping time	Currents:		Tripping time
			conventional non-tripping current	conventional tripping current		hold current surges	trip at least at	
IEC/EN 60898-1	B	06 to 63 A	1.13 · I_n		> 1 h	3 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		5 · I_n	< 0.1 s
	C	0.5 to 63 A	1.13 · I_n		> 1 h	5 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		10 · I_n	< 0.1 s
	D	0.5 to 63 A	1.13 · I_n		> 1 h	10 · I_n		> 0.1 s
				1.45 · I_n	< 1 h		20 · I_n	< 0.1 s
IEC/EN 60947-2	K	0.2 to 63 A	1.05 · I_n		> 1 h	10 · I_n		> 0.2 s
				1.3 · I_n	< 1 h [3]		14 · I_n	< 0.2 s
	Z	0.5 to 63 A	1.05 · I_n		> 1 h	2 · I_n		> 0.2 s
				1.3 · I_n	< 1 h [3]		3 · I_n	< 0.2 s

[1] The indicated electromagnetic tripping values apply to a frequency range of 16 2/3... 60 Hz. For different network frequencies or direct current the values change according to the multipler in the table below
[2] The thermal releases are calibrated to a nominal reference ambient temperature; for Z and K, the value is 40 °C, for B, C and D is 30 °C. In the case of higher ambient temperatures, the current values fall by ca. 6 % for each 10 K temperature rise.
[3] As from operating temperature (after I_1 > 1 h or, as applicable, 2 h).

	AC			DC
	100 Hz	200 Hz	400 Hz	
Multiplier	1.1	1.2	1.5	1.5

The thermal tripping performance is independent from the network frequency.

Miniature Circuit breakers S300P

Derating

For installations of miniature circuit breakers at other temperatures than the reference value and installations of several miniature circuit breakers directly side by side, derating factors have to be considered.

Deviating ambient temperature

The rated value of the current of a miniature circuit breaker refers to a temperature of 40 °C for circuit-breakers with characteristics K and Z and 30 °C for characteristics B, C and D. The following table contains the derating of load capability of S300P MCBs with temperature from -40 °C to 70 °C for the curves B, C, D, K, and Z.

Tripping characteristic	Rated Current I_n (A)	Max. Operating currents depending on the ambient temperature T (°C)											
		-40	-30	-20	-10	0	10	20	30	40	50	60	70
B. C and D	0.5	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
	1	1.2	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9
	1.6	1.9	1.9	1.8	1.8	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.4
	2	2.4	2.4	2.3	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.8	1.8
	3	3.6	3.5	3.5	3.4	3.3	3.2	3.1	3.0	2.9	2.8	2.7	2.6
	4	4.8	4.7	4.6	4.5	4.4	4.2	4.1	4.0	3.9	3.8	3.6	3.5
	6	7.3	7.1	6.9	6.7	6.5	6.4	6.2	6.0	5.8	5.6	5.5	5.3
	8	9.7	9.4	9.2	9.0	8.7	8.5	8.2	8.0	7.8	7.5	7.3	7.0
	10	12.1	11.8	11.5	11.2	10.9	10.6	10.3	10.0	9.7	9.4	9.1	8.8
	13	15.5	15.5	15.0	14.5	14.0	14.0	13.5	13.0	12.5	12.0	12.0	11.5
	16	19.5	19.0	18.5	18.0	17.5	17.0	16.5	16.0	15.5	15.0	14.5	14.0
	20	24.0	23.5	23.0	22.5	22.0	21.0	20.5	20.0	19.5	19.0	18.0	17.5
	25	30.5	29.5	29.0	28.0	27.5	26.5	26.0	25.0	24.5	23.5	23.0	22.0
	32	38.5	38.0	37.0	36.0	35.0	34.0	33.0	32.0	31.0	30.0	29.0	28.0
	40	48.5	47.0	46.0	45.0	43.5	42.5	41.0	40.0	39.0	37.5	36.5	35.0
	50	60.5	59.0	57.5	56.0	54.5	53.0	51.5	50.0	48.5	47.0	45.5	44.0
	63	76.0	74.5	72.5	70.5	68.5	67.0	65.0	63.0	61.0	59.0	57.5	55.5
K and Z	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4
	0.75	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7
	1	1.3	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9
	1.6	2.1	2.1	2.0	1.9	1.9	1.8	1.7	1.7	1.6	1.5	1.5	1.4
	2	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.0	1.9	1.9	1.8
	3	4.0	3.9	3.7	3.6	3.5	3.3	3.2	3.1	3.0	2.9	2.8	2.7
	4	5.3	5.2	5.0	4.8	4.6	4.5	4.3	4.1	4.0	3.9	3.7	3.6
	6	8.0	7.7	7.5	7.2	6.9	6.7	6.5	6.2	6.0	5.8	5.6	5.4
	8	10.7	10.3	9.9	9.6	9.3	8.9	8.6	8.3	8.0	7.7	7.4	7.1
	10	13.4	12.9	12.4	12.0	11.6	11.2	10.8	10.4	10.0	9.6	9.3	8.9
	13	17.5	17.0	16.0	15.5	15.0	14.5	14.0	13.5	13.0	12.5	12.0	11.5
	16	21.5	20.5	20.0	19.0	18.5	18.0	17.0	16.5	16.0	15.5	15.0	14.5
	20	26.5	26.0	25.0	24.0	23.0	22.5	21.5	20.5	20.0	19.5	18.5	18.0
	25	33.5	32.0	31.0	30.0	29.0	28.0	27.0	26.0	25.0	24.0	23.0	22.5
	32	43.0	41.5	40.0	38.5	37.0	35.5	34.5	33.0	32.0	31.0	29.5	28.5
	40	53.5	51.5	49.5	48.0	46.5	44.5	43.0	41.5	40.0	38.5	37.0	35.5
	50	67.0	64.5	62.0	60.0	58.0	56.0	54.0	52.0	50.0	48.0	46.5	44.5
	63	84.5	81.0	78.5	75.5	73.0	70.5	67.5	65.5	63.0	60.5	58.5	56.5

Influence of adjacent devices

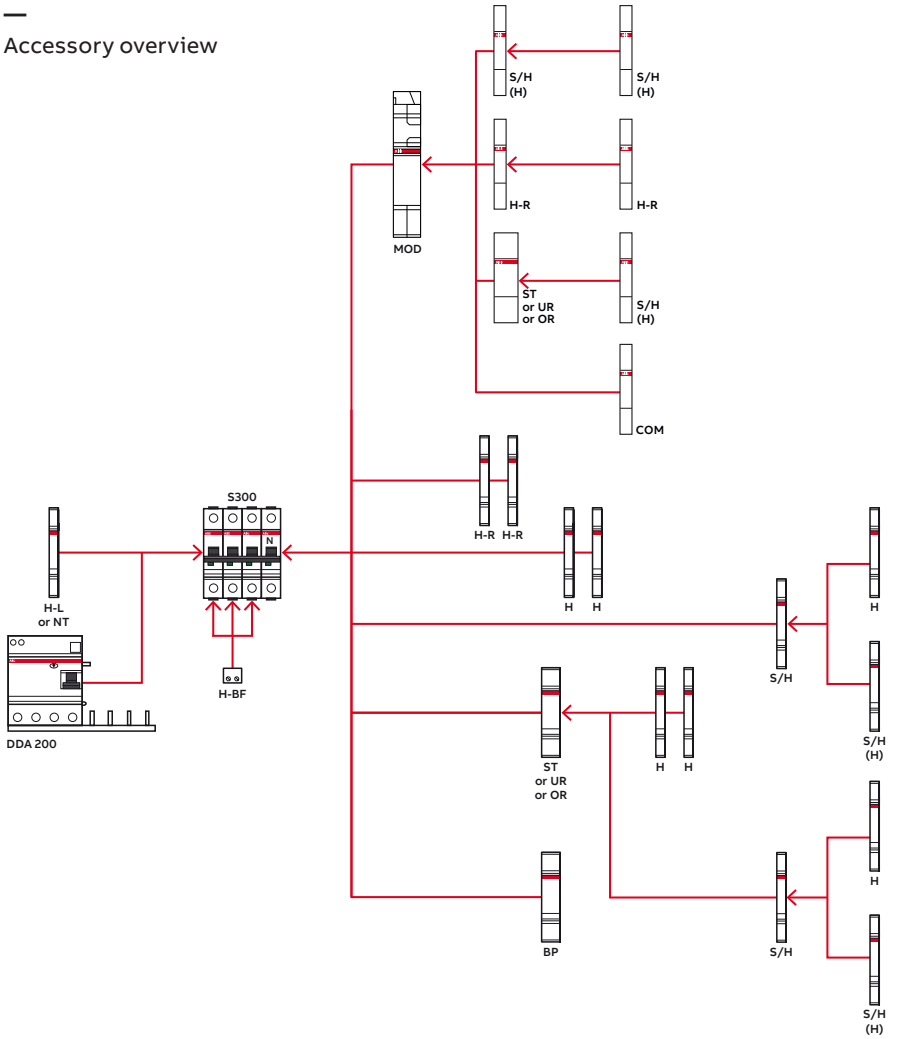
If several miniature circuit breakers are installed directly side by side with high load on all poles, a correction factor must be applied to the rated current (see table). If distance pieces are used, the factor is not to be considered.

No. of adjacent devices	Factor F
1	1
2.3	0.9
4.5	0.8
≥ 6	0.75

Miniature Circuit breakers S300P

Accessories and dimensional drawings

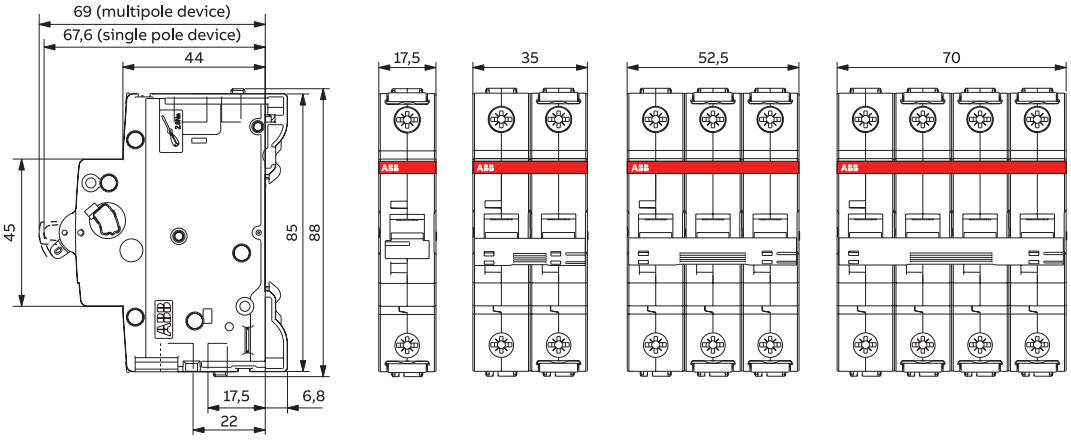
Accessory overview



H	Auxiliary contact (change-over contact)	S2C-H6R	H-L	Auxiliary contact	S2C-H..L
H-R	Auxiliary contact	S2C-H6-..R	H-BF	Auxiliary contact for bottom fitting (1 per pole)	S2C-H01 S2C-H10
S/H	Signal/Auxiliary contact used as auxiliary contact	S2C-S/H6R	BP	Mechanical tripping device	S2C-BP
			NT	Neutral disconnector	S2C-NT..
ST	Shunt trip	S3C-A..	MOD (1)	Motor operating device	S3C-MOD
UR	Undervoltage release	S2C-UA	COM	ModBus Interface	eMOD/AR ModBus
OR	Overvoltage release	S2C-OVP			
DDA 200	RCD-block	DDA 20..			

(1) In case of using S300 with DDA 200, MOD does not operate in case of earth-voltage fault

Dimensional drawing



Miniature Circuit breakers S300P

B characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	6	9080583	S301P-B6	2CDS381001R0065	0.124	10
	8	9086011	S301P-B8	2CDS381001R0085	0.124	10
	10	9080521	S301P-B10	2CDS381001R0105	0.124	10
	13	9080484	S301P-B13	2CDS381001R0135	0.124	10
	16	9080439	S301P-B16	2CDS381001R0165	0.124	10
	20	9080392	S301P-B20	2CDS381001R0205	0.124	10
	25	9080347	S301P-B25	2CDS381001R0255	0.124	10
	32	9080255	S301P-B32	2CDS381001R0325	0.124	10
	40	9080187	S301P-B40	2CDS381001R0405	0.124	10
	50	9080064	S301P-B50	2CDS381001R0505	0.124	10
	63	9079938	S301P-B63	2CDS381001R0635	0.124	10
2	6	9078993	S302P-B6	2CDS382001R0065	0.248	5
	8	9086059	S302P-B8	2CDS382001R0085	0.248	5
	10	9078931	S302P-B10	2CDS382001R0105	0.248	5
	13	9078894	S302P-B13	2CDS382001R0135	0.248	5
	16	9078849	S302P-B16	2CDS382001R0165	0.248	5
	20	9078801	S302P-B20	2CDS382001R0205	0.248	5
	25	9078757	S302P-B25	2CDS382001R0255	0.248	5
	32	9078665	S302P-B32	2CDS382001R0325	0.248	5
	40	9078597	S302P-B40	2CDS382001R0405	0.248	5
	50	9078474	S302P-B50	2CDS382001R0505	0.248	5
	63	9078344	S302P-B63	2CDS382001R0635	0.248	5
3	6	9078191	S303P-B6	2CDS383001R0065	0.372	1
	8	9086073	S303P-B8	2CDS383001R0085	0.372	1
	10	9078139	S303P-B10	2CDS383001R0105	0.372	1
	13	9078092	S303P-B13	2CDS383001R0135	0.372	1
	16	9078047	S303P-B16	2CDS383001R0165	0.372	1
	20	9078009	S303P-B20	2CDS383001R0205	0.372	1
	25	9077958	S303P-B25	2CDS383001R0255	0.372	1
	32	9077866	S303P-B32	2CDS383001R0325	0.372	1
	40	9077798	S303P-B40	2CDS383001R0405	0.372	1
	50	9077675	S303P-B50	2CDS383001R0505	0.372	1
	63	9077545	S303P-B63	2CDS383001R0635	0.372	1

Miniature Circuit breakers S300P

B characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	6	9076593	S304P-B6	2CDS384001R0065	0.496	1
	8	9086110	S304P-B8	2CDS384001R0085	0.496	1
	10	9076531	S304P-B10	2CDS384001R0105	0.496	1
	13	9076494	S304P-B13	2CDS384001R0135	0.496	1
	16	9076449	S304P-B16	2CDS384001R0165	0.496	1
	20	9135559	S304P-B20	2CDS384001R0205	0.496	1
	25	9076357	S304P-B25	2CDS384001R0255	0.496	1
	32	9076265	S304P-B32	2CDS384001R0325	0.496	1
	40	9076197	S304P-B40	2CDS384001R0405	0.496	1
	50	9076074	S304P-B50	2CDS384001R0505	0.496	1
	63	9075947	S304P-B63	2CDS384001R0635	0.496	1
1+N	6	9079785	S301P-B6NA	2CDS381103R0065	0.248	5
	8	9086035	S301P-B8NA	2CDS381103R0085	0.248	5
	10	9079730	S301P-B10NA	2CDS381103R0105	0.248	5
	13	9079693	S301P-B13NA	2CDS381103R0135	0.248	5
	16	9079648	S301P-B16NA	2CDS381103R0165	0.248	5
	20	9079600	S301P-B20NA	2CDS381103R0205	0.248	5
	25	9079556	S301P-B25NA	2CDS381103R0255	0.248	5
	32	9079464	S301P-B32NA	2CDS381103R0325	0.248	5
	40	9079396	S301P-B40NA	2CDS381103R0405	0.248	5
	50	9079273	S301P-B50NA	2CDS381103R0505	0.248	5
	63	9079143	S301P-B63NA	2CDS381103R0635	0.248	5
3+N	6	9077392	S303P-B6NA	2CDS383103R0065	0.496	1
	8	9086097	S303P-B8NA	2CDS383103R0085	0.496	1
	10	9077330	S303P-B10NA	2CDS383103R0105	0.496	1
	13	9077293	S303P-B13NA	2CDS383103R0135	0.496	1
	16	9077248	S303P-B16NA	2CDS383103R0165	0.496	1
	20	9135641	S303P-B20NA	2CDS383103R0205	0.496	1
	25	9077156	S303P-B25NA	2CDS383103R0255	0.496	1
	32	9077064	S303P-B32NA	2CDS383103R0325	0.496	1
	40	9076999	S303P-B40NA	2CDS383103R0405	0.496	1
	50	9076876	S303P-B50NA	2CDS383103R0505	0.496	1
	63	9076746	S303P-B63NA	2CDS383103R0635	0.496	1

Miniature Circuit breakers S300P

C characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9079891	S301P-C0.5	2CDS381001R0984	0.124	10
	1	9080675	S301P-C1	2CDS381001R0014	0.124	10
	1.6	9079914	S301P-C1.6	2CDS381001R0974	0.124	10
	2	9080651	S301P-C2	2CDS381001R0024	0.124	10
	3	9080637	S301P-C3	2CDS381001R0034	0.124	10
	4	9080613	S301P-C4	2CDS381001R0044	0.124	10
	6	9080590	S301P-C6	2CDS381001R0064	0.124	10
	8	9080569	S301P-C8	2CDS381001R0084	0.124	10
	10	9080538	S301P-C10	2CDS381001R0104	0.124	10
	13	9080491	S301P-C13	2CDS381001R0134	0.124	10
	16	9080446	S301P-C16	2CDS381001R0164	0.124	10
	20	9080408	S301P-C20	2CDS381001R0204	0.124	10
	25	9080354	S301P-C25	2CDS381001R0254	0.124	10
	32	9080262	S301P-C32	2CDS381001R0324	0.124	10
	40	9080194	S301P-C40	2CDS381001R0404	0.124	10
	50	9080071	S301P-C50	2CDS381001R0504	0.124	10
	63	9079945	S301P-C63	2CDS381001R0634	0.124	10
2	0.5	9078306	S302P-C0.5	2CDS382001R0984	0.248	5
	1	9079082	S302P-C1	2CDS382001R0014	0.248	5
	1.6	9078320	S302P-C1.6	2CDS382001R0974	0.248	5
	2	9079068	S302P-C2	2CDS382001R0024	0.248	5
	3	9079044	S302P-C3	2CDS382001R0034	0.248	5
	4	9079020	S302P-C4	2CDS382001R0044	0.248	5
	6	9079006	S302P-C6	2CDS382001R0064	0.248	5
	8	9078979	S302P-C8	2CDS382001R0084	0.248	5
	10	9078948	S302P-C10	2CDS382001R0104	0.248	5
	13	9078900	S302P-C13	2CDS382001R0134	0.248	5
	16	9078856	S302P-C16	2CDS382001R0164	0.248	5
	20	9078818	S302P-C20	2CDS382001R0204	0.248	5
	25	9078764	S302P-C25	2CDS382001R0254	0.248	5
	32	9078672	S302P-C32	2CDS382001R0324	0.248	5
	40	9078603	S302P-C40	2CDS382001R0404	0.248	5
	50	9078481	S302P-C50	2CDS382001R0504	0.248	5
	63	9078351	S302P-C63	2CDS382001R0634	0.248	5
3	0.5	9077507	S303P-C0.5	2CDS383001R0984	0.372	1
	1	9078283	S303P-C1	2CDS383001R0014	0.372	1
	1.6	9077521	S303P-C1.6	2CDS383001R0974	0.372	1
	2	9078269	S303P-C2	2CDS383001R0024	0.372	1
	3	9078245	S303P-C3	2CDS383001R0034	0.372	1
	4	9078221	S303P-C4	2CDS383001R0044	0.372	1
	6	9078207	S303P-C6	2CDS383001R0064	0.372	1
	8	9078177	S303P-C8	2CDS383001R0084	0.372	1
	10	9078146	S303P-C10	2CDS383001R0104	0.372	1
	13	9078108	S303P-C13	2CDS383001R0134	0.372	1
	16	9078054	S303P-C16	2CDS383001R0164	0.372	1
	20	9078016	S303P-C20	2CDS383001R0204	0.372	1
	25	9077965	S303P-C25	2CDS383001R0254	0.372	1
	32	9077873	S303P-C32	2CDS383001R0324	0.372	1
	40	9077804	S303P-C40	2CDS383001R0404	0.372	1
	50	9077682	S303P-C50	2CDS383001R0504	0.372	1
	63	9077552	S303P-C63	2CDS383001R0634	0.372	1

Miniature Circuit breakers S300P

C characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9135511	S304P-C0.5	2CDS384001R0984	0.496	1
	1	9076685	S304P-C1	2CDS384001R0014	0.496	1
	1.6	9075923	S304P-C1.6	2CDS384001R0974	0.496	1
	2	9076661	S304P-C2	2CDS384001R0024	0.496	1
	3	9076647	S304P-C3	2CDS384001R0034	0.496	1
	4	9076623	S304P-C4	2CDS384001R0044	0.496	1
	6	9135573	S304P-C6	2CDS384001R0064	0.496	1
	8	9076579	S304P-C8	2CDS384001R0084	0.496	1
	10	9076548	S304P-C10	2CDS384001R0104	0.496	1
	13	9135566	S304P-C13	2CDS384001R0134	0.496	1
	16	9076456	S304P-C16	2CDS384001R0164	0.496	1
	20	9076418	S304P-C20	2CDS384001R0204	0.496	1
	25	9076364	S304P-C25	2CDS384001R0254	0.496	1
	32	9076272	S304P-C32	2CDS384001R0324	0.496	1
	40	9135689	S304P-C40	2CDS384001R0404	0.496	1
	50	9076081	S304P-C50	2CDS384001R0504	0.496	1
	63	9075954	S304P-C63	2CDS384001R0634	0.496	1
1+N	0.5	9079105	S301P-C0.5NA	2CDS381103R0984	0.248	5
	1	9079877	S301P-C1NA	2CDS381103R0014	0.248	5
	1.6	9079129	S301P-C1.6NA	2CDS381103R0974	0.248	5
	2	9079853	S301P-C2NA	2CDS381103R0024	0.248	5
	3	9079839	S301P-C3NA	2CDS381103R0034	0.248	5
	4	9079815	S301P-C4NA	2CDS381103R0044	0.248	5
	6	9079792	S301P-C6NA	2CDS381103R0064	0.248	5
	8	9079778	S301P-C8NA	2CDS381103R0084	0.248	5
	10	9079747	S301P-C10NA	2CDS381103R0104	0.248	5
	13	9079709	S301P-C13NA	2CDS381103R0134	0.248	5
	16	9079655	S301P-C16NA	2CDS381103R0164	0.248	5
	20	9079617	S301P-C20NA	2CDS381103R0204	0.248	5
	25	9079563	S301P-C25NA	2CDS381103R0254	0.248	5
	32	9079471	S301P-C32NA	2CDS381103R0324	0.248	5
	40	9079402	S301P-C40NA	2CDS381103R0404	0.248	5
	50	9079280	S301P-C50NA	2CDS381103R0504	0.248	5
	63	9079150	S301P-C63NA	2CDS381103R0634	0.248	5
3+N	0.5	9135580	S303P-C0.5NA	2CDS383103R0984	0.496	1
	1	9077484	S303P-C1NA	2CDS383103R0014	0.496	1
	1.6	9076722	S303P-C1.6NA	2CDS383103R0974	0.496	1
	2	9077460	S303P-C2NA	2CDS383103R0024	0.496	1
	3	9077446	S303P-C3NA	2CDS383103R0034	0.496	1
	4	9077422	S303P-C4NA	2CDS383103R0044	0.496	1
	6	9077408	S303P-C6NA	2CDS383103R0064	0.496	1
	8	9077378	S303P-C8NA	2CDS383103R0084	0.496	1
	10	9077347	S303P-C10NA	2CDS383103R0104	0.496	1
	13	9135658	S303P-C13NA	2CDS383103R0134	0.496	1
	16	9077255	S303P-C16NA	2CDS383103R0164	0.496	1
	20	9077217	S303P-C20NA	2CDS383103R0204	0.496	1
	25	9077163	S303P-C25NA	2CDS383103R0254	0.496	1
	32	9077071	S303P-C32NA	2CDS383103R0324	0.496	1
	40	9135627	S303P-C40NA	2CDS383103R0404	0.496	1
	50	9076883	S303P-C50NA	2CDS383103R0504	0.496	1
	63	9076753	S303P-C63NA	2CDS383103R0634	0.496	1

Miniature Circuit breakers S300P

D characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9079907	S301P-D0.5	2CDS381001R0981	0.124	10
	1	9080682	S301P-D1	2CDS381001R0011	0.124	10
	1.6	9079921	S301P-D1.6	2CDS381001R0971	0.124	10
	2	9080668	S301P-D2	2CDS381001R0021	0.124	10
	3	9080644	S301P-D3	2CDS381001R0031	0.124	10
	4	9080620	S301P-D4	2CDS381001R0041	0.124	10
	6	9080606	S301P-D6	2CDS381001R0061	0.124	10
	8	9080576	S301P-D8	2CDS381001R0081	0.124	10
	10	9080545	S301P-D10	2CDS381001R0101	0.124	10
	13	9080507	S301P-D13	2CDS381001R0131	0.124	10
	16	9080453	S301P-D16	2CDS381001R0161	0.124	10
	20	9080415	S301P-D20	2CDS381001R0201	0.124	10
	25	9080361	S301P-D25	2CDS381001R0251	0.124	10
	32	9080279	S301P-D32	2CDS381001R0321	0.124	10
	40	9080200	S301P-D40	2CDS381001R0401	0.124	10
	50	9080088	S301P-D50	2CDS381001R0501	0.124	10
	63	9079952	S301P-D63	2CDS381001R0631	0.124	10
2	0.5	9078313	S302P-D0.5	2CDS382001R0981	0.248	5
	1	9079099	S302P-D1	2CDS382001R0011	0.248	5
	1.6	9078337	S302P-D1.6	2CDS382001R0971	0.248	5
	2	9079075	S302P-D2	2CDS382001R0021	0.248	5
	3	9079051	S302P-D3	2CDS382001R0031	0.248	5
	4	9079037	S302P-D4	2CDS382001R0041	0.248	5
	6	9079013	S302P-D6	2CDS382001R0061	0.248	5
	8	9078986	S302P-D8	2CDS382001R0081	0.248	5
	10	9078955	S302P-D10	2CDS382001R0101	0.248	5
	13	9078917	S302P-D13	2CDS382001R0131	0.248	5
	16	9078863	S302P-D16	2CDS382001R0161	0.248	5
	20	9078825	S302P-D20	2CDS382001R0201	0.248	5
	25	9078771	S302P-D25	2CDS382001R0251	0.248	5
	32	9078689	S302P-D32	2CDS382001R0321	0.248	5
	40	9078610	S302P-D40	2CDS382001R0401	0.248	5
	50	9078498	S302P-D50	2CDS382001R0501	0.248	5
	63	9078368	S302P-D63	2CDS382001R0631	0.248	5
3	0.5	9077514	S303P-D0.5	2CDS383001R0981	0.372	1
	1	9078290	S303P-D1	2CDS383001R0011	0.372	1
	1.6	9077538	S303P-D1.6	2CDS383001R0971	0.372	1
	2	9078276	S303P-D2	2CDS383001R0021	0.372	1
	3	9078252	S303P-D3	2CDS383001R0031	0.372	1
	4	9078238	S303P-D4	2CDS383001R0041	0.372	1
	6	9078214	S303P-D6	2CDS383001R0061	0.372	1
	8	9078184	S303P-D8	2CDS383001R0081	0.372	1
	10	9078153	S303P-D10	2CDS383001R0101	0.372	1
	13	9078115	S303P-D13	2CDS383001R0131	0.372	1
	16	9078061	S303P-D16	2CDS383001R0161	0.372	1
	20	9078023	S303P-D20	2CDS383001R0201	0.372	1
	25	9077972	S303P-D25	2CDS383001R0251	0.372	1
	32	9077880	S303P-D32	2CDS383001R0321	0.372	1
	40	9077811	S303P-D40	2CDS383001R0401	0.372	1
	50	9077699	S303P-D50	2CDS383001R0501	0.372	1
	63	9077569	S303P-D63	2CDS383001R0631	0.372	1

Miniature Circuit breakers S300P

D characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9075916	S304P-D0.5	2CDS384001R0981	0.496	1
	1	9076692	S304P-D1	2CDS384001R0011	0.496	1
	1.6	9075930	S304P-D1.6	2CDS384001R0971	0.496	1
	2	9076678	S304P-D2	2CDS384001R0021	0.496	1
	3	9076654	S304P-D3	2CDS384001R0031	0.496	1
	4	9076630	S304P-D4	2CDS384001R0041	0.496	1
	6	9076616	S304P-D6	2CDS384001R0061	0.496	1
	8	9076586	S304P-D8	2CDS384001R0081	0.496	1
	10	9076555	S304P-D10	2CDS384001R0101	0.496	1
	13	9076517	S304P-D13	2CDS384001R0131	0.496	1
	16	9076463	S304P-D16	2CDS384001R0161	0.496	1
	20	9076425	S304P-D20	2CDS384001R0201	0.496	1
	25	9076371	S304P-D25	2CDS384001R0251	0.496	1
	32	9076289	S304P-D32	2CDS384001R0321	0.496	1
	40	9076210	S304P-D40	2CDS384001R0401	0.496	1
	50	9076098	S304P-D50	2CDS384001R0501	0.496	1
	63	9075961	S304P-D63	2CDS384001R0631	0.496	1
1+N	0.5	9079112	S301P-D0.5NA	2CDS381103R0981	0.248	5
	1	9079884	S301P-D1NA	2CDS381103R0011	0.248	5
	1.6	9079136	S301P-D1.6NA	2CDS381103R0971	0.248	5
	2	9079860	S301P-D2NA	2CDS381103R0021	0.248	5
	3	9079846	S301P-D3NA	2CDS381103R0031	0.248	5
	4	9079822	S301P-D4NA	2CDS381103R0041	0.248	5
	6	9079808	S301P-D6NA	2CDS381103R0061	0.248	5
	8	9085717	S301P-D8NA	2CDS381103R0081	0.248	5
	10	9079754	S301P-D10NA	2CDS381103R0101	0.248	5
	13	9079716	S301P-D13NA	2CDS381103R0131	0.248	5
	16	9079662	S301P-D16NA	2CDS381103R0161	0.248	5
	20	9079624	S301P-D20NA	2CDS381103R0201	0.248	5
	25	9079570	S301P-D25NA	2CDS381103R0251	0.248	5
	32	9079488	S301P-D32NA	2CDS381103R0321	0.248	5
	40	9079419	S301P-D40NA	2CDS381103R0401	0.248	5
	50	9079297	S301P-D50NA	2CDS381103R0501	0.248	5
	63	9079167	S301P-D63NA	2CDS381103R0631	0.248	5
3+N	0.5	9076715	S303P-D0.5NA	2CDS383103R0981	0.496	1
	1	9077491	S303P-D1NA	2CDS383103R0011	0.496	1
	1.6	9076739	S303P-D1.6NA	2CDS383103R0971	0.496	1
	2	9077477	S303P-D2NA	2CDS383103R0021	0.496	1
	3	9077453	S303P-D3NA	2CDS383103R0031	0.496	1
	4	9077439	S303P-D4NA	2CDS383103R0041	0.496	1
	6	9077415	S303P-D6NA	2CDS383103R0061	0.496	1
	8	9077385	S303P-D8NA	2CDS383103R0081	0.496	1
	10	9077354	S303P-D10NA	2CDS383103R0101	0.496	1
	13	9077316	S303P-D13NA	2CDS383103R0131	0.496	1
	16	9077262	S303P-D16NA	2CDS383103R0161	0.496	1
	20	9077224	S303P-D20NA	2CDS383103R0201	0.496	1
	25	9077170	S303P-D25NA	2CDS383103R0251	0.496	1
	32	9077088	S303P-D32NA	2CDS383103R0321	0.496	1
	40	9077019	S303P-D40NA	2CDS383103R0401	0.496	1
	50	9076890	S303P-D50NA	2CDS383103R0501	0.496	1
	63	9076760	S303P-D63NA	2CDS383103R0631	0.496	1

Miniature Circuit breakers S300P

K characteristic



S 301



S 302

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.2	9080552	S301P-K0.2	2CDS381001R0087	0.124	10
	0.3	9080514	S301P-K0.3	2CDS381001R0117	0.124	10
	0.5	9080477	S301P-K0.5	2CDS381001R0157	0.124	10
	0.75	9080422	S301P-K0.75	2CDS381001R0187	0.124	10
	1	9080385	S301P-K1	2CDS381001R0217	0.124	10
	1.6	9080330	S301P-K1.6	2CDS381001R0257	0.124	10
	2	9080316	S301P-K2	2CDS381001R0277	0.124	10
	3	9080293	S301P-K3	2CDS381001R0317	0.124	10
	4	9080248	S301P-K4	2CDS381001R0337	0.124	10
	6	9080224	S301P-K6	2CDS381001R0377	0.124	10
	8	9080170	S301P-K8	2CDS381001R0407	0.124	10
	10	9080156	S301P-K10	2CDS381001R0427	0.124	10
	13	9080132	S301P-K13	2CDS381001R0447	0.124	10
	16	9080125	S301P-K16	2CDS381001R0467	0.124	10
	20	9080101	S301P-K20	2CDS381001R0487	0.124	10
	25	9080057	S301P-K25	2CDS381001R0517	0.124	10
	32	9080033	S301P-K32	2CDS381001R0537	0.124	10
	40	9080019	S301P-K40	2CDS381001R0557	0.124	10
	50	9079990	S301P-K50	2CDS381001R0577	0.124	10
	63	9079976	S301P-K63	2CDS381001R0607	0.124	10
2	0.2	9078962	S302P-K0.2	2CDS382001R0087	0.248	5
	0.3	9078924	S302P-K0.3	2CDS382001R0117	0.248	5
	0.5	9078887	S302P-K0.5	2CDS382001R0157	0.248	5
	0.75	9078832	S302P-K0.75	2CDS382001R0187	0.248	5
	1	9078795	S302P-K1	2CDS382001R0217	0.248	5
	1.6	9078740	S302P-K1.6	2CDS382001R0257	0.248	5
	2	9078726	S302P-K2	2CDS382001R0277	0.248	5
	3	9078702	S302P-K3	2CDS382001R0317	0.248	5
	4	9078658	S302P-K4	2CDS382001R0337	0.248	5
	6	9078634	S302P-K6	2CDS382001R0377	0.248	5
	8	9078580	S302P-K8	2CDS382001R0407	0.248	5
	10	9078566	S302P-K10	2CDS382001R0427	0.248	5
	13	9078542	S302P-K13	2CDS382001R0447	0.248	5
	16	9078535	S302P-K16	2CDS382001R0467	0.248	5
	20	9078511	S302P-K20	2CDS382001R0487	0.248	5
	25	9078467	S302P-K25	2CDS382001R0517	0.248	5
	32	9078443	S302P-K32	2CDS382001R0537	0.248	5
	40	9078429	S302P-K40	2CDS382001R0557	0.248	5
	50	9078405	S302P-K50	2CDS382001R0577	0.248	5
	63	9078382	S302P-K63	2CDS382001R0607	0.248	5

Miniature Circuit breakers S300P

K characteristic



S 303



S 304

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
3	0.2	9078160	S303P-K0.2	2CDS383001R0087	0.372	1
	0.3	9078122	S303P-K0.3	2CDS383001R0117	0.372	1
	0.5	9078085	S303P-K0.5	2CDS383001R0157	0.372	1
	0.75	9078030	S303P-K0.75	2CDS383001R0187	0.372	1
	1	9077996	S303P-K1	2CDS383001R0217	0.372	1
	1.6	9077941	S303P-K1.6	2CDS383001R0257	0.372	1
	2	9077927	S303P-K2	2CDS383001R0277	0.372	1
	3	9077903	S303P-K3	2CDS383001R0317	0.372	1
	4	9077859	S303P-K4	2CDS383001R0337	0.372	1
	6	9077835	S303P-K6	2CDS383001R0377	0.372	1
	8	9077781	S303P-K8	2CDS383001R0407	0.372	1
	10	9077767	S303P-K10	2CDS383001R0427	0.372	1
	13	9077743	S303P-K13	2CDS383001R0447	0.372	1
	16	9077736	S303P-K16	2CDS383001R0467	0.372	1
	20	9077712	S303P-K20	2CDS383001R0487	0.372	1
	25	9077668	S303P-K25	2CDS383001R0517	0.372	1
	32	9077644	S303P-K32	2CDS383001R0537	0.372	1
	40	9077620	S303P-K40	2CDS383001R0557	0.372	1
	50	9077606	S303P-K50	2CDS383001R0577	0.372	1
	63	9077583	S303P-K63	2CDS383001R0607	0.372	1
4	0.2	9076562	S304P-K0.2	2CDS384001R0087	0.496	1
	0.3	9076524	S304P-K0.3	2CDS384001R0117	0.496	1
	0.5	9076487	S304P-K0.5	2CDS384001R0157	0.496	1
	0.75	9076432	S304P-K0.75	2CDS384001R0187	0.496	1
	1	9076395	S304P-K1	2CDS384001R0217	0.496	1
	1.6	9076340	S304P-K1.6	2CDS384001R0257	0.496	1
	2	9076326	S304P-K2	2CDS384001R0277	0.496	1
	3	9135542	S304P-K3	2CDS384001R0317	0.496	1
	4	9076258	S304P-K4	2CDS384001R0337	0.496	1
	6	9076234	S304P-K6	2CDS384001R0377	0.496	1
	8	9076180	S304P-K8	2CDS384001R0407	0.496	1
	10	9076166	S304P-K10	2CDS384001R0427	0.496	1
	13	9076142	S304P-K13	2CDS384001R0447	0.496	1
	16	9076135	S304P-K16	2CDS384001R0467	0.496	1
	20	9076111	S304P-K20	2CDS384001R0487	0.496	1
	25	9076067	S304P-K25	2CDS384001R0517	0.496	1
	32	9076043	S304P-K32	2CDS384001R0537	0.496	1
	40	9076029	S304P-K40	2CDS384001R0557	0.496	1
	50	9135528	S304P-K50	2CDS384001R0577	0.496	1
	63	9075985	S304P-K63	2CDS384001R0607	0.496	1

Miniature Circuit breakers S300P

K characteristic



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1+N	0.2	9079761	S301P-K0.2NA	2CDS381103R0087	0.248	5
	0.3	9079723	S301P-K0.3NA	2CDS381103R0117	0.248	5
	0.5	9079686	S301P-K0.5NA	2CDS381103R0157	0.248	5
	0.75	9079631	S301P-K0.75NA	2CDS381103R0187	0.248	5
	1	9079594	S301P-K1NA	2CDS381103R0217	0.248	5
	1.6	9079549	S301P-K1.6NA	2CDS381103R0257	0.248	5
	2	9079525	S301P-K2NA	2CDS381103R0277	0.248	5
	3	9079501	S301P-K3NA	2CDS381103R0317	0.248	5
	4	9079457	S301P-K4NA	2CDS381103R0337	0.248	5
	6	9079433	S301P-K6NA	2CDS381103R0377	0.248	5
	8	9079389	S301P-K8NA	2CDS381103R0407	0.248	5
	10	9079365	S301P-K10NA	2CDS381103R0427	0.248	5
	13	9079341	S301P-K13NA	2CDS381103R0447	0.248	5
	16	9079334	S301P-K16NA	2CDS381103R0467	0.248	5
	20	9079310	S301P-K20NA	2CDS381103R0487	0.248	5
	25	9079266	S301P-K25NA	2CDS381103R0517	0.248	5
	32	9079242	S301P-K32NA	2CDS381103R0537	0.248	5
	40	9079228	S301P-K40NA	2CDS381103R0557	0.248	5
	50	9135665	S301P-K50NA	2CDS381103R0577	0.248	5
	63	9079181	S301P-K63NA	2CDS381103R0607	0.248	5
3+N	0.2	9077361	S303P-K0.2NA	2CDS383103R0087	0.496	1
	0.3	9077323	S303P-K0.3NA	2CDS383103R0117	0.496	1
	0.5	9077286	S303P-K0.5NA	2CDS383103R0157	0.496	1
	0.75	9077231	S303P-K0.75NA	2CDS383103R0187	0.496	1
	1	9077194	S303P-K1NA	2CDS383103R0217	0.496	1
	1.6	9077149	S303P-K1.6NA	2CDS383103R0257	0.496	1
	2	9077125	S303P-K2NA	2CDS383103R0277	0.496	1
	3	9135634	S303P-K3NA	2CDS383103R0317	0.496	1
	4	9077057	S303P-K4NA	2CDS383103R0337	0.496	1
	6	9077033	S303P-K6NA	2CDS383103R0377	0.496	1
	8	9076982	S303P-K8NA	2CDS383103R0407	0.496	1
	10	9076968	S303P-K10NA	2CDS383103R0427	0.496	1
	13	9076944	S303P-K13NA	2CDS383103R0447	0.496	1
	16	9076937	S303P-K16NA	2CDS383103R0467	0.496	1
	20	9076913	S303P-K20NA	2CDS383103R0487	0.496	1
	25	9076869	S303P-K25NA	2CDS383103R0517	0.496	1
	32	9076845	S303P-K32NA	2CDS383103R0537	0.496	1
	40	9076821	S303P-K40NA	2CDS383103R0557	0.496	1
	50	9135597	S303P-K50NA	2CDS383103R0577	0.496	1
	63	9076784	S303P-K63NA	2CDS383103R0607	0.496	1

Miniature Circuit breakers S300P

Z characteristic



S 301



S 302



S 303

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
1	0.5	9080460	S301P-Z0.5	2CDS381001R0158	0.124	10
	1	9080378	S301P-Z1	2CDS381001R0218	0.124	10
	1.6	9080323	S301P-Z1.6	2CDS381001R0258	0.124	10
	2	9080309	S301P-Z2	2CDS381001R0278	0.124	10
	3	9080286	S301P-Z3	2CDS381001R0318	0.124	10
	4	9080231	S301P-Z4	2CDS381001R0338	0.124	10
	6	9080217	S301P-Z6	2CDS381001R0378	0.124	10
	8	9080163	S301P-Z8	2CDS381001R0408	0.124	10
	10	9080149	S301P-Z10	2CDS381001R0428	0.124	10
	16	9080118	S301P-Z16	2CDS381001R0468	0.124	10
	20	9080095	S301P-Z20	2CDS381001R0488	0.124	10
	25	9080040	S301P-Z25	2CDS381001R0518	0.124	10
	32	9080026	S301P-Z32	2CDS381001R0538	0.124	10
	40	9080002	S301P-Z40	2CDS381001R0558	0.124	10
	50	9079983	S301P-Z50	2CDS381001R0578	0.124	10
	63	9079969	S301P-Z63	2CDS381001R0608	0.124	10
2	0.5	9078870	S302P-Z0.5	2CDS382001R0158	0.248	5
	1	9078788	S302P-Z1	2CDS382001R0218	0.248	5
	1.6	9078733	S302P-Z1.6	2CDS382001R0258	0.248	5
	2	9078719	S302P-Z2	2CDS382001R0278	0.248	5
	3	9078696	S302P-Z3	2CDS382001R0318	0.248	5
	4	9078641	S302P-Z4	2CDS382001R0338	0.248	5
	6	9078627	S302P-Z6	2CDS382001R0378	0.248	5
	8	9078573	S302P-Z8	2CDS382001R0408	0.248	5
	10	9078559	S302P-Z10	2CDS382001R0428	0.248	5
	16	9078528	S302P-Z16	2CDS382001R0468	0.248	5
	20	9078504	S302P-Z20	2CDS382001R0488	0.248	5
	25	9078450	S302P-Z25	2CDS382001R0518	0.248	5
	32	9078436	S302P-Z32	2CDS382001R0538	0.248	5
	40	9078412	S302P-Z40	2CDS382001R0558	0.248	5
	50	9078399	S302P-Z50	2CDS382001R0578	0.248	5
	63	9078375	S302P-Z63	2CDS382001R0608	0.248	5
3	0.5	9078078	S303P-Z0.5	2CDS383001R0158	0.372	1
	1	9077989	S303P-Z1	2CDS383001R0218	0.372	1
	1.6	9077934	S303P-Z1.6	2CDS383001R0258	0.372	1
	2	9077910	S303P-Z2	2CDS383001R0278	0.372	1
	3	9077897	S303P-Z3	2CDS383001R0318	0.372	1
	4	9077842	S303P-Z4	2CDS383001R0338	0.372	1
	6	9077828	S303P-Z6	2CDS383001R0378	0.372	1
	8	9077774	S303P-Z8	2CDS383001R0408	0.372	1
	10	9077750	S303P-Z10	2CDS383001R0428	0.372	1
	16	9077729	S303P-Z16	2CDS383001R0468	0.372	1
	20	9077705	S303P-Z20	2CDS383001R0488	0.372	1
	25	9077651	S303P-Z25	2CDS383001R0518	0.372	1
	32	9077637	S303P-Z32	2CDS383001R0538	0.372	1
	40	9077613	S303P-Z40	2CDS383001R0558	0.372	1
	50	9077590	S303P-Z50	2CDS383001R0578	0.372	1
	63	9077576	S303P-Z63	2CDS383001R0608	0.372	1

Miniature Circuit breakers S300P

Z characteristic



S 304



S 301 NA



S 303 NA

Number of poles	Rated current [A]	Order details Bbn 401677 EAN	Type code	Ordercode	Weight 1 piece kg	Pack unit pc.
4	0.5	9076470	S304P-Z0.5	2CDS384001R0158	0.496	1
	1	9076388	S304P-Z1	2CDS384001R0218	0.496	1
	1.6	9076333	S304P-Z1.6	2CDS384001R0258	0.496	1
	2	9076319	S304P-Z2	2CDS384001R0278	0.496	1
	3	9076296	S304P-Z3	2CDS384001R0318	0.496	1
	4	9076241	S304P-Z4	2CDS384001R0338	0.496	1
	6	9076227	S304P-Z6	2CDS384001R0378	0.496	1
	8	9076173	S304P-Z8	2CDS384001R0408	0.496	1
	10	9076159	S304P-Z10	2CDS384001R0428	0.496	1
	16	9076128	S304P-Z16	2CDS384001R0468	0.496	1
	20	9135535	S304P-Z20	2CDS384001R0488	0.496	1
	25	9076050	S304P-Z25	2CDS384001R0518	0.496	1
	32	9076036	S304P-Z32	2CDS384001R0538	0.496	1
	40	9076012	S304P-Z40	2CDS384001R0558	0.496	1
	50	9075992	S304P-Z50	2CDS384001R0578	0.496	1
	63	9075978	S304P-Z63	2CDS384001R0608	0.496	1
1+N	0.5	9079679	S301P-Z0.5NA	2CDS381103R0158	0.248	5
	1	9079587	S301P-Z1NA	2CDS381103R0218	0.248	5
	1.6	9079532	S301P-Z1.6NA	2CDS381103R0258	0.248	5
	2	9079518	S301P-Z2NA	2CDS381103R0278	0.248	5
	3	9079495	S301P-Z3NA	2CDS381103R0318	0.248	5
	4	9079440	S301P-Z4NA	2CDS381103R0338	0.248	5
	6	9079426	S301P-Z6NA	2CDS381103R0378	0.248	5
	8	9079372	S301P-Z8NA	2CDS381103R0408	0.248	5
	10	9079358	S301P-Z10NA	2CDS381103R0428	0.248	5
	16	9079327	S301P-Z16NA	2CDS381103R0468	0.248	5
	20	9135672	S301P-Z20NA	2CDS381103R0488	0.248	5
	25	9079259	S301P-Z25NA	2CDS381103R0518	0.248	5
	32	9079235	S301P-Z32NA	2CDS381103R0538	0.248	5
	40	9079211	S301P-Z40NA	2CDS381103R0558	0.248	5
	50	9079198	S301P-Z50NA	2CDS381103R0578	0.248	5
	63	9079174	S301P-Z63NA	2CDS381103R0608	0.248	5
3+N	0.5	9077279	S303P-Z0.5NA	2CDS383103R0158	0.496	1
	1	9077187	S303P-Z1NA	2CDS383103R0218	0.496	1
	1.6	9077132	S303P-Z1.6NA	2CDS383103R0258	0.496	1
	2	9077118	S303P-Z2NA	2CDS383103R0278	0.496	1
	3	9077095	S303P-Z3NA	2CDS383103R0318	0.496	1
	4	9077040	S303P-Z4NA	2CDS383103R0338	0.496	1
	6	9077026	S303P-Z6NA	2CDS383103R0378	0.496	1
	8	9076975	S303P-Z8NA	2CDS383103R0408	0.496	1
	10	9076951	S303P-Z10NA	2CDS383103R0428	0.496	1
	16	9076920	S303P-Z16NA	2CDS383103R0468	0.496	1
	20	9135610	S303P-Z20NA	2CDS383103R0488	0.496	1
	25	9076852	S303P-Z25NA	2CDS383103R0518	0.496	1
	32	9076838	S303P-Z32NA	2CDS383103R0538	0.496	1
	40	9076814	S303P-Z40NA	2CDS383103R0558	0.496	1
	50	9076791	S303P-Z50NA	2CDS383103R0578	0.496	1
	63	9076777	S303P-Z63NA	2CDS383103R0608	0.496	1

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Smart Building

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9AKK107992A4964 Rev. F - 04.2024

ITEM	Tag	DP-200N1-Q38	: AUX 6,6KV - DP-200N1-Q38		Dwg	1723002197-EL-DG-00013	
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)		Module		
TASK	code	C10002937	Location	Onshore Activities	User	Rosetti Marino Quality Control	
FORM	Process	PRE-COMM	Activity	FTS	Discipline	Electrical	Form	FTR-2	Protection Relay

FTR2 - Protection relay
Record sheet

RELAY DATA

Manufacturer:	ABB	Serial N°:	NA	Relay type:	NA
Auxiliary supply:	NA	Location:	B200	Cubicle:	+03
Switchboard:	DP-200N1				

Current transformers

Tag	Number of	Ratio	Location

Voltage transformers

Tag	Number of	Ratio	Location

Test result (refer to manufacturer's procedure)

ANSI function	Setting	Injection	Trip value	Time delay	
				Setting	Trip value
I	10A	NA	NA	FIXED	NA

Testing & measurement instruments used

Type	Serial n°	Calibration certificate	Validity
FLUKE 1663	5380144	7727/24	10/07/2025

Comments:

Page 1/1	Performed by	☐ WITNESS ☉ REVIEW	☐ WITNESS ☐ REVIEW
Company	RM COMM	RM COMM	CPY NOT PRESENT
Name	Mattia Girotti	Kristian Castellani	Witness waived
Date	2024-10-25	2024-10-29	2024-10-29
Signature	PROVERLIS Digitaly signed by Mattia Girotti 2024-10-25T07:53:40.473Z	PROVERLIS Digitaly signed by Kristian Castellani 2024-10-29T08:50:01.899Z	PROVERLIS Digitaly signed by Witness waived 2024-10-29T09:03:08.620Z

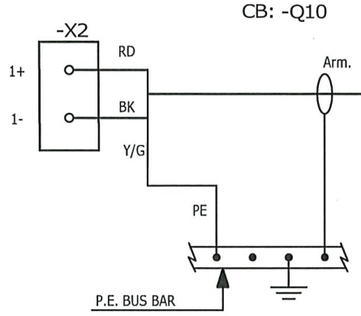
Section 4.2 Electrical
“As-Commissioned” interconnection diagrams

FROM	TO

DESCRIPTION: DC UPS DB
TAG NUMBER: DP-200F1

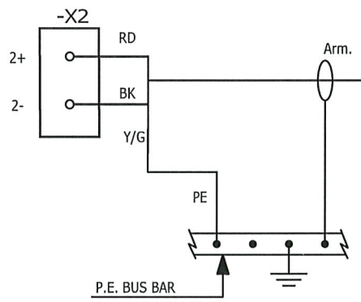
UP-200 F1
MARCO MORETTO
18/3/25

CB: -Q10



84101-CEL
3G16 mm²

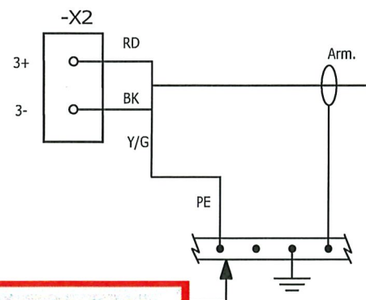
CB: -Q11



84102-CEL
3G16 mm²

CB: -Q12

NO MARK UP
MARCO MORETTO
20/3/25

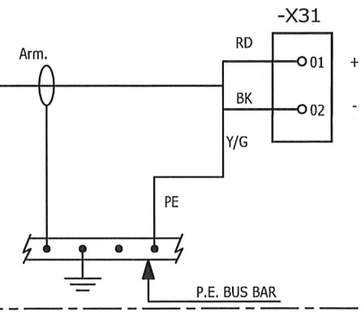


84103-CEL
3G16 mm²

AS COMMISSIONED: GIANLI MATTIA

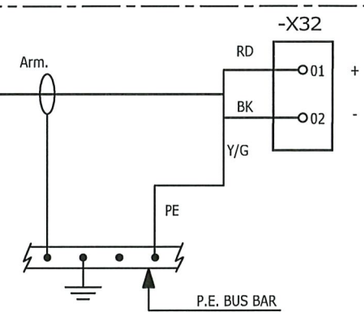
DESCRIPTION: DC CONTROL FOR 66 KV GIS LINE-1
TAG NUMBER: CP-100E1

PANEL: LCP



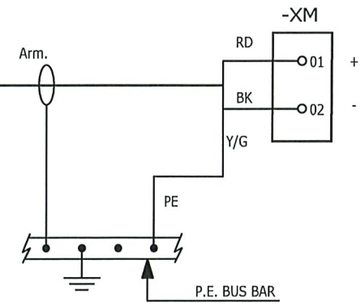
DESCRIPTION: DC CONTROL FOR 66 KV GIS LINE-2
TAG NUMBER: CP-100E1

PANEL: LCP



DESCRIPTION: DC CONTROL FOR 6,6 KV SWITCHGEAR LINE-A
TAG NUMBER: SG-100D1

COLUMN/CUBIC.: A5



VALID FOR CONSTRUCTION
FDL DWG: 123A90-FDL-EL-DG-20149

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
DC UPS DB DP-200F1

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : 1:X

A3 | DRAWING NO. 123A90-DDL-EL-DG-20149 | SHEET 033 | REV. 02

F.to UNI A3: 420mmx297mm

File Name : 123A90-DDL-EL-DG-20149 Rev. 02

FROM	TO

DESCRIPTION: LV SWITCHGEAR
TAG NUMBER: SG-200N1

COLUMN/CUBIC: A2/+02

-X2

400 V INCOMING TRIP FROM 6.6 kV FEEDER

7 → 1
8 → 2
3
4
5
6
7

BK

83006-CEC
7C X 1.5 mm²

BK

DESCRIPTION: 6.6KV HV SWITCHGEAR
TAG NUMBER: SG-100D1

COLUMN A4

-XM

1 → XM / 69
2 → XM / 70
3
4
5
6
7

MARCO MORETTO 10/1/25

DESCRIPTION: 6.6KV HV SWITCHGEAR
TAG NUMBER: SG-100D1

COLUMN/CUBIC.:A4

-XI

10 → 1
11 → 2
3
4

BK

82015-CEC
4C X 4 mm²

NO MARK UP
MARCO MORETTO
7/03/25

BK

DESCRIPTION: 6.6/0.415 kV, 1.6MVA Transformer
TAG NUMBER: CP-200E1

COLUMN/CUBIC.:-

-X1

1 → 31
2 → 32
3
4

AS COMMISSIONED: MATTIA GIRGI

VALID FOR CONSTRUCTION
FDL DWG: **123A90-FDL-EL-DG-20149**

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
LV SWITCHGEAR & 6.6KV HV SWITCHGEAR INTERLOCKS

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : 1:X

A3 | DRAWING NO. 123A90-DDL-EL-DG-20149 | SHEET 081 | REV. 02

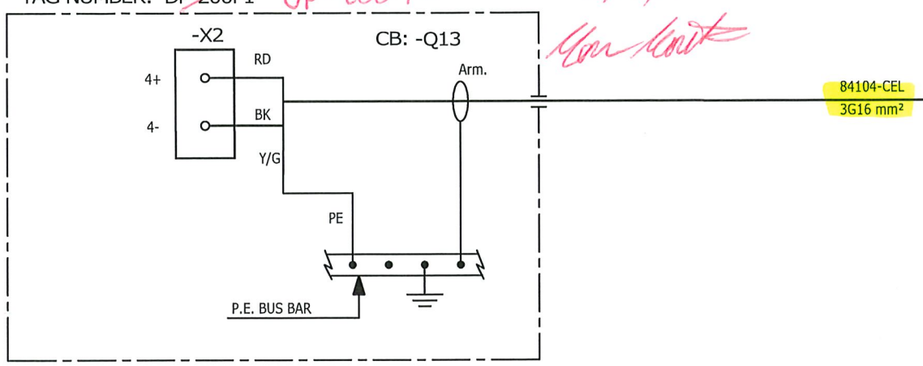
F.to UNI A3: 420mmx297mm

File Name : 123A90-DDL-EL-DG-20149 Rev. 02

FROM	TO

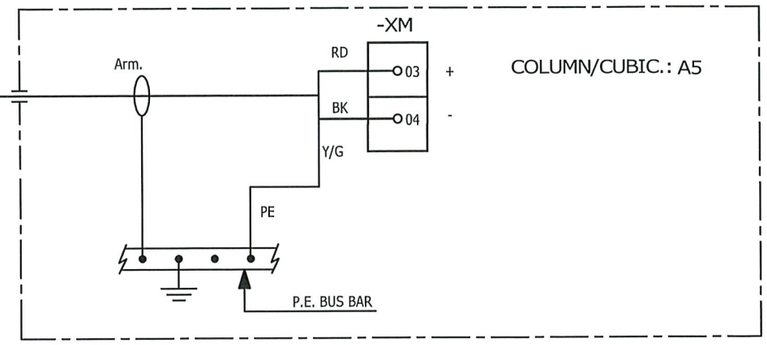
DESCRIPTION: DC UPS DB
TAG NUMBER: DP-200F1 ~~2~~ UP-200 P1

MARCO MORETTO 18/3/25

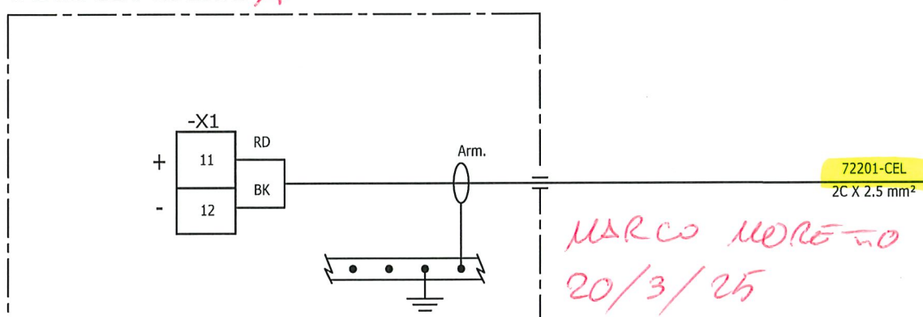


84104-CEL
3G16 mm²

DESCRIPTION: DC CONTROL FOR 6,6 KV SWITCHGEAR LINE-B
TAG NUMBER: SG-100D1



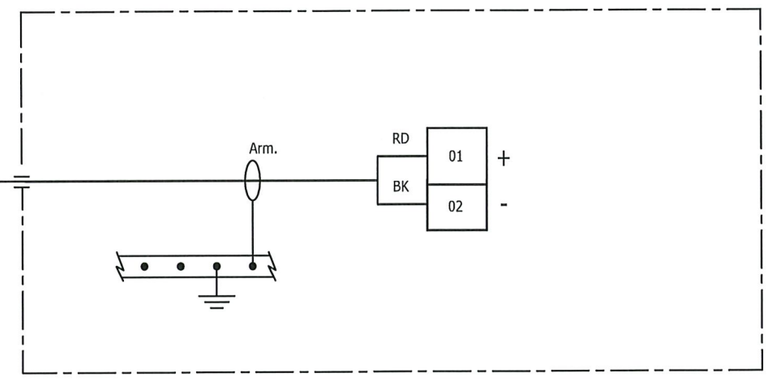
DESCRIPTION: DC UPS NAVAID SYSTEM
TAG NUMBER: NC-200F2 A



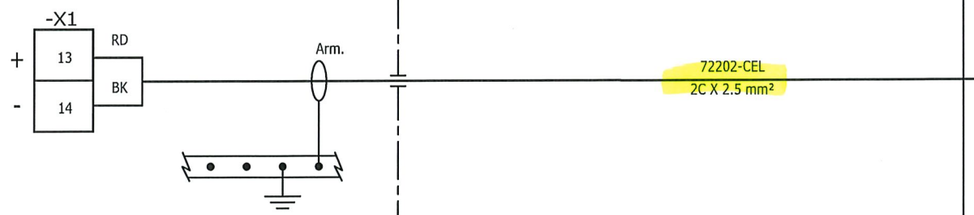
72201-CEL
2C X 2.5 mm²

MARCO MORETTO 20/3/25

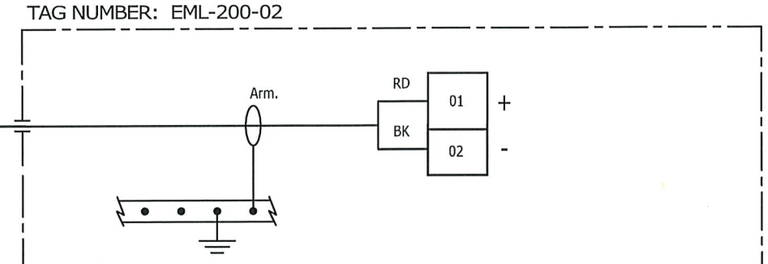
DESCRIPTION: NAV AIDS MAIN YELLOW LANTERNS
TAG NUMBER: EML-200-01



DESCRIPTION: NAV AIDS MAIN YELLOW LANTERNS
TAG NUMBER: EML-200-02



72202-CEL
2C X 2.5 mm²



AS COMMISSIONED: MATTIA GIROTTI

VALID FOR CONSTRUCTION
FDL DWG: **123A90-FDL-EL-DG-20149**

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
DC UPS DB & DC UPS NAVAID SYSTEM

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : 1:X

A3	DRAWING NO. 123A90-DDL-EL-DG-20149	SHEET 034	REV. 02

F.to UNI A3: 420mmx297mm

File Name : 123A90-DDL-EL-DG-20149 Rev. 02

FROM	TO

DESCRIPTION: 6.6/0.415 KV TRANSFORMER
TAG NUMBER: CP-200E1

TRIP 63T, 49T TO RELAY

-X1

WIND. TEMPERATURE TRIP	X1 / 36	1
	X1 / 38	2
PRESSURE RELAY TRIP	X1 / 20	3
	X1 / 21	4
		5
		6
		7

BK

83004-CEC
7C X 1.5 mm²

BK

A4

-XM

1	XM / 23	WIND. TEMPERATURE TRIP
2	XM / 24	
3	XM / 21	PRESSURE RELAY TRIP
4	XM / 22	
5		
6		
7		

MARCO MORETTO
10/1/25

DESCRIPTION: LV SWITCHGEAR
TAG NUMBER: SG-200N1

COLUMN/CUBIC. A2/08 ~~A2/02~~

PERMISSIVES FROM LV TO 6.6KV FEEDER CB AND EARTHING SWITCH

-X2

X2 / 21	1	
X2 / 22	2	
X2 / 23	3	
X2 / 24	4	
X2 / 25	5	
X2 / 26	6	
	7	

MARCO MORETTO
20/3/25

BK

83005-CEC
7C X 1.5 mm²

BK

-XM

1	XM / 27	CB OPENED FROM LV SWBD
2	XM / 28	
3	XM / 39	CB IN TEST POSITION FROM LV SWBD
4	XM / 40	
5	XM / 41	FROM LV SWBD TRIPPED
6	XM / 42	
7		

AS COMMISSIONED: MATTIA GINOTTI

VALID FOR CONSTRUCTION
FDL DWG: **123A90-FDL-EL-DG-20149**

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
LV SWITCHGEAR & 6.6KV HV SWITCHGEAR INTERLOCKS

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : 1:X

A3	DRAWING NO.	SHEET	REV.
	123A90-DDL-EL-DG-20149	080	02

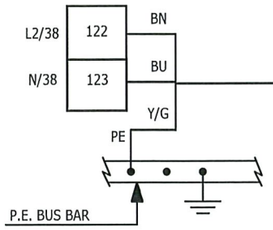
F.to UNI A3: 420mmx297mm

File Name : 123A90-DDL-EL-DG-20149 Rev. 02

FROM	TO

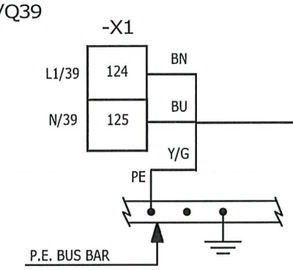
DESCRIPTION: LIGHTING & SMALL POWER DB BOP
TAG NUMBER: DP-200N1

CUBICLE/CB: +03/Q38



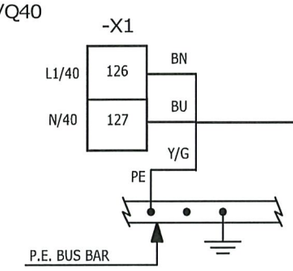
83119-CEL
3G2.5 mm²

CUBICLE/CB: +03/Q39



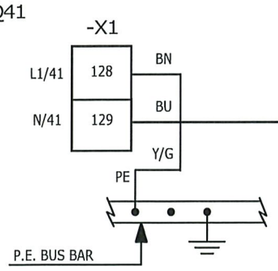
83120-CEL
3G2.5 mm²

CUBICLE/CB: +03/Q40



83121-CEL
3G2.5 mm²

CUBICLE/CB: +03/Q41



83122-CEL
3G2.5 mm²

AS COMMISSIONED: MATTIA GIROTTI

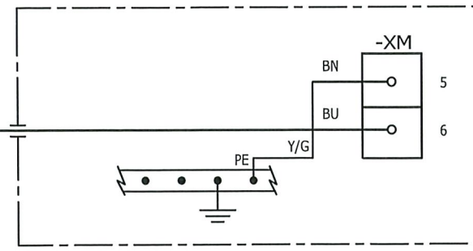
NO MARK UP
MARCO MORETTO
18/3/25

MARCO MORETTO

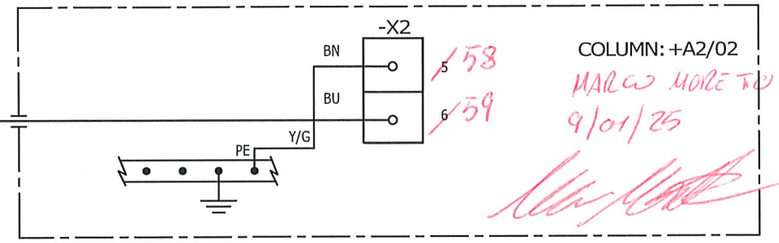
NO MARK UP
18/3/25

MARCO MORETTO
20/3/25

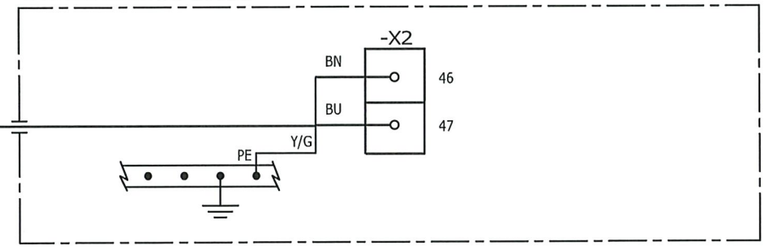
DESCRIPTION: AUXILIARY 6.6KV SWITCHBOARD
TAG NUMBER: SG-100D1



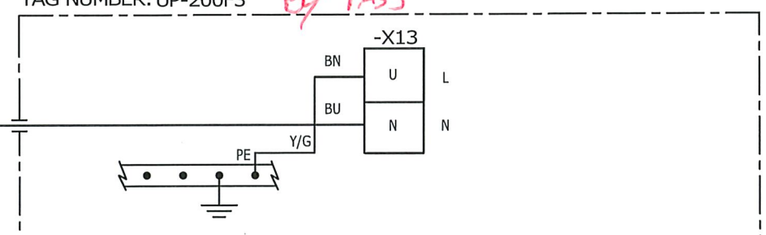
DESCRIPTION: AUXILIARY LV
TAG NUMBER: SG-200N1



DESCRIPTION: LV SWBD 800/460V AUXILIARY
TAG NUMBER: SG-200D2



DESCRIPTION: AC UPS PAS AUXILIARY
TAG NUMBER: UP-200F3 BY PASS



VALID FOR CONSTRUCTION
FDL DWG: 123A90-FDL-EL-DG-20149

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
LIGHTING & SMALL POWER DB BOP

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : 1:X

A3	DRAWING NO.	SHEET	REV.
	123A90-DDL-EL-DG-20149	056	02

F.to UNI A3: 420mmx297mm

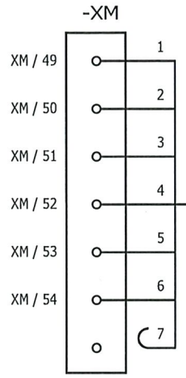
File Name : 123A90-DDL-EL-DG-20149 Rev. 02

FROM	TO

DESCRIPTION: 6.6KV HV SWITCHGEAR
TAG NUMBER: SG-100D1

INTERTRIP AND 86 TRIP TO LV INCOMING

COLUMN: A4

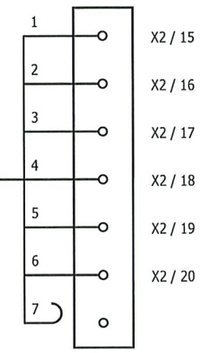


BK — 82013-CEC 7C X 1.5 mm² — BK

NO MARK UP
MARCO MORETO
18/3/25

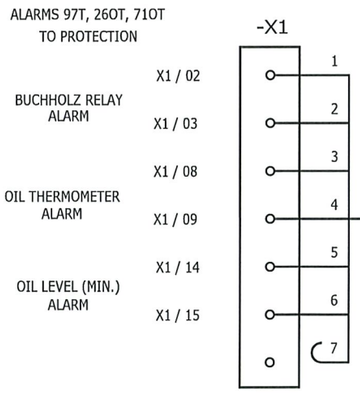
DESCRIPTION: LV SWITCHGEAR
TAG NUMBER: SG-200N1

COLUMN/CUBIC.: ~~A1/02~~ A2/02



DESCRIPTION: 6.6/0.415 KV TRANSFORMER
TAG NUMBER: CP-200DE1A

COLUMN/CUBIC.: -



BK — 83001-CEC 7C X 1.5 mm² — BK

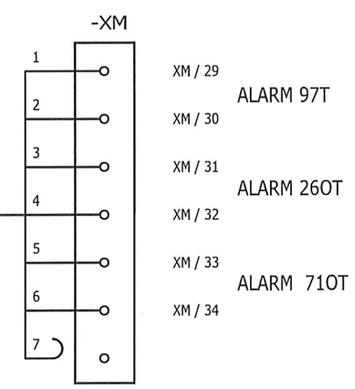
NO MARK UP

MARCO MORETO
7/03/25

AS COMMISSIONED: MATTIA GIROTI

DESCRIPTION: 6.6KV HV SWITCHGEAR
TAG NUMBER: SG-100D1

COLUMN/CUBIC.: A4



VALID FOR CONSTRUCTION
FDL DWG: **123A90-FDL-EL-DG-20149**

REV.:	DATE:	SIGNATURE:
2_F	09/01/25	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
02	19/11/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
01	16/10/24	SAI	FMA/AMA	FPA/DLO	ACCEPTED FOR CONSTRUCTION (AFC)
00	08/07/24	SAI	FMA/AMA	FPA/DLO	ISSUE FOR REVIEW (IFR)

TITLE : BASE LOAD POWER HUB (BLPH)
ELECTRICAL INTERCONNECTING WIRING DIAGRAM
CP-200DE1A TRANSFORMER ALARMS PROTECTION

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : 1:X

A3 | DRAWING NO. 123A90-DDL-EL-DG-20149 | SHEET 078 | REV. 02

F.to UNI A3: 420mmx297mm

File Name : 123A90-DDL-EL-DG-20149 Rev. 02

"SG-100D1" MV SWBD 6,6kV

INTERCONNECTING

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
26/03/2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

IMESA ELECTRICAL ENGINEERING

DWG n°: 231151/SD/22

Item n°: PF1113279

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – INTERCONNECTING

Cover

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 1

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00022 Rev.03

AS COMMISSIONED NO MARK UP
GIROTTI MATTIA 26/03/2025

INDEX

Sheet	Description	Revision 0	1	2	3	4	5	6	7	8
1	Cover	X	X	X	X					
2	Index	X	X	X	X					
3	Table of reference documents	X	X	X	X					
4	Intercolumn Wiring	X	X	X	X					
5	Intercolumn Wiring	X	X	X	X					
6	Intercolumn Wiring	X	X	X	X					
7	Network architecture IEC 61850	X	X	X	X					
8	Network architecture Modbus TCP/IP	X	X	X	X					

Sheet	Description	Revision 0	1	2	3	4	5	6	7	8

=						
+						
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)	
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n°: 231151/SD/22

Item n°: PF1113279

TITLE : SG-100D1 – INTERCONNECTING

Index

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 2

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00022 Rev.03

TABLE OF REFERENCES		
Document nr. Client	Document nr. Supplier	Document title
1723002197-EL-DA-00006	231151/SD/6	SG-100D1 GENERAL ARRANGEMENTS
1723002197-EL-DG-00010	231151/SD/10	SG-100D1 ELECTRICAL SINGLE LINE DIAGRAM
1723002197-EL-DG-00015	231151/SD/15	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - INCOMING FEEDER
1723002197-EL-DG-00016	231151/SD/16	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BUS BAR METERING
1723002197-EL-DG-00017	231151/SD/17	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BESS FEEDER
1723002197-EL-DG-00018	231151/SD/18	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - ELECTROLYSER FEEDER
1723002197-EL-DG-00019	231151/SD/19	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - FUEL CELL FEEDER
1723002197-EL-DG-00020	231151/SD/20	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200ED1
1723002197-EL-DG-00021	231151/SD/21	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200DE1

NOTE: To better understand this document you have to use in conjuction with the documents listed on the table above

AS COMMISSIONED
CIROTTI MATTIA
NO MARK UP
26/03/2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n°: 231151/SD/22
Item n°: PF1113279

TITLE : SG-100D1 - INTERCONNECTING
Table of reference documents

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 3

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00022 Rev.03

	ELECTROLYSER "A1"	SOLAR "A2"	BESS PACKAGE "A3"	TRANSF. 1,6MVA TR-200DE1 "A4"	VT BUS BARS "A5"	INCOMING "A6"	FUEL CELL "A7"
V.aux 110Vdc	1 XC XC-2/A1 — 2 XC	XC-1/A2 RD 1x6 1 XC — 2 XC XC-2/A2	XC-1/A3 1 XC — 2 XC XC-2/A3	XC-1/A4 RD 1x6 1 XC — 2 XC XC-2/A4	XC-1/A5 RD 1x6 1 XC — 2 XC XC-2/A5	XC-1/A6 1 XC — 2 XC XC-2/A6	XC-1/A7 RD 1x6 1 XC — 2 XC
	3 XC XC-4/A1 — 4 XC	XC-3/A2 WH 1x6 3 XC — 4 XC XC-4/A2	XC-3/A3 3 XC — 4 XC XC-4/A3	XC-3/A4 WH 1x6 3 XC — 4 XC XC-4/A4	XC-3/A5 WH 1x6 3 XC — 4 XC XC-4/A5	XC-3/A6 3 XC — 4 XC XC-4/A6	XC-3/A7 WH 1x6 3 XC — 4 XC
V.aux 24Vdc	5 XC XC-6/A1 — 6 XC	XC-5/A2 RD 1x1,5 5 XC — 6 XC XC-6/A2	XC-5/A3 5 XC — 6 XC XC-6/A3	XC-5/A4 RD 1x1,5 5 XC — 6 XC XC-6/A4	XC-5/A5 RD 1x1,5 5 XC — 6 XC XC-6/A5	XC-5/A6 5 XC — 6 XC XC-6/A6	XC-5/A7 RD 1x1,5 5 XC — 6 XC
	7 XC XC-8/A1 — 8 XC	XC-7/A2 WH 1x1,5 7 XC — 8 XC XC-8/A2	XC-7/A3 7 XC — 8 XC XC-8/A3	XC-7/A4 WH 1x1,5 7 XC — 8 XC XC-8/A4	XC-7/A5 WH 1x1,5 7 XC — 8 XC XC-8/A5	XC-7/A6 7 XC — 8 XC XC-8/A6	XC-7/A7 WH 1x1,5 7 XC — 8 XC
V.aux 230Vac	9 XC XC-10/A1 — 10 XC	XC-9/A2 BK 1x6 9 XC — 10 XC XC-10/A2	XC-9/A3 9 XC — 10 XC XC-10/A3	XC-9/A4 BK 1x6 9 XC — 10 XC XC-10/A4	XC-9/A5 BK 1x6 9 XC — 10 XC XC-10/A5	XC-9/A6 9 XC — 10 XC XC-10/A6	XC-9/A7 BK 1x6 9 XC — 10 XC
	11 XC XC-12/A1 — 12 XC	XC-11/A2 BK 1x6 11 XC — 12 XC XC-12/A2	XC-11/A3 11 XC — 12 XC XC-12/A3	XC-11/A4 BK 1x6 11 XC — 12 XC XC-12/A4	XC-11/A5 BK 1x6 11 XC — 12 XC XC-12/A5	XC-11/A6 11 XC — 12 XC XC-12/A6	XC-11/A7 BK 1x6 11 XC — 12 XC
VOLTMETRICAL LINE FROM MAIN BUS BAR 110:1,73Vac	13 XC XC-14/A1 — 14 XC	XC-13/A2 BK 1x1.5 13 XC — 14 XC XC-14/A2	XC-13/A3 13 XC — 14 XC XC-14/A3	XC-13/A4 BK 1x1.5 13 XC — 14 XC XC-14/A4	XC-13/A5 BK 1x1.5 13 XC — 14 XC XC-14/A5	XC-13/A6 13 XC — 14 XC XC-14/A6	XC-13/A7 BK 1x1.5 13 XC — 14 XC
	15 XC XC-16/A1 — 16 XC	XC-15/A2 BK 1x1.5 15 XC — 16 XC XC-16/A2	XC-15/A3 15 XC — 16 XC XC-16/A3	XC-15/A4 BK 1x1.5 15 XC — 16 XC XC-16/A4	XC-15/A5 BK 1x1.5 15 XC — 16 XC XC-16/A5	XC-15/A6 15 XC — 16 XC XC-16/A6	XC-15/A7 BK 1x1.5 15 XC — 16 XC
	17 XC XC-18/A1 — 18 XC	XC-17/A2 BK 1x1.5 17 XC — 18 XC XC-18/A2	XC-17/A3 17 XC — 18 XC XC-18/A3	XC-17/A4 BK 1x1.5 17 XC — 18 XC XC-18/A4	XC-17/A5 BK 1x1.5 17 XC — 18 XC XC-18/A5	XC-17/A6 17 XC — 18 XC XC-18/A6	XC-17/A7 BK 1x1.5 17 XC — 18 XC
	19 XC XC-20/A1 — 20 XC	XC-19/A2 BK 1x1.5 19 XC — 20 XC XC-20/A2	XC-19/A3 19 XC — 20 XC XC-20/A3	XC-19/A4 BK 1x1.5 19 XC — 20 XC XC-20/A4	XC-19/A5 BK 1x1.5 19 XC — 20 XC XC-20/A5	XC-19/A6 19 XC — 20 XC XC-20/A6	XC-19/A7 BK 1x1.5 19 XC — 20 XC
VOLTMETRICAL LINE FROM MAIN BUS BAR 110:3Vac	21 XC XC-22/A1 — 22 XC	XC-21/A2 BK 1x1.5 21 XC — 22 XC XC-22/A2	XC-21/A3 21 XC — 22 XC XC-22/A3	XC-21/A4 BK 1x1.5 21 XC — 22 XC XC-22/A4	XC-21/A5 BK 1x1.5 21 XC — 22 XC XC-22/A5	XC-21/A6 21 XC — 22 XC XC-22/A6	XC-21/A7 BK 1x1.5 21 XC — 22 XC
	23 XC XC-24/A1 — 24 XC	XC-23/A2 BK 1x1.5 23 XC — 24 XC XC-24/A2	XC-23/A3 23 XC — 24 XC XC-24/A3	XC-23/A4 BK 1x1.5 23 XC — 24 XC XC-24/A4	XC-23/A5 BK 1x1.5 23 XC — 24 XC XC-24/A5	XC-23/A6 23 XC — 24 XC XC-24/A6	XC-23/A7 BK 1x1.5 23 XC — 24 XC
EARTH.SWITCH OPEN (VT BUS BARS UNIT)	25 XC XC-25/A1 — BK 1x1.5 — XC-27/A5 BK 1x1.5 27 XC						
	26 XC XC-26/A1 — BK 1x1.5 — XC-28/A5 BK 1x1.5 28 XC						
		25 XC XC-25/A2 — BK 1x1.5 — XC-29/A5 BK 1x1.5 29 XC					
		26 XC XC-26/A2 — BK 1x1.5 — XC-30/A5 BK 1x1.5 30 XC					
			25 XC XC-25/A3 — BK 1x1.5 — XC-31/A5 BK 1x1.5 31 XC				
			26 XC XC-26/A3 — BK 1x1.5 — XC-32/A5 BK 1x1.5 32 XC				

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
26/03/2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

IMESA ELECTRICAL ENGINEERING

DWG n°: 231151/SD/22

Item n°: PF1113279

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – INTERCONNECTING

Intercolumn Wiring

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 4

REV. 03

File Name : 1723002197-EL-DG-00022 Rev.03

F.to UNI A3: 420mmx297mm

1	2	3	4	5	6	7	8	9	10
	ELECTROLYSER "A1"	SOLAR "A2"	BESS PACKAGE "A3"		TRANSF. 1,6MVA TR-200DE1 "A4"	VT BUS BARS "A5"	INCOMING "A6"	FUEL CELL "A7"	

A

B

C

D

E

EARTH.SWITCH OPEN (FROM VT BUS BARS UNIT)

ENABLING COMMAND EARTHING SWITCH VT BUS BARS UNIT

SIGNALS FROM VT BUS BARS UNIT TO CELL PAKAGE UNIT

25 XC — XC-25/A4 — XC-33/A5 BK 1x1.5 — 33 XC

26 XC — XC-26/A4 — XC-34/A5 BK 1x1.5 — 34 XC

35 XC — XC-35/A5 BK 1x1.5 — XC-25/A6 — 25 XC

36 XC — XC-36/A5 BK 1x1.5 — XC-26/A6 — 26 XC

37 XC — XC-37/A5 BK 1x1.5 — XC-25/A7 — 25 XC

38 XC — XC-38/A5 BK 1x1.5 — XC-26/A7 — 26 XC

28 XC — XC-28/A1 — XC-27/A2 BK 1x1.5 — 27 XC

28 XC — XC-28/A2 — XC-27/A3 BK 1x1.5 — 27 XC

28 XC — XC-28/A3 — XC-27/A4 BK 1x1.5 — 27 XC

28 XC — XC-28/A4 — XC-25/A5 BK 1x1.5 — 25 XC

26 XC — XC-26/A5 — XC-27/A6 BK 1x1.5 — 27 XC

28 XC — XC-28/A6 — XC-27/A7 BK 1x1.5 — 27 XC

27 XC — XC-27/A1 BK 1x1.5 — XC-28/A7 BK 1x1.5 — 28 XC

45 XC — XC-45/A5 BK 1x1.5 — XC-29/A7 — 29 XC

46 XC — XC-46/A5 BK 1x1.5 — XC-30/A7 — 30 XC

49 XC — XC-49/A5 BK 1x1.5 — XC-31/A7 — 31 XC

50 XC — XC-50/A5 BK 1x1.5 — XC-32/A7 — 32 XC

41 XC — XC-41/A5 BK 1x1.5 — XC-33/A7 — 33 XC

42 XC — XC-42/A5 BK 1x1.5 — XC-34/A7 — 34 XC

43 XC — XC-43/A5 BK 1x1.5 — XC-35/A7 — 35 XC

44 XC — XC-44/A5 BK 1x1.5 — XC-36/A7 — 36 XC

47 XC — XC-47/A5 BK 1x1.5 — XC-37/A7 — 37 XC

48 XC — XC-48/A5 BK 1x1.5 — XC-38/A7 — 38 XC

39 XC — XC-39/A5 BK 1x1.5 — XC-39/A7 — 39 XC

40 XC — XC-40/A5 BK 1x1.5 — XC-40/A7 — 40 XC

51 XC — XC-51/A5 BK 1x1.5 — XC-41/A7 — 41 XC

52 XC — XC-52/A5 BK 1x1.5 — XC-42/A7 — 42 XC

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
26/03/2025

=							
+							
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)		
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)		
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION		

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n°: 231151/SD/22

Item n°: PF1113279

TITLE : SG-100D1 – INTERCONNECTING

Intercolumn Wiring

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 5

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00022 Rev.03

1	2	3	4	5	6	7	8	9	10

	ELECTROLYSER "A1"	SOLAR "A2"	BESS PACKAGE "A3"	TRANSF. 1,6MVA TR-200DE1 "A4"	VT BUS BARS "A5"	INCOMING "A6"	FUEL CELL "A7"
A	29 XC-29/A1 XC BK 1x1.5						XC-47/A7 BK 1x1.5 47 XC
	30 XC-30/A1 XC BK 1x1.5						XC-48/A7 BK 1x1.5 48 XC
	31 XC-31/A1 XC BK 1x1.5	XC-29/A2 29 XC					
	32 XC-32/A1 XC BK 1x1.5	XC-30/A2 30 XC					
B	PROTECTION RELAY HEALTHY	31 XC-31/A2 XC BK 1x1.5	XC-29/A3 29 XC				
		32 XC-32/A2 XC BK 1x1.5	XC-30/A3 30 XC				
			31 XC-31/A3 XC BK 1x1.5	XC-29/A4 29 XC			
			32 XC-32/A3 XC BK 1x1.5	XC-30/A4 30 XC			
			37 XC-37/A3 XC BK 1x1.5	XC-31/A4 31 XC			
			38 XC-38/A3 XC BK 1x1.5	XC-32/A4 32 XC			
C						31 XC-31/A6 XC BK 1x1.5	XC-45/A7 45 XC
						32 XC-32/A6 XC BK 1x1.5	XC-46/A7 46 XC
	230Vac AUXILIARY SUPPLY HEALTHY	33 XC-33/A1 XC BK 1x1.5	XC-33/A2 BK 1x1.5 34 XC	34 XC-34/A2 XC BK 1x1.5	XC-34/A3 34 XC	33 XC-33/A3 XC BK 1x1.5	XC-33/A4 33 XC
		34 XC-34/A1 XC BK 1x1.5				34 XC-34/A4 XC BK 1x1.5	XC-54/A5 54 XC
						53 XC-53/A5 XC BK 1x1.5	XC-33/A6 33 XC
						34 XC-34/A6 XC BK 1x1.5	XC-43/A7 43 XC
							XC-44/A7 44 XC
D	OPENING COMMAND FROM INCOMING	35 XC-35/A1 XC BK 1x1.5				XC-35/A6 35 XC	
		36 XC-36/A1 XC BK 1x1.5				XC-36/A6 36 XC	

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
26/03/2025

=							
+							
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)		
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)		
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION		

CROSSWIND

ROSETTI MARINO

IMESA ELECTRICAL ENGINEERING

DWG n°: 231151/SD/22

Item n°: PF1113279

TITLE : SG-100D1 – INTERCONNECTING

Intercolumn Wiring

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

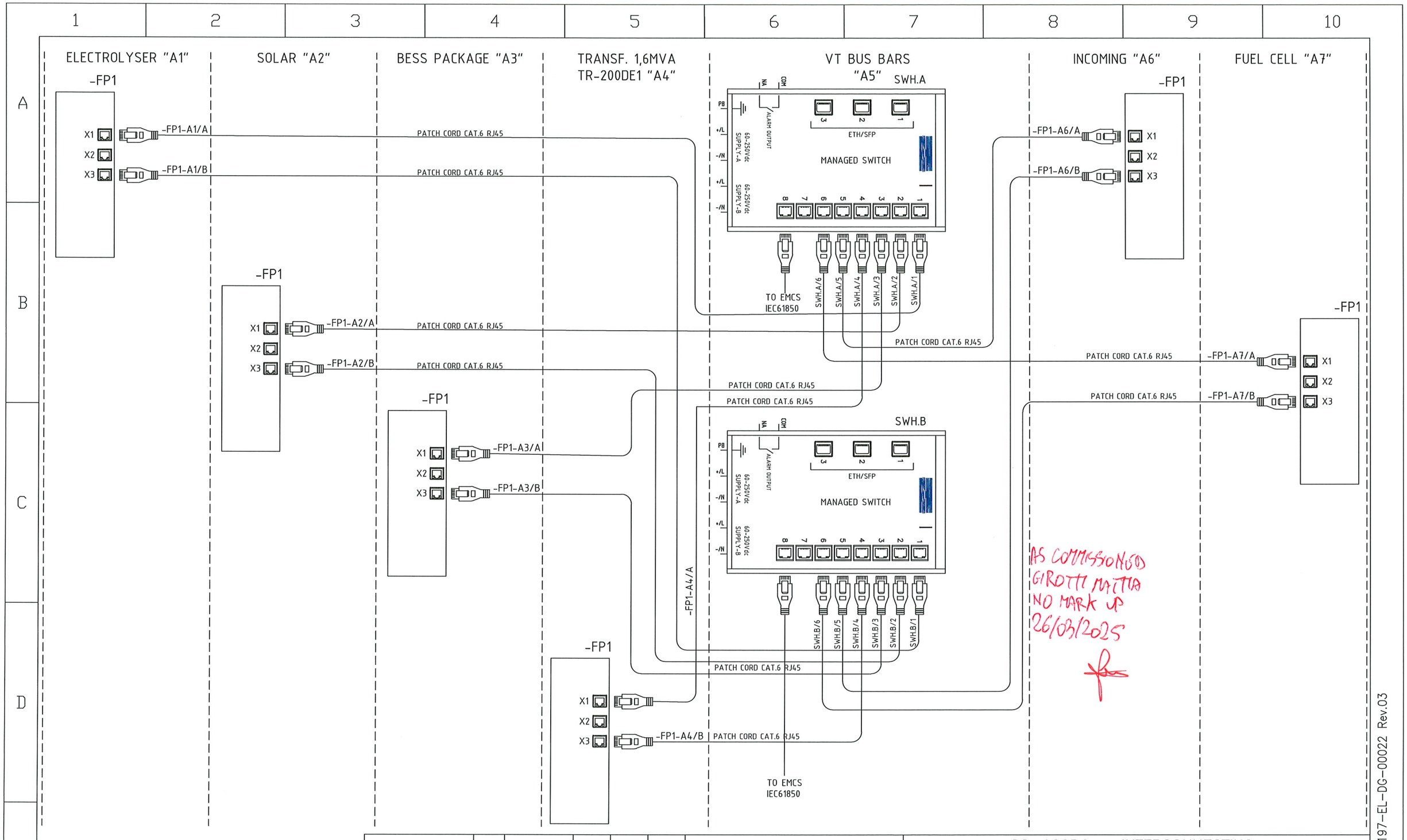
DRAWING NO. 1723002197-EL-DG-00022

SHEET 6

REV. 03

File Name : 1723002197-EL-DG-00022 Rev.03

F.to UNI A3: 420mmx297mm



REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

ROSETTI MARINO

IMESA ELECTRICAL ENGINEERING

DWG n°: 231151/SD/22

Item n°: PF1113279

TITLE : SG-100D1 - INTERCONNECTING

Network architecture IEC 61850

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 7

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00022 Rev.03

ELECTROLYSER "A1"

SOLAR "A2"

BESS PACKAGE "A3"

TRANSF. 1,6MVA
TR-200DE1 "A4"

VT BUS BARS
"A5"

INCOMING "A6"

FUEL CELL "A7"

-TR1

CARD 11

X0

X1

-TR1-A1/2

PATCH CORD CAT.6 RJ45

-TR1

CARD 12

X0

X1

-TR1-A2/1

-TR1-A2/2

PATCH CORD CAT.6 RJ45

-TR1

CARD 13

X0

X1

-TR1-A3/1

-TR1-A3/2

PATCH CORD CAT.6 RJ45

-TR1

CARD 14

X0

X1

-TR1-A4/1

-TR1-A4/2

PATCH CORD CAT.6 RJ45

DP1

ALARM RELAY MODULE XL
ARM XL

+V

-0V

PB

COM

Y2

Y3

Y4

Y5

MODBUS RS485

MODBUS TCP/IP

-DP1-A5/DB9

RJ45 TO DB9 ARM-XL COMM. CABLE

SW1

ABB
SWICON

PD1

PDCOM

-ETH-SW

-PD1-A5

PATCH CORD CAT.6 RJ45

SWH.C

HIRSCHMANN

ETHERNET SWITCH

ETH/SFP

SPW

to EMCS

MODBUS TCP/IP

-ETH-TR1

-ETH-SW

230VAC
SUPPLY

PATCH CORD CAT.6 RJ45

-TR1

CARD 10

X0

X1

-TR1-A5/1

-TR1-A5/2

-TR1-A6/1

-TR1-A6/2

-TR1

CARD 15

X0

X1

-TR1-A7/1

-TR1-A7/2

PATCH CORD CAT.6 RJ45

-TR1

CARD 16

X0

X1

AS COMMISSIONED
GIROTTI MATTIA
NO MARK UP
26/03/2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	28/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for construction (AFC)
1	23/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n°: 231151/SD/22

Item n°: PF1113279

TITLE : SG-100D1 - INTERCONNECTING

Network architecture Modbus TCP/IP

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00022

SHEET 8

REV. 03

File Name : 1723002197-EL-DG-00022 Rev.03

F.to UNI A3: 420mmx297mm

Section 4.3 Instrumentation functional test sheets index

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00 & discipline : I

Instrumental	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
82-XS-001	OPEN SOLAR INCOMING CIRCUIT BREAKERS	ONSHORE	C10003828	FJ01D	100	2025-04-04	RFO 1
82-XS-002	OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003827	FJ01D	100	2025-04-04	RFO 1
82-XS-003	OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003826	FJ01D	100	2025-04-04	RFO 1

ROSETTI MARINO | PROVERLIS | CROSSWIND

ITEM	Tag	82-XS-003	: OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS	Dwg	123A90-DDL-IN-LIS-40089		
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)	Module			
TASK	code	C10003826	Location	Onshore Activities	User	Rosetti Marino Quality Control	
FORM	Process	COMM	Activity FTS	Discipline	Instrumental	Form FJ01D	Digital Loop

LOOP DATA

Loop TAG	82-XS-003				TSLD	123A90-FDL-IN-DG-40014 rev. 1_A			
IO Type	Input	No	Output	Yes	Energy by transmitter	No	Energy by system	Yes	
Marshalling	B400-SIS-001	Terminal	11A/11B		Slot	07	Rack 02	Chanel	11

LOOP TEST

1	Check earth isolation of the loop.					OK
2	Connect loop to terminal					OK
3	Energise Loop (close loop) and record status	Normal	Yes	Alarm/trip	No	OK
4	De-Energise Loop (open loop) and record status	Normal	No	Alarm/trip	Yes	OK
5	Record Fail Safe position	Open	NA	Closed	NA	NA

LOOP SERVICE

		Action	Alarm / Control		Display	
		Trip	GA	DCS	SOE	DCS	
6	Loop energized	No		Yes		OK	OK
7	Loop not energized	Yes		Yes		OK	OK
8	Checking of line monitoring	No		No		OK	OK
9	Checking of Maintenance Inhibition	NA		NA		NA	NA
10	Associated safety Level / bar						
11	Associated outputs						

LOOP DOCUMENTATION

12	Loop diagram is marked up and attached to this test sheet	OK
13	Cause and effect chart is highlighted accordingly	OK
14	Any defect is recorded for punch list issuance	

TESTING & MEASUREMENT INSTRUMENT USED

Type	Serial N.	Calibration Certificate	Validity
MULTIMETER FLUKE	AW1/018 17140769	7715/24	10/07/2025

Comments:

	Performed by	☐ WITNESS ☐ REVIEW	☐ WITNESS ☐ REVIEW
Company	ROSETTI COMM	RM COMM	CROSSWIND
Name	Alejandro Sasia	Giandonato Delmissier	PP PAUL WILLIAMSON
Date	2025-03-27	2025-04-03	2025-04-04

PROVERLIS Digitaly signed by Alejandro Sasia 2025-03-27T15:18:47.549Z

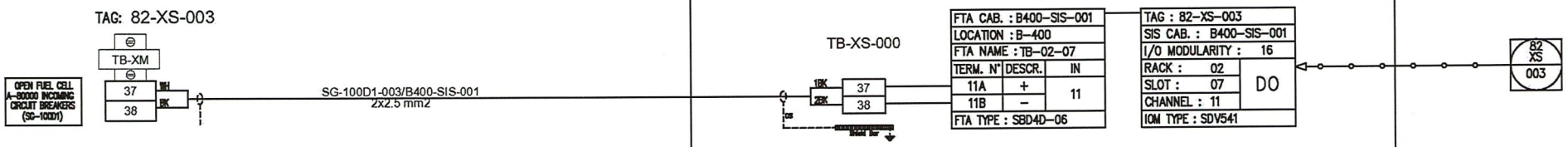
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Signature			

DRAWING NO. 123A90-DDL-IN-DG-40014 REV. 00

FIELD	ITER – B400	CENTRAL CONTROL ROOM
	SAFETY INSTRUMENTED SYSTEM	OPERATOR CONSOLE



NO MARK UP
27-03-2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2024	VBA	LCA	DLO	ISSUE FOR REVIEW (IFR)

VALID FOR CONSTRUCTION
FDL DWG: 123A90-FDL-IN-DG-40014
REV.: 0_A | DATE: 23/10/24 | SIGNATURE: G.Randi
ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

TITLE : INSRUMENT LOOP DIAGRAM
82-XS-003
OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS

CONTRACT NO./TITLE CONTRACT_NO.			SCALE 1:1
DRAWN: VBA	CHECKED: LCA	APPROVED: DLO	DATE 23/10/2024

A3	DRAWING NO. 123A90-DDL-IN-DG-40014	SHEET 156	REV. 00

File Name : 123A90-DDL-IN-DG-40014_IES/20

ROSETTI MARINO | PROVERLIS | CROSSWIND

ITEM	Tag	82-XS-002	: OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS		Dwg	123A90-DDL-IN-LIS-40089	
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)		Module		
TASK	code	C10003827	Location	Onshore Activities	User	Rosetti Marino Quality Control	
FORM	Process	COMM	Activity FTS	Discipline Instrumental	Form	FJ01D	Digital Loop

LOOP DATA

Loop TAG	82-XS-002			TSLD	123A90-FDL-IN-DG-40014 rev. 1_A		
IO Type	Input	No	Output Yes	Energy by transmitter	No	Energy by system	Yes
Marshalling	B400-SIS-001	Terminal	10A/10B	Slot	07	Rack 02	Chanel 10

LOOP TEST

1	Check earth isolation of the loop.					OK
2	Connect loop to terminal					OK
3	Energise Loop (close loop) and record status	Normal	Yes	Alarm/trip	No	OK
4	De-Energise Loop (open loop) and record status	Normal	No	Alarm/trip	Yes	OK
5	Record Fail Safe position	Open	NA	Closed	NA	NA

LOOP SERVICE

		Action Trip	GA	Alarm / Control DCS	SOE	Display DCS	
6	Loop energized	No		Yes		OK	OK
7	Loop not energized	Yes		Yes		OK	OK
8	Checking of line monitoring	No		No		OK	OK
9	Checking of Maintenance Inhibition	NA		NA		NA	NA
10	Associated safety Level / bar						
11	Associated outputs						

LOOP DOCUMENTATION

12	Loop diagram is marked up and attached to this test sheet	OK
13	Cause and effect chart is highlighted accordingly	OK
14	Any defect is recorded for punch list issuance	

TESTING & MEASUREMENT INSTRUMENT USED

Type	Serial N.	Calibration Certificate	Validity
MULTIMETER FLUKE	AW1/018 17140769	7715/24	10/07/2025

Comments:

	Performed by	WITNESS ☐ REVIEW	WITNESS ☐ REVIEW
Company	ROSETTI COMM	RM COMM	CROSSWIND
Name	Alejandro Sasia	Giandonato Delmissier	PP PAUL WILLIAMSON
Date	2025-03-27	2025-04-03	2025-04-04

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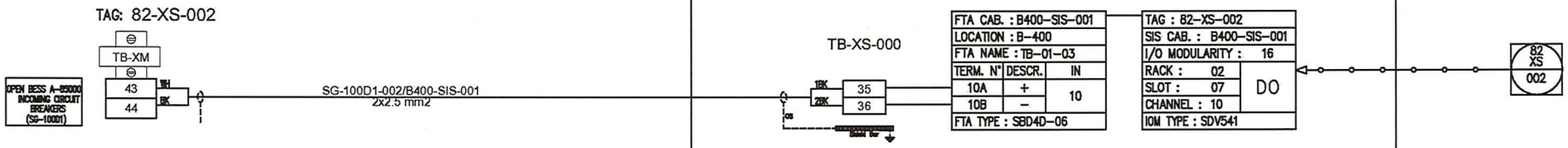
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Signature			

DRAWING NO. 123A90-DDL-IN-DG-40014 REV. 00

FIELD	ITER – B400	CENTRAL CONTROL ROOM
	SAFETY INSTRUMENTED SYSTEM	OPERATOR CONSOLE



NO MARK UP
27-03-2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2024	VBA	LCA	DLO	ISSUE FOR REVIEW (IFR)

VALID FOR CONSTRUCTION
FDL DWG: 123A90-FDL-IN-DG-40014
REV.: 0_A | DATE: 23/10/24 | SIGNATURE: G.Randi
ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

TITLE : INSRUMENT LOOP DIAGRAM
82–XS–002
OPEN BESS A–85000 INCOMING CIRCUIT BREAKERS

CONTRACT NO./TITLE CONTRACT_NO.			SCALE 1:1
DRAWN: VBA	CHECKED: LCA	APPROVED: DLO	DATE 23/10/2024

A3	DRAWING NO. 123A90–DDL–IN–DG–40014	SHEET 155	REV. 00

File Name : 123A90-DDL-IN-DG-40014_REV.00

ROSETTI MARINO | PROVERLIS | CROSSWIND

ITEM	Tag	82-XS-001	: OPEN SOLAR INCOMING CIRCUIT BREAKERS	Dwg	123A90-DDL-IN-LIS-40089		
	S/Sys	82-00	: MV 6.6 kV Switchboard (SG-100D1)	Module			
TASK	code	C10003828	Location	Onshore Activities	User	Rosetti Marino Quality Control	
FORM	Process	COMM	Activity FTS	Discipline	Instrumental	Form FJ01D	Digital Loop

LOOP DATA

Loop TAG	82-xs 001			TSLD	1234A90-FDL-IN-DG-40014 rev. 1_A		
IO Type	Input No	Output Yes		Energy by transmitter	No	Energy by system	Yes
Marshalling	B400-SIS-001	Terminal 09A/09B		Slot 07	Rack 02	Chanel 09	

LOOP TEST

1	Check earth isolation of the loop.					OK
2	Connect loop to terminal					OK
3	Energise Loop (close loop) and record status	Normal	Yes	Alarm/trip	No	OK
4	De-Energise Loop (open loop) and record status	Normal	No	Alarm/trip	Yes	OK
5	Record Fail Safe position	Open	NA	Closed	NA	NA

LOOP SERVICE

		Action Trip	GA	Alarm / Control DCS	SOE	Display DCS	
6	Loop energized	No		Yes		OK	OK
7	Loop not energized	Yes		Yes		OK	OK
8	Checking of line monitoring	No		No		OK	OK
9	Checking of Maintenance Inhibition	NA		NA		NA	NA
10	Associated safety Level / bar						
11	Associated outputs						

LOOP DOCUMENTATION

12	Loop diagram is marked up and attached to this test sheet	OK
13	Cause and effect chart is highlighted accordingly	OK
14	Any defect is recorded for punch list issuance	

TESTING & MEASUREMENT INSTRUMENT USED

Type	Serial N.	Calibration Certificate	Validity
MULTIMETER FLUKE	AW1/018 17140769	7715/24	10/07/2025

Comments:

	Performed by	☐ WITNESS ☐ REVIEW	☐ WITNESS ☐ REVIEW
Company	ROSETTI COMM	RM COMM	CROSSWIND
Name	Alejandro Sasia	Giandonato Delmissier	PP PAUL WILLIAMSON
Date	2025-03-27	2025-04-03	2025-04-04

PROVERLIS Digitaly signed by Alejandro Sasia 2025-03-27T15:25:09.668Z

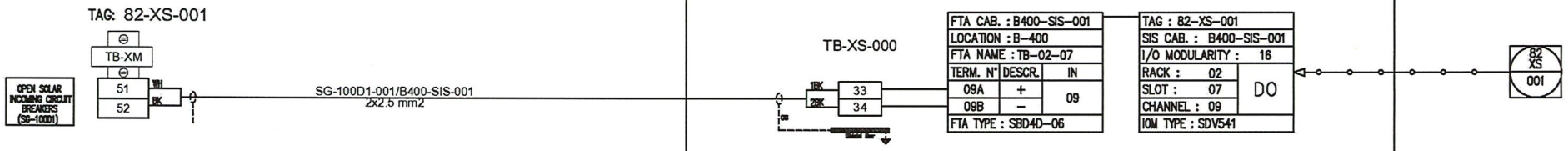
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Signature			

DRAWING NO. 123A90-DDL-IN-DG-40014 REV. 00

FIELD	ITER – B400	CENTRAL CONTROL ROOM
	SAFETY INSTRUMENTED SYSTEM	OPERATOR CONSOLE



NO MARK UP
27-03-2025

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
00	23/10/2024	VBA	LCA	DLO	ISSUE FOR REVIEW (IFR)

VALID FOR CONSTRUCTION
FDL DWG: 123A90-FDL-IN-DG-40014

REV.:	DATE:	SIGNATURE:
0_A	23/10/24	G.Randi

ROSETTI MARINO SpA

CROSSWIND

ROSETTI MARINO

TITLE : INSRUMENT LOOP DIAGRAM
82-XS-001
OPEN SOLAR INCOMING CIRCUIT BREAKERS

CONTRACT NO./TITLE CONTRACT_NO.			SCALE 1:1
DRAWN: VBA	CHECKED: LCA	APPROVED: DLO	DATE 23/10/2024

A3	DRAWING NO. 123A90-DDL-IN-DG-40014	SHEET 154	REV. 00

File Name : 123A90-DDL-IN-DG-40014_REV.00

Section 4.4 Instrumentation “As-Commissioned” interconnection diagrams

NOT APPLICABLE

Section 4.5 Telecommunication functional test sheets index

NOT APPLICABLE

Section 4.6 Telecommunication
“As-Commissioned” I.C.D. / TSLD's

NOT APPLICABLE

Section 5 SITE / OPERATIONAL

Section 5.1 Operational Test Procedure

Section 5.2 Operational Test Certificates

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00

Miscellaneous	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems	ONSHORE	C10004623	5300	100	2025-04-26	-
		OFFSHORE	C10004945	5300	0	-	-

ITEM	Tag	123A90-PML-COM-PRO-03046 : OTP - 6.6 kV Switchgear & Transformer Systems				Dwg	123A90-PML-COM-PRO-03046
	S/Sys	82-00 : MV 6.6 kV Switchboard (SG-100D1)				Module	
TASK	code	C10004623		Location	Onshore Activities	User	Rosetti Marino Quality Control
FORM	Process	COMM	Activity OTS	Discipline	Miscellaneous Form 5300		Operational Test Procedure

OTP - OPERATIONAL TEST PROCEDURE

Attached procedure number: 123A90-PML-COM-PRO-03046

Associated subsystems: 82-00

Completion date: 24/04/2025

Comments/Remarks:

	Performed by	● WITNESS ☐ REVIEW	☐ WITNESS ☐ REVIEW
	COMMISSIONING DISCIPLINE LEAD	RM COMMISSIONING MANAGER	CPY COMMISSIONING MANAGER
Name	Kristian Castellani	Anthony Iveson	Gerry McCann
Date	2025-04-24	2025-04-24	2025-04-26
Signature	PROVERLIS Digitaly signed by Kristian Castellani 2025-04-24T16:27:45.341Z	PROVERLIS Digitaly signed by Anthony Iveson 2025-04-24T16:34:12.326Z	PROVERLIS Digitaly signed by Gerry McCann 2025-04-26T06:02:49.335Z

Base Load Power Hub (BLPH)

OTP: 6.6 kV Switchgear & Transformer Systems

Document Number: **123A90-PML-COM-PRO-03046**

Document Class: 2

01	28/11/2024	Accepted for Construction (AFC)	K.CASTELLANI	A.IVESON	M.BRUNELLI
00	18/09/2024	Issue for Review (IFR)	K.CASTELLANI	A.IVESON	M.BRUNELLI
Rev.	Date	Description	Prepared	Reviewed	Approved

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File: 123A90-PML-COM-PRO-03046

Revision / Change Log

Rev.	Description
00	Issue for Review (IFR)
01	Accepted for Construction (AFC)

HOLDS LIST

No.	Description
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1 INTRODUCTION

1.1 Project Overview

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.2 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.



Figure 1 - HOLLANDSE KUST NOORD WIND PARK Location Map

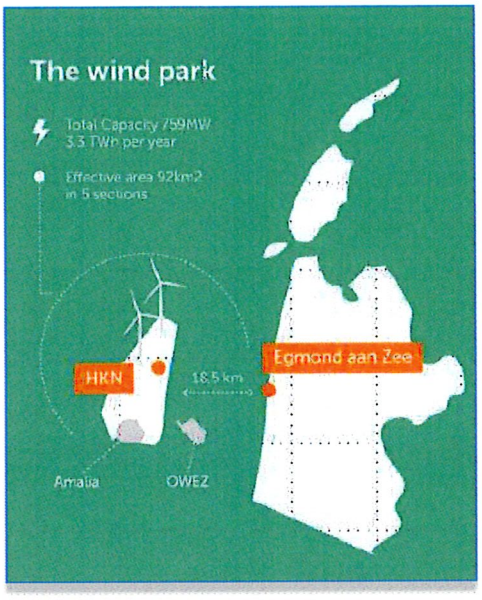


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile is located on coordinates E 590719.1, N 5841602.3 and is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.3 Project Concept

All components included in the BLPH will be integrated onshore on a topside and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

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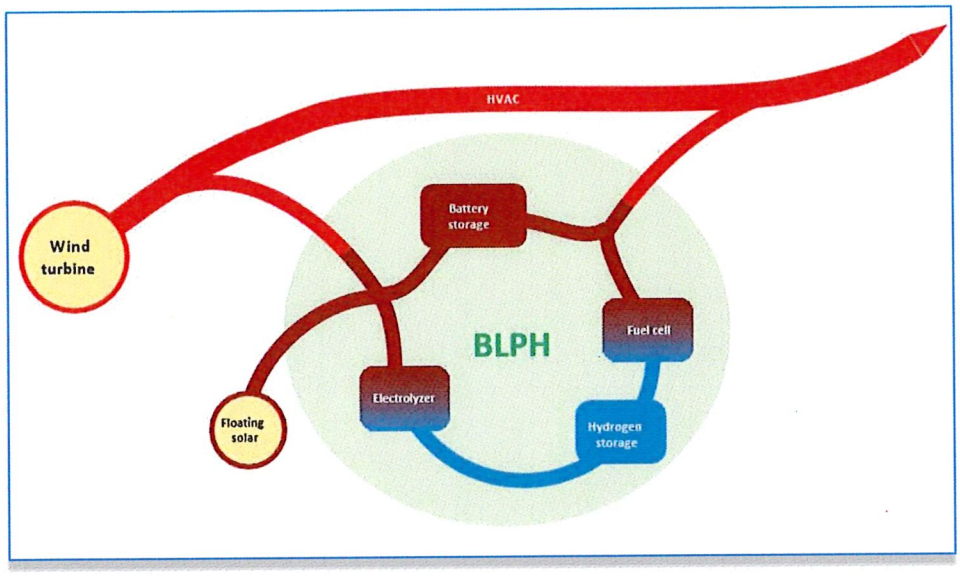


Figure 3 - BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH is to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The purpose of this document is to describe the methodology and the planned actions to be implemented for the preparation and execution of Mechanical Completion, Pre-commissioning, Commissioning & Start-Up activities to be performed on the PLANT, including COMPANY PROVIDED ITEMS, at the onshore premises of CONTRACTOR located in Milan (Italy) offices and Piomboni yard - Marina di Ravenna (Italy).

CONTRACTOR, pursuant to CONTRACT and PROJECT requirements, shall implement an exacting methodology, complete with a distinct set of tools and documentation to meet the following key objectives:

Perform the Mechanical Completion, Pre-commissioning and Commissioning on the WORKSITE to the maximum extent possible so as to minimise the commissioning operations on SITE;

- Ensure safety for the people, environment and facilities during the execution of the Commissioning activities at WORKSITE,
- Ensure integrity and operation of the equipment for their lifetime in accordance with PROJECT design and specifications,

- Plan a smooth and flawless execution of the Commissioning activities avoiding unforeseen downtimes and delays.

Achievement of the above objectives shall be obtained by:

- Defining and prioritizing a predetermined sequence of the Mechanical Completion checks, Pre-commissioning and Commissioning tests and tasks,
- Checking, testing systematically and exhaustively all the components of PLANT in compliance with PROJECT approved procedures and CONTRACT terms, managed by a dedicated team of inspectors, technicians and field engineers who will perform the Mechanical Completion, Pre-commissioning, Commissioning and Start-Up tasks and subsequently record the results via discipline specific check, inspection and test sheets (ITR's) & where applicable via discrete Operational Test Procedures (OTP's).
- Ensuring full traceability of the performed checks and tests, through implementation of a dedicated Project Completions Management System (CMS) containing individual references to all tagged items.

3 OTP SUMMARY

3.1 Test Objective

The operating test of the 6.6KV Power Distribution switchboard system is executed to ensure that the system is started up in a safe and controlled manner and to verify the correct operation according to the project requirements.

Aim of this document is to provide the sequence and appropriate actions to test the 6.6KV Power Distribution Switchboard SG-100D1.

Commissioning activities shall be developed as follows:

- Onshore pre-commissioning and commissioning activities at Contractor site (WORKSITE)
- PHASE 1: SWBD SG-100D1 With only Auxiliary power supplies energized
- PHASE 2: SWBD SG-100D1 With main 6,6kV power supply energized
- PHASE 3: SWBD SG-100D1 feeder n.A4 to LV SWBD "SB-200N1" will be energized
- PHASE 4: SWBD SG-100D1 feeder n.A3 to "BESS" will be energized
- PHASE 5: SWBD SG-100D1 feeder n.A7 to "FUEL CELL" will be energized
- PHASE 6: SWBD SG-100D1 feeder n.A1 to "ELECTROLYSER" will be energized
- PHASE 7: SWBD SG-100D1 feeder n.A2 to "SOLAR Transformer TR-200-ED1" will be energized
- OFFSHORE PHASE commissioning activities at SITE

3.2 System Boundary Limits

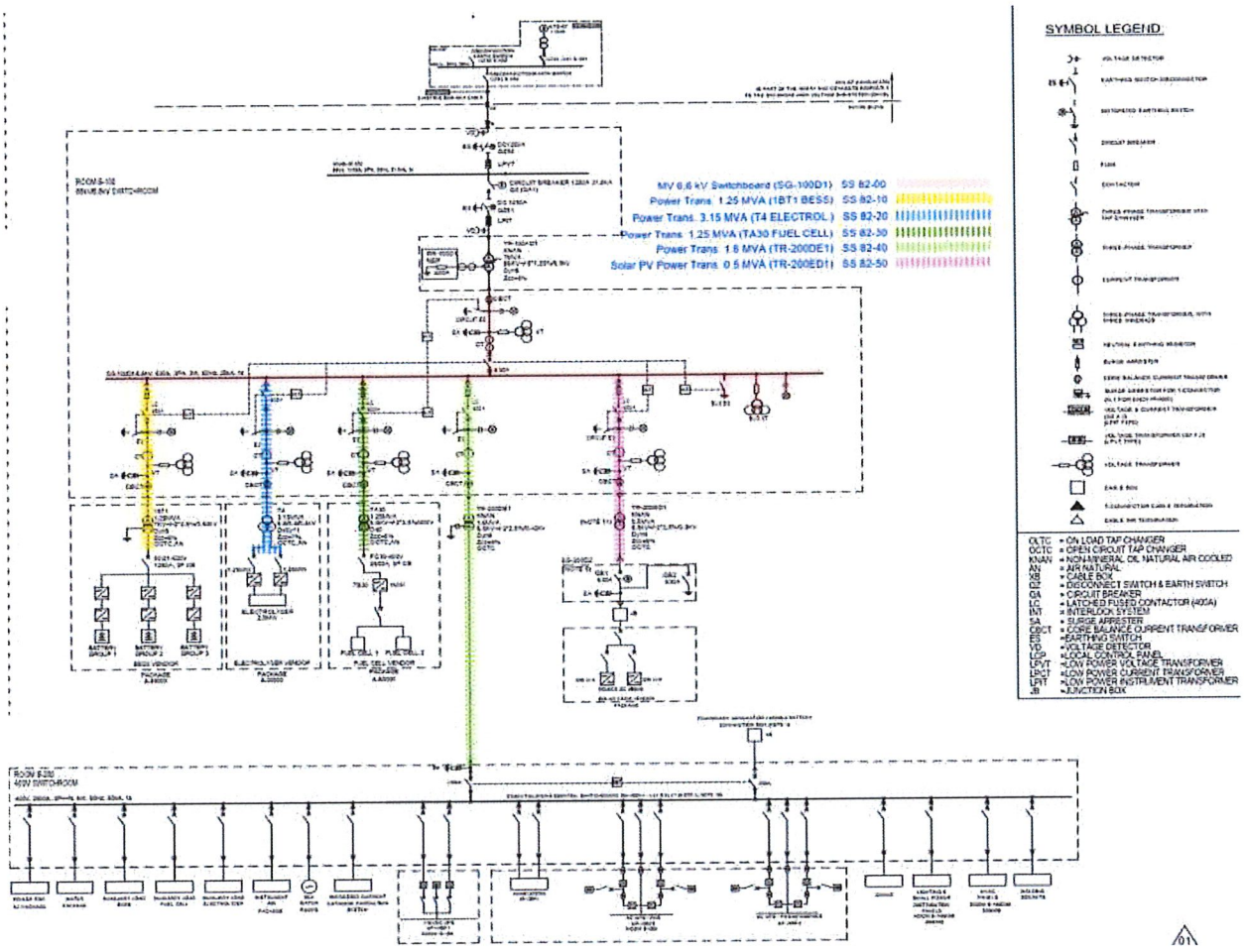


Figure 4 – OTP System Boundary Limits

This picture is extracted from the document n° 123A90-EL-DG-20158 "OVERALL/SINGLE LINE".

3.3 Test and System Description

This document is related to the following systems/ subsystems:

- 82-00: 6,6 kV Switchboard SG-100D1

All equipment is installed inside Technical Room B-100.

System boundary limits are defined in OVERALL SINGLE LINE DIAGRAM Doc. 123A90-DDL-EL-DG-20158.

These parts of the system shall be tested at worksite and at site.

The 6.6KV switchboards are metal enclosed prefabricated self-supporting type, for floor installation in compliance to the requirements of IEC 61439 1&2.

The 6.6KV switchboard (SWBD) main data are the following:

GENERAL CHARACTERISTICS CLIMATIC CONDITION:

- Installation: Marine Offshore-Indoor
- Design Ambient Temperature: -8,4+40°C
- Rel. Humidity average 95%

ENCLOSURES:

- Type: Floor Standing
- Finish Colour: RAL 7035

CONNECTIONS:

- Cable Compartment Access: From the TOP (Incoming & Outgoing)
- Accessibility: Front and Rear

POWER SUPPLY:

- Rated Service Voltage: 6,6kV
- Rated insulation Voltage: 7,2kV
- Rated frequency: 50 Hz
- Rated Power-Frequency with Stands Voltage: 20 kV
- Switchboard Rated Current: 630A
- Rated Peak Withstand Current (Ik): 25kA/1s
- Internal Arc Classification: 25kA x1s
- Neutral operation: TN-S (Neutral not distributed)

BUSBARS:

- Busbars: 3P
- Material: Electrolytic Copper
- Maximum Operating Temperature: 70°C
- Protection: Internal IP20/External IP 30

There are two Aux power supply (230VAC, 110VDC).

- 110VDC A/B From UPS UP-200F1 MCB Q12, Q13.
  - Supply motor spring charger
  - Command circuits (feeders)
- 230V from DP-200N1 MCB Q38
  - Space heaters and internal lighting

The basic Single Line Diagram of the switchboards and relevant connections is illustrated in the document 123A90-DDL-EL-DG-20158 "Overall/Key Single Line Electrical Diagram".

3.4 Safety Devices

- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g., safety shoes, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements.
- For Arc Flash Risk Category to be consider, without maintenance switch ON, for SG-200D1 PPE Level 1 online Side Fault and Level 1 for Bus Side Fault, as per Arc Flash Energy Calculation 123A90-DDL-EL-RE-20172, section 3.7 and attachment 2.
- Will be used the ARC FLASH appropriate PPE.
- Warning safety signs are to be posted with restricted access to essential personnel only.
- Adequate firefighting equipment.

3.5 HSE Management

All necessary safety precautions must be taken to avoid any risk for personnel injury.

- All personnel involved in this operational test shall be competent for the tasks they will be required to undertake
- Place safety / warning signs and segregate the entire area with barrier tapes (safety barriers) of a colour distinguished (blue and white) from those used for construction activities
- Restrict access into area only to authorized personnel
- Conduct "Toolbox Talk" with all personnel prior to starting test work
- Appropriate Personnel Protective Equipment (PPE) and safety equipment e.g. safety shoes, safety glasses, hand gloves, helmet, earplugs etc. are available and must be used in line with the site requirements
- All activities carried out on the project shall be performed in accordance with the "Permit to Work" system Doc. PRO-HSE-23
- Additional reference corporate safety documentation to be observed and adhered to; PRO-HSE-30 Working with Electricity, PRO-HSE-25 Simultaneous Operations (SIMOPS) and PRO-HSE-07 HAZID.
- Electrical and mechanical isolations are to be assured as per Doc. PRO-HSE-08 and "Commissioning and start-up operation" procedure.
- Observe and enforce all international codes and regulations to safeguard personnel, plant and environment.
- Ensure that the working area is clean, tidy, well illuminated and that access and escape routes are free from obstructions.

Before starting work on any of the activities in this OTP it is the responsibility of the persons performing the work to:

- Familiarize themselves with the plant/equipment to be worked on
- Ensure they are aware of all other work activities that are taking place, or due to take place
- If necessary, re-plan any situation/activity
- Ensure proper communications between parties involved in the execution of the OTP
- Read the relevant Vendor documentation for the equipment covered by this OTP and observe any special requirements and limitations recommended or imposed by Vendor
- Verify that all personnel involved in the implementation of this procedure are familiar with its content as well as the associated safety requirements (Toolbox Talk)

3.6 Acceptance Criteria

Before Power ON:

Visual inspection and verification are a crucial step to identify any obvious issues with the installation, such as loose connections, missing components, or damage to the equipment.

Crosschecking the installation with engineering documentation ensures that the installation is done correctly and according to the manufacturer's guidelines. These steps can help identify any missing or incorrect components, and wrong connections.

All protection relays must be set and compliance with the Electrical Protection Relay Selectivity Study Report 123A90-DDL-EL-RE-20168.

Check the protection setting on related check sheet (ITR-B) for each protection.

Applicable panels:

- SS82-00: SG-100D1

Refer Overall SLD with Marked Sub-systems.

The 6.6kV switchboard and its outgoings must be isolated with circuits breakers and contactor extracted and opened and earthing switches closed to ensure safety conditions.

After Power ON:

Powering ON the units (before auxiliary and after main supply) circuits are an essential step to verify that the equipment is functioning correctly. Observing if everything is OK and any alarm will help detect possible errors or malfunctions.

Phase 1 It will be only auxiliary power to each unit, systems/devices that will be available at this stage.

Phase 1 will prove correct:

- Verify the correct extract position of the circuit breaker.
- Verify the correct service position of the circuit breaker (with bypass)
- Verify electrical interlocks
- Verify mechanical interlocks with the key system

Phase 2 will be powered with 6,6 kV to test Unit A6 Main Incomer and A5 Measuring Unit as per design and with other systems connected to distribution board.

Phase 2 will prove correct:

- Test and validation of safety interlock between 6.6kV and low voltage SWBDs
- Verify phase sequence, frequency, voltage and current
- Verify the incomer, Measuring, feeder 6.6KV A6 column, EMCS

If available, it will be used ESD (SIS) operation through the related cabinet

Phase 3 will be powered with 6,6 kV to test 6.6/0.4kV transformer TR-200DE1 feeder A4 as per design and with other systems connected to distribution board.

Phase 4 will be powered with 6,6 kV to test BESS incomer A3 of SG-100D1

Phase 5 will be powered with 6,6 kV to test FUEL CELL incomer A7 of SG-100D1

Phase 6 will be powered with 6,6 kV, to test Electrolyser feeder A1 of SG-100D1

Phase 7 will be powered with 6,6 kV, to test Solar TR100-ED1 incomer A2 of SG-100D1

Performing the steps in this OTP as per engineering documents is crucial to ensure that the equipment is operating correctly and that it meets the desired design specifications. Observing the results will help identify any issues that may arise during the operation.

Overall, following these steps shall provide a comprehensive and effective way to verify the equipment installation and functionality.

4 DOCUMENTS REFERENCES AND ABBREVIATIONS

4.1 Reference Documents

4.1.1 Company Documents and Standards

Document ID	Document Title
[1] K559-2254-CG-PHI-001	Commissioning Philosophy
[2] K559-2254-EL-ELL-002	BLPH Electrical Load List (CCS MODE 2(A) 'HOT STANDBY')
[3] K559-2254-EL-ELL-003	BLPH Electrical Load List (CCS MODE 3(C) 'DISCHARGING')
[4] K559-2254-EL-ELL-004	BLPH Electrical Load List (CCS MODE 4(A) 'COLD STANDBY')
[5] K559-2254-EL-ELL-005	BLPH Electrical Load List (CCS MODE 4A(D) 'EMERGENCY MODE (Island))
[6] K559-2254-EL-ELL-006	BLPH Electrical Load List (CCS MODE 5(D) 'POWER OUT (Blackout))
[7] K559-2254-PR-PHI-001	Main process control philosophy

Table 1: Company Key Reference Documentation

These documents were produced in FEED and made available to RM for info. They have subsequently been superseded by Detailed Design, similar or same deliverables.

4.1.2 Project Documents

Document ID	Document Title
[1] 123A90-PML-PM-LIS-01001	Master Document Register
[2] 123A90-PML-PM-PL-00001	Project Execution Plan
[3] 123A90-PML-QHSE-PL-00001	Project HSE Plan
[4] 123A90-PRO-HSE-23	RM Yard Permit To Work Procedure
[5] 123A90-PML-COM-PL-03002	Mechanical Completion & Commissioning Execution Plan
[6] 123A90-PML-COM-PRO-03007	Commissioning Strategy
[7] 123A90-PML-COM-LIS-03011	System/Sub-Systems List
[8] 123A90-PML-COM-LIS-03012	System/Sub-System Boundary Limit Diagrams
[9] 123A90-PML-COM-PRO-03038	Leak Test Procedure
[10] 123A90-PML-COM-SP-03032	Pre-Commissioning Functional Test Sheet Template Collection (ITR-B)
[11] 123A90-PML-COM-SP-03014	Commissioning TDS - Temporary Equipment & Facilities
[12] 123A90-PML-COM-PRO-03019	OTP – Onshore Performance & Integrated Test Procedure
[13] 123A90-PML-COM-LIS-03034	Inhibit-Override Register
[14] 123A90-PML-COM-LIS-03035	PSV Calibration Register
[15] 123A90-PML-COM-PRO-03036	OTP - Black Start Procedure
[16] 123A90-PML-COM-LIS-03024	Commissioning Spare Parts and Consumables List
[17] 123A90-PML-COM-PRO-03022	Initial offshore START-UP procedures
[18] 123A90-PML-COM-SP-03057	Worksite WEF (Work Execution Flow Scheme)
[19] 123A90-PML-COM-SP-03058	Site WEF (Work Execution Flow Scheme)
[20] 123A90-PML-COM-RE-03001	Commissioning Final Dossier (ITR-B)
[21] 123A90-PML-QHSE-PRO-00116	Flushing and Cleaning Procedures

Document ID	Document Title
[22] 123A90-PML-QHSE-SP-00118	Mechanical Completion Check Sheet Template Collection (ITR-A)
[23] 123A90-PML-QHSE-RE-00115	Mechanical Completion Final Dossier (ITR-A)
[24] 123A90-PML-QHSE-PRO-00117	Punch list Management Procedure
[25] 123A90- 123A90-PML-COM-PRO-03041	OTP - Hydrogen Storage & Venting Systems
[26] 123A90- 123A90-PML-COM-PRO-03042	OTP - Sea Water Intake & Fresh Water Treatment Systems
[27] 123A90- 123A90-PML-COM-PRO-03043	OTP - Instrument Air System
[28] 123A90- 123A90-PML-COM-PRO-03055	OTP - Nitrogen Generation System
[29] 123A90- 123A90-PML-COM-PRO-03044	OTP - HVAC Systems
[30] 123A90- 123A90-PML-COM-PRO-03045	OTP - HV Switchgear & 66 kV Transformer Systems
[31] 123A90- 123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems
[32] 123A90- 123A90-PML-COM-PRO-03047	OTP - LV Switch Boards & LV Distribution Board Systems
[33] 123A90- 123A90-PML-COM-PRO-03048	OTP - Lighting & Small Power Systems
[34] 123A90- 123A90-PML-COM-PRO-03049	OTP - Electrical Heat Tracing Systems
[35] 123A90- 123A90-PML-COM-PRO-03050	OTP - DC UPS System 10kVA UP-200F1
[36] 123A90- 123A90-PML-COM-PRO-03051	OTP - Data Network Systems
[37] 123A90- 123A90-PML-COM-PRO-03052	OTP - Telecom & Surveillance Systems
[38] 123A90- 123A90-PML-COM-PRO-03053	OTP - Navaid System
[39] 123A90- 123A90-PML-COM-PRO-03054	OTP - F&G and ESD C&E Logics
[40] 123A90-PML-QHSE-PRO-00120	Proverlis Management Procedure
[41] 123A90-PML-COM-PRO-03056	OTP – Document Template
[42] 123A90-PML-COM-PRO-03059	OTP - AC UPS System 35kVA UP-200F3
[43] 123A90-PML-COM-PRO-03060	OTP - AC UPS System 15kVA UP-200F4

Table 2: Reference Project Deliverables

4.1.3 Vendor Documents

Document ID	Document Title
[1] 1723002197-COM-LIS-00052	SPARE PART INDEX REGISTER (COMMISSIONING AND OPERATION)
[2] 1723002197-EL-CAL-00049	HEAT DISSIPATION CALCULATIONS
[3] 1723002197-EL-DA-00006	SG-200D1 HV SWBD 6,6kV - GENERAL ARRANGEMENTS DWG
[4] 1723002197-EL-DG-00010	SG-200D1 HV SWBD 6,6kV ELECTRICAL SINGLE LINE DIAGRAM
[5] 1723002197-EL-DG-00022	SG-200N1 LV SWBD 6,6kV INTERCONNECTING AND AUX DISTRIBUTION
[6] 1723002197-EL-DG-00018	SG-200D1 HV SWBD 6,6kV (UNIT A1) - FUNCTIONAL DIAGRAM ELECTROLYSER FEEDER A-20000
[7] 1723002197-EL-DG-00020	SG-200D1 HV SWBD 6,6 kV (UNIT A2) - FUNCTIONAL DIAGRAM TRASNFORMER FEEDER TR-200ED1
[8] 1723002197-EL-DG-00017	SG-200D1 HV SWBD 6,6 kV (UNIT A3) - FUNCTIONAL DIAGRAM BESS FEEDER A-85000
[9] 1723002197-EL-DG-00021	SG-200D1 HV SWBD 6,6 kV (UNIT A4) - FUNCTIONAL DIAGRAM TRASNFORMER FEEDER TR200DE1
[10] 1723002197-EL-DG-00016	SG-200D1 HV SWBD 6,6 kV (UNIT A5) - FUNCTIONAL DIAGRAM BUS BAR METERING
[11] 1723002197-EL-DG-00015	SG-200D1 HV SWBD 6,6 kV (UNIT A6) - FUNCTIONAL DIAGRAM INCOMING FEEDER
[12] 1723002197-EL-DG-00019	SG-200D1 HV SWBD 6,6 kV (UNIT A7) - FUNCTIONAL DIAGRAM FEEDER A-80000
[13] 1723002197-EL-LIS-00041	IO LIST HV SWITCHGEAR
[14] 1723002197-EL-LIS-00050	CONSUMPTION LIST
[15] 1723002197-EL-LIS-00051	DATA TABLE
[16] 1723002197-EL-LIS-00053	SPECIAL TOOLS LIST
[17] 1723002197-EL-MAN-00054	INSTALLATION OPERATING AND MAINTENANCE MANUAL
[18] 1723002197-EL-REP-00038	PROTECTION SETTING REPORT

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Document ID	Document Title
[19] 1723002197-EL-SO-00039	SG-100D1 PROTECTION CONFIGURATION (INCLUDING I/O CONFIGURATION) (CID File and PCM600)
[20] 1723002197-MAT-PRO-00004	MV-LV SWG PAINTING PROCEDURE
[21] 1723002197-MD-LIS-00001	SUPPLIER MASTER INDEX REGISTER (SMIR)
[22] 1723002197-QC-DB-00048	EQUIPMENT MANUFACTURERS RECORD BOOK
[23] 1723002197-QC-ITP-00003	INSPECTION AND TEST PLAN - LV Switchgear
[24] 1723002197-QC-LIS-00005	EQUIPMENT MANUFACTURER RECORD BOOK (FINAL DOSSIER) - INDEX
[25] 1723002197-QC-PRO-00044	FACTORY ACCEPTANCE TEST PROCEDURE - HV Switchgear
[26] 1723002197-QC-PRO-00046	SITE ACCEPTANCE TEST PROCEDURE - HV Switchgear
[27] 1723002197-QC-PRO-00055	PACKING, SHIPPING, HANDLING AND STORAGE PROCEDURES

Table 3: Vendor Reference Documentation

4.2 Acronyms and Abbreviations

Acronyms and Abbreviations	Descriptions
AIS	Automatic Identification System
AHU	Air Handling Unit
AOC	Achievement of Commissioning
C&E	Cause & Effects
CCS	Central Control System
CCTV	Closed Circuit Television
CMS	Completions Management System
CPI	Company Provided Item
CRS	Comments Response Sheet
CSU	Commissioning & Start-Up

Acronyms and Abbreviations	Descriptions
E&I	Electrical & Instrumentation
EMCS	Electrical Monitoring & Control System
ESD	Emergency Shut Down
FAT	Factory Acceptance Test
FT	Functional Test
F&G	Fire & Gas
GALT	Gross Air Leak Test
HAZID	Hazard Identification Studies
HAZOP	Hazard and Operability Studies
HKN	Hollandse Kust Noord
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
HSE	Health, Safety, & Environment
ICSS	Integrated Control and Safety System
ITR	Inspection & Test Record
LC	Locked Closed
LO	Locked Open
LoSH	Limits of System Handover
LOTO	Lock-Out / Tag-Out
LV	Low Voltage
MC	Mechanical Completion
MDR	Master Document Register
MOC	Management of Change

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Acronyms and Abbreviations	Descriptions
NUI	Normally Unmanned Installation
OEM	Original Equipment Manufacturer
OMAR	Operating Modes Assurance Review
OTP	Operational Test Procedure (Commissioning)
OR	Operations Readiness
ORR	Operations Readiness Review
PACO	Process Automation, Control and Optimisation
PCS	Process Control System
PID (P&ID)	Piping and Instrumentation Diagram
PSV	Pressure Safety Valve
PTW	Permit to Work
PVP	Piping and Vessels Preparation
PC&C	Pre-Commissioning & Commissioning
PSUA	Pre Start-Up Audit
PSSR	Pre Start-up Safety Review
RFC	Ready for Commissioning
RFO	Ready for Operation
RFSA	Ready For Sail Away
RFSU	Ready For Start-Up
SAT	Site Acceptance test
SECE	Safety Environmental Critical Element
SIF	Safety Instrumentation Function
SIL	Safety Integrity Level

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Acronyms and Abbreviations	Descriptions
SIMOPS	Simultaneous Operations & Maintenance
SIS	Safety Instrumented System
SLD	Single Line Diagram
SoF	Statement of Fitness
TA	Technical Authority
TQ	Technical Query
TIV	Technical Integrity verification
UPS	Uninterruptible Power Supply
VHF	Very High Frequency
VSAT	Very Small Aperture Terminal

Table 4: Acronyms and Abbreviations

5 OTP AT WORKSITE

This section refers to the activities on the Contractor worksite (construction yard).

5.1 PLANNING AND MANPOWER

5.1.1 Planned tasks with estimated manpower

Estimated manpower for the entire duration of the Test:

- 1 E&I commissioning superintendent
- 1 E&I commissioning supervisor from Contractor
- 1 E&I commissioning technicians from Contractor
- 1 Vendor technician
- 1 PCS/ESD Operator workstation specialist (phase 2,3,4,5,6,7)

5.1.2 Test duration estimate

The test duration should be as follows:

- 8 days approx.

If necessary, the estimated time can be extended in order to complete all required pre-commissioning and commissioning activities.

5.1.3 Vendor Assistance

Vendor IMESA S.p.A. will provide a qualified specialist to assist with all aspects of commissioning of the 6.6KV SWBD.

5.1.4 Items Postponed to C&E OTP (IEC61850 ETHERNET PHASE 2,3,4,5,6,7)

These following signals are implemented into protocol IEC61850 and will be implemented into cause effect & diagram of EMCS.

Signal tag:	Signal description:
X120-4	LOCKOUT RELAY FROM MVS UNIT 4 (IEC 61850)
X120-3	C.B. OPENED OR ISOLATED FROM MVS UNIT 4 (IEC61850)
	GOOSE FROM INCOMINGS UNIT A6: TRIPPED ARC PROTECTION FROM 100-AD1 TRANSFORMER & - ARC MAIN BUS BAR BB SG-100D1 - ARC CONTACTOR COMPART "CB" SG-100D1 - ARC "CABLE COMPARTMENT "CC" SG-100D1

5.1.5 HOLDS

Not applicable

5.2 OTP Test Requirements

First, confirm that the following equipment are installed and operational in technical room B-100:

- HVAC system
- Substation lifesaving & Intervention Kit
- Toolbox and service trolley for switchgear
- Lighting & Fire and Gas system

5.2.1 Pre-Commissioning Achievement

Prior the commissioning operation starts, the relevant pre-commissioning ITRs should be fully signed.

5.2.2 Commissioning Achievement

The commissioning achievement will be the successful operation, functionality and safeguarding test of 6.6KV Power distribution System, installed and put in operation during the WORKSITE phase:

- 82-00: 6,6kV Switchboard SG-100D1

5.2.3 Status of Required Associated Subsystems

PHASE 1 - Test without 6,6kV Main Power Supply, with present only auxiliary supply only to each Unit of switchboard.

Subsystems required RFC for Commissioning of 6,6kV Switchboard

- 82-00: 6,6 kV Switchboard (SG-100D1)
- 83:99: Low Voltage 400V Temporary Yard Power Supply
- 88-00: Earthing System
- 84-00: UPS System UP-200F1

PHASE 2 - Test with 6,6kV Main Power Supply of Incomer Unit A6 and Measuring Unit A5

Subsystems required RFC for Commissioning of 6,6kV Switchboard :

- 88-00: Earthing System
- 82-00: 6.6 kV Switchboard (SG-100D1)
- 84-00: UPS System UP-200F1
- 82-99: 6.6kV power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 86-00: IEC61850 Ethernet Communication Network
- 86-00: MODBUS RTU Communication Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

PHASE 3 - Test with 6,6kV Main Power Supply of Feeder for TR-200E1 6.6/0.4kV transformer Unit A4

Subsystems required RFC for Commissioning of 6,6kV Switchboard :

- 88-00: Earthing System
- 82-00: HV 6.6 kV Switchboard (SG-100D1)
- 82-40: Transformer 1,6 MVA TR-200DE1
- 84-00: UPS System UP-200F1
- 82-99: power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 86-00: IEC61850 Ethernet Communication Medium and Low Voltage Network
- 86-00: MODBUS RTU Switchboard 6.6kV Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

PHASE 4 - Test with 6,6kV Main Power Supply of Feeder for BESS PACKAGE Unit A3

Subsystems required RFC for Commissioning of 6,6kV Switchboard :

- 88-00: Earthing System
- 82-00: 6.6 kV Switchboard (SG-100D1)
- 82-40: Transformer 1,6 MVA TR-200DE1
- 82-10: 6.6kV Bess Package Unit A3
- 82-99: 6.6kV power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 83-00: 400V Switchboard SG-200N1
- 79-00: SIS Safety Instrumented System (ESD)
- 86-00: IEC61850 Ethernet Communication Network
- 86-00: MODBUS RTU Communication Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

PHASE 5 - Test with 6,6kV Main Power Supply of Feeder for FUEL CELL PACKAGE Unit A7

Subsystems required RFC for Commissioning of 6,6kV Switchboard :

- 88-00: Earthing System
- 82-00: SG-100D1 6.6kV SWBD Unit A7 6,6 kV
- 82-40: Transformer 1,6 MVA TR-200DE1
- 82-99: 6.6kV power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 83-00: 400V Switchboard SG-200N1
- 79-00: SIS Safety Instrumented System (ESD)
- 86-00: IEC61850 Ethernet Communication Network
- 86-00: MODBUS RTU Communication Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

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PHASE 6 - Test with 6,6kV Main Power Supply of Feeder for ELECTROLIZER PACKAGE Unit A1

Subsystems required RFC for Commissioning of 6,6kV Switchboard:

- 88-00: Earthing System
- 82-00: SG-100D1 6.6kV SWBD Unit A6 6,6 kV
- 82-40: Transformer 1,6 MVA TR-200DE1
- 82-99: 6.6kV power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 83-00: 400V Switchboard SG-200N1
- 79-00: SIS Safety Instrumented System (ESD)
- 86-00: IEC61850 Ethernet Communication Network
- 86-00: MODBUS RTU Communication Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

PHASE 7 - Test with 6,6kV Main Power Supply of Feeder for SOLAR PACKAGE Unit A2

Subsystems required RFC for Commissioning of 6,6kV Switchboard:

- 88-00: Earthing System
- 82-00: SG-100D1 6.6kV SWBD Unit A6 6,6 kV
- 82-40: Transformer 1,6 MVA TR-200DE1
- 82-99: 6.6kV power supply from temporary 6,6 kV Diesel Generator Yard facilities
- 83-00: 400V Switchboard SG-200N1
- 79-00: SIS Safety Instrumented System (ESD)
- 86-00: IEC61850 Ethernet Communication Network
- 86-00: MODBUS RTU Communication Network
- 87-00: Electrical Monitoring & Control System (EMCS)
- 87-10: Process Control System (PCS)

5.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required:

- Voltage, frequency, continuity tester (Multimeter)
- Phases sequence tester
- Extracting tool & transportation trolley
- Portable radios (3 pcs + 1 per Technical Room)
- 230Vac/24VDC temporary stabilized power supply converter
- OMICRON secondary injection test kit

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PAGE 1

TESTING & MEASUREMENT INSTRUMENT USED			
Type	Serial N.	Calibration certificate	Validity

5.2.5 Consumable List

Not applicable

5.2.6 Commissioning Spare Parts

Reference is made to IMESA Spare Part List 1723002197-COM-LIS-00052 regarding the 6.6kV SWBD spare parts.

5.2.7 Temporary Facilities

Not applicable

5.3 OTP DESCRIPTION - WORKSITE

5.3.1 OTP Test Preparation

Step	Description	Result	Verified by	Date
1	System Ready for Commissioning Certificate (RFC) is issued and approved. N.B. RFC certificates for all associated connected downstream transformers will also be required prior to energisation.	ok	[illegible]	03/12/2024
2	No Mechanical Completion or Pre-commissioning punch list 'A' items are outstanding against the system to be commissioned.	ok	[illegible]	03/12
3	Factory Acceptance Test Procedure has been carried out successfully (refer to Doc. 1723002197-QC-PRO-00044)	ok	[illegible]	03/12

Step	Description	Result	Verified by	Date
4	All personnel involved in the implementation of this procedure are familiar with its content as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).	ok		03/12
5	A final walkdown of the system has been completed, to ensure that the system and the area are ready for commissioning.	ok		03/12
6	Check that areas are free for work and escape routes are clear of any obstructions.	ok		03/12
7	All safety barriers and warning signs have been installed.	ok		03/12
8	Ensure that proper communications have been established between parties involved in the implementation of the procedure.	ok		03/12
9	Verify availability of test equipment and consumables as per section 5.2.4.	ok		03/12
10	With reference to Commissioning Temporary equipment & Facilities (refer on Doc. 123A90-PML-COM-SP-03014), check that power is available to any temporary equipment or test equipment (if any).	ok		03/12
11	System(s) isolations as per LOTO procedure defined within HSSE Permits to Work and Commissioning procedures duly prepared and approved	ok		03/12
12	All yard personnel have been duly notified by dedicated LUN (Livening Up Notification) that the system(s) is ready for commissioning.	ok		03/12

5.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
13	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.	OK		03/12
14	Verify that all relevant associated systems / subsystems are completed.	OK		03/12
15	Check that grounding and bonding are in accordance with applicable documents.	Ok		03/12
16	Review and confirm protection settings on up-stream power supply (temporary 6,6 kV yard supply)	ok		04/12
17	Verify finalization of SG-100D1 6.6KV Switchboard Units internal power and auxiliary circuit connections in accordance with manufacturers documentation.	OK		03/12
18	Verify and confirm completion and availability of associated systems and subsystems (PHASE 2 and 3,4,5,6)	OK		03/12

5.3.3 Mechanical Preparation

Not applicable.

5.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
19	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.	ok		03/12
20	Verify that all relevant associated systems / subsystems are ready to work.	ok		03/12
21	Check Inhibit and Override register has been prepared and validated.	ok		03/12

Step	Description	Result	Verified by	Date
22	Verify that relevant equipment/ components are available and in operation for start of commissioning activities.	Ok		03/12

5.3.5 Piping Preparation

Not applicable

5.3.6 Additional Discipline Preparation

Not applicable.

5.4 OTP Steps WORKSITE

5.4.1 PHASE 1 – Test without 6,6kV Main Power Supply, with auxiliary supply only to each Unit of switchboard

The previous sections must be successfully performed prior to commissioning of the 6.6KV Switchboard without power supply 6,6 KV.

In PHASE 1 Temporary Yard Auxiliaries Power supply will be connected as 110 V and 230 V without 6,6 kV main power supply.

In the following steps the functionality of the 6.6KV Switchboards shall be tested:

- SS 82-00: 6,6kV Switchboard "SG-100D1"

5.4.1.1 Test Preparation

Need to Verify:

- Auxiliary power supplies are available 230V DP-200N1 (Internal Heaters & Lights)
- Auxiliary power supplies are available 110 V A/B UPS UP-200F1
- Phase1 400V Temporary Yard power supply is available SG-200N1 (A2/+08)

All systems and subsystems involved in this procedure must be ready for commissioning and available.

5.4.1.2 *Auxiliary Supply SG-100D1 6.6kV switchboard*

Step	Description	Result	Verified by	Date
Auxiliaries Energization of 6.6kV SWBD SG-100D1				
23	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.	OK		03/12
24	Verify that all relevant associated systems / subsystems are completed.	OK		03/12
25	Check that grounding and bonding are in accordance with applicable documents	OK		03/12
26	Review and confirm protection settings on up-stream 6.6KV Switchboards feeder power supply circuit breakers.	OK		03/12
27	Verify and confirm the power by UPS supply A&B 110V on Column A5 With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 11 - Supply A XM 1-2 ..... 119 ..... Vdc - Supply B XM 3-4 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02	OK		03/12
28	Verify and confirm the power supply 110V on Column A1 With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 11 - Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02.	OK		03/12
29	Verify and confirm the power supply 110V on Column A2	OK		03/12

Step	Description	Result	Verified by	Date
	With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 11 - Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02	OK		03/12
30	Verify and confirm the power supply 110V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 11 - Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02.	OK		03/12
31	Verify and confirm the power supply 110V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 10 - Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02	OK		03/12
32	Verify and confirm the power supply 110V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 11 - Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02	OK		03/12
33	Verify and confirm the power supply 110V on Column A7 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 11	OK		03/12

Step	Description	Result	Verified by	Date
	- Supply XC 1-3 ..... 119 ..... Vdc - Close MCB QD01 - Close MCB QD02	OK		03/12
34	Verify and confirm the power supply 24V on Column A5 With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 13 - Supply XC 5-7 ..... 119 ..... Vdc - Switch on MCB QD5 - Switch on MCB QD6 - Verify the led on ethernet switch A - Verify the led on ethernet switch B - Verify the led on ethernet switch C	OK		03/12
35	Verify and confirm the power supply 24V on Column A1 With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 11 - Supply XC 5-7 ..... 119 ..... Vdc - Close MCB QD4	OK		03/12
36	Verify and confirm the power supply 24V on Column A2 With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 11 - Supply XC 5-7 ..... 119 ..... Vdc - Close MCB QD4	OK		03/12
37	Verify and confirm the power supply 24V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 11 - Supply XC 5-7 ..... 119 ..... Vdc - Close MCB QD4	OK		03/12

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Step	Description	Result	Verified by	Date
38	Verify and confirm the power supply 24V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 11 - Supply XC 5-7 ..23,8.. Vdc - Close MCB QD4	OK		03/12
39	Verify and confirm the power supply 24V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 11 - Supply XC: 5-7 ..23,9.. Vdc - Close MCB QD4	OK		03/12
40	Verify and confirm the power supply 24V on Column A7 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 11 - Supply XC: 5-7 ..24.. Vdc - Close MCB QD4	OK		03/12
41	Verify and confirm the power supply 230V on Column A5 With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 10 - Supply XM 5-7 ..230.. Vac - Close MCB QA1 - Close MCB QA2 - Supply XC 9-11 ..230.. Vac - Supply XC 10-12 ..230.. Vac	OK		03/12
42	Verify and confirm the power supply 230V on Column A1	OK		03/12

Step	Description	Result	Verified by	Date
	With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12
43	Verify and confirm the power supply 230V on Column A2 With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12
44	Verify and confirm the power supply 230V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12
45	Verify and confirm the power supply 230V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12
46	Verify and confirm the power supply 230V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12
47	Verify and confirm the power supply 230V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 13 - Supply XC 9-11 230 Vac	OK		05/12

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Step	Description	Result	Verified by	Date
48	With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 8,9 Close the following MCBs - QV1 ..... ☑ - QV2 ..... ☑ - QV3 ..... ☑ - QV4 ..... ☑	ok		03/12

5.4.1.3 Command and Feedback Verification in Test Position

Step	Description	Result	Verified by	Date
	VERIFICATION OF COMMAND IN TEST POSITION			
49	Unit A1-Feeder Electrolyser Rack in Circuit Breaker QM in Test Position and verify the functionality starting from isolated condition, QM is in extract position and Earthing Switch BGE is closed; - Open earthing Switch BGE - Remove the KEY G3477 which is now free - Insert the key G3477 on breaker rack in/rack out system - Rack in Breaker QM in test position - Verify Breaker status on HMI: Test position and Open - Place the Selector SA1 in Local Position - Press PUSH Button SC1 to close the Breaker QM - Verify Breaker status on HMI: Test position and Closed - Open Breaker and Rack Out to extract position.	OK		03/12/2024

Step	Description	Result	Verified by	Date
	- Verify Breaker status on HMI: Extract position and Opened			
50	Unit A2 - Feeder Solar Package Rack in Contactor K1 in Test Position and verify the functionality starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed; - Open earthing Switch BGE - Remove the **KEY-3 G3476** which is now free - Insert the **KEY-3 G3476** on Contactor rack in/rack out system - Rack in Contactor K1 in test position - Verify Contactor status on HMI: Test position and Open - Place the Selector SA1 in Local Position - Press PUSH Button SC1 to close the Contactor K1 - Verify Contactor status on HMI: Test position and Closed - Open Contactor K1 and Rack Out to extract position. - Verify Contactor status on HMI: Extract position and opened	ok		03/12
51	Unit A3 - Feeder BESS Package Rack in Contactor K1 in Test Position and verify the functionality starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed. - Open earthing Switch BGE - Remove the **KEY-3 G3095** which is now free - Insert the **KEY-2 19834** (KEY 2 should be free from LoTo procedure) on Contactor rack in/rack out system	ok		04/12

Step	Description	Result	Verified by	Date
	- Rack in Contactor K1 in test position - Verify Contactor status on HMI: Test position and Open - Place the Selector SA1 in Local Position - Press PUSH Button SC1 to close the Contactor K1 - Verify Contactor status on HMI: Test position and Closed - Open Contactor K1 and Rack Out to extract position. - Verify Contactor status on HMI: Extract position and Opened	ok	M Patella	04/12
52	Unit A4 - Feeder TRANSFORMER TR-200DE1 Rack in Contactor K1 in Test Position and verify the functionality starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed; - Open earthing Switch BGE - Remove the KEY-3 G3398 which is now free - Insert the KEY-2 19465 (KEY 2 should be free from LoTo procedure) on Contactor rack in/rack out system - Rack in Contactor K1 in test position - Verify Contactor status on HMI: Test position and Open - Place the Selector SA1 in Local Position - Press PUSH Button SC1 to close the Contactor K1 - Verify Contactor status on HMI: Test position and Closed - Open Contactor K1 and Rack Out to extract position.	ok	M Patella	04/12

Step	Description	Result	Verified by	Date
	- Verify Contactor status on HMI: Extract position and Opened			
53	Unit A7 - Feeder FUEL CELL Package Rack in Contactor K1 in Test Position and verify the functionality starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed; - Open earthing Switch BGE - Remove the KEY-3 G3223 which is now free - Insert the KEY-2 19163 (KEY 2 should be free from LoTo procedure) on Contactor rack in/rack out system - Rack in Contactor K1 in test position - Verify Contactor status on HMI: Test position and Open - Place the Selector SA1 in Local Position - Press PUSH Button SC1 to close the Contactor K1 - Verify Contactor status on HMI: Test position and Closed - Open Contactor K1 and Rack Out to extract position. - Verify Contactor status on HMI: Extract position and opened	ok		05/12

The electrical interlocks are between Medium Voltage and Low Voltage and High Voltage

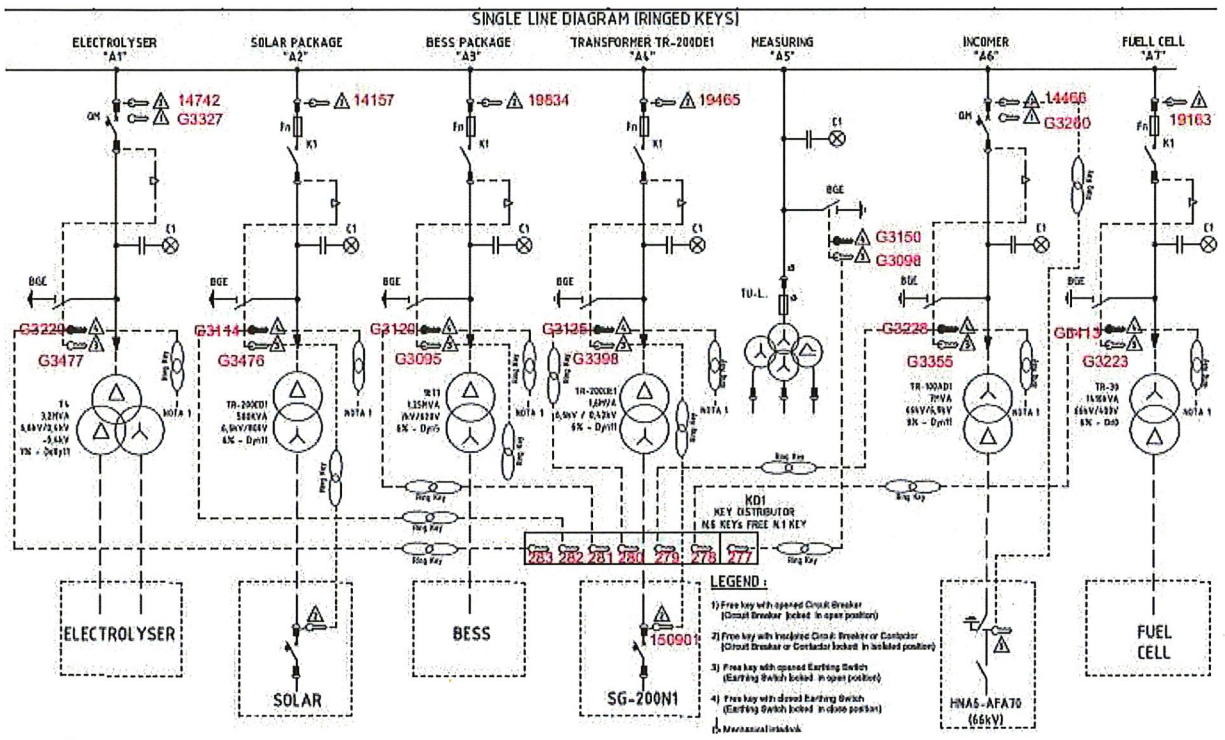
5.4.1.4

5.4.1.4 SG-100D1 Interlocks & Key Interlocks

See below the key interlocks between units earthing switches /breakers (contactors) of 6.6kV SWBD and their downstream devices.

Step	Description	Result	Verified by	Date
KEY Interlocks of 6.6kV SWBD SG-100D1				

KD1: KEY Distributor



KEY 283: KEY ringed with KEY4 G3220 SG-100D1 UNIT A1

KEY 282: KEY ringed with KEY4 G3114 SG-100D1 UNIT A2

KEY 281: KEY ringed with KEY4 G3120 SG-100D1 UNIT A3

KEY 280: KEY ringed with KEY4 G3135 SG-100D1 UNIT A4

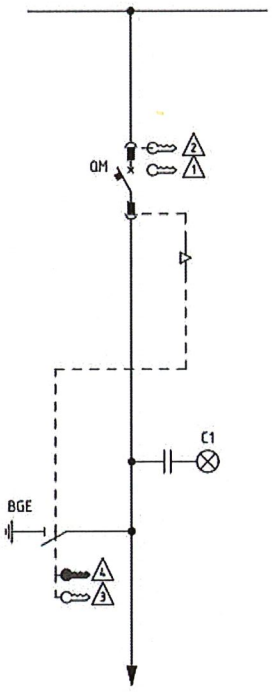
KEY 279: KEY ringed with KEY4 G3228 SG-100D1 UNIT A6

KEY 278: KEY ringed with KEY4 G3413 SG-100D1 UNIT A7

KEY 277: KEY ringed with KEY3 G3098 SG-100D1 UNIT A5

KD1: KEY DISTRIBUTOR

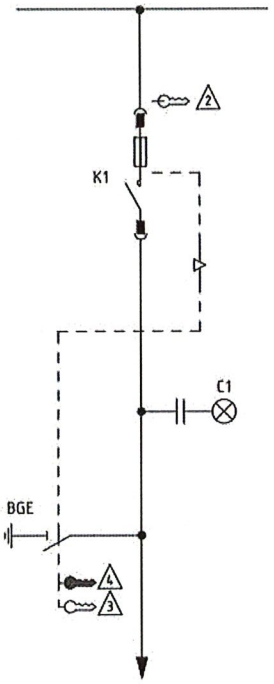
KEY277 is free with all keys on key distributor

Step	Description	Result	Verified by	Date
54	The key distributor KD1 is a key interlock device to ensure the correct and safety action during manoeuvres on the earthing switches and circuit breakers /contactors on the 6.6kV switchboard SG-100D1. The key 277 will be freed when all KEY-4 of earthing switches (keys number 283, 282, 281, 280, 279, 278) are all inserted on the KD1. Extracting key 277 all keys will be locked on KD1.	Ok		07/12
	Unit A1 Column Electrolyser – Typical single line diagram 1 Free key with opened Circuit Breaker (Circuit Breaker locked in open position) 2 Free key with insolated Circuit Breaker (Circuit Breaker locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position)			
55	Unit A1-Feeder Electrolyser Verify functionality key interlock starting from isolated condition, QM is in extract position and Earthing Switch BGE is closed. Internal Unit Interlock: - QM Rack in /rack out system is interlocked with earthing switch BGE opened	Ok		07/12

Step	Description	Result	Verified by	Date
	- Earthing switch opened: QM rack in/rack out system is unlocked. It's possible to move the breaker in test or service position - Earthing switch closed: QM rack in/rack out system is locked. It's not possible to rack-in the breaker. - QM Racked in: BGE earthing switch is locked. It's not possible to close the earthing switch. - QM Racked out: BGE earthing switch is unlocked. It is possible to close the earthing switch. Key external Interlock: - KEY-1 Free key with opened circuit breaker, locked in open position. Available for use with LOTO procedure. - KEY-2 Free key with racked out circuit breaker, locked in extract position (isolated). Available for use with LOTO procedure. - KEY-3 Free key with opened earthing switch BGE. Earthing switch locked in open position. This key is mechanically coupled (ringed) with the Incomer downstream device. The incomer downstream device is unlocked and is free to close. Once the Incomer downstream device is closed, KEY3 is locked on it. To release the KEY-3 open the downstream device. - KEY-4 Free key with closed earthing switch. Earthing switch is locked in closed position (downstream isolated). This is mechanically coupled (ringed) with the key distributor DP1 and with downstream devices (e.g. transformer and enclosure door). Once downstream device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To release KEY-4 reinstate downstream normal condition.			

Step	Description	Result	Verified by	Date
	Unit A2 Column Transformer feeder TR-200ED1 – Typical single line diagram			
	2 Free key with insolated Contactor (Contactor locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position)			
56	Unit A2-SOLAR PACKAGE FEEDER Verify functionality key interlock starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed. Internal Unit Interlock: - QM Rack in /rack out system is interlocked with earthing switch BGE opened - Earthing switch opened: K1 rack in/rack out system is unlocked. It's possible to move the contactor in test or service position - Earthing switch closed: K1 rack in/rack out system is locked. It's not possible to rack-in the breaker. - Contactor K1 is Racked in: BGE earthing switch is locked. It's not possible to close the earthing switch.	OK		09/12

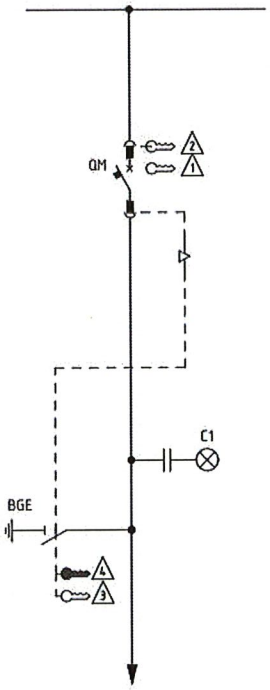
Step	Description	Result	Verified by	Date
	- Contactor K1 is Racked out: BGE earthing switch is unlocked. It is possible to close the earthing switch. Key external Interlock: - KEY-2 Free key with racked out contactor, locked in extract position (isolated). Free to use in LOTO procedure or something similar - KEY-3 Free key with opened earthing switch BGE. Earthing switch locked in open position. This key is mechanically coupled with the contactor downstream device. The incomer downstream device is unlocked and is free to close. Once the Incomer downstream device is closed, KEY3 is locked on it. To unlock the KEY-3 open the downstream device. - KEY-4 Free key is free with closed earthing switch. Earthing switch is locked in closed position (downstream isolated). This is mechanically coupled with the key distributor DP1 and with downstream devices (e.g. transformer unit door). Once downstream device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate downstream normal condition.			

Step	Description	Result	Verified by	Date
	Unit A3 Column "BESS PACKAGE FEEDER" – Typical single line diagram 2 Free key with insolated Contactor (Contactor locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position) 			
57	Unit A3-BESS PACKAGE FEEDER Verify functionality key interlock starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed. Internal Unit Interlock: - Contactor K1 Rack in /rack out system is interlocked with earthing switch BGE opened - Earthing switch opened: QM rack in/rack out system is unlocked. It's possible to move the breaker in test or service position - Earthing switch closed: QM rack in/rack out system is locked. It's not possible to rack-in the breaker. - Contactor K1 is Racked in: BGE earthing switch is locked. It's not possible to close the earthing switch. - Contactor K1 is Racked out: BGE earthing switch is unlocked. It is possible to close the earthing switch.	OK		05/12

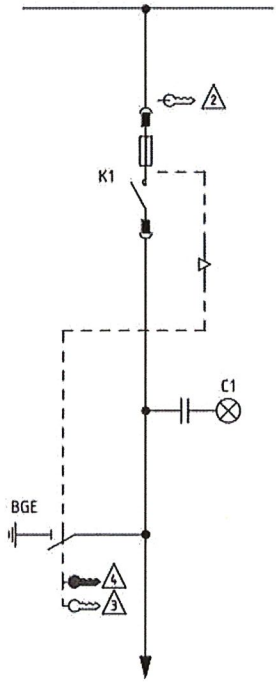
Step	Description	Result	Verified by	Date
	Key external Interlock: - KEY-2 Free key with racked out contactor, locked in extract position (isolated). Free to use in LOTO procedure or something similar - KEY-3 Free key with opened earthing switch BGE. Earthing switch locked in open position. This key is mechanically coupled with the Incomer downstream device. The incomer downstream device is unlocked and is free to close. Once the Incomer downstream device is closed, KEY3 is locked on it. To unlock the KEY-3 open the downstream device. - KEY-4 Free key is free with closed earthing switch. Earthing switch is locked in closed position (downstream isolated). This is mechanically coupled with the key distributor DP1 and with downstream devices (e.g. transformer unit door). Once downstream device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate downstream normal condition.			

Step	Description	Result	Verified by	Date
	Unit A4 TRANSFORMER TR-200DE1 FEEDER – Typical single line diagram			
	2 Free key with insolated Contactor (Contactor locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position)			
58	Unit A4-TRANSFORMER TR-200DE1 FEEDER Verify functionality key interlock starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed. Internal Unit Interlock: - Contactor K1 Rack in /rack out system is interlocked with earthing switch BGE opened - Earthing switch opened: Contactor K1 rack in/rack out system is unlocked. It's possible to move the breaker in test or service position - Earthing switch closed: Contactor K1 rack in/rack out system is locked. It's not possible to rack-in the breaker. - K1 Contactor Racked in: BGE earthing switch is locked. It's not possible to close the earthing switch.	ok		07/12

Step	Description	Result	Verified by	Date
	- K1 Contactor Racked out: BGE earthing switch is unlocked. It is possible to close the earthing switch. Key external Interlock: - KEY-2 Free key with racked out contactor, locked in extract position (isolated). Free to use in LOTO procedure or something similar - KEY-3 Free key with opened earthing switch BGE. Earthing switch locked in open position. This key is mechanically coupled with the Incomer downstream device. The incomer downstream device is unlocked and is free to close. Once the Incomer downstream device is closed, KEY3 is locked on it. To unlock the KEY-3 open the downstream device. - KEY-4 Free key is free with closed earthing switch. Earthing switch is locked in closed position (downstream isolated). This is mechanically coupled with the key distributor DP1 and with downstream devices (e.g. transformer unit door). Once downstream device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate downstream normal condition.			

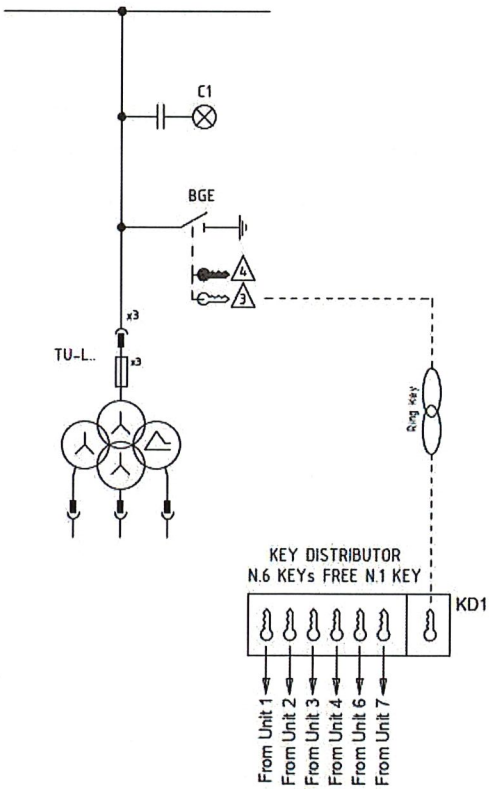
Step	Description	Result	Verified by	Date
	Unit A6 INCOMING CIRCUIT BREAKER – Typical single line diagram			
	1 Free key with opened Circuit Breaker (Circuit Breaker locked in open position) 2 Free key with insolated Circuit Breaker (Circuit Breaker locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position)			
59	Unit A6-INCOMING CIRCUIT BREAKER Verify functionality key interlock starting from isolated condition, QM is in extract position and Earthing Switch BGE is closed. Internal Unit Interlock: - QM Rack in /rack out system is interlocked with earthing switch BGE opened - Earthing switch opened: QM rack in/rack out system is unlocked. It's possible to move the breaker in test or service position - Earthing switch closed: QM rack in/rack out system is locked. It's not possible to rack-in the breaker. - QM Racked in: BGE earthing switch is locked. It's not possible to close the earthing switch.	ok		03/12

Step	Description	Result	Verified by	Date
	- QM Racked out: BGE earthing switch is unlocked. It is possible to close the earthing switch. Key external Interlock: - KEY-1 is free with Opened Circuit Breaker. Circuit Breaker Locked in Open Position. It is usable in LOTO procedure. - Lock the circuit breaker in extracted position by means of KEY-2 "14742" - KEY-2 is free with the Circuit Breaker in Extract Position and Open. Circuit Breaker locked in isolated position. It is used mechanically locked (ringed) with the **upstream** Earthing Switch locked in open position. - KEY-3 is free with Opened earthing switch locked in open position. It can use ringed with **upstream** devices. - KEY-4 is free with closed Earthing switch locked in closed position. This is mechanically coupled with the key distributor DP1 and with **upstream** devices (e.g. transformer unit door). Once **upstream** device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate **upstream** normal condition. - KD1 KEY DISTRIBUTOR: With the key that is released from KD1 Key distributor, unlock the opening position of the earthing switch.			

Step	Description	Result	Verified by	Date
	Unit A7 Column FUEL CELL FEEDER- Typical single line diagram			
	2 Free key with insolated Contactor (Contactor locked in isolated position) 3 Free key with opened Earthing Switch (Earthing Switch locked in open position) 4 Free key with closed Earthing Switch (Earthing Switch locked in close position)			
60	Unit A7-FUEL CELL FEEDER Verify functionality key interlock starting from isolated condition, K1 is in extract position and Earthing Switch BGE is closed. Key external Interlock: - KEY-2 Free key with racked out Contactor, locked in extract position (isolated). Free to use in LOTO procedure or something similar - KEY-3 Free key with opened earthing switch BGE. Earthing switch locked in open position. This key is mechanically coupled with the Incomer downstream device. The incomer downstream device is unlocked and is free to close. Once the Incomer downstream device is closed, KEY3 is locked on it. To unlock the KEY-3 open the downstream device.	Ok		05/12

Step	Description	Result	Verified by	Date
	- KEY-4 Free key is free with closed earthing switch. Earthing switch is locked in closed position (downstream isolated) . This is mechanically coupled with the key distributor DP1 and with downstream devices (e.g. transformer unit door). Once downstream device (or key distributor DP1) keeps KEY-4locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate downstream normal condition			

Unit A5 MEASURING and BUS BAR - Typical single line diagram



3 Free key with opened Earthing Switch (Earthing Switch locked in open position)

4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

Step	Description	Result	Verified by	Date
61	- KEY-3 is free with Opened earthing switch locked in open position. It can use ringed with **upstream** devices. - KEY-4 is free with closed Earthing switch locked in closed position. This is mechanically coupled with the key distributor DP1 and with **upstream** devices (e.g. transformer unit door). Once **upstream** device (or key distributor DP1) keeps KEY-4 locked, it's not possible to open the earthing switch. To unlock KEY-4 reinstate **upstream** normal condition. - KD1 KEY DISTRIBUTOR: With the key that is released from KD1 Key distributor, unlock the opening position of the earthing switch.	OK		

5.4.1.5 OTP Worksite PHASE 1 - Test Notes and Remarks

5.4.1.6 OTP Worksite PHASE 1 - Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.1.7 OTP Worksite PHASE 1 - Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature
K. CASTELLANI		LEAD TECHNICAL COMM.	
J. M'ALLISTER		OPS ENG	
M. TARCA		COMM MANAGER CW	
ANTHONY IVESON		COMM. MGR. ROSETTI M.	

* A4 PROTECTION IN OVERRIDE DURING TEST P1 & P2

5.4.2 PHASE 2 – Test with 6,6kV Main Power Supply of Incomer Unit A6 and Measuring Unit A5

It is foreseen that previous sections are successfully performed.

All auxiliary circuits are powered ON, the breakers of voltage references are switched on for FP1 Protection Relay.

In this PHASE will be tested the SWBD Incomer Unit A6 and Measuring Unit A5. Tests will be performed successfully and accepted to proceed in the next phases.

After this PHASE all systems will be fed from SWBD SG-100D1 that will be available without pending point, ready to work and powered ON ready to next phases.

In the following steps will be performed the first energization of the Incomer Unit (A6) and related measuring unit (A5), that they will be ready for commissioning.

Will be performed the unit functionality tests and will be tested all provided I/O lists for these units, referring to vendor document 1723002197-EL-LIS-00041 of the 6.6KV Switchboards.

Shall be tested the following systems and subsystems:

- SS 83-00: 6,6 kV Switchboard
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-10: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System

5.4.2.1 Test Preparation

Verification of systems and subsystems of 6.6KV Switchboards, feeding main busbar and without loads connected.

The Incomer Unit A6 and Measuring Unit A5 involved in this procedure must be ready for commissioning and available.

The Unit A5 and A6 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

The CBs for voltage measuring and reference are already closed in PHASE 1

To perform the I/O signal tests is mandatory that the EMCS cabinet – IEC 61850 network system – Modbus TCP-IP network system - are already tested, available and ready to work.

To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

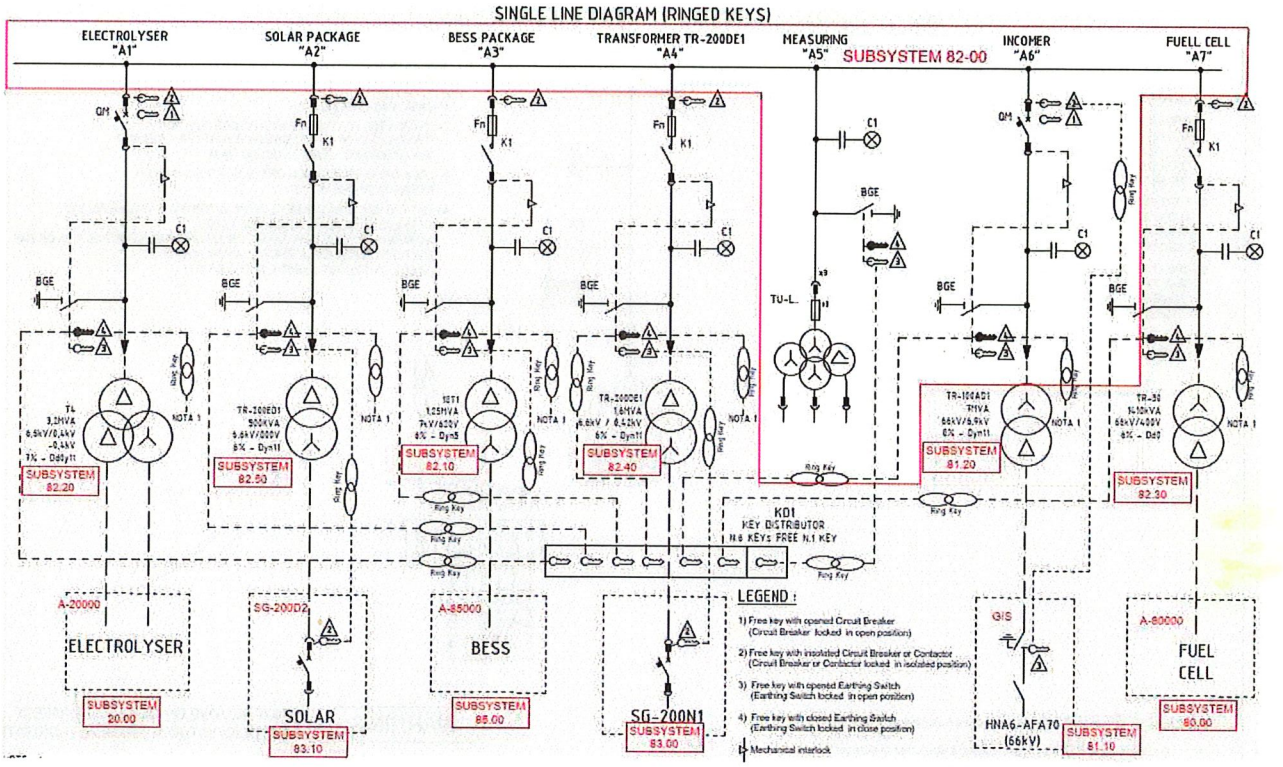
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PIDSEZ

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A5, A6 UNIT and main busbar

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the upstream is not powered, Measuring Unit A5 has its Earthing Switch (BGE) Closed and Incomer Unit A6 has its Earthing Switch (BGE) Closed and Its Main Breaker QM in extract position and opened.

The main 6,6kV supply will be provided from 6,6kV Temporary Yard Power Supply system and will be provided only after the following safety checks.

Step	Description	Result	Verified by	Date

See the Measuring Unit A5 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

MEASURING AND BUS BAR OPERATING SEQUENCE

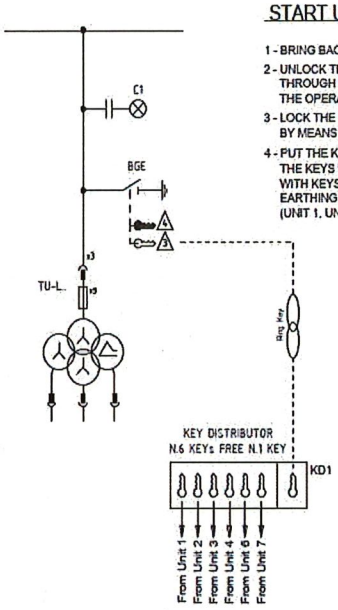
PUTTING OUT OF SERVICE

1 - OPEN AND CARRY IN ISOLATED POSITION ALL CIRCUIT BREAKERS AND CONTACTORS AND THEN CLOSE THE EARTHING SWITCH FOR THE FOLLOWING UNITS: (UNIT 1, UNIT 2, UNIT 3, UNIT 4, UNIT 6, UNIT 7). LOCK THE EARTHING SWITCH IN CLOSE POSITION BY MEANS OF THE RESPECTIVE KEYS (4).

2 - PUT THE KEYS "4" OF THE EARTHING SWITCHES IN THE KEYS-DISTRIBUTOR 'KD1'. WITH THE KEY THAT IS RELEASED FROM THE 'KD1' KEY DISTRIBUTOR, UNLOCK THE OPENING POSITION OF THE EARTHING SWITCH

3 - OPEN THE COVER OF THE EARTHING SWITCH OPERATING SEAT BY TURNING THE ACTUATOR ANTICLOCKWISE, CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE

5 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY "4".



START UP

1 - BRING BACK THE KEY "4".

2 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY "4". OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE

3 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY "3".

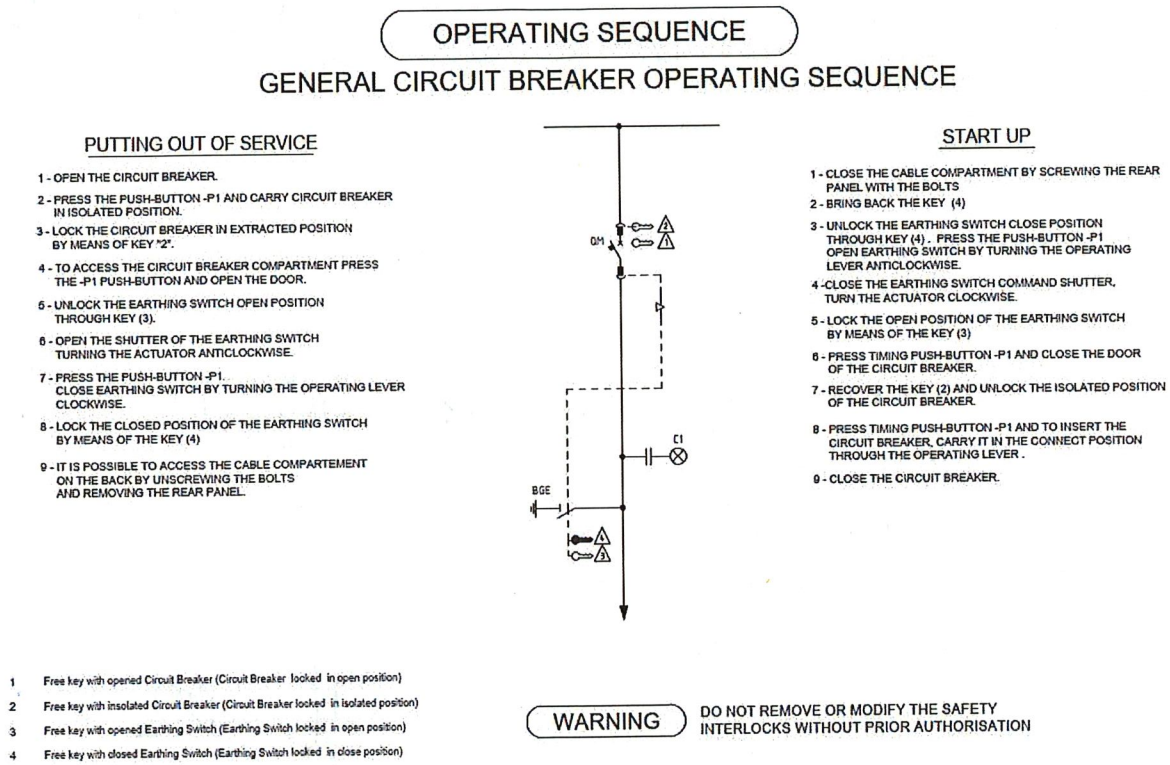
4 - PUT THE KEY "3" IN THE KEYS-DISTRIBUTOR "KD1", WILL BE RELEASE THE KEYS "4" OF ALL EARTHING SWITCHES . WITH KEYS "4" WILL BE POSSIBLE UNLOCKING THE CLOSE POSITION OF THE EARTHING SWITCHES OF THE FOLLOWING UNITS: (UNIT 1, UNIT 2, UNIT 3, UNIT 4, UNIT 6, UNIT 7) .

3 Free key with opened Earthing Switch (Earthing Switch locked in open position)

4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

Step	Description	Result	Verified by	Date
	See the Incomer Unit A6 operating sequences to put the unit *out of service* or *in service*			



OPERATING SEQUENCE

GENERAL CIRCUIT BREAKER OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CIRCUIT BREAKER.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CIRCUIT BREAKER IN ISOLATED POSITION.
3 - LOCK THE CIRCUIT BREAKER IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CIRCUIT BREAKER COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL.

START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4). PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 -CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CIRCUIT BREAKER.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CIRCUIT BREAKER.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CIRCUIT BREAKER, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CIRCUIT BREAKER.

1 Free key with opened Circuit Breaker (Circuit Breaker locked in open position)
2 Free key with insolated Circuit Breaker (Circuit Breaker locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

62	Verify and confirm that **Unit A6** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3228/279** is locked on KD1 device. **KEY-3 G3355** is locked on BGE Earthing Switch closed ..... ☑ - QM Main Breaker is locked in extract position and opened. **KEY-2 14466** is locked on 66kV **upstream** safety isolation device. ..... ☑ Note: see the detail of upstream safety isolation device (e.g. 66kV Earthing Switch) on 66kV OTP procedure	ok	[signature]	09/12

Step	Description	Result	Verified by	Date
63	Verify and confirm that **Unit A5** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-3 G3098/277** is locked on KD1 device. ..... ☑ - **KEY-4 G3150** is unlocked and available to use in the LoTo Procedure..... ☑	ok		04/12
Switchboard preparation to receive 6,6kV Temporary Yard Power Supply on Incomer Unit A6				
64	The keys 278, 279, 280, 281, 282, 283 are interlocked on KD1. On Unit A5 - Take **KEY-4 G3150** insert it on BGE and open Earthing Switch..... ☑ - **KEY-3 G3098/277** is now available, withdraw it and insert in keys Interlock device KD1 ..... ☑	ok		05/12
65	To unlock Incomer Unit A6 BGE Earthing Switch - QM main Breaker is locked in extract position ..... ☑ - **KEY-1 G3260** is locked on LoTo procedure to keep breaker isolated in compliance with project PTW Procedure..... ☑ - **KEY-2 14466** is locked on 66kV **upstream** safety isolation device ... ☑ - **KEY-3 G3355** is used and locked on PTW procedure. Once it is available insert it on BGE Earthing Switch to allow opening switch procedure.. ☑ - **KEY-4 G3228** has been released from KD1. Insert **KEY-4 G3228** on BGE and open it..... ☑ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 will turn to green..... ☑	ok		05/12

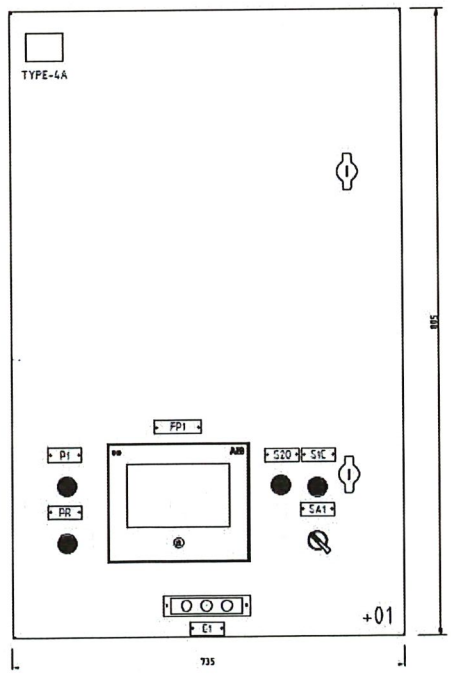
Step	Description	Result	Verified by	Date
	- Remove the safety isolation device, extract KEY-2 14466 and place it on rack in/out system to unlock the QM main breaker..... ☑ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green..... ☑ - Rack in QM Main Breaker in TEST position ..... ☑	ok	05/12	

Test the Unit A6 Incomer Breaker Functionality with "commissioning bypass" activated simulating the QM Breaker in "service position" (N.B.: *breaker kept in test position but with full functionality of service position).*

With reference Vendor doc. N° 1723002197-EL-DG-00015)

Note: *See next section 5.4.2.3/4/5 EMCS IEC61850 and MODBUS TCP-IP - A6 Unit I/O list*

DOOR LAY-OUT



DEVICES name plate				
ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S10	PUSH BUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSH BUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
E1	PILOT LIGHT	VOLTAGE	PRESENCE	
P1	PUSH BUTTON	TRUCK-DOOR-E.SWITCH	ENABLING	TYPE-2A

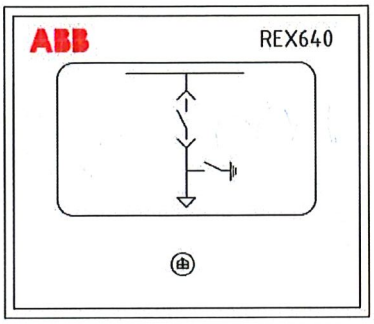
66	Hardwired I/O signals between Unit A6 and 66kV switchboard:			

Step	Description	Result	Verified by	Date
	Arc Flash cable Compartment Tripped, Sheet 27 Confirm open contact without alarm - XM 63-64 ☑ C.B. connected in service position and opened, sheet 27 Confirm close contact with breaker in service position (with "commissioning bypass") and opened - XM 65-66 ☑ Earthing Switch BGE opened Confirm close contact with Earthing Switch opened - XM 67-68 ☑ - XM 73-74 ☑ Transformer TD-100AD1 General Trip Signal to 66kV Switchboard Confirm Open contact with no Trip Signal - Trip XM 79-80 ☑ Circuit Breaker Opened Confirm close contact with C.B. opened - XM 89-90 ☑ - XM 91-92 ☑	OK		05/12
67	Hardwired I/O signals between 66kV switchboard and Unit A6: From 66kV C.B. opened (opening command) Confirm open contact with 66kV C.B. Closed - XM 43-44 ☑ - XM 81-82 ☑ - XM 83-84 ☑ Confirm close contact with 66kV lockout relay healthy - XM 25-26 ☑	OK		05/12

Step	Description	Result	Verified by	Date
	Confirm open contact with 66kV lockout relay healthy (opening command) - XM 11-12 ..... ☑			
68	Hardwired I/O signals from TR-100AD1 (66/6,6 kV) Transformer to Unit A6: Alarm and Trip I/O Signals from Transformer TR-100AD1 to Unit A6 Confirm open contact with No Alarm or No Trip status Relay Buchholz - Trip XM 27-28 (97T)..... ☑ - Alarm XM 61-62 (97T)..... ☑ Transformer oil temperature - Trip XM 29-30 (26OT) ..... ☑ - Alarm XM 47-48 (26OT)..... ☑ Transformer Pressure Relay - Trip XM 31-32 (63T)..... ☑ Transformer windings temperature - Trip XM 33-34 (49T)..... ☑ - Alarm XM 53-54 (49T)..... ☑ Transformer OLTC Oil Level Indicator - Trip XM 35-36 (71OOLTC)..... ☑ - Alarm XM 55-56 (71OOLTC) ..... ☑ Transformer OLTC Protection Relay - Trip XM 37-38 (97OLTC) ..... ☑ Transformer Protection Oil Level - Trip XM 39-40 (71OT) ..... ☑ - Alarm XM 49-50 (71OT)..... ☑ Transformer self-dehydrating breather	OK	[illegible]	05/12

Step	Description	Result	Verified by	Date
	- Alarm XM 51-52 (89T.2)..... ☑ Transformer Membrane Control - Alarm XM 45-46 (89T.1)..... ☑ TR-100AD1 General Alarm - Alarm XM 57-58 ..... ☑ General Alarm from RR-100D1 NER - Alarm XM 85-86 ..... ☑	ok		05/12
69	Hardwired I/O Signals From / To Incomer Unit A6 – Other Devices Signal From Unit A6 to BESS PACKAGE 66kV C.B. open & QM Incomer C.B. Open or in Test Position Confirm Closed Contact with 66kV C.B. open & QM Incomer C.B. Open or in Test Position - XM 87-88 (C.B. Isolated)..... ☑ Synchronization Closing Command Signal from BESS PACKAGE Confirm open Contact with Normal condition (No Synchro). Connect a temporary jumper between terminals and confirm QM Breaker Closed (with bypass) - XM 59-60 ..... ☑	ok		05/12
	HMI of FP1 Protection Relay and its LEDs signalling			

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Step	Description	Result	Verified by	Date
	PROTECTION DISPLAY  LHMI - TOUCH DISPLAY - COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED - PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED			
70	The QM Breaker is in test position. Closing and opening QM Breaker command, simulating (C.B. in) service position with "commissioning bypass" Close QM Incoming Breaker - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. ..... ☑ - Close QM Breaker by pressing push button S1C ..... ☑ - Verify and confirm the breaker status closed via on board mechanical red signal ..... ☑	OK		05/12

LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCS)	-	GREEN	OK = TCS OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISH
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/67-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/51N-1/51N-2 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY SIC (ESO)	RED	-	ALARM = ESO TRIPPED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ..... ☑ Open QM Incoming Breaker - Open QM Breaker by pressing push button S2O ..... ☑ - Verify and confirm the breaker status open via on board mechanical green signal ..... ☑ - See on FP1 Protection Relay Display if Breaker Opened is confirmed on REX640 HMI ..... ☑	ok		05/12
71	Rack in QM Main Breaker in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the following tests to be performed in the **final operational configuration.**	ok		05/12
72	Confirm availability of the 6,6kV Main Temporary Yard Power Supply and prepare to energize. To allow closing QM breaker: Keep open contact disconnecting cables on following terminal: - XM 11-12 ..... ☑ - XM 43-44 ..... ☑ - XM 81-82 ..... ☑ - XM 83-84 ..... ☑ Ensure close contact connecting a jumper between terminals: - XM 25-26 ..... ☑ When the power supply is available confirm the following: - On Unit A6 the voltage presence lamps C1 are ON ..... ☑	ok		05/12

Step	Description	Result	Verified by	Date
	- Led-2 "BREAKER READY (TCS)" on protection relay REX640 will turn to green..... ☑	ok		05/12
73	A6 Unit – Incoming Breaker – **Local** command Close QM Incoming Breaker, feeding 6,6kV SWBD SG-100D1 main busbar - Place the selector SA1 in Local position ..... ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF..... ☑ o LED-6 must be OFF..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close QM Breaker by pressing push button S1C..... ☑ - Verify and confirm the breaker status closed via on board mechanical red signal ..... ☑ - On Unit A5 the busbar voltage presence lamps C1 are ON..... ☑ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ..... ☑	ok		05/12

Step	Description	Result	Verified by	Date
74	A6 Unit – Incoming Breaker – **Remote** command from Close QM Incoming Breaker, feeding 6,6kV SWBD SG-100D1 main busbar - Place the selector SA1 in Remote position ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ☑ o LED-2 must be GREEN ☑ o LED-3 must be GREEN ☑ o LED-4 must be GREEN ☑ o LED-5 must be OFF ☑ o LED-6 must be OFF ☑ o LED-7 must be GREEN ☑ o LED-8 must be GREEN ☑ o LED-9 must be OFF ☑ o LED-10 must be OFF ☑ o LED-11 must be OFF ☑ - Close QM Breaker from EMCS System ☑ - Verify and confirm the breaker status closed via on board mechanical red signal ☑ - On Unit A5 the busbar voltage presence lamps C1 are ON ☑ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ☑ - Open QM Breaker from EMCS System ☑ - Verify and confirm the breaker status opened via on board mechanical green signal ☑	OK		09/01/25

Step	Description	Result	Verified by	Date
	- On Unit A5 the busbar voltage presence lamps C1 are OFF ..... ☑	ok		05/12

5.4.2.2 230Vac Auxiliary devices tests

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
INCOMER UNIT A6				
75	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) ..... 229 V	ok		05/12
76	Power up 230Vac auxiliary circuits. - Close MCB QA2 ..... 229 ..... ☑	ok		05/12
77	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch LS that switch on light with opened door and switch off it with door closed. - Verify and confirm ..... 230 ..... ☑	ok		05/12
78	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat HGR is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm ..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	ok		05/12

Step	Description	Result	Verified by	Date
79	Internal 230Vac Socket test The internal 230Vac Socket XS1 is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac).....☐	ok		05/12
MEASURING UNIT A5				
80	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XM 5-6 (230V)..229,30..... V - XC 9-11 (230V)..228,75..... V - XC 10-12 (230V)..230,00..... V	ok		05/12
81	Power up 230Vac auxiliary circuits. - Close MCB QA1 .....☐ Verify and confirm voltage presence on terminals: - XC 9-11 (230V)..230,00..... V - XC 10-12 (230V)..228,5..... V 230Vac Auxiliary Healthy relay is on - Verify and confirm .....☑ Verify and confirm close contact between terminals XC 47-48 .....☑	ok		05/12
82	Power up 230Vac auxiliary circuits. - Close MCB QA2 .....☐			05/12
83	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch LS that switch on light with opened door and switch off it with door closed. - Verify and confirm.....☐			05/12

Step	Description	Result	Verified by	Date
84	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm.....☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red .....☑	ok		05/12
85	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac).....☑	Ok		05/12

5.4.2.3 EMCS EC61850 - Electrical Monitoring & Control System

The EMCS will be tested with the 6.6kV Switchboard SG-100D1: In detail it will be tested the functionalities provided on I/O lists, refer to vendor document **1723002197-EL-LIS-00041 with the A6 Unit INCOMER.**

5.4.2.4 EMCS IEC61850 – A6 Unit I/O list

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS REX640.

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
INCOMING FEEDER TR-100AD1 "A6"		
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
SYNCHRO "OK"	DIGITAL	LD0.LEDGGIO1.ST.Ind3.stVal
PROTECTION TRIPPED "59N-1"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "59N-2"	DIGITAL	LD0.ROVPTOV2.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "27-2"	DIGITAL	LD0.PHPTUV2.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
PROTECTION TRIPPED "59-2"	DIGITAL	LD0.PHPTOV2.ST.Op.general
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-l2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSFORMER PROTECTION TRIPPED "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind9.stVal

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SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
TRANSFORMER PROTECTION ALARM "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind8.stVal
TRANSFORMER PROTECTION TRIPPED "OIL PRESSURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind12.stVal
TRANSF. PROT. SELF DEHYDRATING BREATHER ALARM	DIGITAL	LD0.SCBIGGIO1.ST.Ind11.stVal
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
TRANSFORMER PROTECTION ALARM BUCHHOLZ	DIGITAL	LD0.SDBIGGIO1.ST.Ind7.stVal
TRANSFORMER PROTECTION TRIPPED BUCHHOLZ	DIGITAL	LD0.SDBIGGIO1.ST.Ind9.stVal
TRANSFORMER OLTC PROTECTION RELAY	DIGITAL	LD0.SBBIGGIO1.ST.Ind9.stVal
TRANSFORMER PROTECTION ALARM LEVEL OIL	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
TRANSFORMER PROTECTION TRIPPED LEVEL OIL	DIGITAL	LD0.SCBIGGIO1.ST.Ind7.stVal
TRANSFORMER PROTECTION ALARM OIL LEVEL INDICATOR	DIGITAL	LD0.SDBIGGIO1.ST.Ind3.stVal
TRANSF. OLTC PROTECTION TRIPPED OIL LEVEL INDICATOR	DIGITAL	LD0.SCBIGGIO1.ST.Ind1.stVal
TRANSFORMER PROTECTION ALARM MEMBRANE CONTROL	DIGITAL	LD0.SCBIGGIO1.ST.Ind6.stVal
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
V.T. HEALTLY CIRCUIT	DIGITAL	LD0.SCBIGGIO1.ST.Ind2.stVal
INTERTRIP SEND TO 66kV SWITCHB.	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
C.B. CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
C.B. OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO5.stVal
C.B. READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
C.B. READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
LIVE VOLTAGE 6.6kV ON THE MAIN BUS-BARS	DIGITAL	LD0.VMMXU2.ST.HiWrn.stVal
TRIPPED ARC CABLE COMPARTEMENT	DIGITAL	LD0.SCBOGGIO1.ST.SPCSO2.stVal
TR-100AD1 GENERAL ALAM	DIGITAL	LD0.SDBIGGIO1.ST.Ind4.stVal
RR-100D1 NER GENERAL ALARM	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal

Step	Description	Result	Verified by	Date
86	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		05/12

5.4.2.5 EMCS MODBUS TCP-IP

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

SIGNAL_DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
INCOMING FEEDER TR-100AD1 "A6"			
Phase L1 - Temperature Detection - cable Compart.	15	40146	ΔT
Phase L2 - Temperature Detection - cable Compart.	15	40147	ΔT
Phase L3 - Temperature Detection - cable Compart.	15	40148	ΔT
Phase L1 - Temperature Detection - C.B. Compart.	15	40149	ΔT
Phase L2 - Temperature Detection - C.B. Compart.	15	40150	ΔT
Phase L3 - Temperature Detection - C.B. Compart.	15	40151	ΔT
Phase L1 - Temperature Detection - Main Bus Bar	15	40152	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	15	40153	ΔT

Step	Description	Result	Verified by	Date
87	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		05/12

N.B.: Following PHASE 2 we will consider the SWBD Incomer Unit (A6) and Measuring Unit (A5) tested, available, and continually energized ready for operation.

5.4.2.6 OTP Worksite PHASE 2 - Test Notes and Remarks

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5.4.2.7 *OTP Worksite PHASE 2 - Tests Certifying Authority Table of Attendances*

Name and Surname	Certifying Authority	Position	Signature

5.4.2.8 *OTP Worksite PHASE 2 - Tests Final Signatures and Company Acceptance*

Name and Surname	Certifying Authority	Position	Signature
K CASTELLANI		LEAD ELE COMMISSIONING	
M TAYLOR		COMM MANAGER CW	
J MCALLISTER		OPS ENG	
ANTHONY IVERSON		COMM. MGR ROSETTI M.	

* ALL PROTECTION IN OVERRIDE DURING TEST

5.4.3 PHASE 3 - Test with 6,6kV Main Power Supply of Unit A4 Feeder for TR-200E1 6.6/0.4kV Transformer

5.4.3.1 OTP Steps WORKSITE - PHASE 3

It is foreseen that previous PHASE 2 is successfully performed. 6.6KV Switchboard is working in normal operation and no alarm pending.

In this Phase will be tested the Unit A4 Feeder for TR-200E1 6.6/0.4kV Transformer with 6,6 kV from main busbar

After this PHASE all systems will be fed from SWBD SG-200N1 that will be available without pending point, ready to work and powered ON ready to next phases.

In the following steps the functionality of the 6.6KV Switchboard shall be tested for:

- SS 82-00: 6,6 kV 6.6kV SG-100D1 SWBD.
- SS 83-00: 400/230V Low Voltage SG-200N1 SWBD.
- SS 83-20: 400/230V Distribution Board DP-200N1.
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-10: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System

5.4.3.2 Test Preparation

Verification of system and subsystem 6.6KV Power Distribution Switchboards Unit A4 is completed without punch lists or pending point that limit the power up.

Verify that Unit A4 Feeder for TR-200E1 6.6/0.4kV Transformer is available.

Auxiliary power supplies in SG-100D1 are available from:

- UPS AC/DC 110V UP-200F1
- DISTRIBUTION BOARD AC 230V DP-200N1
- 24Vdc From MEASURING UNIT A5

The list electrical hardwired interlocks are between K1 Contactor of Unit A4 and LV SWBD SG-200N1 Incomer.

The Unit A4 Feeder for TR-200E1 6.6/0.4kV Transformer involved in this procedure must be available and ready for commissioning.

The test of all internal interconnections between units of 6.6KV Switchboard SG-100D1 are tested on Vendor SAT procedure 1723002197-QC-PRO-00046

The Unit A4 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

To perform the I/O signal tests is mandatory that the EMCS cabinet – IEC 61850 network system – Modbus TCP-IP network system - are already tested, available and ready to work.

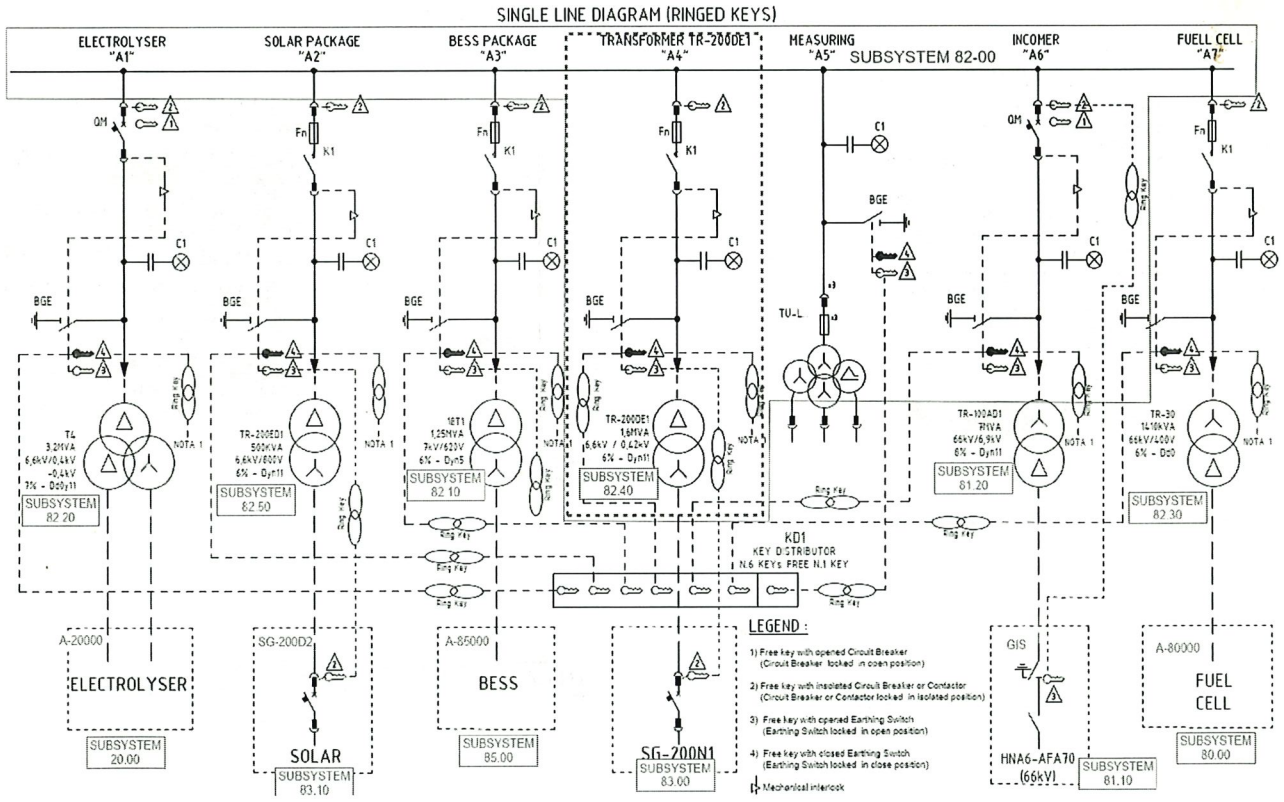
To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

PAGE 31

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A4 UNIT Feeder for TR-200E1 6.6/0.4kV Transformer

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the main busbars are powered on, Unit A4 has its Earthing Switch (BGE) Closed and Its Contactor K1 is in extract position and opened, it is isolated status.

The 6,6kV supply is provided from main busbar will be possible to change isolated status, only after the following safety checks.

Step	Description	Result	Verified by	Date

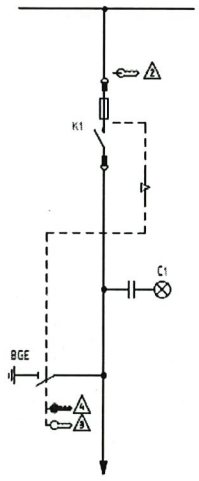
See the Feeder Unit A4 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

GENERAL CONTACTOR OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CONTACTOR.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CONTACTOR IN ISOLATED POSITION.
3 - LOCK THE CONTACTOR IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CONTACTOR COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4). PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 -CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CONTACTOR.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CONTACTOR.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CONTACTOR, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CONTACTOR.

2 Free key with insolated Contactor (Contactor locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

88	Verify and confirm that **Unit A4** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3135/280** is on KD1 device. **KEY-3 G3398,** that is mechanically coupled (ringed) with **KEY-2 150901** of **SG-200N1** main Incomer, it is locked on BGE Earthing Switch closed ...☐	OK	M Ostos SM (CW)	09/01

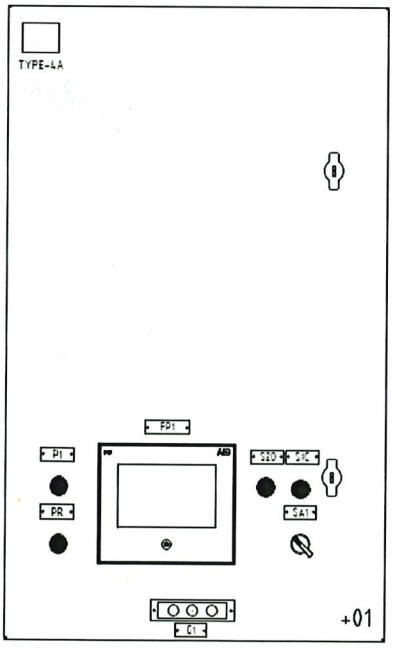
Step	Description	Result	Verified by	Date
	- K1 Contactor is locked in extract position and opened. **KEY-2 19465** is locked on the LoTo Procedure ..... ☑ *N.B.: See the Key interlocks details on section 5.4.1.4 SG-100D1 Interlocks & Key Interlocks*	ok	JM (cw)	09/01
Unit preparation to receive 6,6kV from main busbar on Feeder Unit A4				
89	Ensure voltage reference on REX640 Protection relay: - Close MCB QV4 ..... ☑ - Close MCB QV5 ..... ☑ The protection relay is now available and ready to operate	ok	JM (cw)	09/01
90	The **KEY-4 3135/280** is in KD1 device and it is withdrawable On Unit A4 - Take **KEY-4 G3135/280** insert it on BGE and open Earthing Switch ..... ☑ - **KEY-3 G3398/277** is now unlocked and withdrawable to use it on SG-200N1 SWBD Incomer ..... ☑	ok	JM (cw)	09/01
91	To unlock Incomer Breaker of Unit A4 - K1 main contactor is locked in extract position ..... ☑ - **KEY-2 19465** is locked on LoTo procedure to keep breaker isolated in compliance with project PTW Procedure ..... ☑ - **KEY-3 G3398/277** is unlocked with BGE opened. - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 HMI will turn to green ☑	ok	JM (cw)	09/01

Step	Description	Result	Verified by	Date
	- The internal Interlock is unlocking Rack in/out Contactor system. The **KEY-2 19465** has been freed from PTW procedure, insert it on Rack in/out system and bring contactor in test position..... ☑ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green..... ☑	ok	09/01 JM (CW)	

Test the Unit A4 Feeder for TR-200E1 6.6/0.4kV Transformer contactor Functionality with "commissioning bypass" activated simulating the K1 contactor in "service position" (N.B.: *contactor kept in test position but with full functionality of service position).*

With reference Vendor doc. N° 1723002197-EL-DG-00021)

Note: *See next sections 5.4.3.5/6/7 EMCS IEC61850 AND MODBUS TCP-IP – A4 Unit I/O list*



DOOR LAY-OUT

DEVICES name plate

ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S2O	PUSHBUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSHBUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
C1	PILOT LIGHT	VOLTAGE	PRESENCE	
P1	PUSHBUTTON	TRUCK-DOOR-SWITCH	ENABLING	TYPE-2A

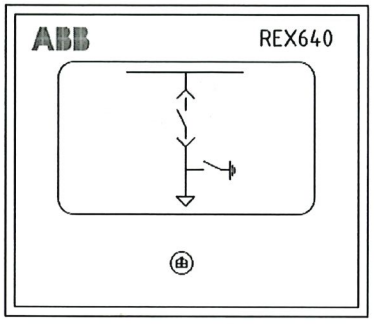
92	Hardwired I/O signals between Unit A4 and TR-200DE1 Transformer 6,6/0,42 kV:	ok		09/01

Step	Description	Result	Verified by	Date
	Confirm open contact with No Alarm or No Trip status (sheets 22-24) Relay Buchholz - Trip XM 17-18 (97T) ..... ☑ - Alarm XM 29-30 (97T)..... ☑ Transformer oil temperature - Trip XM 19-20 (26OT)..... ☑ - Alarm XM 31-32 (26OT) ..... ☑ Transformer Pressure Relay - Trip XM 21-22 (63T) ..... ☑ Transformer windings temperature - Trip XM 23-24 (49T) ..... ☑ - Alarm XM 37-38 (49T)..... ☑ Transformer Protection Oil Level - Alarm XM 33-34 (71OT) ..... ☑	OK	JM (CW)	09/01/2025
93	Hardwired I/O signals between Unit A4 and SG-200N1 LV Switchboard From LV SWBD SG-200N1 To 6.6KV SWBD SG-100D1 (sheets 25-26) Incomer C.B. QF1 (on SG-200N1) is in test position Confirm QF1 in Test Position Confirm close contact between terminals on SG-100D1: - XM 39-40..... ☑ Confirm QF1 not tripped Confirm open contact between terminals: - XM 41-42..... ☑ Incomer C.B. QF1 (on SG-200N1) opened (closing Interlock)	Ok		09/01/2025

Step	Description	Result	Verified by	Date
	Confirm closing contact with QF1 opened between terminals on SG-100D1 - - XM 27-28..... ☑ From 6.6KV SWBD SG-100D1 To LV SWBD SG-200N1 Opening (on SG-200N1) LV QF1 Incomer Breaker command signal Confirm close contact with K1 contactor status opened or in test position: - XM 49-50..... ☑ Confirm open contact with K86 (on SG-100D1) lock out relay healthy: - XM 51-52 (opening command) ..... ☑ - XM 69-70 (closing command) ☑ Closing (on SG-200N1) LV QF1 command permissive signal – Contactor status closed + contactor in service position + Earthing switch opened Confirm close contact with K1 contactor in service position (with "commissioning bypass") and Closed and BGE Earthing Switch opened - XM 53-54..... ☑	ok	[illegible]	09/01/[illegible]
	HMI of FP1 Protection Relay and its LEDs signalling		JM(CW)	

Step	Description	Result	Verified by	Date

PROTECTION DISPLAY



LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCC)	-	GREEN	OK = TCC OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISM
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/67-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/51N-1/51N-2 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY DIG (ECD)	RED	-	ALARM = ECD TRIPPED

LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

94	The K1 Contactor is in test position. Closing and opening K1 Contactor command, simulating (K1 in) service position with "commissioning bypass" Close K1 Contactor feeder - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the contactor closing. ..... ☑ - Close K1 Contactor by pressing push button S1C ..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑	OK	M. Rafelle J.M (CW)	09/01/25

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑ Open K1 Contactor feeder - Open K1 Contactor by pressing push button S2O ..... ☑ - Verify and confirm the Contactor status open via on board mechanical green signal..... ☑ - See on FP1 Protection Relay Display if Contactor Opened is confirmed on REX640 HMI ..... ☑	ok	JM (CW)	09/01/2025
95	Before to close the K1 Contactor ensure and confirm that the TRANSFORMER FEEDER TR-200DE1 has Ready for Commissioning Certificate and it is available to receive the 6,6kV Power Supply	ok	JM (CW)	09/01/2025
96	Rack in K1 Contactor in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the following tests to be performed in the **final operational configuration.**	ok	JM (CW)	
97	A4 Unit – Feeder for TR-200E1 6.6/0.4kV Transformer Confirm the conditions to close the K1 Contactor following: - On Unit A5 the voltage presence lamps C1 are ON ..... ☑ - Led-2 "BREAKER READY (TCS)" on Unit A4 protection relay REX640 is green..... ☑ Close K1 Contactor, feeding downstream TR-200DE1 6.6/0.4kV Transformer - **Local** command - Place the selector SA1 in Local position ..... ☑	ok	JM (CW)	09/01/2025

Step	Description	Result	Verified by	Date
	- All permissive interlock signals are authorizing the Contactor closing command. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00021 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close K1 Contactor by pressing push button S1C ..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑ - On Unit A4 the downstream voltage presence lamps C1 are ON ..... ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑	ok	JM(CW)	02/01/2025
98	A4 Unit – Feeder for TR-200E1 6.6/0.4kV Transformer - **Remote** command Close K1 Contactor, feeding downstream TR-200E1 6.6/0.4kV Transformer - Place the selector SA1 in Remote position ..... ☑	ok		02/01/25

Step	Description	Result	Verified by	Date
	- All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close QM Breaker from EMCS System ..... ☑ - Verify and confirm the breaker status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ..... ☑ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ..... ☑ - Open QM Breaker from EMCS System ..... ☑ - Verify and confirm the breaker status opened via on board mechanical green signal..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are OFF ..... ☑	OK		09/01/2025

5.4.3.3 230Vac Auxiliary devices tests

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
UNIT A4 - TRANSFORMER TR-200DE1 FEEDER				
99	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) ..... 230 V	OK		09/01/2025
100	Power up 230Vac auxiliary circuits. - Close MCB QA2 ..... 229 ..... ☑	OK		
101	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch **LS** that switch on light with opened door and switch off it with door closed. - Verify and confirm ..... 229 ..... ☑	OK		
102	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm ..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	OK		
103	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac) ..... ☑	OK		

5.4.3.4 SIS Safety Instrumented System

Not applicable

5.4.3.5 EMCS EC61850 - Electrical Monitoring & Control System

The EMCS will be tested with the 6,6kV SWBD: In detail it will be tested the functionalities provided on I/O lists vendor document **1723002197-EL-LIS-00041 with the A4 Unit TRANSFORMER FEEDER TR-200DE1.**

5.4.3.6 EMCS IEC61850 - A4 Unit I/O List

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS Relay REX640.

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
TRANSFORMER FEEDER TR-200DE1 "A4		
PROTECTION TRIPPED "50"	DIGITAL	LD0.PHHPTOC2.ST.Op.general
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHHPTOC1.ST.Op.general
PROTECTION TRIPPED "50-2"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51"	DIGITAL	LD0.PHLPTOC2.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general
PROTECTION TRIPPED "51G"	DIGITAL	LD0.EFHPTOC1.ST.Op.general
PROTECTION TRIPPED "59N-1"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "59N-2"	DIGITAL	LD0.ROVPTOV2.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-l2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSFORMER PROTECTION TRIPPED "BUCHHOLZ"	DIGITAL	LD0.SCBIGGIO1.ST.Ind7.stVal
TRANSFORMER PROTECTION ALARM "BUCHHOLZ"	DIGITAL	LD0.SCBIGGIO1.ST.Ind6.stVal
TRANSFORMER PROTECTION TRIPPED "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind9.stVal
TRANSFORMER PROTECTION ALARM "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind8.stVal
PROTECTION TRIPPED ALARM "OIL LEVEL"	DIGITAL	LD0.SCBIGGIO1.ST.Ind10.stVal
TRANSFORMER PROTECTION TRIPPED "OIL PRESSURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind12.stVal
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
TRANSF. OIL LEVEL VERY LOW ALARM	DIGITAL	LD0.SCBIGGIO1.ST.Ind11.stVal
TRANSFORMER GENERAL ALARM	DIGITAL	LD0.SDBIGGIO1.ST.Ind7.stVal

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Once printed shall be considered as "NOT CONTROLLED" copy.

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	IEC61850 ITEM TAG
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
INTERTRIP SEND TO L.V. SWITCHBOARD	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal
Contactor CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
Contactor OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO3.stVal
Contactor READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
Contactor READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
PROTECTION RELAY UNIT 3 HEALTHY	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal
SELECTOR SWITCH OF OVERRIDE (SIL ENABLED)	DIGITAL	LD0.SDBIGGIO1.ST.Ind9.stVal

Step	Description	Result	Verified by	Date
104	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		09/01

5.4.3.7 EMCS MODBUS TCP-IP

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

SIGNAL_DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
TRANSFORMER FEEDER TR-200DE1 "A4"			
Phase L1 - Temperature Detection - cable Compart.	13	40133	ΔT
Phase L2 - Temperature Detection - cable Compart.	13	40134	ΔT
Phase L3 - Temperature Detection - cable Compart.	13	40135	ΔT
Phase L1 - Temperature Detection - Contactor Compart.	13	40136	ΔT
Phase L2 - Temperature Detection - Contactor Compart.	13	40137	ΔT
Phase L3 - Temperature Detection - Contactor Compart.	13	40138	ΔT
Phase L1 - Temperature Detection - Main Bus Bar	13	40139	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	13	40140	ΔT

Step	Description	Result	Verified by	Date
105	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		02/05

5.4.3.8 OTP Worksite PHASE 3 Test Notes and Remarks

5.4.3.9 OTP Worksite PHASE 3 Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.3.10 OTP Worksite PHASE 3 Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature
KRISTIAN OSTERGAARD	ROSETTI M.	LEAD ELE. COMM.	
JAMIE MCALLISTER	CW	OPS COM ENG	
ANTHONY IVESON		ROSETTIMARINO COMM. MGR.	

5.4.4 PHASE 4 - Test with 6,6kV Main Power Supply of Unit A3 Feeder for BESS PACKAGE A-85000

5.4.4.1 OTP Steps WORKSITE - PHASE 4

It is foreseen that previous PHASE 2 is successfully performed. 6.6KV Switchboard is working in normal operation and no alarm pending.

In this Phase will be tested the Unit A3 Feeder for BESS PACKAGE with 6,6 kV from main busbar

In the following steps will be tested the energization of the BESS PACKAGE feeder, that it will be ready for commissioning. The test will be performed with load connected

- SS 83-00: 6,6 kV Switchboard
- SS 82-10: Power Transformer 1.25 MVA (1BT1 BESS)
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-00: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System
- SS 85-00: BESS Package (A-85000)

5.4.4.2 Test Preparation

Verification of system and subsystem 6.6KV Power Distribution Switchboards Unit A3 is completed without punch lists or pending point that limit the power up.

Verify that Unit A3 Feeder for BESS PACKAGE is available.

Auxiliary power supplies in SG-100D1 are available from:

- UPS AC/DC 110V UP-200F1
- DISTRIBUTION BOARD AC 230V DP-200N1
- 24Vdc From MEASURING UNIT A5

The list electrical hardwired interlocks are between K1 Contactor of Unit A3 and other devices.

The Unit A3 Feeder for BESS PACKAGE involved in this procedure must be available and ready for commissioning.

The test of all internal interconnections between units of 6.6KV Switchboard SG-100D1 are tested on Vendor SAT procedure 1723002197-QC-PRO-00046

The Unit A3 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

To perform the I/O signal tests is mandatory that the EMCS cabinet - IEC 61850 network system - Modbus TCP-IP network system - are already tested, available and ready to work.

To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

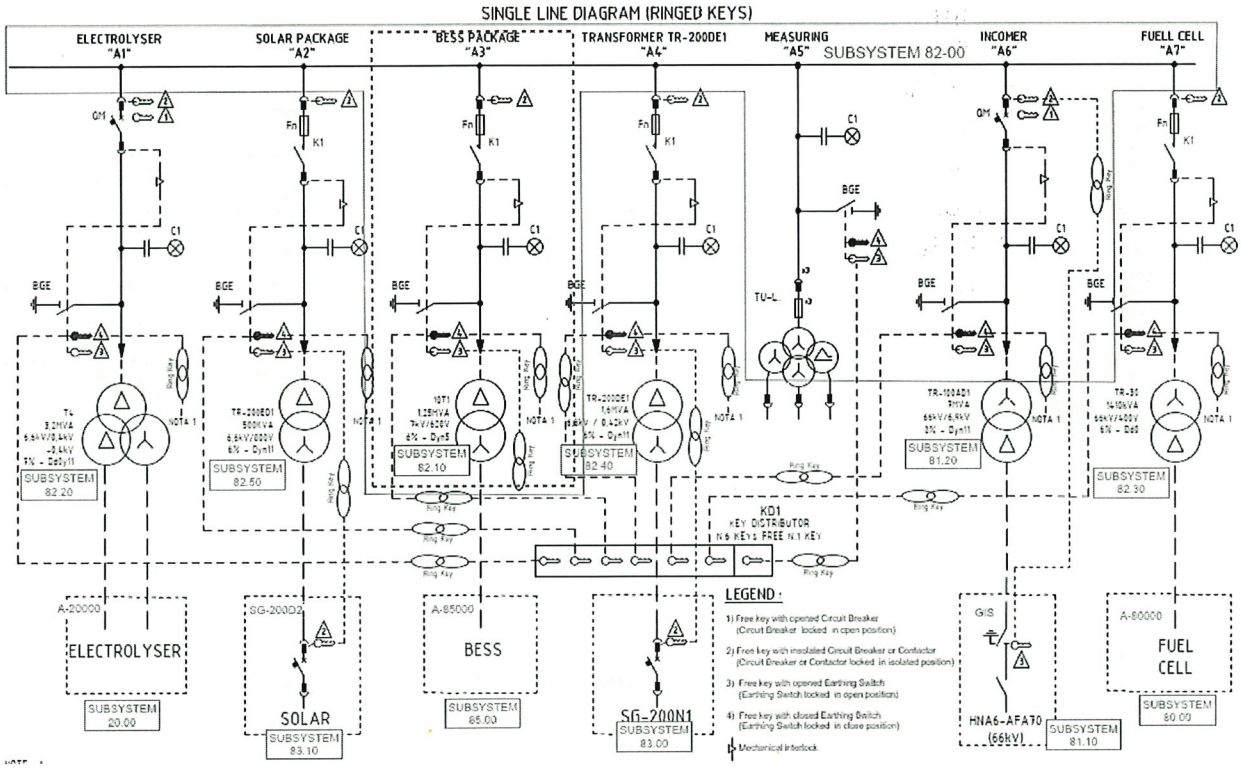
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PHASE 1

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A3 UNIT Feeder for BESS PACKAGE

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the main busbars are powered on, Unit A3 has its Earthing Switch (BGE) Closed and Its Contactor K1 is in extract position and opened, it is in isolated status.

The 6,6kV supply is provided from main busbar will be possible to change isolated status, only after the following safety checks.

Step	Description	Result	Verified by	Date

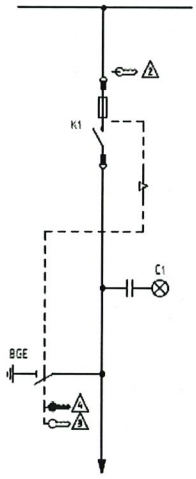
See the Feeder Unit A3 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

GENERAL CONTACTOR OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CONTACTOR.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CONTACTOR IN ISOLATED POSITION.
3 - LOCK THE CONTACTOR IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CONTACTOR COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4) . PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 -CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CONTACTOR.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CONTACTOR.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CONTACTOR, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CONTACTOR.

2 Free key with insolated Contactor (Contactor locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

106	Verify and confirm that **Unit A3** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3120/281** is on KD1 device. **KEY-3 G3095,** that is mechanically coupled (ringed) with **safety device** of **BESS PACKAGE,** it is locked on BGE Earthing Switch closed ..... ☑ - K1 Contactor is locked in extract position and opened. **KEY-2 19834** is locked on the LoTo Procedure ☑	OK		09/05

Step	Description	Result	Verified by	Date
	N.B.: See the Key interlocks details on section 5.4.1.4 SG-100D1 Interlocks & Key Interlocks	ok		09/01
Unit preparation to receive 6,6kV from main busbar on Feeder Unit A3				
107	Ensure voltage reference on REX640 Protection relay: - Close MCB QV4..... ☑ - Close MCB QV5..... ☑ The protection relay is now available and ready to operate	ok		09/01
108	ESD Signal Healthy from SIS Ensure that the ESD signal from SIS is healthy (24Vdc), the KSIL (safety SIL relay) is ON . Measure between terminals: - XM 43-44 (24Vdc)..... ☑ If SIS cabinet is not available apply the override to bypass the ESD signal: - Place in Override position (ON) the SA2 selector Now is possible to proceed with Unit tests *N.B.:* XM 43-44=24Vdc ESD is Healthy and KSIL is ON XM 43-44=0Vdc ESD is Tripped and KSIL is OFF			09/01
109	The **KEY-4 3120/281** is in KD1 device and it is withdrawable On Unit A3 - Take **KEY-4 G3120/281** insert it on BGE and open Earthing Switch.... ☑ - **KEY-3 G3095** is now unlocked and withdrawable to use it on BESS PACKAGE ..... ☑	ok		
110	To unlock Contactor Feeder of Unit A3	ok		09/01

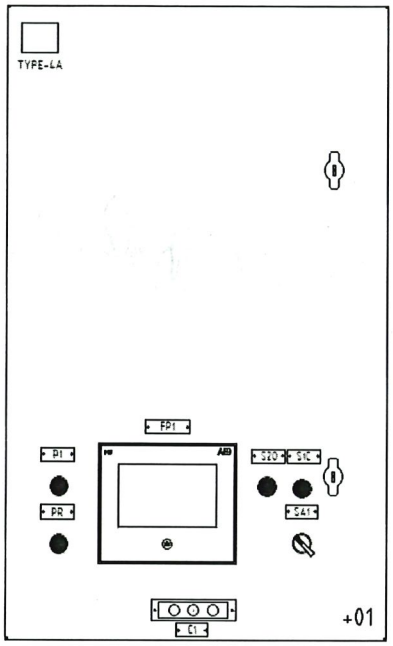
Step	Description	Result	Verified by	Date
	- K1 main contactor is locked in extract position ..... ☑ - KEY-2 19834 is locked on LoTo procedure to keep breaker isolated in compliance with project PTW Procedure ..... ☑ - KEY-4 G3120 is locked on BGE Earthing Switch ..... ☑ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 HMI will turn to green ..... ☑ - The internal Interlock is unlocking Rack in/out Contactor system. The KEY-2 19834 has been freed from PTW procedure, insert it on Rack in/out system and bring contactor in test position..... ☑ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green ..... ☑ -	ok	SM (CW)	09/01

Test the Unit A3 Feeder for BESS PACKAGE contactor Functionality with "commissioning bypass" activated simulating the K1 contactor in "service position" (N.B.: *contactor kept in test position but with full functionality of service position).*

With reference Vendor doc. N° 1723002197-EL-DG-00017)

Note: *See next section 5.4.4.5/6/7 EMCS IEC61850 – A3 Unit I/O list*

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Step	Description	Result	Verified by	Date
	DOOR LAY-OUT 			

DEVICES name plate				
ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S20	PUSHBUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSHBUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
C1	PILOT LIGHT	VOLTAGE	PRESENCE	
P1	PUSHBUTTON	TRUCK-DOOR-E.SWITCH	ENABLING	TYPE-2A

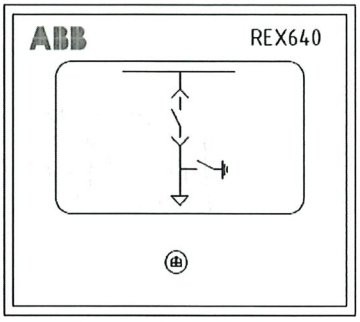
111	Hardwired I/O signals between Unit A3 and BESS PACKAGE There are not hardwired connections between Unit A3 and BESS PACKAGE. There are the predispositions for some future signals. See following Available Opening Command Verify and confirm open contact between terminals - XM 9-10..... ☐ - XM 11-12..... ☐ - XM 13-14..... ☐ Available trip contact on lockout relay (K86) circuits Verify and confirm open contact between terminals	N.A.		

Step	Description	Result	Verified by	Date
	- XM 15-16..... ☐ - XM 17-18..... ☐ Available "transformer trip winding temperature" Verify and confirm open contact between terminals - XM 65-66..... ☐ Available "transformer alarm winding temperature" Verify and confirm open contact between terminals - XM 33-34..... ☐ Available external closing interlock Verify and confirm close contact between terminals - XM 21-22 (there is a jumper)..... ☐ - XM 23-24 (make a jumper)..... ☐ Available from LV SWBD – C.B. TEST POSITION Verify and confirm open contact between terminals - XM 35-36..... ☐ Available from LV SWBD – TRIPPED Verify and confirm open contact between terminals - XM 37-38..... ☐ Available Remote Opening Command Verify and confirm open contact between terminals - XM 39-40..... ☐	N.A. (NO INTERCONNECTING)		09/01

Step	Description	Result	Verified by	Date
	Available signal for Contactor opened and in test position Confirm close contact with K1 contactor status opened or in test position: - XM 45-46..... ☐ Available lock out relay K86 healthy + Arc detector Healthy (on Unit A3) to downstream device. Confirm open contact between terminals: - XM 47-48 ..... ☐ Available Closing LV SWBD command permissive signal – Contactor status closed + contactor in service position + Earthing switch opened to downstream device Confirm close contact with K1 contactor in service position (with "commissioning bypass") and Closed and BGE Earthing Switch opened XM 49-50..... ☐	N.A.		
	HMI of FP1 Protection Relay and its LEDs signalling			

Step	Description	Result	Verified by	Date

PROTECTION DISPLAY



LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCS)	-	GREEN	OK = TCS OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISH
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/67-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/51N-1/51N-2 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY DC (ECO)	RED	-	ALARM = ECO TRIPPED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

112	The K1 Contactor is in test position. Closing and opening K1 Contactor command, simulating (K1 in) service position with "commissioning bypass" Close K1 Contactor feeder - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the contactor closing. ☑ - Close K1 Contactor by pressing push button S1C..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal..... ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑	OK		29/01

Step	Description	Result	Verified by	Date
	Open K1 Contactor feeder - Open K1 Contactor by pressing push button S2O ..... ☑ - Verify and confirm the Contactor status open via on board mechanical green signal ..... ☑ - See on FP1 Protection Relay Display if Contactor Opened is confirmed on REX640 HMI..... ☑			
113	ESD Test Signal from SIS Functioning test of the ESD signal (82xS002) that comes from SIS Contactor must be in test position and Closed (with commissioning Bypass) and SA2 Selector must be in Healthy position (Not Override), SIS sends to KSIL Relay an healthy signal and KSIL Relay is ON Send a trip signal from SIS: - K1 Contactor goes OFF ..... ☑ - KSIL Relay is off ..... ☑ Reinstate the healthy condition of K1 and KSIL relay - Place the SA2 Selector in Override position (ON)..... ☑ Send a trip signal from SIS - K1 Contactor remain ON ..... ☑ - KSIL Relay is off ..... ☑	O/K		09/01
114	Before to close the K1 Contactor ensure and confirm that the BESS PACKAGE has Ready for Commissioning Certificate and it is available to receive the 6,6kV Power Supply	O/K	SM(CW)	09/01
115	Rack in K1 Contactor in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the	O/K	SM(CW)	09/01

Step	Description	Result	Verified by	Date
	following tests to be performed in the final operational configuration.			
116	A3 Unit – Feeder for BESS PACKAGE Confirm the conditions to close the K1 Contactor following: - On Unit A5 the voltage presence lamps C1 are ON ..... ☑ - Led-2 "CONTACTOR READY (TCS)" on Unit A3 protection relay REX640 is green ..... ☑ Close K1 Contactor, feeding downstream BESS PACKAGE - Place the selector SA1 in Local position ..... ☑ - All permissive interlock signals are authorizing the Contactor closing command. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00017 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close K1 Contactor by pressing push button S1C ..... ☐	ok	[illegible]	09/01 SM(cw)

Step	Description	Result	Verified by	Date
	- Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ..... ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑	OK	JM(CV)	09/01
117	A3 Unit – Feeder for BESS PACKAGE - **Remote** command Close K1 Contactor, feeding downstream BESS PACKAGE - Place the selector SA1 in Remote position ..... ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close QM Breaker from EMCS System ..... ☑	OK		09/01

Step	Description	Result	Verified by	Date
	- Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ..... ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑ - Open K1 Contactor from EMCS System ..... ☑ - Verify and confirm the Contactor status opened via on board mechanical green signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are OFF ..... ☑			

5.4.4.3 230Vac Auxiliary devices tests

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
UNIT A4 - TRANSFORMER TR-200DE1 FEEDER				
118	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) ..... 228 V	OK		09/01/2025
119	Power up 230Vac auxiliary circuits. - Close MCB QA2 ..... ☑	OK		09/01/2025

Step	Description	Result	Verified by	Date
120	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch **LS** that switch on light with opened door and switch off it with door closed. - Verify and confirm..... ☑	ok		09/01
121	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	ok		09/01
122	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac)..... ☑	ok		09/01

5.4.4.4 SIS Safety Instrumented System - I/O signal from SIS to SG-100D1 UNIT A3

The following I/O list represent the hardwired signals that are connected on Unit A3 and they come from the SIS (Emergency Shut Down).

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	ITEM TAG
BESS FEEDER A-85000 "A3"		
EMERGENCY OPEN BY SIS BESS FEEDER A-85000	DIGITAL	82XS0002

Step	Description	Result	Verified by	Date
123	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		

5.4.4.5 EMCS IEC61850 - Electrical Monitoring & Control System

The EMCS will be tested with the 6.6kV SWBD: In detail it will be tested the functionalities provided on I/O lists vendor document **1723002197-EL-LIS-00041 with the A3 Unit BESS PACKAGE.**

5.4.4.6 EMCS IEC61850 – A3 Unit I/O List

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS Relay REX640

DESCRITPION	SIGNAL TYPE	TAG SIGNAL
BESS FEEDER A-85000 "A3"		
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general
SYNCHRO "OK"	DIGITAL	LD0.LEDGGIO1.ST.Ind3.stVal
PROTECTION TRIPPED "59N-1"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "59N-2"	DIGITAL	LD0.ROVPTOV2.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "27-2"	DIGITAL	LD0.PHPTUV2.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
PROTECTION TRIPPED "59-2"	DIGITAL	LD0.PHPTOV2.ST.Op.general
PROTECTION TRIPPED "67-1"	DIGITAL	LD0.DPHLPDOC1.ST.Op.general
PROTECTION TRIPPED "67-2"	DIGITAL	LD0.DPHLPDOC2.ST.Op.general

DESCRITPION	SIGNAL TYPE	TAG SIGNAL
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-l2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
V.T. HEALTLY CIRCUIT	DIGITAL	LD0.SCBIGGIO1.ST.Ind2.stVal
INTERTRIP SEND TO L.V. SWITCHBOARD	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal
Contactor CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
Contactor OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO3.stVal

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DESCRITPION	SIGNAL TYPE	TAG SIGNAL
Contactor READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
Contactor READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
PROTECTION RELAY UNIT 2 HEALTHY	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal
PROTECTION RELAY UNIT 4 HEALTHY	DIGITAL	LD0.SCBIGGIO1.ST.Ind6.stVal
SELECTOR SWITCH OF OVERRIDE (SIL ENABLED)	DIGITAL	LD0.SDBIGGIO1.ST.Ind9.stVal

Step	Description	Result	Verified by	Date
124	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☐		

5.4.4.7 EMCS MODBUS TCP-IP

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
BESS FEEDER A-85000 "A3"			
Phase L1 - Temperature Detection - cable Compart.	12	40125	ΔT
Phase L2 - Temperature Detection - cable Compart.	12	40126	ΔT
Phase L3 - Temperature Detection - cable Compart.	12	40127	ΔT
Phase L1 - Temperature Detection - Contactor Compart.	12	40128	ΔT

DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
Phase L2 - Temperature Detection - Contactor Compart.	12	40129	ΔT
Phase L3 - Temperature Detection - Contactor Compart.	12	40130	ΔT
Phase L1 - Temperature Detection - Main Bus Bar	12	40131	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	12	40132	ΔT

Step	Description	Result	Verified by	Date
125	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		09/05

5.4.4.8 OTP Worksite PHASE 4 Test Notes and Remarks

5.4.4.9 OTP Worksite PHASE 4 Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.4.10 OTP Worksite PHASE 4 Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature
[illegible]	ROSETTI M.	[illegible]	
JAMIE M'ALLISTER	CW	OPS COM ENG	
ANTHONY IVESON		COMM. MGR. ROSETTI M.	

5.4.5 PHASE 5 - Test with 6,6kV Main Power Supply of Unit A7 Feeder for FUEL CELL PACKAGE

5.4.5.1 OTP Steps WORKSITE - PHASE 5

It is foreseen that previous PHASE 2 is successfully performed. 6.6KV Switchboard is working in normal operation and no alarm pending.

In this Phase will be tested the Unit A7 Feeder for FUEL CELL PACKAGE with 6,6 kV from main busbar

In the following steps will be tested the energization of the FUEL CELL PACKAGE feeder, that it will be ready for commissioning. The test will be performed with load connected

- SS 83-00: 6,6 kV Switchboard
- SS 82-20: Power Transformer 1.25 MVA (TA30 FUEL CELL)
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-00: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System
- SS 80-00: Hydrogen Fuel Cell Package (A-80000)

5.4.5.2 Test Preparation

Verification of system and subsystem 6.6KV Power Distribution Switchboards Unit A7 is completed without punch lists or pending point that limit the power up.

Verify that Unit A7 Feeder for FUEL CELL PACKAGE is available.

Auxiliary power supplies in SG-100D1 are available from:

- UPS AC/DC 110V UP-200F1
- DISTRIBUTION BOARD AC 230V DP-200N1
- 24Vdc From MEASURING UNIT A5

The Unit A7 Feeder for FUEL CELL PACKAGE involved in this procedure must be available and ready for commissioning.

The test of all internal interconnections between units of 6.6KV Switchboard SG-100D1 are tested on Vendor SAT procedure 1723002197-QC-PRO-00046

The Unit A7 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

To perform the I/O signal tests is mandatory that the EMCS cabinet - IEC 61850 network system - Modbus TCP-IP network system - are already tested, available and ready to work.

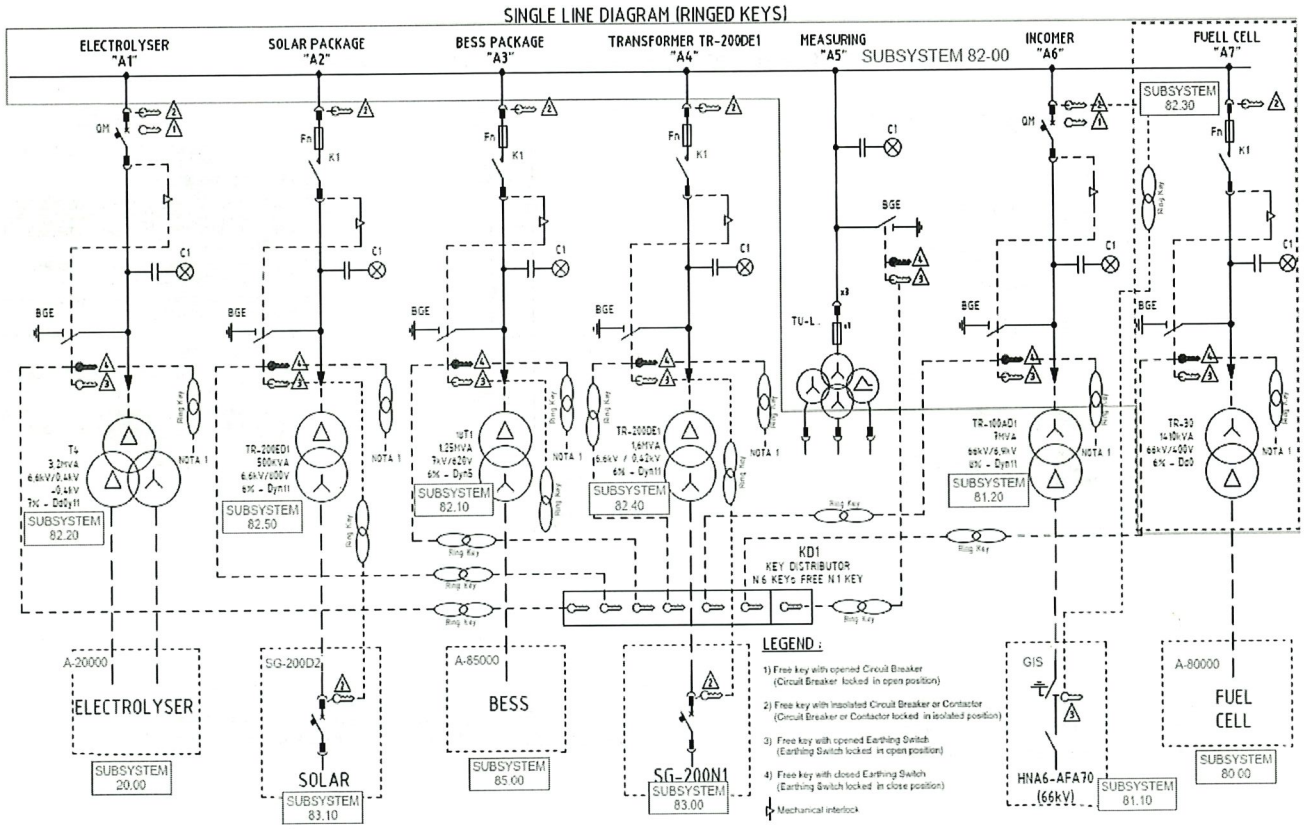
To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

PHASE 5/1

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A7 UNIT Feeder for FUEL CELL PACKAGE

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the main busbars are powered on, Unit A7 has its Earthing Switch (BGE) Closed and Its Contactor K1 is in extract position and opened, it is in isolated status.

The 6,6kV supply is provided from main busbar will be possible to change isolated status, only after the following safety checks.

Step	Description	Result	Verified by	Date

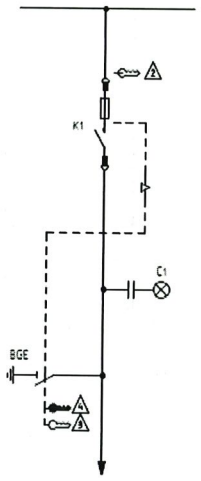
See the Feeder Unit A7 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

GENERAL CONTACTOR OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CONTACTOR.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CONTACTOR IN ISOLATED POSITION.
3 - LOCK THE CONTACTOR IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CONTACTOR COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL.



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4). PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 - CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CONTACTOR.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CONTACTOR.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CONTACTOR, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER.
9 - CLOSE THE CONTACTOR.

2 Free key with insolated Contactor (Contactor locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

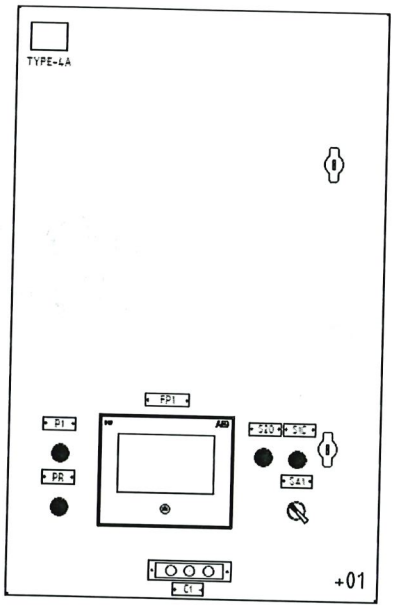
WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

126	Verify and confirm that **Unit A7** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3413/278** is on KD1 device. **KEY-3 G3223,** that is mechanically coupled (ringed) with **safety device** of **FUEL CELL PACKAGE,** it is locked on BGE Earthing Switch closed ..... ☐	OK		13/02

Step	Description	Result	Verified by	Date
	- K1 Contactor is locked in extract position and opened. **KEY-2 19163** is locked on the LoTo Procedure..... ☑ *N.B.: See the Key interlocks details on section 5.4.1.4 SG-100D1 Interlocks & Key Interlocks*	ok		13/02
Unit preparation to receive 6,6kV from main busbar on Feeder Unit A7				
127	Ensure voltage reference on REX640 Protection relay: - Close MCB QV4..... ☑ - Close MCB QV5..... ☑ The protection relay is now available and ready to operate	ok		13/02
128	ESD Signal Healthy from SIS Ensure that the ESD signal from SIS is healthy (24Vdc), the KSIL (safety SIL relay) is ON. Measure between terminals: - XM 37-38 (24Vdc)..... ☑ *<u>If SIS cabinet doesn't send the Healthy ESD signal, it needs to wait the availability of SIS system/Cabinet because the override is NOT present</u>* *N.B.:* *XM 37-38=24Vdc ESD is Healthy and KSIL is ON* *XM 37-38=0Vdc ESD is Tripped and KSIL is OFF*		ESD NOT DYNAMICALLY TRIPPED AT VCB	
129	The **KEY-4 3413/281** is in KD1 device and it is withdrawable On Unit A7 - Take **KEY-4 G3120/281** insert it on BGE and open Earthing Switch..... ☑ - **KEY-3 G3223** is now unlocked and withdrawable to use it on FUEL CELL PACKAGE ..... ☑	ok		13/02
130	To unlock Contactor Feeder of Unit A7			

Step	Description	Result	Verified by	Date
	- K1 main Contactor is locked in extract position ..... ☑ - KEY-2 19163 is locked on LoTo procedure to keep Contactor isolated in compliance with project PTW Procedure ..... ☑ - KEY-4 G3413 is locked on BGE Earthing Switch ..... ☑ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 HMI will turn to green..... ☑ - The internal Interlock is unlocking Rack in/out Contactor system. The KEY-2 19163 has been freed from PTW procedure, insert it on Rack in/out system and bring contactor in test position..... ☑ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green ..... ☑	ok	SM(CW)	

Step	Description	Result	Verified by	Date
	Test the Unit A7 Feeder for FUEL CELL PACKAGE contactor Functionality with "commissioning bypass" activated simulating the K1 contactor in "service position" (N.B.: *contactor kept in test position but with full functionality of service position).* With reference Vendor doc. N° 1723002197-EL-DG-00019) Note: *See next section 5.4.4.5/6/7 EMCS IEC61850 – A7 Unit I/O list*			



DOOR LAY-OUT

DEVICES name plate

ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S1O	PUSH-BUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSH-BUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
S1A	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
K1	PILOT LIGHT	VOLTAGE	PRESENCE	
PI	PUSH-BUTTON	TRUCK-DOOR-E.SWITCH	ENABLING	TYPE-2A

131	Hardwired I/O signals between Unit A7 and FUEL CELL PACKAGE There are not hardwired connections between Unit A7 and FUEL CELL PACKAGE. There are the predispositions for some future signals. See following Available Opening Command Verify and confirm open contact between terminals - XM 9-10 ☑ - XM 11-12 ☑ - XM 13-14 ☑	N/A	N/A	

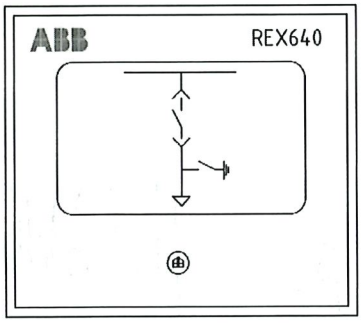
Step	Description	Result	Verified by	Date
	Available trip contact on lockout relay (K86) circuits Verify and confirm open contact between terminals - XM 15-16.....☐ - XM 17-18.....☐ Available "transformer trip winding temperature" Verify and confirm open contact between terminals - XM 21-22.....☐ Available "transformer alarm winding temperature" Verify and confirm open contact between terminals - XM 27-28.....☐ Available external closing interlock Verify and confirm close contact between terminals - XM 23-24 (there is a jumper).....☐ - XM 25-26 (make a jumper).....☐ Available from LV SWBD – C.B. TEST POSITION Verify and confirm open contact between terminals - XM 29-30.....☐ Available from LV SWBD – TRIPPED Verify and confirm open contact between terminals - XM 31-32.....☐ Available Remote Opening Command	N.A.		

Step	Description	Result	Verified by	Date
	Verify and confirm open contact between terminals - XM 33-34..... ☐ Available signal for Contactor opened and in test position Confirm close contact with K1 contactor status opened or in test position: - XM 39-40..... ☐ Available lock out relay K86 healthy (on Unit A7) to downstream device. Confirm open contact between terminals: - XM 41-42 ..... ☐ Available Closing LV SWBD command permissive signal – Contactor status closed + contactor in service position + Earthing switch opened to downstream device Confirm close contact with K1 contactor in service position (with "commissioning bypass") and Closed and BGE Earthing Switch opened - XM 43-44..... ☐	N.A.		13/02

Step	Description	Result	Verified by	Date

HMI of FP1 Protection Relay and its LEDs signalling

PROTECTION DISPLAY



LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	59-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCS)	-	GREEN	OK = TCS OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISM
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/51-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	SYN/SHH-1/SEF-1 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY SIC (ECO)	RED	-	ALARM = ECO TRIPPED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

132	The K1 Contactor is in test position. Closing and opening K1 Contactor command, simulating (K1 in) service position with "commissioning bypass" Close K1 Contactor feeder - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the contactor closing. ..... ☑ - Close K1 Contactor by pressing push button S1C ..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑	OK		

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑ Open K1 Contactor feeder - Open K1 Contactor by pressing push button S2O ..... ☑ - Verify and confirm the Contactor status open via on board mechanical green signal..... ☑ - See on FP1 Protection Relay Display if Contactor Opened is confirmed on REX640 HMI ..... ☑	ok		13/02
133	**ESD** Test Signal from **SIS** Functioning test of the ESD signal (82xS003) that comes from SIS Contactor must be in test position and Closed (with commissioning Bypass), SIS sends to KSIL Relay an healthy signal and KSIL Relay is ON Send a trip signal from SIS: - K1 Contactor goes OFF ..... ☑ - KSIL Relay is off ..... ☑ Reinstate the healthy condition of K1 and KSIL relay	ok		13/02
134	Before to close the K1 Contactor ensure and confirm that the FUEL CELL PACKAGE has Ready for Commissioning Certificate and it is available to receive the 6,6kV Power Supply	ok		13/02
135	Rack in K1 Contactor in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the following tests to be performed in the **final operational configuration.**	ok		13/02
136	A7 Unit – Feeder for FUEL CELL PACKAGE			

Step	Description	Result	Verified by	Date
	Confirm the conditions to close the K1 Contactor following: - On Unit A5 the voltage presence lamps C1 are ON ..... ☐ - Led-2 "CONTACTOR READY (TCS)" on Unit A7 protection relay REX640 is green ..... ☑ Close K1 Contactor, feeding downstream FUEL CELL PACKAGE - Place the selector SA1 in Local position ..... ☐ - All permissive interlock signals are authorizing the Contactor closing command. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00019 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☐ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☐ o LED-11 must be OFF ..... ☐ - Close K1 Contactor by pressing push button S1C ..... ☐ - Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ..... ☐	OK	13/12	

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ..... ☑	Ok		13/02
137	A7 Unit – Feeder for FUEL CELL PACKAGE - **Remote** command Close K1 Contactor, feeding downstream ~~BESS PACKAGE~~ FUEL CELL - Place the selector SA1 in Remote position ..... ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN..... ☑ o LED-3 must be GREEN..... ☑ o LED-4 must be GREEN..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF..... ☑ o LED-11 must be OFF..... ☑ - Close QM Breaker from EMCS System ..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON..... ☑	Ok		13/02

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI .....☑ - Open K1 Contactor from EMCS System .....☑ - Verify and confirm the Contactor status opened via on board mechanical green signal .....☑ - Verify that the voltage presence lamps C1 on downstream busbar are OFF .....☑			

5.4.5.3 230Vac Auxiliary devices tests

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
UNIT A4 - TRANSFORMER TR-200DE1 FEEDER				
138	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) V	OK		13/02
139	Power up 230Vac auxiliary circuits. - Close MCB QA2 .....☐	OK		13/02
140	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch LS that switch on light with opened door and switch off it with door closed. - Verify and confirm.....☐	OK		13/02

Step	Description	Result	Verified by	Date
141	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm ..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	ok		13/02
142	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac) ..... ☑	ok		13/02

5.4.5.4 SIS Safety Instrumented System - I/O signal from SIS to SG-100D1 UNIT A7

The following I/O list represent the hardwired signals that are connected on Unit A7 and they come from the SIS (Emergency Shut Down).

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	ITEM TAG
FUELL CELL A-80000 "A7"		
EMERGENCY OPEN BY SIS FUEL CELL A-8000	DIGITAL	82XS0003

Step	Description	Result	Verified by	Date
143	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		13/02

5.4.5.5 *EMCS IEC61850 - Electrical Monitoring & Control System*

The EMCS will be tested with the 6.6kV SWBD: In detail it will be tested the functionalities provided on I/O lists vendor document **1723002197-EL-LIS-00041 with the A7 Unit FUEL CELL PACKAGE.**

5.4.5.6 *EMCS IEC61850 – A7 Unit I/O List*

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS Relay REX640.

DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
FUELL CELL A-80000 "A7"		
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general
SYNCHRO "OK"	DIGITAL	LD0.LEDGGIO1.ST.Ind3.stVal
PROTECTION TRIPPED "59N-1"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "59N-2"	DIGITAL	LD0.ROVPTOV2.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "27-2"	DIGITAL	LD0.PHPTUV2.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
PROTECTION TRIPPED "59-2"	DIGITAL	LD0.PHPTOV2.ST.Op.general
PROTECTION TRIPPED "67-1"	DIGITAL	LD0.DPHLPDOC1.ST.Op.general

DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
PROTECTION TRIPPED "67-2"	DIGITAL	LD0.DPHLPDOC2.ST.Op.general
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-l2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
V.T. HEALTLY CIRCUIT	DIGITAL	LD0.SCBIGGIO1.ST.Ind2.stVal
INTERTRIP SEND TO L.V. SWITCHBOARD	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal
Contactor CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
Contactor OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal

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DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO3.stVal
Contactor READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
Contactor READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
PROTECTION RELAY UNIT 6 HEALTHY	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal
AUXILIARY 230VAC HEALTHY (ALL SWITCHBOARD)	DIGITAL	LD0.SDBIGGIO1.ST.Ind7.stVal
TR-100AD1 GENERAL ALAM	DIGITAL	N.A.
MCB'S CLOSED (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind6.stVal
V.T. HEALTLY CIRCUIT (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind7.stVal
UPS 110VDC A SUPPLY "ON" (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind8.stVal
UPS 110VDC B SUPPLY "ON" (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind9.stVal
230VAC SUPPLY "ON" (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind10.stVal
24VDC SUPPLY "ON" (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind11.stVal
EARTHING SWITCH OPENED (FROM MEASURE UNIT A5)	DIGITAL	LD0.SCBIGGIO1.ST.Ind3.stVal

Step	Description	Result	Verified by	Date
144	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		13/02

5.4.5.7 EMCS MODBUS TCP-IP

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
FUELL CELL A-80000 "A7"			
Phase L1 - Temperature Detection - cable Compart.	15	40154	ΔT
Phase L2 - Temperature Detection - cable Compart.	15	40155	ΔT
Phase L3 - Temperature Detection - cable Compart.	15	40156	ΔT
Phase L1 - Temperature Detection - Contactor Compart.	15	40157	ΔT
Phase L2 - Temperature Detection - Contactor Compart.	15	40158	ΔT
Phase L3 - Temperature Detection - Contactor Compart.	15	40159	ΔT
Phase L1 - Temperature Detection - Main Bus Bar	15	40160	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	15	40161	ΔT

Step	Description	Result	Verified by	Date
145	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		13/12

5.4.5.8 OTP Worksite PHASE 5 Test Notes and Remarks

CUBICLE DOES NOT TRIP FROM SIS IN TEST POSITION.
TRIP TO RELAY CONFIRMED. DYNAMIC TEST TO TAKE PLACE WITH BALLARD WHEN THEY RETURN TO SITE. COMPLETED 13.02.25

5.4.5.9 *OTP Worksite PHASE 5 Tests Certifying Authority Table of Attendances*

Name and Surname	Certifying Authority	Position	Signature

5.4.5.10 *OTP Worksite PHASE 5 Tests Final Signatures and Company Acceptance*

Name and Surname	Certifying Authority	Position	Signature
MILTIADIS CASTALAS	ROSETTI M.	LEAD ELE COMMISSION	
JAMIE MCALISTER	CW	OPS COMM ENG	
JOHN MACKILLOP	CW	OPS COMM ENG	
ANTHONY WILSON		COMM. MGR. ROSETTI M.	

5.4.6 PHASE 6 - Test with 6,6kV Main Power Supply of Unit A1 Feeder for ELECTROLYSER PACKAGE

5.4.6.1 OTP Steps WORKSITE - PHASE 6

It is foreseen that previous PHASE 2 is successfully performed. 6.6KV Switchboard is working in normal operation and no alarm pending.

In this Phase will be tested the Unit A1 Feeder for ELECTROLYSER TRANSFORMER PACKAGE with 6,6 kV from main busbar

In the following steps the functionality of the 6.6KV Switchboard shall be tested for:

- SS 83-00: 6,6 kV Switchboard
- SS 82-20: Power Transformer 3.15 MVA (T4 ELECTROLYSER)
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-00: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System
- SS 20-00: ELECTROLYSER

5.4.6.2 Test Preparation

Verification of system and subsystem 6.6KV Power Distribution Switchboards Unit A1 is completed without punch lists or pending point that limit the power up.

Verify that Unit A1 Feeder for ELECTROLYSER TRANSFORMER PACKAGE is available.

Auxiliary power supplies in SG-100D1 are available from:

- UPS AC/DC 110V UP-200F1
- DISTRIBUTION BOARD AC 230V DP-200N1
- 24Vdc From MEASURING UNIT A5

The list electrical hardwired interlocks are between QM Breaker of Unit A1 and LV SWBD SG-200N1 Incomer.

The Unit A1 Feeder for ELECTROLYSER TRANSFORMER PACKAGE involved in this procedure must be available and ready for commissioning.

The test of all internal interconnections between units of 6.6KV Switchboard SG-100D1 are tested on Vendor SAT procedure 1723002197-QC-PRO-00046

The Unit A4 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

To perform the I/O signal tests is mandatory that the EMCS cabinet - IEC 61850 network system - Modbus TCP-IP network system - are already tested, available and ready to work.

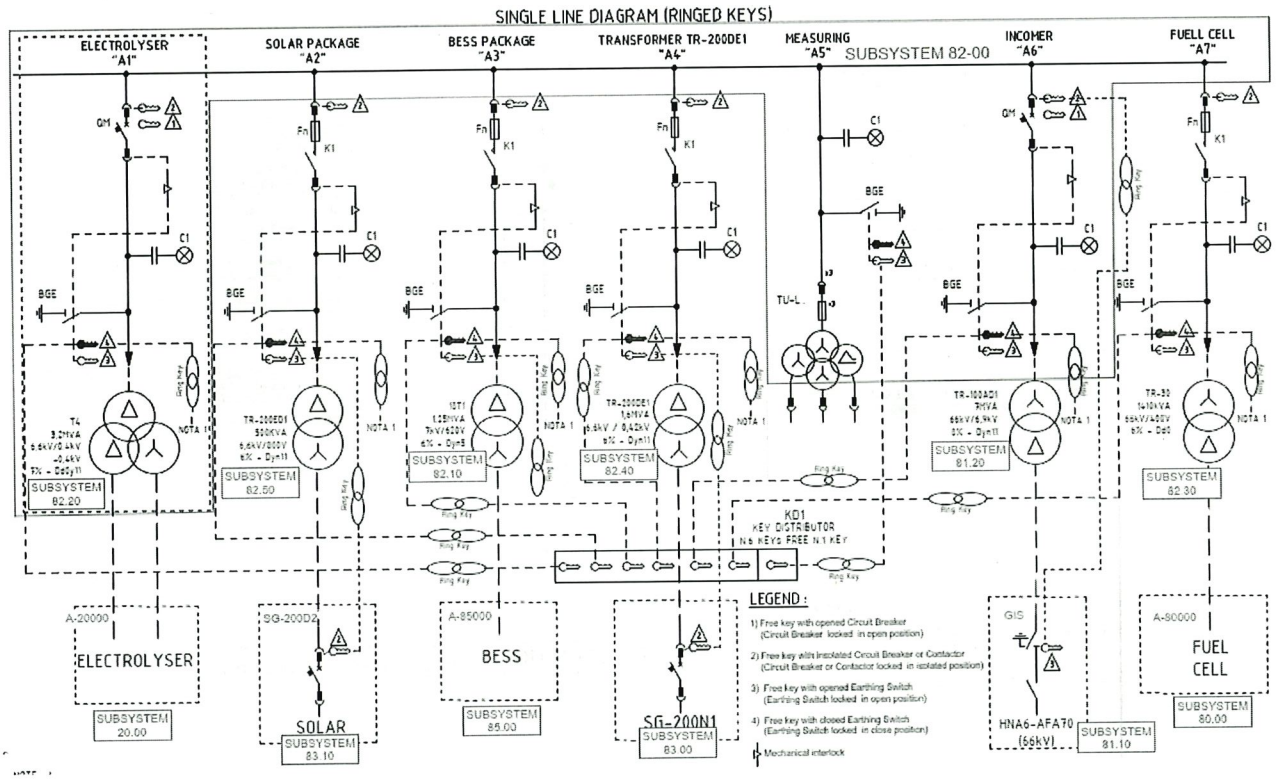
To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

PANSC 611

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A1 UNIT Feeder for ELECTROLYSER TRANSFORMER PACKAGE

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the main busbars are powered on, Unit A1 has its Earthing Switch (BGE) Closed and Its QM Breaker is in extract position and opened, it is in isolated status.

The 6,6kV supply is provided from main busbar will be possible to change isolated status, only after the following safety checks.

Step	Description	Result	Verified by	Date

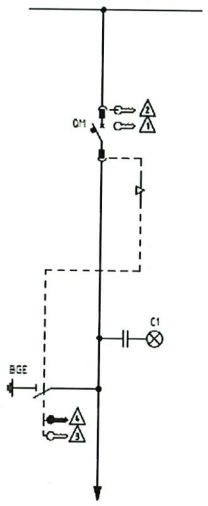
See the Feeder Unit A1 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

GENERAL CIRCUIT BREAKER OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CIRCUIT BREAKER.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CIRCUIT BREAKER IN ISOLATED POSITION.
3 - LOCK THE CIRCUIT BREAKER IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CIRCUIT BREAKER COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL.



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4) . PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 -CLOSE THE EARTHING SWITCH COMMAND SHUTTER. TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CIRCUIT BREAKER.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CIRCUIT BREAKER.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CIRCUIT BREAKER, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CIRCUIT BREAKER.

1 Free key with opened Circuit Breaker (Circuit Breaker locked in open position)
2 Free key with insolated Circuit Breaker (Circuit Breaker locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

146	Verify and confirm that **Unit A1** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3220/283** is on KD1 device. **KEY-3 G3477**, that is mechanically coupled (ringed) with **safety device of ELECTROLYSER TRANSFORMER PACKAGE**, it is locked on BGE Earthing Switch closed ..... ☑ - QM Breaker is locked in extract position and opened. **KEY-2 14742** is locked on the LoTo Procedure . ☑	OK	[illegible]	13/02

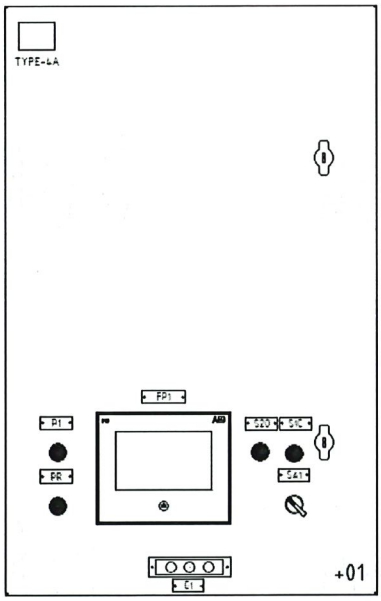
Step	Description	Result	Verified by	Date
	N.B.: See the Key interlocks details on section 5.4.1.4 SG-100D1 Interlocks & Key Interlocks	Ok		13/02
Unit preparation to receive 6,6kV from main busbar on Feeder Unit A1				
147	Ensure voltage reference on REX640 Protection relay: - Close MCB QV4 ..... 110 V ☑ - Close MCB QV5 ..... 110 V ☑ The protection relay is now available and ready to operate	Ok		13/02
148	The **KEY-4 3413/281** is in KD1 device and it is withdrawable On Unit A7 - Take **KEY-4 G3120/281** insert it on BGE and open Earthing Switch .... ☑ - **KEY-3 G3223** is now unlocked and withdrawable to use it on ELECTROLYSER TRANSFORMER PACKAGE ..... ☑	Ok		13/02
149	To unlock Breaker Feeder of Unit A7 - QM main Breaker is locked in extract position ..... ☑ - **KEY-2 14742** is locked on LoTo procedure to keep breaker isolated in compliance with project PTW Procedure ..... ☑ - **KEY-4 G3413** is locked on BGE Earthing Switch ..... ☑ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 HMI will turn to green ..... ☑ - The internal Interlock is unlocking Rack in/out Breaker system. The **KEY-2 19163** has been freed from PTW procedure, insert it on Rack in/out system and bring Breaker in test position ..... ☑	Ok		13/02

Step	Description	Result	Verified by	Date
	- Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green	ok		13/02

Test the Unit A1 Feeder for ELECTROLYSER TRANSFORMER PACKAGE Breaker Functionality with "commissioning bypass" activated simulating the QM Breaker in "service position" (N.B.: *Breaker kept in test position but with full functionality of service position).*

With reference Vendor doc. N° 1723002197-EL-DG-00018)

Note: *See next section 5.4.4.5/6/7 EMCS IEC61850 - A1 Unit I/O list*



DOOR LAY-OUT

DEVICES name plate				
ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S1O	PUSH-BUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSH-BUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
C1	PILOT LIGHT	VOLTAGE	PRESENCE	
P1	PUSH-BUTTON	TRUCK-DOOR-E SWITCH	ENABLING	TYPE-2A

150	Hardwired I/O signals between Unit A1 and ELECTROLYSER TRANSFORMER PACKAGE There are not hardwired connections between Unit A1 and ELECTROLYSER TRANSFORMER PACKAGE There are the predispositions for some future signals. See following Available Opening Command Verify and confirm open contact between terminals	ok		13/02

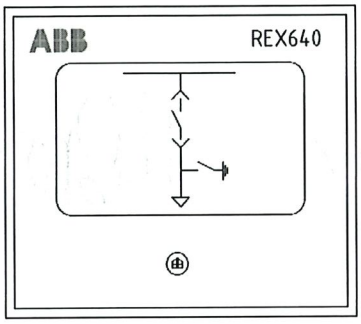
Step	Description	Result	Verified by	Date
	- XM 11-12 ☑ - XM 13-14 ☑ - XM 15-16 ☑ - XM 17-18 ☑ Available trip contact on lock out relay (K86) circuits Verify and confirm open contact between terminals - XM 19-20 ☑ - XM 21-22 ☑ Available "transformer trip winding temperature" Verify and confirm open contact between terminals - XM 29-30 ☑ Available "transformer alarm winding temperature" Verify and confirm open contact between terminals - XM 43-44 ☑ Available external closing interlock Verify and confirm close contact between terminals - XM 31-32 (there is a jumper) ☑ - XM 33-34 (make a jumper) ☑ Available "transformer trip oil temperature" Verify and confirm open contact between terminals - XM 25-26 ☑	OK		13/02

Step	Description	Result	Verified by	Date
	Available "transformer alarm oil temperature" Verify and confirm open contact between terminals - XM 37-38.....☑ Available "transformer trip oil pressure relay" Verify and confirm open contact between terminals - XM 27-28.....☑ Available "transformer alarm oil pressure relay" Verify and confirm open contact between terminals - XM 41-42.....☑ Available from downstream SWBD – C.B. TEST POSITION Verify and confirm open contact between terminals - XM 45-46.....☑ Available from downstream SWBD – C.B. TRIPPED Verify and confirm open contact between terminals - XM 47-48.....☑ Available Remote Opening Command Verify and confirm open contact between terminals - XM 49-50.....☑ - XM 51-52.....☑			

Step	Description	Result	Verified by	Date
	Available signal for Breaker opened and in test position Confirm close contact with QM Breaker status opened or in test position: - XM 55-56 ..... ☑ Available lock out relay K86 healthy (on Unit A7) to downstream device. Confirm open contact between terminals: - XM 57-58 ..... ☑ Available Closing command permissive signal – Breaker status closed + Breaker in service position + Earthing switch opened to downstream device Confirm close contact with QM Breaker in service position (with "commissioning bypass") and Closed and BGE Earthing Switch opened - XM 59-60 ..... ☑	OK		13/02

Step	Description	Result	Verified by	Date
	HMI of FP1 Protection Relay and its LEDs signalling			
151	The QM Breaker is in test position. Closing and opening QM Breaker command, simulating (QM in) service position with "commissioning bypass" Close QM Breaker feeder - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the Breaker closing.. ☑ - Close QM Breaker by pressing push button S1C ..... ☑ - Verify and confirm the Breaker status closed via on board mechanical red signal ..... ☑	OK	13/08	

PROTECTION DISPLAY



LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCC)	-	GREEN	OK = TCC OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISM
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/67-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/51N-1/67N-1/67N-2 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY DIG (ESD)	RED	-	ALARM = ESD TRIPPED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI .....☑ Open QM Breaker feeder - Open QM Breaker by pressing push button S2O .....☑ - Verify and confirm the Breaker status open via on board mechanical green signal.....☑ - See on FP1 Protection Relay Display if Breaker Opened is confirmed on REX640 HMI .....☑			
152	Before to close the QM Breaker ensure and confirm that the ELECTROLYSER TRANSFORMER PACKAGE has Ready for Commissioning Certificate and it is available to receive the 6,6kV Power Supply	Ok	SM (CW)	13/02
153	Rack in QM Breaker in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the following tests to be performed in the **final operational configuration.**	ok	SM (CW)	13/02
154	A1 Unit – Feeder for ELECTROLYSER TRANSFORMER PACKAGE Confirm the conditions to close the QM Breaker following: - On Unit A5 the voltage presence lamps C1 are ON .....☑ - Led-2 "BREAKER READY (TCS)" on Unit A7 protection relay REX640 is green .....☑ Close QM Breaker, feeding downstream ELECTROLYSER TRANSFORMER PACKAGE - Place the selector SA1 in Local position .....☑	Ok	SM (CW)	13/02

Step	Description	Result	Verified by	Date
	- All permissive interlock signals are authorizing the Breaker closing command. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00019 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close QM Breaker by pressing push button S1C ..... ☑ - Verify and confirm the Breaker status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ..... ☑ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ..... ☑	Ok –	[signature] SM (CW)	13/02
155	A1 Unit – Feeder for ELECTROLYSER TRANSFORMER PACKAGE - **Remote** command Close QM Breaker, feeding downstream ELECTROLYSER TRANSFORMER PACKAGE - Place the selector SA1 in Remote position ..... ☐	Ok	[signature]	13/02

Step	Description	Result	Verified by	Date
	- All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN..... ☑ o LED-3 must be GREEN..... ☐ o LED-4 must be GREEN..... ☑ o LED-5 must be OFF ..... ☐ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ..... ☑ o LED-8 must be GREEN..... ☐ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF..... ☐ o LED-11 must be OFF..... ☑ - Close QM Breaker from EMCS System ..... ☑ - Verify and confirm the Breaker status closed via on board mechanical red signal..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON..... ☑ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI ..... ☑ - Open QM Breaker from EMCS System ..... ☑ - Verify and confirm the Breaker status opened via on board mechanical green signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are OFF ..... ☑	OK		13/02

5.4.6.3 *230Vac Auxiliary devices tests*

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
UNIT A1 - ELECTROLYSER TRANSFORMER PACKAGE FEEDER				
156	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) ..... 229 V	Ok		13/02
157	Power up 230Vac auxiliary circuits. - Close MCB QA2 ..... ☑	Ok		13/02
158	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch **LS** that switch on light with opened door and switch off it with door closed. - Verify and confirm..... ☑	Ok		13/02
159	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	Ok		13/02
160	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac)..... ☑	Ok		13/02

5.4.6.4 SIS Safety Instrumented System - I/O signal from SIS to SG-100D1 UNIT A1

Not applicable

5.4.6.5 EMCS IEC61850 - Electrical Monitoring & Control System

The EMCS will be tested with the 6.6kV SWBD: In detail it will be tested the functionalities provided on I/O lists vendor document **1723002197-EL-LIS-00041 with the A7 Unit FUEL CELL PACKAGE.**

5.4.6.6 EMCS IEC61850 - A1 Unit I/O List

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS Relay REX640

DESCRIPTION	SIGNAL TYPE	TAG SIGNAL
ELECTROLYSER FEEDER A-20000 "A1"		
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general
PROTECTION TRIPPED "59N"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-I2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f

DESCRIPTION	SIGNAL TYPE	TAG SIGNAL
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSFORMER PROTECTION TRIPPED "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind9.stVal
TRANSFORMER PROTECTION ALARM "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind8.stVal
TRANSFORMER PROTECTION TRIPPED "OIL PRESSURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind12.stVal
TRANSFORMER PROTECTION ALARM "OIL PRESSURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind11.stVal
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
V.T. HEALTLY CIRCUIT	DIGITAL	LD0.SCBIGGIO1.ST.Ind2.stVal
INTERTRIP SEND TO L.V. SWITCHBOARD	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal
C.B. CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
C.B. OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO3.stVal
C.B. READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
C.B. READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal

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DESCRIPTION	SIGNAL TYPE	TAG SIGNAL
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
PROTECTION RELAY UNIT 7 HEALTHY	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal

Step	Description	Result	Verified by	Date
161	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		13/12

5.4.6.7 *EMCS MODBUS TCP-IP*

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
ELECTROLYSER FEEDER A-20000 "A1"			
Phase L1 - Temperature Detection - cable Compart.	10	40109	ΔT
Phase L2 - Temperature Detection - Câble Compart.	10	40110	ΔT
Phase L3 - Temperature Detection - cable Compart.	10	40111	ΔT
Phase L1 - Temperature Detection - C.B. Compart.	10	40112	ΔT
Phase L2 - Temperature Detection - C.B. Compart.	10	40113	ΔT
Phase L3 - Temperature Detection - C.B. Compart.	10	40114	ΔT

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DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
Phase L1 - Temperature Detection - Main Bus Bar	10	40115	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	10	40116	ΔT

Step	Description	Result	Verified by	Date
162	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		13/02

5.4.6.8 OTP Worksite PHASE 6 Test Notes and Remarks

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5.4.6.9 OTP Worksite PHASE 6 Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.6.10 OTP Worksite PHASE 6 Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature
KRISTIAN OSKEVOLL	CROSSWIND	ROSETTI M.	
JAMIE MCALLISTER	CW	OFS COM ENG	
ANTHONY IVESON		COMM. MGR. - ROSETTI M.	

PHASE 7II

5.4.7 PHASE 7 - Test with 6,6kV Main Power Supply of Feeder for Solar PV Package Power Transformer TR-200ED1

5.4.7.1 OTP Steps WORKSITE - PHASE 7

It is foreseen that previous PHASE 2 is successfully performed. 6.6KV Switchboard is working in normal operation and no alarm pending.

In this Phase will be tested the Unit A2 Feeder for Solar PV Package Power Transformer TR-200ED1 with 6,6 kV from main busbar.

In the following steps will be tested the energization of the Solar PV Package Power Transformer TR-200ED1 feeder, that it will be ready for commissioning. The test will be performed with load connected

In the following steps the functionality of the 6.6KV Switchboard shall be tested for:

- SS 83-00: 6,6 kV Switchboard
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-00: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System
- SS 82-50: Solar PV Package Power Transformer 0.5 MVA (TR-200ED1)
- SS 83-10: 400 V Switchboard Solar (SG-200D2) – SOLAR PACKAGE

5.4.7.2 Test Preparation

Verification of system and subsystem 6.6KV Power Distribution Switchboards Unit A2 is completed without punch lists or pending point that limit the power up.

Verify that Unit A2 Feeder for Solar PV Package Power Transformer TR-200ED1 is available.

Auxiliary power supplies in SG-100D1 are available from:

- UPS AC/DC 110V UP-200F1
- DISTRIBUTION BOARD AC 230V DP-200N1
- 24Vdc From MEASURING UNIT A5

The Unit A2 Feeder for Solar PV Package Power Transformer TR-200ED1 involved in this procedure must be available and ready for commissioning.

The test of all internal interconnections between units of 6.6KV Switchboard SG-100D1 are tested on Vendor SAT procedure 1723002197-QC-PRO-00046

The Unit A2 auxiliary circuits are powered, protection relay and all internal devices are ready to work.

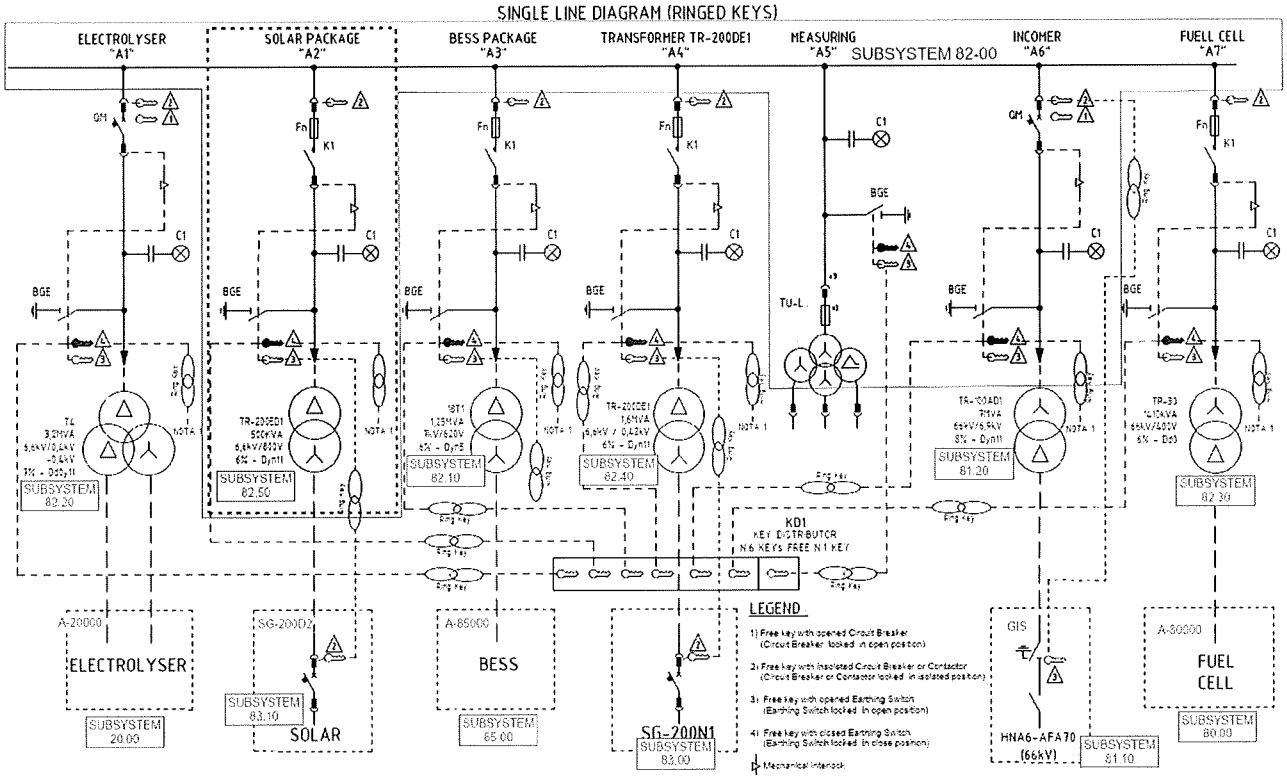
To perform the I/O signal tests is mandatory that the EMCS cabinet – IEC 61850 network system – Modbus TCP-IP network system - are already tested, available and ready to work.

To test all signals, refer to specific electrical pre-commissioning ITRs, they will be used to test the specific functioning of all I/O.

Step	Description	Result	Verified by	Date

SG-100D1 6.6KV Switchboard - Energization A2 UNIT Feeder for Solar PV Package Power Transformer TR-200ED1

Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)



The test starts with SWBD in safety status, the main busbars are powered on, Unit A2 has its Earthing Switch (BGE) Closed and Its Contactor K1 is in extract position and opened, it is in isolated status.

The 6,6kV supply is provided from main busbar will be possible to change isolated status, only after the following safety checks.

Step	Description	Result	Verified by	Date

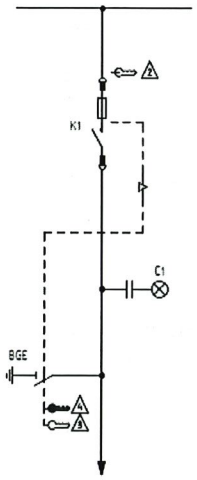
See the Feeder Unit A2 operating sequences to put the unit *out of service* or *in service*

OPERATING SEQUENCE

GENERAL CONTACTOR OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CONTACTOR.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CONTACTOR IN ISOLATED POSITION.
3 - LOCK THE CONTACTOR IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CONTACTOR COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL.



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4). PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 - CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CONTACTOR.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CONTACTOR.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CONTACTOR. CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CONTACTOR.

2 Free key with insolated Contactor (Contactor locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

163	Verify and confirm that **Unit A2** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3141/282** is on KD1 device. **KEY-3 G3476,** that is mechanically coupled (ringed) with **safety device** of **Solar PV Package Power Transformer TR-200ED1,** it is locked on BGE Earthing Switch closed ..... ☐ - K1 Contactor is locked in extract position and opened. **KEY-2 14157** is locked on the LoTo Procedure ..... ☐	dl	M Postelli JM (CW)	15/01/2025 15.01.25

Step	Description	Result	Verified by	Date
	N.B.: See the Key interlocks details on section 5.4.1.4 SG-100D1 Interlocks & Key Interlocks	ok		15/01/2025
Unit preparation to receive 6,6kV from main busbar on Feeder Unit A2				
164	Ensure voltage reference on REX640 Protection relay: - Close MCB QV4 .....☑ - Close MCB QV5 .....☑ The protection relay is now available and ready to operate	ok	SM (cw)	15.01.25
165	ESD Signal Healthy from SIS Ensure that the ESD signal from SIS is healthy (24Vdc), the KSIL (safety SIL relay) is ON. Measure between terminals: - XM 51-52 (24Vdc) .....☐ *N.B. If SIS system doesn't send the Healthy ESD signal, it needs to wait the availability of SIS system/Cabinet because the override is NOT present* *N.B.:* XM 51-52=24Vdc ESD is Healthy and KSIL is ON XM 51-52=0Vdc ESD is Tripped and KSIL is OFF			
166	The **KEY-4 3114/282** is in KD1 device and it is withdrawable On Unit A2 - Take **KEY-4 3114/282** insert it on BGE and open Earthing Switch.....☐ - **KEY-3 G3476** is now unlocked and withdrawable to use it on Solar PV Package Power Transformer 0.5 MVA (TR-200ED1) .....☐	ok	SM (cw)	15.01.25
167	To unlock Contactor Feeder of Unit A2			

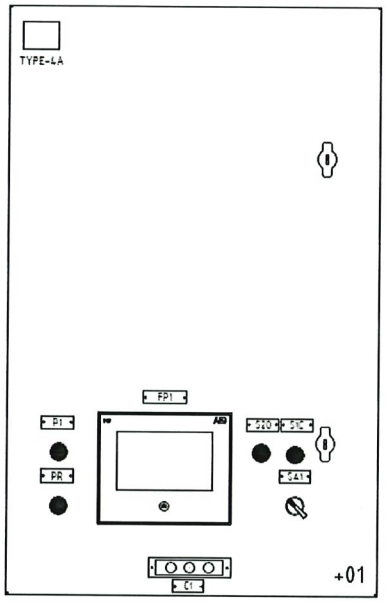
Step	Description	Result	Verified by	Date
	- K1 main Contactor is locked in extract position ..... ☑ - KEY-2 14157 is locked on LoTo procedure to keep Contactor isolated in compliance with project PTW Procedure ..... ☑ - KEY-4 G3114 is locked on BGE Earthing Switch ..... ☑ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 HMI will turn to green ..... ☑ - The internal Interlock is unlocking Rack in/out Contactor system. The KEY-2 14157 has been freed from PTW procedure, insert it on Rack in/out system and bring contactor in test position..... ☑ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green..... ☑	ok	JM (CW)	15/01/25

Step	Description	Result	Verified by	Date

Test the Unit A2 Feeder for Solar PV Package Power Transformer TR-200ED1 contactor Functionality with "commissioning bypass" activated simulating the K1 contactor in "service position" (N.B.: *contactor kept in test position but with full functionality of service position).*

With reference Vendor doc. N° 1723002197-EL-DG-00020)

Note: *See next section 5.4.4.5/6/7 EMCS IEC61850 – A2 Unit I/O list*



DOOR LAY-OUT

DEVICES name plate

ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
SIO	PUSHBUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
SIC	PUSHBUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
C1	PILOT LIGHT	VOLTAGE	PRESENCE	
PI	PUSHBUTTON	TRUCK-DOOR-E.SWITCH	ENABLING	TYPE-2A

168	Hardwired I/O signals between Unit A2 and Solar PV Package Power Transformer TR-200ED1 There are not hardwired connections between Unit A2 and Solar PV Package Power Transformer TR-200ED1. There are the predispositions for some future signals. See following Available Opening Command Verify and confirm open contact between terminals - XM 9-10 ..... ☑ - XM 11-12 ..... ☑ - XM 13-14 ..... ☑	OK	15/01/2025	

Step	Description	Result	Verified by	Date
	Available trip contact on lockout relay (K86) circuits Verify and confirm open contact between terminals - XM 15-16 ..... ☐ - XM 17-18 ..... ☐ "Transformer winding temperature" Verify and confirm open contact between terminals - XM 27-28 (trip)..... ☑ - XM 41-42 (alarm)..... ☐ Transformer Relay Buchholz Verify and confirm open contact between terminals - XM 21-22 trip ..... ☑ - XM 33-34 alarm ..... ☐ Transformer Oil Temperature Verify and confirm open contact between terminals - XM 23-24 trip ..... ☑ - XM 35-36 alarm ..... ☐ Transformer Pressure Relay Verify and confirm open contact between terminals - XM 25-26 trip ..... ☑ - XM 39-40 alarm ..... ☐ Transformer Oil Level Verify and confirm open contact between terminals - XM 37-38 Level..... ☐	OK	[signature]	15/01/2025

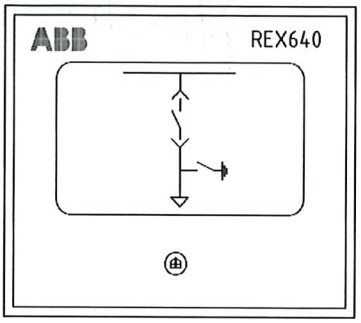
Step	Description	Result	Verified by	Date
	Available external closing interlock Verify and confirm close contact between terminals - XM 29-30 (disconnect jumper) ..... ☐ External closing interlock from L.V. SWBD CB OPENED Verify and confirm close contact between terminals - XM 31-32 ..... ☐ From LV SWBD – C.B. TEST POSITION Verify and confirm open contact between terminals - XM 43-44 ..... ☑ From LV SWBD – TRIPPED Verify and confirm open contact between terminals - XM 45-46 ..... ☐ Available Remote Opening Command Verify and confirm open contact between terminals - XM 47-48 ..... ☐ - XM 49-50 ..... ☐ Available signal for Contactor opened and in test position to LV SWBD Confirm close contact with K1 contactor status opened or in test position: - XM 53-54 ..... ☑ Available lock out relay K86 healthy (on Unit A2) to LV SWBD.	OK	[illegible] 15/01/[illegible]	

Step	Description	Result	Verified by	Date
	Confirm open contact between terminals: - XM 55-56 ..... ☐ Available Closing LV SWBD command permissive signal – Contactor status closed + contactor in service position + Earthing switch opened to LV SWBD Confirm close contact with K1 contactor in service position (with "commissioning bypass") and Closed and BGE Earthing Switch opened - XM 57-58 ..... ☑	OK	[signature]	15/01/2025 15.01.25

Step	Description	Result	Verified by	Date

HMI of FP1 Protection Relay and its LEDs signalling

PROTECTION DISPLAY



LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCO)	-	GREEN	OK = TCO OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISH
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/51-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/51N-1/67N-1 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY DC (ECO)	RED	-	ALARM = ECO TRIPPED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

169	The K1 Contactor is in test position. Closing and opening K1 Contactor command, simulating (K1 in) service position with "commissioning bypass" Close K1 Contactor feeder - Place the selector SA1 in Local Position ..... ☑ - All permissive interlock signals are authorizing the contactor closing. ..... ☑ - Close K1 Contactor by pressing push button S1C..... ☑ - Verify and confirm the Contactor status closed via on board mechanical red signal ☑	OK		15/05/2025

Step	Description	Result	Verified by	Date
	- See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ... ☑ Open K1 Contactor feeder - Open K1 Contactor by pressing push button S2O .... ☑ - Verify and confirm the Contactor status open via on board mechanical green signal ..... ☑ - See on FP1 Protection Relay Display if Contactor Opened is confirmed on REX640 HMI ... ☑	OK	[signature] SM (CW)	15/01/25 15.01.25
170	**ESD** Test Signal from **SIS** Functioning test of the ESD signal (82xS003) that comes from SIS Contactor must be in test position and Closed (with commissioning Bypass), SIS sends to KSIL Relay an healthy signal and KSIL Relay is ON Send a trip signal from SIS: - K1 Contactor goes OFF ..... ☑ - KSIL Relay is off ..... ☑ Reinstate the healthy condition of K1 and KSIL relay	OK REF. ITRB CJ0003826	[signature]	15/01/25
171	Before to close the K1 Contactor ensure and confirm that the Solar PV Package Power Transformer TR-200ED1 has Ready for Commissioning Certificate and it is available to receive the 6,6kV Power Supply	Ok	[signature] SM (CW)	15/01/25 15.01.25
172	Rack in K1 Contactor in SERVICE position and confirm that it is available. N.B.: ensure that the "commissioning bypass" has been disabled to allow the following tests to be performed in the **final operational configuration.**	Ok	[signature] SM (CW)	15/01/25 15.01.25

Step	Description	Result	Verified by	Date
173	A2 Unit – Feeder for Solar PV Package Power Transformer TR-200ED1 Confirm the conditions to close the K1 Contactor following: - On Unit A5 the voltage presence lamps C1 are ON .. ☑ - Led-2 "CONTACTOR READY (TCS)" on Unit A2 protection relay REX640 is green ..... ☑ Close K1 Contactor, feeding downstream Solar PV Package Power Transformer TR-200ED1 - Place the selector SA1 in Local position ..... ☑ - All permissive interlock signals are authorizing the Contactor closing command. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00019 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN ..... ☑ o LED-3 must be GREEN ..... ☑ o LED-4 must be GREEN ..... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN .... ☑ o LED-8 must be GREEN ..... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF ..... ☑ o LED-11 must be OFF ..... ☑ - Close K1 Contactor by pressing push button S1C..... ☑	ok	[signature]	15/01/25

Step	Description	Result	Verified by	Date
	- Verify and confirm the Contactor status closed via on board mechanical red signal ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON. ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI ... ☑	ok	JM (CW)	15/01/25 15.01.25
174	A2 Unit – Feeder for Solar PV Package Power Transformer TR-200ED1 - **Remote** command Close K1 Contactor, feeding Solar PV Package Power Transformer TR-200ED1 - Place the selector SA1 in Remote position ..... ☑ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF ..... ☑ o LED-2 must be GREEN.... ☑ o LED-3 must be GREEN.... ☑ o LED-4 must be GREEN.... ☑ o LED-5 must be OFF ..... ☑ o LED-6 must be OFF ..... ☑ o LED-7 must be GREEN ... ☑ o LED-8 must be GREEN.... ☑ o LED-9 must be OFF ..... ☑ o LED-10 must be OFF..... ☑ o LED-11 must be OFF..... ☑	ok		25/01/2025

Step	Description	Result	Verified by	Date
	- Close K1 Contactor from EMCS System ..... ☐ - Verify and confirm the Contactor status closed via on board mechanical red signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are ON ☑ - See on FP1 Protection Relay Display if Contactor Closed is confirmed on REX640 HMI . ☑ - Open K1 Contactor from EMCS System ..... ☑ - Verify and confirm the Contactor status opened via on board mechanical green signal ..... ☑ - Verify that the voltage presence lamps C1 on downstream busbar are OFF ..... ☑			

5.4.7.3 230Vac Auxiliary devices tests

The 230Vac auxiliary devices tests consist in the verification of internal lighting, internal space heater and internal socket.

Step	Description	Result	Verified by	Date
UNIT A4 - TRANSFORMER TR-200DE1 FEEDER				
175	Verify and confirm 230Vac auxiliary power is present between following terminals, take the value: - XC 9-11 (230V) V	ok	[signature]	25/01/2025
176	Power up 230Vac auxiliary circuits. - Close MCB QA2 ..... ☐	ok	[signature]	25/01/2025

Step	Description	Result	Verified by	Date
177	Internal Lighting test. The internal lighting is installed only inside the auxiliary compartment. There is a limit switch **LS** that switch on light with opened door and switch off it with door closed. - Verify and confirm..... ☑	OK		25/01/2025
178	Internal space heater test The internal space heater is installed only inside the auxiliary compartment. The thermostat **HGR** is installed inside the same compartment, its range is -10 ÷ +80°C. Decrease the set point till switch on the space heater and KGR relay will be ON. - Verify and confirm..... ☑ - Led-12 "SPACE HEATER ON" on protection relay REX640 HMI will turn to red ..... ☑	OK		25/01/2025
179	Internal 230Vac Socket test The internal 230Vac Socket **XS1** is installed only inside the auxiliary compartment. Take a Multimeter and measure the voltage between socket poles. - Verify and confirm (230Vac)..... ☑	OK		25/01/2025

5.4.7.4 SIS Safety Instrumented System - I/O signal from SIS to SG-100D1 UNIT A2

The following I/O list represent the hardwired signals that are connected on Unit A2 and they come from the SIS (Emergency Shut Down).

SIGNAL_DESCRIPTION	TYPE ANALOG/DIGITAL	ITEM TAG
TRANSFORMER FEEDER TR-200ED1 "A2"		
EMERGENCY OPEN BY SIS TRANSFORMER FEEDER TR-200ED1	DIGITAL	82XS001

Step	Description	Result	Verified by	Date
180	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results..... ☑		25/01/2025

5.4.7.5 *EMCS IEC61850 - Electrical Monitoring & Control System*

The EMCS will be tested with the 6.6kV SWBD: In detail it will be tested the functionalities provided on I/O lists vendor document **1723002197-EL-LIS-00041 with the A2 Solar PV Package Power Transformer TR-200ED1.**

5.4.7.6 *EMCS IEC61850 – A2 Unit I/O List*

The following data list is a part of redundant networking in ethernet technology from the electrical PROTECTIONS Relay REX640

DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
TRANSFORMER FEEDER TR-200ED1 "A2"		
PROTECTION TRIPPED "50-1"	DIGITAL	LD0.PHIPTOC1.ST.Op.general
PROTECTION TRIPPED "51-1"	DIGITAL	LD0.PHLPTOC1.ST.Op.general
PROTECTION TRIPPED "51N"	DIGITAL	LD0.EFLPTOC1.ST.Op.general
SYNCHRO "OK"	DIGITAL	LD0.LEDGGIO1.ST.Ind3.stVal
PROTECTION TRIPPED "59N-1"	DIGITAL	LD0.ROVPTOV1.ST.Op.general
PROTECTION TRIPPED "59N-2"	DIGITAL	LD0.ROVPTOV2.ST.Op.general
PROTECTION TRIPPED "27-1"	DIGITAL	LD0.PHPTUV1.ST.Op.general
PROTECTION TRIPPED "27-2"	DIGITAL	LD0.PHPTUV2.ST.Op.general
PROTECTION TRIPPED "59-1"	DIGITAL	LD0.PHPTOV1.ST.Op.general
PROTECTION TRIPPED "59-2"	DIGITAL	LD0.PHPTOV2.ST.Op.general
PROTECTION TRIPPED "67-1"	DIGITAL	LD0.DPHLPDOC1.ST.Op.general
PROTECTION TRIPPED "67-2"	DIGITAL	LD0.DPHLPDOC2.ST.Op.general
SELECTOR SWITCH IN LOCAL POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO6.stVal

DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
SELECTOR SWITCH IN REMOTE POSITION	DIGITAL	LD0.MVGAPC1.ST.SPCSO7.stVal
Line Current (L1)	ANALOG	LD0.CMMXU1.A.phsA.cVal.mag.f
Line Current (L2)	ANALOG	LD0.CMMXU1.A.phsB.cVal.mag.f
Line Current (L3)	ANALOG	LD0.CMMXU1.A.phsC.cVal.mag.f
Line Volts MAIN BUS BAR (L1-l2)	ANALOG	LD0.VMMXU1.PPV.phsAB.cVal.mag.f
Line Volts MAIN BUS BAR (L2-L3)	ANALOG	LD0.VMMXU1.PPV.phsBC.cVal.mag.f
Line Volts MAIN BUS BAR (L3-L1)	ANALOG	LD0.VMMXU1.PPV.phsCA.cVal.mag.f
Frequency	ANALOG	LD0.FMMXU1.Hz.mag.f
APPARENT POWER (kVA)	ANALOG	LD0.PEMMXU1.TotVA.mag.f
REAL POWER (kW)	ANALOG	LD0.PEMMXU1.TotW.mag.f
REACTIVE POWER (kVAR)	ANALOG	LD0.PEMMXU1.TotVAr.mag.f
POWER FACTOR	ANALOG	LD0.PEMMXU1.TotPF.mag.f
TRANSFORMER PROTECTION TRIPPED "BUCHHOLZ"	DIGITAL	LD0.SCBIGGIO1.ST.Ind7.stVal
TRANSFORMER PROTECTION ALARM "BUCHHOLZ"	DIGITAL	LD0.SCBIGGIO1.ST.Ind6.stVal
TRANSFORMER PROTECTION TRIPPED "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind9.stVal
TRANSFORMER PROTECTION ALARM "OIL TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind8.stVal
TRANSFORMER PROTECTION TRIP "OIL PRESSURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind12.stVal
TRANSF. OIL LEVEL VERY LOW ALARM	DIGITAL	LD0.SCBIGGIO1.ST.Ind11.stVal
TRANSFORMER PROTECTION ALARM "OIL PRESSURE"	DIGITAL	N.A.
TRANSF. PROTECTION TRIPPED "WINDING TEMPERATURE"	DIGITAL	LD0.SCBIGGIO1.ST.Ind14.stVal

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DESCRIPTION	SIGNAL TYPE	SIGNAL TAG
TRANSF. PROTECTION ALARM "WINDING TEMPERATURE	DIGITAL	LD0.SCBIGGIO1.ST.Ind13.stVal
TRANSF. GENERAL ALARM	DIGITAL	LD0.SDBIGGIO1.ST.Ind7.stVal
WATCHDOG PROTECTION RELAY	DIGITAL	LD0.LPHD1.PhyHealth.stVal
V.T. HEALTLY CIRCUIT	DIGITAL	LD0.SCBIGGIO1.ST.Ind2.stVal
INTERTRIP SEND TO L.V. SWITCHBOARD	DIGITAL	LD0.MVGAPC1.ST.SPCSO4.stVal
K86 TRIPPED	DIGITAL	LD0.SBBIGGIO1.ST.Ind7.stVal
Contactor CLOSED AND INSERTED	DIGITAL	LD0.MVGAPC1.ST.SPCSO8.stVal
Contactor OPENED OR ISOLATED	DIGITAL	LD0.MVGAPC2.ST.SPCSO2.stVal
MCB'S CLOSED	DIGITAL	LD0.MVGAPC2.ST.SPCSO3.stVal
Contactor READY (TCS)	DIGITAL	LD0.TCSSCBR1.ST.CircAlm.stVal
Contactor READY TO CLOSE	DIGITAL	LD0.MVGAPC2.ST.SPCSO1.stVal
OPENING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO2.stVal
CLOSING COMMAND	DIGITAL	LD0.SPCGAPC1.SPCSO1.stVal
PROTECTION RELAY UNIT 1 HEALTHY	DIGITAL	LD0.SDBIGGIO1.ST.Ind8.stVal
SELECTOR SWITCH OF OVERRIDE IN OFF (SIL ENABLED)	DIGITAL	LD0.SDBIGGIO1.ST.Ind9.stVal

Step	Description	Result	Verified by	Date
181	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results		

5.4.7.7 EMCS MODBUS TCP-IP

The following signals data type represent the thermal temperature of copper BUS BAR and CABLE Unit of the 6.6kV SWBD.

DESCRIPTION	SLAVE ADDRESS	MODBUS REGISTER	UNIT
TRANSFORMER FEEDER TR-200ED1 "A2"			
Phase L1 - Temperature Detection - cable Compart.	11	40117	ΔT
Phase L2 - Temperature Detection - cable Compart.	11	40118	ΔT
Phase L3 - Temperature Detection - cable Compart.	11	40119	ΔT
Phase L1 - Temperature Detection - Contactor Compart.	11	40120	ΔT
Phase L2 - Temperature Detection - Contactor Compart.	11	40121	ΔT
Phase L3 - Temperature Detection - Contactor Compart.	11	40122	ΔT
Phase L1 - Temperature Detection - Main Bus Bar	11	40123	ΔT
Phase L3 - Temperature Detection - Main Bus Bar	11	40124	ΔT

Step	Description	Result	Verified by	Date
182	Confirm correct and positive result of precommissioning Check Sheet for above signals I/O list	Correct and positive results ..... ☑		25/01/2025

5.4.7.8 OTP Worksite PHASE 7 Test Notes and Remarks

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5.4.7.9 OTP Worksite PHASE 7 Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

5.4.7.10 OTP Worksite PHASE 7 Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature
KRISTIAN OVERGAARD	ROSETTI M	LEAD ELE POWER	
JAMIE MCALLISTER	CW	OPS COM ENG	
ANTHONY IVESON		BUM. MGR. - ASSIST M.	

5.5 POST TEST CONDITIONS

All the electrical contacts which were disconnected for the testing purposes must be reconnected.

After functional tests have been completed, system / sub-systems are left in healthy and safety condition and that they are operational.

5.6 REINSTATEMENT AND PRESERVATION TASKS

Generally, the system/ sub-system shall be reinstated at its initial condition; and the following activities must be carried out as minimum:

- all inhibition done for the test shall be removed (as per Inhibit / Override List)
- all equipment/devices shall be returned in healthy functional conditions

All preservation routines identified and required will be included in relevant Preservation ITR within the Proverlis Completions System.

6 OTP AT SITE OFFSHORE

6.1 PLANNING AND MANPOWER

6.1.1 Offshore site test overview

It is expected that all precommissioning tests, systems energization and commissioning steps will have been successfully performed during the Onshore Phases.

Consequently, during the offshore SITE phase, the respective systems will be inspected prior to re-energization.

No additional test steps will be required on these items of equipment, correct operation and functioning will be verified.

6.1.2 Planned tasks with estimated manpower

Estimated manpower for the entire duration of the Test:

- 1 E&I commissioning superintendent
- 1 E&I commissioning supervisor from Contractor
- 2 E&I commissioning technicians from Contractor

6.1.3 Test duration estimate

The test duration should be as follows:

- 1 day

6.1.4 Vendor Assistance

Not applicable

6.1.5 Items Postponed to C&E OTP

Not applicable

6.1.6 HOLDS

Not applicable

6.2 OTP TEST REQUIREMENTS-OFFSHORE SITE

6.2.1 Pre-Commissioning Achievement

Not applicable

6.2.2 Commissioning Achievement

The commissioning achievement will be the successful operation, functionality and safeguarding test of Power distribution System 6.6KV, installed and put in operation during the WORKSITE IN ONSHORE phase.

In OFFSHORE Phase the 6,6kV Switchboard will be powered ON to be ready to operate with incomer/feeder connected on it.

Once powered on the 6.6KV Switchboard will be ready to operate with:

- Main power from HV grid connection
- BESS PACKAGE (source)
- FUEL CELL PACKAGE (source)
- SOLAR Package (Source)
- ELECTROLYSER PACKAGE (load)
- 6,6/0,4kV Transformer TR-200DE1 (load)

6.2.3 Status of Required Associated Subsystems

Subsystems required for Commissioning of 6.6KV Power Distribution:

- SS 83-00: 6,6 kV Switchboard
- SS 87-00: Electrical Monitoring & Control System (EMCS)
- SS 87-10: Process Control System (PCS)
- SS 79-00: SIS Safety Instrumented System
- SS 84-00: UPS System UP-200F1

6.2.4 Special Tools & Test Equipment

The following special tool and Test Equipment are required:

- Voltage, frequency, continuity tester (Multimeter)
- Phases sequence tester
- extracting tool & transportation trolley
- Portable radios (3 pcs + 1 per Technical Room)

TESTING & MEASUREMENT INSTRUMENT USED			
Type	Serial N.	Calibration certificate	Validity

6.2.5 Consumable List

Not applicable

6.2.6 Commissioning Spare Parts

The commissioning spare parts are indicated in the document 1723002197-COM-LIS-00052 "Commissioning Spare Parts".

6.2.7 Temporary Facilities

Not applicable

6.3 OTP DESCRIPTION – OFFSHORE SITE

6.3.1 OTP Test Preparation

Step	Description	Result	Verified by	Date
1	System Ready for Operation (RFO) from worksite phase Certificate is issued and approved.			
2	No blocking punch list items are outstanding against the system to be commissioned.			
3	System(s), (de)isolations as per LOTO procedure enclosed within commissioning Work Permits procedures prepared and approved			
4	Verify and confirm that all steps performed at WORKSITE of this procedure are completed without any pending issues that would prevent from proceeding with the offshore SITE PROCEDURE			
5	All personnel involved in the implementation of this procedure are familiar with this procedure as well as with associated safety requirements (Toolbox Talk to be conducted before initiation of activities).			
6	A final walkdown after hook-up of the system has been completed, any preservation items have been removed and to ensure that the system and the area are ready for energization for following items:			

Step	Description	Result	Verified by	Date
	UP-200F1 110V AC UPS SG-100D1 6,6kV Main Switchboard			
7	Check that areas are free for work and escape routes are clear of any obstructions.			
8	Ensure that proper communications have been established between parties involved in the implementation of the procedure.			
9	Verify availability of test equipment and consumables as per chapters 6.2.4.			
10	Verify and confirm that the HV systems are ready to power on the 6.6KV Switchboard and the HV is present.			
11	All personnel have been duly notified during dedicated daily SIMOPS meetings that the system(s) is ready for commissioning.			

6.3.2 Electrical Preparation

Step	Description	Result	Verified by	Date
12	No blocking punch list items are outstanding against the system to be commissioned.			
13	Review and confirm no changes are required to be performed on existing protection settings.			

6.3.3 Mechanical Preparation

Not applicable.

6.3.4 Instrument Preparation

Step	Description	Result	Verified by	Date
14	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
15	Verify that all relevant associated systems / subsystems are ready.			
16	Verify as relevant Inhibit and Override list has been prepared and validated.			
17	Verify that relevant equipment/ components are available and in operation for start of commissioning activities.			

6.3.5 Piping Preparation

Not applicable

6.3.6 Additional Discipline Preparation

Not applicable.

6.4 OTP Steps OFFSHORE SITE

The previous chapters must be successfully performed prior to commissioning of the 6.6KV SWBD.

UPS-200F1 is energized at this point.

In the following steps the functionality of the 6.6KV Power Distribution Switchboards shall be tested for:

- SS 84-00: UPS-200F1 110 VDC
- SS 82-00: SWBD SG-100D1 6,6k V

6.4.1 Test preparation

Step	Description	Result	Verified by	Date
Auxiliaries Energization of 6,6kV SWBD SG-100D1				
18	Check related punch list 'B' items and confirm acceptability for start of commissioning activities.			
19	Verify that all relevant associated systems / subsystems are completed.			
20	Verify and confirm the power by UPS supply A&B 110V on Column A5 With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 11 - Close MCB QD01 - Close MCB QD02			
21	Verify and confirm the power supply 110V on Column A1 With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 11 - Close MCB QD01 - Close MCB QD02.			
22	Verify and confirm the power supply 110V on Column A2			

Step	Description	Result	Verified by	Date
	With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 11 - Close MCB QD01 - Close MCB QD02			
23	Verify and confirm the power supply 110V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 11 - Close MCB QD01 - Close MCB QD02.			
24	Verify and confirm the power supply 110V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 10 - Close MCB QD01 - Close MCB QD02			
25	Verify and confirm the power supply 110V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 11 - Close MCB QD01 - Close MCB QD02			
26	Verify and confirm the power supply 110V on Column A7 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 11 - Close MCB QD01 - Close MCB QD02			
27	Verify and confirm the power supply 24V on Column A5			

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Step	Description	Result	Verified by	Date
	With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 13 - Switch on MCB QD5 - Switch on MCB QD6 - Verify the led on ethernet switch A - Verify the led on ethernet switch B - Verify the led on ethernet switch C			
28	Verify and confirm the power supply 24V on Column A1 With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 11 - Close MCB QD4			
29	Verify and confirm the power supply 24V on Column A2 With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 11 - Close MCB QD4			
30	Verify and confirm the power supply 24V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 11 - Close MCB QD4			
31	Verify and confirm the power supply 24V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 11 - Close MCB QD4			
32	Verify and confirm the power supply 24V on Column A6			

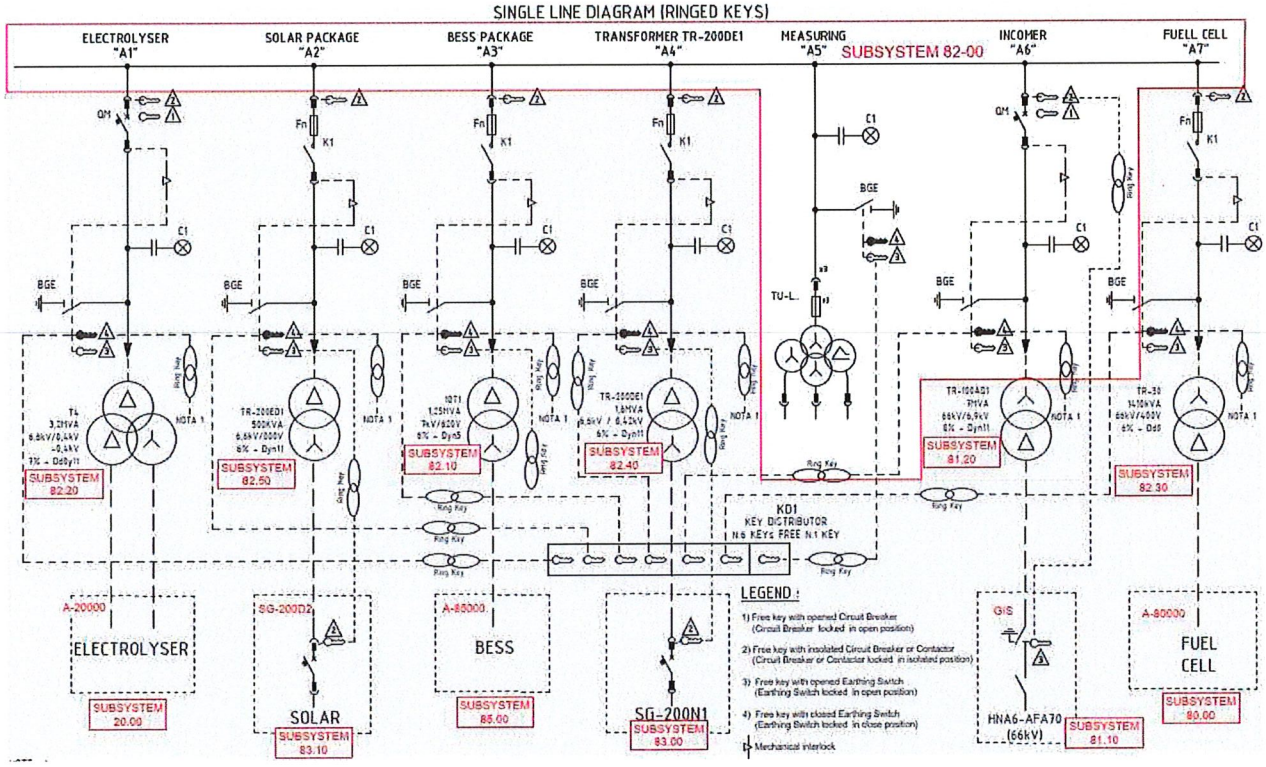
Step	Description	Result	Verified by	Date
	With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 11 - Close MCB QD4			
33	Verify and confirm the power supply 24V on Column A7 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 11 - Close MCB QD4			
34	Verify and confirm the power supply 230V on Column A5 With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 10 - Close MCB QA1 - Close MCB QA2			
35	Verify and confirm the power supply 230V on Column A1 With reference Vendor doc. N° 1723002197-EL-DG-00018 (Column A1) sheet 13 - Close MCB QA2			
36	Verify and confirm the power supply 230V on Column A2 With reference Vendor doc. N° 1723002197-EL-DG-00020 (Column A2) sheet 13 - Close MCB QA2			
37	Verify and confirm the power supply 230V on Column A3 With reference Vendor doc. N° 1723002197-EL-DG-00017 (Column A3) sheet 13 - Close MCB QA2			

Step	Description	Result	Verified by	Date
38	Verify and confirm the power supply 230V on Column A4 With reference Vendor doc. N° 1723002197-EL-DG-00021 (Column A4) sheet 13 - Close MCB QA2			
39	Verify and confirm the power supply 230V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00015 (Column A6) sheet 13 - Close MCB QA2			
40	Verify and confirm the power supply 230V on Column A6 With reference Vendor doc. N° 1723002197-EL-DG-00019 (Column A7) sheet 13 - Close MCB QA2			
41	With reference Vendor doc. N° 1723002197-EL-DG-00016 (Column A5) sheet 8,9 Close the following MCBs - QV1 ..... ☐ - QV2 ..... ☐ - QV3 ..... ☐ - QV4 ..... ☐			
42	With reference Vendor doc. N° 1723002197-EL-DG-00015/17/18/19/20/21 (Column A6/A3/A1/A7/A2/A4) Close following MCBs for voltage references to protection relais: - Close MCB QV4 - Close MCB QV5			

6.4.2 Test Steps

The 6.6KV Switchboard SG-100D1 has all auxiliary circuits powered on, and it is ready to operate. After this steps the SWBD will remain powered ON to permit the package start up.

Step	Description	Result	Verified by	Date
SG-100D1 6.6KV Switchboard - Energization A5, A6 UNIT and main busbar				
Switchboard Single Line Diagram – Key & Mechanical Interlock (ref. to vendor doc. 1723002197-EL-DG-00056 sheet 015)				
The test starts with SWBD in safety status, the upstream is not powered, Measuring Unit A5 has its Earthing Switch (BGE) Closed and Incomer Unit A6 has its Earthing Switch (BGE) Closed and Its Main Breaker QM in extract position and opened. The main 6,6kV supply will be provided from 6,6kV Temporary Yard Power Supply system and will be provided only after the following safety checks. See the Measuring Unit A5 operating sequences to put the unit *out of service* or *in service*				



Step	Description	Result	Verified by	Date

OPERATING SEQUENCE

MEASURING AND BUS BAR OPERATING SEQUENCE

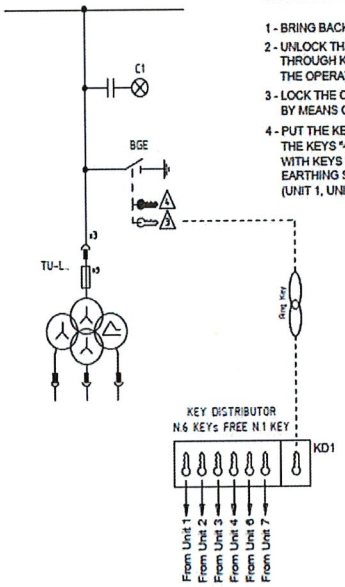
PUTTING OUT OF SERVICE

1 - OPEN AND CARRY IN ISOLATED POSITION ALL CIRCUIT BREAKERS AND CONTACTORS AND THEN CLOSE THE EARTHING SWITCH FOR THE FOLLOWING UNITS: (UNIT 1, UNIT 2, UNIT 3, UNIT 4, UNIT 6, UNIT 7). LOCK THE EARTHING SWITCH IN CLOSE POSITION BY MEANS OF THE RESPECTIVE KEYS (4).

2 - PUT THE KEYS "4" OF THE EARTHING SWITCHES IN THE KEYS-DISTRIBUTOR 'KD1'. WITH THE KEY THAT IS RELEASED FROM THE "KD1" KEY DISTRIBUTOR, UNLOCK THE OPENING POSITION OF THE EARTHING SWITCH

3 - OPEN THE COVER OF THE EARTHING SWITCH OPERATING SEAT BY TURNING THE ACTUATOR ANTICLOCKWISE, CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE

5 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY "4".



START UP

1 - BRING BACK THE KEY "4".

2 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY "4". OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE

3 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY "3".

4 - PUT THE KEY "3" IN THE KEYS-DISTRIBUTOR "KD1". WILL BE RELEASE THE KEYS "4" OF ALL EARTHING SWITCHES . WITH KEYS "4" WILL BE POSSIBLE UNLOCKING THE CLOSE POSITION OF THE EARTHING SWITCHES OF THE FOLLOWING UNITS: (UNIT 1, UNIT 2, UNIT 3, UNIT 4, UNIT 6, UNIT 7) .

3 Free key with opened Earthing Switch (Earthing Switch locked in open position)

4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

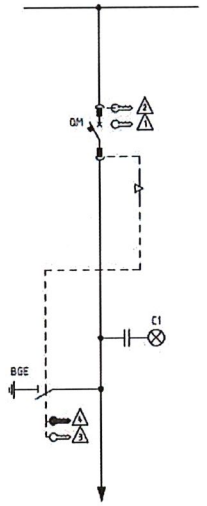
Step	Description	Result	Verified by	Date
	See the Incomer Unit A6 operating sequences to put the unit *out of service* or *in service*			

OPERATING SEQUENCE

GENERAL CIRCUIT BREAKER OPERATING SEQUENCE

PUTTING OUT OF SERVICE

1 - OPEN THE CIRCUIT BREAKER.
2 - PRESS THE PUSH-BUTTON -P1 AND CARRY CIRCUIT BREAKER IN ISOLATED POSITION.
3 - LOCK THE CIRCUIT BREAKER IN EXTRACTED POSITION BY MEANS OF KEY "2".
4 - TO ACCESS THE CIRCUIT BREAKER COMPARTMENT PRESS THE -P1 PUSH-BUTTON AND OPEN THE DOOR.
5 - UNLOCK THE EARTHING SWITCH OPEN POSITION THROUGH KEY (3).
6 - OPEN THE SHUTTER OF THE EARTHING SWITCH TURNING THE ACTUATOR ANTICLOCKWISE.
7 - PRESS THE PUSH-BUTTON -P1. CLOSE EARTHING SWITCH BY TURNING THE OPERATING LEVER CLOCKWISE.
8 - LOCK THE CLOSED POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (4)
9 - IT IS POSSIBLE TO ACCESS THE CABLE COMPARTEMENT ON THE BACK BY UNSCREWING THE BOLTS AND REMOVING THE REAR PANEL.



START UP

1 - CLOSE THE CABLE COMPARTMENT BY SCREWING THE REAR PANEL WITH THE BOLTS
2 - BRING BACK THE KEY (4)
3 - UNLOCK THE EARTHING SWITCH CLOSE POSITION THROUGH KEY (4) . PRESS THE PUSH-BUTTON -P1 OPEN EARTHING SWITCH BY TURNING THE OPERATING LEVER ANTICLOCKWISE.
4 -CLOSE THE EARTHING SWITCH COMMAND SHUTTER, TURN THE ACTUATOR CLOCKWISE.
5 - LOCK THE OPEN POSITION OF THE EARTHING SWITCH BY MEANS OF THE KEY (3)
6 - PRESS TIMING PUSH-BUTTON -P1 AND CLOSE THE DOOR OF THE CIRCUIT BREAKER.
7 - RECOVER THE KEY (2) AND UNLOCK THE ISOLATED POSITION OF THE CIRCUIT BREAKER.
8 - PRESS TIMING PUSH-BUTTON -P1 AND TO INSERT THE CIRCUIT BREAKER, CARRY IT IN THE CONNECT POSITION THROUGH THE OPERATING LEVER .
9 - CLOSE THE CIRCUIT BREAKER.

1 Free key with opened Circuit Breaker (Circuit Breaker locked in open position)
2 Free key with insolated Circuit Breaker (Circuit Breaker locked in isolated position)
3 Free key with opened Earthing Switch (Earthing Switch locked in open position)
4 Free key with closed Earthing Switch (Earthing Switch locked in close position)

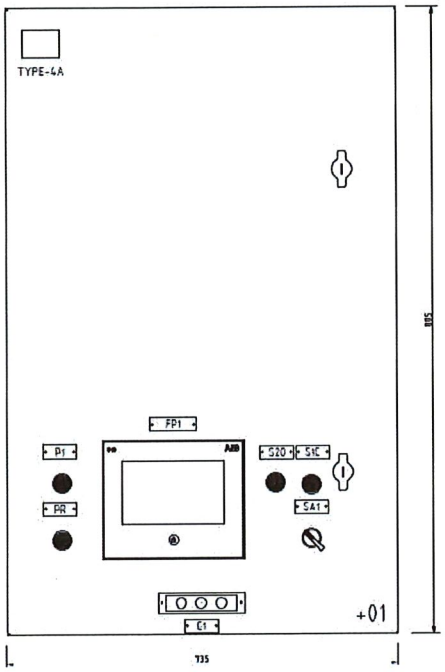
WARNING DO NOT REMOVE OR MODIFY THE SAFETY INTERLOCKS WITHOUT PRIOR AUTHORISATION

43	Verify and confirm that **Unit A6** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-4 G3228/279** is locked on KD1 device. **KEY-3 G3355** is locked on BGE Earthing Switch closed ..... ☐ - QM Main Breaker is locked in extract position and opened. **KEY-2 14466** is locked on 66kV **upstream** safety isolation device. ..... ☐ Note: see the detail of upstream safety isolation device (e.g. HV Earthing Switch) on HV OTP procedure			

Step	Description	Result	Verified by	Date
44	Verify and confirm that **Unit A5** is in safety status with following checks: - BGE Earthing Switch is locked in closed position. **KEY-3 G3098/277** is locked on KD1 device. ..... ☐ - **KEY-4 G3150** is unlocked and available to use in the LoTo Procedure..... ☐			
Switchboard preparation to receive 6,6kV Temporary Yard Power Supply on Incomer Unit A6				
45	The keys 278, 279, 280, 281, 282, 283 are interlocked on KD1. On Unit A5 - Take **KEY-4 G3150** insert it on BGE and open Earthing Switch..... ☐ - **KEY-3 G3098/277** is now available, withdraw it and insert in keys Interlock device KD1 ..... ☐			
46	To unlock Incomer Unit A6 BGE Earthing Switch - QM main Breaker is locked in extract position ..... ☐ - **KEY-1 G3260** is locked on LoTo procedure to keep breaker isolated in compliance with project PTW Procedure..... ☐ - **KEY-2 14466** is locked on 66kV **upstream** safety isolation device ...☐ - **KEY-3 G3355** is used and locked on PTW procedure. Once it is available insert it on BGE Earthing Switch to allow opening switch procedure.. ☐ - **KEY-4 G3228** has been released from KD1. Insert KEY-**4 G3228** on BGE and open it..... ☐ - Led-7 "EARTHING SWITCH ENABLE" on protection relay REX640 will turn to green ..... ☐			

Step	Description	Result	Verified by	Date
	- Remove the safety isolation device, extract KEY-2 14466 and place it on rack in/out system to unlock the QM main breaker.....☐ - Led-8 "RACK IN/OUT ENABLE" on protection relay REX640 will turn to green.....☐			

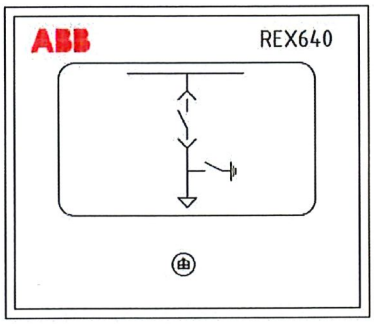
Close the Unit A6 Incomer Breaker



DOOR LAY-OUT

DEVICES name plate				
ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	NOTE
FP1	PROTECTION RELAY	PROTECTION RELAY		TYPE-1A
S20	PUSH BUTTON	OPEN COMMAND	CONTACTOR	TYPE-2A
S1C	PUSH BUTTON	CLOSE COMMAND	CONTACTOR	TYPE-2A
SA1	SELECTOR SWITCH	LOCAL / REMOTE		TYPE-2A
PR	LIGHT PUSH BUTTON	RESET LOCK-OUT	TRIP LOCK-OUT	TYPE-2A
C1	PILOT LIGHT	VOLTAGE	PRESENCE	
P1	PUSH BUTTON	TRUCK-DOOR-E.SWITCH	ENABLING	TYPE-2A

Step	Description	Result	Verified by	Date
	HMI of FP1 Protection Relay and its LEDs signalling			
	PROTECTION DISPLAY			



LEDs PAGE 1

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-1	27-1/27-2/59-1/59-2 - VOLTAGE PROTECTION	RED	-	ALARM = OVER/UNDER VOLTAGE PROTECTION
LED-2	CONTACTOR READY (TCC)	-	GREEN	OK = TCC OK (CONTACTOR READY)
LED-3	SYNCHRO CHECK		GREEN	OK = SYNCHRONISM
LED-4	CONTACTOR READY TO CLOSE	-	GREEN	OK = CONTACTOR READY TO CLOSE
LED-5	50-1/51-1/67-1/67-2 - TRIPPED	RED	-	ALARM = OVERCURRENT PROTECTION TRIPPED
LED-6	51N/59N-1/59N-2 - TRIPPED	RED	-	ALARM = EARTH PROTECTION TRIPPED
LED-7	EARTHING SWITCH UNLOCKED	-	GREEN	OK = EARTHING SWITCH UNLOCKED
LED-8	RACK-IN/OUT ENABLED	-	GREEN	OK = CONTACTOR TRUCK UNLOCKED
LED-9	ARC PROTECTION TRIPPED	RED	-	ALARM = TRIP ARC PROTECTION
LED-10	GOOSE ALARM	RED	-	ALARM = GOOSE FAULT
LED-11	EMERGENCY OPENING BY SIG (ESD)	RED	-	ALARM = ESD TRIPPED

LHMI - TOUCH DISPLAY

- COMMANDS "CLOSE C.B." AND "OPEN C.B." NOT ENABLED
- PUSH BUTTON "REMOTE / LOCAL" NOT ENABLED

LEDs PAGE 2

Item	NAME PLATE	COLOUR		Note
		ALARM	OK	
LED-12	SPACE HEATER "ON"	RED	-	ALARM = SPACE HEATER "ON"
LED-13				
LED-14				
LED-15				
LED-16				
LED-17				
LED-18				
LED-19				
LED-20				
LED-21				
LED-22				

47	Rack in QM Main Breaker in SERVICE position and confirm that it is available.			
48	Confirm availability of the 6,6kV Main Power Supply and prepare to energize. When the power supply is available confirm the following: - On Unit A6 the voltage presence lamps C1 are ON .....☐ - Led-2 "BREAKER READY (TCS)" on protection relay REX640 will turn to green.....☐			
49	A6 Unit - Incoming Breaker - **Local** command			

Step	Description	Result	Verified by	Date
	Close QM Incoming Breaker, feeding 6,6kV SWBD SG-100D1 main busbar - Place the selector SA1 in Local position .....☐ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF.....☐ o LED-2 must be GREEN .....☐ o LED-3 must be GREEN .....☐ o LED-4 must be GREEN .....☐ o LED-5 must be OFF.....☐ o LED-6 must be OFF.....☐ o LED-7 must be GREEN .....☐ o LED-8 must be GREEN .....☐ o LED-9 must be OFF.....☐ o LED-10 must be OFF .....☐ o LED-11 must be OFF .....☐ - Close QM Breaker by pressing push button S1C.....☐ - Verify and confirm the breaker status closed via on board mechanical red signal .....☐ - On Unit A5 the busbar voltage presence lamps C1 are ON.....☐ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI .....☐			
50	A6 Unit – Incoming Breaker – **Remote** command from EMCS Close QM Incoming Breaker, feeding 6,6kV SWBD SG-100D1 main busbar			

Step	Description	Result	Verified by	Date
	- Place the selector SA1 in Remote position .....☐ - All permissive interlock signals are authorizing the Circuit Breaker closing. See LEDs status On REX640 protection relay (refer to Vendor doc. N° 1723002197-EL-DG-00015 sheets 4 and 5: o LED-1 must be OFF.....☐ o LED-2 must be GREEN .....☐ o LED-3 must be GREEN .....☐ o LED-4 must be GREEN .....☐ o LED-5 must be OFF.....☐ o LED-6 must be OFF.....☐ o LED-7 must be GREEN .....☐ o LED-8 must be GREEN .....☐ o LED-9 must be OFF.....☐ o LED-10 must be OFF .....☐ o LED-11 must be OFF .....☐ - Close QM Breaker from EMCS System .....☐ - Verify and confirm the breaker status closed via on board mechanical red signal .....☐ - On Unit A5 the busbar voltage presence lamps C1 are ON.....☐ - See on FP1 Protection Relay Display if Breaker Closed is confirmed on REX640 HMI .....☐ - Open QM Breaker from EMCS System .....☐ - Verify and confirm the breaker status opened via on board mechanical green signal.....☐ - On Unit A5 the busbar voltage presence lamps C1 are OFF .....☐			

6.4.3 OTP OFFSHORE SITE - Tests Notes and Remarks

6.4.4 OTP OFFSHORE SITE Tests Certifying Authority Table of Attendances

Name and Surname	Certifying Authority	Position	Signature

6.4.5 OTP OFFSHORE SITE Tests Final Signatures and Company Acceptance

Name and Surname	Certifying Authority	Position	Signature

6.5 POST TEST CONDITIONS

All the electrical contacts which were disconnected for the testing purposes must be reconnected.

After functional tests have been completed, system / sub-systems are left in healthy and safety condition and that they are operational.

6.6 REINSTATEMENT AND PRESERVATION TASKS

Generally, the system/ sub-system shall be reinstated at its initial condition; and the following activities must be carried out as minimum:

- all inhibition done for the test shall be removed (as per Inhibit / Override List)
- all equipment/devices shall be returned in healthy functional conditions.

7 APPENDICES

7.1 Vendor SAT Procedure

7.1.1 The Vendor SAT procedure is a document number 1723002197-QC-PRO-00046

Base Load Power Hub (BLPH)

SITE ACCEPTANCE TEST PROCEDURE
HV Switchgear
Document Number: 1723002197-QC-PRO-00046

Document Class: 2

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STANDARDIZED H.V. MINIVER/C SWITCHBOARDS

Site Acceptance Test Procedure



IMESA® ELECTRICAL ENGINEERING

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1. INTRODUCTION

1.1. PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1. Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.



Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2. Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

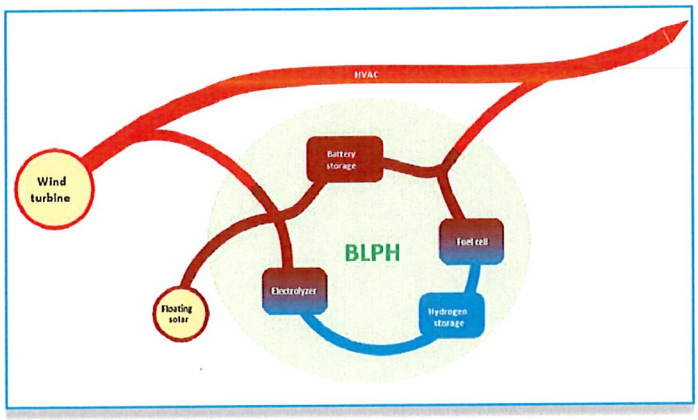


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.
The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2. SCOPE AND APPLICABILITY

This document provides the commissioning and start-up methods, as well as the testing procedures at site, applicable to H.V. Electrical Switchboards, manufactured by IMESA in compliance to Standard IEC 62271-200 and designated as Miniver-C type.

The procedure is applicable to the following switchgear tag: SG-100D1

3. APPLICABLE STANDARDS AND DOCUMENTS

The tester will make reference to Standards IEC 62271-200 and IEC 62271-1 and to the engineering documents listed here below.

Ref.	Imesa Doc No.	Description
A1	1723002197-EL-DA-00006	SG-100D1 General Arrangement DWG and foundation load calculation including COG
A2	1723002197-EL-DG-00010	SG-100D1 Electrical Single Line Diagram
A3	1723002197-EL-DG-00015	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - INCOMING FEEDER (including Terminals and BOM)
A4	1723002197-EL-DG-00016	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BUS BAR METERING (including Terminals and BOM)
A5	1723002197-EL-DG-00017	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BESS FEEDER (including Terminals and BOM)
A6	1723002197-EL-DG-00018	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - ELECTROLYSER FEEDER (including Terminals and BOM)
A7	1723002197-EL-DG-00019	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - FUEL CELL FEEDER (including Terminals and BOM)
A8	1723002197-EL-DG-00020	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200ED1 (including Terminals and BOM)
A9	1723002197-EL-DG-00021	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200DE1 (including Terminals and BOM)
A10	1723002197-EL-DG-00022	SG-100D1 MV SWG INTERCONNECTING AND AUX DISTRIBUTION DIAGRAM (including BOM)
A11	1723002197-EL-DG-00023	SG-100D1 MV SWG LOGIC DIAGRAM - INCOMING FEEDER
A12	1723002197-EL-DG-00024	SG-100D1 MV SWG LOGIC DIAGRAM - BUS BAR METERING
A13	1723002197-EL-DG-00025	SG-100D1 MV SWG LOGIC DIAGRAM - BESS FEEDER
A14	1723002197-EL-DG-00026	SG-100D1 MV SWG LOGIC DIAGRAM - ELECTROLYSER FEEDER
A15	1723002197-EL-DG-00027	SG-100D1 MV SWG LOGIC DIAGRAM - FUEL CELL FEEDER
A16	1723002197-EL-DG-00028	SG-100D1 MV SWG LOGIC DIAGRAM - TRANSFORMER FEEDER TR200ED1
A17	1723002197-EL-DG-00029	SG-100D1 MV SWG LOGIC DIAGRAM - TRANSFORMER FEEDER TR200DE1
A18	1723002197-EL-DS-00034	SG-100D1 EQUIPMENT DATA SHEETS INCLUDING MSDS and WEIGHT DATA SHEET
A19	1723002197-EL-CAL-00014	SG-100D1 CURRENT and VOLTAGE TRANSFORMER SIZING CALCULATION and CHARACTERISTIC
A20		MV Switchgear - F.A.T. Report
A21	1723002197-EL-CAL-00056	OPERATION SEQUENCES AND KEY INTERLOCK
A22	1723002197-EL-CAL 00054	INSTALLATION OPERATING AND MAINTENACE MANUAL

Hard copy of the a.m. IMESA documents, properly stamped and signed as "AS BUILT", will be available for the needed testing activities and verifications.

4. SAFETY RECOMMENDATIONS

WARNING



- All the operations of electric maintenance and installation must be performed by qualified technicians
- All the standard electric safety procedures must be respected
- Never touch inside the switchboard; only after making sure it is out of voltage and grounded
- Always wear personal protective equipments (insulating shoes in rubber, protective glasses, safety helmet, etc...)
- Never work alone
- Never remove safety screens
- Always pay maximum attention when handling components or performing measurements inside the panel
- It shall be taken in mind that this test procedure is only for the equipment and is to be used together (not instead of) all safety procedures specified by local Laws, rules, regulations and Standards

People attending the commissioning and testing activities must wear:

SHOES: Workers, staff of the Customer, the End User or its representatives (inspectors) present during the tests shall wear safety shoes, ever. The staff of the Customer, the End User or its representatives (inspectors) present during the tests must arrive already equipped with their own shoes. The staff of the Customer, the End User or its representatives (inspectors), present during the tests and not wearing safety shoes, may still access the Safe Area, but not the test area. They will therefore only observe the test from Safe Area and conducting the review of the results in test reports.

GLASSES: Workers must wear safety glasses when performing risky for their eyes.

HELMET: Workers must wear protective helmets when performing lifting and handling, or when there is a suspended load. When there are suspended loads or handling and lifting the staff of the Customer, the End User or its representatives (inspectors) present during the tests must remain in the Safe Area.

GLOVES: Workers must wear gloves when performing risky for the hands or vibrations.

DRESS: All workers must wear appropriate safety clothing, forever. Helmet, gloves, glasses, safety clothing are not required to staff of the Customer, the end Customer or his representatives (inspectors) present during the tests.

When testing the dielectric properties (applied voltage test), **insulated gloves** and **shoes with retractable toe caps**, as well as suitable **protection clothing covering body and arms**, to be worn.
If the test is suspended even temporarily, the test instrument must be disconnected from the mains.

Before to start any activity, to thoroughly check that the following points are confirmed:

- the lighting system in the area is suitable and in operation
- phone or radio communication system is available, even temporarily for the present activities
- the fire-fighting system is in operation and provided with valid certification (portable fire extinguishers may be also suitable for purpose)
- earthing plant in the area and earthing connections of the subsystems to be energized have been completed and tested

5. GENERAL DESCRIPTION

5.1. PURPOSE OF SAT

The purpose of the SAT (Site Acceptance Test) is to inspect the switchboard, after installation at site, to ensure that it is ready for energization and start-up and also that its performance requirements will be met.
Prior to performing any Site Acceptance Testing, all Punch list items have to be rectified and closed.

5.2. TESTING TASKS

After completion of the installation phase of the switchboard and in order to prepare it for SAT, pre-commissioning and commissioning are to be first carried out, as further detailed in the next paragraphs.

The overall test activities will be performed by means of the specific test equipment, under the control and responsibility of the test executor, along with some assistants.

The main steps that will be performed are the following:

- Verification of the test procedures and of the related documentation availability.
- Preparation of the test setup
- Execution of the tests according to the Test Procedure and release of the SAT Test Report
- Signing of the SAT Test Report by the test executor and the attending people.

Estimated lead time to carry out all these tests is 3/4 weeks (it depends on site activities conditions, actually).

For additional tests not included in its own scope of work, IMESA will provide technical support, as agreed in advance.

List of the tests

Item	Activity	Tool	Support Requested	Type of Test
a.	Mechanical check	Torque Wrench	Mech. Engineer Inspection/Quality Officer	Mandatory
b.	Testing contact resistance at busbars, CBs & Fused Contactors	Current generator and digital multimeter	Electrical Engineer Inspection/Quality Officer	Mandatory
c.	Primary Injection on current transformers	Injection current bench	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that CT is not damaged)
d.	Primary Injection on voltage transformers	Apply low voltage to check the functionality of VT (400V)	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that VT is not damaged)
e.	Testing of protection relays by secondary injection	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory

Item	Activity	Tool	Support Requested	Type of Test
f.	Functional test of IEDs, and interlocks.	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
g.	High voltage test	Hi pot equipment	Electrical Engineer Inspection/Quality Officer	Mandatory
h.	Infrared sensors tests	Non-contact temperature measuring tool	Electrical Engineer (Temperature sensors specialist) Inspection/Quality Officer	Suggested (to verify correct settings)
i.	Arc flash detecting system test	Camera Flash Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
j.	Network Goose Messaging system test	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
k.	ENMC system communication test	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer ENMC test is intended in charge to PMS vendor (IMESA to only provide assistance, where requested and agreed)	Mandatory
l.	Partial discharge detecting system test	Calibration tools	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Suggested (to verify correct settings)

5.3. TEST EQUIPMENT

- Megger (e.g. : Chauvin Arnoux ca 6547)
- Tester / Multimeter
- Testing bench for primary injection (e.g. : Omicron CPC 100)
- Relay Testing System (through current / voltage secondary injection - (e.g. : Omicron CMC 353)
- Torque Wrench (e.g. Dina Beta NM 20÷100)
- Voltage drop test equipment (e.g. : Multimeter + TEIB PP77 100A DC)
- Hi-pot test bench (e.g. : Phenix 650-2P)

NOTES:

- it shall be advised in advance availability of the testing equipment at site or whether those are to be provided by the commissioning engineer himself;
- availability of calibration certificates of the above testing equipment, having valid date, must be ensured.

5.4. TEST PHASE AND PASS/FAIL CRITERIA

For each test a set of pass/fail criteria will be defined (it is also possible that each test has a different criteria) in order to establish an acceptance procedure.
Where acceptance and rejection criteria are not established, they shall be defined according to the best practice, making reference to standards or samples.

The main possibilities are the following:

- All the steps are successfully performed (the test passes)
- Some steps fail but the function under test is verified (the test passes after client approval)
- Some steps fail and the function under test is not verified (the test fails)
- Some steps fail but with a specific corrective action the proper function is recovered (the test must be repeated);

If the test fails, a related NCR will be released.

6. PRE-COMMISSIONING PROCEDURE

6.1. GENERAL INFORMATION

Locking magnets are installed on the HV circuit breaker / HV Fused contactor compartments, to increase general safety of the H.V. Switchboard.

RLE1
Locking magnet on the operating mechanism.
If de-energized, it mechanically prevents circuit breaker / contactor closure.

RLE2
Locking magnet on the truck.
If de-energized, it mechanically prevents circuit breaker / contactor racking-in and racking-out operations.

RLE3 (provided on request)
Locking magnet on the earthing switch.
If de-energized, it mechanically prevents any earthing switch operation (closing and opening, as well).

RLE4
Locking magnet on the circuit breaker compartment door.
If de-energized, it prevents opening and closing of the circuit breaker compartment door.

Circuit Breaker and contactor status (Open / Close / Tripped) is showed on the HMI panel of the protection relays.

For the programmable indication, assigned to the single LED indicator available on the protection relay's HMI panel, please, refer to the relevant table in the schematic diagrams.

IT IS RECOMMENDED TO FORESEE THE ATTENDANCE OF AN IMESA TECHNICIAN DURING THE ABOVE MENTIONED ACTIVITIES

6.2. PRE-COMMISIONING ACTIVITIES

Before to start Pre-Commissioning, please, read carefully the I.O.M. document (Installation, Operation and Maintenance manual).
Then proceed with the following checks and actions.

1. Switchboard's cubicles shall be in good and clean status. Make sure that switchboard is clean, free from dust, traces of humidity, installation material debris, cables pieces, tools, provisional connections, etc. , as well as any foreign object.
2. Visually check the interior and exterior of the switchboard for signs of evident damage
3. Make sure that the switchboard is correctly installed according to the General Arrangement Drawings
4. Maintenance clearances shall be according to the General Arrangement Drawings
5. Make sure that any support or protection used to handle the equipment has been removed
6. Make sure that, after completion of the installation, the switchboard overall protection degree is as per General Arrangement Drawings
7. Visual inspection to check that bolted connections of the HV and earthing circuits (at busbars, CBs poles, CTs, VTs, etc.) are suitably tighten. No disalignment is expected at the marks provided over the bolt, during torque wrench tightening at the factory. In case found, to torque wrench again the connection (see par. 7.1).
8. Cable passages shall be free and unobstructed
9. Couple the auxiliary interpanel connections by the relevant plugs and socket (see schematic diagrams with control voltage distribution loop, panels interconn. wiring and communication network loop)
10. Cabling of control cables from the field in accordance with I/O list / schematics shall be completed
11. Check the incoming / outgoing power cables proper support and earthing screens connections.
12. Make sure that terminals and all the connections have been properly tightened
13. Make sure that all the safety interlock keys (master and copies) have been provided and installed. There are manoeuvres not allowed (forced operations shall be avoided).
14. Remove each H.V. circuit breaker and contactor from its cubicle, by means of the provided lifting / transport trolley, for a visual check of the breaker status and cleaning; including fixed poles of the enclosure and tulip contacts on the removable part.
    Make sure that the breaker is free from dust and traces of humidity and that there are no signs of evident damage.
15. Make sure that all H.V. fuses are correctly installed and that rating is in conformity to the schematic diagrams and parts lists.
16. All necessary warning and caution signs (voltage level indication, warning for live parts, etc.) shall be installed according to the safety standards and procedures.

The results of the a.m. activities shall be recorded on PRE-COMMISSIONING ACTIVITIES REPORT form (see par. 9)

7. COMMISIONING ACTIVITIES

Carry out the following checks and actions.

1. To be verified that all HV circuit breakers and HV fused contactors are in open and racked-out position; with charged closing springs.

   N.B. : it is recommended to manually rewind all the circuit breakers closing springs, before to supply the relevant spring motor chargers, with aux. supply voltage 110 V d.c. , in order to prevent concurrent start-up of many motor gears, which may result in excessive load for the supplying circuit.

   As an alternative, it can be taken care that supply to those motors is provided one by one; by separately closing the relevant MCB, provided within the LV compartment of each feeder unit.
2. Check that all the earthing switches are in closed position.
3. Connect all external aux. supplies and check that are at correct voltage value and phase sequence.
4. Check thoroughly the Operating Sequences and the relevant mechanical safety interlocks, by putting in service and then again out of service all the H.V. units.
5. With CBs / Contactors in test position, close and open the same by local command.
6. Make sure that the phase sequence, at the H.V. circuits, is in accordance to the electrical diagrams and that all incoming breakers are connected with the same phase sequence.
7. Check monitoring loops (hardwired status / alarm signals / visual status indications).
8. Check protection relays loops, concerning IEDs' integrated logic functions.
9. Put the HV CBs / HV Contactors in service (racked-in) position and repeat the test for opening / closing the same from local and remote commands, including control loops from / to the field (commands, status, alarm, etc.)

   N.B. : It is necessary to simulate voltage presence at the bus-bars and at the incomers, to enable CBs closing commands. Voltage presence shall be simulated, at voltage and frequency protection relays, to avoid trip commands for "dead bus-bars" function (see relevant schematic diagrams and protective relays selectivity study).
10. Check HV CBs / HV Contactors tripping, locking-out and alarming functions.

The results of the a.m. activities shall be recorded on the COMMISSIONING ACTIVITIES REPORT form (see par. 9)

8. SAT TESTING PROCEDURE

8.1. MECHANICAL TESTS

1. Bus-bars tightening check

Torque wrench all the bolted joints of the shipping sections, which have been coupled at site, according to the values indicated here below.
After tightening, each bolt is to be marked by red paint to indicated its relative position against the fixed part (as done for the torque wrench tightening provided at the factory).

The table below shows the torque wrench settings to be used for bolted connections fixing the panels and the bus-bars, too.

Screws	M6	M8	MI0	M12	M14	M16
Wrench setting (Nm) -Min	8	19	40	68	100	160
Wrench setting (Nm) - Nominal	9	22	45	75	115	185
Wrench setting (Nm) - Max	10	25	50	83	130	200

2. Tightening at CTs and VTs primary terminals

Primary terminals of the current transformer are made of copper, with threaded screws inserts provided to be used for fastening the primary conductor.

Torque wrench values are to be applied in accordance to the data sheets / to the installation manuals of the Current & Voltage Transformers' manufacturer.

The results of the a.m. activities shall be recorded on SAT REPORT FOR MECHANICAL TEST form (see par. 9)

8.2. MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUITS

Measurement of the resistance of the main circuit shall be carried out where joints between shipping sections have been coupled at site. The test is to carried out in accordance to subclause 6.4.1 of Std. IEC 62271-1.
For the routine test, the d.c. voltage drop or resistance of each pole of the main circuit shall be measured under conditions as much as possible similar, with regard to ambient air temperature and point of measurement, to those of the corresponding type test.
The measurement is to be made by volt-ammetrical method with a d.c. current equal to 100 A, across the main circuit of each panel unit phase.

Acceptance criteria:
The measured resistance shall not exceed 1,2 Ru where Ru is equal to the resistance measured before the temperature rise type test.

The results of the a.m. activities shall be recorded on SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUITS form (see par. 9)

8.3. TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS

Insulation resistance measurement
When the breaker is closed, measure the insulation resistance, phase to ground, with 5 kV d.c. Megger. The test is to be carried out with the other two phases short-circuited and connected to ground.
Then open the breaker and measure the insulation resistance pole to pole.
The above to be carried out for all the phases.

Minimum value of insulation resistance is to be 50 MΩ.

Contact resistance test
The breaker will be in close position before starting the test.
Then inject d.c. current of 100 A on each pole (from in to out of each phase) and measure the voltage drop across it. The measurement is to be done by multimeter
By applying Ohm's law, the resistance value is then calculated. The obtained value needs to be compared with the value given by the manufacturer. Reference is to be made to the voltage drop value of VD4 Circuit Breakers/VSC Contactors, detailed in the relevant Test Reports.

As an alternative, an apparatus with direct reading (Omicron) can be used.

The results of the a.m. activities shall be recorded on SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS form (see par. 9)

8.4. PRIMARY INJECTION ON CURRENT AND VOLTAGE TRANSFORMERS

1. Testing CTs ratio

   Test the CT for correct ratio with direct current injection to CT primary circuit and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

2. Testing VTs ratio

   Test the VT for correct ratio with direct voltage injection to VT primary circuit (low voltage 400 V, for testing purpose) and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

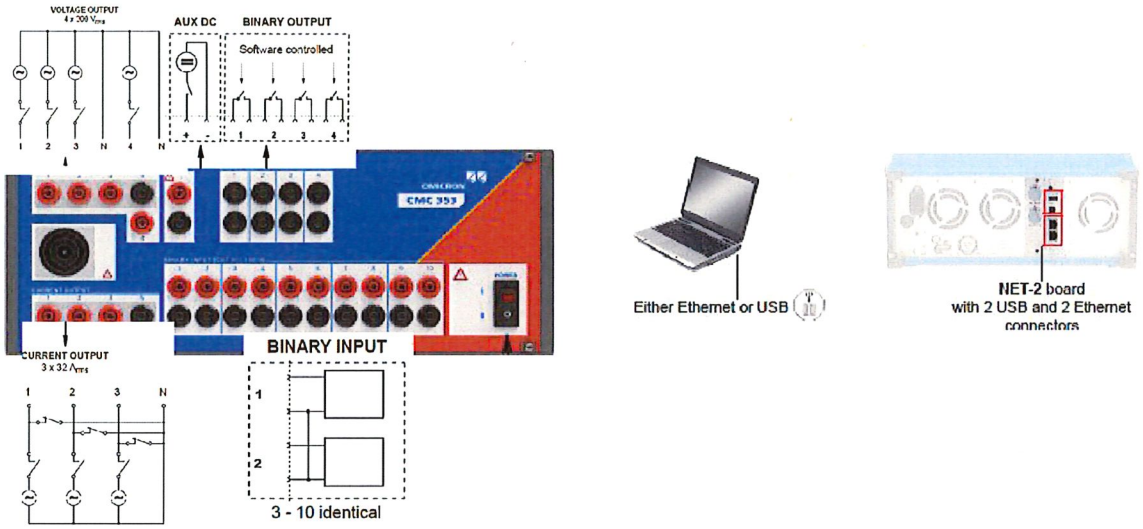
   The results of the a.m. activities shall be recorded on SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs form (see par. 9)

8.5. SECONDARY INJECTION TESTS ON PROTECTION RELAYS

Refer to the schematic diagrams, for connections and for checking logic functions.
Refer to the selectivity study for the protection relays' setting parameters.
Softwares to be employed for uploading, setting and testing the H.V. Switchgear's protection relays are:

- Interface Software to be used – ABB PCM600 2.9 32 bit / ABB PCM600 2.10 32 bit
- ITT600 Integrated Testing Tool or equivalent

Omicron secondary injection test kit – connection and interface



Example of testing instruments connection

1 – Connection of the test set to the PC (USB Port) for data exchange: output of the data simulation, loading of the binary signal
2 – Connection of the analogue outputs of the test set to the transformer inputs of the test object, to inject the simulated currents and voltages.
3 – Connection of the binary outputs of the test set to the binary inputs of the test object, to send binary input signals to the test object.
4 – Connection of the binary inputs of the test set to the binary outputs of the test object, to receive the binary output signals from the test object.

The recorded tripping values shall be in conformity with the Selectivity study

N.B. : Checks on the Partial Discharge detecting systems calibration are also intended within this testing phase.

The results of the a.m. activities shall be recorded on SAT REPORT FOR PROTECTION FUNCTIONS CHECK form (see par. 9)

8.6. HI-POT TEST

The dielectric tests are carried out to check that the installation and re-connection activities at site have been made correctly and that no damage occurred to the equipment, during shipment and installation.

These tests shall be performed before to install the power and cables.

8.6.1. POWER-FREQUENCY WITHSTAND VOLTAGE TEST AND INSULATION RESISTANCE MEASUREMENT

All the VT's, surge arresters, insulation monitoring devices, etc. must be disconnected before the test.
A voltage generator, at industrial power frequency voltage, is to be used to carry out the test.

1. Insulation resistance measurement

Before and after the Hi-pot test, insulation resistance measurement is to be carried out, applying 5 kV d.c. by means of Megger device. The measurement is to be carried out at each phase, while the other two are short-circuited and connected to ground.
The values detected before and after the Hi-pot test will be recorded in the SAT Report.

2. Carrying out the test on the power circuits

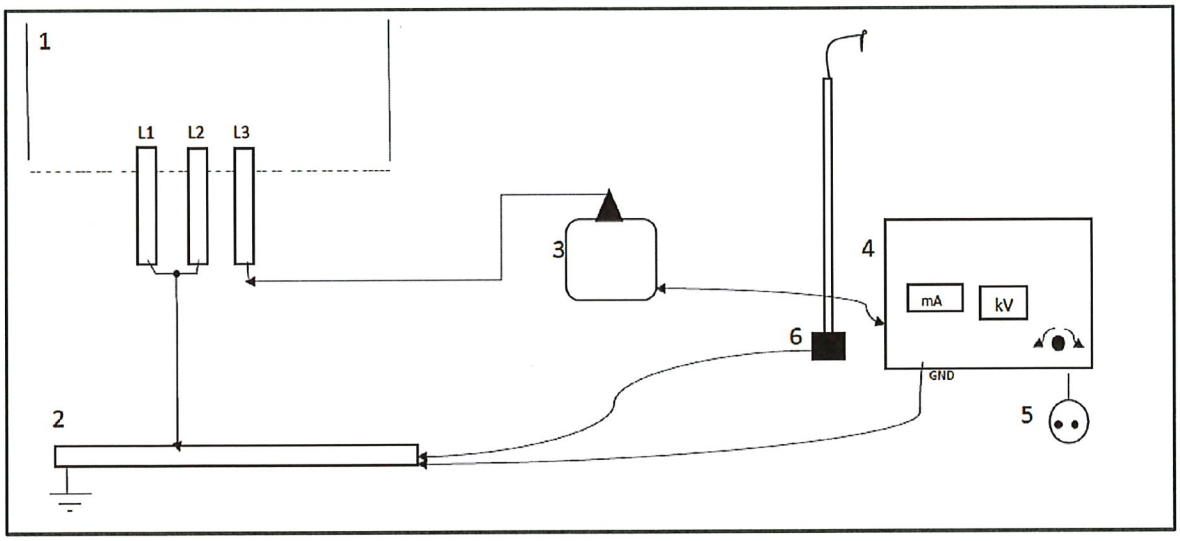
The test voltage to be applied, referring to the rated voltage of the switchboard is as follows (ref. IEC 62271-1, Table 1):

Rated Voltage kV r.m.s. value)	Test Voltage (kV r.m.s. value) AC (100% during F.A.T.)	Test Voltage (kV r.m.s. value) AC (80% during S.A.T.)	Applicability
7.2	20	16	

N.B.: the above test voltage value is 80% of the rated power-frequency withstand voltage at FAT, as specified in clause 7.105 of Std. IEC 62271-200.

HI-Pot Test Lay-Out

1) HV Switchboard Busbar
2) Ground Reference
3) Step-up Transformer
4) Hi-Pot Tester
5) Power supply
6) Ground stick



Example: test layout for testing at phase L3

- Connect to ground the control desk, the VT truck, the foil, the equipment under test
- Limit the test area by means of appropriate barriers
- Connect the MV pole of the VT to the phase under test of the panel, while the other two phases are connected together and to ground
- Connect the flashing lights barriers, the VT truck and its power plug
- The operator, before starting the test, must ensure that nobody is within the hurdles
- Close the main switch of the testing bench and rotate slowly the rheostat knob, until reached the test voltage value, read on the voltmeter (**N.B.** if the rheostat knob is in zero position, the circuit is not closed)

All the above indication may be slightly different, depending on the VT truck type, available at site.

Check the dielectric strength of the main circuits by applying the test voltage for 1 minute on the following points:

- between phase L1 and the phases L2 and L3 connected to ground
- between phase L2 and the phases L1 and L3 connected to ground
- between phase L3 and the phases L1 and L2 connected to ground

The test is considered successful when no discharge or perforation occur within 1 minute.
If discharge phenomena are perceived, the test is considered anyway valid if the test bench does not detect this phenomenology.

After the test or if there has been a discharge, return to zero the rheostat and discharge any possible capacitive voltage remained on the VT pole, by means of the foil. After that, it will be allowed to access to the test object.

Apply the same test to the other two phases, in turn, by repeating the steps described here above.

The results of the a.m. dielectric tests shall be recorded on SAT REPORT FOR HI-POT TEST form (see par. 9)

8.6.2. DIELECTRIC TEST ON AUXILIARY CIRCUIT AND INSULATION RESISTANCE MEASUREMENT

1. Insulation resistance measurement

Before and after the dielectric test on auxiliary circuits, insulation resistance measurement is to be carried out, applying 500 V d.c. by means of Megger device. The measurement is to be carried out at each pole, while the other one is connected to ground.

The values detected before and after the below test will be recorded in the SAT Report.

2. Carrying out the dielectric test on the auxiliary circuits

The test is to be carried out by applying the voltage test between the single pole of the auxiliary and control circuits and ground (between each conductor and the other conductors connected to ground, in turns).

All current absorbing equipment, which would be damaged by the application of the testing voltage (coils, metering instruments, differential circuit breakers, etc.) must be disconnected before the test.

The voltage value to be applied is 2000 V, with duration of 1 min. (CEI EN 62271-1, pos. 6.2.10 applies).

The test is considered successful, if no discharge or perforation occur during the test (1 minute).

The results of the a.m. dielectric tests shall be recorded on SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS form (see par. 9)

8.7. INFRARED SENSORS TESTS

It is here detailed the test method to carry out testing on Exertherm devices, based on infrared thermal sensing.

1. All sensor distance from busbar locations must adhere to standards for clearance from bus bars and cables, depending on circuits rated voltage.

2. Testing must be carried out in a location which provides reasonably stable ambient conditions; i.e. avoid rooms where direct sunlight cannot be prevented, or which are subject to frequent ambient variances.

3. Ambient temperature will be measured on the Exertherm Sensors i.e. at the lens end of the IRT/c using any suitably calibrated non-contact temperature measuring instrument, with certified accuracy. Calibration certificate must be available for scrutiny and up to date.

4. The following method of ambient measurement will be adopted.

   Ambient air temperature is to be between 10°C and 40°C

   - Measurement of ambient air temperature: indoor ambient air temperatures shall be determined by taking the average of the readings of three temperature-measuring devices, such as thermometers or thermocouples, placed as follows:

   a) One level with the top of the structure
   b) One 30 cm above the bottom of the structure
   c) One midway between the two positions a) and b).

   - All temperature-measuring devices shall be placed 30 cm from the structure, not in front of ventilators, and in locations unaffected by drafts caused by the structure or appreciable radiation from the equipment. When the ambient air temperature is subject to variations that might result in errors in measuring the temperature rise, the temperature-measuring devices should be immersed in a suitable liquid, such as oil, in a suitable container, or reliably attached to a suitable mass of metal.

NOTE - A convenient form for such a container consists of a metal cylinder with a hole drilled partly through it. This is filled with liquid and the temperature-measuring device is placed therein. The size of the container should be at least 2.5 cm in diameter and 5.0 cm high.

The ambient temperature used when calculating the connection delta temperature will be the local ambient recorded at the Exertherm Sensor location.

5. All Datacard power supplies will be maintained at 24V d.c. ±10%.

6. All equipment test apparatus and Sensors to be used during these tests will be left to acclimatise in the switchgear for a period of a minimum of 1 hour prior to any tests taking place.

7. It is assumed that all Datacards are programmed and commissioned according to the relevant product instructions.

8.7.1. TEST PROCEDURE – TEST WITH CIRCUITS NOT ENERGISED

1. Ensure all power supplies are set at the correct voltage and within specification i.e. at 110 V d.c. and 24 V d.c. ±10%.

2. Take a reading of room ambient as described in the previous section and note this value on the test check sheet (section Room Ambient)

3. Take a reading of the ambient temperature at the Sensor under test and note this value on the test check sheet (section Ambient Test Reading)

4. Take a reading from the Datacard software on the Sensor under test and note the value on the test check sheet (section Sensor Reading Under Test)

5. Take a reading of absolute temperature from the busbar with a suitably calibrated and certified temperature measurement device and note this reading. This should be an average reading across the connection point and not just one 'spot' temperature and note the value on the test check sheet (section Absolute Reading At Sensor)

6. Subtraction of the ambient temperature (at the sensor) from the connection temperature will result in the Delta T value and note the value on the test check sheet (section Calculated Delta T Reading). This should comply with the IR Sensor reading ±3°C (5.4°F)

7. Note down all these readings for future reference.

Repeat the steps 3 to 7 for all Sensors in the panel.

All these readings should produce a Delta T value of between -3°C (-5.4°F) to +3°C (+5.4°F)

It should be noted that this is not process control and therefore readings will not be exact to the degree. The Exertherm Sensor is 100% repeatable in identical conditions.

8.7.2. TEST PROCEDURE – TEST WITH CIRCUITS ENERGISED

1. With the switchgear energised and set in test conditions, with test currents and loading, allow all temperature, including ambient temperature to become stable.
   Leave all equipment to again acclimatise to local conditions for a minimum of 30 minutes.

2. Ensure all power supplies are set at the correct voltage and within specification i.e. at 110 V d.c. and 24 V d.c. ±10%.

3. Take a reading of room ambient temperature as described in the previous section and note this value on the test check sheet (section Room Ambient)

4. Take a reading of the ambient temperature at the Sensor under test and note this value on the test check sheet (section Ambient Test Reading)

5. Take a reading from the Datacard software on the Sensor under test and note the value on the test check sheet (section Sensor Reading Under Test)

6. Take a reading of absolute temperature from the busbar with a suitably calibrated and certified temperature measurement device and note this reading. This should be an average reading across the connection point and not just one 'spot' temperature and note the value on the test check sheet (section Absolute Reading At Sensor)

7. Subtraction of the ambient (at the sensor) from the connection temperature will result in the Delta T value and note the value on the test check sheet OEM Design Validation Test Record (section Calculated Delta T Reading). This should comply with the Exertherm IRT/c sensor reading ±3°C (5.4°F)

8. Note all these readings for future reference.

Repeat these steps 4 to 7 for all Sensors in the panel.

All these readings should produce a Delta T value of between -3°C (-5.4°F) to +3°C (+5.4°F).

The results shall be compared to the relevant data sheet for the Sensor's tolerances in terms of accuracy and repeatability.

The results of the a.m. tests shall be recorded on SAT REPORT FOR INFRARED SENSORS TESTS form (see par. 9)

8.8. NETWORK and GOOSE TESTING

Preliminary checks

1) Ensure that each IED is set with the right parameter of the network below cited
   - Technical key
   - IP address
   - Subnet Mask (in charge to Network vendor engineer)
   - Main NTP address (in charge to Network vendor engineer)
   - Backup NTP address (in charge to Network vendor engineer)
   - Time clock (in charge to Network vendor engineer)
2) Ensure that Ethernet switch is duly set (in charge to Network vendor engineer)
3) Ensure that the IED is switched ON

8.8.1. INTERNAL GOOSE MESSAGING TEST

- Function ANSI 27 block for feeders

Simulate voltage loss from VTs on Busbars metering unit, by opening the distribution MCB, at the secondary circuits of the VTs, or rack-out the VTs trolley, or simulate fuses blown on the VTs' primary circuits.
On different feeder, simulate undervoltage condition with racked-in & closed position of the HV breaker.
The HV Circuit Breaker or HV Vacuum Contactor shall remain closed.

- Arc Flash Trip

CABLE COMPARTMENT

Arc Flash detected on power cables compartment shall only open the breaker of its own feeder unit, in case of contemporary detection of arc flash light and current flow reading, through the CTs and protection relay.
At the Incoming units, breaker opening is activated by only detecting arc flash light.

Test execution:
Connect the test bench in order to inject a secondary current, according the setting tables, to the unit's protection relay.
Inject the current and simulate a flash light in the cables compartment, from the rear of the Swbd.
The test can be consider passed if the breaker will be opened.

BUSBARS OR CB COMPARTMENT:

Arc Flash detected on Busbars chamber or on CB compartment shall result in a complete shutdown of the Switchboard, in case of contemporary detection of arc flash light and current flow reading, through the CTs and protection relay.

Test execution:
Connect the test bench in order to inject a secondary current, according the setting tables, to the protection relay of the Incoming unit.
Choose a CB compartment or Busbar section where to simulate the flash light, inject the current and simulate the flash light in the compartment.
The test can be consider passed if the complete shutdown of the busbars section will be verified.

8.8.2. EXTERNAL GOOSE MESSAGING TEST

Scope of these tests is in cooperation with the Network vendor engineer.
The tests can start only if all Ethernet switches have been set from the Network vendor engineer.

- PMS Goose test:

The HVSB receives and transmit goose messages from/to PMS.
For testing purpose of proper communication with PMS, the HVSB vendor can support the PMS vendor or the Network vendor engineer for execution of the following activities:

- opening closing the HV circuit breaker / HV Contactors
- racking-in / racking-out HV circuit breaker / HV Contactors
- opening / closing the earthing switches
- secondary injection tests on the protection relays

This part of the SAT is in charge to the Network Vendor.

8.8.3. INFRARED SENSORS MODBUS NETWORK

Scope of these tests is in cooperation with the Network vendor engineer.
The tests can start only if all Ethernet switches have been set from the Network vendor engineer.

These activities can be performed in parallel to IR sensors tests (see paragraph 7.7). This is possible also if the Network is not connected with the PMS, by connecting directly to the switch installed in the HVSB.

This part of the SAT is in charge to the Network Vendor.

The results of the a.m. Goose messaging tests shall be recorded on SAT REPORT FOR GOOSE MESSAGING TESTS form (see par. 9)

9. PRE-ENERGIZATION REQUIREMENTS

Before to proceed with energization of the HVSB, the following is to be verified.

- Make sure to pull off the short-circuit jumpers fitted on amperometric terminal boards, to avoid running the units with current transformer (-TI..-L..) short-circuited at secondary windings.
- Make sure to have re-closed the disconnecting terminals fitted on voltmetric terminal boards, to avoid running the units with voltage transformer (-TU-L..) not connected at secondary windings.
- Make sure that all the miniature CBs for aux. and measuring circuits are closed
- All system protections, controls, detectors and monitoring devices shall be reset and ready for operation
- All protections and control logics shall be reset and ready for operation
- All recording equipment, where provided, shall be in operation
- No alarm and/or trip signal shall be active
- Earthing switches shall be locked in open position
- Voltage transformers shall be in service position (racked-in), with primary fuses suitably placed
- H.V. circuit breakers and vacuum contactors shall be in service position (racked-in), open and available
- Fuses at the HV vacuum contactors shall be suitably placed
- Mechanical and electrical interlocks are to be suitably in operation
- All removable protections against direct contacts with accessible parts (panels, grids, plates, doors, etc.), shall be correctly placed and fixed
- All the doors shall be closed and fixed panels are to be correctly positioned and bolted

10. PRE-COMMISSIONING, COMMISSIONING AND SAT REPORT TEMPLATES

The following forms are intended for recording the results of Pre-Commissioning, Commissioning and SAT activities.

Forms provided by the customer may also be employed, on request.

PRE-COMMISSIONING ACTIVITIES REPORT

COMMISSIONING ACTIVITIES REPORT

SAT REPORT FOR MECHANICAL TESTS

SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUIT

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS
- INSULATION RES. MEASUREMENT -

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS
- INSULATION RES. MEASUREMENT –

SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs

SAT REPORT FOR PROTECTION FUNCTIONS CHECK

SAT REPORT FOR HI-POT TEST

SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS

SAT REPORT FOR INFRARED SENSORS TESTS

SAT REPORT FOR GOOSE MESSAGING TESTS

IMESA ELECTRICAL ENGINEERING

PRE-COMMISSIONING ACTIVITIES REPORT

SWBD: **SG-100D1**

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
COLUMN: 1	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 2	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 3	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 4	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 5	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 6	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 7	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

COMMISSIONING ACTIVITIES REPORT

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2	3	4	5	6	7	8	9	10							
COLUMN: 1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 5	N/A	OK	OK	OK	N/A	OK	N/A	N/A	N/A	N/A							
COLUMN: 6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 7	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR MECHANICAL TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	1	2															
COLUMN: 1	OK	OK															
COLUMN: 2	OK	OK															
COLUMN: 3	OK	OK															
COLUMN: 4	OK	OK															
COLUMN: 5	OK	OK															
COLUMN: 6	OK	OK															
COLUMN: 7	OK	OK															

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

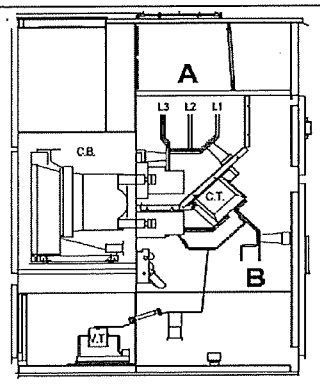
SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUIT

SWBD: SG-100D1

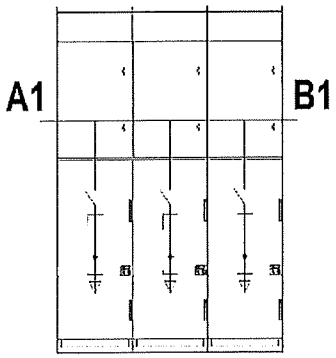
CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Value of injected current: 100 A

TYPICAL PANEL ARRANGEMENT DRAWING



Panel unit circuit



Switchboard's bus-bars

Measure =ment between AB or A1/B1	Phase L1 *Measured resistance* (μΩ)*	Phase L2 *Measured resistance* (μΩ)*	Phase L3 *Measured resistance* (μΩ)*
A1-B1	198.56	223.42	200.62

* *To obtain the measured resistance value, in μΩ, is sufficient to multiply by 10 the measured v.d. in mV (e.g. : voltage drop of 1.4 mV = 14 μΩ)*

NOTES:

TEST PERFORMER **EXECUTED**	**WITNESS** **ACCEPTED / VERIFIED**	**QUALITY OFFICER** **ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: IMESA **Name: Piangerelli**	**Company: Rosetti** **Name: Castellani**	**Company:** **Name:**	**Company:** **Name:**
Date: 06/12/2024	**Date:** 06/12/2024	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS - INSULATION RES. MEASUREMENT -

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Megger test with 5 kV d.c.

DESCRIPTION	Phase L1 *Measured insulation resistance* (MΩ)*	Phase L2 *Measured insulation resistance* (MΩ)*	Phase L3 *Measured insulation resistance* (MΩ)*
COLUMN: 1			
COLUMN: 2			
COLUMN: 3			
COLUMN: 4			
COLUMN: 5			
COLUMN: 6			
COLUMN: 7			

* *Minimum value of insulation resistance is to be 50 MΩ*

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS - RESISTANCE OF THE MAIN CIRCUIT -

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Value of injected current: 100 A

DESCRIPTION	Phase L1 *Measured resistance* (μΩ)*	Phase L2 *Measured resistance* (μΩ)*	Phase L3 *Measured resistance* (μΩ)*
COLUMN: 1			
COLUMN: 2			
COLUMN: 3			
COLUMN: 4			
COLUMN: 5			
COLUMN: 6			
COLUMN: 7			

* *To obtain the measured resistance value, in μΩ, is sufficient to multiply by 10 the measured v.d. in mV (e.g. : voltage drop of 1.4 mV = 14 μΩ)*

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - N/A – not applicable × SEE NOTE

DESCRIPTION	**1**	**2**															
COLUMN: 1																	
COLUMN: 2																	
COLUMN: 3																	
COLUMN: 4																	
COLUMN: 5																	
COLUMN: 6																	
COLUMN: 7																	

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PROTECTION FUNCTIONS CHECK

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**
PROT. RELAYS' COORD. STUDY DOC. :	**PANEL UNIT:**	**RELAY SERIAL NO. :**

protection unit setting test values					*protection unit operation check values*			
Protection Function	*ANSI Code*	*Setting*		*CT/VT Ratio*	*Phase*	*Test Value*	*Operating Time*	*Result*
		Value	Time [s] or K					

Notes:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR HI-POT TEST

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend	**OK** -	**N/A** – not applicable	× SEE NOTE											
DESCRIPTION	**1**	**2**												
HI-POT TEST ON POWER CIRCUITS	OK	OK												

Applied Voltage on the power circuits: 16 kV (80% of the FAT rated value)
Duration Time: 60 s

Measured Insulation Resistance

BEFORE TEST	AFTER TEST
L1 – L2= 1.89 TΩ	L1 – L2= 1.68 TΩ
L1 – L3= 2.36 TΩ	L1 – L3= 2.06 TΩ
L2 – L3= 1.94 TΩ	L2 – L3= 2.03 TΩ

NOTES:
Equipment disconnected during Hi-Pot test:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: IMESA **Name: Piangerelli**	**Company: Rosetti** **Name: Castellani**	**Company:** **Name:**	**Company:** **Name:**
Date: 06/14/2024	**Date:** 06/12/2024	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2											
DIELECTRIC TEST ON AUX. CIRCUITS													

Applied Voltage on the power circuits: 2000 V a.c.
Duration Time: 60 s

Measured Insulation Resistance

BEFORE TEST	AFTER TEST
110 V d.c. =	110 V d.c. =
230 V a.c. =	230 V a.c. =
24 V d.c. =	24 V d.c. =

NOTES:
Equipment disconnected during dielectric test:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR INFRARED SENSORS TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Modbus Address			Serial N.					
Data Card Channels (2)								
	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8
Section Reference (1)								
Phase Reference								
Sensor Type								
IR.EM-06.SC – Delta T								
No Sensor								
IR.EM-06.SC ONLY								
Busbar Size								
Mounting Distance								
Gain Factor Used								
Site Acceptance Test								
Initial Value								
Heat Tested Reading								

(1) Note CB = Cable Compartment BB = Busbar Compartment

(2) See ref. Documents 1723002197-EL-LIS-00041 and 1723002197-EL-DG-00022

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR GOOSE MESSAGING TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

					From					
					SIGNAL Description	BB VT OPEN	ES BB OPEN	CLOSING COMMAND	OPENING COMMAND	
	CUBICLE	DEVICE	SIGNAL	GOOSERX N		0	1	2	3	
Destination Unit			TRIP							
			ARC FAULT							

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

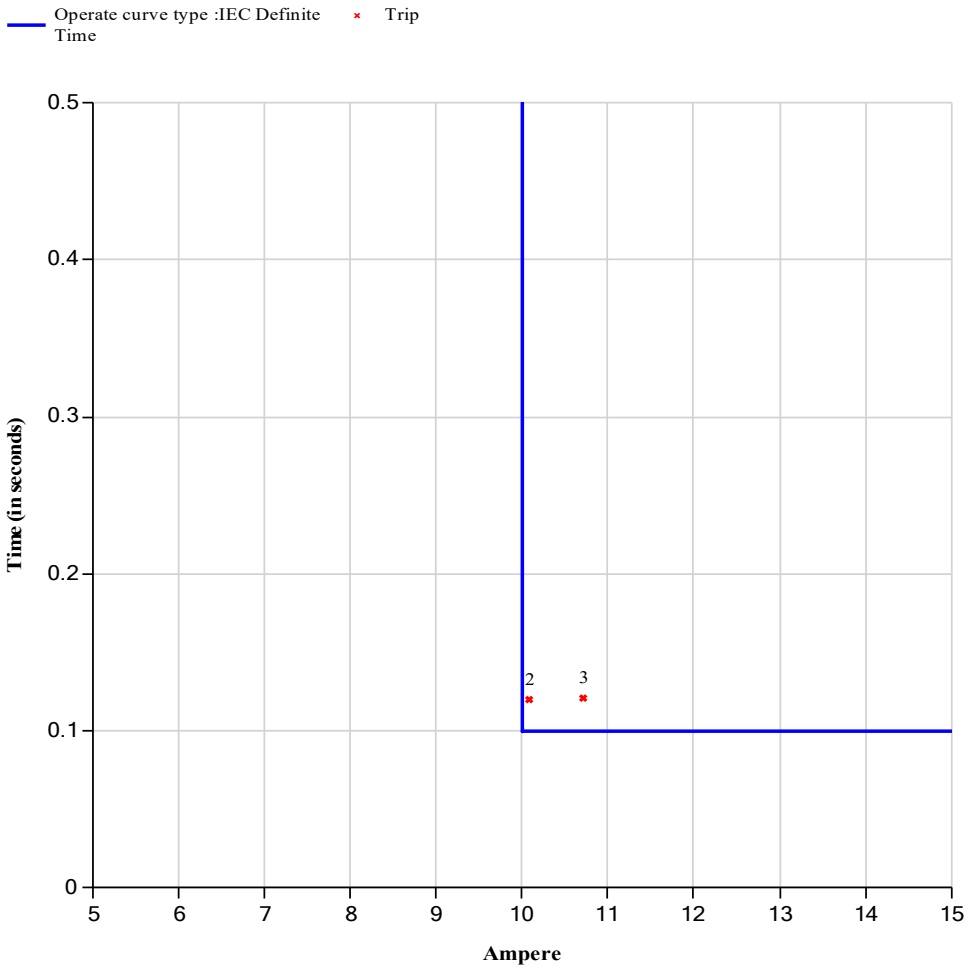
ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 275.6 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.100 xIn
Operate delay time : 100 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	9.75	0.098	0	0	0	0
2	10.08	0.101	0	100	120	20
3	10.71	0.107	0	100	121	21

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

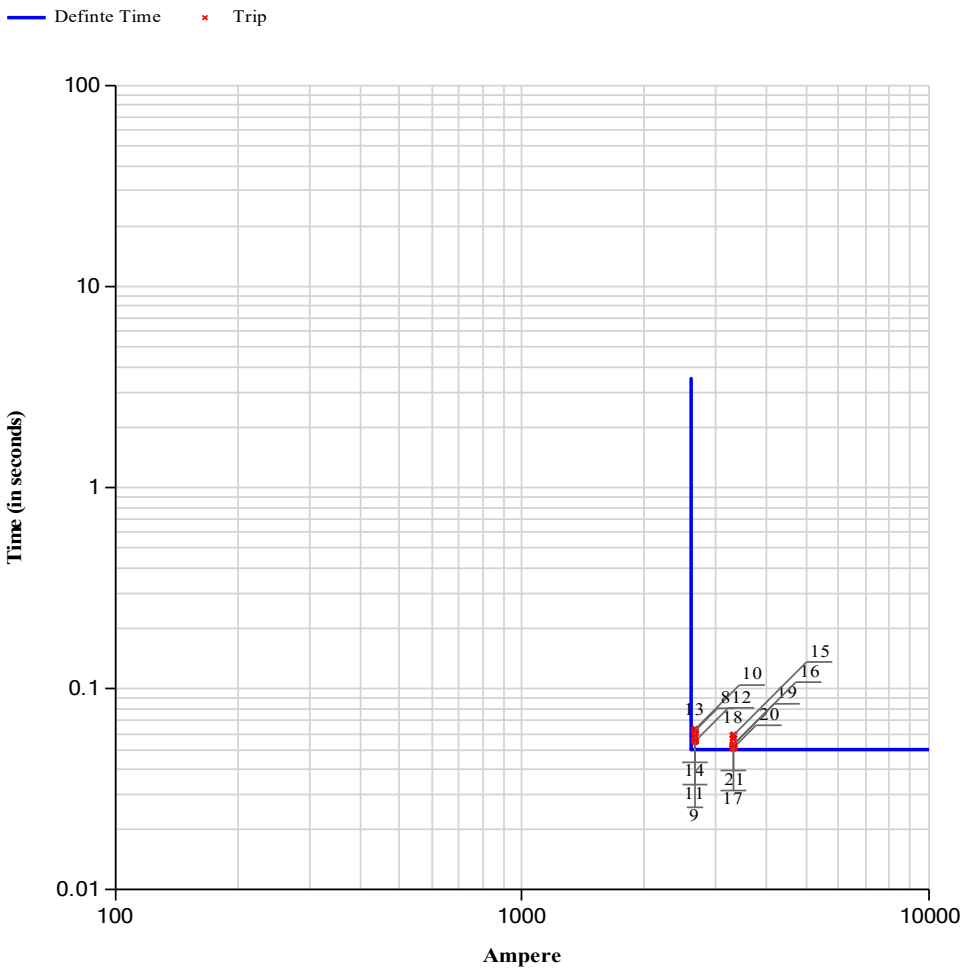
ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858

IEC61850 : PHIPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 400 / 1 A
Nominal current : 275.6 A
Num of start phases : 1 Out of 3
Reset delay time : 20 ms
Start value : 6.50 xIn
Start valure Mult : 1.0
Operate delay time : 50 ms



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2529	6.323	0	0	0	0	0	0	0	0	0	0
2	0	0	0	2529	6.323	240	0	0	0	0	0	0
3	0	0	0	0	0	0	2529	6.323	120	0	0	0
4	2529	6.323	0	2529	6.323	180	0	0	0	0	0	0
5	0	0	0	2529	6.323	240	2529	6.323	60	0	0	0
6	2529	6.323	300	0	0	0	2529	6.323	120	0	0	0
7	2529	6.323	0	2529	6.323	240	2529	6.323	120	0	0	0
8	2657	6.643	0	0	0	0	0	0	0	50	62	24
9	0	0	0	2657	6.643	240	0	0	0	50	55	10

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

RELAY TYPE : ABB REX640

ITEM : UNIT A1

Sn. : 1VHR81041858

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHIPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	2657	6.643	120	50	63	26
11	2657	6.643	0	2657	6.643	180	0	0	0	50	58	16
12	0	0	0	2657	6.643	240	2657	6.643	60	50	55	10
13	2657	6.643	300	0	0	0	2657	6.643	120	50	62	24
14	2657	6.643	0	2657	6.643	240	2657	6.643	120	50	56	12
15	3303	8.258	0	0	0	0	0	0	0	50	59	18
16	0	0	0	3303	8.258	240	0	0	0	50	53	6
17	0	0	0	0	0	0	3303	8.258	120	50	52	4
18	3303	8.258	0	3303	8.258	180	0	0	0	50	57	14
19	0	0	0	3303	8.258	240	3303	8.258	60	50	53	6
20	3303	8.258	300	0	0	0	3303	8.258	120	50	51	2
21	3303	8.258	0	3303	8.258	240	3303	8.258	120	50	51	2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

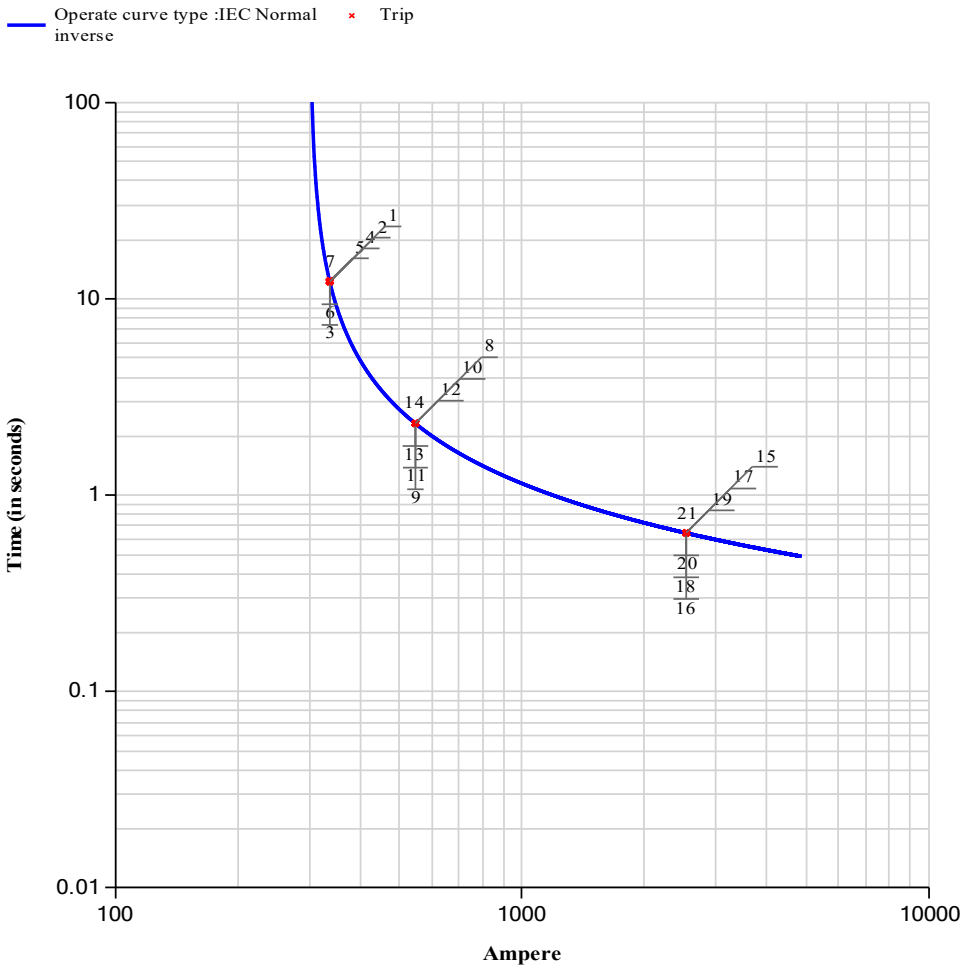
ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 400 / 1 A
Nominal current : 275.6 A
Num. start phases : 1 out of 3
Minimum operate time : 50 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 0.75 xIn
Start value mult. : 1.00
Time multiplier : 0.20
Operate curve type : IEC Normal inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	336	0.841	0	0	0	0	0	0	0	12214	12269	0.45
2	0	0	0	336	0.841	240	0	0	0	12214	12221	0.06
3	0	0	0	0	0	0	336	0.841	120	12214	12408	1.59
4	336	0.841	0	336	0.841	240	0	0	120	12214	12237	0.19
5	0	0	0	336	0.841	240	336	0.841	120	12214	12379	1.35
6	336	0.841	0	0	0	240	336	0.841	120	12214	12265	0.42
7	336	0.841	0	336	0.841	240	336	0.841	120	12214	12299	0.7
8	546	1.365	0	0	0	0	0	0	0	2323	2330	0.3
9	0	0	0	546	1.365	240	0	0	0	2323	2330	0.3

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

RELAY TYPE : ABB REX640

ITEM : UNIT A1

Sn. : 1VHR81041858

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	546	1.365	120	2323	2331	0.34
11	546	1.365	0	546	1.365	240	0	0	120	2323	2330	0.3
12	0	0	0	546	1.365	240	546	1.365	120	2323	2329	0.26
13	546	1.365	0	0	0	240	546	1.365	120	2323	2329	0.26
14	546	1.365	0	546	1.365	240	546	1.365	120	2323	2330	0.3
15	2529	6.323	0	0	0	0	0	0	0	643	646	0.47
16	0	0	0	2529	6.323	240	0	0	0	643	644	0.16
17	0	0	0	0	0	0	2529	6.323	120	643	645	0.31
18	2529	6.323	0	2529	6.323	240	0	0	120	643	644	0.16
19	0	0	0	2529	6.323	240	2529	6.323	120	643	644	0.16
20	2529	6.323	0	0	0	240	2529	6.323	120	643	646	0.47
21	2529	6.323	0	2529	6.323	240	2529	6.323	120	643	643	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

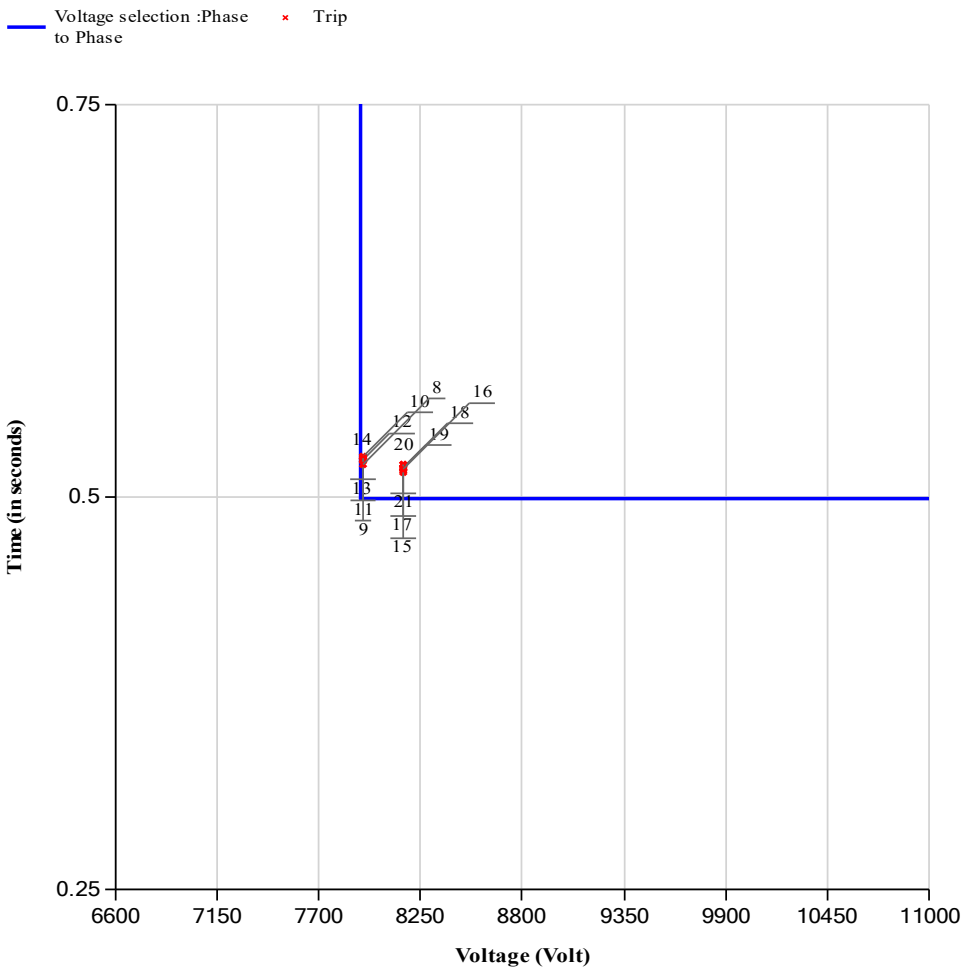
ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 500 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5262	87.704	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5262	87.701	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5262	87.703	120	0	0	0
4	4556	75.93	0	4556	75.93	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4556	75.929	240	4556	75.929	120	0	0	0
6	4556	75.932	0	3811	63.509	240	4556	75.932	120	0	0	0
7	4556	75.934	0	4556	75.934	240	4556	75.934	120	0	0	0
8	5315	88.576	0	3811	63.509	240	3811	63.509	120	500	521	4.2
9	3811	63.509	0	5316	88.596	240	3811	63.509	120	500	525	5

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

RELAY TYPE : ABB REX640

ITEM : UNIT A1

Sn. : 1VHR81041858

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5316	88.594	120	500	526	5.2
11	4584	76.395	0	4584	76.395	240	3811	63.509	120	500	524	4.8
12	3811	63.509	0	4583	76.39	240	4583	76.39	120	500	524	4.8
13	4583	76.387	0	3811	63.509	240	4583	76.387	120	500	526	5.2
14	4583	76.389	0	4583	76.389	240	4583	76.389	120	500	524	4.8
15	5554	92.565	0	3811	63.509	240	3811	63.509	120	500	516	3.2
16	3811	63.509	0	5553	92.553	240	3811	63.509	120	500	518	3.6
17	3811	63.509	0	3811	63.509	240	5553	92.557	120	500	521	4.2
18	4709	78.478	0	4709	78.478	240	3811	63.509	120	500	519	3.8
19	3811	63.509	0	4709	78.488	240	4709	78.488	120	500	519	3.8
20	4708	78.474	0	3811	63.509	240	4708	78.474	120	500	521	4.2
21	4709	78.48	0	4709	78.48	240	4709	78.48	120	500	517	3.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

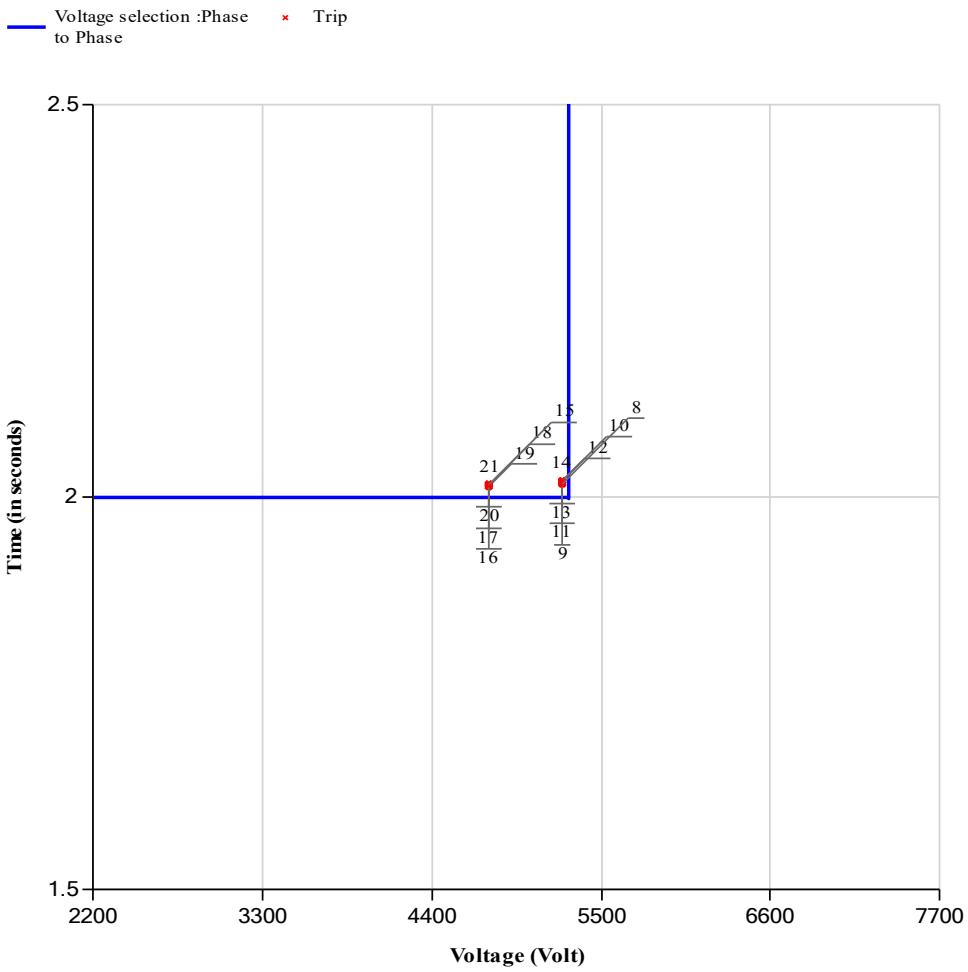
EQUIPMENT DESCRIPTION : -A-20000

ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858



IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.10 xUn
Enable block value : False
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2000 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2258	37.637	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2259	37.65	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2259	37.648	120	0	0	0
4	3067	51.12	0	3067	51.12	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3067	51.122	240	3067	51.122	120	0	0	0
6	3067	51.124	0	3811	63.509	240	3067	51.124	120	0	0	0
7	3067	51.123	0	3067	51.123	240	3067	51.123	120	0	0	0
8	2171	36.188	0	3811	63.509	240	3811	63.509	120	2000	2017	0.85
9	3811	63.509	0	2172	36.194	240	3811	63.509	120	2000	2019	0.95

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

RELAY TYPE : ABB REX640

ITEM : UNIT A1

Sn. : 1VHR81041858

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2172	36.194	120	2000	2021	1.05
11	3028	50.472	0	3028	50.472	240	3811	63.509	120	2000	2019	0.95
12	3811	63.509	0	3028	50.469	240	3028	50.469	120	2000	2021	1.05
13	3028	50.463	0	3811	63.509	240	3028	50.463	120	2000	2021	1.05
14	3028	50.467	0	3028	50.467	240	3028	50.467	120	2000	2018	0.9
15	1536	25.595	0	3811	63.509	240	3811	63.509	120	2000	2016	0.8
16	3811	63.509	0	1536	25.594	240	3811	63.509	120	2000	2014	0.7
17	3811	63.509	0	3811	63.509	240	1536	25.599	120	2000	2017	0.85
18	2753	45.88	0	2753	45.88	240	3811	63.509	120	2000	2016	0.8
19	3811	63.509	0	2753	45.881	240	2753	45.881	120	2000	2014	0.7
20	2753	45.882	0	3811	63.509	240	2753	45.882	120	2000	2017	0.85
21	2753	45.88	0	2753	45.88	240	2753	45.88	120	2000	2014	0.7

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-20000

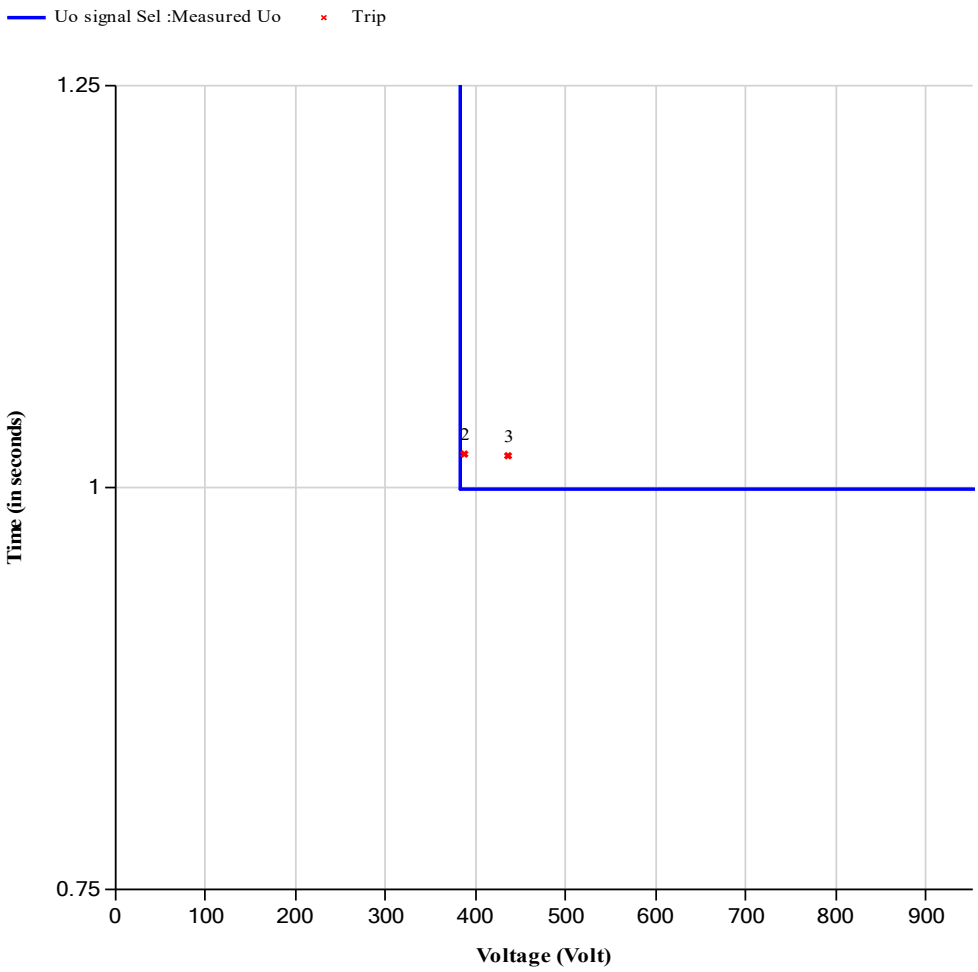
ITEM : UNIT A1

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041858

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1000 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	372	10.733	0	0	0
2	387	11.181	1000	1021	2.1
3	436	12.581	1000	1020	2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

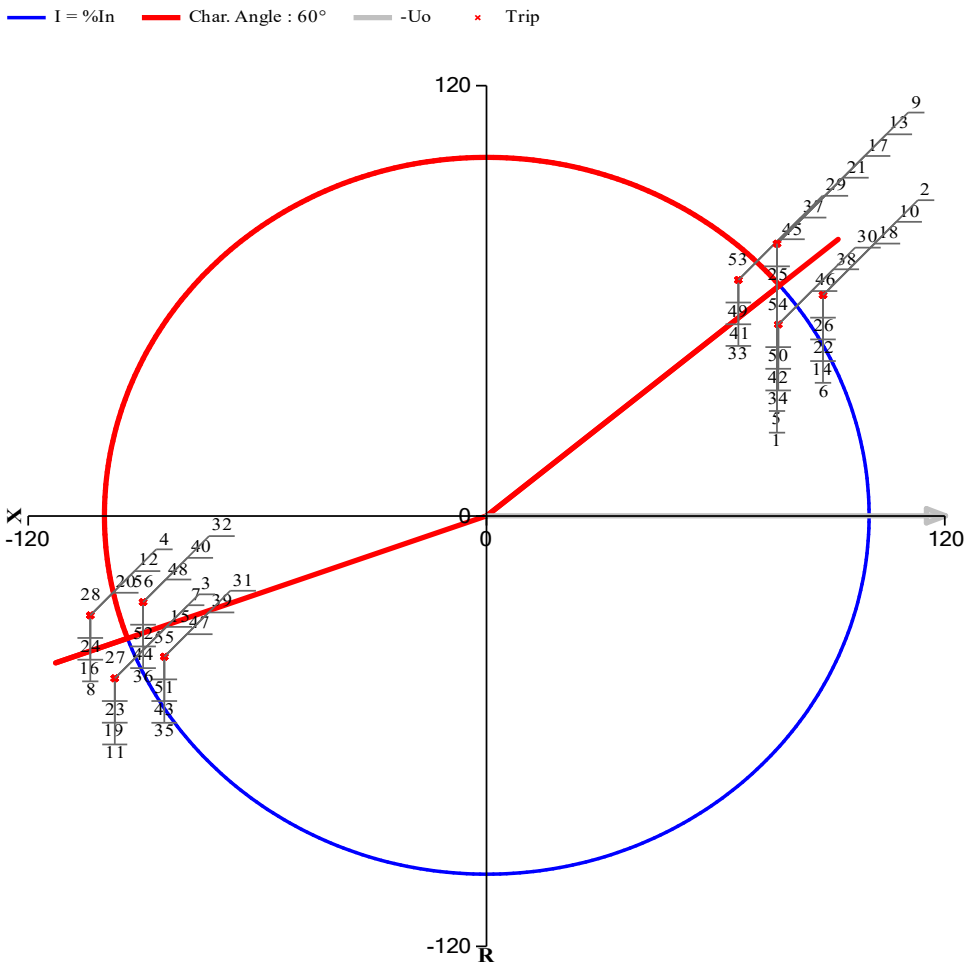
EQUIPMENT DESCRIPTION : -TR-200ED1

ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857



IEC61850 : DPHLPDOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 50 A
Nominal current : 43.7 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 1.00 xIn
Start value mult. : 1.00
Directional mode : Reverse
Operate curve type : IEC Definite Time
Operate delay time : 700 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	1.074	45	1.074	-75	1.074	165	0.953	0	0.953	240	0.953	120	700	720	2.86
2	1.074	35	1.074	-85	1.074	155	0.953	0	0.953	240	0.953	120	0	0	0
3	1.074	-155	1.074	85	1.074	-35	0.953	0	0.953	240	0.953	120	0	0	0
4	1.074	-165	1.074	75	1.074	-45	0.953	0	0.953	240	0.953	120	700	721	3
5	1.074	75	1.074	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	700	721	3
6	1.074	65	1.074	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	1.074	-125	1.074	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	1.074	-135	1.074	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	700	722	3.14
9	0	0	1.074	-45	1.074	135	63.509	0	0.953	-140.71	0.953	140.71	700	722	3.14

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	1.074	-55	1.074	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	1.074	115	1.074	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	1.074	105	1.074	-75	63.509	0	0.953	-140.71	0.953	140.71	700	725	3.57
13	1.074	15	0	240	1.074	-165	0.953	20.71	63.509	240	0.953	99.29	700	720	2.86
14	1.074	5	0	240	1.074	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	1.074	175	0	240	1.074	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	1.074	165	0	240	1.074	-15	0.953	20.71	63.509	240	0.953	99.29	700	723	3.29
17	1.074	45	0	0	0	0	0.953	0	63.509	240	63.509	120	700	721	3
18	1.074	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	1.074	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	1.074	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	700	720	2.86
21	0	0	1.074	-75	0	0	63.509	0	0.953	240	63.509	120	700	723	3.29
22	0	0	1.074	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	1.074	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	1.074	75	0	0	63.509	0	0.953	240	63.509	120	700	722	3.14
25	0	0	0	0	1.074	165	63.509	0	63.509	240	0.953	120	700	719	2.71
26	0	0	0	0	1.074	155	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	1.074	-35	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	1.074	-45	63.509	0	63.509	240	0.953	120	700	722	3.14
29	0.931	45	0.931	-75	0.931	165	0.953	0	0.953	240	0.953	120	0	0	0
30	0.931	35	0.931	-85	0.931	155	0.953	0	0.953	240	0.953	120	0	0	0
31	0.931	-155	0.931	85	0.931	-35	0.953	0	0.953	240	0.953	120	0	0	0
32	0.931	-165	0.931	75	0.931	-45	0.953	0	0.953	240	0.953	120	0	0	0
33	0.931	75	0.931	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.931	65	0.931	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.931	-125	0.931	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.931	-135	0.931	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.931	-45	0.931	135	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.931	-55	0.931	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.931	115	0.931	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.931	105	0.931	-75	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.931	15	0	240	0.931	-165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.931	5	0	240	0.931	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.931	175	0	240	0.931	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.931	165	0	240	0.931	-15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.931	45	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.931	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.931	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.931	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.931	-75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.931	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.931	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.931	75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.931	165	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.931	155	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.931	-35	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.931	-45	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

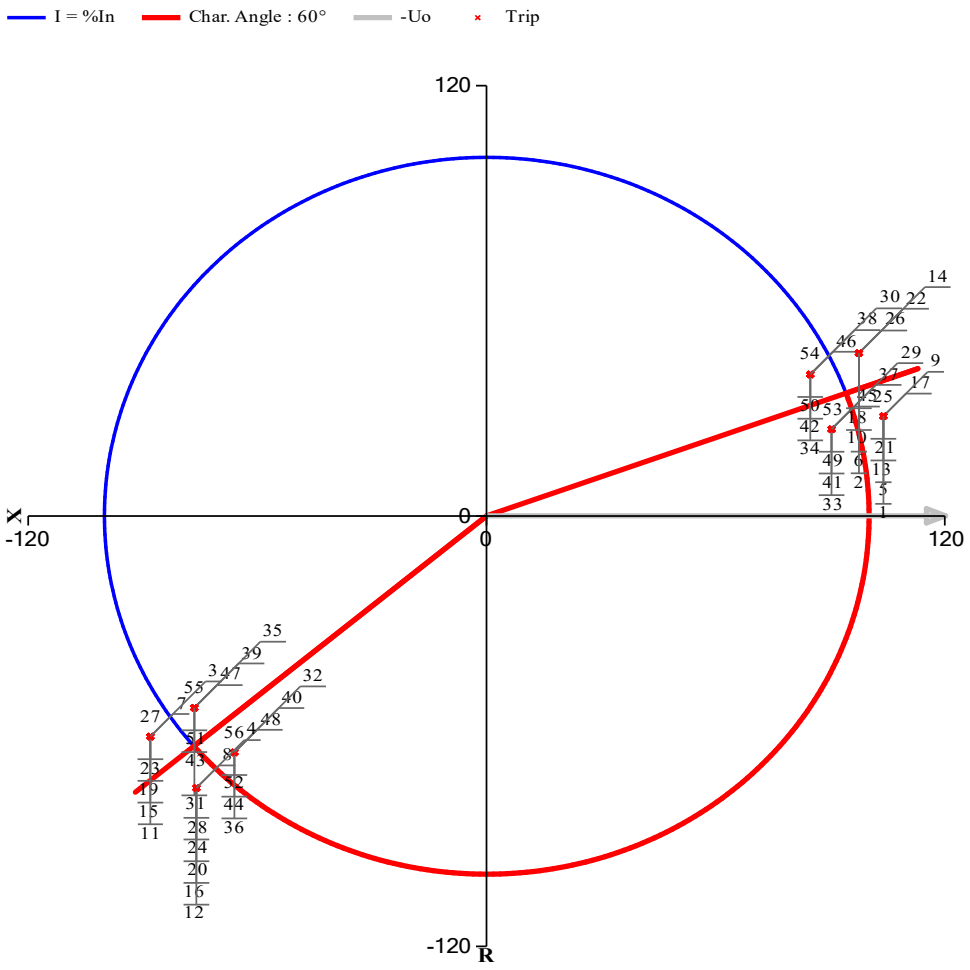
EQUIPMENT DESCRIPTION : -TR-200ED1

ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857



IEC61850 : DPHLPDOC2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 50 A
Nominal current : 43.7 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 1.00 xIn
Start value mult. : 1.00
Directional mode : Forward
Operate curve type : IEC Definite Time
Operate delay time : 100 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	1.074	15	1.074	-105	1.074	135	0.953	0	0.953	240	0.953	120	100	118	18
2	1.074	25	1.074	-95	1.074	145	0.953	0	0.953	240	0.953	120	0	0	0
3	1.074	-145	1.074	95	1.074	-25	0.953	0	0.953	240	0.953	120	0	0	0
4	1.074	-135	1.074	105	1.074	-15	0.953	0	0.953	240	0.953	120	100	122	22
5	1.074	45	1.074	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	121	21
6	1.074	55	1.074	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	1.074	-115	1.074	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	1.074	-105	1.074	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	125	25
9	0	0	1.074	-75	1.074	105	63.509	0	0.953	-140.71	0.953	140.71	100	124	24

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	1.074	-65	1.074	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	1.074	125	1.074	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	1.074	135	1.074	-45	63.509	0	0.953	-140.71	0.953	140.71	100	124	24
13	1.074	-15	0	240	1.074	165	0.953	20.71	63.509	240	0.953	99.29	100	120	20
14	1.074	-5	0	240	1.074	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	1.074	-175	0	240	1.074	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	1.074	-165	0	240	1.074	15	0.953	20.71	63.509	240	0.953	99.29	100	118	18
17	1.074	15	0	0	0	0	0.953	0	63.509	240	63.509	120	100	119	19
18	1.074	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	1.074	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	1.074	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	100	120	20
21	0	0	1.074	-105	0	0	63.509	0	0.953	240	63.509	120	100	120	20
22	0	0	1.074	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	1.074	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	1.074	105	0	0	63.509	0	0.953	240	63.509	120	100	124	24
25	0	0	0	0	1.074	135	63.509	0	63.509	240	0.953	120	100	122	22
26	0	0	0	0	1.074	145	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	1.074	-25	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	1.074	-15	63.509	0	63.509	240	0.953	120	100	123	23
29	0.934	15	0.934	-105	0.934	135	0.953	0	0.953	240	0.953	120	0	0	0
30	0.934	25	0.934	-95	0.934	145	0.953	0	0.953	240	0.953	120	0	0	0
31	0.934	-145	0.934	95	0.934	-25	0.953	0	0.953	240	0.953	120	0	0	0
32	0.934	-135	0.934	105	0.934	-15	0.953	0	0.953	240	0.953	120	0	0	0
33	0.934	45	0.934	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.934	55	0.934	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.934	-115	0.934	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.934	-105	0.934	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.934	-75	0.934	105	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.934	-65	0.934	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.934	125	0.934	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.934	135	0.934	-45	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.934	-15	0	240	0.934	165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.934	-5	0	240	0.934	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.934	-175	0	240	0.934	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.934	-165	0	240	0.934	15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.934	15	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.934	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.934	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.934	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.934	-105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.934	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.934	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.934	105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.934	135	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.934	145	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.934	-25	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.934	-15	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

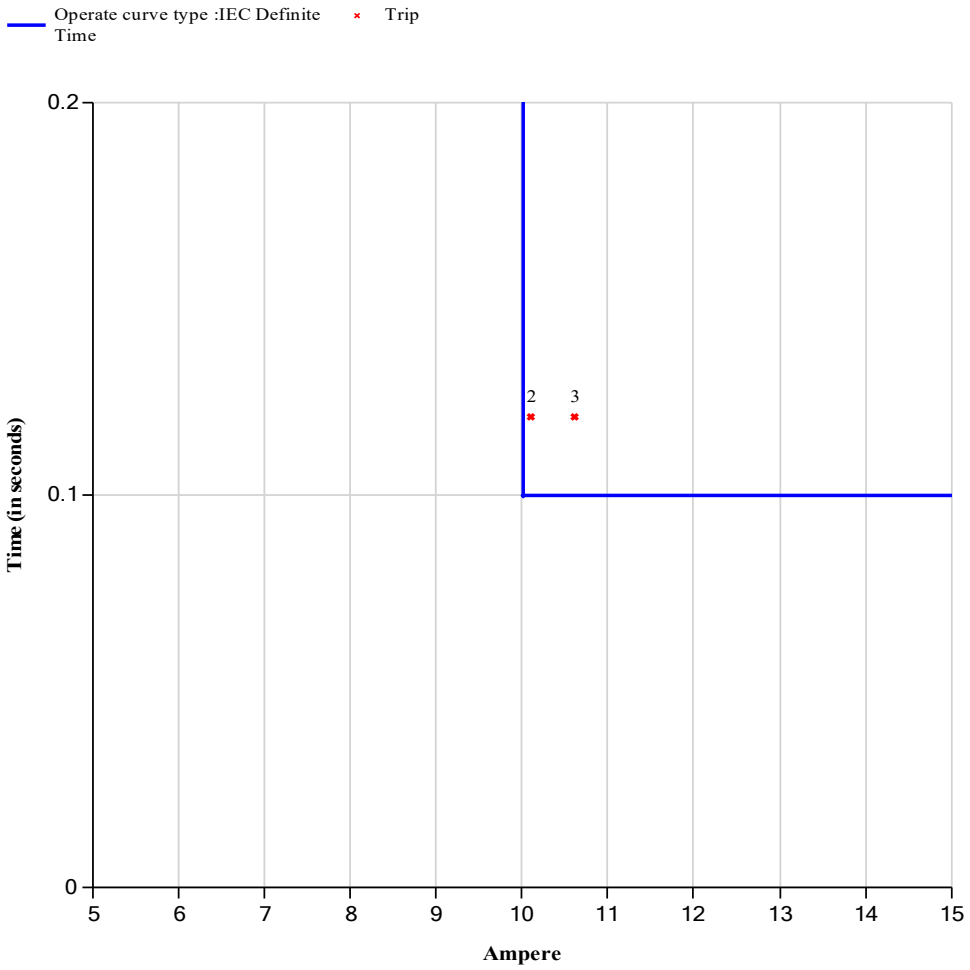
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 43.7 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.100 xIn
Operate delay time : 100 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	9.77	0.098	0	0	0	0
2	10.1	0.101	0	100	120	20
3	10.61	0.106	0	100	120	20

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

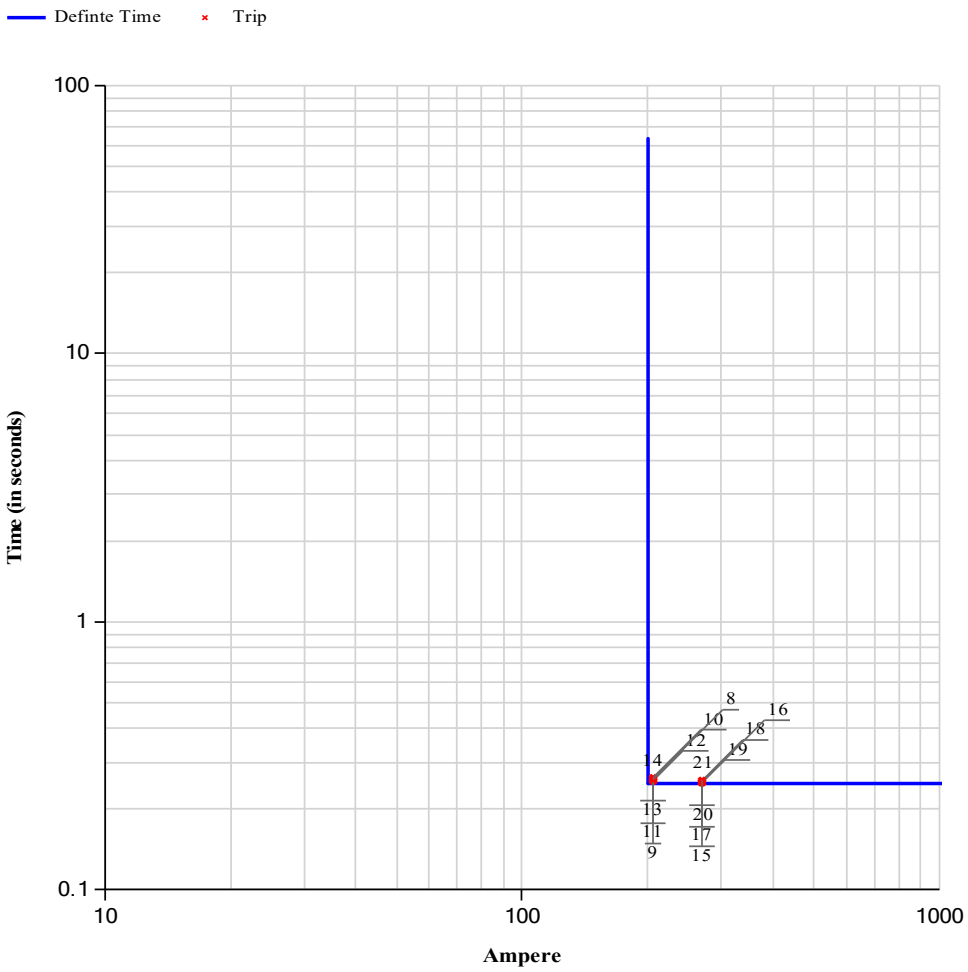
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : PHIPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 50 / 1 A
Nominal current : 43.7 A
Num of start phases : 1 Out of 3
Reset delay time : 20 ms
Start value : 4.00 xIn
Start valure Mult : 1.0
Operate delay time : 250 ms



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	196	3.918	0	0	0	0	0	0	0	0	0	0
2	0	0	0	196	3.918	240	0	0	0	0	0	0
3	0	0	0	0	0	0	196	3.918	120	0	0	0
4	196	3.918	0	196	3.918	180	0	0	0	0	0	0
5	0	0	0	196	3.918	240	196	3.918	60	0	0	0
6	196	3.918	300	0	0	0	196	3.918	120	0	0	0
7	196	3.918	0	196	3.918	240	196	3.918	120	0	0	0
8	206	4.111	0	0	0	0	0	0	0	250	259	3.6
9	0	0	0	206	4.111	240	0	0	0	250	255	2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHIPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	206	4.111	120	250	263	5.2
11	206	4.111	0	206	4.111	180	0	0	0	250	260	4
12	0	0	0	206	4.111	240	206	4.111	60	250	256	2.4
13	206	4.111	300	0	0	0	206	4.111	120	250	262	4.8
14	206	4.111	0	206	4.111	240	206	4.111	120	250	257	2.8
15	269	5.384	0	0	0	0	0	0	0	250	257	2.8
16	0	0	0	269	5.384	240	0	0	0	250	252	0.8
17	0	0	0	0	0	0	269	5.384	120	250	252	0.8
18	269	5.384	0	269	5.384	180	0	0	0	250	256	2.4
19	0	0	0	269	5.384	240	269	5.384	60	250	252	0.8
20	269	5.384	300	0	0	0	269	5.384	120	250	252	0.8
21	269	5.384	0	269	5.384	240	269	5.384	120	250	252	0.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

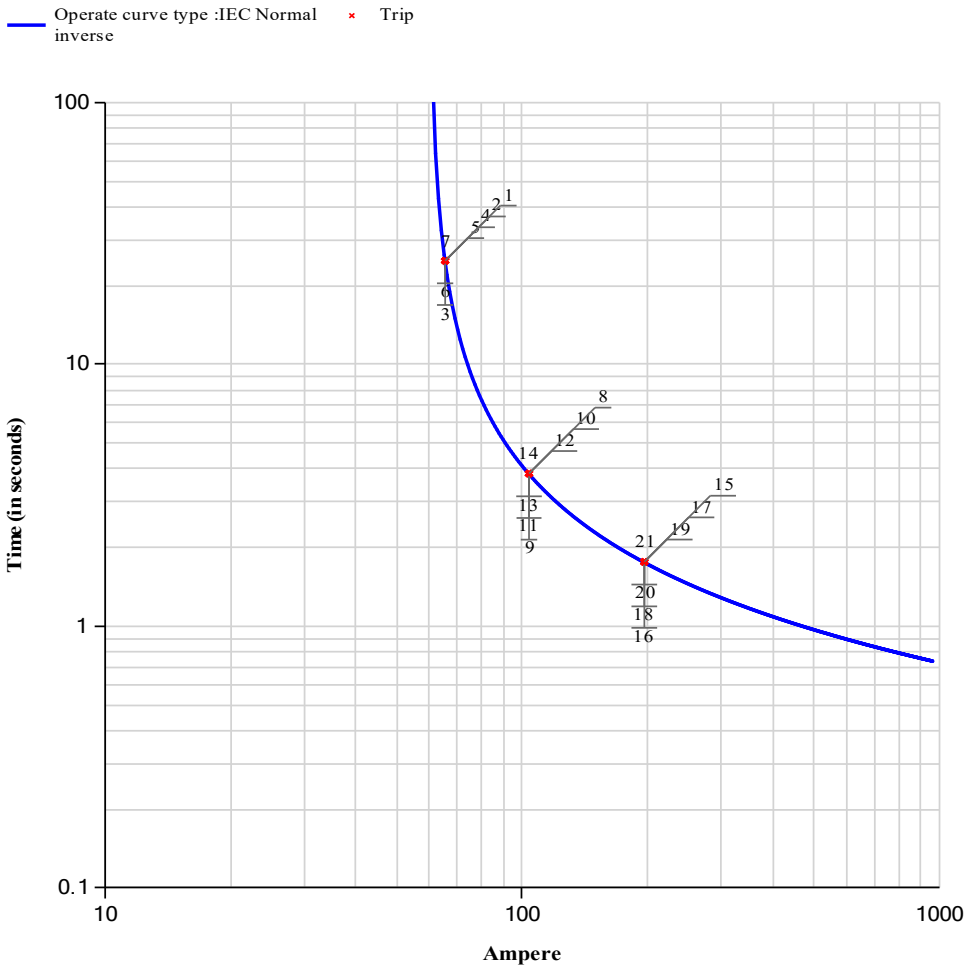
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 50 / 1 A
Nominal current : 43.7 A
Num. start phases : 1 out of 3
Minimum operate time : 300 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 1.20 xIn
Start value mult. : 1.00
Time multiplier : 0.30
Operate curve type : IEC Normal inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	65	1.307	0	0	0	0	0	0	0	24565	24910	1.4
2	0	0	0	65	1.307	240	0	0	0	24565	24910	1.4
3	0	0	0	0	0	0	65	1.307	120	24565	24923	1.46
4	65	1.307	0	65	1.307	240	0	0	120	24565	24909	1.4
5	0	0	0	65	1.307	240	65	1.307	120	24565	24912	1.41
6	65	1.307	0	0	0	240	65	1.307	120	24565	24912	1.41
7	65	1.307	0	65	1.307	240	65	1.307	120	24565	24912	1.41
8	104	2.075	0	0	0	0	0	0	0	3813	3832	0.5
9	0	0	0	104	2.075	240	0	0	0	3813	3831	0.47

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	104	2.075	120	3813	3838	0.66
11	104	2.075	0	104	2.075	240	0	0	120	3813	3828	0.39
12	0	0	0	104	2.075	240	104	2.075	120	3813	3832	0.5
13	104	2.075	0	0	0	240	104	2.075	120	3813	3829	0.42
14	104	2.075	0	104	2.075	240	104	2.075	120	3813	3829	0.42
15	196	3.918	0	0	0	0	0	0	0	1754	1765	0.63
16	0	0	0	196	3.918	240	0	0	0	1754	1763	0.51
17	0	0	0	0	0	0	196	3.918	120	1754	1766	0.68
18	196	3.918	0	196	3.918	240	0	0	120	1754	1760	0.34
19	0	0	0	196	3.918	240	196	3.918	120	1754	1759	0.29
20	196	3.918	0	0	0	240	196	3.918	120	1754	1763	0.51
21	196	3.918	0	196	3.918	240	196	3.918	120	1754	1759	0.29

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

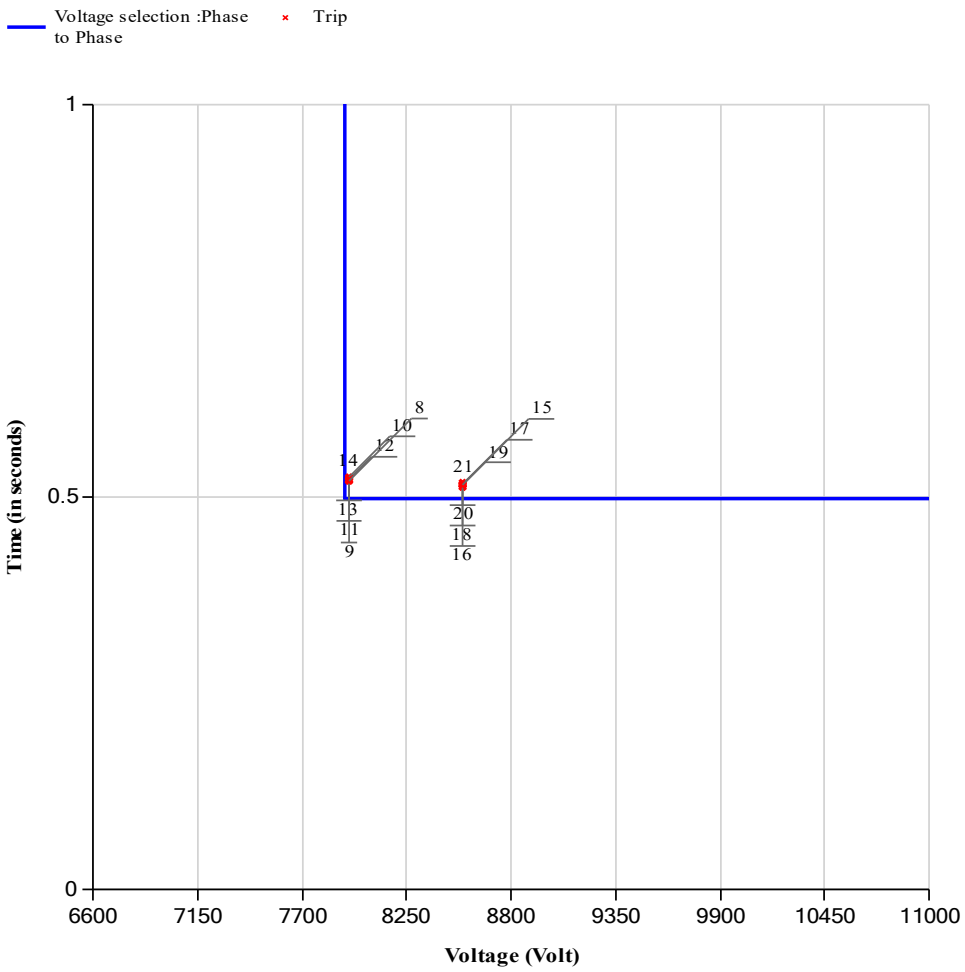
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 500 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5262	87.705	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5262	87.695	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5261	87.682	120	0	0	0
4	4555	75.919	0	4555	75.919	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4556	75.928	240	4556	75.928	120	0	0	0
6	4556	75.928	0	3811	63.509	240	4556	75.928	120	0	0	0
7	4555	75.922	0	4555	75.922	240	4555	75.922	120	0	0	0
8	5322	88.701	0	3811	63.509	240	3811	63.509	120	500	521	4.2
9	3811	63.509	0	5323	88.715	240	3811	63.509	120	500	522	4.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5322	88.7	120	500	526	5.2
11	4587	76.458	0	4587	76.458	240	3811	63.509	120	500	522	4.4
12	3811	63.509	0	4587	76.455	240	4587	76.455	120	500	523	4.6
13	4587	76.458	0	3811	63.509	240	4587	76.458	120	500	525	5
14	4587	76.453	0	4587	76.453	240	4587	76.453	120	500	521	4.2
15	5975	99.579	0	3811	63.509	240	3811	63.509	120	500	516	3.2
16	3811	63.509	0	5975	99.586	240	3811	63.509	120	500	513	2.6
17	3811	63.509	0	3811	63.509	240	5975	99.578	120	500	517	3.4
18	4933	82.21	0	4933	82.21	240	3811	63.509	120	500	516	3.2
19	3811	63.509	0	4933	82.214	240	4933	82.214	120	500	516	3.2
20	4933	82.21	0	3811	63.509	240	4933	82.21	120	500	519	3.8
21	4932	82.208	0	4932	82.208	240	4932	82.208	120	500	514	2.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

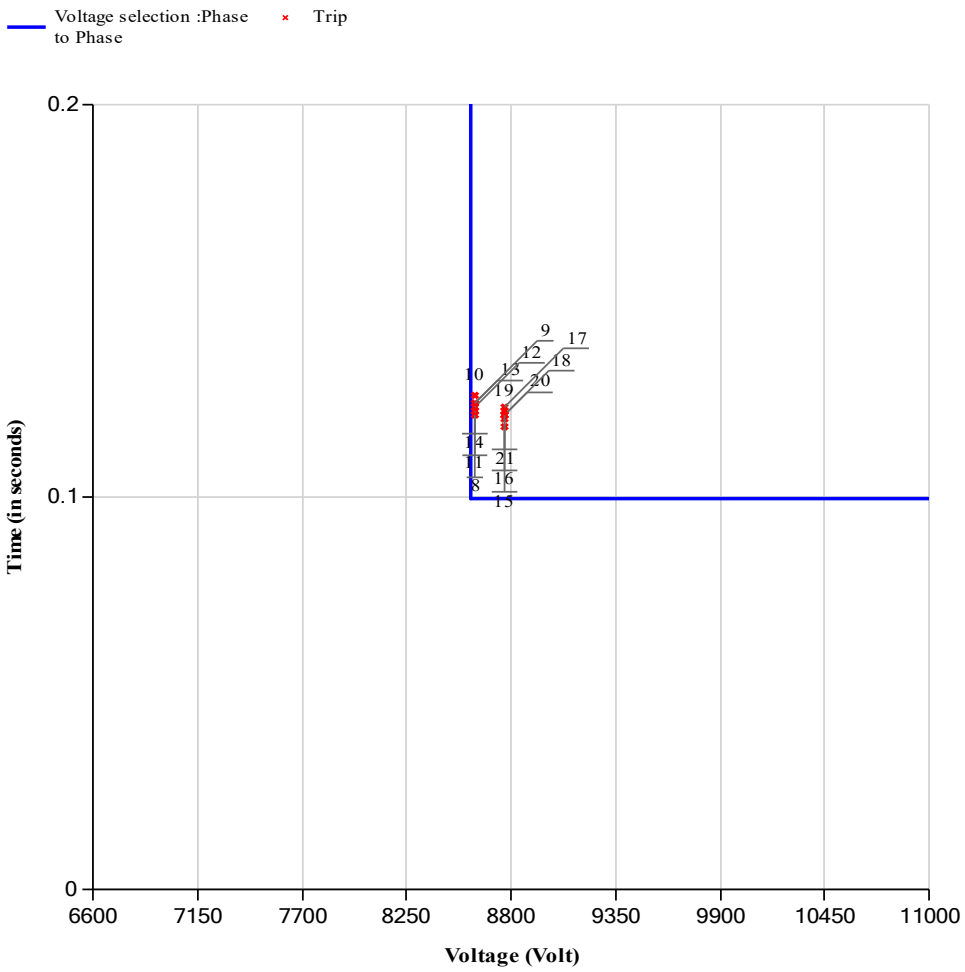
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : PHPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.30 xUn
Time multiplier : 1.00
Operate delay time : 100 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5975	99.585	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5975	99.58	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5975	99.586	120	0	0	0
4	4932	82.2	0	4932	82.2	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4932	82.205	240	4932	82.205	120	0	0	0
6	4932	82.201	0	3811	63.509	240	4932	82.201	120	0	0	0
7	4932	82.208	0	4932	82.208	240	4932	82.208	120	0	0	0
8	6045	100.758	0	3811	63.509	240	3811	63.509	120	100	121	21
9	3811	63.509	0	6044	100.738	240	3811	63.509	120	100	124	24

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	6045	100.75	120	100	126	26
11	4969	82.824	0	4969	82.824	240	3811	63.509	120	100	122	22
12	3811	63.509	0	4969	82.823	240	4969	82.823	120	100	123	23
13	4970	82.831	0	3811	63.509	240	4970	82.831	120	100	124	24
14	4970	82.827	0	4970	82.827	240	4970	82.827	120	100	122	22
15	6214	103.567	0	3811	63.509	240	3811	63.509	120	100	121	21
16	3811	63.509	0	6214	103.561	240	3811	63.509	120	100	120	20
17	3811	63.509	0	3811	63.509	240	6214	103.572	120	100	123	23
18	5060	84.331	0	5060	84.331	240	3811	63.509	120	100	121	21
19	3811	63.509	0	5060	84.337	240	5060	84.337	120	100	122	22
20	5060	84.337	0	3811	63.509	240	5060	84.337	120	100	121	21
21	5060	84.332	0	5060	84.332	240	5060	84.332	120	100	118	18

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

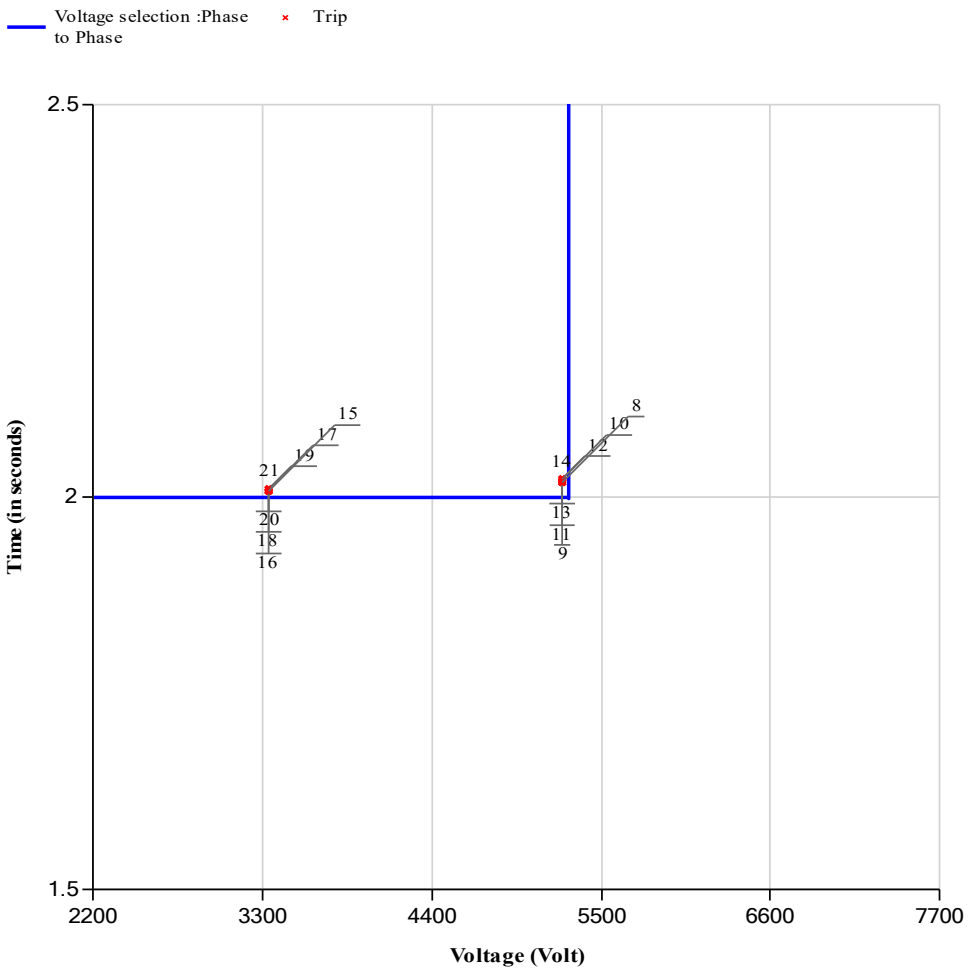
EQUIPMENT DESCRIPTION : -TR-200ED1

ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857



IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2000 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2272	37.87	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2273	37.876	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2272	37.875	120	0	0	0
4	3074	51.228	0	3074	51.228	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3074	51.227	240	3074	51.227	120	0	0	0
6	3074	51.231	0	3811	63.509	240	3074	51.231	120	0	0	0
7	3074	51.232	0	3074	51.232	240	3074	51.232	120	0	0	0
8	2171	36.181	0	3811	63.509	240	3811	63.509	120	2000	2019	0.95
9	3811	63.509	0	2171	36.19	240	3811	63.509	120	2000	2019	0.95

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2172	36.196	120	2000	2023	1.15
11	3028	50.464	0	3028	50.464	240	3811	63.509	120	2000	2021	1.05
12	3811	63.509	0	3028	50.466	240	3028	50.466	120	2000	2024	1.2
13	3028	50.47	0	3811	63.509	240	3028	50.47	120	2000	2021	1.05
14	3028	50.467	0	3028	50.467	240	3028	50.467	120	2000	2019	0.95
15	0	0	0	3811	63.509	240	3811	63.509	120	2000	2008	0.4
16	3811	63.509	0	0	0	240	3811	63.509	120	2000	2008	0.4
17	3811	63.509	0	3811	63.509	240	0	0	120	2000	2010	0.5
18	1927	32.115	0	1927	32.115	240	3811	63.509	120	2000	2008	0.4
19	3811	63.509	0	1927	32.116	240	1927	32.116	120	2000	2011	0.55
20	1927	32.115	0	3811	63.509	240	1927	32.115	120	2000	2011	0.55
21	1927	32.116	0	1927	32.116	240	1927	32.116	120	2000	2008	0.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

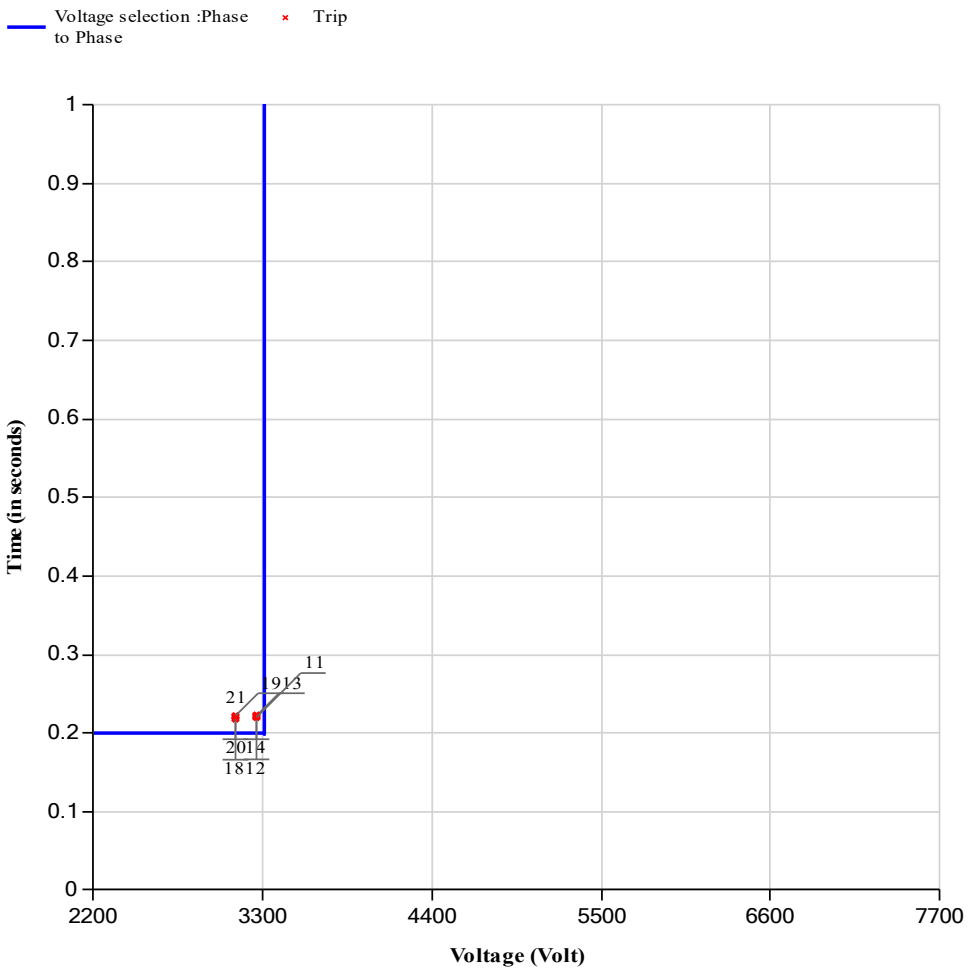
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : PHPTUV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.50 xUn
Time multiplier : 1.00
Operating delay time : 200 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
4	1927	32.117	0	1927	32.117	240	3811	63.509	120	0	0	0
5	3811	63.509	0	1927	32.117	240	1927	32.117	120	0	0	0
6	1927	32.117	0	3811	63.509	240	1927	32.117	120	0	0	0
7	1927	32.116	0	1927	32.116	240	1927	32.116	120	0	0	0
8	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
9	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

RELAY TYPE : ABB REX640

ITEM : UNIT A2

Sn. : 1VHR81041857

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
11	1881	31.351	0	1881	31.351	240	3811	63.509	120	200	220	10
12	3811	63.509	0	1881	31.353	240	1881	31.353	120	200	223	11.5
13	1881	31.351	0	3811	63.509	240	1881	31.351	120	200	222	11
14	1881	31.351	0	1881	31.351	240	1881	31.351	120	200	221	10.5
15	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
16	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
17	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
18	1802	30.04	0	1802	30.04	240	3811	63.509	120	200	218	9
19	3811	63.509	0	1803	30.042	240	1803	30.042	120	200	222	11
20	1803	30.043	0	3811	63.509	240	1803	30.043	120	200	221	10.5
21	1802	30.04	0	1802	30.04	240	1802	30.04	120	200	220	10

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

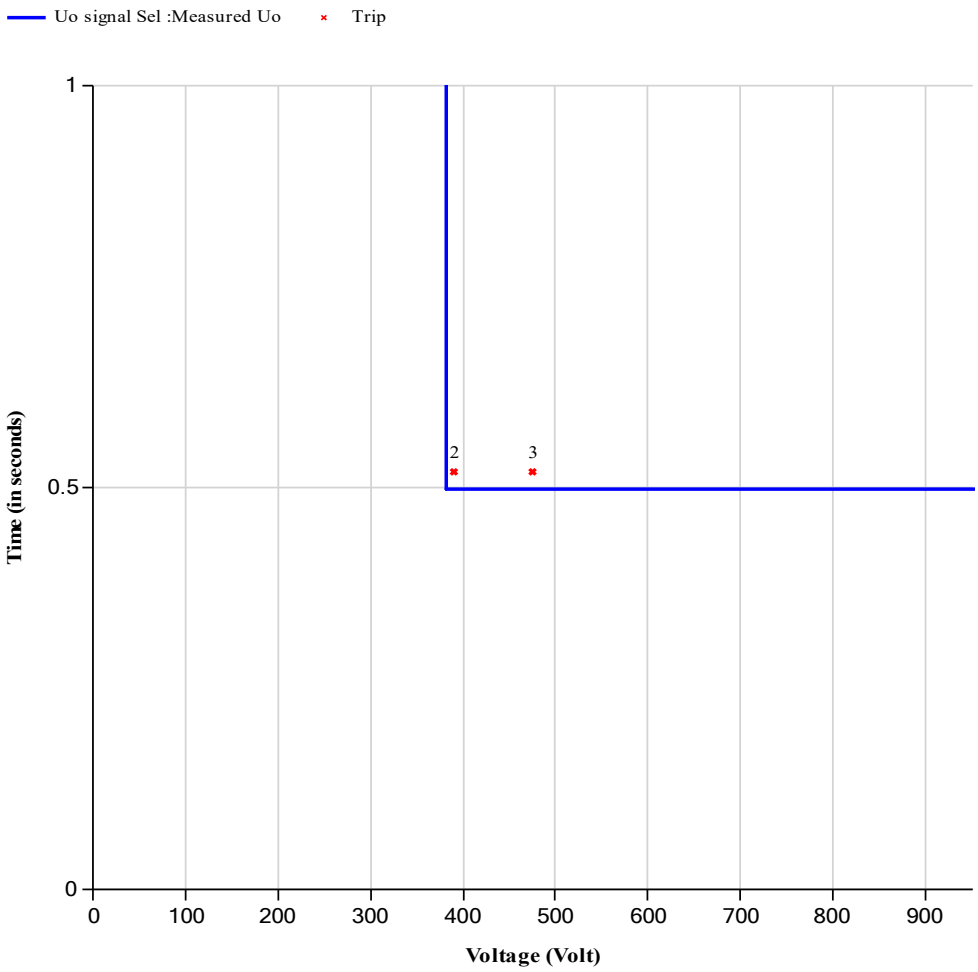
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 500 msec



NB : ALARM ONLY

N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	371	10.714	0	0	0
2	390	11.26	500	520	4
3	475	13.717	500	520	4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200ED1

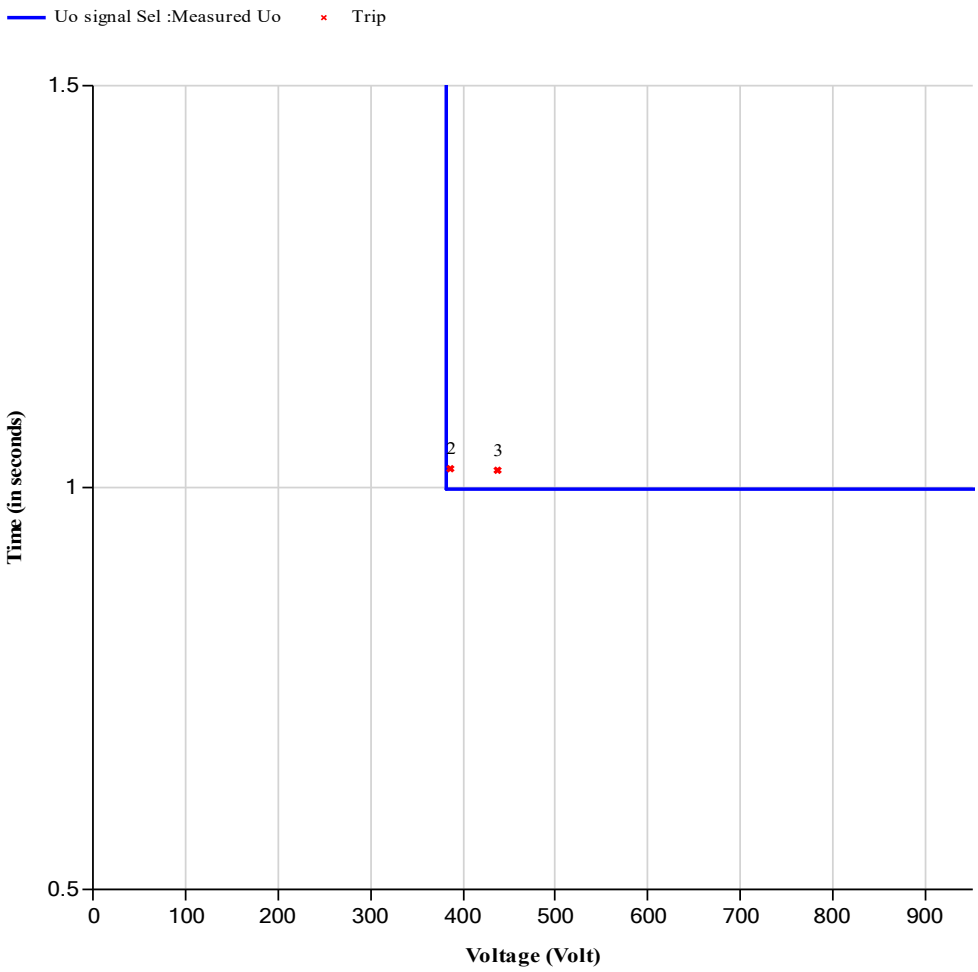
ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857

IEC61850 : ROVPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1000 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	1000	1024	2.4
3	437	12.625	1000	1022	2.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

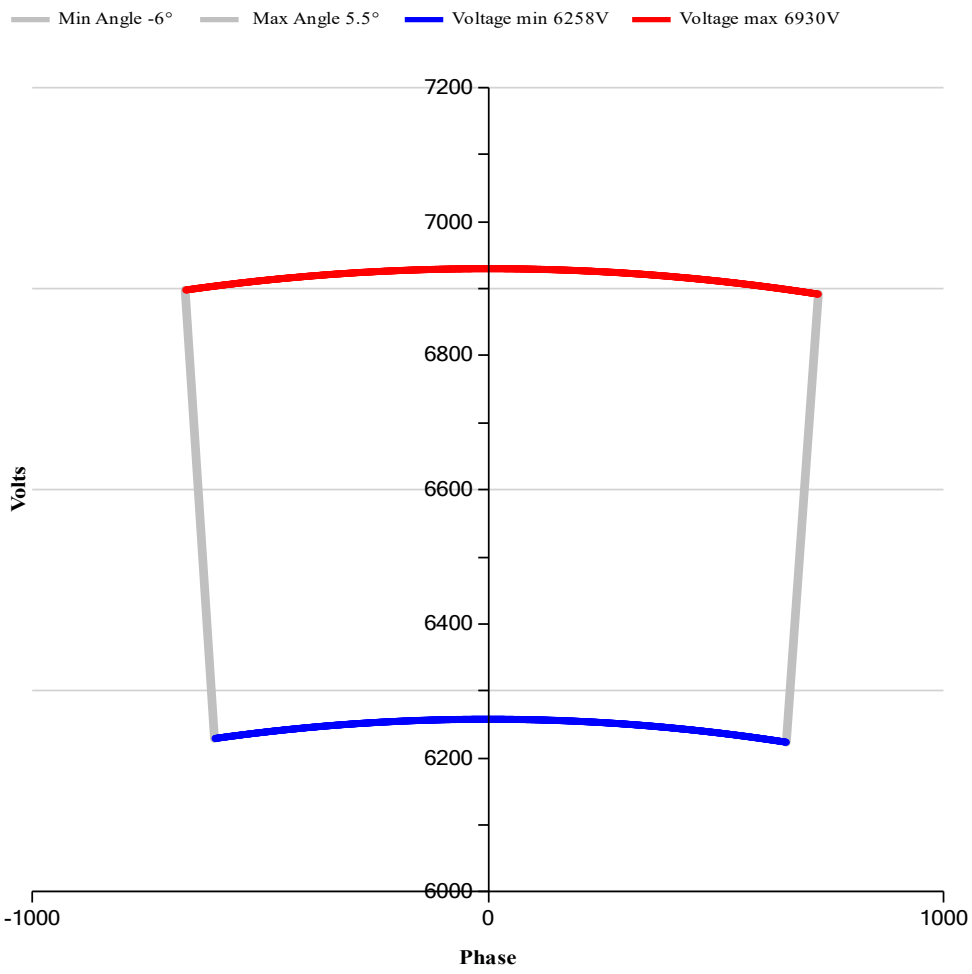
EQUIPMENT DESCRIPTION : -TR-200ED1

ITEM : UNIT A2

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041857



IEC61850 : SECRSYN
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Synchro check Mode : Asynchronous
Control Mode : Continuous
Dead line value : 0.10 xUn
Live line value : 0.50 xUn
Dead bus value : 0.10 xUn
Live bus value : 0.50 xUn
Close pulse : 200 ms
Max energizing V : 0.64 xUn
Phase shift : 0 deg
Minimum Syn time : 10000 ms
Maximum Syn time : 5000 ms
Energizing time : 100 ms
Closing time CB : 50 ms
Live dead mode : Not Both Live
Difference voltage : 0.05 xUn
Difference frequency : 0.010 xFn
Difference angle : 5 deg

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	V4(V)	V4"(V)	V4(°)	F (Hz)
1	3811	63.509	0	3811	63.509	240	3811	63.509	120	6258	104.3	30	50
2	3811	63.509	0	3811	63.509	240	3811	63.509	120	6930	115.5	30	50
3	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	24	50
4	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	35.5	50
5	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	49.5
6	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	50.5

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

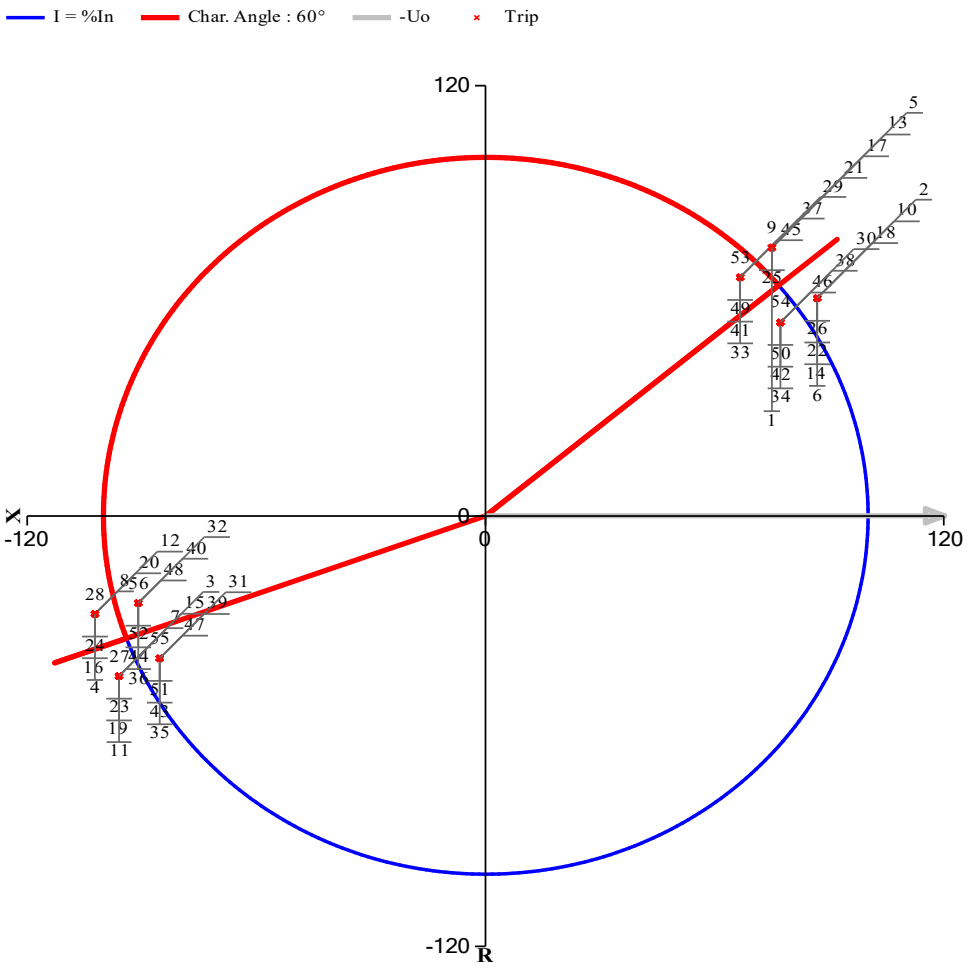
EQUIPMENT DESCRIPTION : -A-85000

ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854



IEC61850 : DPHLPDOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 150 A
Nominal current : 103.1 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 0.80 xIn
Start value mult. : 1.00
Directional mode : Reverse
Operate curve type : IEC Definite Time
Operate delay time : 900 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0.847	45	0.847	-75	0.847	165	0.953	0	0.953	240	0.953	120	900	918	2
2	0.847	35	0.847	-85	0.847	155	0.953	0	0.953	240	0.953	120	0	0	0
3	0.847	-155	0.847	85	0.847	-35	0.953	0	0.953	240	0.953	120	0	0	0
4	0.847	-165	0.847	75	0.847	-45	0.953	0	0.953	240	0.953	120	900	922	2.44
5	0.847	75	0.847	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	900	922	2.44
6	0.847	65	0.847	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	0.847	-125	0.847	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	0.847	-135	0.847	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	900	920	2.22
9	0	0	0.847	-45	0.847	135	63.509	0	0.953	-140.71	0.953	140.71	900	924	2.67

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0.847	-55	0.847	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	0.847	115	0.847	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	0.847	105	0.847	-75	63.509	0	0.953	-140.71	0.953	140.71	900	923	2.56
13	0.847	15	0	240	0.847	-165	0.953	20.71	63.509	240	0.953	99.29	900	920	2.22
14	0.847	5	0	240	0.847	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	0.847	175	0	240	0.847	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	0.847	165	0	240	0.847	-15	0.953	20.71	63.509	240	0.953	99.29	900	924	2.67
17	0.847	45	0	0	0	0	0.953	0	63.509	240	63.509	120	900	919	2.11
18	0.847	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	0.847	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	0.847	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	900	920	2.22
21	0	0	0.847	-75	0	0	63.509	0	0.953	240	63.509	120	900	923	2.56
22	0	0	0.847	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	0.847	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	0.847	75	0	0	63.509	0	0.953	240	63.509	120	900	924	2.67
25	0	0	0	0	0.847	165	63.509	0	63.509	240	0.953	120	900	921	2.33
26	0	0	0	0	0.847	155	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	0.847	-35	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	0.847	-45	63.509	0	63.509	240	0.953	120	900	924	2.67
29	0.753	45	0.753	-75	0.753	165	0.953	0	0.953	240	0.953	120	0	0	0
30	0.753	35	0.753	-85	0.753	155	0.953	0	0.953	240	0.953	120	0	0	0
31	0.753	-155	0.753	85	0.753	-35	0.953	0	0.953	240	0.953	120	0	0	0
32	0.753	-165	0.753	75	0.753	-45	0.953	0	0.953	240	0.953	120	0	0	0
33	0.753	75	0.753	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.753	65	0.753	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.753	-125	0.753	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.753	-135	0.753	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.753	-45	0.753	135	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.753	-55	0.753	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.753	115	0.753	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.753	105	0.753	-75	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.753	15	0	240	0.753	-165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.753	5	0	240	0.753	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.753	175	0	240	0.753	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.753	165	0	240	0.753	-15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.753	45	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.753	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.753	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.753	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.753	-75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.753	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.753	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.753	75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.753	165	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.753	155	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.753	-35	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.753	-45	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

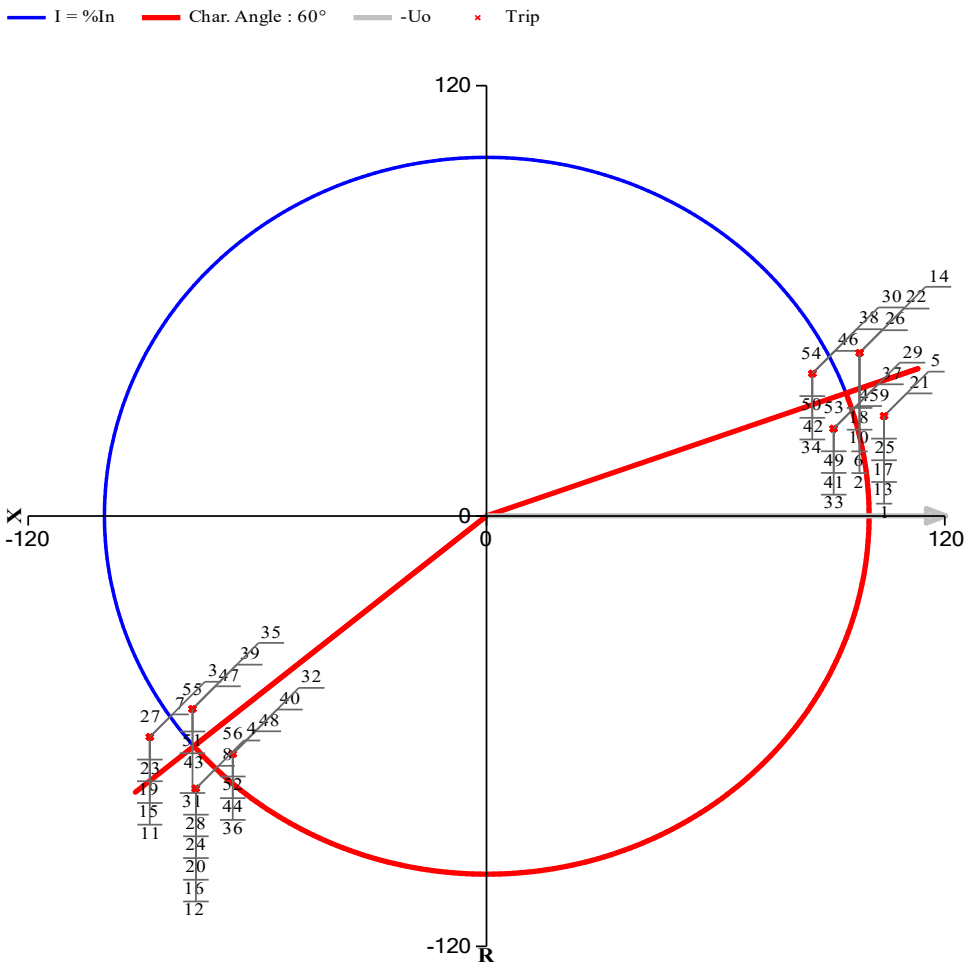
EQUIPMENT DESCRIPTION : -A-85000

ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854



IEC61850 : DPHLPDOC2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 150 A
Nominal current : 103.1 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 0.80 xIn
Start value mult. : 1.00
Directional mode : Forward
Operate curve type : IEC Definite Time
Operate delay time : 100 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0.861	15	0.861	-105	0.861	135	0.953	0	0.953	240	0.953	120	100	120	20
2	0.861	25	0.861	-95	0.861	145	0.953	0	0.953	240	0.953	120	0	0	0
3	0.861	-145	0.861	95	0.861	-25	0.953	0	0.953	240	0.953	120	0	0	0
4	0.861	-135	0.861	105	0.861	-15	0.953	0	0.953	240	0.953	120	100	120	20
5	0.861	45	0.861	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	121	21
6	0.861	55	0.861	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	0.861	-115	0.861	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	0.861	-105	0.861	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	123	23
9	0	0	0.861	-75	0.861	105	63.509	0	0.953	-140.71	0.953	140.71	100	124	24

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0.861	-65	0.861	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	0.861	125	0.861	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	0.861	135	0.861	-45	63.509	0	0.953	-140.71	0.953	140.71	100	125	25
13	0.861	-15	0	240	0.861	165	0.953	20.71	63.509	240	0.953	99.29	100	119	19
14	0.861	-5	0	240	0.861	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	0.861	-175	0	240	0.861	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	0.861	-165	0	240	0.861	15	0.953	20.71	63.509	240	0.953	99.29	100	121	21
17	0.861	15	0	0	0	0	0.953	0	63.509	240	63.509	120	100	120	20
18	0.861	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	0.861	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	0.861	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	100	122	22
21	0	0	0.861	-105	0	0	63.509	0	0.953	240	63.509	120	100	123	23
22	0	0	0.861	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	0.861	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	0.861	105	0	0	63.509	0	0.953	240	63.509	120	100	125	25
25	0	0	0	0	0.861	135	63.509	0	63.509	240	0.953	120	100	124	24
26	0	0	0	0	0.861	145	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	0.861	-25	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	0.861	-15	63.509	0	63.509	240	0.953	120	100	121	21
29	0.752	15	0.752	-105	0.752	135	0.953	0	0.953	240	0.953	120	0	0	0
30	0.752	25	0.752	-95	0.752	145	0.953	0	0.953	240	0.953	120	0	0	0
31	0.752	-145	0.752	95	0.752	-25	0.953	0	0.953	240	0.953	120	0	0	0
32	0.752	-135	0.752	105	0.752	-15	0.953	0	0.953	240	0.953	120	0	0	0
33	0.752	45	0.752	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.752	55	0.752	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.752	-115	0.752	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.752	-105	0.752	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.752	-75	0.752	105	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.752	-65	0.752	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.752	125	0.752	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.752	135	0.752	-45	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.752	-15	0	240	0.752	165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.752	-5	0	240	0.752	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.752	-175	0	240	0.752	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.752	-165	0	240	0.752	15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.752	15	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.752	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.752	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.752	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.752	-105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.752	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.752	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.752	105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.752	135	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.752	145	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.752	-25	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.752	-15	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

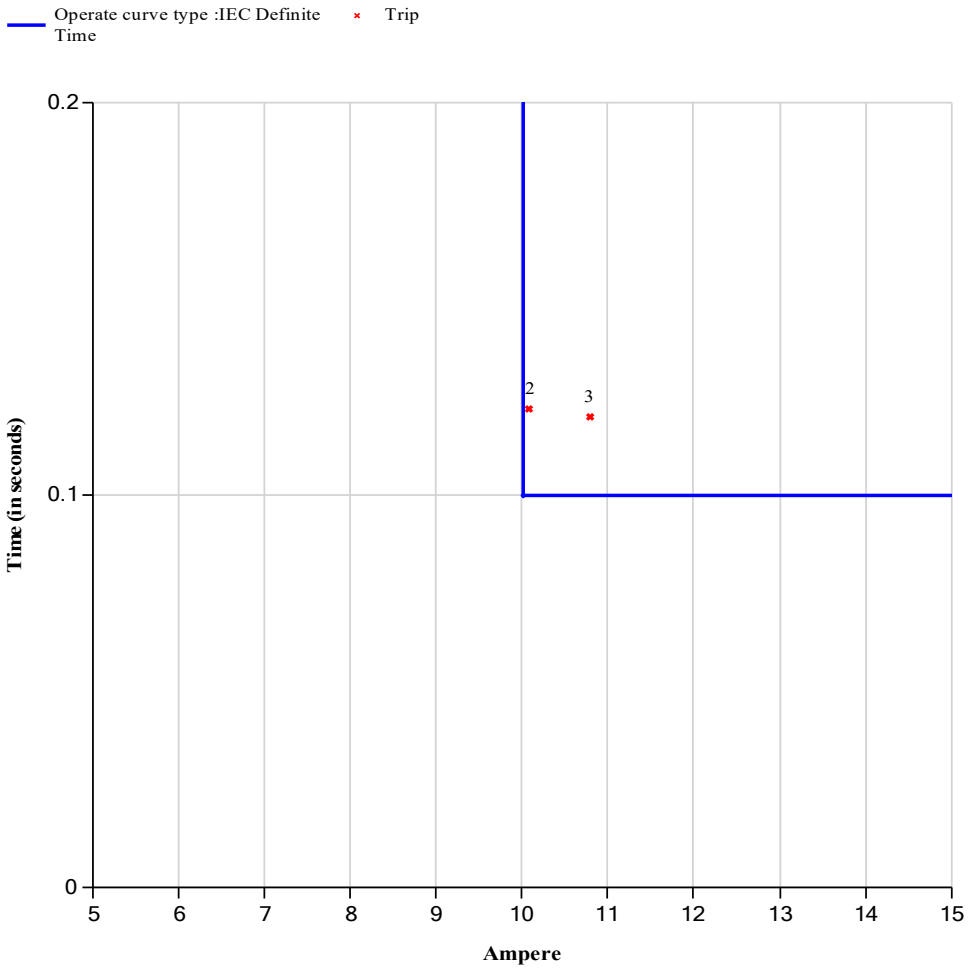
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 103.1 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.100 xIn
Operate delay time : 100 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	9.854	0.099	0	0	0	0
2	10.078	0.101	0	100	122	22
3	10.791	0.108	0	100	120	20

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

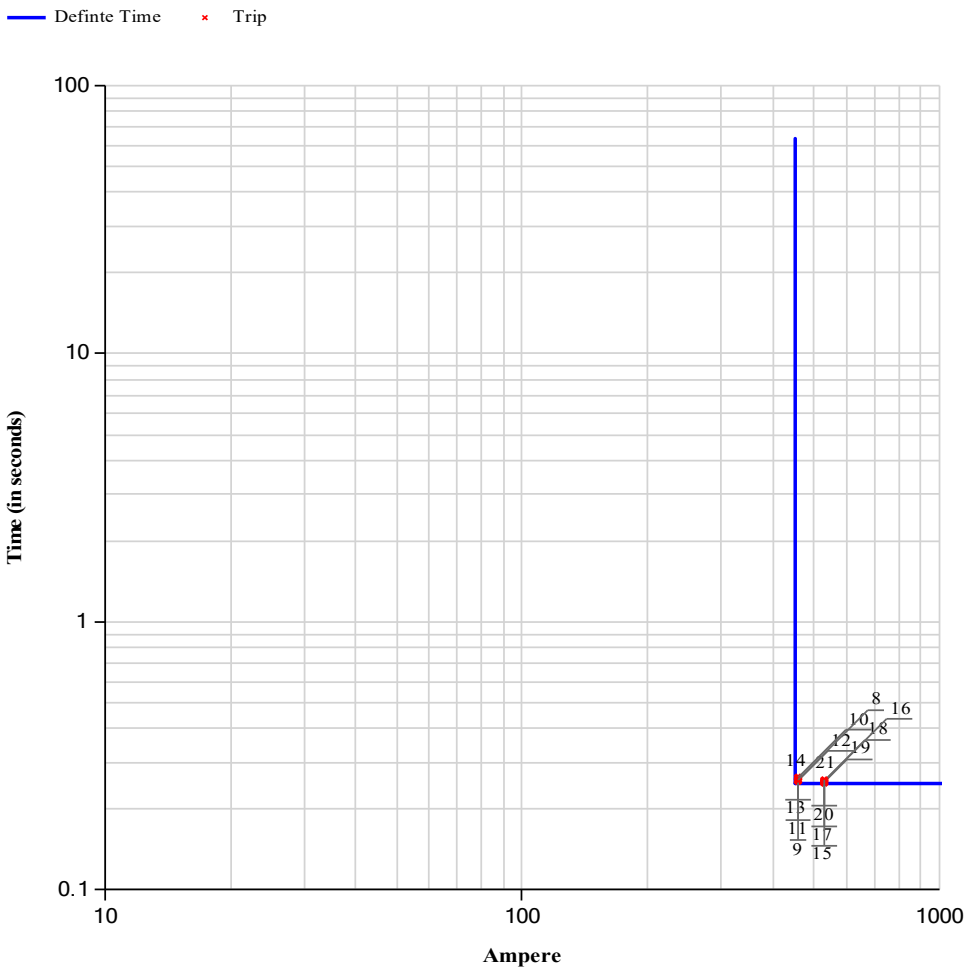
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHIPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 150 / 1 A
Nominal current : 103.1 A
Num of start phases : 1 Out of 3
Reset delay time : 20 ms
Start value : 3.00 xIn
Start valure Mult : 1.0
Operate delay time : 250 ms



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	436	2.904	0	0	0	0	0	0	0	0	0	0
2	0	0	0	436	2.904	240	0	0	0	0	0	0
3	0	0	0	0	0	0	436	2.904	120	0	0	0
4	436	2.904	0	436	2.904	180	0	0	0	0	0	0
5	0	0	0	436	2.904	240	436	2.904	60	0	0	0
6	436	2.904	300	0	0	0	436	2.904	120	0	0	0
7	436	2.904	0	436	2.904	240	436	2.904	120	0	0	0
8	457	3.048	0	0	0	0	0	0	0	250	258	3.2
9	0	0	0	457	3.048	240	0	0	0	250	255	2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHIPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	457	3.048	120	250	263	5.2
11	457	3.048	0	457	3.048	180	0	0	0	250	259	3.6
12	0	0	0	457	3.048	240	457	3.048	60	250	256	2.4
13	457	3.048	300	0	0	0	457	3.048	120	250	264	5.6
14	457	3.048	0	457	3.048	240	457	3.048	120	250	256	2.4
15	528	3.521	0	0	0	0	0	0	0	250	258	3.2
16	0	0	0	528	3.521	240	0	0	0	250	255	2
17	0	0	0	0	0	0	528	3.521	120	250	253	1.2
18	528	3.521	0	528	3.521	180	0	0	0	250	256	2.4
19	0	0	0	528	3.521	240	528	3.521	60	250	253	1.2
20	528	3.521	300	0	0	0	528	3.521	120	250	251	0.4
21	528	3.521	0	528	3.521	240	528	3.521	120	250	252	0.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

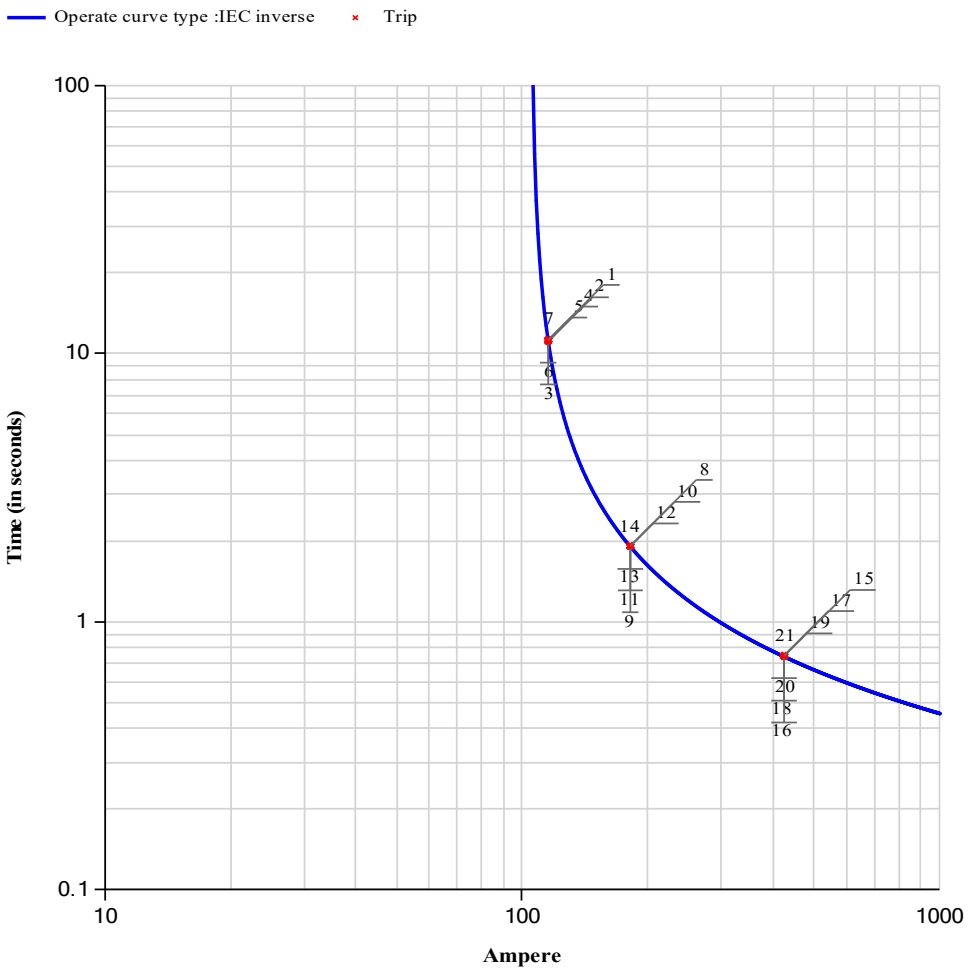
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 150 / 1 A
Nominal current : 103.1 A
Num. start phases : 1 out of 3
Minimum operate time : 250 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 0.70 xIn
Start value mult. : 1.00
Time multiplier : 0.15
Operate curve type : IEC inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	115	0.769	0	0	0	0	0	0	0	11158	11254	0.86
2	0	0	0	115	0.769	240	0	0	0	11158	11116	0.38
3	0	0	0	0	0	0	115	0.769	120	11158	11256	0.88
4	115	0.769	0	115	0.769	240	0	0	120	11158	11257	0.89
5	0	0	0	115	0.769	240	115	0.769	120	11158	11254	0.86
6	115	0.769	0	0	0	240	115	0.769	120	11158	11258	0.9
7	115	0.769	0	115	0.769	240	115	0.769	120	11158	11253	0.85
8	181	1.209	0	0	0	0	0	0	0	1911	1922	0.58
9	0	0	0	181	1.209	240	0	0	0	1911	1917	0.31

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	181	1.209	120	1911	1918	0.37
11	181	1.209	0	181	1.209	240	0	0	120	1911	1919	0.42
12	0	0	0	181	1.209	240	181	1.209	120	1911	1920	0.47
13	181	1.209	0	0	0	240	181	1.209	120	1911	1916	0.26
14	181	1.209	0	181	1.209	240	181	1.209	120	1911	1915	0.21
15	423	2.822	0	0	0	0	0	0	0	743	747	0.54
16	0	0	0	423	2.822	240	0	0	0	743	744	0.13
17	0	0	0	0	0	0	423	2.822	120	743	751	1.08
18	423	2.822	0	423	2.822	240	0	0	120	743	745	0.27
19	0	0	0	423	2.822	240	423	2.822	120	743	747	0.54
20	423	2.822	0	0	0	240	423	2.822	120	743	750	0.94
21	423	2.822	0	423	2.822	240	423	2.822	120	743	745	0.27

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

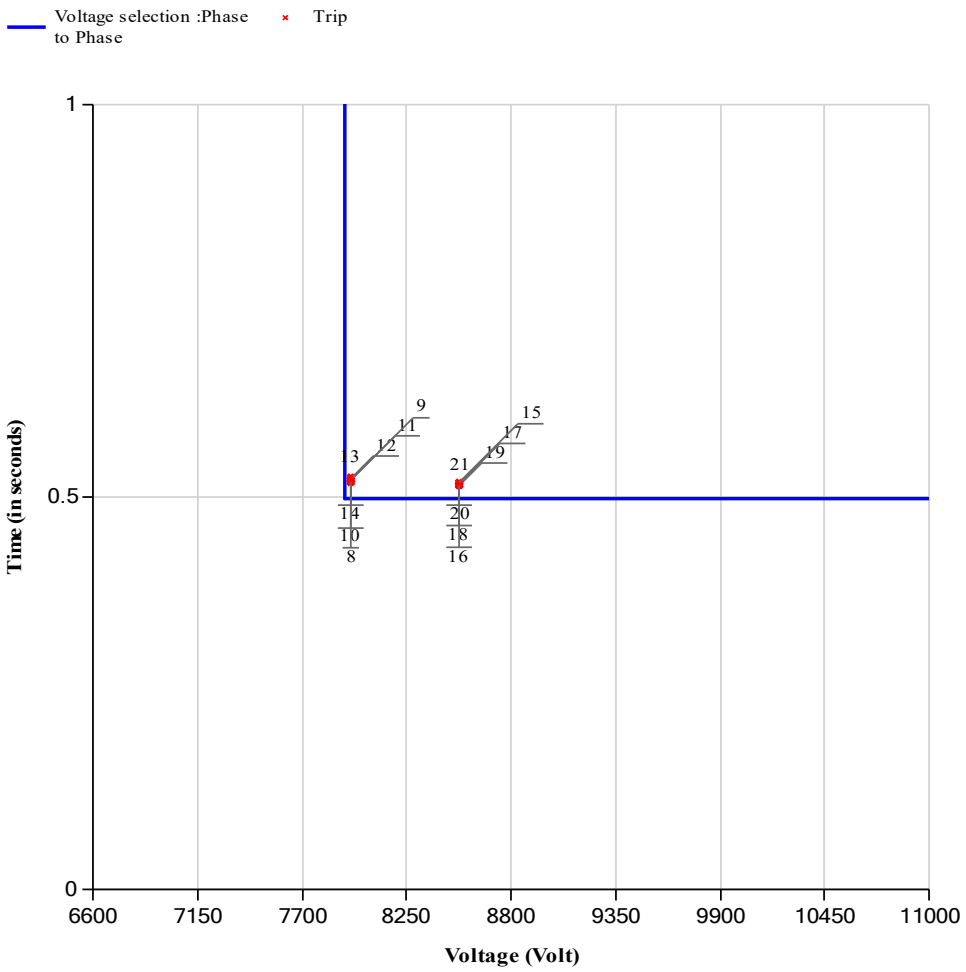
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 500 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5252	87.53	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5252	87.528	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5251	87.517	120	0	0	0
4	4550	75.838	0	4550	75.838	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4550	75.837	240	4550	75.837	120	0	0	0
6	4550	75.831	0	3811	63.509	240	4550	75.831	120	0	0	0
7	4550	75.833	0	4550	75.833	240	4550	75.833	120	0	0	0
8	5332	88.872	0	3811	63.509	240	3811	63.509	120	500	520	4
9	3811	63.509	0	5332	88.862	240	3811	63.509	120	500	522	4.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5333	88.886	120	500	522	4.4
11	4592	76.54	0	4592	76.54	240	3811	63.509	120	500	522	4.4
12	3811	63.509	0	4593	76.545	240	4593	76.545	120	500	524	4.8
13	4592	76.534	0	3811	63.509	240	4592	76.534	120	500	526	5.2
14	4592	76.542	0	4592	76.542	240	4592	76.542	120	500	519	3.8
15	5955	99.244	0	3811	63.509	240	3811	63.509	120	500	519	3.8
16	3811	63.509	0	5955	99.242	240	3811	63.509	120	500	516	3.2
17	3811	63.509	0	3811	63.509	240	5955	99.246	120	500	517	3.4
18	4921	82.024	0	4921	82.024	240	3811	63.509	120	500	516	3.2
19	3811	63.509	0	4922	82.026	240	4922	82.026	120	500	515	3
20	4921	82.025	0	3811	63.509	240	4921	82.025	120	500	519	3.8
21	4922	82.031	0	4922	82.031	240	4922	82.031	120	500	516	3.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

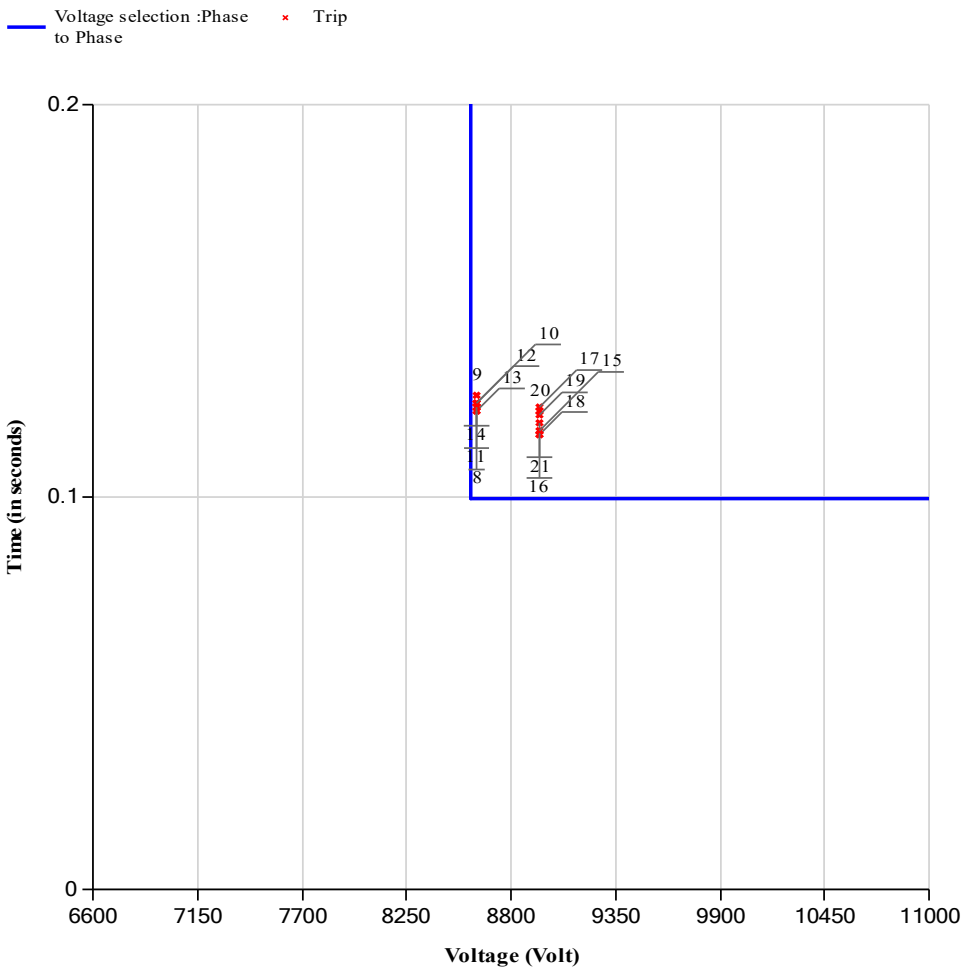
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.30 xUn
Time multiplier : 1.00
Operate delay time : 100 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5975	99.582	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5974	99.567	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5975	99.575	120	0	0	0
4	4932	82.207	0	4932	82.207	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4932	82.201	240	4932	82.201	120	0	0	0
6	4933	82.209	0	3811	63.509	240	4933	82.209	120	0	0	0
7	4932	82.208	0	4932	82.208	240	4932	82.208	120	0	0	0
8	6055	100.914	0	3811	63.509	240	3811	63.509	120	100	123	23
9	3811	63.509	0	6054	100.901	240	3811	63.509	120	100	126	26

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	6055	100.912	120	100	124	24
11	4974	82.908	0	4974	82.908	240	3811	63.509	120	100	122	22
12	3811	63.509	0	4975	82.923	240	4975	82.923	120	100	124	24
13	4974	82.908	0	3811	63.509	240	4974	82.908	120	100	122	22
14	4975	82.916	0	4975	82.916	240	4975	82.916	120	100	124	24
15	6412	106.865	0	3811	63.509	240	3811	63.509	120	100	117	17
16	3811	63.509	0	6412	106.862	240	3811	63.509	120	100	119	19
17	3811	63.509	0	3811	63.509	240	6411	106.854	120	100	123	23
18	5166	86.108	0	5166	86.108	240	3811	63.509	120	100	116	16
19	3811	63.509	0	5166	86.096	240	5166	86.096	120	100	121	21
20	5166	86.097	0	3811	63.509	240	5166	86.097	120	100	122	22
21	5166	86.103	0	5166	86.103	240	5166	86.103	120	100	116	16

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

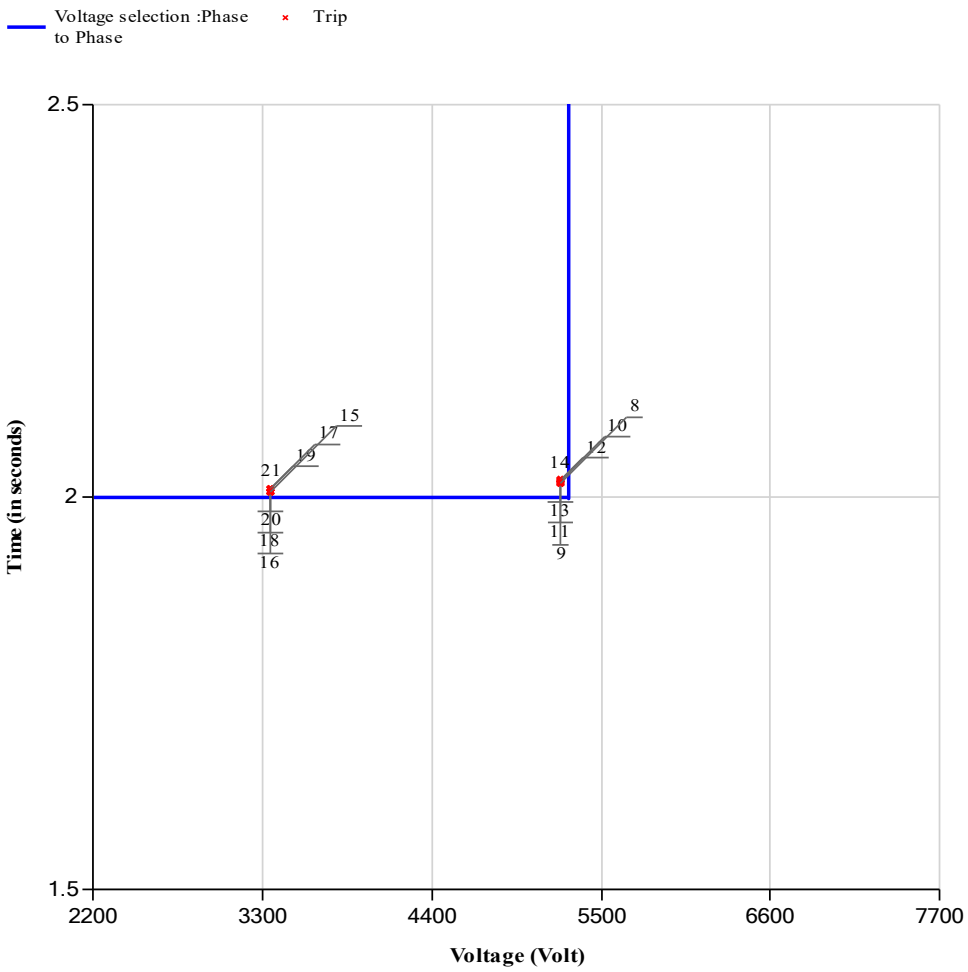
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2000 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2273	37.884	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2273	37.891	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2272	37.874	120	0	0	0
4	3074	51.237	0	3074	51.237	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3074	51.228	240	3074	51.228	120	0	0	0
6	3074	51.228	0	3811	63.509	240	3074	51.228	120	0	0	0
7	3074	51.232	0	3074	51.232	240	3074	51.232	120	0	0	0
8	2156	35.939	0	3811	63.509	240	3811	63.509	120	2000	2018	0.9
9	3811	63.509	0	2157	35.949	240	3811	63.509	120	2000	2019	0.95

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

CLIENT : ROSETTI MARINO Group of Companies

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2156	35.937	120	2000	2021	1.05
11	3022	50.361	0	3022	50.361	240	3811	63.509	120	2000	2020	1
12	3811	63.509	0	3021	50.358	240	3021	50.358	120	2000	2022	1.1
13	3021	50.353	0	3811	63.509	240	3021	50.353	120	2000	2023	1.15
14	3021	50.358	0	3021	50.358	240	3021	50.358	120	2000	2018	0.9
15	0	0	0	3811	63.509	240	3811	63.509	120	2000	2007	0.35
16	3811	63.509	0	0	0	240	3811	63.509	120	2000	2008	0.4
17	3811	63.509	0	3811	63.509	240	0	0	120	2000	2011	0.55
18	1933	32.223	0	1933	32.223	240	3811	63.509	120	2000	2007	0.35
19	3811	63.509	0	1934	32.226	240	1934	32.226	120	2000	2011	0.55
20	1934	32.226	0	3811	63.509	240	1934	32.226	120	2000	2011	0.55
21	1934	32.225	0	1934	32.225	240	1934	32.225	120	2000	2007	0.35

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

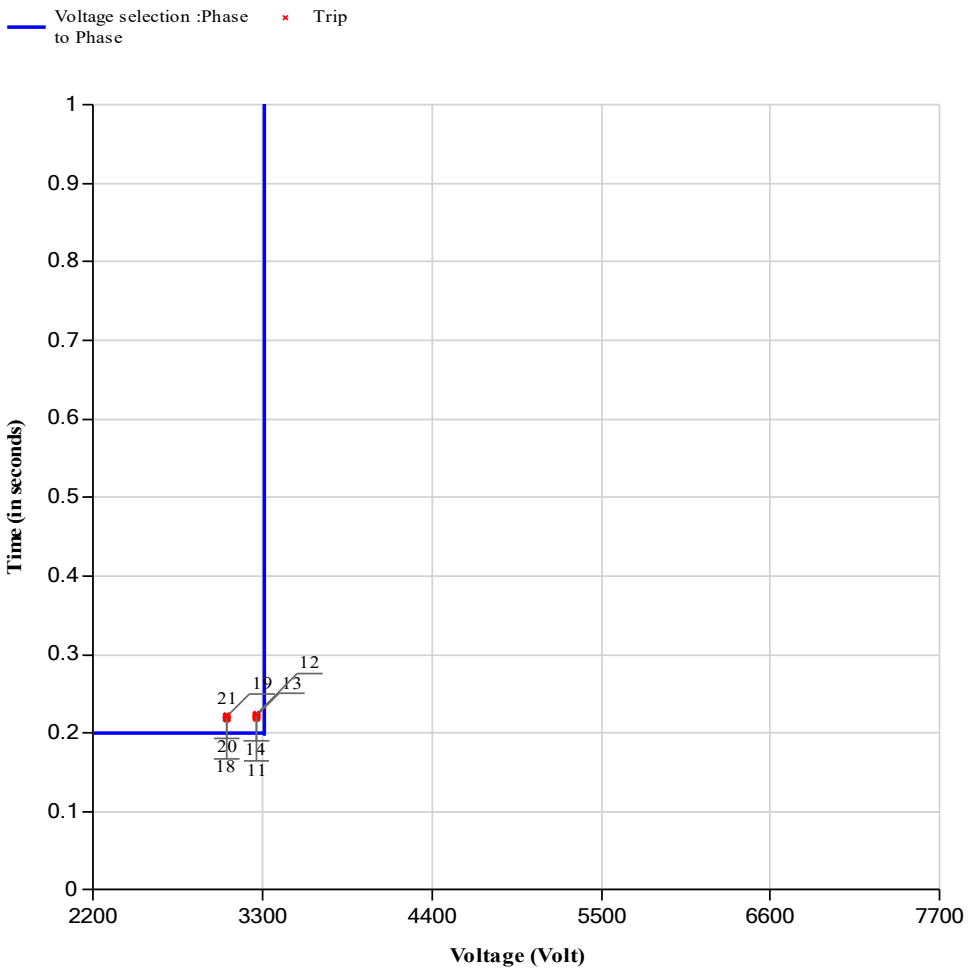
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : PHPTUV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.50 xUn
Time multiplier : 1.00
Operating delay time : 200 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
4	1934	32.225	0	1934	32.225	240	3811	63.509	120	0	0	0
5	3811	63.509	0	1933	32.224	240	1933	32.224	120	0	0	0
6	1933	32.225	0	3811	63.509	240	1933	32.225	120	0	0	0
7	1934	32.225	0	1934	32.225	240	1934	32.225	120	0	0	0
8	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
9	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

RELAY TYPE : ABB REX640

ITEM : UNIT A3

Sn. : 1VHR81041854

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
11	1881	31.351	0	1881	31.351	240	3811	63.509	120	200	221	10.5
12	3811	63.509	0	1881	31.352	240	1881	31.352	120	200	224	12
13	1881	31.35	0	3811	63.509	240	1881	31.35	120	200	222	11
14	1881	31.351	0	1881	31.351	240	1881	31.351	120	200	219	9.5
15	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
16	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
17	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
18	1770	29.496	0	1770	29.496	240	3811	63.509	120	200	219	9.5
19	3811	63.509	0	1770	29.496	240	1770	29.496	120	200	221	10.5
20	1770	29.496	0	3811	63.509	240	1770	29.496	120	200	222	11
21	1770	29.494	0	1770	29.494	240	1770	29.494	120	200	218	9

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

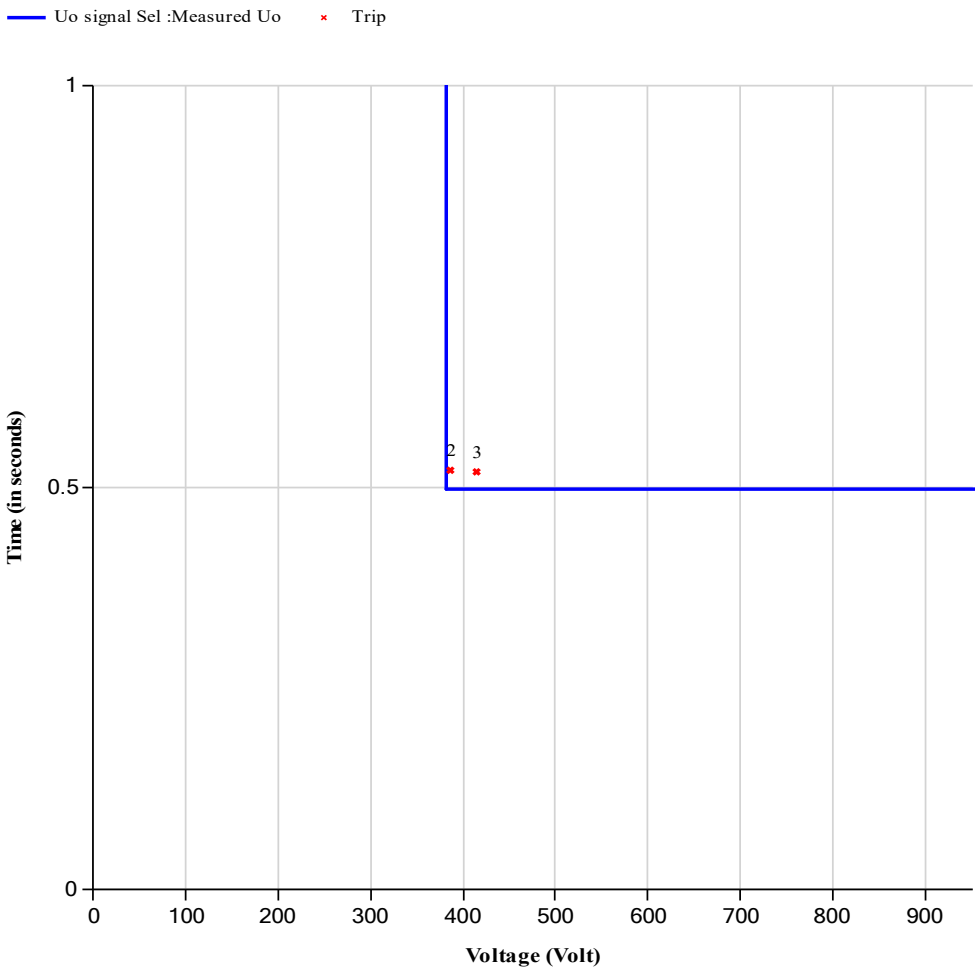
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 500 msec



NB : ALARM ONLY

N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	500	522	4.4
3	415	11.97	500	520	4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

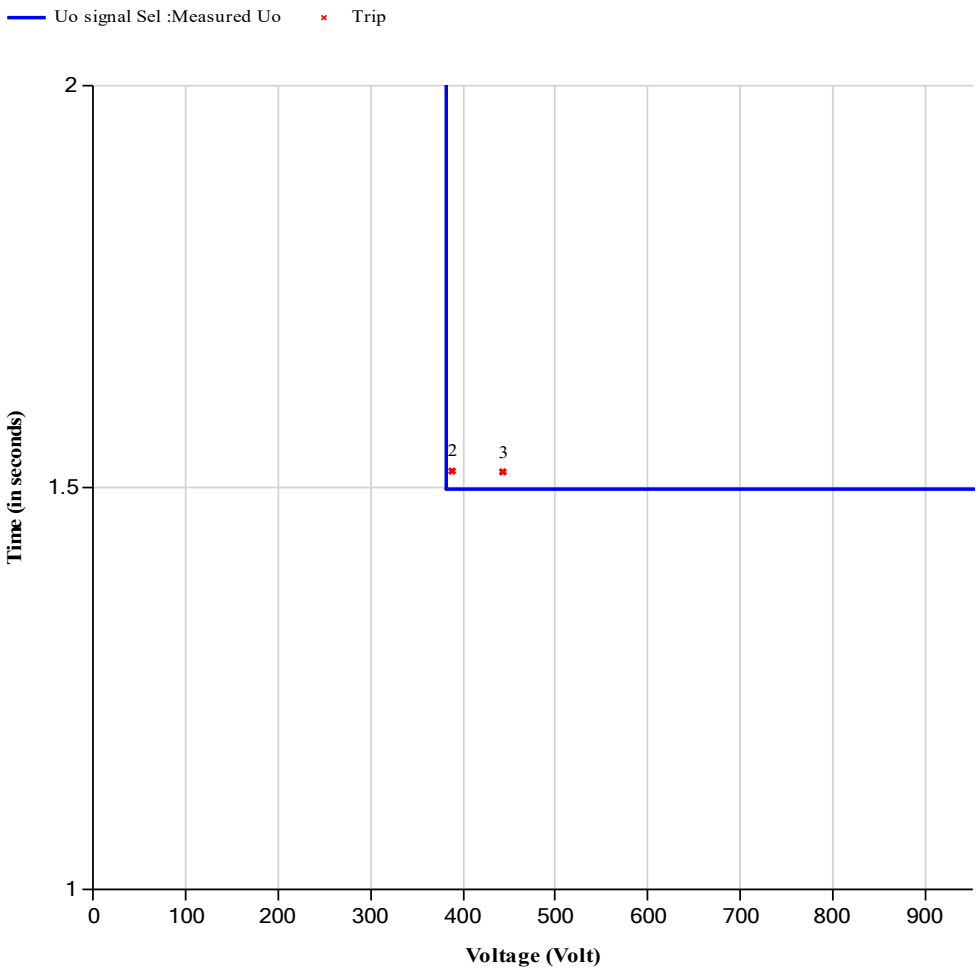
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : ROVPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1500 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	388	11.205	1500	1521	1.4
3	443	12.789	1500	1520	1.33

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-85000

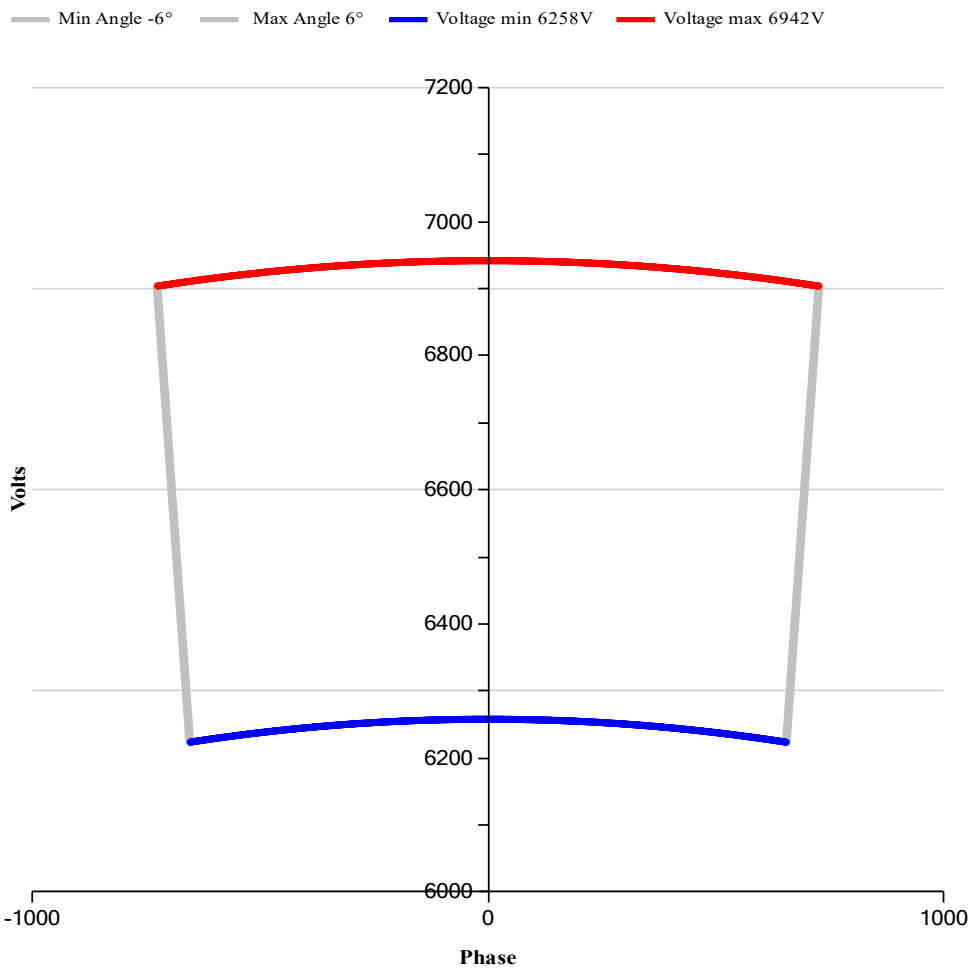
ITEM : UNIT A3

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041854

IEC61850 : SECRSYN1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Synchro check Mode : Asynchronous
Control Mode : Continuous
Dead line value : 0.10 xUn
Live line value : 0.50 xUn
Dead bus value : 0.10 xUn
Live bus value : 0.50 xUn
Close pulse : 200 ms
Max energizing V : 0.64 xUn
Phase shift : 0 deg
Minimum Syn time : 10000 ms
Maximum Syn time : 5000 ms
Energizing time : 100 ms
Closing time CB : 50 ms
Live dead mode : Not Both Live
Difference voltage : 0.05 xUn
Difference frequency : 0.010 xFn
Difference angle : 5 deg



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	V4(V)	V4"(V)	V4(°)	F (Hz)
1	3811	63.509	0	3811	63.509	240	3811	63.509	120	6258	104.3	30	50
2	3811	63.509	0	3811	63.509	240	3811	63.509	120	6942	115.7	30	50
3	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	24	50
4	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	36	50
5	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	49.5
6	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	50.5

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

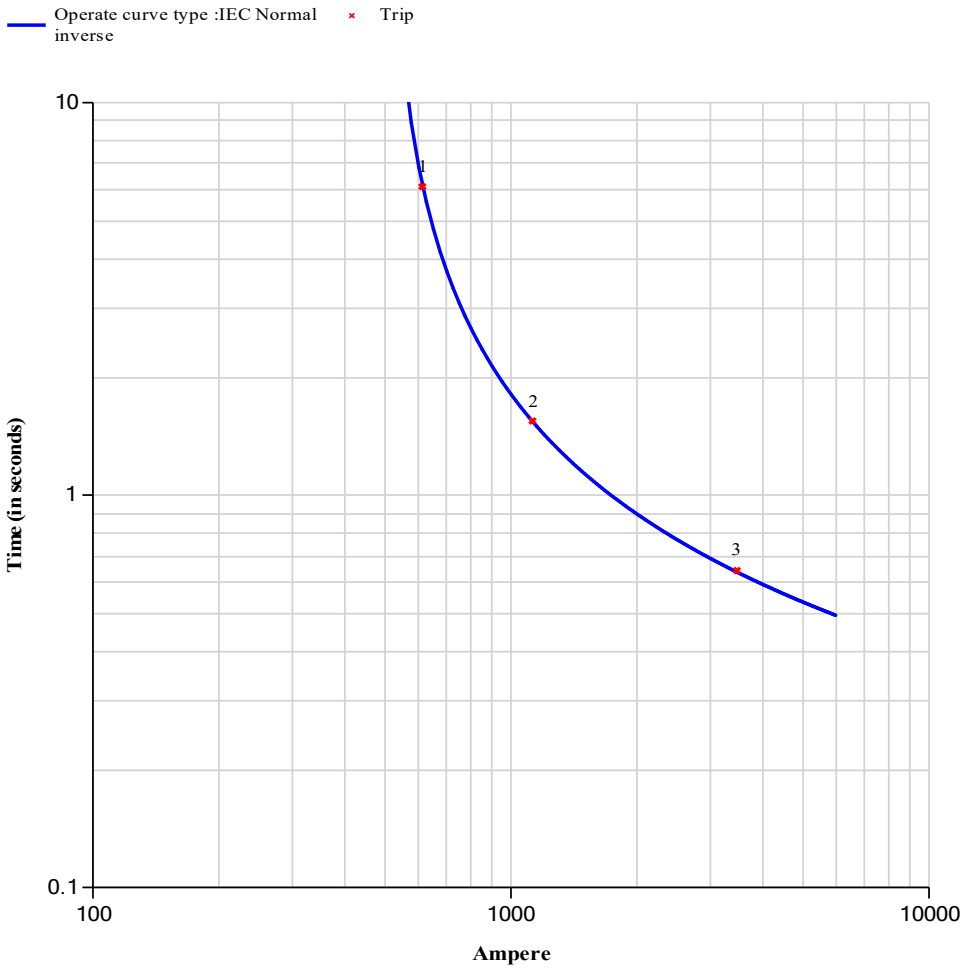
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : EFHPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 2500 / 1 A
Nominal current : 140 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.200 xIn
Time multiplier : 0.18
Operate curve type : IEC Normal inverse
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	612.51	0.245	0	6196	6114	1.32
2	1123.54	0.449	0	1544	1548	0.26
3	3466.56	1.387	0	638	644	0.94

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

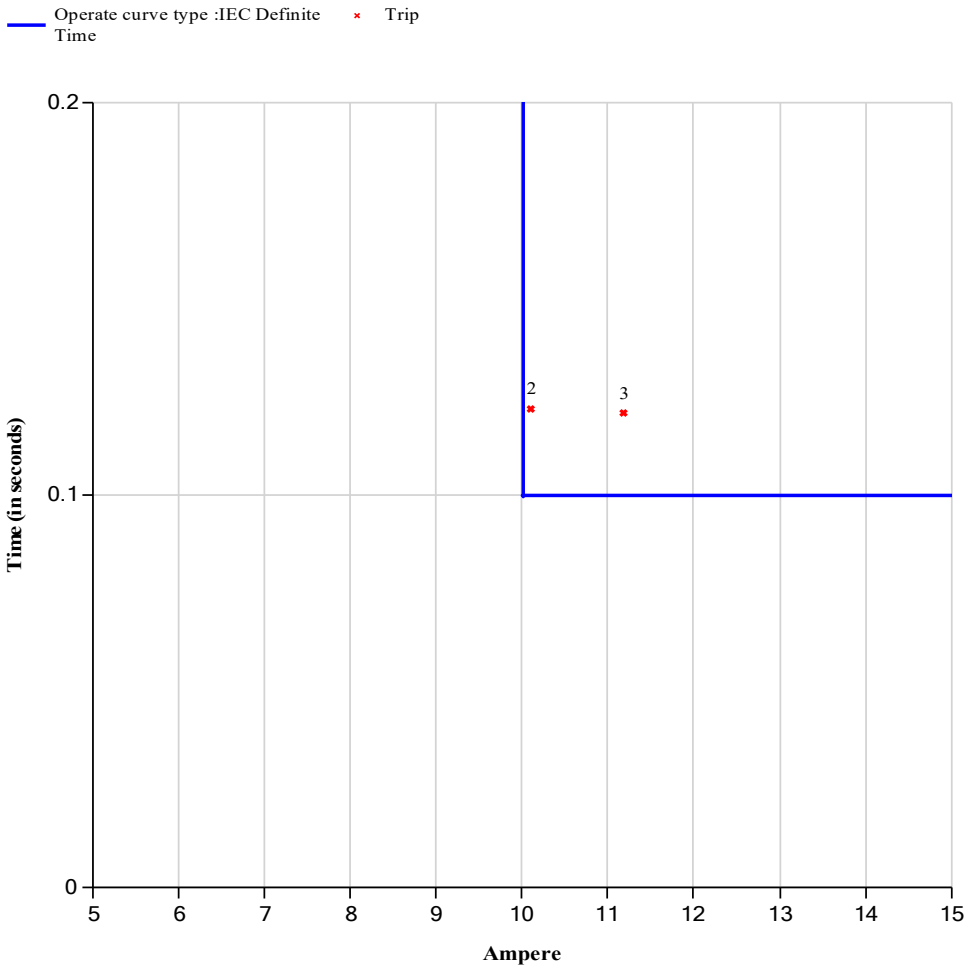
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 140 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.100 xIn
Operate delay time : 100 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	9.75	0.098	0	0	0	0
2	10.1	0.101	0	100	122	22
3	11.18	0.112	0	100	121	21

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

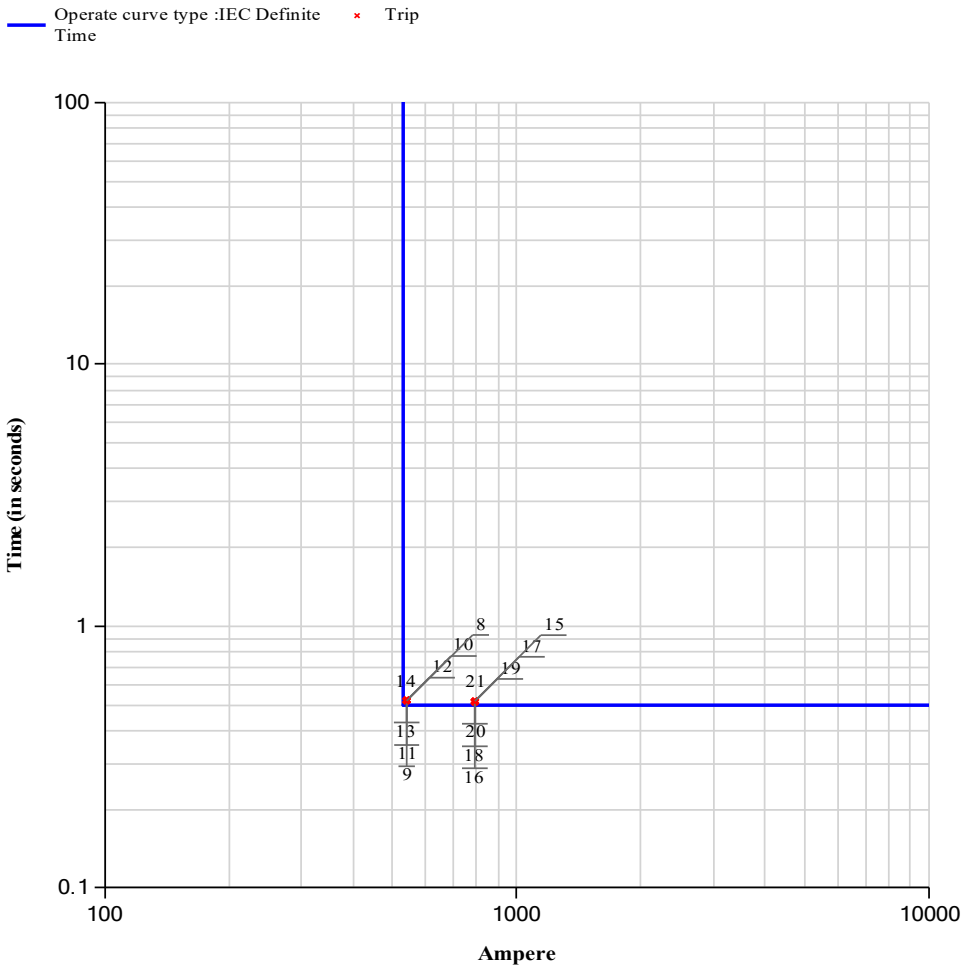
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHHPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 200 / 1 A
Nominal current : 140 A
Num. start phases : 1 out of 3
Minimum operate time : 500 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 2.65 xIn
Start value mult. : 1.0
Operate delay time : 500 msec
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	515	2.574	0	0	0	0	0	0	0	0	0	0
2	0	0	0	515	2.574	240	0	0	0	0	0	0
3	0	0	0	0	0	0	515	2.574	120	0	0	0
4	515	2.574	0	515	2.574	240	0	0	120	0	0	0
5	0	0	0	515	2.574	240	515	2.574	120	0	0	0
6	515	2.574	0	0	0	240	515	2.574	120	0	0	0
7	515	2.574	0	515	2.574	240	515	2.574	120	0	0	0
8	541	2.703	0	0	0	0	0	0	0	500	519	3.8
9	0	0	0	541	2.703	240	0	0	0	500	522	4.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHHPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	541	2.703	120	500	522	4.4
11	541	2.703	0	541	2.703	240	0	0	120	500	520	4
12	0	0	0	541	2.703	240	541	2.703	120	500	522	4.4
13	541	2.703	0	0	0	240	541	2.703	120	500	524	4.8
14	541	2.703	0	541	2.703	240	541	2.703	120	500	520	4
15	791	3.955	0	0	0	0	0	0	0	500	518	3.6
16	0	0	0	791	3.955	240	0	0	0	500	513	2.6
17	0	0	0	0	0	0	791	3.955	120	500	518	3.6
18	791	3.955	0	791	3.955	240	0	0	120	500	514	2.8
19	0	0	0	791	3.955	240	791	3.955	120	500	516	3.2
20	791	3.955	0	0	0	240	791	3.955	120	500	518	3.6
21	791	3.955	0	791	3.955	240	791	3.955	120	500	517	3.4

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

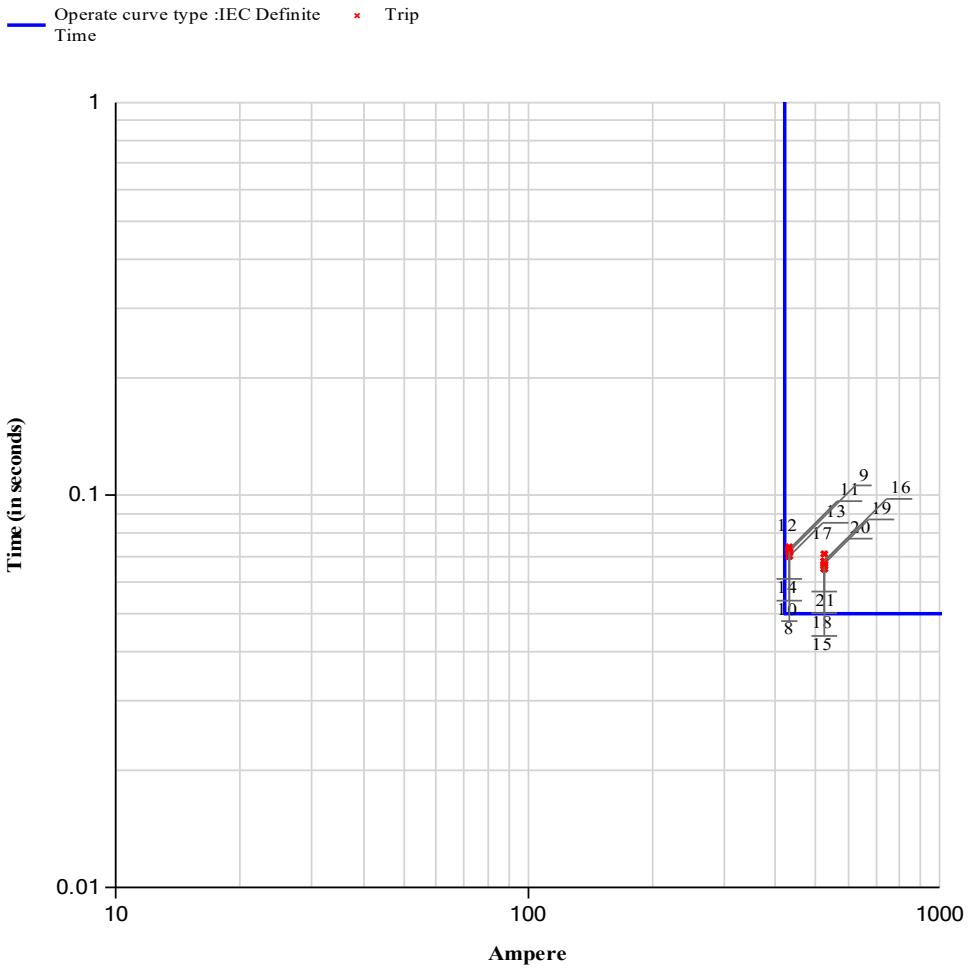
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHHPTOC2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 200 / 1 A
Nominal current : 140 A
Num. start phases : 1 out of 3
Minimum operate time : 50 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 2.10 xIn
Start value mult. : 1.00
Operate delay time : 50 msec
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	410	2.052	0	0	0	0	0	0	0	0	0	0
2	0	0	0	410	2.052	240	0	0	0	0	0	0
3	0	0	0	0	0	0	410	2.052	120	0	0	0
4	410	2.052	0	410	2.052	240	0	0	120	0	0	0
5	0	0	0	410	2.052	240	410	2.052	120	0	0	0
6	410	2.052	0	0	0	240	410	2.052	120	0	0	0
7	410	2.052	0	410	2.052	240	410	2.052	120	0	0	0
8	431	2.154	0	0	0	0	0	0	0	50	72	44
9	0	0	0	431	2.154	240	0	0	0	50	72	44

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHHPTOC2

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	431	2.154	120	50	73	46
11	431	2.154	0	431	2.154	240	0	0	120	50	73	46
12	0	0	0	431	2.154	240	431	2.154	120	50	74	48
13	431	2.154	0	0	0	240	431	2.154	120	50	70	40
14	431	2.154	0	431	2.154	240	431	2.154	120	50	70	40
15	524	2.619	0	0	0	0	0	0	0	50	66	32
16	0	0	0	524	2.619	240	0	0	0	50	68	36
17	0	0	0	0	0	0	524	2.619	120	50	71	42
18	524	2.619	0	524	2.619	240	0	0	120	50	65	30
19	0	0	0	524	2.619	240	524	2.619	120	50	67	34
20	524	2.619	0	0	0	240	524	2.619	120	50	68	36
21	524	2.619	0	524	2.619	240	524	2.619	120	50	65	30

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

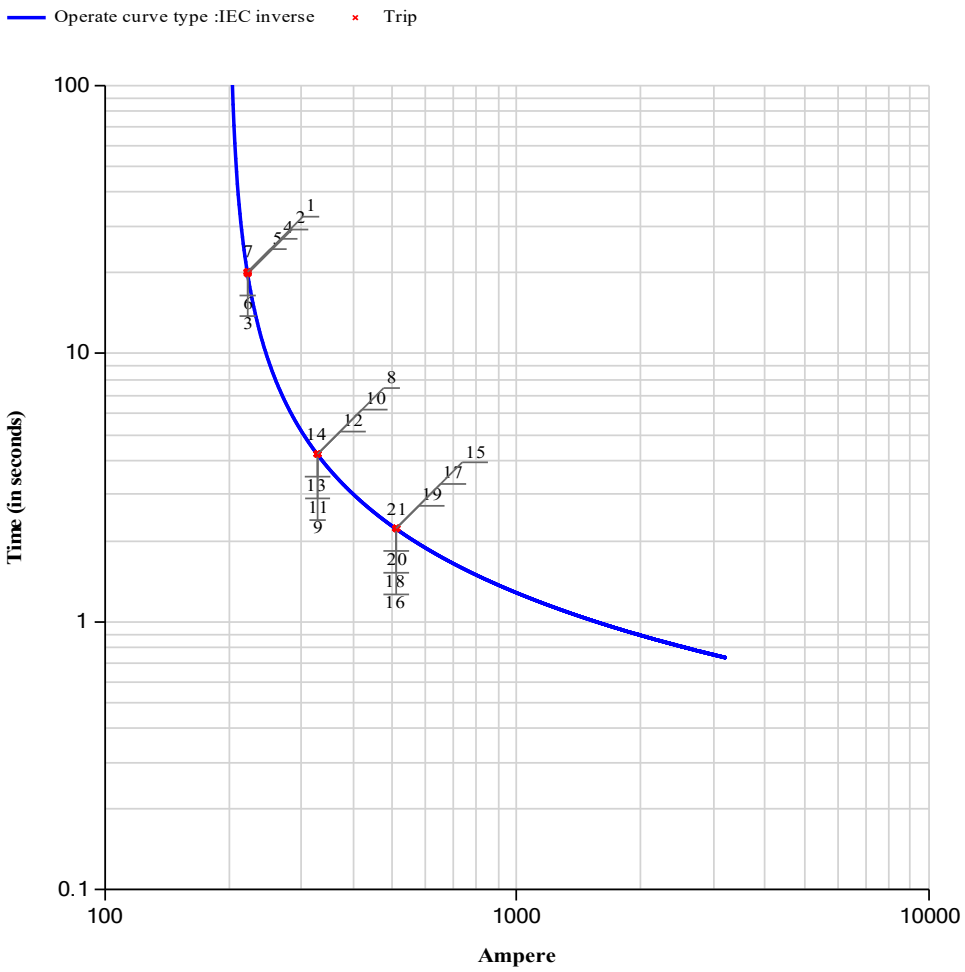
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 200 / 1 A
Nominal current : 140 A
Num. start phases : 1 out of 3
Minimum operate time : 500 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 1.00 xIn
Start value mult. : 1.00
Time multiplier : 0.30
Operate curve type : IEC inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	222	1.112	0	0	0	0	0	0	0	19719	20224	2.56
2	0	0	0	222	1.112	240	0	0	0	19719	19886	0.85
3	0	0	0	0	0	0	222	1.112	120	19719	20238	2.63
4	222	1.112	0	222	1.112	240	0	0	120	19719	20140	2.13
5	0	0	0	222	1.112	240	222	1.112	120	19719	20241	2.65
6	222	1.112	0	0	0	240	222	1.112	120	19719	20035	1.6
7	222	1.112	0	222	1.112	240	222	1.112	120	19719	20181	2.34
8	329	1.643	0	0	0	0	0	0	0	4207	4229	0.52
9	0	0	0	329	1.643	240	0	0	0	4207	4230	0.55

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	329	1.643	120	4207	4234	0.64
11	329	1.643	0	329	1.643	240	0	0	120	4207	4228	0.5
12	0	0	0	329	1.643	240	329	1.643	120	4207	4228	0.5
13	329	1.643	0	0	0	240	329	1.643	120	4207	4231	0.57
14	329	1.643	0	329	1.643	240	329	1.643	120	4207	4226	0.45
15	510	2.549	0	0	0	0	0	0	0	2223	2235	0.54
16	0	0	0	510	2.549	240	0	0	0	2223	2233	0.45
17	0	0	0	0	0	0	510	2.549	120	2223	2236	0.58
18	510	2.549	0	510	2.549	240	0	0	120	2223	2233	0.45
19	0	0	0	510	2.549	240	510	2.549	120	2223	2234	0.49
20	510	2.549	0	0	0	240	510	2.549	120	2223	2235	0.54
21	510	2.549	0	510	2.549	240	510	2.549	120	2223	2230	0.31

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

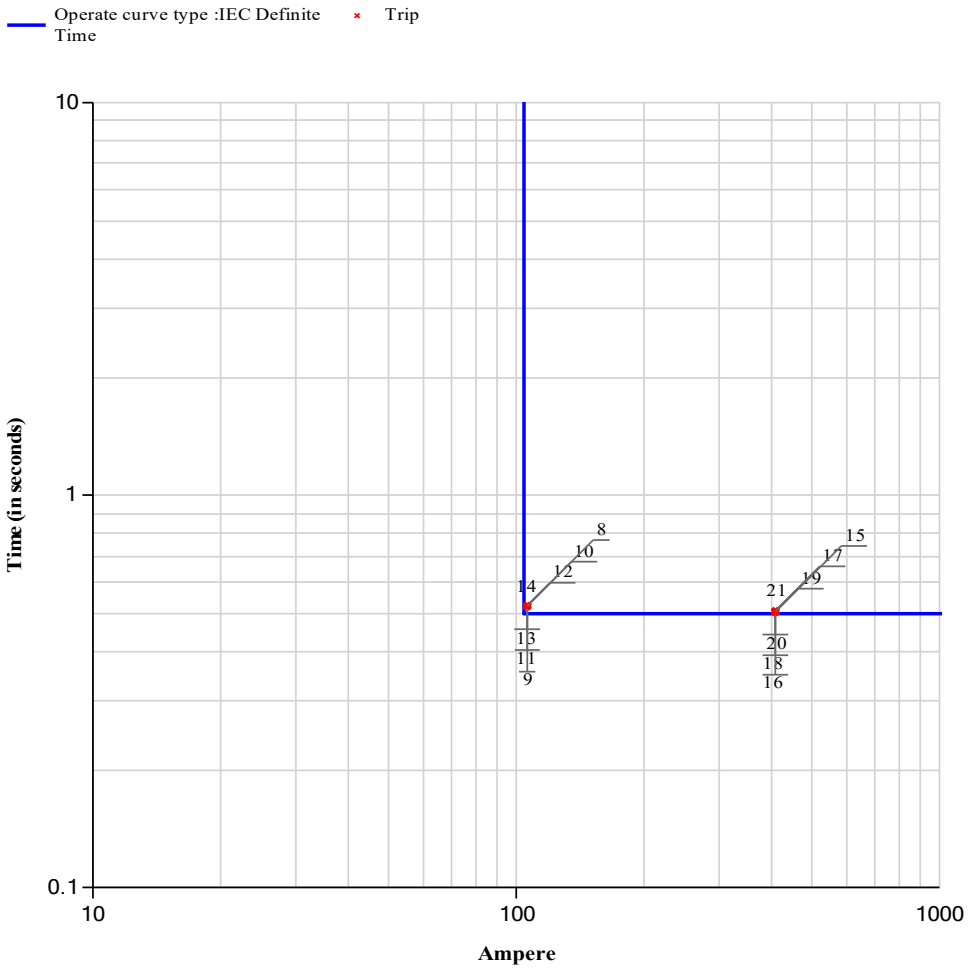
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHLPTOC2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 200 / 1 A
Nominal current : 140 A
Num. start phases : 1 out of 3
Minimum operate time : 500 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 0.52 xIn
Start value mult. : 1.00
Operate delay time : 500 msec
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	102	0.509	0	0	0	0	0	0	0	0	0	0
2	0	0	0	102	0.509	240	0	0	0	0	0	0
3	0	0	0	0	0	0	102	0.509	120	0	0	0
4	102	0.509	0	102	0.509	240	0	0	120	0	0	0
5	0	0	0	102	0.509	240	102	0.509	120	0	0	0
6	102	0.509	0	0	0	240	102	0.509	120	0	0	0
7	102	0.509	0	102	0.509	240	102	0.509	120	0	0	0
8	106	0.529	0	0	0	0	0	0	0	500	523	4.6
9	0	0	0	106	0.529	240	0	0	0	500	524	4.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC2

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	106	0.529	120	500	523	4.6
11	106	0.529	0	106	0.529	240	0	0	120	500	524	4.8
12	0	0	0	106	0.529	240	106	0.529	120	500	525	5
13	106	0.529	0	0	0	240	106	0.529	120	500	521	4.2
14	106	0.529	0	106	0.529	240	106	0.529	120	500	522	4.4
15	408	2.041	0	0	0	0	0	0	0	500	505	1
16	0	0	0	408	2.041	240	0	0	0	500	504	0.8
17	0	0	0	0	0	0	408	2.041	120	500	509	1.8
18	408	2.041	0	408	2.041	240	0	0	120	500	508	1.6
19	0	0	0	408	2.041	240	408	2.041	120	500	507	1.4
20	408	2.041	0	0	0	240	408	2.041	120	500	505	1
21	408	2.041	0	408	2.041	240	408	2.041	120	500	506	1.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

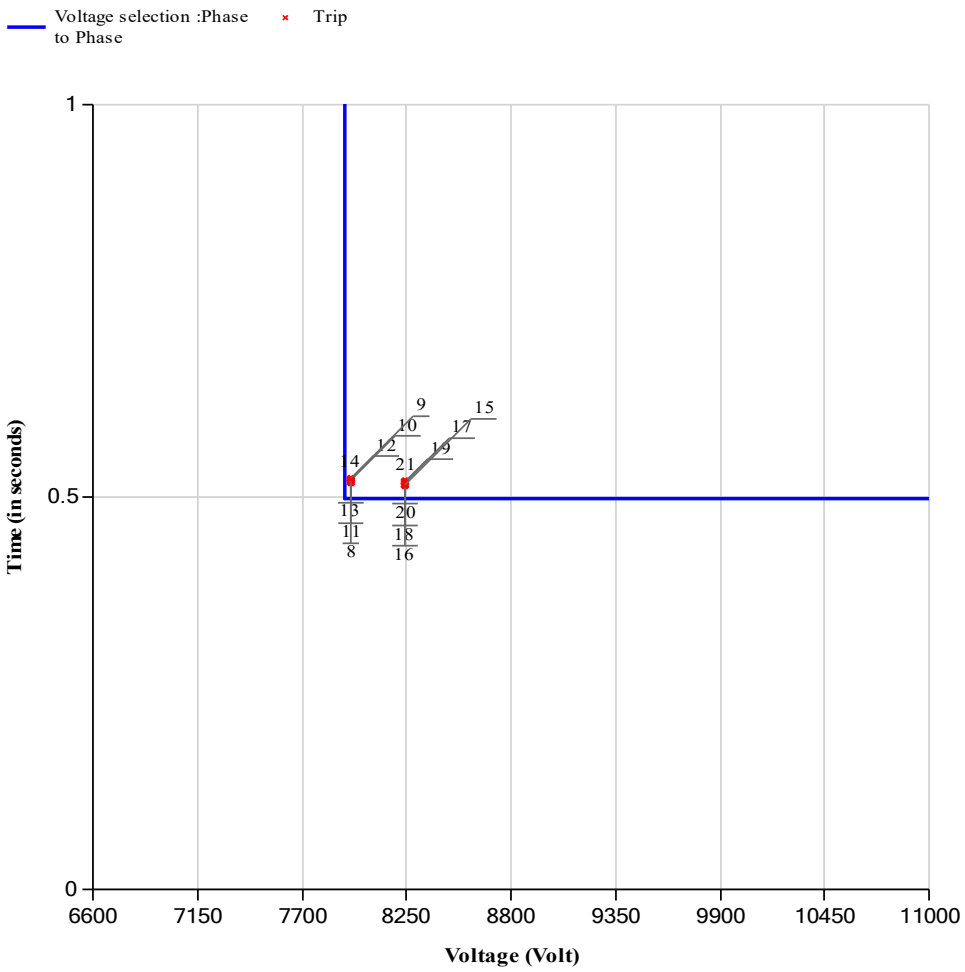
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 500 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5261	87.686	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5261	87.68	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5262	87.697	120	0	0	0
4	4555	75.918	0	4555	75.918	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4556	75.926	240	4556	75.926	120	0	0	0
6	4555	75.922	0	3811	63.509	240	4555	75.922	120	0	0	0
7	4555	75.922	0	4555	75.922	240	4555	75.922	120	0	0	0
8	5332	88.873	0	3811	63.509	240	3811	63.509	120	500	521	4.2
9	3811	63.509	0	5333	88.885	240	3811	63.509	120	500	524	4.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5333	88.878	120	500	522	4.4
11	4593	76.543	0	4593	76.543	240	3811	63.509	120	500	519	3.8
12	3811	63.509	0	4592	76.539	240	4592	76.539	120	500	524	4.8
13	4593	76.544	0	3811	63.509	240	4593	76.544	120	500	522	4.4
14	4592	76.542	0	4592	76.542	240	4592	76.542	120	500	519	3.8
15	5645	94.078	0	3811	63.509	240	3811	63.509	120	500	516	3.2
16	3811	63.509	0	5645	94.088	240	3811	63.509	120	500	518	3.6
17	3811	63.509	0	3811	63.509	240	5644	94.074	120	500	519	3.8
18	4757	79.283	0	4757	79.283	240	3811	63.509	120	500	516	3.2
19	3811	63.509	0	4757	79.288	240	4757	79.288	120	500	520	4
20	4758	79.292	0	3811	63.509	240	4758	79.292	120	500	521	4.2
21	4757	79.286	0	4757	79.286	240	4757	79.286	120	500	515	3

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

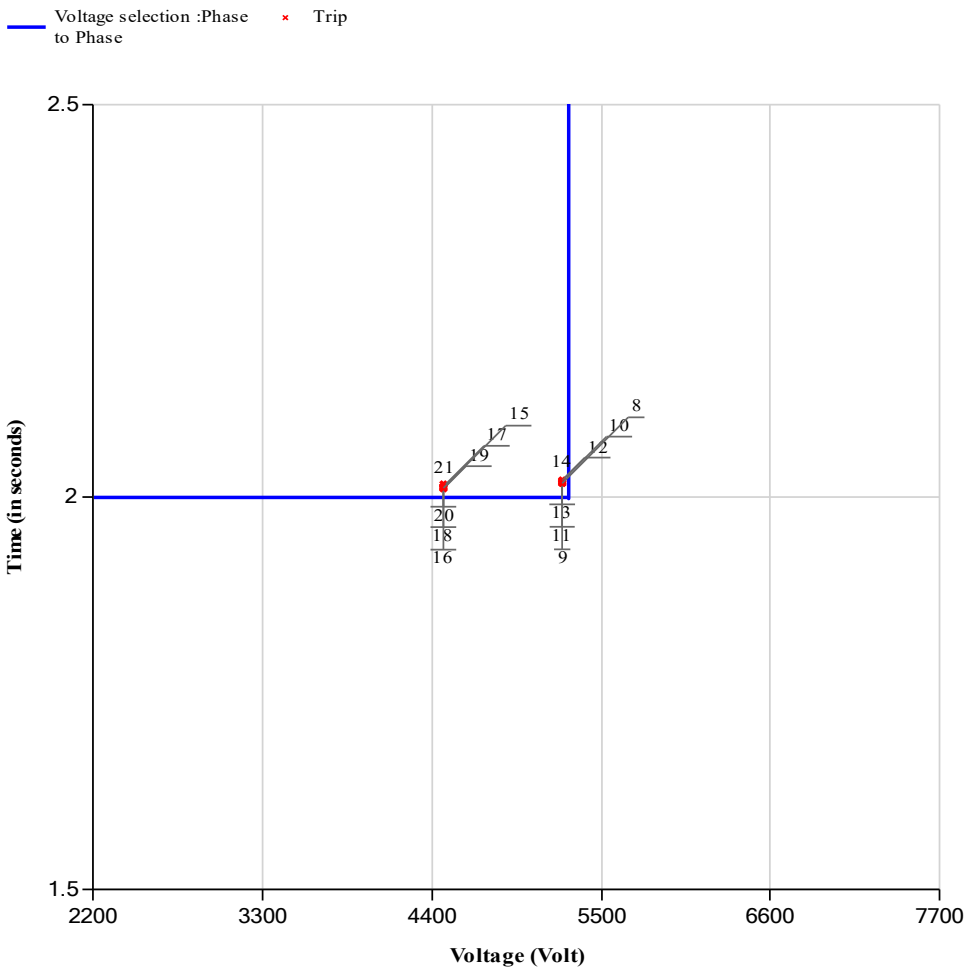
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.10 xUn
Enable block value : False
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2000 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2273	37.876	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2273	37.889	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2273	37.886	120	0	0	0
4	3074	51.229	0	3074	51.229	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3074	51.227	240	3074	51.227	120	0	0	0
6	3074	51.23	0	3811	63.509	240	3074	51.23	120	0	0	0
7	3074	51.232	0	3074	51.232	240	3074	51.232	120	0	0	0
8	2171	36.178	0	3811	63.509	240	3811	63.509	120	2000	2018	0.9
9	3811	63.509	0	2172	36.197	240	3811	63.509	120	2000	2018	0.9

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2171	36.191	120	2000	2021	1.05
11	3028	50.465	0	3028	50.465	240	3811	63.509	120	2000	2019	0.95
12	3811	63.509	0	3028	50.465	240	3028	50.465	120	2000	2022	1.1
13	3028	50.468	0	3811	63.509	240	3028	50.468	120	2000	2020	1
14	3028	50.467	0	3028	50.467	240	3028	50.467	120	2000	2020	1
15	1114	18.566	0	3811	63.509	240	3811	63.509	120	2000	2012	0.6
16	3811	63.509	0	1114	18.559	240	3811	63.509	120	2000	2013	0.65
17	3811	63.509	0	3811	63.509	240	1114	18.574	120	2000	2014	0.7
18	2582	43.036	0	2582	43.036	240	3811	63.509	120	2000	2014	0.7
19	3811	63.509	0	2583	43.043	240	2583	43.043	120	2000	2011	0.55
20	2582	43.037	0	3811	63.509	240	2582	43.037	120	2000	2017	0.85
21	2582	43.039	0	2582	43.039	240	2582	43.039	120	2000	2012	0.6

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

CLIENT : ROSETTI MARINO Group of Companies

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

EQUIPMENT DESCRIPTION : -TR-200DE1

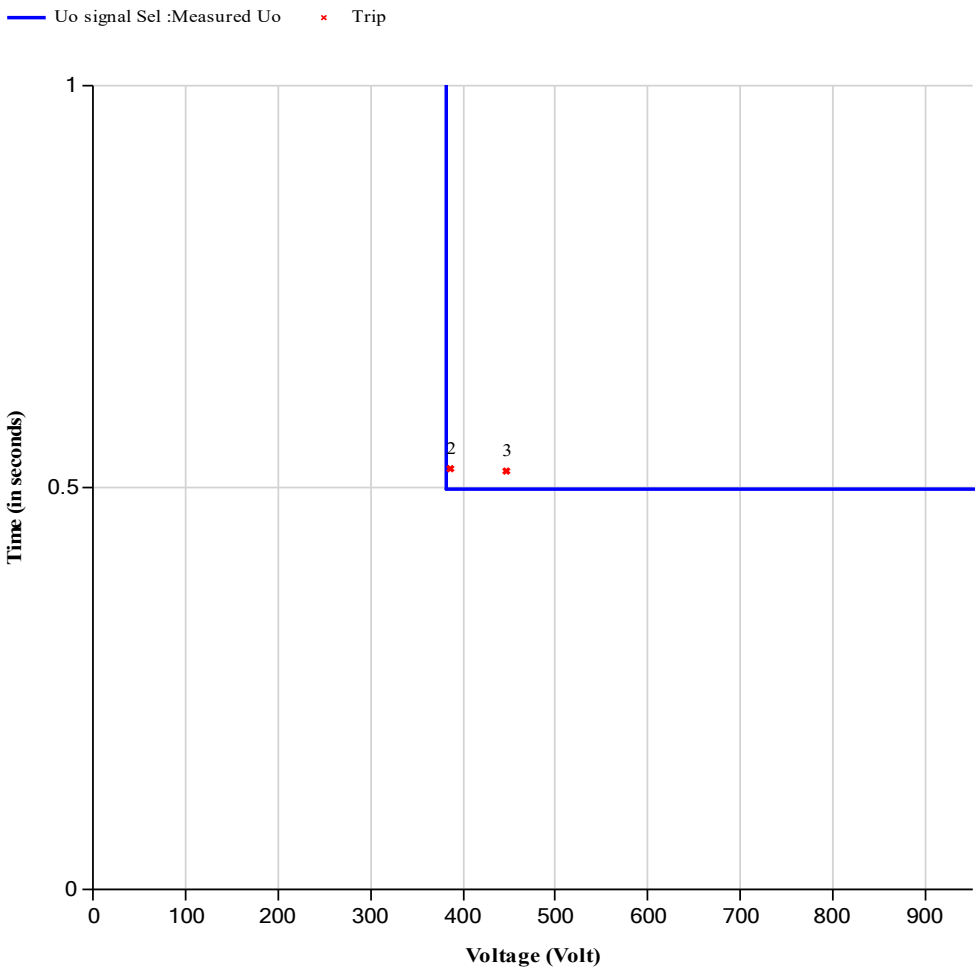
RELAY TYPE : ABB REX640

ITEM : UNIT A4

Sn. : 1VHR81041856

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 500 msec



NB : ALARM ONLY

N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	500	524	4.8
3	447	12.898	500	521	4.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200DE1

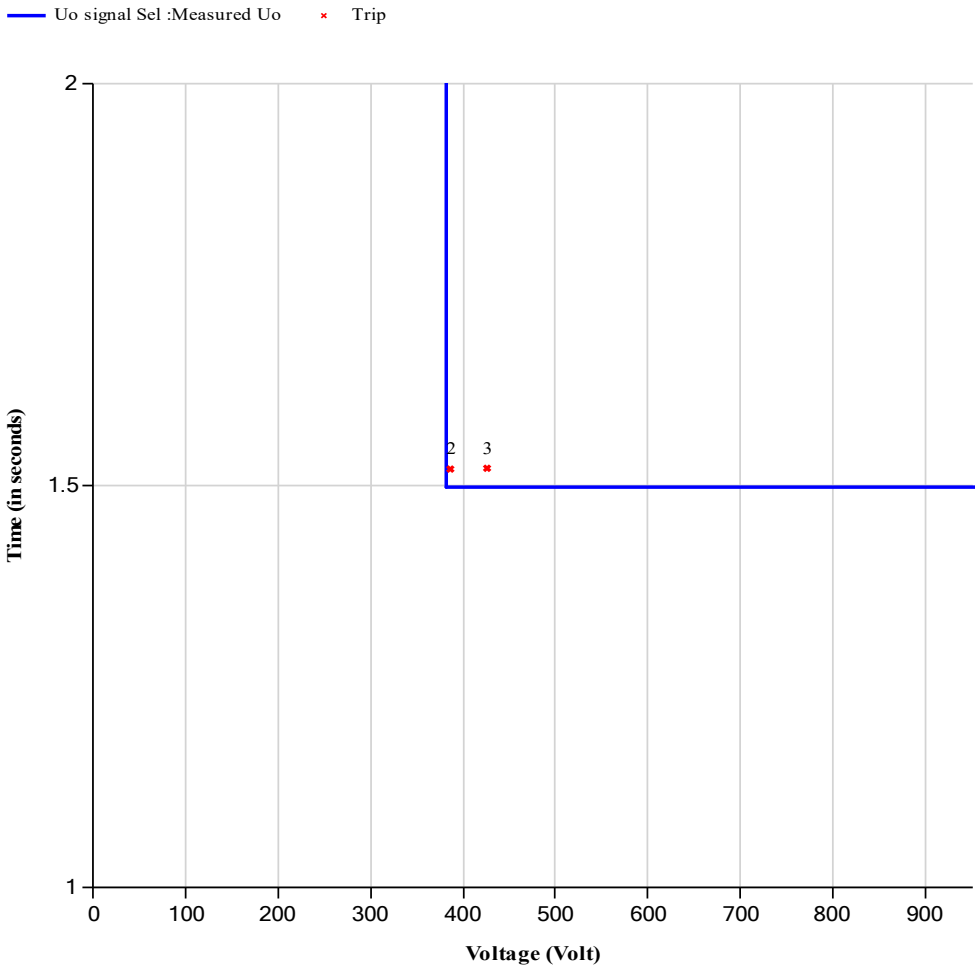
ITEM : UNIT A4

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041856

IEC61850 : ROVPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1500 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	1500	1521	1.4
3	426	12.297	1500	1522	1.47

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

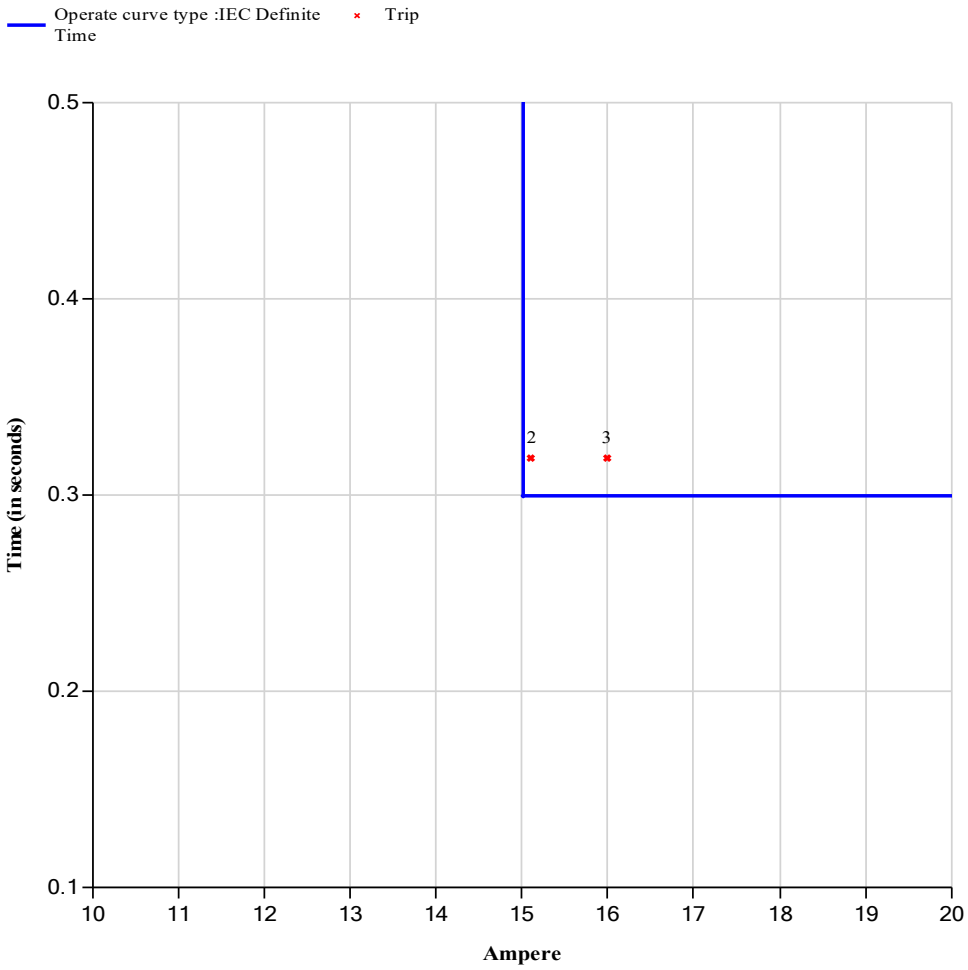
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 585.7 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.150 xIn
Operate delay time : 300 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	14.85	0.149	0	0	0	0
2	15.1	0.151	0	300	319	6.33
3	15.99	0.16	0	300	319	6.33

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

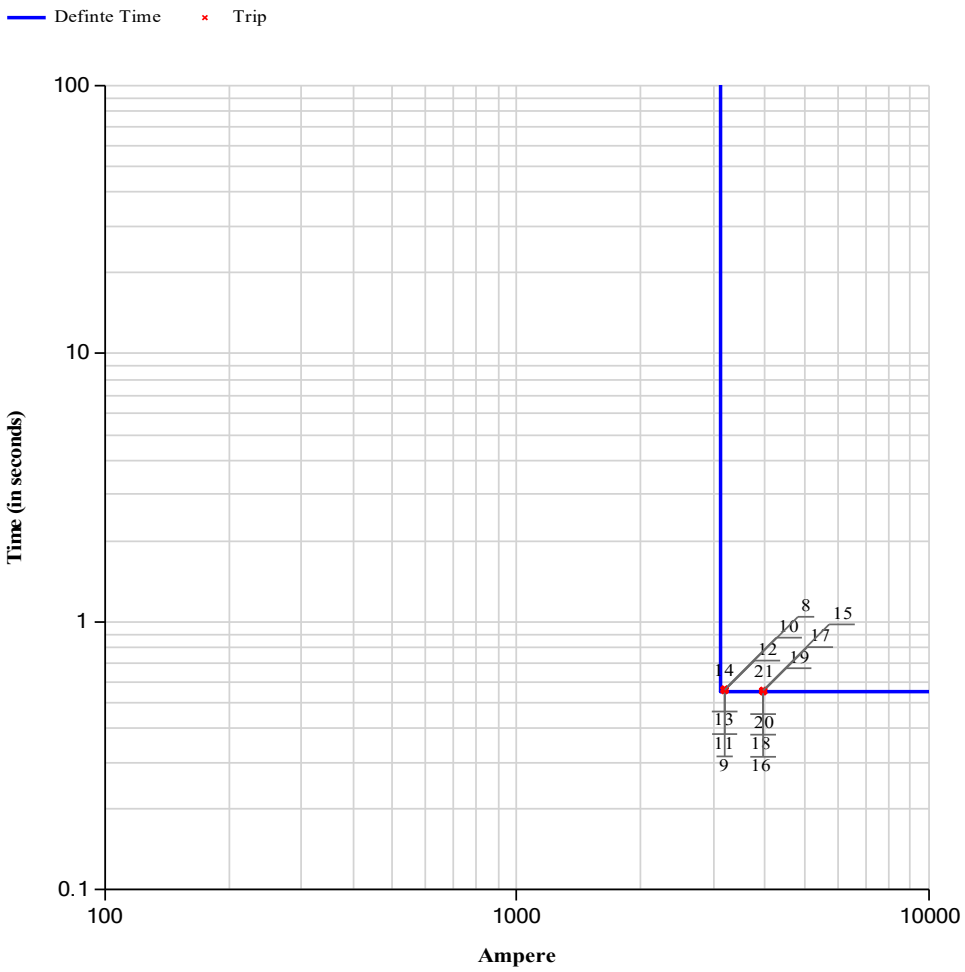
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : PHIPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 600 / 1 A
Nominal current : 585.7 A
Num of start phases : 1 Out of 3
Reset delay time : 20 ms
Start value : 5.20 xIn
Start valure Mult : 1.0
Operate delay time : 550 ms



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	3040	5.067	0	0	0	0	0	0	0	0	0	0
2	0	0	0	3040	5.067	240	0	0	0	0	0	0
3	0	0	0	0	0	0	3040	5.067	120	0	0	0
4	3040	5.067	0	3040	5.067	180	0	0	0	0	0	0
5	0	0	0	3040	5.067	240	3040	5.067	60	0	0	0
6	3040	5.067	300	0	0	0	3040	5.067	120	0	0	0
7	3040	5.067	0	3040	5.067	240	3040	5.067	120	0	0	0
8	3192	5.321	0	0	0	0	0	0	0	550	558	1.45
9	0	0	0	3192	5.321	240	0	0	0	550	556	1.09

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHIPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	3192	5.321	120	550	562	2.18
11	3192	5.321	0	3192	5.321	180	0	0	0	550	559	1.64
12	0	0	0	3192	5.321	240	3192	5.321	60	550	556	1.09
13	3192	5.321	300	0	0	0	3192	5.321	120	550	563	2.36
14	3192	5.321	0	3192	5.321	240	3192	5.321	120	550	556	1.09
15	3957	6.595	0	0	0	0	0	0	0	550	556	1.09
16	0	0	0	3957	6.595	240	0	0	0	550	554	0.73
17	0	0	0	0	0	0	3957	6.595	120	550	551	0.18
18	3957	6.595	0	3957	6.595	180	0	0	0	550	556	1.09
19	0	0	0	3957	6.595	240	3957	6.595	60	550	554	0.73
20	3957	6.595	300	0	0	0	3957	6.595	120	550	551	0.18
21	3957	6.595	0	3957	6.595	240	3957	6.595	120	550	550	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

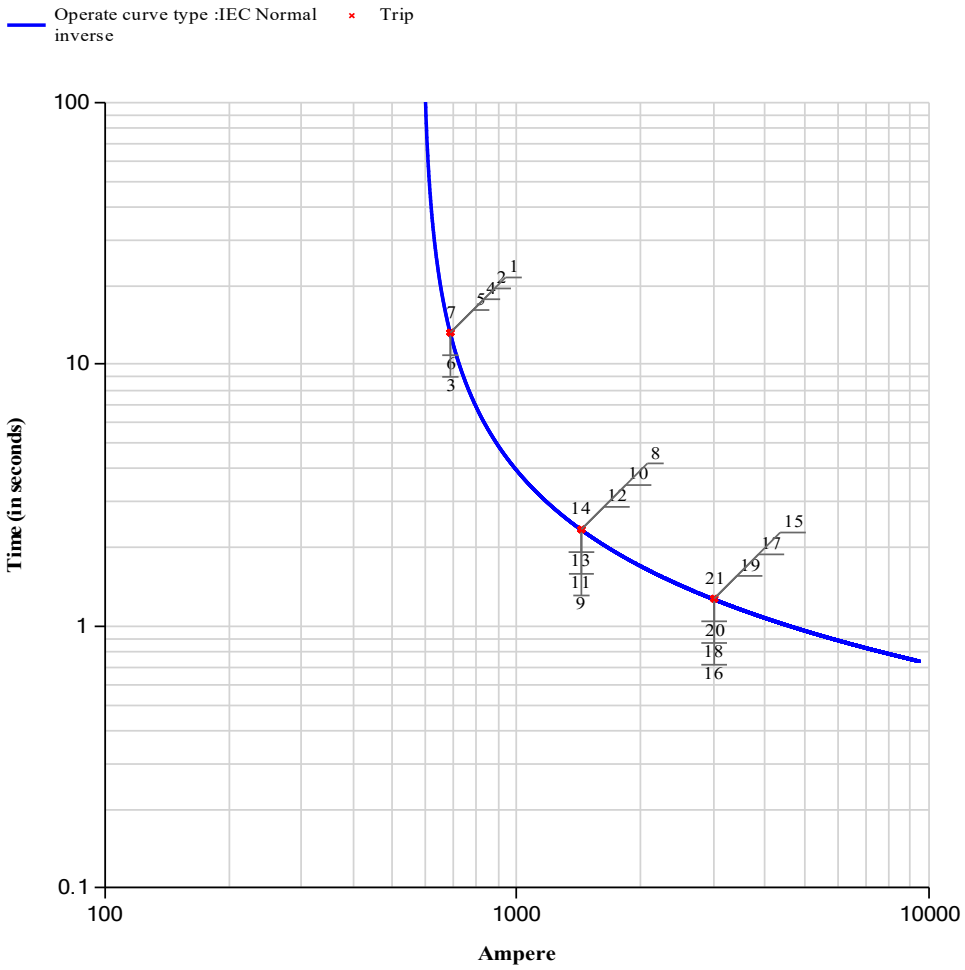
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 600 / 1 A
Nominal current : 585.7 A
Num. start phases : 1 out of 3
Minimum operate time : 550 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 0.98 xIn
Start value mult. : 1.00
Time multiplier : 0.30
Operate curve type : IEC Normal inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	690	1.15	0	0	0	0	0	0	0	13114	13236	0.93
2	0	0	0	690	1.15	240	0	0	0	13114	13218	0.79
3	0	0	0	0	0	0	690	1.15	120	13114	13240	0.96
4	690	1.15	0	690	1.15	240	0	0	120	13114	13236	0.93
5	0	0	0	690	1.15	240	690	1.15	120	13114	13240	0.96
6	690	1.15	0	0	0	240	690	1.15	120	13114	13237	0.94
7	690	1.15	0	690	1.15	240	690	1.15	120	13114	13234	0.92
8	1434	2.39	0	0	0	0	0	0	0	2334	2347	0.56
9	0	0	0	1434	2.39	240	0	0	0	2334	2343	0.39

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	1434	2.39	120	2334	2347	0.56
11	1434	2.39	0	1434	2.39	240	0	0	120	2334	2343	0.39
12	0	0	0	1434	2.39	240	1434	2.39	120	2334	2344	0.43
13	1434	2.39	0	0	0	240	1434	2.39	120	2334	2344	0.43
14	1434	2.39	0	1434	2.39	240	1434	2.39	120	2334	2344	0.43
15	3011	5.018	0	0	0	0	0	0	0	1265	1277	0.95
16	0	0	0	3011	5.018	240	0	0	0	1265	1275	0.79
17	0	0	0	0	0	0	3011	5.018	120	1265	1276	0.87
18	3011	5.018	0	3011	5.018	240	0	0	120	1265	1276	0.87
19	0	0	0	3011	5.018	240	3011	5.018	120	1265	1277	0.95
20	3011	5.018	0	0	0	240	3011	5.018	120	1265	1275	0.79
21	3011	5.018	0	3011	5.018	240	3011	5.018	120	1265	1273	0.63

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

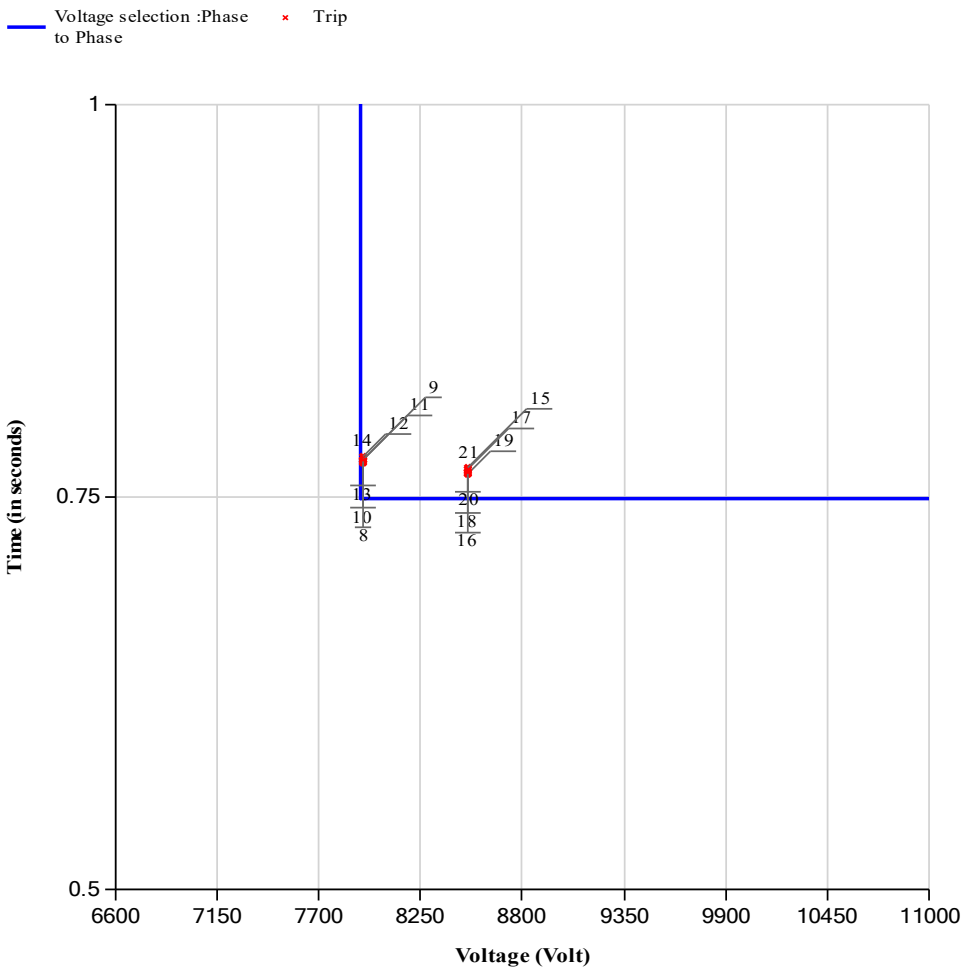
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 750 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



NB : ALARM ONLY

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5263	87.716	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5263	87.725	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5262	87.707	120	0	0	0
4	4556	75.93	0	4556	75.93	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4556	75.93	240	4556	75.93	120	0	0	0
6	4556	75.934	0	3811	63.509	240	4556	75.934	120	0	0	0
7	4556	75.934	0	4556	75.934	240	4556	75.934	120	0	0	0
8	5315	88.581	0	3811	63.509	240	3811	63.509	120	750	773	3.07
9	3811	63.509	0	5314	88.573	240	3811	63.509	120	750	774	3.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5315	88.583	120	750	774	3.2
11	4583	76.384	0	4583	76.384	240	3811	63.509	120	750	774	3.2
12	3811	63.509	0	4583	76.388	240	4583	76.388	120	750	776	3.47
13	4583	76.39	0	3811	63.509	240	4583	76.39	120	750	772	2.93
14	4583	76.389	0	4583	76.389	240	4583	76.389	120	750	773	3.07
15	5934	98.9	0	3811	63.509	240	3811	63.509	120	750	769	2.53
16	3811	63.509	0	5933	98.884	240	3811	63.509	120	750	765	2
17	3811	63.509	0	3811	63.509	240	5933	98.888	120	750	768	2.4
18	4911	81.85	0	4911	81.85	240	3811	63.509	120	750	766	2.13
19	3811	63.509	0	4910	81.841	240	4910	81.841	120	750	765	2
20	4911	81.846	0	3811	63.509	240	4911	81.846	120	750	768	2.4
21	4911	81.844	0	4911	81.844	240	4911	81.844	120	750	766	2.13

NB : ALARM ONLY

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

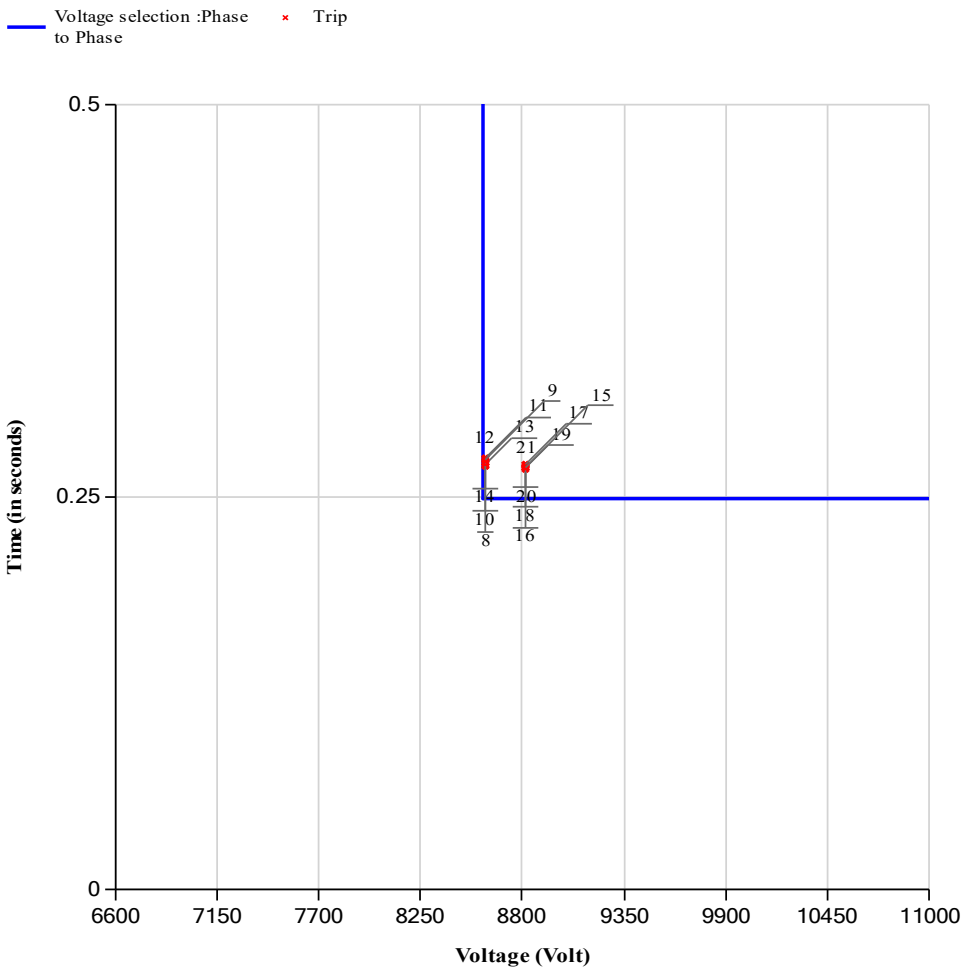
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : PHPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.30 xUn
Time multiplier : 1.00
Operate delay time : 250 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5985	99.746	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5985	99.752	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5985	99.744	120	0	0	0
4	4938	82.3	0	4938	82.3	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4938	82.307	240	4938	82.307	120	0	0	0
6	4938	82.305	0	3811	63.509	240	4938	82.305	120	0	0	0
7	4938	82.299	0	4938	82.299	240	4938	82.299	120	0	0	0
8	6037	100.611	0	3811	63.509	240	3811	63.509	120	250	270	8
9	3811	63.509	0	6037	100.62	240	3811	63.509	120	250	274	9.6

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	6036	100.601	120	250	272	8.8
11	4965	82.754	0	4965	82.754	240	3811	63.509	120	250	275	10
12	3811	63.509	0	4966	82.761	240	4966	82.761	120	250	275	10
13	4966	82.759	0	3811	63.509	240	4966	82.759	120	250	271	8.4
14	4965	82.753	0	4965	82.753	240	4965	82.753	120	250	270	8
15	6272	104.533	0	3811	63.509	240	3811	63.509	120	250	269	7.6
16	3811	63.509	0	6271	104.524	240	3811	63.509	120	250	268	7.2
17	3811	63.509	0	3811	63.509	240	6270	104.505	120	250	271	8.4
18	5091	84.847	0	5091	84.847	240	3811	63.509	120	250	270	8
19	3811	63.509	0	5091	84.842	240	5091	84.842	120	250	269	7.6
20	5090	84.839	0	3811	63.509	240	5090	84.839	120	250	271	8.4
21	5091	84.844	0	5091	84.844	240	5091	84.844	120	250	269	7.6

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

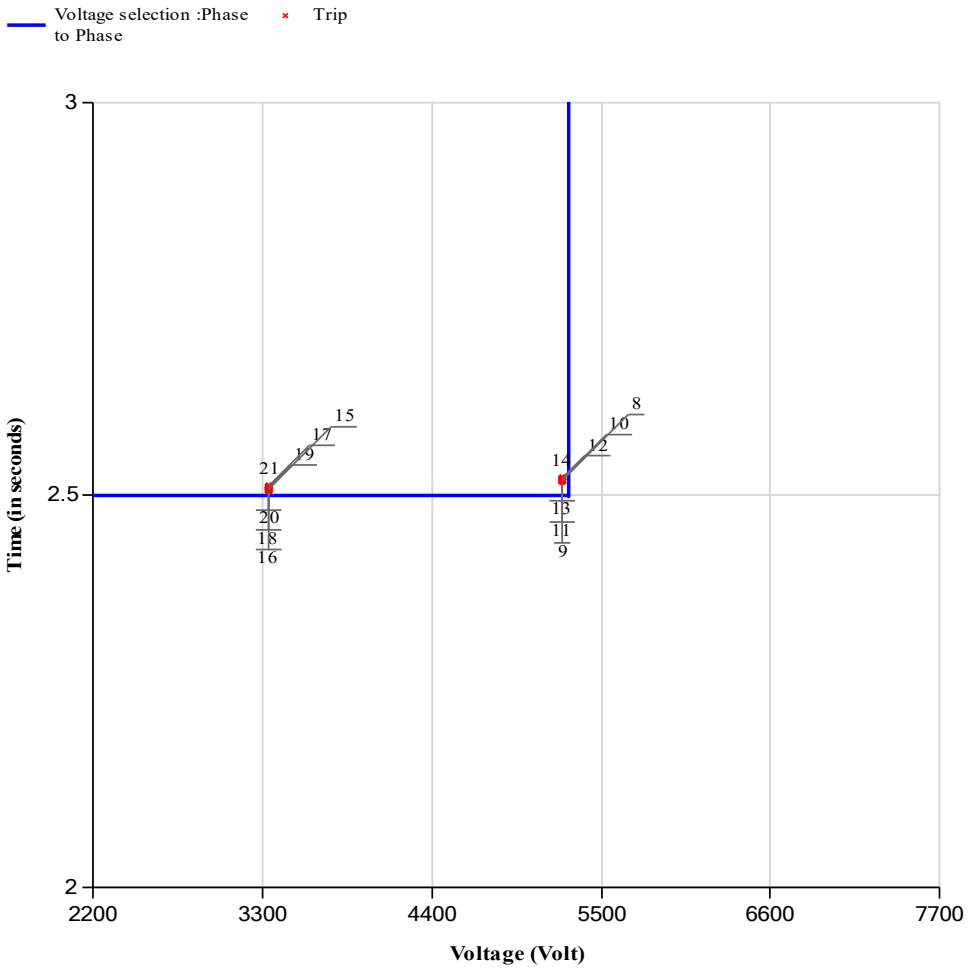
EQUIPMENT DESCRIPTION : -TR-200AD1

ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859



IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2500 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2243	37.391	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2244	37.407	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2244	37.401	120	0	0	0
4	3061	51.01	0	3061	51.01	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3061	51.016	240	3061	51.016	120	0	0	0
6	3061	51.016	0	3811	63.509	240	3061	51.016	120	0	0	0
7	3061	51.014	0	3061	51.014	240	3061	51.014	120	0	0	0
8	2171	36.19	0	3811	63.509	240	3811	63.509	120	2500	2519	0.76
9	3811	63.509	0	2171	36.185	240	3811	63.509	120	2500	2519	0.76

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2171	36.181	120	2500	2521	0.84
11	3028	50.468	0	3028	50.468	240	3811	63.509	120	2500	2518	0.72
12	3811	63.509	0	3028	50.469	240	3028	50.469	120	2500	2522	0.88
13	3028	50.466	0	3811	63.509	240	3028	50.466	120	2500	2522	0.88
14	3028	50.467	0	3028	50.467	240	3028	50.467	120	2500	2518	0.72
15	0	0	0	3811	63.509	240	3811	63.509	120	2500	2508	0.32
16	3811	63.509	0	0	0	240	3811	63.509	120	2500	2506	0.24
17	3811	63.509	0	3811	63.509	240	0	0	120	2500	2512	0.48
18	1927	32.118	0	1927	32.118	240	3811	63.509	120	2500	2508	0.32
19	3811	63.509	0	1927	32.118	240	1927	32.118	120	2500	2510	0.4
20	1927	32.117	0	3811	63.509	240	1927	32.117	120	2500	2510	0.4
21	1927	32.116	0	1927	32.116	240	1927	32.116	120	2500	2507	0.28

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

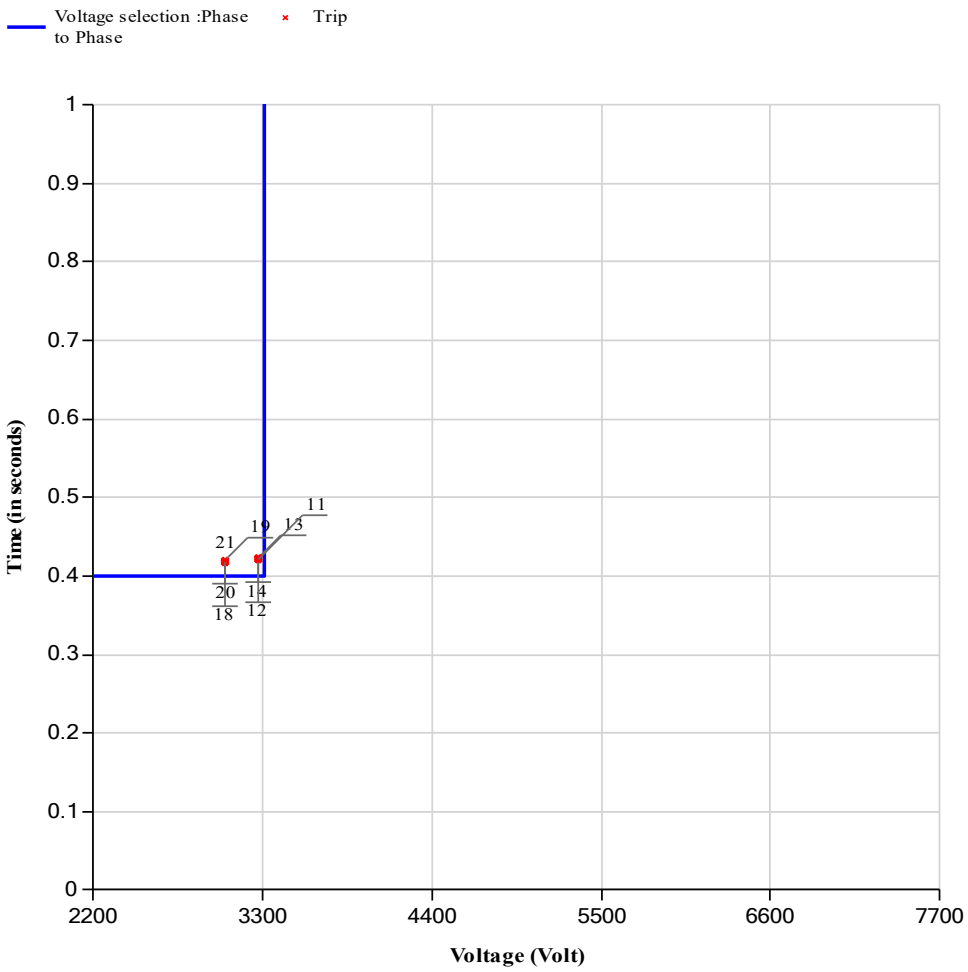
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : PHPTUV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.50 xUn
Time multiplier : 1.00
Operating delay time : 400 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
4	1927	32.118	0	1927	32.118	240	3811	63.509	120	0	0	0
5	3811	63.509	0	1927	32.117	240	1927	32.117	120	0	0	0
6	1927	32.114	0	3811	63.509	240	1927	32.114	120	0	0	0
7	1927	32.116	0	1927	32.116	240	1927	32.116	120	0	0	0
8	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
9	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

RELAY TYPE : ABB REX640

ITEM : UNIT A6

Sn. : 1VHR81041859

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
11	1888	31.46	0	1888	31.46	240	3811	63.509	120	400	421	5.25
12	3811	63.509	0	1888	31.463	240	1888	31.463	120	400	423	5.75
13	1888	31.463	0	3811	63.509	240	1888	31.463	120	400	423	5.75
14	1888	31.461	0	1888	31.461	240	1888	31.461	120	400	421	5.25
15	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
16	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
17	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
18	1763	29.386	0	1763	29.386	240	3811	63.509	120	400	418	4.5
19	3811	63.509	0	1763	29.387	240	1763	29.387	120	400	420	5
20	1763	29.387	0	3811	63.509	240	1763	29.387	120	400	419	4.75
21	1763	29.385	0	1763	29.385	240	1763	29.385	120	400	417	4.25

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

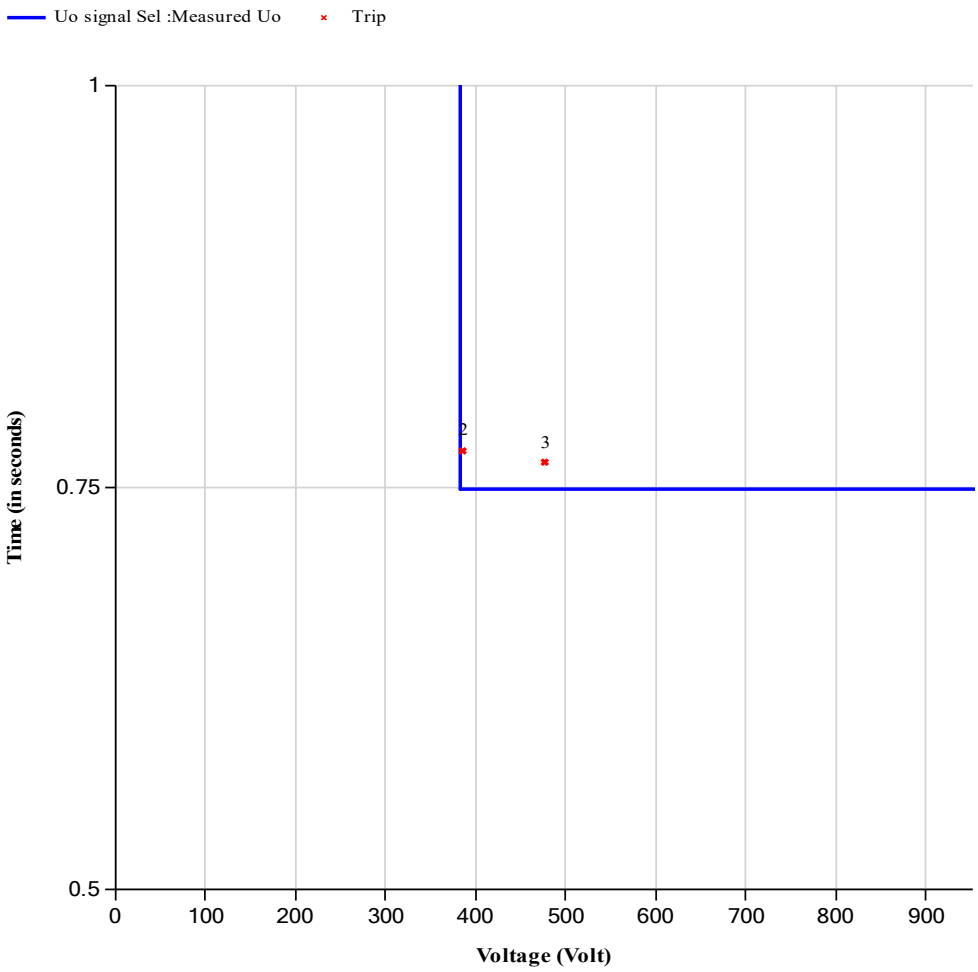
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 750 msec



NB : ALARM ONLY

N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	376	10.845	0	0	0
2	385	11.125	750	773	3.07
3	477	13.757	750	766	2.13

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

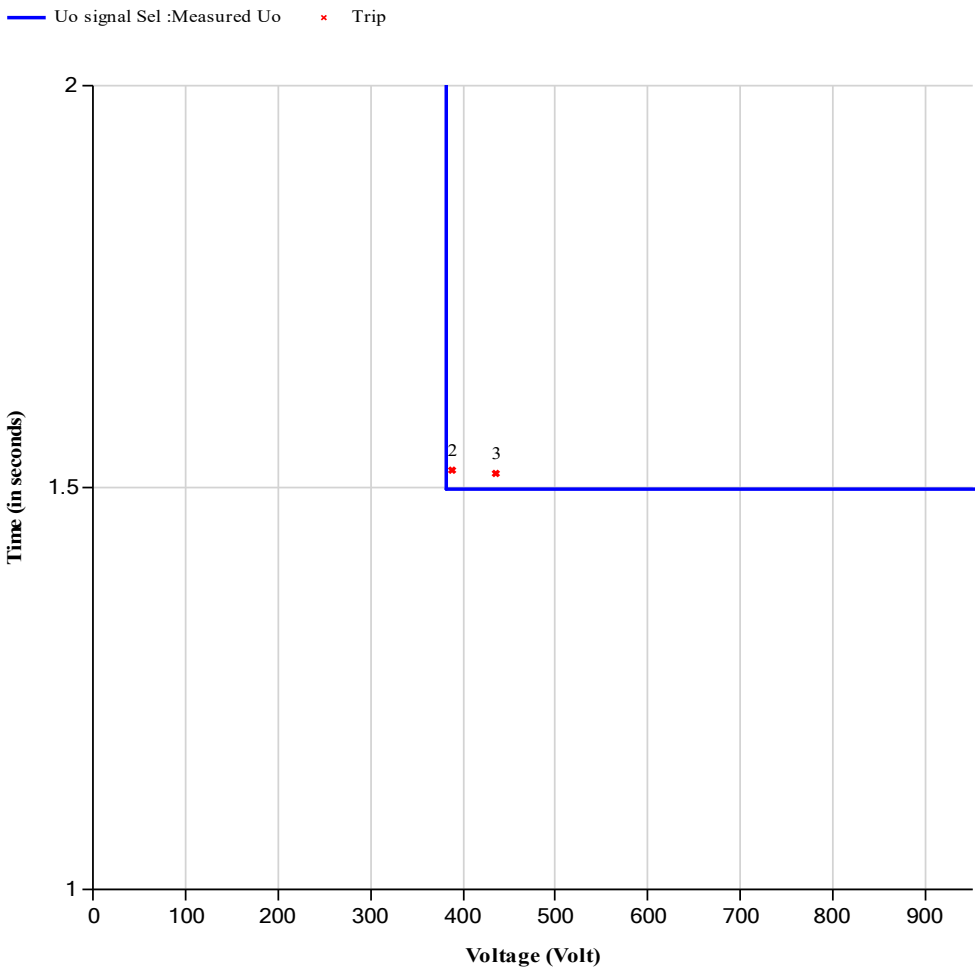
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : ROVPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1500 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	375	10.823	0	0	0
2	388	11.205	1500	1522	1.47
3	435	12.57	1500	1518	1.2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -TR-200AD1

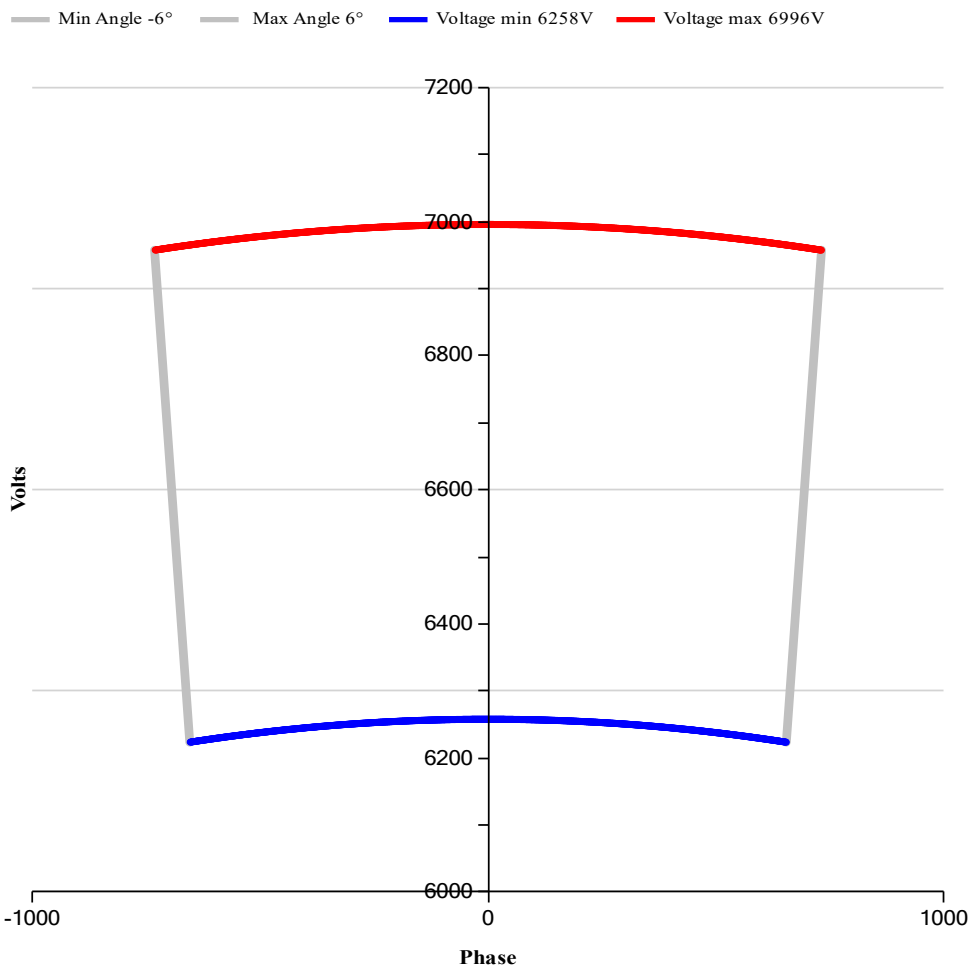
ITEM : UNIT A6

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041859

IEC61850 : SECRSYN1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Synchro check Mode : Asynchronous
Control Mode : Continuous
Dead line value : 0.10 xUn
Live line value : 0.50 xUn
Dead bus value : 0.10 xUn
Live bus value : 0.50 xUn
Close pulse : 200 ms
Max energizing V : 1.11 xUn
Phase shift : 0 deg
Minimum Syn time : 10000 ms
Maximum Syn time : 10000 ms
Energizing time : 100 ms
Closing time CB : 50 ms
Live dead mode : Not Both Live
Difference voltage : 0.05 xUn
Difference frequency : 0.010 xFn
Difference angle : 5 deg



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	V4(V)	V4"(V)	V4(°)	F (Hz)
1	3811	63.509	0	3811	63.509	240	3811	63.509	120	6258	104.3	30	50
2	3811	63.509	0	3811	63.509	240	3811	63.509	120	6996	116.6	30	50
3	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	24	50
4	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	36	50
5	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	49.5
6	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	50.45

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

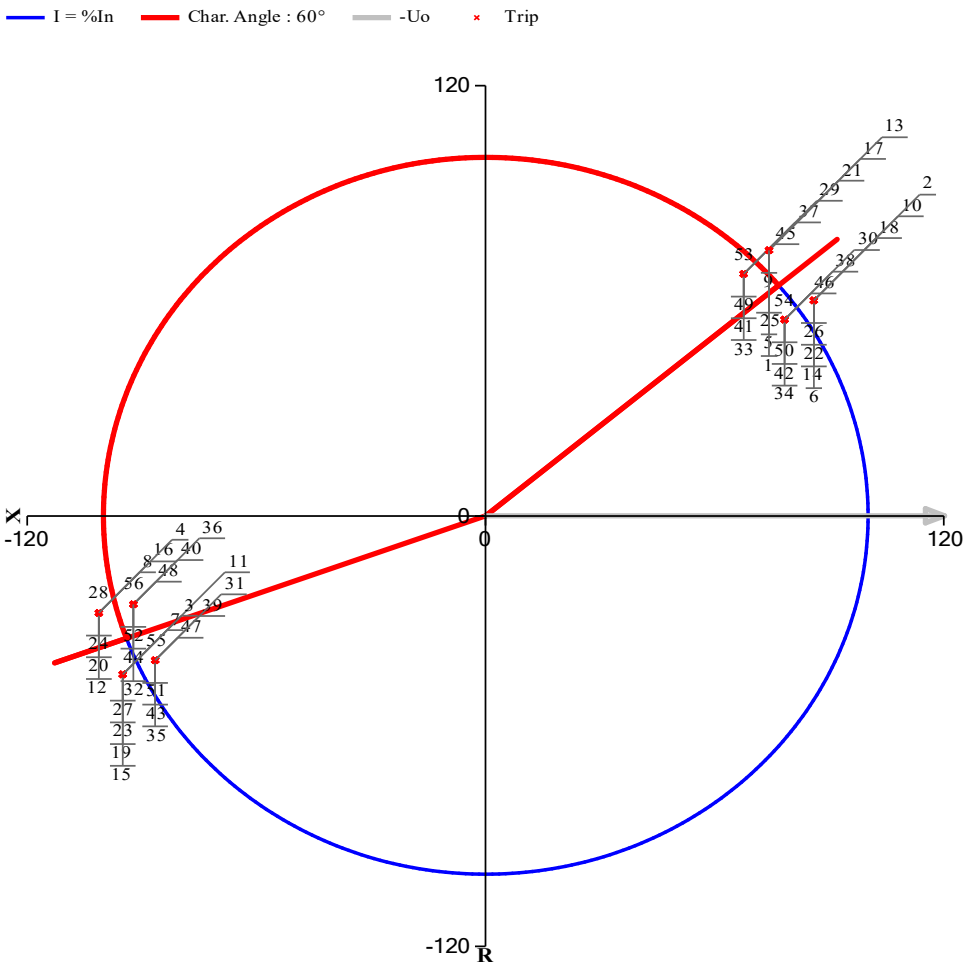
EQUIPMENT DESCRIPTION : -A-80000

ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855



IEC61850 : DPHLPDOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 150 A
Nominal current : 109.3 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 0.80 xIn
Start value mult. : 1.00
Directional mode : Reverse
Operate curve type : IEC Definite Time
Operate delay time : 700 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0.838	45	0.838	-75	0.838	165	0.953	0	0.953	240	0.953	120	700	718	2.57
2	0.838	35	0.838	-85	0.838	155	0.953	0	0.953	240	0.953	120	0	0	0
3	0.838	-155	0.838	85	0.838	-35	0.953	0	0.953	240	0.953	120	0	0	0
4	0.838	-165	0.838	75	0.838	-45	0.953	0	0.953	240	0.953	120	700	722	3.14
5	0.838	75	0.838	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	700	725	3.57
6	0.838	65	0.838	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	0.838	-125	0.838	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	0.838	-135	0.838	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	700	721	3
9	0	0	0.838	-45	0.838	135	63.509	0	0.953	-140.71	0.953	140.71	700	720	2.86

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0.838	-55	0.838	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	0.838	115	0.838	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	0.838	105	0.838	-75	63.509	0	0.953	-140.71	0.953	140.71	700	721	3
13	0.838	15	0	240	0.838	-165	0.953	20.71	63.509	240	0.953	99.29	700	718	2.57
14	0.838	5	0	240	0.838	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	0.838	175	0	240	0.838	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	0.838	165	0	240	0.838	-15	0.953	20.71	63.509	240	0.953	99.29	700	723	3.29
17	0.838	45	0	0	0	0	0.953	0	63.509	240	63.509	120	700	723	3.29
18	0.838	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	0.838	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	0.838	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	700	721	3
21	0	0	0.838	-75	0	0	63.509	0	0.953	240	63.509	120	700	722	3.14
22	0	0	0.838	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	0.838	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	0.838	75	0	0	63.509	0	0.953	240	63.509	120	700	721	3
25	0	0	0	0	0.838	165	63.509	0	63.509	240	0.953	120	700	723	3.29
26	0	0	0	0	0.838	155	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	0.838	-35	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	0.838	-45	63.509	0	63.509	240	0.953	120	700	723	3.29
29	0.763	45	0.763	-75	0.763	165	0.953	0	0.953	240	0.953	120	0	0	0
30	0.763	35	0.763	-85	0.763	155	0.953	0	0.953	240	0.953	120	0	0	0
31	0.763	-155	0.763	85	0.763	-35	0.953	0	0.953	240	0.953	120	0	0	0
32	0.763	-165	0.763	75	0.763	-45	0.953	0	0.953	240	0.953	120	0	0	0
33	0.763	75	0.763	-105	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.763	65	0.763	-115	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.763	-125	0.763	55	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.763	-135	0.763	45	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.763	-45	0.763	135	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.763	-55	0.763	125	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.763	115	0.763	-65	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.763	105	0.763	-75	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.763	15	0	240	0.763	-165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.763	5	0	240	0.763	-175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.763	175	0	240	0.763	-5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.763	165	0	240	0.763	-15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.763	45	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.763	35	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.763	-155	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC1

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.763	-165	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.763	-75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.763	-85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.763	85	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.763	75	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.763	165	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.763	155	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.763	-35	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.763	-45	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

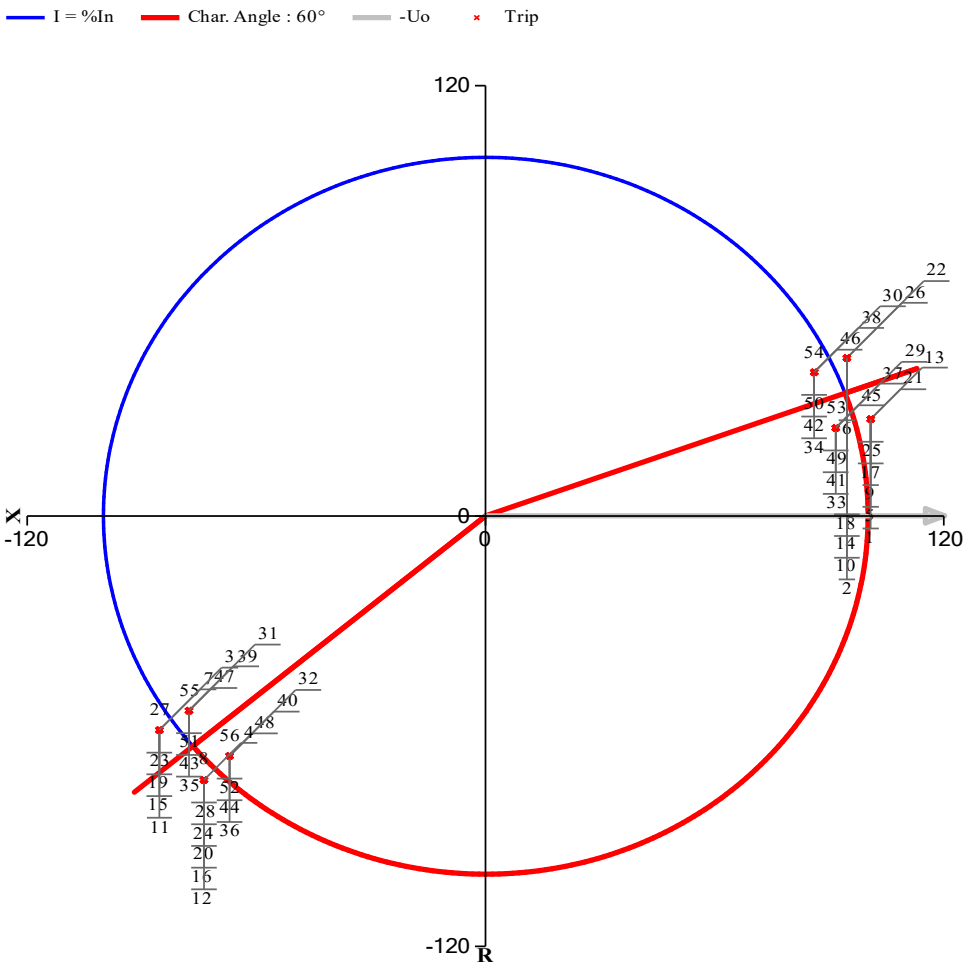
EQUIPMENT DESCRIPTION : -A-80000

ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855



IEC61850 : DPHLPDOC2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
Primary Current : 150 A
Nominal current : 109.3 A
Reset delay time : 20 msec
Minimum operate time : 20 msec
Allow non direction : False
Measurement mode : DFT
Min operate current : 0.01 xIn
Min operate voltage : 0.01 xUn
Num of start phases : 1 Out of 3
Start value : 0.80 xIn
Start value mult. : 1.00
Directional mode : Forward
Operate curve type : IEC Definite Time
Operate delay time : 100 msec
Type of reset curve : Immediate
Characteristic angle : 60 deg
Max forward angle : 80 deg
Max reverse angle : 80 deg
Min forward angle : 80 deg
Min reverse angle : 80 deg
Voltage Mem time : 40 msec
Pol quantity : Cross Pol

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0.834	15	0.834	-105	0.834	135	0.953	0	0.953	240	0.953	120	100	122	22
2	0.834	25	0.834	-95	0.834	145	0.953	0	0.953	240	0.953	120	0	0	0
3	0.834	-145	0.834	95	0.834	-25	0.953	0	0.953	240	0.953	120	0	0	0
4	0.834	-135	0.834	105	0.834	-15	0.953	0	0.953	240	0.953	120	100	120	20
5	0.834	45	0.834	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	120	20
6	0.834	55	0.834	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
7	0.834	-115	0.834	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
8	0.834	-105	0.834	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	100	123	23
9	0	0	0.834	-75	0.834	105	63.509	0	0.953	-140.71	0.953	140.71	100	125	25

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0.834	-65	0.834	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
11	0	0	0.834	125	0.834	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
12	0	0	0.834	135	0.834	-45	63.509	0	0.953	-140.71	0.953	140.71	100	123	23
13	0.834	-15	0	240	0.834	165	0.953	20.71	63.509	240	0.953	99.29	100	122	22
14	0.834	-5	0	240	0.834	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
15	0.834	-175	0	240	0.834	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
16	0.834	-165	0	240	0.834	15	0.953	20.71	63.509	240	0.953	99.29	100	120	20
17	0.834	15	0	0	0	0	0.953	0	63.509	240	63.509	120	100	119	19
18	0.834	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
19	0.834	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
20	0.834	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	100	121	21
21	0	0	0.834	-105	0	0	63.509	0	0.953	240	63.509	120	100	123	23
22	0	0	0.834	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
23	0	0	0.834	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
24	0	0	0.834	105	0	0	63.509	0	0.953	240	63.509	120	100	124	24
25	0	0	0	0	0.834	135	63.509	0	63.509	240	0.953	120	100	124	24
26	0	0	0	0	0.834	145	63.509	0	63.509	240	0.953	120	0	0	0
27	0	0	0	0	0.834	-25	63.509	0	63.509	240	0.953	120	0	0	0
28	0	0	0	0	0.834	-15	63.509	0	63.509	240	0.953	120	100	120	20
29	0.758	15	0.758	-105	0.758	135	0.953	0	0.953	240	0.953	120	0	0	0
30	0.758	25	0.758	-95	0.758	145	0.953	0	0.953	240	0.953	120	0	0	0
31	0.758	-145	0.758	95	0.758	-25	0.953	0	0.953	240	0.953	120	0	0	0
32	0.758	-135	0.758	105	0.758	-15	0.953	0	0.953	240	0.953	120	0	0	0
33	0.758	45	0.758	-135	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
34	0.758	55	0.758	-125	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
35	0.758	-115	0.758	65	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
36	0.758	-105	0.758	75	0	120	0.953	-20.71	0.953	-99.29	63.509	120	0	0	0
37	0	0	0.758	-75	0.758	105	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
38	0	0	0.758	-65	0.758	115	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
39	0	0	0.758	125	0.758	-55	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
40	0	0	0.758	135	0.758	-45	63.509	0	0.953	-140.71	0.953	140.71	0	0	0
41	0.758	-15	0	240	0.758	165	0.953	20.71	63.509	240	0.953	99.29	0	0	0
42	0.758	-5	0	240	0.758	175	0.953	20.71	63.509	240	0.953	99.29	0	0	0
43	0.758	-175	0	240	0.758	5	0.953	20.71	63.509	240	0.953	99.29	0	0	0
44	0.758	-165	0	240	0.758	15	0.953	20.71	63.509	240	0.953	99.29	0	0	0
45	0.758	15	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
46	0.758	25	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
47	0.758	-145	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : DPHLPDOC2

N.	I1"(A)	I1(°)	I2"(A)	I2(°)	I3"(A)	I3(°)	V1"(V)	V1(°)	V2"(V)	V2(°)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
48	0.758	-135	0	0	0	0	0.953	0	63.509	240	63.509	120	0	0	0
49	0	0	0.758	-105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
50	0	0	0.758	-95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
51	0	0	0.758	95	0	0	63.509	0	0.953	240	63.509	120	0	0	0
52	0	0	0.758	105	0	0	63.509	0	0.953	240	63.509	120	0	0	0
53	0	0	0	0	0.758	135	63.509	0	63.509	240	0.953	120	0	0	0
54	0	0	0	0	0.758	145	63.509	0	63.509	240	0.953	120	0	0	0
55	0	0	0	0	0.758	-25	63.509	0	63.509	240	0.953	120	0	0	0
56	0	0	0	0	0.758	-15	63.509	0	63.509	240	0.953	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

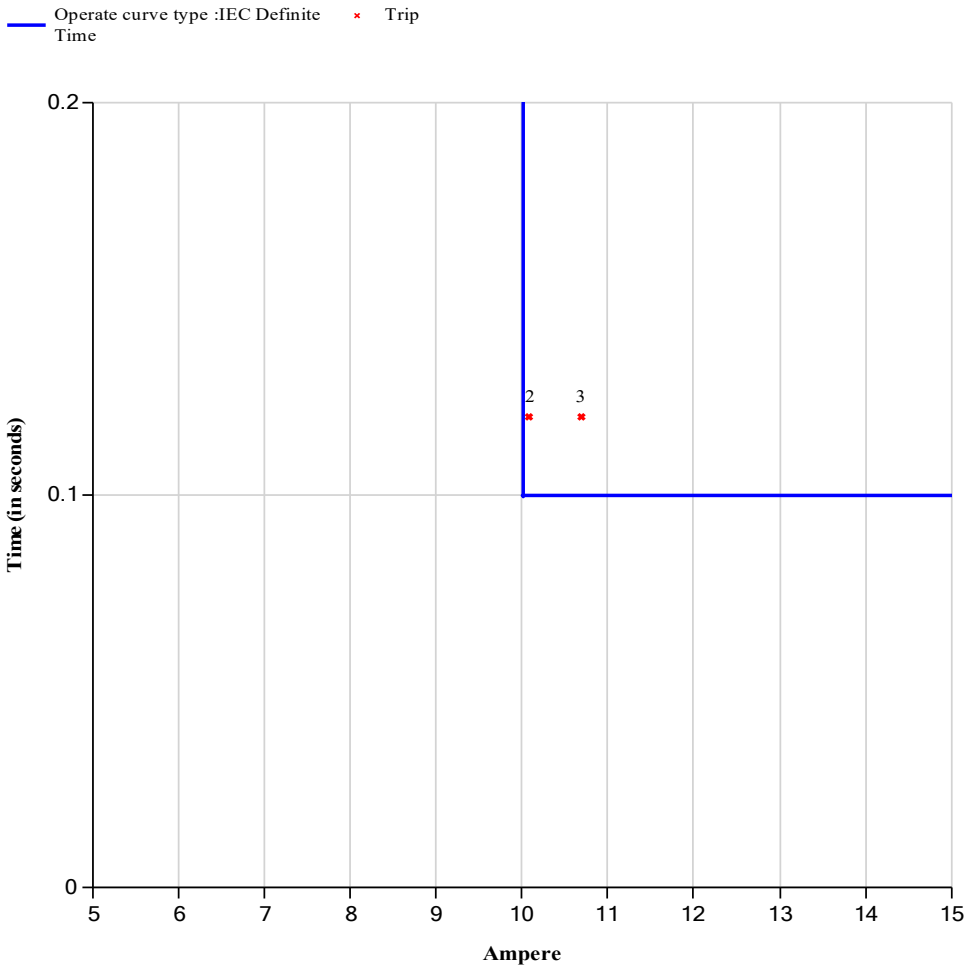
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : EFLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 100 / 1 A
Nominal current : 109.3 A
Minimum operate time : 100 ms
Measured mode : DFT
Io signal Sel : Measured Io
Start value : 0.100 xIn
Operate delay time : 100 ms
Operate curve type : IEC Definite Time
Type of reset : Immediate



N.	I0	I0"(A)	I0(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	9.752	0.098	0	0	0	0
2	10.078	0.101	0	100	120	20
3	10.689	0.107	0	100	120	20

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

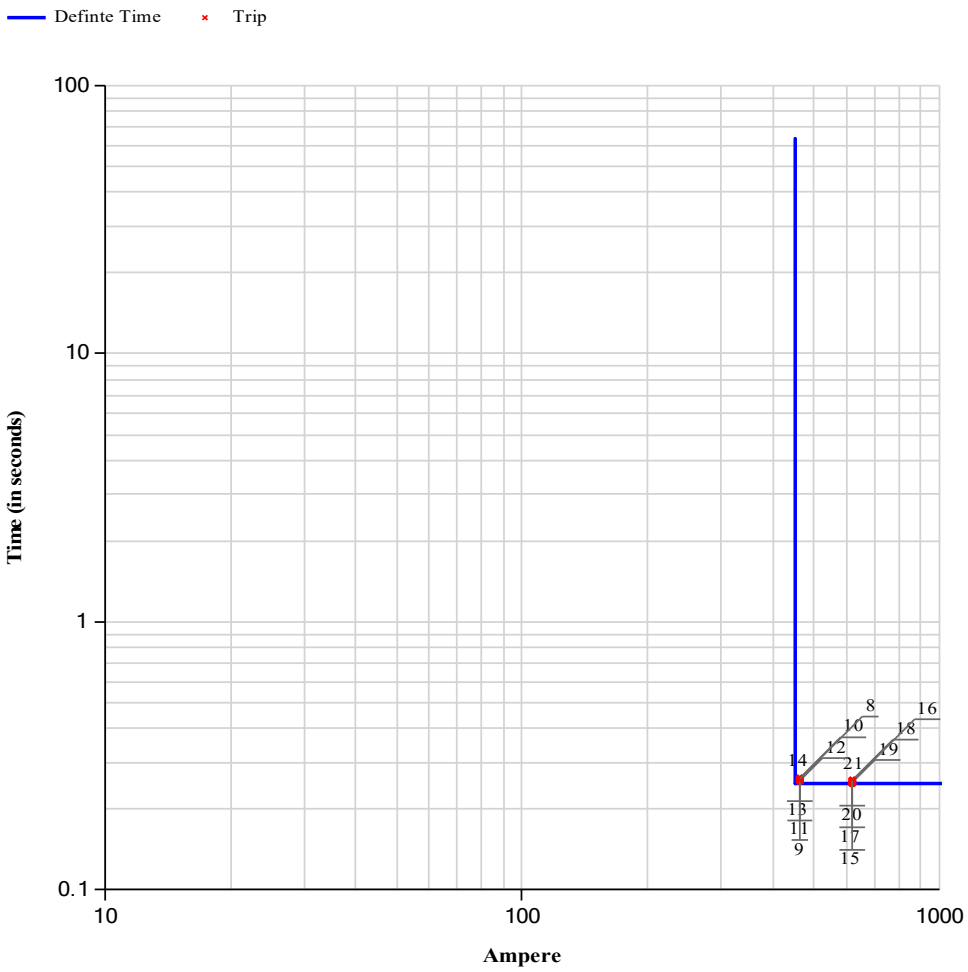
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHIPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 150 / 1 A
Nominal current : 109.3 A
Num of start phases : 1 Out of 3
Reset delay time : 20 ms
Start value : 3.00 xIn
Start valure Mult : 1.0
Operate delay time : 250 ms



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	436	2.904	0	0	0	0	0	0	0	0	0	0
2	0	0	0	436	2.904	240	0	0	0	0	0	0
3	0	0	0	0	0	0	436	2.904	120	0	0	0
4	436	2.904	0	436	2.904	180	0	0	0	0	0	0
5	0	0	0	436	2.904	240	436	2.904	60	0	0	0
6	436	2.904	300	0	0	0	436	2.904	120	0	0	0
7	436	2.904	0	436	2.904	240	436	2.904	120	0	0	0
8	462	3.077	0	0	0	0	0	0	0	250	260	4
9	0	0	0	462	3.077	240	0	0	0	250	255	2

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHIPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	462	3.077	120	250	262	4.8
11	462	3.077	0	462	3.077	180	0	0	0	250	258	3.2
12	0	0	0	462	3.077	240	462	3.077	60	250	256	2.4
13	462	3.077	300	0	0	0	462	3.077	120	250	261	4.4
14	462	3.077	0	462	3.077	240	462	3.077	120	250	255	2
15	616	4.108	0	0	0	0	0	0	0	250	257	2.8
16	0	0	0	616	4.108	240	0	0	0	250	254	1.6
17	0	0	0	0	0	0	616	4.108	120	250	251	0.4
18	616	4.108	0	616	4.108	180	0	0	0	250	257	2.8
19	0	0	0	616	4.108	240	616	4.108	60	250	252	0.8
20	616	4.108	300	0	0	0	616	4.108	120	250	251	0.4
21	616	4.108	0	616	4.108	240	616	4.108	120	250	250	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

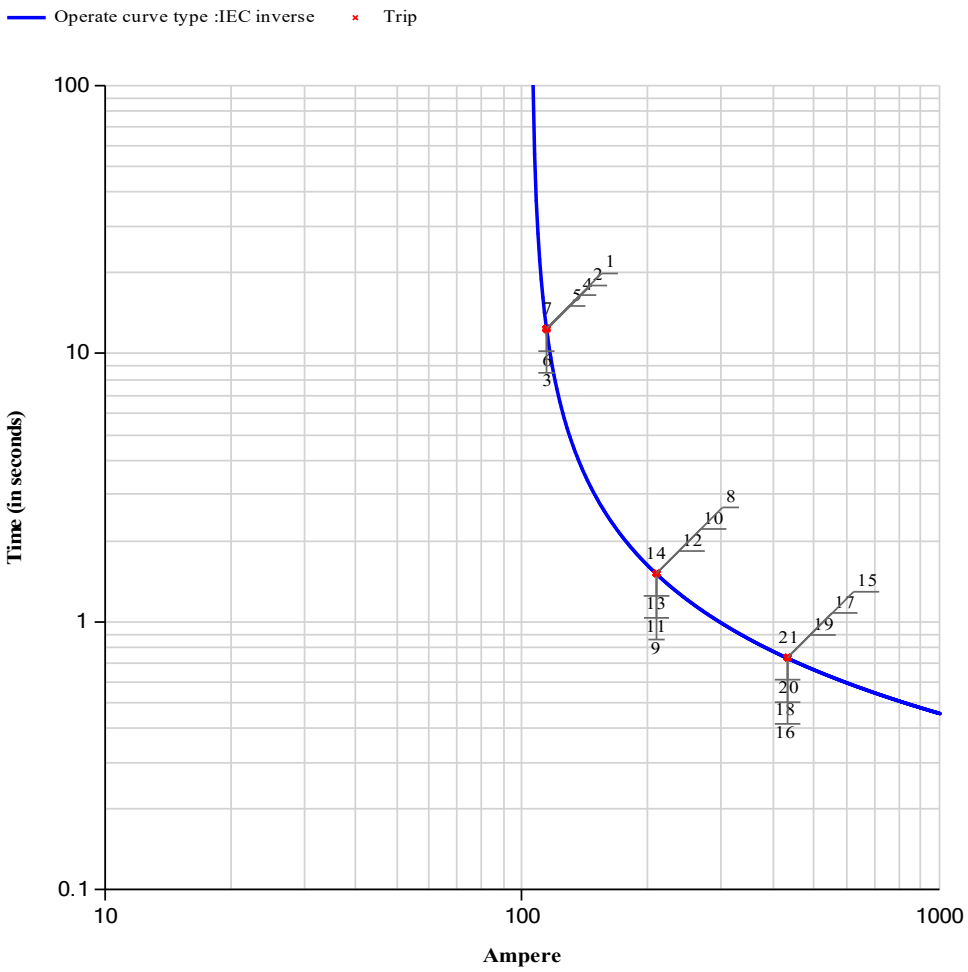
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHLPTOC1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
CT RATIO : 150 / 1 A
Nominal current : 109.3 A
Num. start phases : 1 out of 3
Minimum operate time : 300 msec
Reset delay time : 20 msec
Measurement mode : DFT
Start value : 0.70 xIn
Start value mult. : 1.00
Time multiplier : 0.15
Operate curve type : IEC inverse
Type of reset : Immediate



N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	114	0.762	0	0	0	0	0	0	0	12439	12427	0.1
2	0	0	0	114	0.762	240	0	0	0	12439	12291	1.19
3	0	0	0	0	0	0	114	0.762	120	12439	12431	0.06
4	114	0.762	0	114	0.762	240	0	0	120	12439	12424	0.12
5	0	0	0	114	0.762	240	114	0.762	120	12439	12424	0.12
6	114	0.762	0	0	0	240	114	0.762	120	12439	12427	0.1
7	114	0.762	0	114	0.762	240	114	0.762	120	12439	12423	0.13
8	210	1.397	0	0	0	0	0	0	0	1509	1518	0.6
9	0	0	0	210	1.397	240	0	0	0	1509	1517	0.53

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHLPTOC1

N.	I1(A)	I1"(A)	I1(°)	I2(A)	I2"(A)	I2(°)	I3(A)	I3"(A)	I3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	0	0	0	0	0	0	210	1.397	120	1509	1520	0.73
11	210	1.397	0	210	1.397	240	0	0	120	1509	1516	0.46
12	0	0	0	210	1.397	240	210	1.397	120	1509	1515	0.4
13	210	1.397	0	0	0	240	210	1.397	120	1509	1519	0.66
14	210	1.397	0	210	1.397	240	210	1.397	120	1509	1515	0.4
15	431	2.877	0	0	0	0	0	0	0	733	736	0.41
16	0	0	0	431	2.877	240	0	0	0	733	735	0.27
17	0	0	0	0	0	0	431	2.877	120	733	739	0.82
18	431	2.877	0	431	2.877	240	0	0	120	733	735	0.27
19	0	0	0	431	2.877	240	431	2.877	120	733	737	0.55
20	431	2.877	0	0	0	240	431	2.877	120	733	740	0.95
21	431	2.877	0	431	2.877	240	431	2.877	120	733	737	0.55

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

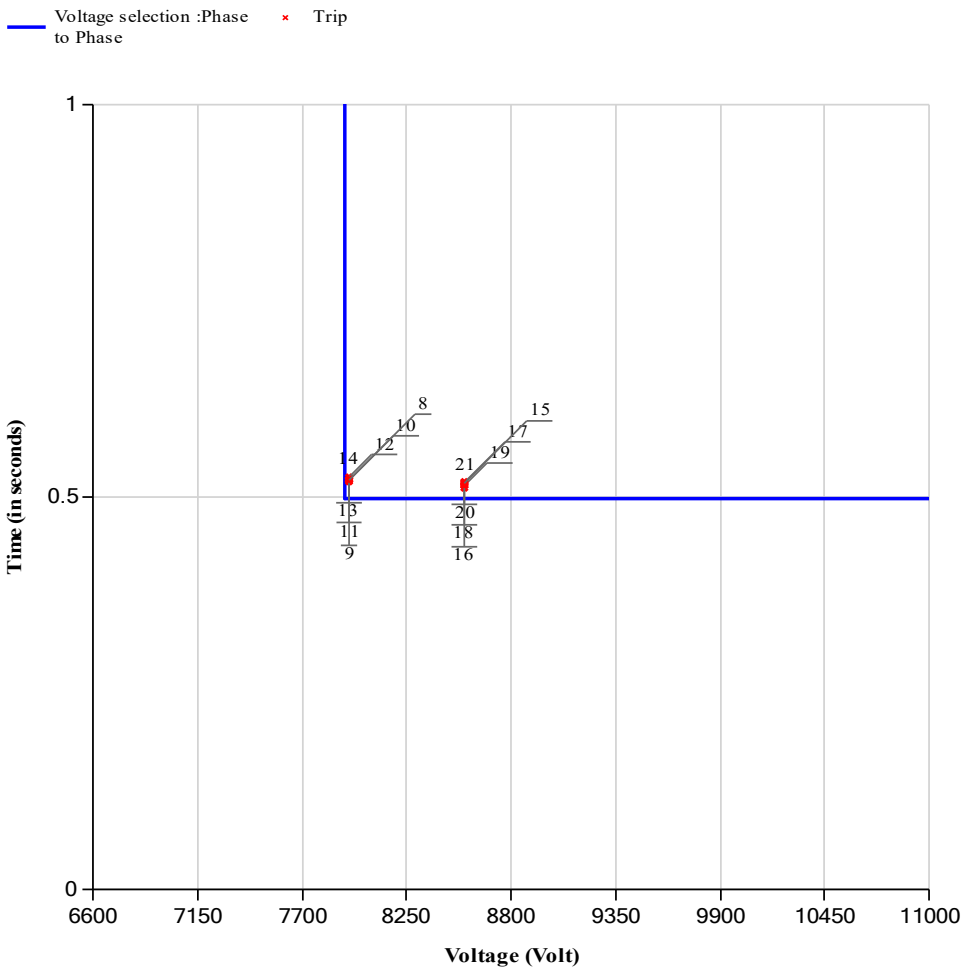
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.20 xUn
Time multiplier : 1.00
Operate delay time : 500 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5261	87.684	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5262	87.7	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5262	87.695	120	0	0	0
4	4555	75.92	0	4555	75.92	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4556	75.928	240	4556	75.928	120	0	0	0
6	4556	75.926	0	3811	63.509	240	4556	75.926	120	0	0	0
7	4555	75.922	0	4555	75.922	240	4555	75.922	120	0	0	0
8	5322	88.7	0	3811	63.509	240	3811	63.509	120	500	522	4.4
9	3811	63.509	0	5323	88.711	240	3811	63.509	120	500	523	4.6

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	5322	88.693	120	500	522	4.4
11	4587	76.446	0	4587	76.446	240	3811	63.509	120	500	520	4
12	3811	63.509	0	4587	76.452	240	4587	76.452	120	500	526	5.2
13	4587	76.449	0	3811	63.509	240	4587	76.449	120	500	522	4.4
14	4587	76.453	0	4587	76.453	240	4587	76.453	120	500	523	4.6
15	5985	99.754	0	3811	63.509	240	3811	63.509	120	500	518	3.6
16	3811	63.509	0	5985	99.742	240	3811	63.509	120	500	512	2.4
17	3811	63.509	0	3811	63.509	240	5985	99.746	120	500	519	3.8
18	4938	82.303	0	4938	82.303	240	3811	63.509	120	500	517	3.4
19	3811	63.509	0	4937	82.29	240	4937	82.29	120	500	515	3
20	4938	82.298	0	3811	63.509	240	4938	82.298	120	500	520	4
21	4938	82.296	0	4938	82.296	240	4938	82.296	120	500	515	3

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

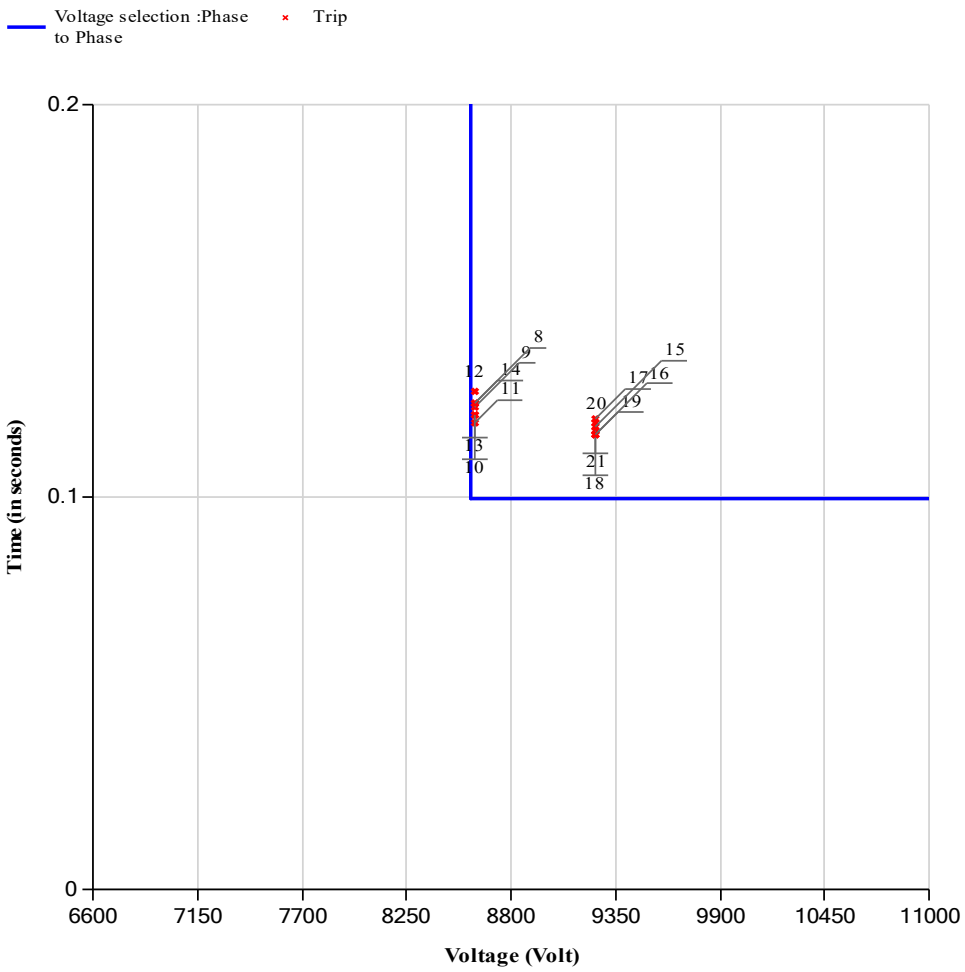
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 out of 3
Reset delay time : 20 ms
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 1.30 xUn
Time multiplier : 1.00
Operate delay time : 100 ms
Operating curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	5984	99.738	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	5985	99.749	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	5985	99.753	120	0	0	0
4	4938	82.293	0	4938	82.293	240	3811	63.509	120	0	0	0
5	3811	63.509	0	4938	82.298	240	4938	82.298	120	0	0	0
6	4938	82.294	0	3811	63.509	240	4938	82.294	120	0	0	0
7	4938	82.296	0	4938	82.296	240	4938	82.296	120	0	0	0
8	6045	100.748	0	3811	63.509	240	3811	63.509	120	100	124	24
9	3811	63.509	0	6045	100.753	240	3811	63.509	120	100	123	23

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTOV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	6046	100.759	120	100	121	21
11	4970	82.836	0	4970	82.836	240	3811	63.509	120	100	119	19
12	3811	63.509	0	4969	82.824	240	4969	82.824	120	100	127	27
13	4970	82.828	0	3811	63.509	240	4970	82.828	120	100	121	21
14	4970	82.827	0	4970	82.827	240	4970	82.827	120	100	124	24
15	6729	112.144	0	3811	63.509	240	3811	63.509	120	100	118	18
16	3811	63.509	0	6729	112.149	240	3811	63.509	120	100	116	16
17	3811	63.509	0	3811	63.509	240	6729	112.143	120	100	120	20
18	5336	88.934	0	5336	88.934	240	3811	63.509	120	100	116	16
19	3811	63.509	0	5336	88.938	240	5336	88.938	120	100	116	16
20	5336	88.939	0	3811	63.509	240	5336	88.939	120	100	119	19
21	5336	88.936	0	5336	88.936	240	5336	88.936	120	100	117	17

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

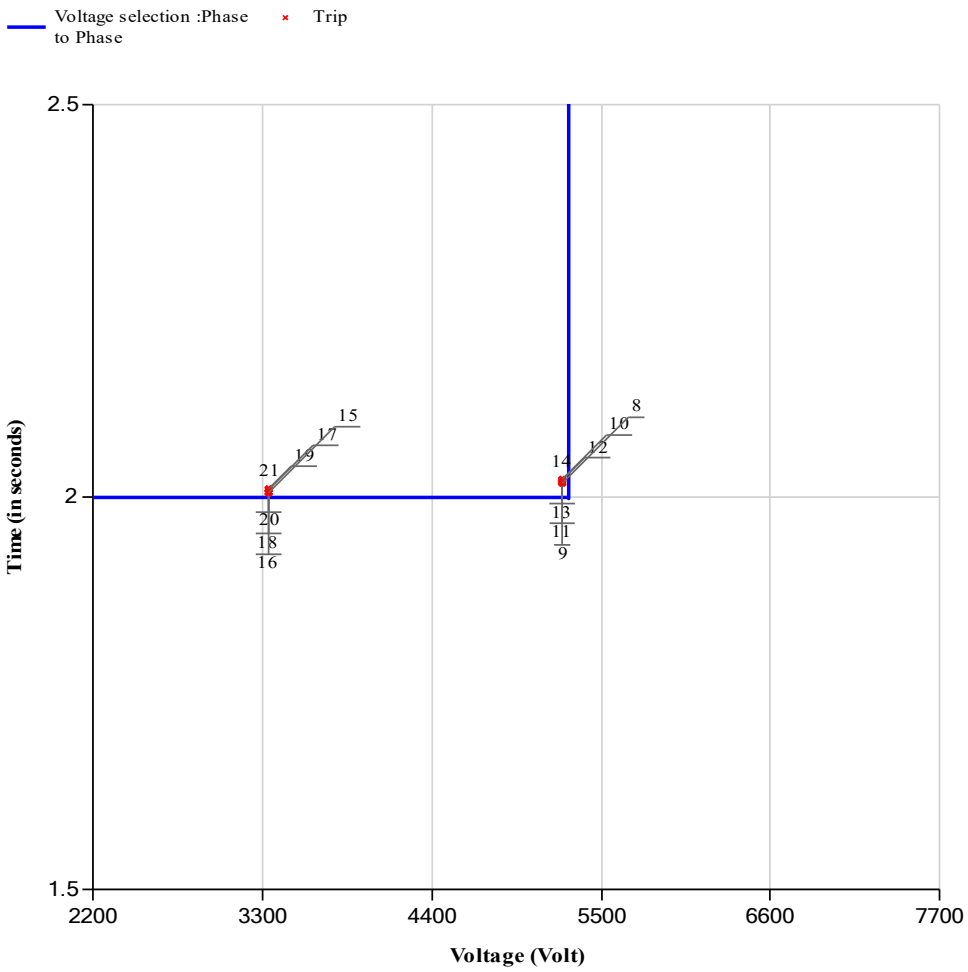
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHPTUV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.80 xUn
Time multiplier : 1.00
Operating delay time : 2000 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	2258	37.631	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	2259	37.643	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	2258	37.636	120	0	0	0
4	3067	51.12	0	3067	51.12	240	3811	63.509	120	0	0	0
5	3811	63.509	0	3067	51.118	240	3067	51.118	120	0	0	0
6	3067	51.122	0	3811	63.509	240	3067	51.122	120	0	0	0
7	3067	51.123	0	3067	51.123	240	3067	51.123	120	0	0	0
8	2172	36.192	0	3811	63.509	240	3811	63.509	120	2000	2018	0.9
9	3811	63.509	0	2171	36.181	240	3811	63.509	120	2000	2019	0.95

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV1

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	2171	36.186	120	2000	2023	1.15
11	3028	50.466	0	3028	50.466	240	3811	63.509	120	2000	2019	0.95
12	3811	63.509	0	3028	50.465	240	3028	50.465	120	2000	2022	1.1
13	3028	50.465	0	3811	63.509	240	3028	50.465	120	2000	2021	1.05
14	3028	50.467	0	3028	50.467	240	3028	50.467	120	2000	2020	1
15	0	0	0	3811	63.509	240	3811	63.509	120	2000	2006	0.3
16	3811	63.509	0	0	0	240	3811	63.509	120	2000	2007	0.35
17	3811	63.509	0	3811	63.509	240	0	0	120	2000	2010	0.5
18	1927	32.113	0	1927	32.113	240	3811	63.509	120	2000	2006	0.3
19	3811	63.509	0	1927	32.118	240	1927	32.118	120	2000	2011	0.55
20	1927	32.117	0	3811	63.509	240	1927	32.117	120	2000	2010	0.5
21	1927	32.116	0	1927	32.116	240	1927	32.116	120	2000	2007	0.35

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

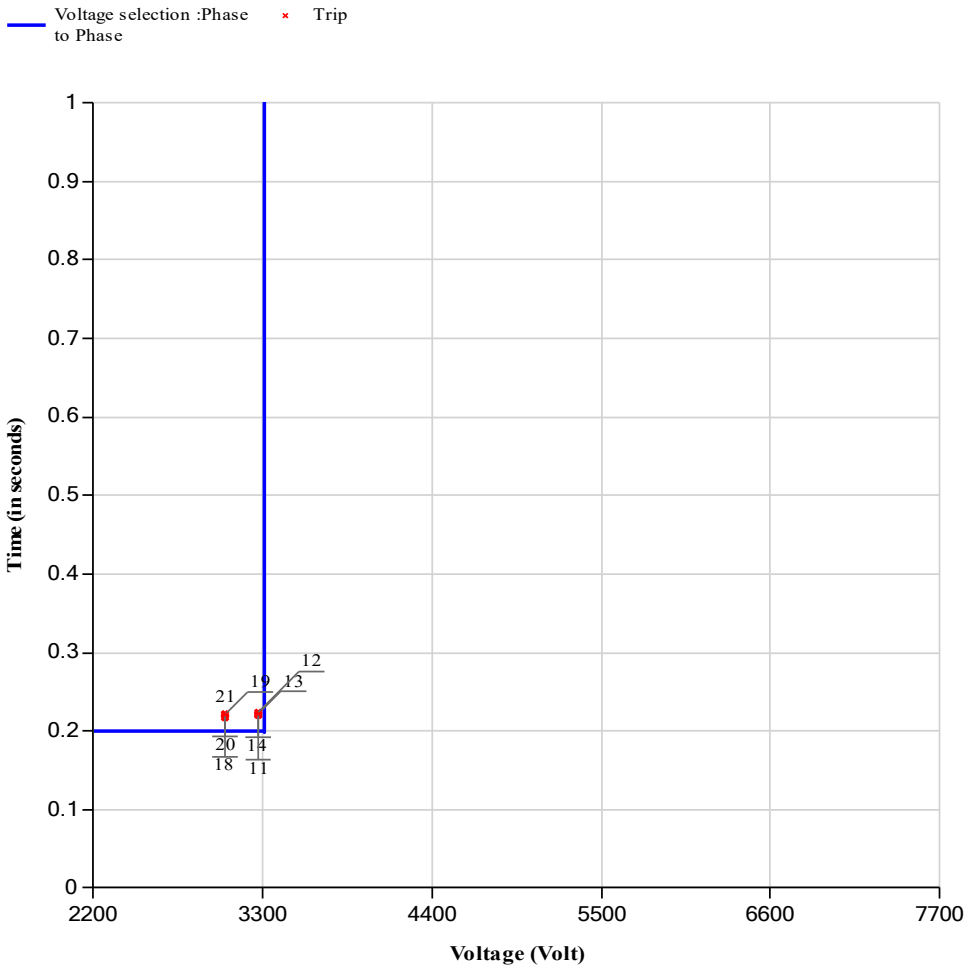
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : PHPTUV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Num of start phases : 1 Out of 3
Minimum operate time : 60 msec
Reset delay time : 20 msec
Voltage block value : 0.20 xUn
Enable block value : True
Voltage selection : Phase to Phase
Relative hysteresis : 4.0 %
Start value : 0.50 xUn
Time multiplier : 1.00
Operating delay time : 200 msec
Operate curve type : IEC Def. Time
Type of reset curve : Immediate
Type of time reset : Freeze Op timer



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
1	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
2	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
3	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
4	1921	32.01	0	1921	32.01	240	3811	63.509	120	0	0	0
5	3811	63.509	0	1920	32.007	240	1920	32.007	120	0	0	0
6	1921	32.009	0	3811	63.509	240	1921	32.009	120	0	0	0
7	1920	32.007	0	1920	32.007	240	1920	32.007	120	0	0	0
8	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
9	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

RELAY TYPE : ABB REX640

ITEM : UNIT A7

Sn. : 1VHR81041855

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

IEC61850 : PHPTUV2

N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	Exp.(ms)	Trip(ms)	Dev.(%)
10	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
11	1888	31.46	0	1888	31.46	240	3811	63.509	120	200	220	10
12	3811	63.509	0	1887	31.458	240	1887	31.458	120	200	224	12
13	1888	31.462	0	3811	63.509	240	1888	31.462	120	200	222	11
14	1888	31.461	0	1888	31.461	240	1888	31.461	120	200	221	10.5
15	0	0	0	3811	63.509	240	3811	63.509	120	0	0	0
16	3811	63.509	0	0	0	240	3811	63.509	120	0	0	0
17	3811	63.509	0	3811	63.509	240	0	0	120	0	0	0
18	1763	29.388	0	1763	29.388	240	3811	63.509	120	200	219	9.5
19	3811	63.509	0	1763	29.383	240	1763	29.383	120	200	221	10.5
20	1763	29.386	0	3811	63.509	240	1763	29.386	120	200	222	11
21	1763	29.385	0	1763	29.385	240	1763	29.385	120	200	217	8.5

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

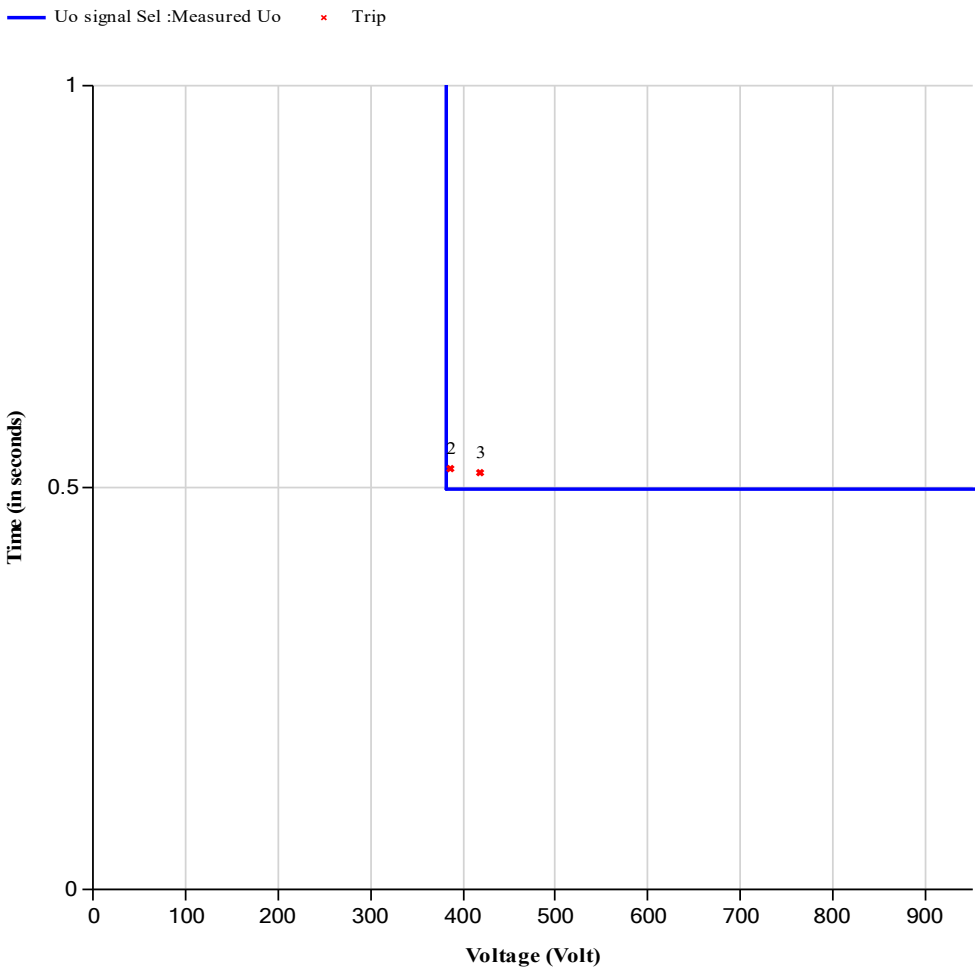
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : ROVPTOV1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 500 msec



NB : ALARM ONLY

N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	500	524	4.8
3	418	12.079	500	519	3.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			

PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

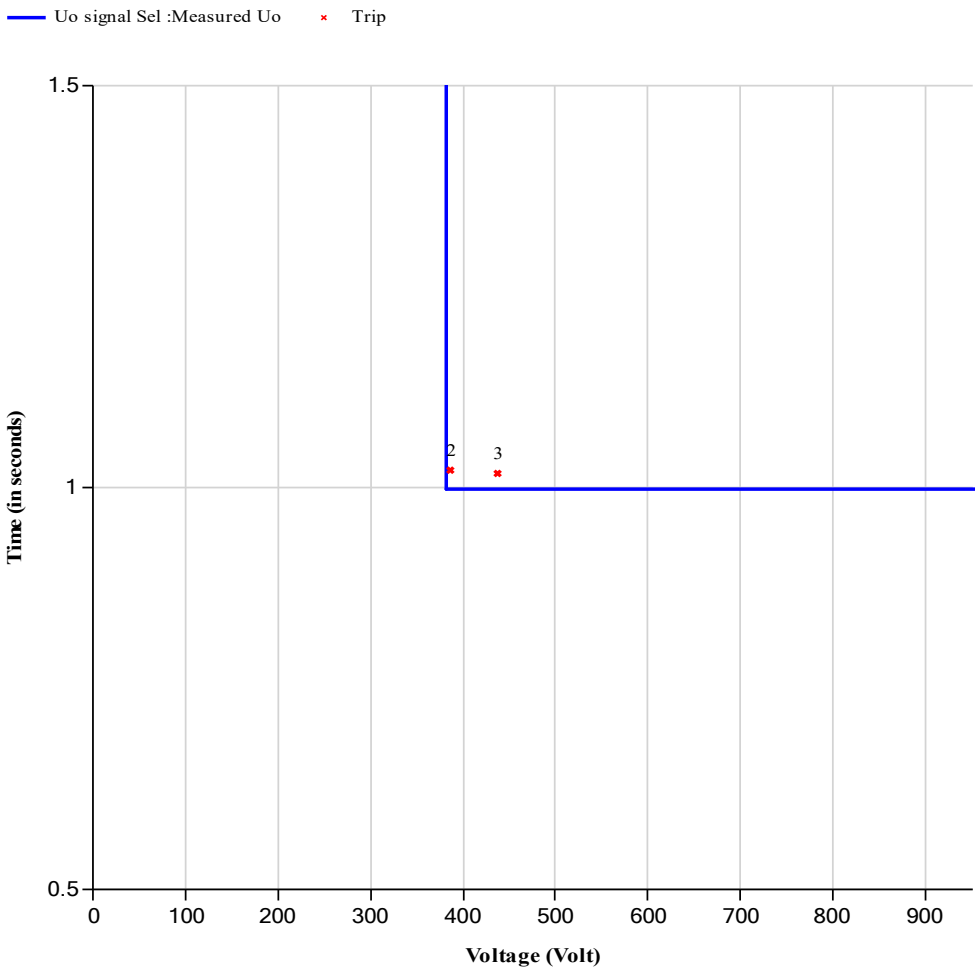
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : ROVPTOV2
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Reset delay time : 20 msec
Uo signal Sel : Measured Uo
Start value : 0.10 xUn
Operate delay time : 1000 msec



N.	V0(V)	V0(V)	Exp.(ms)	Trip(ms)	Dev.(%)
1	373	10.768	0	0	0
2	386	11.151	1000	1022	2.2
3	437	12.625	1000	1018	1.8

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI	OMICRON CMC 356 **Sn. :** DJ297G			
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PROTECTION TEST ON ABB RELAY

PROJECT : CROSSWIND

FUNCTIONAL GROUP : BLPH

SYSTEM : SG-100D1

CLIENT : ROSETTI MARINO Group of Companies

EQUIPMENT DESCRIPTION : -A-80000

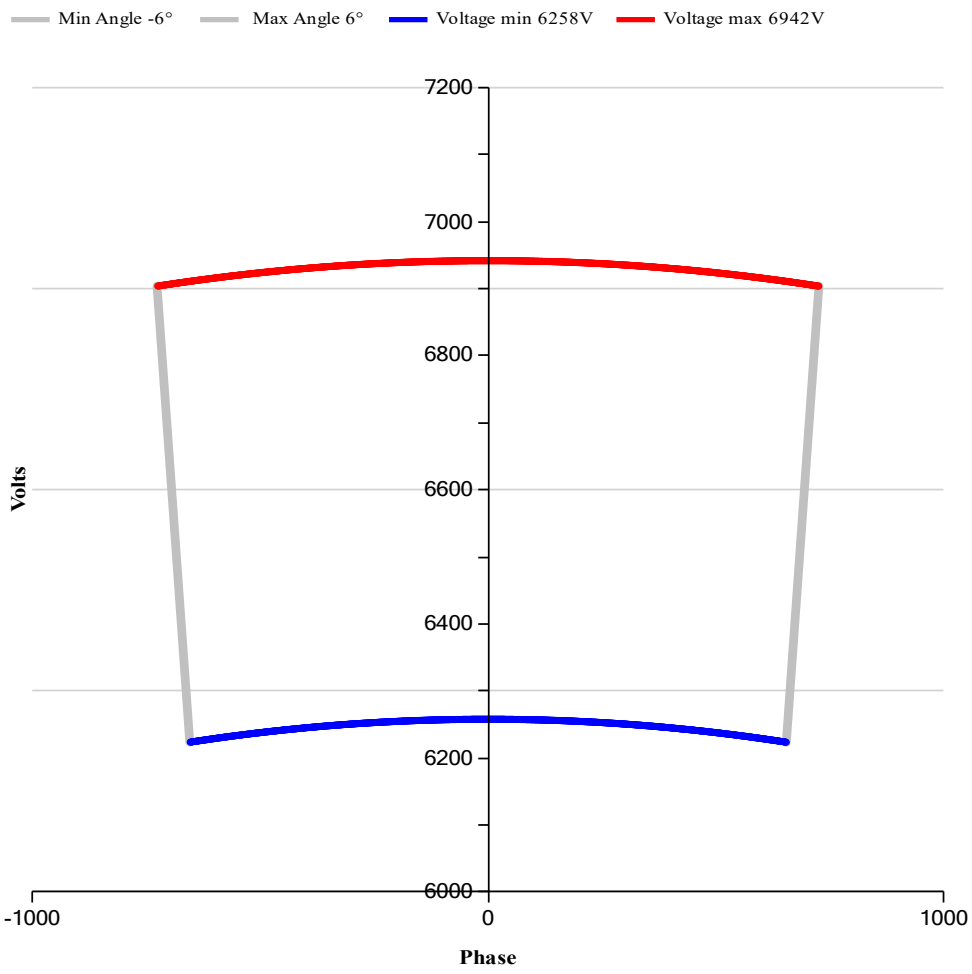
ITEM : UNIT A7

REFERENCE DOCUMENT : 123A90-DDL-EL-RE-20168 Rev.02

RELAY TYPE : ABB REX640

Sn. : 1VHR81041855

IEC61850 : SECRSYN1
Nominal Voltage : 6600 V
Frequency Nominal : 50 Hz
VT RATIO : 6600 / 110 V
Synchro check Mode : Asynchronous
Control Mode : Continuous
Dead line value : 0.10 xUn
Live line value : 0.50 xUn
Dead bus value : 0.10 xUn
Live bus value : 0.50 xUn
Close pulse : 200 ms
Max energizing V : 0.64 xUn
Phase shift : 0 deg
Minimum Syn time : 10000 ms
Maximum Syn time : 5000 ms
Energizing time : 100 ms
Closing time CB : 50 ms
Live dead mode : Not Both Live
Difference voltage : 0.05 xUn
Difference frequency : 0.010 xFn
Difference angle : 5 deg



N.	V1(V)	V1"(V)	V1(°)	V2(V)	V2"(V)	V2(°)	V3(V)	V3"(V)	V3(°)	V4(V)	V4"(V)	V4(°)	F (Hz)
1	3811	63.509	0	3811	63.509	240	3811	63.509	120	6258	104.3	30	50
2	3811	63.509	0	3811	63.509	240	3811	63.509	120	6942	115.7	30	50
3	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	24	50
4	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	36	50
5	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	49.5
6	3811	63.509	0	3811	63.509	240	3811	63.509	120	6600	110	30	50.45

VENDOR :	TEST EQUIPMENT :	CONTRACTOR :	YARD :	CLIENT :
DARIO AZZOLARI ----------	OMICRON CMC 356 **Sn. :** DJ297G	----------	----------	----------

7.2 Proverlis Summary Reports

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CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00

Electrical	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
82013-CEC	6.6KV HV Switchgear / LV Switchgear	ONSHORE	C10002111	CPX10	100	2024-11-26	RFC 1
83005-CEC	LV Switchgear / 6.6KV HV Switchgear	ONSHORE	C10002112	CPX10	100	2024-11-22	RFC 1
83006-CEC	LV Switchgear / 6.6KV HV Switchgear	ONSHORE	C10002113	CPX10	100	2024-11-22	RFC 1
83119-CEL	Lighting & Small Power DB BoP / Auxiliary 6.6kV Switchboard	ONSHORE	C10000638	CPX09	100	2024-11-22	RFC 1
84103-CEL	DC UPS DB / DC Control for 6,6 kV Switchgear Line-A	ONSHORE	C10000567	CPX09	100	2024-11-22	RFC 1
84104-CEL	DC UPS DB / DC Control for 6,6 kV Switchgear Line-B	ONSHORE	C10000568	CPX09	100	2024-11-22	RFC 1
DP-200N1-Q38	AUX 6,6KV - DP-200N1-Q38	ONSHORE	C10002937	FTR-2	100	2024-10-29	-
SG-100D1	MV 6,6kV Switchgear	ONSHORE	C10000864	CPX04	100	2024-09-12	RFC 1
UP-200F1-Q12	DC CONTROL 6,6KV LINE A - UP-200F1-Q12	ONSHORE	C10002935	FTR-2	100	2024-11-08	-
UP-200F1-Q13	DC CONTROL 6,6KV LINE B - UP-200F1-Q13	ONSHORE	C10002936	FTR-2	100	2024-11-08	-

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00

Instrumental	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
82-XS-001	OPEN SOLAR INCOMING CIRCUIT BREAKERS	ONSHORE	C10003828	FJ01D	100	2025-04-04	-
82-XS-002	OPEN BESS A-85000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003827	FJ01D	100	2025-04-04	-
82-XS-003	OPEN FUEL CELL A-80000 INCOMING CIRCUIT BREAKERS	ONSHORE	C10003826	FJ01D	100	2025-04-04	-
C-SG-100D1-001/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	ONSHORE	C10000189	CJX10	100	2024-11-29	RFC 1
C-SG-100D1-002/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	ONSHORE	C10000190	CJX10	100	2024-11-29	RFC 1
C-SG-100D1-003/B400-SIS-001	TRIP SIGNAL / MARSHALLING PCS	ONSHORE	C10000191	CJX10	100	2024-11-29	RFC 1

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00

Telecom	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
SG-100D1/B400-NET-001.01	MV 6,6kV Switchgear / Network Cabinet / EMCS System	ONSHORE	C10004361	CIX09	100	2024-11-22	RFC 1
SG-100D1/B400-NET-001.02	MV 6,6kV Switchgear / Network Cabinet / EMCS System	ONSHORE	C10004362	CIX09	100	2024-11-22	RFC 1
SG-100D1/B400-NET-001.03	MV 6,6kV Switchgear / Network Cabinet / EMCS System	ONSHORE	C10004363	CIX09	100	2024-11-22	RFC 1

CROSSWIND

ROSETTI MARINO

Project CROSSWIND

STATUS INDEX DETAIL

Filtered on subsystem: 82-00

Miscellaneous	82-00 MV 6.6 kV Switchboard (SG-100D1)						
ITEM		TASK					
Code	Description	Location	Code	Form	Progress	Date	Certificate
123A90-PML-COM-PRO-03046	OTP - 6.6 kV Switchgear & Transformer Systems	ONSHORE	C10004623	5300	99	-	-
		OFFSHORE	C10004945	5300	0	-	-

7.3 Equipment Related Technical Queries

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7.4 As built Documentation

After the commissioning phases, when the tests are terminated, it will be issued as built documentation of the 6.6KV SWBD as:

- General arrangement 1723002197-EL-DA-00006
- Wiring diagram A6 1723002197-EL-DG-00015
- Wiring diagram A5 1723002197-EL-DG-00016
- Wiring diagram A3 1723002197-EL-DG-00017
- Wiring diagram A1 1723002197-EL-DG-00018
- Wiring diagram A7 1723002197-EL-DG-00019
- Wiring diagram A2 1723002197-EL-DG-00020
- Wiring diagram A4 1723002197-EL-DG-00021

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File: 123A90-PML-COM-PRO-03046

7.5 Management of Change – Summary Table of Tasks and Details of Affected Related Documentation

Section 6 PIPING AND VESSEL PREPARATION

Section 6.1 Final Mechanical / Vessel Inspection Checks Index

NOT APPLICABLE

Section 6.2 Leak Test / Drying / Inerting Test Sheets Index

NOT APPLICABLE

Section 6.3 Chemical Loading & First Fill records Index

NOT APPLICABLE

Section 6.4 Chemical Cleaning Reports and Records Index

NOT APPLICABLE

Section 6.5 Lubrication Schedule

NOT APPLICABLE

Section 7 VENDOR

Section 7.1 Vendor Package Summary Index

NOT APPLICABLE

Section 7.2 SAT Procedure with associated punch list and reference (Front Page)

Base Load Power Hub (BLPH)

SITE ACCEPTANCE TEST PROCEDURE
HV Switchgear
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STANDARDIZED H.V. MINIVER/C SWITCHBOARDS

Site Acceptance Test Procedure



IMESA® ELECTRICAL ENGINEERING

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1. INTRODUCTION

1.1. PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1. Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.



Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map



Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2. Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

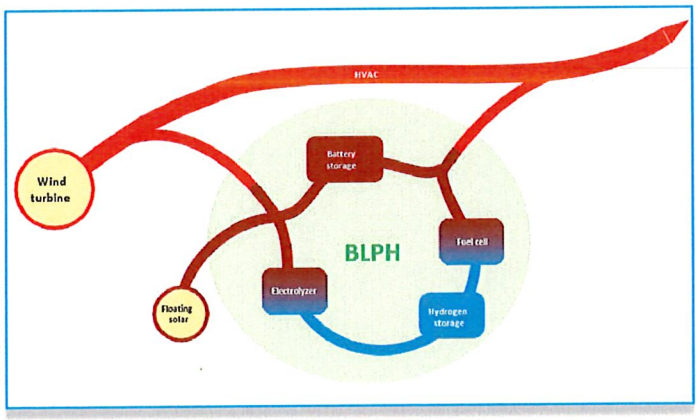


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.
The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2. SCOPE AND APPLICABILITY

This document provides the commissioning and start-up methods, as well as the testing procedures at site, applicable to H.V. Electrical Switchboards, manufactured by IMESA in compliance to Standard IEC 62271-200 and designated as Miniver-C type.

The procedure is applicable to the following switchgear tag: SG-100D1

3. APPLICABLE STANDARDS AND DOCUMENTS

The tester will make reference to Standards IEC 62271-200 and IEC 62271-1 and to the engineering documents listed here below.

Ref.	Imesa Doc No.	Description
A1	1723002197-EL-DA-00006	SG-100D1 General Arrangement DWG and foundation load calculation including COG
A2	1723002197-EL-DG-00010	SG-100D1 Electrical Single Line Diagram
A3	1723002197-EL-DG-00015	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - INCOMING FEEDER (including Terminals and BOM)
A4	1723002197-EL-DG-00016	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BUS BAR METERING (including Terminals and BOM)
A5	1723002197-EL-DG-00017	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - BESS FEEDER (including Terminals and BOM)
A6	1723002197-EL-DG-00018	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - ELECTROLYSER FEEDER (including Terminals and BOM)
A7	1723002197-EL-DG-00019	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - FUEL CELL FEEDER (including Terminals and BOM)
A8	1723002197-EL-DG-00020	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200ED1 (including Terminals and BOM)
A9	1723002197-EL-DG-00021	SG-100D1 MV SWG FUNCTIONAL DIAGRAM - TRANSFORMER FEEDER TR200DE1 (including Terminals and BOM)
A10	1723002197-EL-DG-00022	SG-100D1 MV SWG INTERCONNECTING AND AUX DISTRIBUTION DIAGRAM (including BOM)
A11	1723002197-EL-DG-00023	SG-100D1 MV SWG LOGIC DIAGRAM - INCOMING FEEDER
A12	1723002197-EL-DG-00024	SG-100D1 MV SWG LOGIC DIAGRAM - BUS BAR METERING
A13	1723002197-EL-DG-00025	SG-100D1 MV SWG LOGIC DIAGRAM - BESS FEEDER
A14	1723002197-EL-DG-00026	SG-100D1 MV SWG LOGIC DIAGRAM - ELECTROLYSER FEEDER
A15	1723002197-EL-DG-00027	SG-100D1 MV SWG LOGIC DIAGRAM - FUEL CELL FEEDER
A16	1723002197-EL-DG-00028	SG-100D1 MV SWG LOGIC DIAGRAM - TRANSFORMER FEEDER TR200ED1
A17	1723002197-EL-DG-00029	SG-100D1 MV SWG LOGIC DIAGRAM - TRANSFORMER FEEDER TR200DE1
A18	1723002197-EL-DS-00034	SG-100D1 EQUIPMENT DATA SHEETS INCLUDING MSDS and WEIGHT DATA SHEET
A19	1723002197-EL-CAL-00014	SG-100D1 CURRENT and VOLTAGE TRANSFORMER SIZING CALCULATION and CHARACTERISTIC
A20		MV Switchgear - F.A.T. Report
A21	1723002197-EL-CAL-00056	OPERATION SEQUENCES AND KEY INTERLOCK
A22	1723002197-EL-CAL 00054	INSTALLATION OPERATING AND MAINTENACE MANUAL

Hard copy of the a.m. IMESA documents, properly stamped and signed as "AS BUILT", will be available for the needed testing activities and verifications.

4. SAFETY RECOMMENDATIONS

WARNING



- All the operations of electric maintenance and installation must be performed by qualified technicians
- All the standard electric safety procedures must be respected
- Never touch inside the switchboard; only after making sure it is out of voltage and grounded
- Always wear personal protective equipments (insulating shoes in rubber, protective glasses, safety helmet, etc...)
- Never work alone
- Never remove safety screens
- Always pay maximum attention when handling components or performing measurements inside the panel
- It shall be taken in mind that this test procedure is only for the equipment and is to be used together (not instead of) all safety procedures specified by local Laws, rules, regulations and Standards

People attending the commissioning and testing activities must wear:

SHOES: Workers, staff of the Customer, the End User or its representatives (inspectors) present during the tests shall wear safety shoes, ever. The staff of the Customer, the End User or its representatives (inspectors) present during the tests must arrive already equipped with their own shoes. The staff of the Customer, the End User or its representatives (inspectors), present during the tests and not wearing safety shoes, may still access the Safe Area, but not the test area. They will therefore only observe the test from Safe Area and conducting the review of the results in test reports.

GLASSES: Workers must wear safety glasses when performing risky for their eyes.

HELMET: Workers must wear protective helmets when performing lifting and handling, or when there is a suspended load. When there are suspended loads or handling and lifting the staff of the Customer, the End User or its representatives (inspectors) present during the tests must remain in the Safe Area.

GLOVES: Workers must wear gloves when performing risky for the hands or vibrations.

DRESS: All workers must wear appropriate safety clothing, forever. Helmet, gloves, glasses, safety clothing are not required to staff of the Customer, the end Customer or his representatives (inspectors) present during the tests.

When testing the dielectric properties (applied voltage test), **insulated gloves** and **shoes with retractable toe caps**, as well as suitable **protection clothing covering body and arms**, to be worn.
If the test is suspended even temporarily, the test instrument must be disconnected from the mains.

Before to start any activity, to thoroughly check that the following points are confirmed:

- the lighting system in the area is suitable and in operation
- phone or radio communication system is available, even temporarily for the present activities
- the fire-fighting system is in operation and provided with valid certification (portable fire extinguishers may be also suitable for purpose)
- earthing plant in the area and earthing connections of the subsystems to be energized have been completed and tested

5. GENERAL DESCRIPTION

5.1. PURPOSE OF SAT

The purpose of the SAT (Site Acceptance Test) is to inspect the switchboard, after installation at site, to ensure that it is ready for energization and start-up and also that its performance requirements will be met.
Prior to performing any Site Acceptance Testing, all Punch list items have to be rectified and closed.

5.2. TESTING TASKS

After completion of the installation phase of the switchboard and in order to prepare it for SAT, pre-commissioning and commissioning are to be first carried out, as further detailed in the next paragraphs.

The overall test activities will be performed by means of the specific test equipment, under the control and responsibility of the test executor, along with some assistants.

The main steps that will be performed are the following:

- Verification of the test procedures and of the related documentation availability.
- Preparation of the test setup
- Execution of the tests according to the Test Procedure and release of the SAT Test Report
- Signing of the SAT Test Report by the test executor and the attending people.

Estimated lead time to carry out all these tests is 3/4 weeks (it depends on site activities conditions, actually).

For additional tests not included in its own scope of work, IMESA will provide technical support, as agreed in advance.

List of the tests

Item	Activity	Tool	Support Requested	Type of Test
a.	Mechanical check	Torque Wrench	Mech. Engineer Inspection/Quality Officer	Mandatory
b.	Testing contact resistance at busbars, CBs & Fused Contactors	Current generator and digital multimeter	Electrical Engineer Inspection/Quality Officer	Mandatory
c.	Primary Injection on current transformers	Injection current bench	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that CT is not damaged)
d.	Primary Injection on voltage transformers	Apply low voltage to check the functionality of VT (400V)	Electrical Engineer Inspection/Quality Officer	Suggested (to verify that VT is not damaged)
e.	Testing of protection relays by secondary injection	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory

Item	Activity	Tool	Support Requested	Type of Test
f.	Functional test of IEDs, and interlocks.	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
g.	High voltage test	Hi pot equipment	Electrical Engineer Inspection/Quality Officer	Mandatory
h.	Infrared sensors tests	Non-contact temperature measuring tool	Electrical Engineer (Temperature sensors specialist) Inspection/Quality Officer	Suggested (to verify correct settings)
i.	Arc flash detecting system test	Camera Flash Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
j.	Network Goose Messaging system test	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Mandatory
k.	ENMC system communication test	Secondary injection bench (Omicron)	Electrical Engineer (Relay specialist) Inspection/Quality Officer ENMC test is intended in charge to PMS vendor (IMESA to only provide assistance, where requested and agreed)	Mandatory
l.	Partial discharge detecting system test	Calibration tools	Electrical Engineer (Relay specialist) Inspection/Quality Officer	Suggested (to verify correct settings)

5.3. TEST EQUIPMENT

- Megger (e.g. : Chauvin Arnoux ca 6547)
- Tester / Multimeter
- Testing bench for primary injection (e.g. : Omicron CPC 100)
- Relay Testing System (through current / voltage secondary injection - (e.g. : Omicron CMC 353)
- Torque Wrench (e.g. Dina Beta NM 20÷100)
- Voltage drop test equipment (e.g. : Multimeter + TEIB PP77 100A DC)
- Hi-pot test bench (e.g. : Phenix 650-2P)

NOTES:

- it shall be advised in advance availability of the testing equipment at site or whether those are to be provided by the commissioning engineer himself;
- availability of calibration certificates of the above testing equipment, having valid date, must be ensured.

5.4. TEST PHASE AND PASS/FAIL CRITERIA

For each test a set of pass/fail criteria will be defined (it is also possible that each test has a different criteria) in order to establish an acceptance procedure.
Where acceptance and rejection criteria are not established, they shall be defined according to the best practice, making reference to standards or samples.

The main possibilities are the following:

- All the steps are successfully performed (the test passes)
- Some steps fail but the function under test is verified (the test passes after client approval)
- Some steps fail and the function under test is not verified (the test fails)
- Some steps fail but with a specific corrective action the proper function is recovered (the test must be repeated);

If the test fails, a related NCR will be released.

6. PRE-COMMISSIONING PROCEDURE

6.1. GENERAL INFORMATION

Locking magnets are installed on the HV circuit breaker / HV Fused contactor compartments, to increase general safety of the H.V. Switchboard.

RLE1
Locking magnet on the operating mechanism.
If de-energized, it mechanically prevents circuit breaker / contactor closure.

RLE2
Locking magnet on the truck.
If de-energized, it mechanically prevents circuit breaker / contactor racking-in and racking-out operations.

RLE3 (provided on request)
Locking magnet on the earthing switch.
If de-energized, it mechanically prevents any earthing switch operation (closing and opening, as well).

RLE4
Locking magnet on the circuit breaker compartment door.
If de-energized, it prevents opening and closing of the circuit breaker compartment door.

Circuit Breaker and contactor status (Open / Close / Tripped) is showed on the HMI panel of the protection relays.

For the programmable indication, assigned to the single LED indicator available on the protection relay's HMI panel, please, refer to the relevant table in the schematic diagrams.

IT IS RECOMMENDED TO FORESEE THE ATTENDANCE OF AN IMESA TECHNICIAN DURING THE ABOVE MENTIONED ACTIVITIES

6.2. PRE-COMMISIONING ACTIVITIES

Before to start Pre-Commissioning, please, read carefully the I.O.M. document (Installation, Operation and Maintenance manual).
Then proceed with the following checks and actions.

1. Switchboard's cubicles shall be in good and clean status. Make sure that switchboard is clean, free from dust, traces of humidity, installation material debris, cables pieces, tools, provisional connections, etc. , as well as any foreign object.
2. Visually check the interior and exterior of the switchboard for signs of evident damage
3. Make sure that the switchboard is correctly installed according to the General Arrangement Drawings
4. Maintenance clearances shall be according to the General Arrangement Drawings
5. Make sure that any support or protection used to handle the equipment has been removed
6. Make sure that, after completion of the installation, the switchboard overall protection degree is as per General Arrangement Drawings
7. Visual inspection to check that bolted connections of the HV and earthing circuits (at busbars, CBs poles, CTs, VTs, etc.) are suitably tighten. No disalignment is expected at the marks provided over the bolt, during torque wrench tightening at the factory. In case found, to torque wrench again the connection (see par. 7.1).
8. Cable passages shall be free and unobstructed
9. Couple the auxiliary interpanel connections by the relevant plugs and socket (see schematic diagrams with control voltage distribution loop, panels interconn. wiring and communication network loop)
10. Cabling of control cables from the field in accordance with I/O list / schematics shall be completed
11. Check the incoming / outgoing power cables proper support and earthing screens connections.
12. Make sure that terminals and all the connections have been properly tightened
13. Make sure that all the safety interlock keys (master and copies) have been provided and installed. There are manoeuvres not allowed (forced operations shall be avoided).
14. Remove each H.V. circuit breaker and contactor from its cubicle, by means of the provided lifting / transport trolley, for a visual check of the breaker status and cleaning; including fixed poles of the enclosure and tulip contacts on the removable part.
    Make sure that the breaker is free from dust and traces of humidity and that there are no signs of evident damage.
15. Make sure that all H.V. fuses are correctly installed and that rating is in conformity to the schematic diagrams and parts lists.
16. All necessary warning and caution signs (voltage level indication, warning for live parts, etc.) shall be installed according to the safety standards and procedures.

The results of the a.m. activities shall be recorded on PRE-COMMISSIONING ACTIVITIES REPORT form (see par. 9)

7. COMMISIONING ACTIVITIES

Carry out the following checks and actions.

1. To be verified that all HV circuit breakers and HV fused contactors are in open and racked-out position; with charged closing springs.

   N.B. : it is recommended to manually rewind all the circuit breakers closing springs, before to supply the relevant spring motor chargers, with aux. supply voltage 110 V d.c. , in order to prevent concurrent start-up of many motor gears, which may result in excessive load for the supplying circuit.

   As an alternative, it can be taken care that supply to those motors is provided one by one; by separately closing the relevant MCB, provided within the LV compartment of each feeder unit.
2. Check that all the earthing switches are in closed position.
3. Connect all external aux. supplies and check that are at correct voltage value and phase sequence.
4. Check thoroughly the Operating Sequences and the relevant mechanical safety interlocks, by putting in service and then again out of service all the H.V. units.
5. With CBs / Contactors in test position, close and open the same by local command.
6. Make sure that the phase sequence, at the H.V. circuits, is in accordance to the electrical diagrams and that all incoming breakers are connected with the same phase sequence.
7. Check monitoring loops (hardwired status / alarm signals / visual status indications).
8. Check protection relays loops, concerning IEDs' integrated logic functions.
9. Put the HV CBs / HV Contactors in service (racked-in) position and repeat the test for opening / closing the same from local and remote commands, including control loops from / to the field (commands, status, alarm, etc.)

   N.B. : It is necessary to simulate voltage presence at the bus-bars and at the incomers, to enable CBs closing commands. Voltage presence shall be simulated, at voltage and frequency protection relays, to avoid trip commands for "dead bus-bars" function (see relevant schematic diagrams and protective relays selectivity study).
10. Check HV CBs / HV Contactors tripping, locking-out and alarming functions.

The results of the a.m. activities shall be recorded on the COMMISSIONING ACTIVITIES REPORT form (see par. 9)

8. SAT TESTING PROCEDURE

8.1. MECHANICAL TESTS

1. Bus-bars tightening check

Torque wrench all the bolted joints of the shipping sections, which have been coupled at site, according to the values indicated here below.
After tightening, each bolt is to be marked by red paint to indicated its relative position against the fixed part (as done for the torque wrench tightening provided at the factory).

The table below shows the torque wrench settings to be used for bolted connections fixing the panels and the bus-bars, too.

Screws	M6	M8	MI0	M12	M14	M16
Wrench setting (Nm) -Min	8	19	40	68	100	160
Wrench setting (Nm) - Nominal	9	22	45	75	115	185
Wrench setting (Nm) - Max	10	25	50	83	130	200

2. Tightening at CTs and VTs primary terminals

Primary terminals of the current transformer are made of copper, with threaded screws inserts provided to be used for fastening the primary conductor.

Torque wrench values are to be applied in accordance to the data sheets / to the installation manuals of the Current & Voltage Transformers' manufacturer.

The results of the a.m. activities shall be recorded on SAT REPORT FOR MECHANICAL TEST form (see par. 9)

8.2. MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUITS

Measurement of the resistance of the main circuit shall be carried out where joints between shipping sections have been coupled at site. The test is to carried out in accordance to subclause 6.4.1 of Std. IEC 62271-1.
For the routine test, the d.c. voltage drop or resistance of each pole of the main circuit shall be measured under conditions as much as possible similar, with regard to ambient air temperature and point of measurement, to those of the corresponding type test.
The measurement is to be made by volt-ammetrical method with a d.c. current equal to 100 A, across the main circuit of each panel unit phase.

Acceptance criteria:
The measured resistance shall not exceed 1,2 Ru where Ru is equal to the resistance measured before the temperature rise type test.

The results of the a.m. activities shall be recorded on SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUITS form (see par. 9)

8.3. TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS

Insulation resistance measurement
When the breaker is closed, measure the insulation resistance, phase to ground, with 5 kV d.c. Megger. The test is to be carried out with the other two phases short-circuited and connected to ground.
Then open the breaker and measure the insulation resistance pole to pole.
The above to be carried out for all the phases.

Minimum value of insulation resistance is to be 50 MΩ.

Contact resistance test
The breaker will be in close position before starting the test.
Then inject d.c. current of 100 A on each pole (from in to out of each phase) and measure the voltage drop across it. The measurement is to be done by multimeter
By applying Ohm's law, the resistance value is then calculated. The obtained value needs to be compared with the value given by the manufacturer. Reference is to be made to the voltage drop value of VD4 Circuit Breakers/VSC Contactors, detailed in the relevant Test Reports.

As an alternative, an apparatus with direct reading (Omicron) can be used.

The results of the a.m. activities shall be recorded on SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS form (see par. 9)

8.4. PRIMARY INJECTION ON CURRENT AND VOLTAGE TRANSFORMERS

1. Testing CTs ratio

   Test the CT for correct ratio with direct current injection to CT primary circuit and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

2. Testing VTs ratio

   Test the VT for correct ratio with direct voltage injection to VT primary circuit (low voltage 400 V, for testing purpose) and reading the measured value from the instruments or protection relays LCD display, provided at the LV compartment front door.

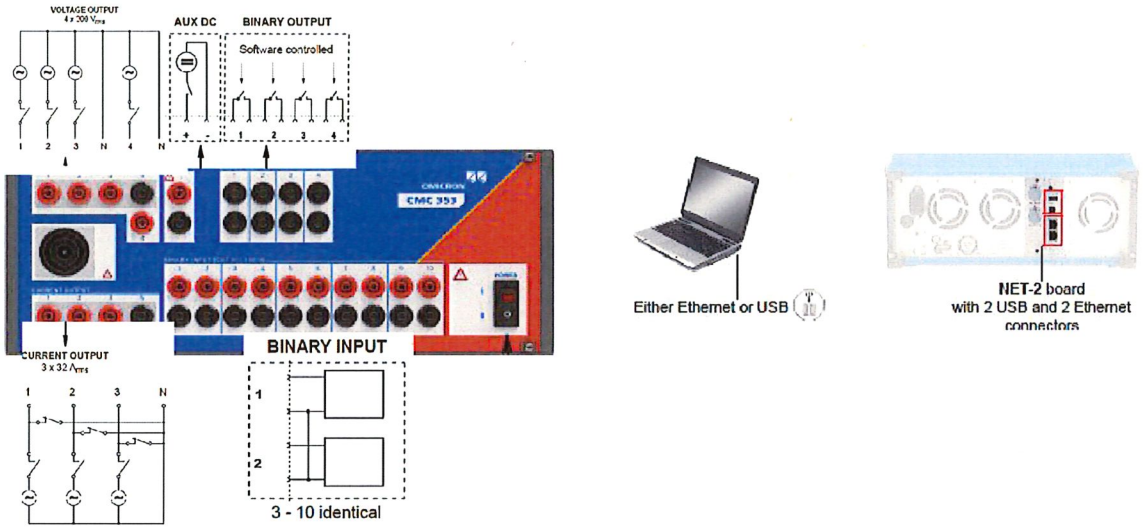
   The results of the a.m. activities shall be recorded on SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs form (see par. 9)

8.5. SECONDARY INJECTION TESTS ON PROTECTION RELAYS

Refer to the schematic diagrams, for connections and for checking logic functions.
Refer to the selectivity study for the protection relays' setting parameters.
Softwares to be employed for uploading, setting and testing the H.V. Switchgear's protection relays are:

- Interface Software to be used – ABB PCM600 2.9 32 bit / ABB PCM600 2.10 32 bit
- ITT600 Integrated Testing Tool or equivalent

Omicron secondary injection test kit – connection and interface



Example of testing instruments connection

1 – Connection of the test set to the PC (USB Port) for data exchange: output of the data simulation, loading of the binary signal
2 – Connection of the analogue outputs of the test set to the transformer inputs of the test object, to inject the simulated currents and voltages.
3 – Connection of the binary outputs of the test set to the binary inputs of the test object, to send binary input signals to the test object.
4 – Connection of the binary inputs of the test set to the binary outputs of the test object, to receive the binary output signals from the test object.

The recorded tripping values shall be in conformity with the Selectivity study

N.B. : Checks on the Partial Discharge detecting systems calibration are also intended within this testing phase.

The results of the a.m. activities shall be recorded on SAT REPORT FOR PROTECTION FUNCTIONS CHECK form (see par. 9)

8.6. HI-POT TEST

The dielectric tests are carried out to check that the installation and re-connection activities at site have been made correctly and that no damage occurred to the equipment, during shipment and installation.

These tests shall be performed before to install the power and cables.

8.6.1. POWER-FREQUENCY WITHSTAND VOLTAGE TEST AND INSULATION RESISTANCE MEASUREMENT

All the VT's, surge arresters, insulation monitoring devices, etc. must be disconnected before the test.
A voltage generator, at industrial power frequency voltage, is to be used to carry out the test.

1. Insulation resistance measurement

Before and after the Hi-pot test, insulation resistance measurement is to be carried out, applying 5 kV d.c. by means of Megger device. The measurement is to be carried out at each phase, while the other two are short-circuited and connected to ground.
The values detected before and after the Hi-pot test will be recorded in the SAT Report.

2. Carrying out the test on the power circuits

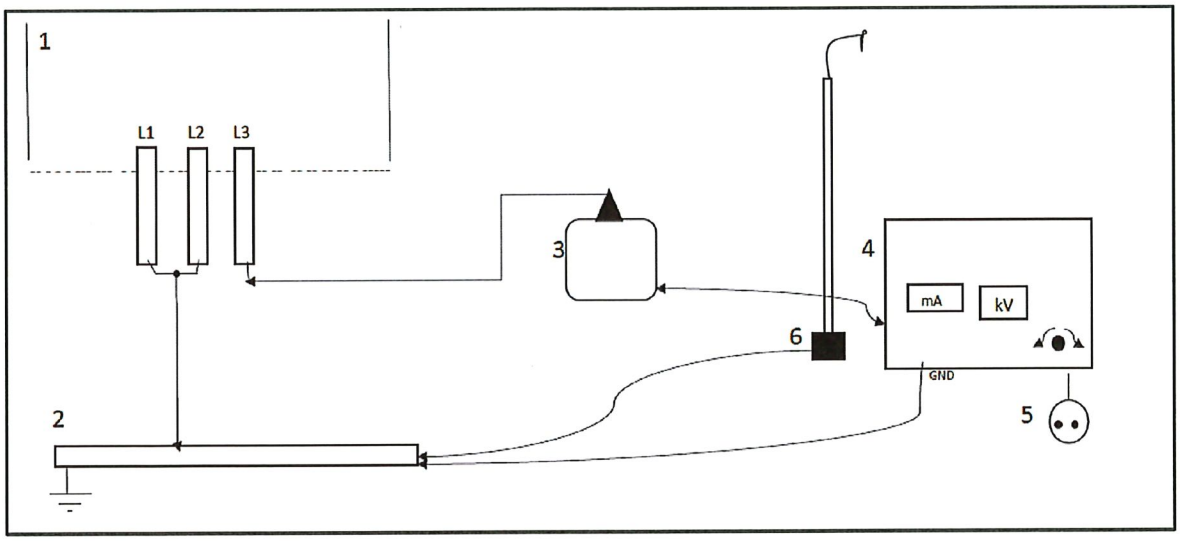
The test voltage to be applied, referring to the rated voltage of the switchboard is as follows (ref. IEC 62271-1, Table 1):

Rated Voltage kV r.m.s. value)	Test Voltage (kV r.m.s. value) AC (100% during F.A.T.)	Test Voltage (kV r.m.s. value) AC (80% during S.A.T.)	Applicability
7.2	20	16	

N.B.: the above test voltage value is 80% of the rated power-frequency withstand voltage at FAT, as specified in clause 7.105 of Std. IEC 62271-200.

HI-Pot Test Lay-Out

1) HV Switchboard Busbar
2) Ground Reference
3) Step-up Transformer
4) Hi-Pot Tester
5) Power supply
6) Ground stick



Example: test layout for testing at phase L3

- Connect to ground the control desk, the VT truck, the foil, the equipment under test
- Limit the test area by means of appropriate barriers
- Connect the MV pole of the VT to the phase under test of the panel, while the other two phases are connected together and to ground
- Connect the flashing lights barriers, the VT truck and its power plug
- The operator, before starting the test, must ensure that nobody is within the hurdles
- Close the main switch of the testing bench and rotate slowly the rheostat knob, until reached the test voltage value, read on the voltmeter (**N.B.** if the rheostat knob is in zero position, the circuit is not closed)

All the above indication may be slightly different, depending on the VT truck type, available at site.

Check the dielectric strength of the main circuits by applying the test voltage for 1 minute on the following points:

- between phase L1 and the phases L2 and L3 connected to ground
- between phase L2 and the phases L1 and L3 connected to ground
- between phase L3 and the phases L1 and L2 connected to ground

The test is considered successful when no discharge or perforation occur within 1 minute.
If discharge phenomena are perceived, the test is considered anyway valid if the test bench does not detect this phenomenology.

After the test or if there has been a discharge, return to zero the rheostat and discharge any possible capacitive voltage remained on the VT pole, by means of the foil. After that, it will be allowed to access to the test object.

Apply the same test to the other two phases, in turn, by repeating the steps described here above.

The results of the a.m. dielectric tests shall be recorded on SAT REPORT FOR HI-POT TEST form (see par. 9)

8.6.2. DIELECTRIC TEST ON AUXILIARY CIRCUIT AND INSULATION RESISTANCE MEASUREMENT

1. Insulation resistance measurement

Before and after the dielectric test on auxiliary circuits, insulation resistance measurement is to be carried out, applying 500 V d.c. by means of Megger device. The measurement is to be carried out at each pole, while the other one is connected to ground.

The values detected before and after the below test will be recorded in the SAT Report.

2. Carrying out the dielectric test on the auxiliary circuits

The test is to be carried out by applying the voltage test between the single pole of the auxiliary and control circuits and ground (between each conductor and the other conductors connected to ground, in turns).

All current absorbing equipment, which would be damaged by the application of the testing voltage (coils, metering instruments, differential circuit breakers, etc.) must be disconnected before the test.

The voltage value to be applied is 2000 V, with duration of 1 min. (CEI EN 62271-1, pos. 6.2.10 applies).

The test is considered successful, if no discharge or perforation occur during the test (1 minute).

The results of the a.m. dielectric tests shall be recorded on SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS form (see par. 9)

8.7. INFRARED SENSORS TESTS

It is here detailed the test method to carry out testing on Exertherm devices, based on infrared thermal sensing.

1. All sensor distance from busbar locations must adhere to standards for clearance from bus bars and cables, depending on circuits rated voltage.

2. Testing must be carried out in a location which provides reasonably stable ambient conditions; i.e. avoid rooms where direct sunlight cannot be prevented, or which are subject to frequent ambient variances.

3. Ambient temperature will be measured on the Exertherm Sensors i.e. at the lens end of the IRT/c using any suitably calibrated non-contact temperature measuring instrument, with certified accuracy. Calibration certificate must be available for scrutiny and up to date.

4. The following method of ambient measurement will be adopted.

   Ambient air temperature is to be between 10°C and 40°C

   - Measurement of ambient air temperature: indoor ambient air temperatures shall be determined by taking the average of the readings of three temperature-measuring devices, such as thermometers or thermocouples, placed as follows:

   a) One level with the top of the structure
   b) One 30 cm above the bottom of the structure
   c) One midway between the two positions a) and b).

   - All temperature-measuring devices shall be placed 30 cm from the structure, not in front of ventilators, and in locations unaffected by drafts caused by the structure or appreciable radiation from the equipment. When the ambient air temperature is subject to variations that might result in errors in measuring the temperature rise, the temperature-measuring devices should be immersed in a suitable liquid, such as oil, in a suitable container, or reliably attached to a suitable mass of metal.

NOTE - A convenient form for such a container consists of a metal cylinder with a hole drilled partly through it. This is filled with liquid and the temperature-measuring device is placed therein. The size of the container should be at least 2.5 cm in diameter and 5.0 cm high.

The ambient temperature used when calculating the connection delta temperature will be the local ambient recorded at the Exertherm Sensor location.

5. All Datacard power supplies will be maintained at 24V d.c. ±10%.

6. All equipment test apparatus and Sensors to be used during these tests will be left to acclimatise in the switchgear for a period of a minimum of 1 hour prior to any tests taking place.

7. It is assumed that all Datacards are programmed and commissioned according to the relevant product instructions.

8.7.1. TEST PROCEDURE – TEST WITH CIRCUITS NOT ENERGISED

1. Ensure all power supplies are set at the correct voltage and within specification i.e. at 110 V d.c. and 24 V d.c. ±10%.

2. Take a reading of room ambient as described in the previous section and note this value on the test check sheet (section Room Ambient)

3. Take a reading of the ambient temperature at the Sensor under test and note this value on the test check sheet (section Ambient Test Reading)

4. Take a reading from the Datacard software on the Sensor under test and note the value on the test check sheet (section Sensor Reading Under Test)

5. Take a reading of absolute temperature from the busbar with a suitably calibrated and certified temperature measurement device and note this reading. This should be an average reading across the connection point and not just one 'spot' temperature and note the value on the test check sheet (section Absolute Reading At Sensor)

6. Subtraction of the ambient temperature (at the sensor) from the connection temperature will result in the Delta T value and note the value on the test check sheet (section Calculated Delta T Reading). This should comply with the IR Sensor reading ±3°C (5.4°F)

7. Note down all these readings for future reference.

Repeat the steps 3 to 7 for all Sensors in the panel.

All these readings should produce a Delta T value of between -3°C (-5.4°F) to +3°C (+5.4°F)

It should be noted that this is not process control and therefore readings will not be exact to the degree. The Exertherm Sensor is 100% repeatable in identical conditions.

8.7.2. TEST PROCEDURE – TEST WITH CIRCUITS ENERGISED

1. With the switchgear energised and set in test conditions, with test currents and loading, allow all temperature, including ambient temperature to become stable.
   Leave all equipment to again acclimatise to local conditions for a minimum of 30 minutes.

2. Ensure all power supplies are set at the correct voltage and within specification i.e. at 110 V d.c. and 24 V d.c. ±10%.

3. Take a reading of room ambient temperature as described in the previous section and note this value on the test check sheet (section Room Ambient)

4. Take a reading of the ambient temperature at the Sensor under test and note this value on the test check sheet (section Ambient Test Reading)

5. Take a reading from the Datacard software on the Sensor under test and note the value on the test check sheet (section Sensor Reading Under Test)

6. Take a reading of absolute temperature from the busbar with a suitably calibrated and certified temperature measurement device and note this reading. This should be an average reading across the connection point and not just one 'spot' temperature and note the value on the test check sheet (section Absolute Reading At Sensor)

7. Subtraction of the ambient (at the sensor) from the connection temperature will result in the Delta T value and note the value on the test check sheet OEM Design Validation Test Record (section Calculated Delta T Reading). This should comply with the Exertherm IRT/c sensor reading ±3°C (5.4°F)

8. Note all these readings for future reference.

Repeat these steps 4 to 7 for all Sensors in the panel.

All these readings should produce a Delta T value of between -3°C (-5.4°F) to +3°C (+5.4°F).

The results shall be compared to the relevant data sheet for the Sensor's tolerances in terms of accuracy and repeatability.

The results of the a.m. tests shall be recorded on SAT REPORT FOR INFRARED SENSORS TESTS form (see par. 9)

8.8. NETWORK and GOOSE TESTING

Preliminary checks

1) Ensure that each IED is set with the right parameter of the network below cited
   - Technical key
   - IP address
   - Subnet Mask (in charge to Network vendor engineer)
   - Main NTP address (in charge to Network vendor engineer)
   - Backup NTP address (in charge to Network vendor engineer)
   - Time clock (in charge to Network vendor engineer)
2) Ensure that Ethernet switch is duly set (in charge to Network vendor engineer)
3) Ensure that the IED is switched ON

8.8.1. INTERNAL GOOSE MESSAGING TEST

- Function ANSI 27 block for feeders

Simulate voltage loss from VTs on Busbars metering unit, by opening the distribution MCB, at the secondary circuits of the VTs, or rack-out the VTs trolley, or simulate fuses blown on the VTs' primary circuits.
On different feeder, simulate undervoltage condition with racked-in & closed position of the HV breaker.
The HV Circuit Breaker or HV Vacuum Contactor shall remain closed.

- Arc Flash Trip

CABLE COMPARTMENT

Arc Flash detected on power cables compartment shall only open the breaker of its own feeder unit, in case of contemporary detection of arc flash light and current flow reading, through the CTs and protection relay.
At the Incoming units, breaker opening is activated by only detecting arc flash light.

Test execution:
Connect the test bench in order to inject a secondary current, according the setting tables, to the unit's protection relay.
Inject the current and simulate a flash light in the cables compartment, from the rear of the Swbd.
The test can be consider passed if the breaker will be opened.

BUSBARS OR CB COMPARTMENT:

Arc Flash detected on Busbars chamber or on CB compartment shall result in a complete shutdown of the Switchboard, in case of contemporary detection of arc flash light and current flow reading, through the CTs and protection relay.

Test execution:
Connect the test bench in order to inject a secondary current, according the setting tables, to the protection relay of the Incoming unit.
Choose a CB compartment or Busbar section where to simulate the flash light, inject the current and simulate the flash light in the compartment.
The test can be consider passed if the complete shutdown of the busbars section will be verified.

8.8.2. EXTERNAL GOOSE MESSAGING TEST

Scope of these tests is in cooperation with the Network vendor engineer.
The tests can start only if all Ethernet switches have been set from the Network vendor engineer.

- PMS Goose test:

The HVSB receives and transmit goose messages from/to PMS.
For testing purpose of proper communication with PMS, the HVSB vendor can support the PMS vendor or the Network vendor engineer for execution of the following activities:

- opening closing the HV circuit breaker / HV Contactors
- racking-in / racking-out HV circuit breaker / HV Contactors
- opening / closing the earthing switches
- secondary injection tests on the protection relays

This part of the SAT is in charge to the Network Vendor.

8.8.3. INFRARED SENSORS MODBUS NETWORK

Scope of these tests is in cooperation with the Network vendor engineer.
The tests can start only if all Ethernet switches have been set from the Network vendor engineer.

These activities can be performed in parallel to IR sensors tests (see paragraph 7.7). This is possible also if the Network is not connected with the PMS, by connecting directly to the switch installed in the HVSB.

This part of the SAT is in charge to the Network Vendor.

The results of the a.m. Goose messaging tests shall be recorded on SAT REPORT FOR GOOSE MESSAGING TESTS form (see par. 9)

9. PRE-ENERGIZATION REQUIREMENTS

Before to proceed with energization of the HVSB, the following is to be verified.

- Make sure to pull off the short-circuit jumpers fitted on amperometric terminal boards, to avoid running the units with current transformer (-TI..-L..) short-circuited at secondary windings.
- Make sure to have re-closed the disconnecting terminals fitted on voltmetric terminal boards, to avoid running the units with voltage transformer (-TU-L..) not connected at secondary windings.
- Make sure that all the miniature CBs for aux. and measuring circuits are closed
- All system protections, controls, detectors and monitoring devices shall be reset and ready for operation
- All protections and control logics shall be reset and ready for operation
- All recording equipment, where provided, shall be in operation
- No alarm and/or trip signal shall be active
- Earthing switches shall be locked in open position
- Voltage transformers shall be in service position (racked-in), with primary fuses suitably placed
- H.V. circuit breakers and vacuum contactors shall be in service position (racked-in), open and available
- Fuses at the HV vacuum contactors shall be suitably placed
- Mechanical and electrical interlocks are to be suitably in operation
- All removable protections against direct contacts with accessible parts (panels, grids, plates, doors, etc.), shall be correctly placed and fixed
- All the doors shall be closed and fixed panels are to be correctly positioned and bolted

10. PRE-COMMISSIONING, COMMISSIONING AND SAT REPORT TEMPLATES

The following forms are intended for recording the results of Pre-Commissioning, Commissioning and SAT activities.

Forms provided by the customer may also be employed, on request.

PRE-COMMISSIONING ACTIVITIES REPORT

COMMISSIONING ACTIVITIES REPORT

SAT REPORT FOR MECHANICAL TESTS

SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUIT

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS
- INSULATION RES. MEASUREMENT -

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS
- INSULATION RES. MEASUREMENT –

SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs

SAT REPORT FOR PROTECTION FUNCTIONS CHECK

SAT REPORT FOR HI-POT TEST

SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS

SAT REPORT FOR INFRARED SENSORS TESTS

SAT REPORT FOR GOOSE MESSAGING TESTS

IMESA ELECTRICAL ENGINEERING

PRE-COMMISSIONING ACTIVITIES REPORT

SWBD: **SG-100D1**

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
COLUMN: 1	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 2	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 3	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 4	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 5	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 6	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	
COLUMN: 7	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	N/A	N/A	OK	OK	OK	OK	

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

COMMISSIONING ACTIVITIES REPORT

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2	3	4	5	6	7	8	9	10							
COLUMN: 1	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 2	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 3	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 4	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 5	N/A	OK	OK	OK	N/A	OK	N/A	N/A	N/A	N/A							
COLUMN: 6	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							
COLUMN: 7	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK							

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR MECHANICAL TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - **N/A** – not applicable × SEE NOTE

DESCRIPTION	1	2															
COLUMN: 1	OK	OK															
COLUMN: 2	OK	OK															
COLUMN: 3	OK	OK															
COLUMN: 4	OK	OK															
COLUMN: 5	OK	OK															
COLUMN: 6	OK	OK															
COLUMN: 7	OK	OK															

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: IMESA Name: Piangerelli	Company: Rosetti Name: Castellani	Company: Name:	Company: Name:
Date: 06/12/2024	Date: 06/12/2024	Date:	Date:

IMESA ELECTRICAL ENGINEERING

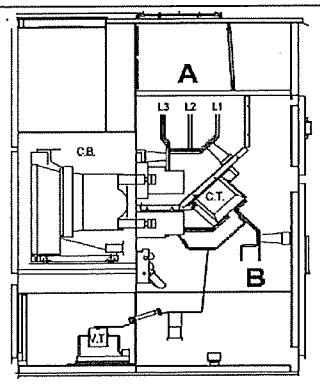
SAT REPORT FOR MEASUREMENT OF THE RESISTANCE OF THE MAIN CIRCUIT

SWBD: SG-100D1

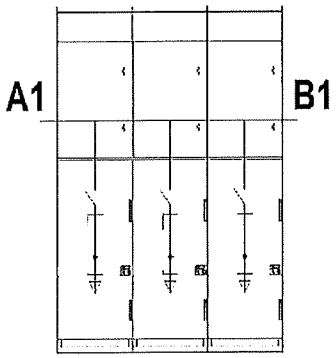
CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Value of injected current: 100 A

TYPICAL PANEL ARRANGEMENT DRAWING



Panel unit circuit



Switchboard's bus-bars

Measure =ment between AB or A1/B1	Phase L1 *Measured resistance* (μΩ)*	Phase L2 *Measured resistance* (μΩ)*	Phase L3 *Measured resistance* (μΩ)*
A1-B1	198.56	223.42	200.62

* *To obtain the measured resistance value, in μΩ, is sufficient to multiply by 10 the measured v.d. in mV (e.g. : voltage drop of 1.4 mV = 14 μΩ)*

NOTES:

TEST PERFORMER **EXECUTED**	**WITNESS** **ACCEPTED / VERIFIED**	**QUALITY OFFICER** **ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: IMESA **Name: Piangerelli**	**Company: Rosetti** **Name: Castellani**	**Company:** **Name:**	**Company:** **Name:**
Date: 06/12/2024	**Date:** 06/12/2024	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS - INSULATION RES. MEASUREMENT -

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Megger test with 5 kV d.c.

DESCRIPTION	Phase L1 *Measured insulation resistance* (MΩ)*	Phase L2 *Measured insulation resistance* (MΩ)*	Phase L3 *Measured insulation resistance* (MΩ)*
COLUMN: 1			
COLUMN: 2			
COLUMN: 3			
COLUMN: 4			
COLUMN: 5			
COLUMN: 6			
COLUMN: 7			

* *Minimum value of insulation resistance is to be 50 MΩ*

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR TESTING H.V. CIRCUIT BREAKERS AND H.V. FUSED CONTACTORS - RESISTANCE OF THE MAIN CIRCUIT -

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Value of injected current: 100 A

DESCRIPTION	Phase L1 *Measured resistance* (μΩ)*	Phase L2 *Measured resistance* (μΩ)*	Phase L3 *Measured resistance* (μΩ)*
COLUMN: 1			
COLUMN: 2			
COLUMN: 3			
COLUMN: 4			
COLUMN: 5			
COLUMN: 6			
COLUMN: 7			

* *To obtain the measured resistance value, in μΩ, is sufficient to multiply by 10 the measured v.d. in mV (e.g. : voltage drop of 1.4 mV = 14 μΩ)*

NOTES:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PRIMARY INJECTION TESTING ON CTs AND VTs

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend **OK** - N/A – not applicable × SEE NOTE

DESCRIPTION	**1**	**2**															
COLUMN: 1																	
COLUMN: 2																	
COLUMN: 3																	
COLUMN: 4																	
COLUMN: 5																	
COLUMN: 6																	
COLUMN: 7																	

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR PROTECTION FUNCTIONS CHECK

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**
PROT. RELAYS' COORD. STUDY DOC. :	**PANEL UNIT:**	**RELAY SERIAL NO. :**

protection unit setting test values					*protection unit operation check values*			
Protection Function	*ANSI Code*	*Setting*		*CT/VT Ratio*	*Phase*	*Test Value*	*Operating Time*	*Result*
		Value	Time [s] or K					

Notes:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR HI-POT TEST

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend	**OK** -	**N/A** – not applicable	× SEE NOTE											
DESCRIPTION	**1**	**2**												
HI-POT TEST ON POWER CIRCUITS	OK	OK												

Applied Voltage on the power circuits: 16 kV (80% of the FAT rated value)
Duration Time: 60 s

Measured Insulation Resistance

BEFORE TEST	AFTER TEST
L1 – L2= 1.89 TΩ	L1 – L2= 1.68 TΩ
L1 – L3= 2.36 TΩ	L1 – L3= 2.06 TΩ
L2 – L3= 1.94 TΩ	L2 – L3= 2.03 TΩ

NOTES:
Equipment disconnected during Hi-Pot test:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: IMESA **Name: Piangerelli**	**Company: Rosetti** **Name: Castellani**	**Company:** **Name:**	**Company:** **Name:**
Date: 06/14/2024	**Date:** 06/12/2024	**Date:**	**Date:**

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR DIELECTRIC TEST ON AUX. CIRCUITS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Legend OK - N/A – not applicable × SEE NOTE

DESCRIPTION	1	2											
DIELECTRIC TEST ON AUX. CIRCUITS													

Applied Voltage on the power circuits: 2000 V a.c.
Duration Time: 60 s

Measured Insulation Resistance

BEFORE TEST	AFTER TEST
110 V d.c. =	110 V d.c. =
230 V a.c. =	230 V a.c. =
24 V d.c. =	24 V d.c. =

NOTES:
Equipment disconnected during dielectric test:

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR INFRARED SENSORS TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

Modbus Address			Serial N.					
Data Card Channels (2)								
	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7	Ch 8
Section Reference (1)								
Phase Reference								
Sensor Type								
IR.EM-06.SC – Delta T								
No Sensor								
IR.EM-06.SC ONLY								
Busbar Size								
Mounting Distance								
Gain Factor Used								
Site Acceptance Test								
Initial Value								
Heat Tested Reading								

(1) Note CB = Cable Compartment BB = Busbar Compartment

(2) See ref. Documents 1723002197-EL-LIS-00041 and 1723002197-EL-DG-00022

TEST PERFORMER	WITNESS	QUALITY OFFICER	
EXECUTED	ACCEPTED / VERIFIED	ACCEPTED / VERIFIED	
Sign:	Sign:	Sign:	Sign:
Company: Name:	Company: Name:	Company: Name:	Company: Name:
Date:	Date:	Date:	Date:

IMESA ELECTRICAL ENGINEERING

SAT REPORT FOR GOOSE MESSAGING TESTS

SWBD: SG-100D1

CUSTOMER:	**PROJECT DESCRIPTION:**	
SITE:	**AREA:**	
SWITCHBOARD:		
DATE:	**DOC. N**	**REV:**

					From					
					SIGNAL Description	BB VT OPEN	ES BB OPEN	CLOSING COMMAND	OPENING COMMAND	
	CUBICLE	DEVICE	SIGNAL	GOOSERX N		0	1	2	3	
Destination Unit			TRIP							
			ARC FAULT							

NOTES:

TEST PERFORMER	**WITNESS**	**QUALITY OFFICER**	
EXECUTED	**ACCEPTED / VERIFIED**	**ACCEPTED / VERIFIED**	
Sign:	**Sign:**	**Sign:**	**Sign:**
Company: **Name:**	**Company:** **Name:**	**Company:** **Name:**	**Company:** **Name:**
Date:	**Date:**	**Date:**	**Date:**

Section 7.3 Vendor Spares & Special Tools lists references

ROSETTI MARINO

SPARE PARTS LIST

CROSSWIND

Document Title	SPARE PART INDEX REGISTER (COMMISSIONING AND OPERATION)
The document relates to	HOLLANDSE KUST NOORD WIND PARK Project - Base Load Power Hub (BLPH)
Project ID	123A90
Doc. nº	1723002197-COM-LIS-00052
Rev.	Issued for review
Rev. Date	08-Aug-24
Contract	CW-I-WP4-2023-05
Status	IFR
Class	3

The equipment consists of the following units/components

1	Tag no.	SG-10/01	SG-20/M1	SG-20/02	DP-20/M1
2	Tag description	HV SWBD 6.6kV	LV SWBD 400/230V	LV SWBD 690V	LV SWBD 400/230V

Supplier: IMESA S.p.A

Address: via G. di Vittorio, 14

JESI - (AN)

ITALY

PO Number: 1723002197_123A90

PO description: HV and LV Switchgears

Supplier telephone no: +39 0731 211034

E-mail: spareparts@imesaspa.com; damiano.santinelli@imesaspa.com

Contact name: Mr. Damiano Santinelli

Contact mobile no: +39 0731 649242

WEBSITE

General Information:

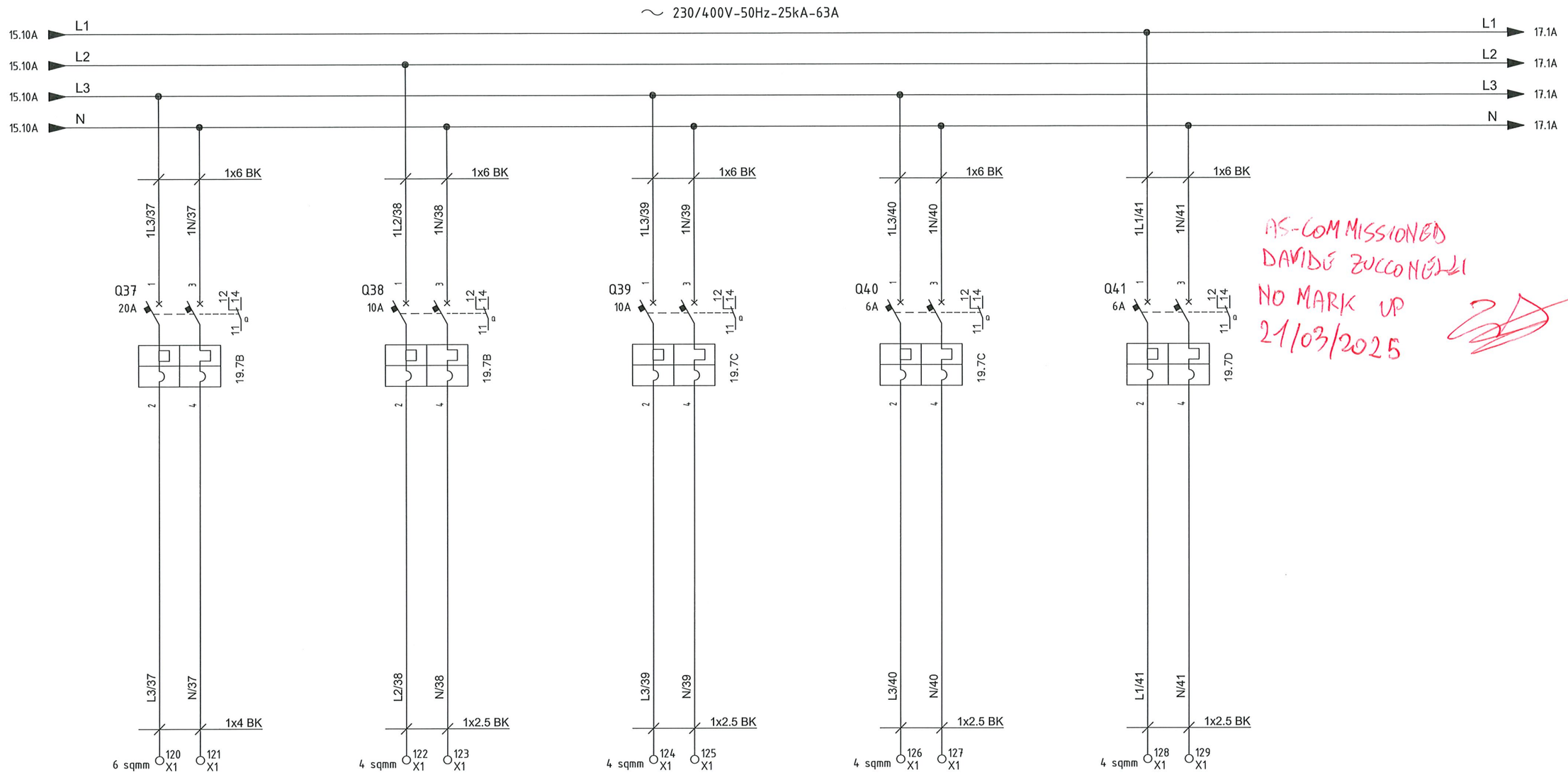
3	Manuf.actuer model/ type no.	M/miner /C	PC/MCC	PC	MCC/I
4	Manuf.actuer serial no.	231155/LED/01/2024	231298/ED/040/2024	231298/ED/070/2024	231298/ED/080/2024
5	Nos.of units	1	1	1	1

MATERIALS DATA

Item Number	Total number of identical spares installed	Description of recommended spare parts	Parts/drawing ref. Project Datasheet no.	Project Detail dwg. no.	Item ref.	Material	Certificate Type (if applicable)	Certificate Reference (if applicable)	Shelf life (years)	Weights (net)	Weights (gross)	Volume	HS Code	ECCN Code	% US Content	Country of origin	Supplier part no.	Manufacturer part no.	Manufacturer name	Commissioning spares Quantity ordered	2 Years spares Quantity ordered	Remarks
7	8		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1	6,00	REX640 GENERAL PURPOSE CODE															MPQ2000001VCF698331R0001	1VCF698331R0001	ABB PT			
2	6,00	ACCESSORY FOR REX640 - 2RCA033008A0001 - SCHERMO A COLORI TOUCH															MPQ2000001VCF698331R0002	1VCF698331R0002	ABB PT			
3	6,00	ACCESSORY FOR REX640 - 1MRS120549-3 - LHMI CABLE 3mt															MPQ2000001VCF698331R0012	1VCF698331R0012	ABB PT			
4	3,00	UMK-RJH/5/8PTDA VARIOFACE MODULE															MPQ2000002900682	2900682	PHOENIX CONTACT spa			
5	5,00	BSR10 SENTRY RELAY SIL3 24Vcc 3NA+1NC COD. A1004000															MPQ2000002TLA01004OR0000	A1004000	ABB SACE SPA			
6	6,00	VOLTAGE PRESENCE SIGNALING DEVICE VPIS 3LED dis.43911082															MPQ2000004391108Z	VPIS108Z	ELECTRONSYSTEM MD srl			
7	1,00	VOLTAGE PRESENCE SIGNALING DEVICE VPIS1118 3-3-36kV dis.43931118															MPQ2000004393111I8	VPIS1118	ELECTRONSYSTEM MD srl			
8	2,00	PATCH CORD CAT.6 UTP WHITE L=1mt ART. 6U-010WH															MPQ2000006U010WH	6U010WH	SECURNET srl			
9	6,00	PATCH CORD CAT.6 UTP YELLOW L=5mt ART. 6U-050-YE															MPQ2000006U050YE	6U050YE	SECURNET srl			
10	1,00	PATCH CORD CAT.6 UTP YELLOW L=7.5mt															MPQ2000006U075YE	6U075YE	SECURNET srl			
11	7,00	MODBUS DATACARD, 8-CHANNEL, EM SENSOR INPUT, RS485 MODBUS RTU OUTPUT															MPQ2000008B0208	808208	QHI Group Ltd			
12	1,00	CONFIGURATION & COMMISSIONING KIT 800447															MPQ2000008B0447	800447	QHI Group Ltd			
13	53,00	IR SENSOR EM-10 SC 801100 CABLE L=10MT															MPQ2000008B01100	801100	QHI Group Ltd			
14	1,00	ARM XL PANEL - 10KB CH 4.3" TOUCHSCREEN DISPLAY															MPQ2000009B0451	900451	QHI Group Ltd			
15	1,00	M-FAST SFP-TX/BiM5 OPTICAL FIBER TRANSCEIVER 100MBIT/S															MPQ2000009420980D1	842098D01	ABB PT			
16	21,00	SURGE DISCHARGE 9KV 10KA CL:1 DMI-9-10-1-L															MPQ2000009900O3	990003	DEHN ITALIA spa		2	
17	122,00	S2C-S/H 6R SINGNALINC CONTACT/AUX															MPQ2000004S63819	A563819	ABB SACE SPA		7	
18	7,00	BCO MOULE AC TYPE 2P 2SA DDA202-25-300mA/AC															MPQ2000008427917	B427917	ABB SACE SPA		1	
19	15,00	REGLETTE LED 4W 220-240V 50-60HZ COD.74041 - RGL P LED 4W 313mm 4000K I															MPQ2000008EG74041	74041	BEGHELLI srl	1		
20	1,00	VOLMETRICAL SWITCH 1Tav.FF CA10.A004-600-FT2 + 50.F776 + 50C 6251															MPQ2000004CA10A004600FT2	CA10A004600FT2	KRAUS & NAIMER			
21	18,00	MICROSWITCH D2VW-5L2-1 WITH LONG LEVER/ROT. OMRON															MPQ2000005D2VW5L21	D2VW-5L2-1	OMRON ELECTRONICS spA		1	
22	144,00	FEED THROUGH TERMINAL BLOCK DAS.4 DOUBLE LEVEL 4mmq GREY															MPQ2000005DS100GR	DS100GR	CABUR spa		8	
23	6,00	TERMINAL PLATE GREY DAS/PT/GR															MPQ2000005DS101GR	DS101GR	CABUR spa		1	
24	7,00	M1173 SCOKET ITALIAN STANDARD 2P+T WITH PROTECTION 250V															MPQ2000005EA9447	EA9447	ABB SACE SPA			
25	40,00	CONTACT BLOCK HOLDER MCBH-00 3 SLOT															MPQ2000006EOS697	EOS697	ABB SACE SPA	6		
26	146,00	MCB-10 1NO CONTACT BLOCK															MPQ2000006EOS705	EOS705	ABB SACE SPA	6		
27	106,00	MCB-01 1NC CONTACT BLOCK															MPQ2000006EOS713	EOS713	ABB SACE SPA		6	
28	1,00	CR-M024DC2L RELAY. CR-M 24VCC 2SC +LED															MPQ2000006ER5454	1SVR405611R100	ABB SACE SPA			
29	8,00	CR-M230AC2L RELAY230V AC 2C/O CONTACTS NA/NC 250V/12A															MPQ2000006ER5520	ER5520	ABB SACE SPA			
30	29,00	CR-M110DC4L RELAY CR-M 110VCC 4C/O CONTACTS +LED															MPQ2000006ER5892	ER5892	ABB SACE SPA	3		
31	191,00	STANDARD SOCKET CR-M4SS FOR RELAY WITH 2/4 C/O CONTACTS															MPQ2000006ER6866	1SVR405651R3000	ABB SACE SPA			
32	75,00	RETAIN.METAL SPRING CR-MH1 ER7286															MPQ2000006ER7286	ER7286	ABB SACE SPA			
33	7,00	H3DM-M2 MULTIFUNC. RELAY WITH TIMER. aux:24-230VCA/CC 2SC.T															MPQ2000009H3DM2	H3DM2AC0C242	OMRON ELECTRONICS spA			
34	47,00	END PLATE GREY HSCB/6/PT/GR															MPQ2000008HB201GR	HB201GR	CABUR spa			
35	7,00	SHORT CIRCUIT PLATE 2 POLES, RED, HSCB/6/PO/2															MPQ2000008HB203	HB203	CABUR spa			
36	7,00	SHORT CIRCUIT PLASTE 4 POLES, RED, HSCB/6/PO/4															MPQ2000008HB204	HB204	CABUR spa			
37	99,00	TERMINAL BLOCK - VOLTMETRIC- HSCB.6/DD/GR SPRING CLAMP															MPQ2000008HB210GR	HB210GR	CABUR spa			
38	60,00	TERMINAL BLOCK - AMMETRICAL- HSCB.6/CD/GR SPRING CLAMP															MPQ2000008HB220GR	HB220GR	CABUR spa			
39	735,00	FEED THROUGH TERMINAL BLOCK HMM.4/GR SPRING CLAMP															MPQ2000009HM250GR	HM250GR	CABUR spa	40		
40	56,00	END PLATE GRAY HMT.4/PT/GR															MPQ2000008HM251GR	HM251GR	CABUR spa			
41	84,00	FEED THROUGH TERMINAL BLOCK HMM.6 SPRING CLAMP															MPQ2000008HM320GR	HM320GR	CABUR spa			
42	21,00	END PLATE HMT.6/PT GRIGIA															MPQ2000008HM321GR	HM321GR	CABUR spa			
43	6,00	FEED THROUGH TERMINAL BLOCK HMM.10 SPRING CLAMP															MPQ2000008HM330GR	HM330GR	CABUR spa			
44	2,00	END PLATE GRAY HMM.10PT															MPQ2000008HM331GR	HM331GR	CABUR spa			
45	6,00	TO 0,72/3/4V 50HZ 100/1A SPS-SVA DWG:5089-00-44 Ø150MM															MPQ2000006KAP15025055	KAP15025055	ESITAS ELEKTRIK SANAYI			
46	3,00	RECTIFIER BRIDGE KBPC 50A 600V KBPC5006															MPQ2000006KBPC5006	KBPC5006	GENERIC			
47	6,00	MiBL-04Y LED BLOCK WITH YELLOW LED 110-130VAC															MPQ2000006KV0225	KV0225	ABB SACE SPA			
48	6,00	MiBL-05Y LED BLOCK WITH YELLOW LED 110÷130VDC															MPQ2000006KV0274	KV0274	ABB SACE SPA			
49	33,00	MP1-10R RED PUSH BUTTON WITH PLASTIC RING. D22															MPQ2000006KW0752	KW0752	ABB SACE SPA	2		
50	33,00	MP1-10G GREEN PUSH BUTTON WITH PLASTIC RING.D22															MPQ2000006KW0760	KW0760	ABB SACE SPA	2		
51	7,00	MP1-10B BLACK PUSH BUTTON WITH PLASTIC RING.D22															MPQ2000006KW0802	KW0802	ABB SACE SPA			
52	7,00	MP1-11Y YELLOW PUSH BUTTON WITH PLASTIC RING - ILLUMINATED. D22															MPQ2000006KW1016	KW1016	ABB SACE SPA			
53	34,00	M2S52-10B 90 DEG. 2P POS. SELECTOR BLACK WITH LEVER AND BLACK RING. D22															MPQ2000006KW3293	1SFAE611201R1006	ABB SACE SPA	2		
54	7,00	PAVM321 DIN SOCKET FOR SCREW TERMINAL BLOCK															MPQ2000009PAVM321	PAVM321	A.M.R.A. soA			
55	42,00	PLUG-IN CROSS CONNECTION PTC/5.0/2 2 POLES															MPQ2000009PTC0502	PTC0502	CABUR spa			
56	42,00	PLUG-IN CROSS CONNECTION PTC/8/0/2 3 POLES															MPQ2000009PTC0802	PTC0802	CABUR spa			
57	8,00	ANTICONDENSATE RESISTOR SKR 150W SUPPLY 220-240VCA															MPQ2000008R1R150230	R1R150230	TORRESAN P. srl COSTRUZIONI EL			
58	6,00	RMBE13-C110T BISTABILE 110VCC 7SC LIN.-M TROPICALIZED															MPQ2000008RMBE13C110T	RMBE13C110T	A.M.R.A. soA		1	
59	2,00	RSPS25-060022GYT-SK9SHHE2SSXX.X RSPS RAIL SWITCH POWER SMART CONFIG.															MPQ2000008RSPS2506022GYT	RSPS2506022GYT	HIRSCHMANN			
60	27,00	MCB 2P 2A-C S202M-C2															MPQ2000005SS50239	SS50239	ABB SACE SPA		2	
61	22,00	MCB 2P 4A-C S202M-C4															MPQ2000005SS50253	SS50253	ABB SACE SPA		2	
62	8,00	MCB 2P 10A-C S202M-C10															MPQ2000005SS50284	SS50284	ABB SACE SPA		1	
63	2,00	MCB 3P 2A-C S203M-C2															MPQ2000005SS50383	SS50383	ABB SACE SPA		1	
64	18,00	MCB 4P 2A-C S204M-C2															MPQ2000005SS50680	SS50680	ABB SACE SPA		1	
65	1,00	MCB 2P 4A-D S202M-D4															MPQ2000006S600422	S600422	ABB SACE SPA		1	
66	1,00	MCB 2P 6A-D S202M-D6															MPQ2000006S600446	S600446	ABB SACE SPA		1	
67	2,00	MCB 2P 25A-D S202M-D25															MPQ2000006S600545	S600545	ABB SACE SPA		1	
68	1,00	MCB 2P 32A-D S202M-D32															MPQ2000006S600613	S600613	ABB SACE SPA		1	
69	1,00	DC/DC CONVERTER IN=110VDC OUT=24VDC 150W 6A MOD. SPS1510X-110C-24-6															MPQ2000009SPS151DX110C246	SPS151DX110C246	ADVEL SRL			
70	15,00	TRT-10A ADJUSTABLE THERMOSTAT. -10° A +80° 1NC IP20 EN50022/35.															MPQ2000007TRT10A230VNC	TRT10A230VNC	FANDIS			
71	3,00	CMF 7.2kV 250A 442/87MM STRIKER 80N 11YMB760741M4811 59014360223289															MPQ2000021VCF501000R0002	1VCF501000R0002	ABB PT		3	
72	2,00	RSP25-11003267T-SK9V9HHE2SXX SWITCH HIRSCHMANN															MPQ2000021VCF698390R0397	2-1VCF698390R0397	HIRSCHMANN			
73	1,00	VOLTAGE INDICATOR 96X96 90° CA 0÷8KV ON TV 6600/110V TROP. SHP VERSION															MPQ2000029F96EVXYYXC1	2-F96EVXYYXC1	FREN Srl			
74	6,00	FUSIBLE CEF 6/12KV 16OA 442/87MM S 1YMB711238M4812															MPQ2000081VCF501000R0002	8-1VCF501000R0002	ABB PT		3	
75	3,00	FUSIBLE CEF 6/12KV 63A 442/63MM S 1YMB711239M4612															MPQ2000091VCF501000R0002	9-1VCF501000R0002	ABB PT		3	
76	3,00	FUSIBLE CEF 6/12KV 200A 442/87MM S 1YMB711239M4812															MPQ2000101VCF501000R0002	10-1VCF501000R0002	ABB PT			
77	6,00	OPTICAL FIBER CABLE PRE-MANUFACT. LENS L=7M: 1MRS120534-7															MPQ2000171VCF698000R0012	00017 1VCF698000R0012	ABB PT			
78	12,00	OPTICAL FIBER CABLE PRE-MANUFACT. LENS L=5M 1MRS120534-5															MPQ2002021VCF698000R0012	00020 1VCF698000R0012	ABB PT			
79	3,00	TA ATB10-BS 7,2/20/60KV 60HZ 600/1-5 SVA-0,5/5P20 10VA-5P20 SEC.P1 SIDE															MPQ2000035ATB10BS	35-ATB10BS	ESITAS ELEKTRIK SANAYI			
80	3,00	TA ATB10-BS 7,2/20/60KV 60HZ 400/1 0.5/5P20-5VA SEC.P2 SIDE															MPQ2000036ATB10BS	36-ATB10BS	ESITAS ELEKTRIK SANAYI			

3,00				81	3,00	TA ATB10-BS 7 2/20/60KV 50HZ 50/1 0.5/5P15-2.5VA SEC.P1 SIDE														MP0200037ATB10BS	37-ATB10BS	ESITAS ELEKTRIK SANAYI						
6,00				82	6,00	TA ATB10-BS 7 2/20/60KV 50HZ 150/1 0.5/5P20 5VA DWG:5150-00 SEC.P2 SIDE														MP0200038ATB10BS	38-ATB10BS	ESITAS ELEKTRIK SANAYI						
3,00				83	3,00	TA ATB10-BS 7 2/20/60KV 50HZ 200/1 0.5/5P20 5VA DWG:5150-00 SEC.P2 SIDE														MP0200039ATB10BS	39-ATB10BS	ESITAS ELEKTRIK SANAYI						
6,00				84	6,00	ANTIFERRORESONANCE RESISTOR TR318 27 OHM 500W L=2.5M														MP0201041VCF501000R0001	104-1VCF501000R0001	ABB PT						
18,00				85	18,00	TJP 4.3 TV 7,2KV 50/60HZ 6600:r3/110:r3/110:r3/110:3V E404008164														MP0201091VCF501000R0001	109-1VCF501000R0001	ABB PT						
	2,00			86	2,00	DX122 IO-MODULE FOR UMC100. 8 DI 110-230 V AC. 4DO. 1AO. SUPPLY 24 V DC														MP0200000151AIG2200D0102	1SAIG2200D0102	ABB SACE SPA						
	2,00			87	2,00	SMK3.0 ADAPTOR AND COMUNICATION INTERFACE														MP0200000151AIR9296008D001	1SAIR9296008D001	ABB SACE SPA						
	2,00			88	2,00	XT2S-160 INTERR MA 20 - 120-280 3p F F														MP0200000151DA0677658R1-5	1SDA067765R1	ABB SACE SPA						
	2,00			89	2,00	XT2S-160 INT. EKIP LSIG In=10A 4P F F														MP0200000151DA0678515R1-1	1SDA067851R1	ABB SACE SPA						
	7,00			90	7,00	XT2S-160 INT. EKIP LSIG In=63A 4P F F														MP0200000151DA0678531R1-1	1SDA067853R1	ABB SACE SPA						
	3,00			91	3,00	XT2S-160 INT. EKIP LSIG In=100A 4P F F														MP0200000151DA0678548R1-1	1SDA067854R1	ABB SACE SPA						
	14,00			92	14,00	XT2S 160 BREAKING PART 4P FF.														MP0200000151DA0681698R1-1	1SDA068169R1	ABB SACE SPA						
	4,00			93	4,00	XT2S 160 BREAKING PART 4P FF.														MP0200000151DA0681699R1-2	1SDA068169R1	ABB SACE SPA						
	1,00			94	1,00	XT2S 160 BREAKING PART 4P FF														MP0200000151DA0681698R1-3	1SDA068169R1	ABB SACE SPA						
	3,00			95	3,00	XT4S-250 BREAKING PART 4p F F														MP0200000151DA0681798R1-4	1SDA068179R1	ABB SACE SPA						
	2,00			96	2,00	XT4S-250 BREAKING PART 4p F F														MP0200000151DA0681798R1-5	1SDA068179R1	ABB SACE SPA						
	1,00			97	1,00	MOBILE PART E1.2C 1250 4P EKIP Hi-TOUCH LSIG WMP														MP0200000151DA0728198R1-1	1SDA072819R1	ABB SACE SPA						
	1,00			98	1,00	E4.2N/MS 3200 4P W MP														MP0200000151DA0735418R1-5	1SDA073541R1	ABB SACE SPA						
	1,00			99	1,00	XT5S 400 BREAKING PART 4P F F														MP0200000151DA1005568R1-3	1SDA100556R1	ABB SACE SPA						
	1,00			100	1,00	XT5S 400 BREAKING PART 4P F F														MP0200000151DA1005568R1-4	1SDA100556R1	ABB SACE SPA						
	3,00			101	3,00	FUSIBLE NH-000 In=16A 690VAC +aem.combinata aL/aG 3NA6805-6														MP0200000I3NA68056	3NA68056	SIEMENS spa						
	1,00			102	1,00	COUPLER MODULE FIELDBUS MODBUS RS485COD.750-315/300-000														MP0200000750315300000	750315300000	WAGO ELETTRONICA srl						
	2,00	2,00		103	4,00	MODULE WITH 8 DIGITAL CHANNELS INPUTS 24V DC 3MS cod.750-430														MP0200000750430	750430	WAGO ELETTRONICA srl						
	1,00	1,00		104	2,00	END CAP MODULE cod.750-600														MP0200000750600	750600	WAGO ELETTRONICA srl						
	1,00	1,00		105	2,00	POWER SUPPLY DISTRIBUTION MODULE 750-602														MP0200000750602	750602	WAGO ELETTRONICA srl						
	1,00			106	1,00	CONFIGURABLE INTERFACE MODULE RS485/RS232 COD: 750-652														MP0200000750652	750652	WAGO ELETTRONICA srl						
	4,00		4,00	107	8,00	SURGE DISCHARGE 255V 25KA CL 1 TIPO DVC I 255 FM														MP0200000961205	961205	DEHN ITALIA spa						
	1,00			108	1,00	RCND FLAG RELAY TO AUM.A4RCND230VCA230VCA														MP0200000A4RCND230VCA	A4RCND230VCA230VCA	TORRESAN P. srl COSTRUZIONI EL						
	3,00			109	3,00	AF190-40-11-13 CONTACTOR 4P 275A 100-250VC/DC														MP0200000AF190401113	AF190401113	ABB SACE SPA						
	1,00			110	1,00	AF265-40-11-13 CONTACTOR 4P 132KW100-250VCA/CC														MP0200000AF265401113	AF265401113	ABB SACE SPA						
	2,00			111	2,00	AF38-30-00-13 CONTACTOR 3P 18,5kW 100...250VAC/CC														MP0200000AF38300013	AF38300013	ABB SACE SPA						
	14,00			112	14,00	AF40-40-00-13 CONTACTOR 4P 70A AC1 100-250VAC/DC														MP0200000AF40400013	AF40400013	ABB SACE SPA						
	4,00			113	4,00	AF52-40-00-13 CONTACTOR 4P 52A 100-250VAC/DC														MP0200000AF52400013	AF52400013	ABB SACE SPA						
	1,00			114	1,00	AF80-40-00-13 CONTACTOR 4P 125A 100-250VAC/CC														MP0200000AF80400013	AF80400013	ABB SACE SPA						
	1,00	2,00		115	3,00	M1L-100R RED LAMP - ROUND D22														MP0200000EO5622	EO5622	ABB SACE SPA						
	1,00	2,00		116	3,00	M1L-100G GREEN LAMP - ROUND D22														MP0200000EO5630	EO5630	ABB SACE SPA						
	1,00	1,00		117	2,00	M1L-100Y YELLOW LAMP - ROUND D22														MP0200000EO5648	EO5648	ABB SACE SPA						
	191,00		4,00	118	195,00	CR-M230AC4L REALY 230VAC 4C/O +LED														MP0200000ER5926	1SVR405613R3100	ABB SACE SPA			3	10		
	186,00		4,00	119	190,00	CR-MH RETAIN. DEVICE PL FOR SOCKET CR-M														MP0200000ER6098	1SVR405659R1000	ABB SACE SPA				10		
	210,00			120	210,00	TERMINAL BLOCK - DOUBLE LAYER HMD.2/GR														MP0200000HD100GR	HD100GR	CABUR spa				20		
	410,00			121	410,00	TERMINAL BLOCK - DOUBLE LAYER HMD.2N/GR														MP0200000HD400GR	HD400GR	CABUR spa				20		
	1,00		2,00	122	3,00	M1BL-07R MODULE WITH INTEGRATED LED - RED 230VCA														MP0200000KV0357	KV0357	ABB SACE SPA						
	1,00		2,00	123	3,00	M1BL-07G MODULE WITH INTEGRATED LED - GREEN 230VCA														MP0200000KV0365	KV0365	ABB SACE SPA						
	2,00		1,00	124	3,00	M1BL-07Y MODULE WITH INTEGRATED LED - YELLOW 220VAC														MP0200000KV0373	KV0373	ABB SACE SPA						
	1,00			125	1,00	M2SSK2-101 ROUND SELECTOR WITH KEY 2P.0-1 EXT CLOSED IN "0"														MP0200000KW4168	KW4168	ABB SACE SPA						
	3,00			126	3,00	FUSIBLE 10,3X38 20A gG E 9F10 GG20 500VCA														MP0200000M277323	M277323	ABB SACE SPA			1			
	4,00			127	4,00	FUSIBLE 10.3X38 16A eG E 9F10 GG16 500VCA														MP0200000M277543	M277543	ABB SACE SPA			1			
	15,00			128	15,00	MULTILED INDICATOR 22/48 3LED (GR-RD+AM)230VAC/DC PR. LAMP+FASTON+TROP														MP0200000ML224831230STLTT	ML224831230STLTTR	DOMO SRL						
	25,00			129	25,00	MULTILED INDICATOR 22/48 4LED (GR-RD+RD+AM) 230VAC/DC PR. LAP+FAS+TROP														MP0200000ML224841230STLTT	ML224841230STLTT	DOMO SRL						
	1,00			130	1,00	MO132-0.16A C.B. MOTOR PROTECTION IONLY MAGNETICI MO132														MP0200000MO132OV16	MO132OV16	ABB SACE SPA						
	2,00			131	2,00	MRP31.0 MODBUS INTERFACE RTU FOR UMC100.3														MP0200000MRP31O	1SAI2S1000R0001	ABB SACE SPA						
	3,00			132	3,00	AMPEROMETRIC TRASF. 250/1A SVA-SP2O TROP														MP0200000TAR105JKSN01V18	TAR105JKSN01V18	FRER Srl						
	2,00			133	2,00	VOLTAGE TRASF. 10VA CL 0,5 400/110V 1TTV010400110 TROPICALIZZATI														MP0200000TTV010400KC1XT	TTV010400KC1XT	FRER Srl						
	2,00			134	2,00	UMC100-PAN OPERATING PANEL FBP PER UMC100 3UC														MP0200000UMC1003PAN	1SAI5900000R0103	ABB SACE SPA						
	2,00			135	2,00	UMC100.3 UC UNIVERSAL MOTOR CONTROLLER 0.24-63A 110...240Vac/dc														MP0200000UMC100SUC	1SAI5300000R1100	ABB SACE SPA						
	1,00	1,00		136	2,00	SWITCHING POWER SUPPLY 90-264VCA/24VCC 5A - CSF120CP														MP0200000XCSF120CP	XCSF120CP	CABUR spa						
	59,00			137	59,00	I/O MODULE 5DI+2DO MODBUS RS485 V=10÷40Vdc 19÷28Vac														MP0200000Z5DI2DO	Z5DI2DO	SENECA			3			
	1,00			138	1,00	REF615 (versione F) HBFAEFCNDCABBA1G														MP0200049VCF698395R1001	0004915VCF698395R1001	ABB PT						
		2,00		139	2,00	FUSIBLE NH-00 6A 800V														MP0200000I1634906	1634906	ITALWEBER spa			1			
		3,00		140	3,00	FUSIBLE NH-00 35A 800V														MP0200000I1634935	1634935	ITALWEBER spa			1			
		2,00		141	2,00	EKIP COMUNICATION MODULE MODBUS TCP FOR E1.2 ..E6.2														MP0200000151DA0724151R1	1SDA072415R1	ABB SACE SPA						
		2,00		142	2,00	EKIP COM ACTUATOR COMUNICATION MODULE E1.2..E6.2														MP0200000151DA0724166R1	1SDA072416R1	ABB SACE SPA						
		1,00		143	1,00	E1.2N/E9 1250 Ekip Touch LSIG 3p WMP														MP0200000151DA1042968R1-3	1SDA104296R1	ABB SACE SPA						
		1,00		144	1,00	E1.2N/E9 1250 Ekip Hi-Touch LSIG 3p WMP														MP0200000151DA1042979R1-1	1SDA104297R1	ABB SACE SPA						
		1,00		145	1,00	FIELDBUS COUPLER MODBUS TCP/UDP ETHERNET 10/100 MBIT/S COD.750-362														MP0200000750362	750362	ABB SACE SPA						
		4,00		146	4,00	DEHNbloc Maxi DBM-1-CI-440-FM 1-POLE with integrated backup fuse														MP0200000961146	961146	DEHN ITALIA spa			2			
		1,00		147	1,00	RCD MODULE. TYPE A ZP 25A DDA202-25-300mA/A														MP0200000B427960	B427960	ABB SACE SPA						
		1,00		148	1,00	SWITCH WITH LEVER R16 2/5 COD.R601-205002-W002														MP0200000R601205002W002	R601205002W002	COVELETRIC snc di RIZZITEL						
		1,00		149	1,00	MCB-2P 6A-C 5202M-C6														MP0200000S5S0260	S5S0260	ABB SACE SPA						
		1,00		150	1,00	ISOLATING TRANSFORMER SINGLE PHASE 50HZ 800/230V P=100VA - TROPICALIZ														MP0200001F14XXX	00001 F14XXX	L.E.F. srl						
			3,00	151	1,00	XT2N 160 EKIP LSI 3E3A1 4 POLES FIXE FRONTAL CONNECTION														MP0200000151DA0671048R1-3	1SDA067104R1	ABB SACE SPA						
			1,00	152	1,00	S800-AUX AUX CONTATCS 2NA+2NC														MP0200000A1206B0	A1206B0	ABB SACE SPA						
			51,00	153	51,00	S2C-HER AUX CONTACT														MP0200000AS63826	AS63826	ABB SACE SPA			3			
			18,00	154	18,00	RCD MODULE TYPE AC ZP 25A DDA202-25-30mA/AC														MP0200000B427911	B427911	ABB SACE SPA			1			
			96,00	155	96,00	FEED THROUGH TERMINAL BLOCK WITH SCREW CBD.4 4mmq														MP0200000CB240	CB240	CABUR spa			5			
			10,00	156	10,00	EHD4-11N AUX CONTACTS 1NA+1NC														MP0200000EHD411N	EHD411N	ABB SACE SPA			1			
			1,00	157	1,00	ES816-20N-06 230V C.C/C.A. MODULAR CONTACTOR 2NA														MP0200000ES81620N06	ES816/20N06	ABB SACE SPA			1			
			8,00	158	8,00	ES840-20 230V AC/DC MODULAR CONTACTOR														MP0200000ES8420N06	ES840/20N06	ABB SACE SPA			1			
			1,00	159	1,00	ES863-40N-06 230V AC/DC MODULAR CONTACTOR														MP0200000ES86340N06	ES863/40N06	ABB SACE SPA			1			
			1,00	160	1,00	TL1 DUSK SENSOR . 1 MODULE COD M229921														MP0200000M229921	M229921	ABB SACE SPA						
			1,00	161	1,00	E204/160q SWITCH DISCONNECTOR 4P 160A M645291														MP0200000M645291	M645291	ABB SACE SPA			1			
			1,00	162	1,00	MCB-4P 50A-C S804S-C50														MP0200000S120091	S120091	ABB SACE SPA			1			
			2,00	163	2,00	MCB S302P C 1 25KA 2P														MP0200000S302PC1	S302PC1	ABB SACE SPA			1			
			4,00	164	4,00	MCB S302P C10 25KA 2P														MP0200000S302PC10	S302PC10	ABB SACE SPA			1			
			6,00	165	6,00	MCB S302P C16 25KA 2P														MP0200000S302PC16	S302PC16	ABB SACE SPA			1			
			11,00	166	11,00	MCB S302P C20 25KA 2P														MP0200000S302PC20	S302PC20	ABB SACE SPA			1			
			21,00	167	21,00	MCB S302P C 6 25KA 2P														MP0200000S302PC6	S302PC6	ABB SACE SPA			2			
			4,00	168	4,00	MCB S302P D16 25KA 2P														MP0200000S302PD16	S302PD16	ABB SACE SPA			1			
			2,00	169	2,00	MCB S304P C10 25KA 4P														MP0200000S304PC10	S304PC10	ABB SACE SPA			1			
1				170	1,00	SWICOM (DISPLAY)														MP0200000VCF681000R0101	1VCF681000R0101	ABB SACE SPA						
1				171	1,00	PDCOM (PARTIAL DISCHARGE MONITORING)														MP0200000VCF681000R0103	1VCF681000R0103	ABB SACE SPA						
1				172	1,00	INTERFACE PDCOM VIS/INSULATOR														MP0200000VCF681000R0104	1VCF681000R0104	ABB SACE SPA						
4				173	4,00	**VSC7/P 7,2KV CONTATTORE V-Contact 400A DCO FOR UNIGEAR - IEC 62271-106 - FOR FUSE E=442mm** OPERATION COUNTER (1VCF309500R0097) NAMEPLATE IN ENGLISH (1VCF309500R0882) ELECTRONIC CONTROL MODULE MAC R2 (1VCF309503R0881) UNDERVOLTAGE SHUNT RELEASE (1VCF309503R3881) POWER SUPPLY MODULE FOR MAC R2 110VDC (1VCF309588R9909) LOCK SOLENOID 110-127Vac/dc (1VCF329700R0913)														MP0200000VCF305581R3200-3	1VCF305581R3200	ABB SACE SPA						
2				174	2,00	**C.B. 3P 12KV 630A 25KA WITHDRAWABLE VD4/P 12.06.25 P150 FOR POWERCUBE** KEY LOCK OPEN POS. WITH DIFFERENT KEY (1VCF339700R0271) POSITION CONTACT (1VCF339700R0291) SPRING CHARGE/DISCHARGE SIGNALING (1VCF339700R0395) NAMEPLATE IN ENGLISH (1VCF339700R0882) TROLLEY LOCKING MAGNET (1VCF339700R1909) 16 AUX CONTACTS (1VCF339701R0194) OPENING INSTANTANEOUS SHUNT RELEASE 110vcc(1VCF339701R2909) SPRING CHARGE MOTOR 110Vcc (1VCF339701R8909) UNDERVOLTAGE SHUNT RELEASE 110-127v AC/DC (1VCF339800R4913) MECHANICAL INTERLOCK WITH DOOR (1VCF349700R0407) CABLING WITH AFUMEX CABLE N07G9-K (1VCF349700R4831)														MP0200000VCF337121R1141-4	1VCF337121R1141	ABB SACE SPA						
6				175	6,00	**TV/F 12/17,5kV WITH AUX CONTACTS FOR NEW VD4 <=40kA** NAME PLATE IN ENGLISH FOR TV/F (1VCF499800R0302) TV/FELECTROMECHANICAL LOCK FOR CELL DOOR 110Vcc (1VCF579700R0909) ELCTROMECHANICAL LOCK 110Vcc FOR EARTHING SWITCH (1VCF599500R0909) KEY LOCK WITH EARTHING SWITCH C.B. INSERTION (1VCF599504R0042) KEY LOCK FOR SWITCH OPEN/CLOSED POSITION (1VCF599504R0063) N.5 AUX CONACTS FOR EARTHING SWITCH (1VCF599505R0001) N.10 AUX CONTACTS FOR EARTHING SWITCH (1VCF599505R0002) SHUTTER FAIL SAFE (1VCF599505R0111) EARTHING SWITCH ST-E 17.31 150 (1VCF599700R0131) 5B PIN WITH AFUMEX CABLE (1VCF599700R0161) 5NA+5NC C.AUX.C.B. INSERTED AND 5NA+5NC C.AUX C.B. OPENED (1VCF599700R0171) EARTHING SWITCH DOOR INTERLOCK MECHANISM (1VCF599700R0280) LEVER FOR EARTHING SWITCH(1VCF599700R0290) PAINTED DOOR (1VCF599700R4882) SUPPORT FOR PUSH BUTTON ON PAINTED DOOR (1VCF599700R4884)														MP0200000VCF498412R0100-20	1VCF498412R0100	ABB SACE SPA						

Section 7.4 Vendor Data / Operations / Maintenance Manuals References



CP-100E1
Auxiliary
GIS
(3G6 sqmm)

SG-100D1
Auxiliary 6.6kV
Switchboard
(3G2.5 sqmm)

SG-200N1
Auxiliary
LV Switchboard
(3G2.5 sqmm)

SG-200D2
Auxiliary
SOLAR SWGR
(3G2.5 sqmm)

UP-200F3
AC UPS PAS - 30 min -
UP-200F3 - Auxiliary
(3G2.5 sqmm)

AS-COMMISSIONED
DAVIDE ZUCCONELLI
NO MARK UP
21/03/2025

VALID FOR CONSTRUCTION
VENDOR DOCUMENT - FDL DWG:
123A90-FDL-1724002197-EL-DG-00033
REV.: 3_A | DATE: 18/03/25 | SIGNATURE: G.Randi
ROSETTI MARINO SpA

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n° : 231298/SD/33
Item n° : PF1002888/101

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+					
3	12/03/2025	Santinelli	Flamminio	Sigismondi	Replaced Twiligh Switch TW1
2	19/08/2024	Santinelli	Flamminio	Sigismondi	As Built (ASB)
1	05/07/2024	Santinelli	Flamminio	Sigismondi	Accepted for construction (AFC)
0	29/05/2024	Santinelli	Flamminio	Sigismondi	Issued for review (IFR)

TITLE : "DP-200N1"
LV SWBD FUNCTIONAL DIAGRAMS
Functional Drawing

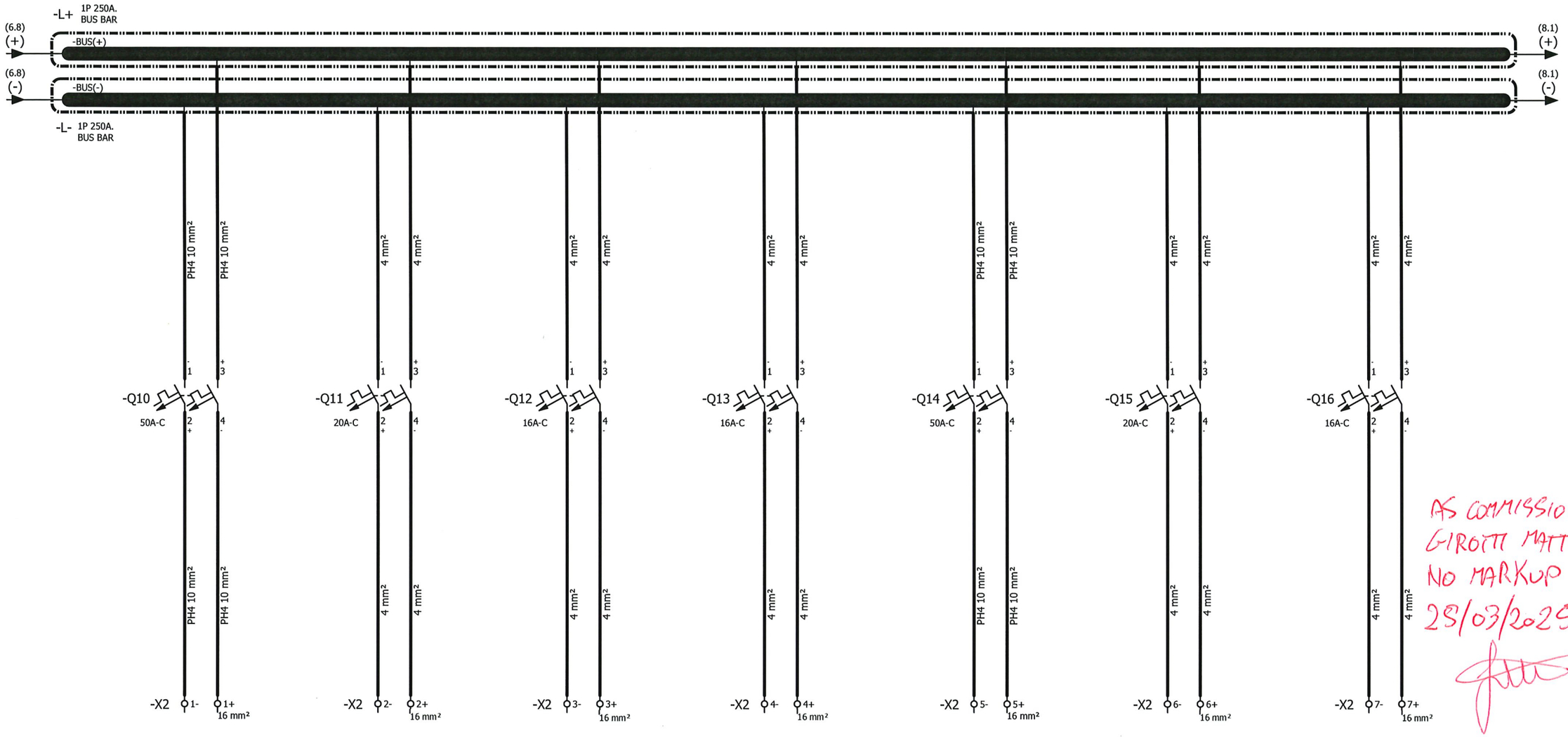
CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : NTS

A3 | DRAWING NO. 1723002197-EL-DG-00033 | SHEET 1.6 | REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00033 Rev. 03

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AS COMMISSIONED
GIROTTI MATTIA
NO MARKUP
28/03/2025

SUPPLIED FROM	-Q10	-Q11	-Q12	-Q13	-Q14	-Q15	-Q16
RATING	50A-C	20A-C	16A-C	16A-C	50A-C	20A-C	16A-C
MAXIMUM CROSS-SECTION	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²	16 mm²
AUXILIARY CONTACT	98 96 95 (/8.5)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)	98 96 95 (/8.4)
FUNCTION	CP-100F1 DC CONTROL 66kV G/S LINE A-5.2KW	CP-100F1 DC CONTROL 66kV G/S LINE B-2KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE A-1KW	SG-100D1 DC CONTROL 6,6kV SWITCHGEAR LINE B-1KW	SPARE 5,5KW	SPARE 2KW	SPARE 1KW

VALID FOR CONSTRUCTION
VENDOR DOCUMENT - FDL DWG:
123A90-FDL-1724000372-EL-DG-00008

REV.:	DATE:	SIGNATURE:
3_A	15/11/24	G.Randi

ROSETTI MARINO SpA

				Date	21/03/2024
				Editor	EBM
				Checked	JOP
Stat	Alteration	Date	Name	Standard	

3W POWER S.P.A.
Hollandse Kust Noord (HKN) wind farm

AEG POWER SOLUTIONS

Distribution
Rectifier 1
System

ES521464 en

= System
+ REC1 20 / 49
& EFS
A3
Sheet 7
Sheets 13

ES521464

AS COMMISSIONED: MATTIA GIRLTW

26/3/25

NO MARK UP

"SG-100D1" HV SWBD 6,6kV (UNIT A5)

FUNCTIONAL DIAGRAM

BUS BAR METERING

=							
+A5							
	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

IMESA ELECTRICAL ENGINEERING

DWG n° : 231151/SD/16

Item n° : PF1113279

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

Cover

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 1

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

AS COMMISSIONED: MATWA GIOTTI 26/3/25 NO MARK UP

INDEX

Sheet	Description	Revision 0	1	2	3	4	5	6	7	8	Sheet	Description	Revision 0	1	2	3	4	5	6	7	8
1	Cover	X	X	X	X																
2	Sheets Index	X	X	X	X																
3	Legend	X	X	X	X																
4	Door Layout	X	X	X	X																
5	Power Diagram	X	X	X	X																
6	Power Diagram	X	X	X	X																
7	110V Protection/Measure Distribution Voltage	X	X	X	X																
8	110V Protection/Measure Distribution Voltage	X	X	X	X																
9	110V Protection/Measure Distribution Voltage	X	X	X	X																
10	230Vac Distribution Voltage	X	X	X	X																
11	110Vdc Distribution Voltage	X	X	X	X																
12	110Vdc/24Vdc Distribution Voltage	X	X	X	X																
13	24Vdc Distribution Voltage	X	X	X	X																
14	Switchs	X	X	X	X																
15	Extherm Device	X	X	X	X																
16	Partial discharge monitoring PDCOM	X	X	X	X																
17	Command Circuit	X	X	X	X																
18	Availables Signals	X	X	X	X																
19	Terminal Strips	X	X	X	X																
20	Terminal strips	X	X	X	X																
21	Terminal strip	X	X	X	X																
22	Bill of Materials	X	X	X	X																
23	Bill of Materials	X	X	X	X																
24	Bill of Materials	X	X	X	X																

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+A5

DWG n° : 231151/SD/16
Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Sheets Index

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 2

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

ACRONIMUS LEGEND

ITEM	DESCRIPTION
BB	ARC SENSOR PROTECTION ON MAIN BUS BARS
BGE	EARTHING SWITCH
C1	VOLTAGE PRESENCE
CB	ARC SENSOR PROTECTION ON C.B. / CONTACTOR COMPARTMENT
CC	ARC SENSOR PROTECTION ON CABLE COMPARTMENT
DCO	DOUBLE COMMAND OPERATED CONTACTOR
DI3	UNDERVOLTAGE CONTACTOR
DP1	ALARM RELAY MODULE TEMPERATURE
E1	INTERNAL LIGHT
E8	RESISTOR FERRO-RESONANCE
EH1	INTERNAL SPACE HEATER
Fn	MV FUSE
FP1	PROTECTION RELAY
GS1	DC/DC CONVERTER
HGR	THERMOSTAT
Kn	AUXILIARY RELAY
K1	MV CONTACTOR
K86	BLOCK RELAY
KT1	DE-ENERGIZATION TIMER
LS	MICRO SWITCH ON AUXILIARY DOOR
MAS	MOTOR SPRING CHARGER
MBC	CLOSING COIL
MBO1	OPENING COIL
MBU	UNDERVOLTAGE
ODn	VOLTAGE DISCHARGER
PU1	MEASURING VOLTAGE INSTRUMENT
PTT	V.T. TRUCK
QM	MV CIRCUIT-BREAKER

ITEM	DESCRIPTION
QDn	M.C.B. CIRCUITS PROTECTION
QVn	M.C.B FOR V.T. PROTECTION
RLO1	COIL FOR CONSOT CLOSING CIRCUIT-BROAKOR
RLO2	COIL FOR UNLOCKING RACK-IN/OUT OPORATION
RLO3	COIL FOR UNLOCKING OPORATION OARTHING
RLO4	COIL FOR UNLOCKING ONCLOSUROO DOOR OPORATION
SU1	VOLTAGO SOLOCTOR
SWH...	OTHORNOT SWITCH
TI-Ln	CURRONT TRANSFORMOR
TO	OMOPOLAR RING CURRONT TRANSFORMOR
TR1	TOMPORATURO CONTROL DOVICO

AS COMMISSIONED: MARIA GIOTTI

26/3/25

NO MARK UP

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+A5

DWG n° : 231151/SD/16

Item n° : PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Legend

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

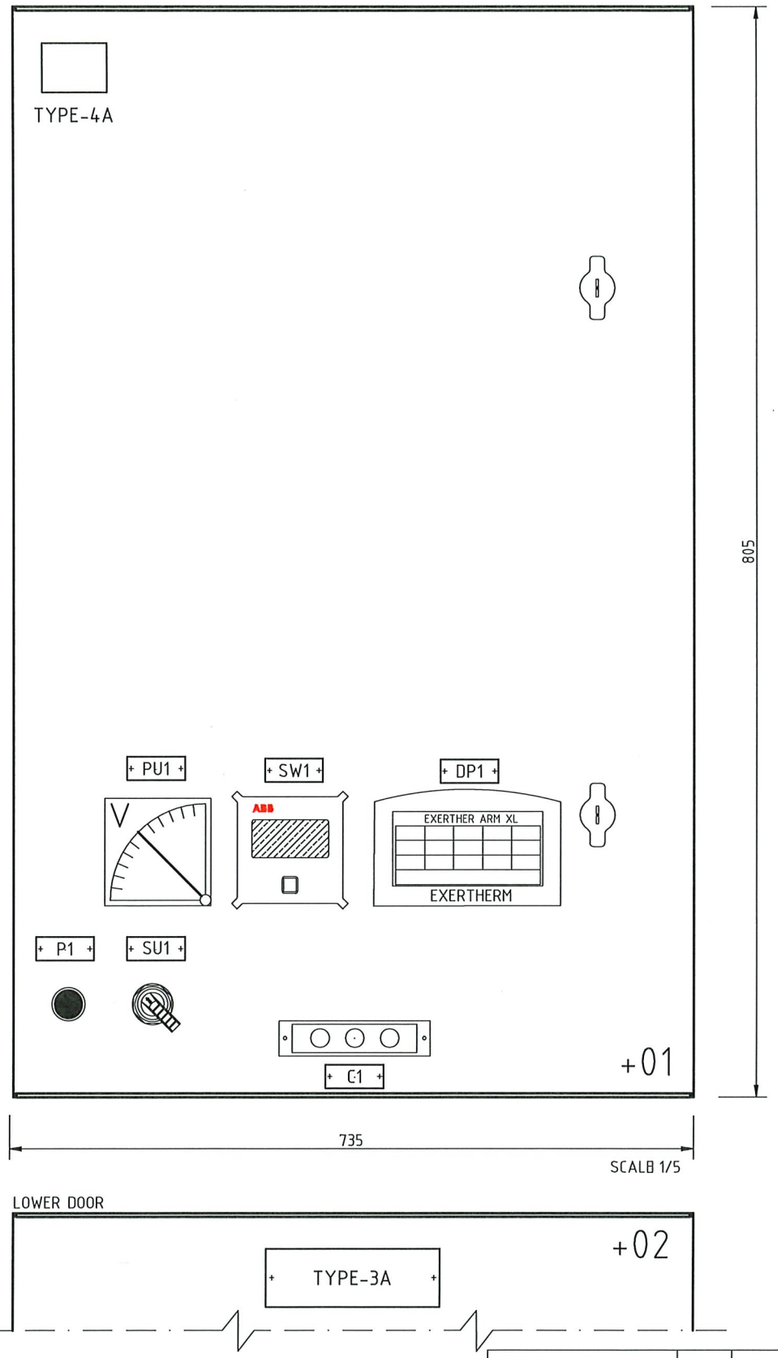
SHEET 3

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

DOOR LAY-OUT

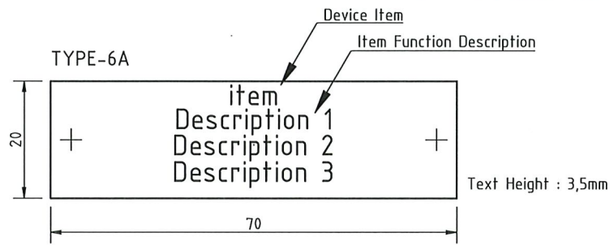


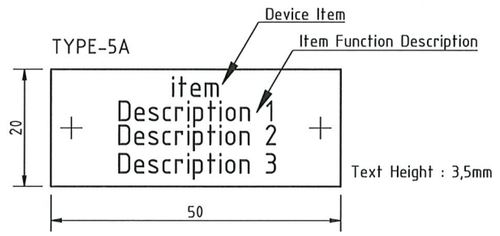
DEVICES name plate					
ITEM	COMPONENT	DESCRIPTION 1	DESCRIPTION 2	DESCRIPTION 3	NOTE
C1	PILOT LIGHT	VOLTAGE	PRESENCE		TYPE-2A
P1	PUSHBUTTON	EARTHING SWITCH	SWITCH	ENABLING	TYPE-5A
SU1	SWITCH	VOLMETRIC	SWITCH		TYPE-2A
PU1	ANALOG INSTRUMENT	BUS-BARS	VOLTAGE		TYPE-1A
SW1	SWICOM	PARTIAL DISCHARGE	MONITORING DISPLAY		TYPE-1A
DP1	ARM XL	INFRARED	TEMPERATURE	DETECTION DISPLAY	TYPE-6A

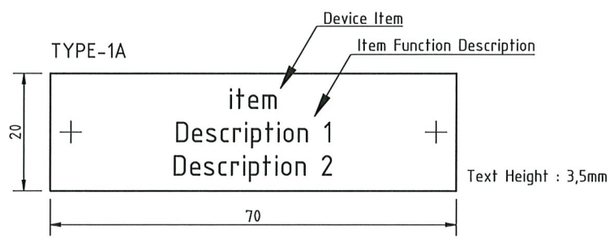
AS COMMISSIONED : MATWA GIROLA

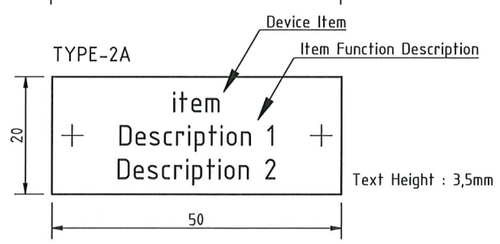
26/3/25

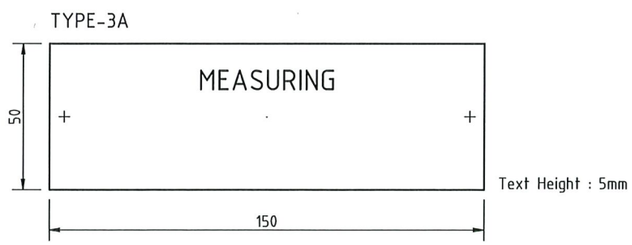
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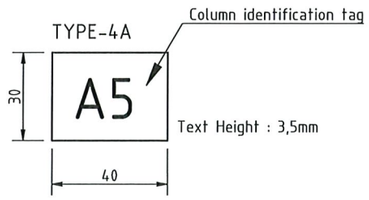












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+A5							
DWG n° : 231151/SD/16	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
Item n° : PF1113279	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

Door Layout

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

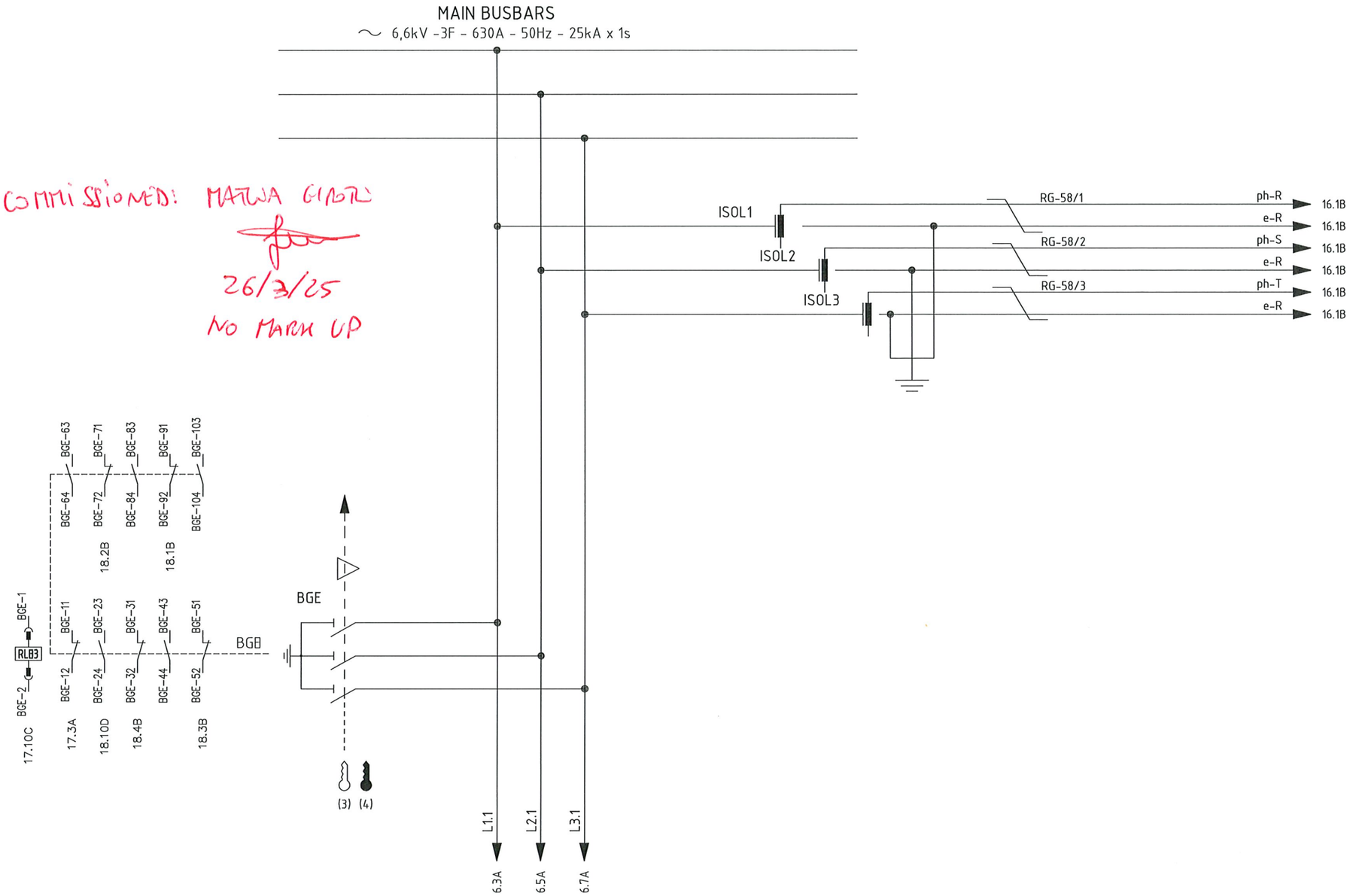
DRAWING NO. 1723002197-EL-DG-00016

SHEET 4

REV. 03

File Name : 1723002197-EL-DG-00016 Rev.03

F.to UNI A3: 420mmx297mm



(3) FREE KEY WITH EARTHING SWITCH IN OPEN POSITION

(4) FREE KEY WITH EARTHING SWITCH IN CLOSED POSITION

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

=
+A5

DWG n°: 231151/SD/16
Item n°: PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Power Diagram

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 5

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

6.600:rad3V/
1° core : 110:rad3V 20VA Cl 0,5/3P
2° core : 110:rad3V 30VA Cl 0,5/3P
3° core : 110:3V 30VA Cl 3P

PTT

ABB

5.4D L1.1 XU L1 — FF1 2A 12 14 11 — 6.9A — A N — 6600:r3/110:r3-110:r3-110:3 TU-L1

5.4D L2.1 XU L2 — FF2 2A 12 14 11 — 6.9B — A N — 6600:r3/110:r3-110:r3-110:3 TU-L2

5.4D L3.1 XU L3 — FF3 2A 12 14 11 — 6.9B — A N — 6600:r3/110:r3-110:r3-110:3 TU-L3

TU-L1 / TU-L2 / TU-L3: 1a 1n 2a 2n da dn — Cl. 0,5/3P | Cl. 0,5/3P | Cl. 3P

N

L1-b3 L2-b3 L3-b3
L1-a3
L1-a2 L3-a2
L2-a1
L3-a1
L1-a1
L2-a2

XU 1 2 3 4 — XU 5 6 7 8 — XU 9 10 — XU 11 12

E8 27ohm-500W 1 2

FUSE HEALTHY

FF1 6.3A 12 14 11 3
FF2 6.5A 12 14 11 2
FF3 6.7A 12 14 11 1
4

BT7 ISOLATED: BT7-11 BT7-12 BT7-21 BT7-22 / BT7-10 BT7-20

BT6 CONNECTED: BT6-12 BT6-11 BT6-22 BT6-21 / BT6-10 BT6-20

18.5D

V1 BK 1x1.5 → 7.1A
V2 BK 1x1.5 → 7.1A
V3 BK 1x1.5 → 7.1A
VN1 BK 1x1.5 → 7.2A
V5 BK 1x1.5 → 8.1A
V6 BK 1x1.5 → 8.1A
V7 BK 1x1.5 → 8.1A
VN2 BK 1x1.5 → 8.2A
da1 BK 1x1.5 → 9.1A
dn1 BK 1x1.5 → 9.1A
5 RD 1x1.5 → 18.4C
6 RD 1x1.5 → 18.5C

AS COMMISSIONED: MARIA FINZI
26/3/25
NO MARK UP

=							
+A5							
	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
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	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION

DWG n° : 231151/SD/16
Item n° : PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

Power Diagram

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

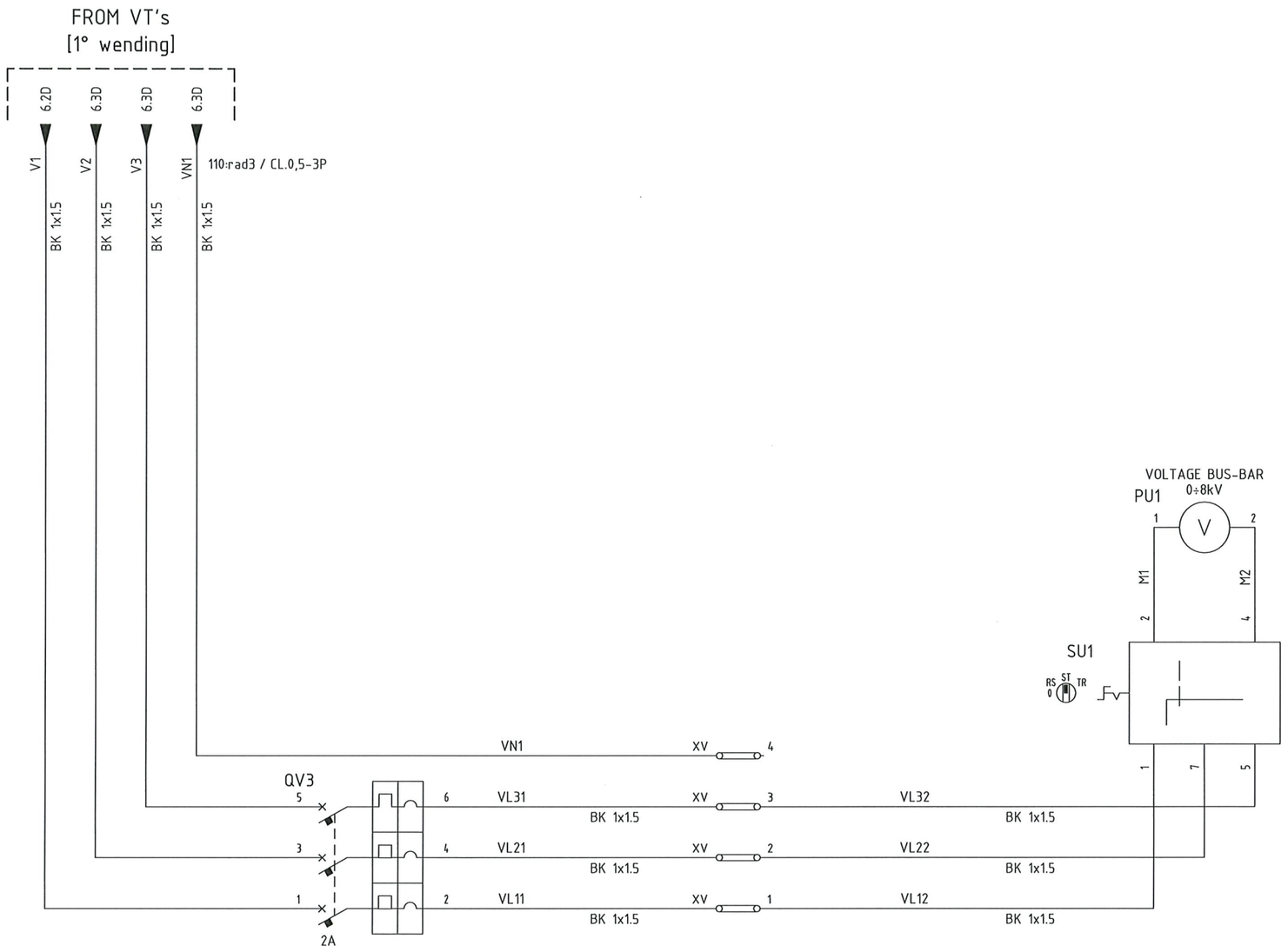
SHEET 6

REV. 03

File Name : 1723002197-EL-DG-00016 Rev.03

F.to UNI A3: 420mmx297mm

110V:rad3 TO VOLTAGE INDICATOR



AS COMMISSIONED: MATTIA GIROTTO

26/3/25

NO MARK UP

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
=					
+A5					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

DWG n°: 231151/SD/16

Item n°: PF1113279

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

110V Protection/Measure Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

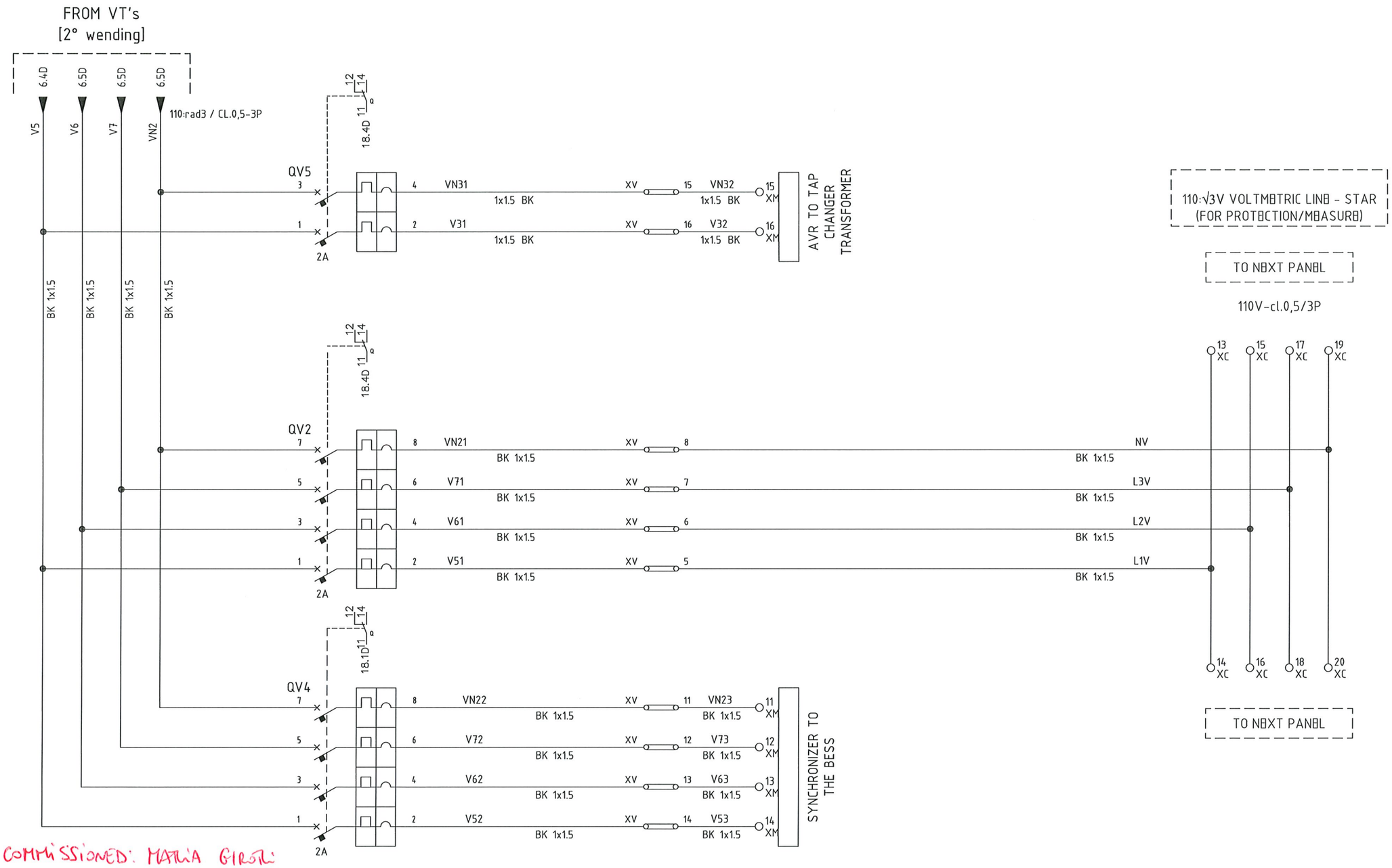
SHEET 7

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

110V: rad3 DISTRIBUTION from MEASURE CUBICLE



AS COMMISSIONED: MATTIA GIROTTI

NO MARK UP 26/3/25

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

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+A5

DWG n°: 231151/SD/16
Item n°: PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

110V Protection/Measure Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

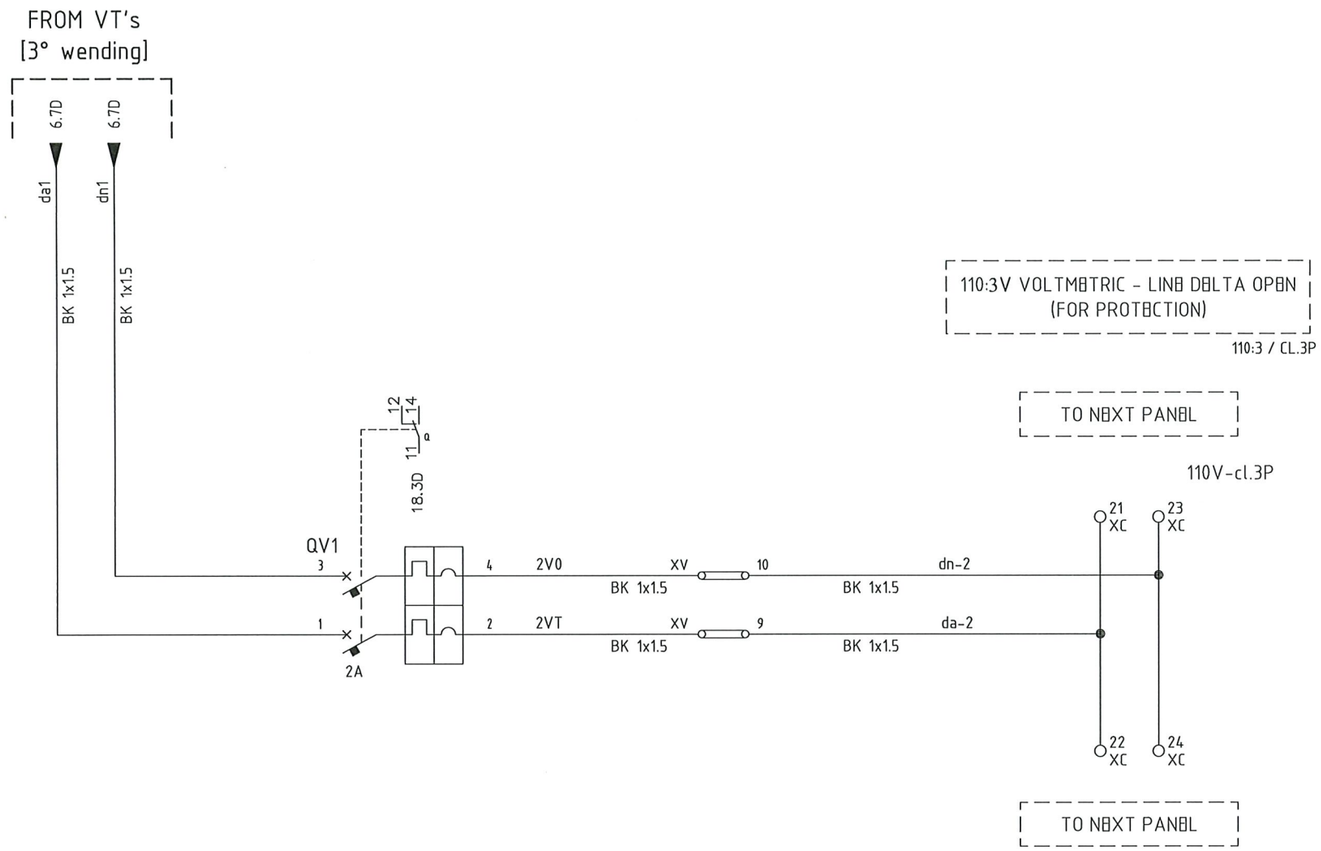
SHEET 8

REV. 03

File Name : 1723002197-EL-DG-00016 Rev.03

F.to UNI A3: 420mmx297mm

110V:3 DISTRIBUTION VOLTAGE TO MEASURE CUBICLE



AS COMMISSIONED: MARIA GIROTTI

26/3/25

NO MARK UP

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+A5							
	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n° : 231151/SD/16

Item n° : PF1113279

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

110V Protection/Measure Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 9

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

230VAC DISTRIBUTION VOLTAGE

230Vac Auxiliary Voltage
from DP-200N1-Q38

QA1
5 XM — 230VN1 — BK 1x6 — 3
6 XM — 230VN2 — BK 1x6 — 1
32A
4 — 230/1 — BK 1x6
2 — 230/2 — BK 1x6

MCB INTERNAL LIGHTING HEATERS AND SOCKET
INTERNAL SPACE HEATER
230VAC SOCKET (AUXILIARY COMPARTMENT)
230VAC AUXILIARY HEALTLY

230V-50Hz

TO NEXT PANEL
9 XC
11 XC
10 XC
12 XC
TO NEXT PANEL

BK 1x6
BK 1x6

QA2
10A
1
3
12
14
11
a
18.7D
300mA
2
4
10
11

BK 1x1.5
BK 1x1.5

BK 1x2.5
BK 1x2.5

LS
NC
NA
COM
12
BK 1x1.5
BK 1x1.5

HGR
1
1x1.5 BK
RANGE -10-80°C
2
13
BK 1x1.5

XS1
230V+PE 10/16A

K230
A1
A2

18.3D
11
12
14
22
21
24
32
31
34
42
41
44

E1
L
4W
N

EH1
L
150W
N
1x1.5 BK
1x1.5 BK

KGR
A1
A2
1x1.5 BK

18.6D
11
12
14
42
41
44

AS COMMISSIONED: MATWA GIROTI
26/3/25
NO MARK UP

=							
+A5							
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)		
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)		
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)		
REV.	DATE	DRN	CHKD	APPD	DESCRIPTION		

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

DWG n° : 231151/SD/16
Item n° : PF1113279

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

230Vac Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

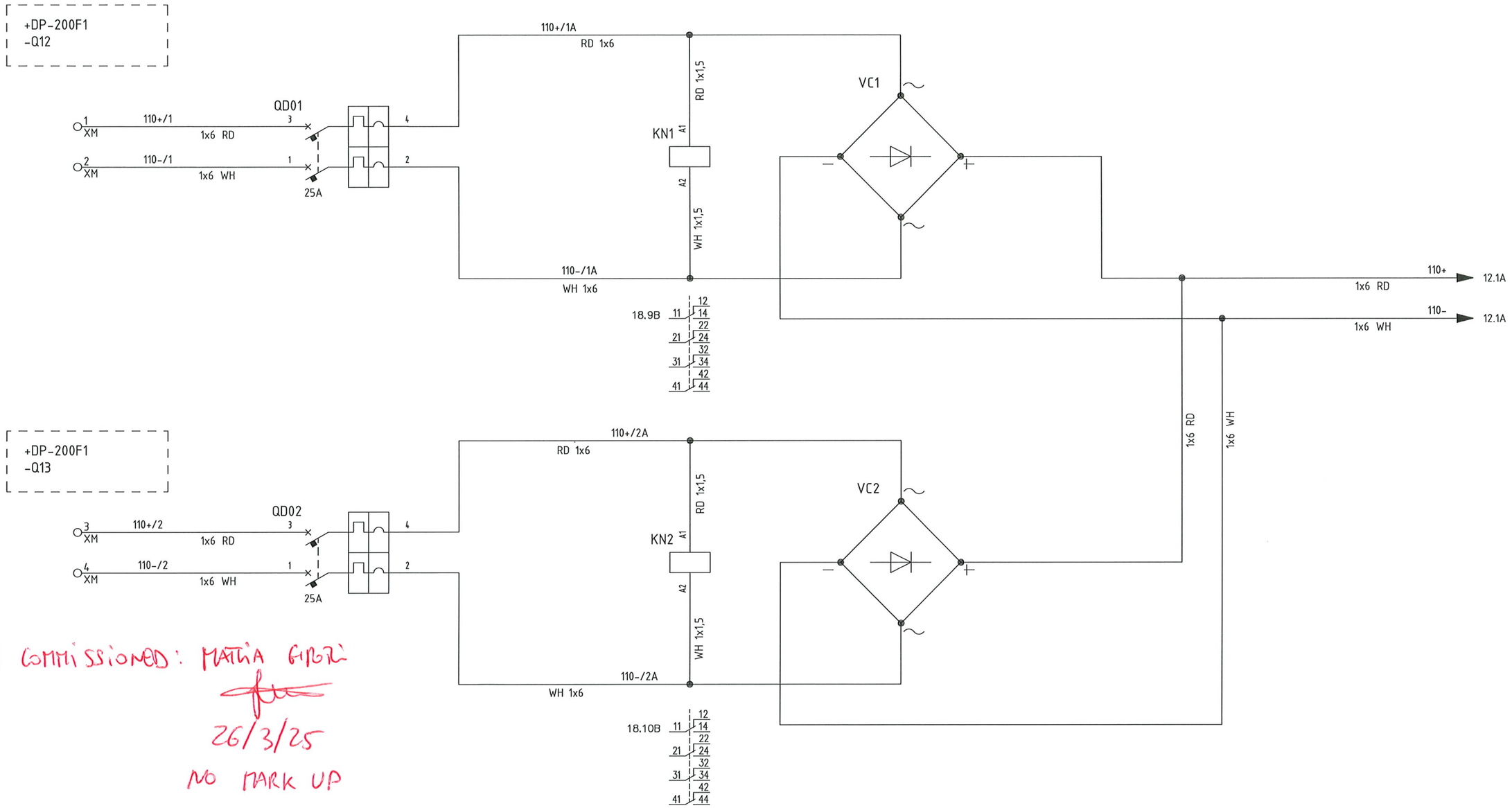
SHEET 10

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

110VDC DISTRIBUTION VOLTAGE



AS COMMISSIONED: MATTIA GIBERTI

26/3/25

NO MARK UP

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+A5							
DWG n° : 231151/SD/16	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
Item n° : PF1113279	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

110Vdc Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

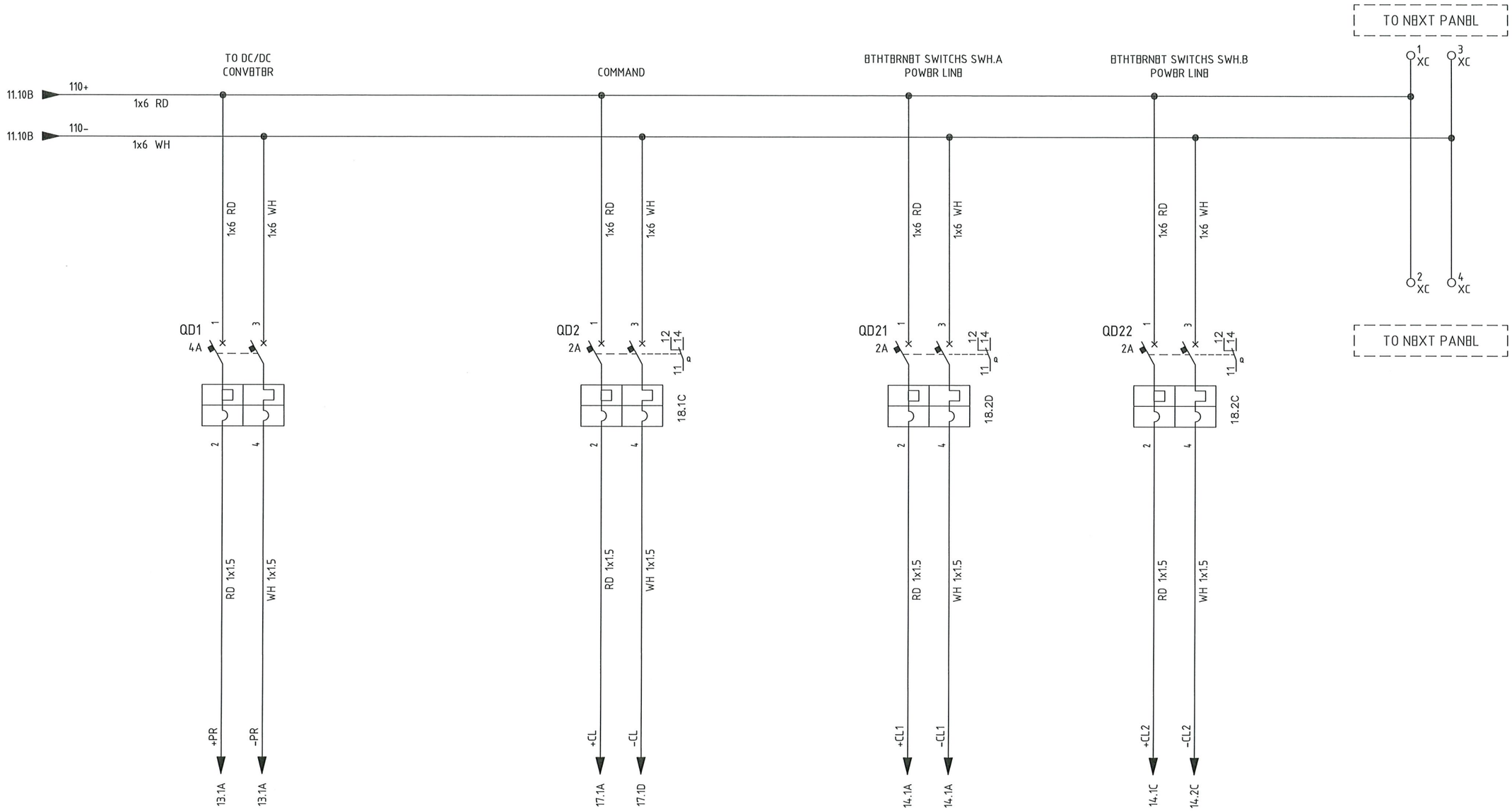
DRAWING NO. 1723002197-EL-DG-00016

SHEET 1.1

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03



AS COMMISSIONED: MATTIA GIUSTI

26/3/25

NO MARK UP

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+A5							
	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION

DWG n°: 231151/SD/16

Item n°: PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

110Vdc/24Vdc Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

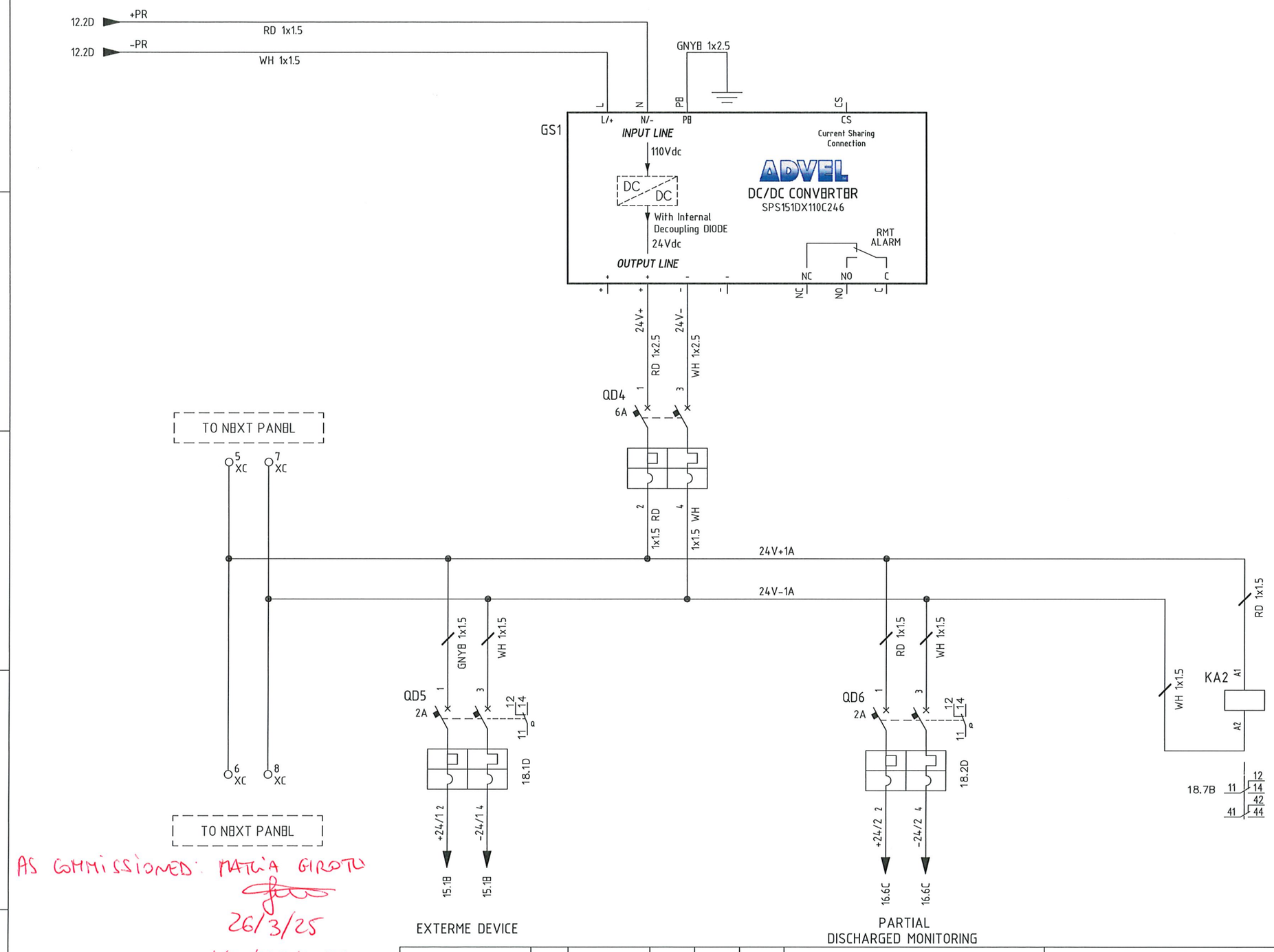
DRAWING NO. 1723002197-EL-DG-00016

SHEET 12

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03



AS COMMISSIONED: MATTIA GIROTTI
26/3/25
NO MARK UP

=							
+A5							
DWG n°: 231151/SD/16	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
Item n°: PF1113279	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

24Vdc Distribution Voltage

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

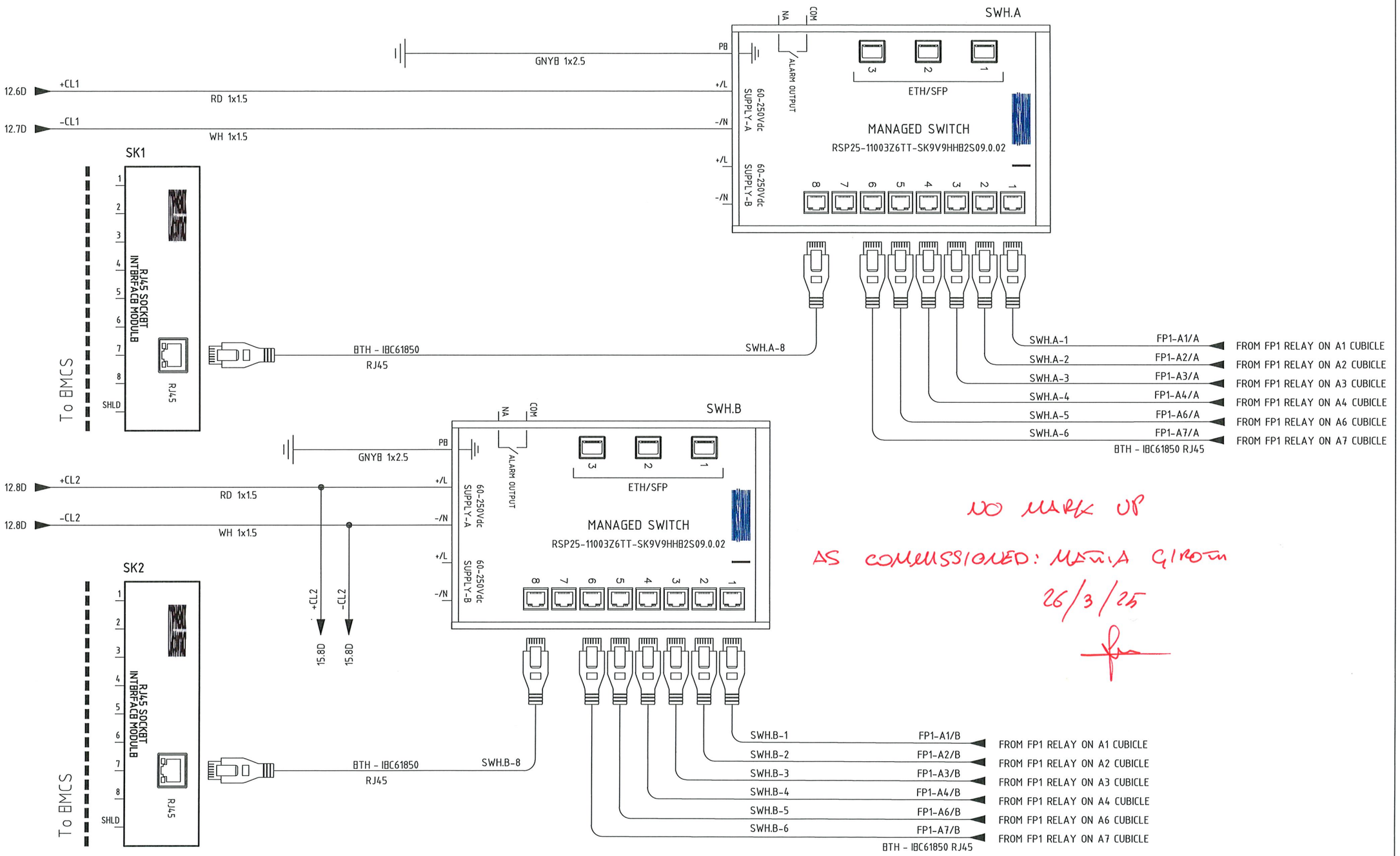
DRAWING NO. 1723002197-EL-DG-00016

SHEET 13

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03



NO MARK UP

AS COMMISSIONED: MARIA GIROTTI

26/3/25

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

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+A5
DWG n° : 231151/SD/16
Item n° : PF1113279

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Switchs

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 1.4

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

NO MARK UP
AS COMMISSIONED: MAMA GIROTTI
26/3/25

ETH-TR1
PATCH CORD CAT.6 RJ45

DP1
EXERTHERM ARM XL
ALARM RELAY MODULE XL
ARM XL
WARNING AL1
CRITICAL AL2
COM FAILURE AL3
MCC ALARM AL4
MODBUS TCP/IP
MODBUS RS485
24VDC POWER SUPPLY
+V -0V PB COM Y2 Y3 Y4 Y5
1x1.5 RD
1x1.5 WH
1x2.5 GNYB
DP1-A7/2
RJ45 TO DB9 MALE 800455
ARM XL COMMS CABLE
FROM EXERTHERM -TR1 CELL PACKAGE UNIT A7

SK3
PHOENIX CONTACT
RJ45
RJ45 SOCKET INTERFACE MODULE
1 2 3 4 5 6 7 8 SHLD
ETH - ModBus TCP Cat. 6
To BMCS

SENSORS ON TV CONNECTION TO MAIN BUS BAR
L1VT L2VT L3VT
+ - Shld
RED BLACK

SENSORS ON MAIN BUS BAR
L1BB L3BB
RED BLACK

TR1
Ain+ Ain- Ch1 Ch2 Ch3 Ch4 Ch5 Ch6 Ch7 Ch8
EXERTHERM
PERMANENT INFRARED HOTSPOT DETECTION
IN 24VDC POWER SUPPLY
OUT 24VDC POWER SUPPLY
MODBUS RS485 X0 X1
PB GNYB 1x2.5

TO PREVIOUS PANEL A4
TR1-A5/1 PATCH CORD CAT.6 RJ45
TR1-A5/2 PATCH CORD CAT.6 RJ45
TO NEXT PANEL A6

13.3D +24/1 RD 1x1.5
13.4D -24/1 WH 1x1.5

SWH.C
HIRSCHMANN
ETHERNET SWITCH
RSPS25-0600ZZ6YT-SK9Z9HHBZS07.1.05
ETH/SFP
SPW
ETH-TR1
ETH-SW PATCH CORD CAT.6 RJ45 16.10D
60-250Vdc SUPPLY
L N +CL2 -CL2 1x2.5 GNYB
14.3D 14.4D

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+A5							
DWG n° : 231151/SD/16	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
Item n° : PF1113279	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
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	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION

IMESA ELECTRICAL ENGINEERING
CROSSWIND
ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Extherm Device

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK
SCALE : NTS
A3
DRAWING NO. 1723002197-EL-DG-00016
SHEET 15
REV. 03

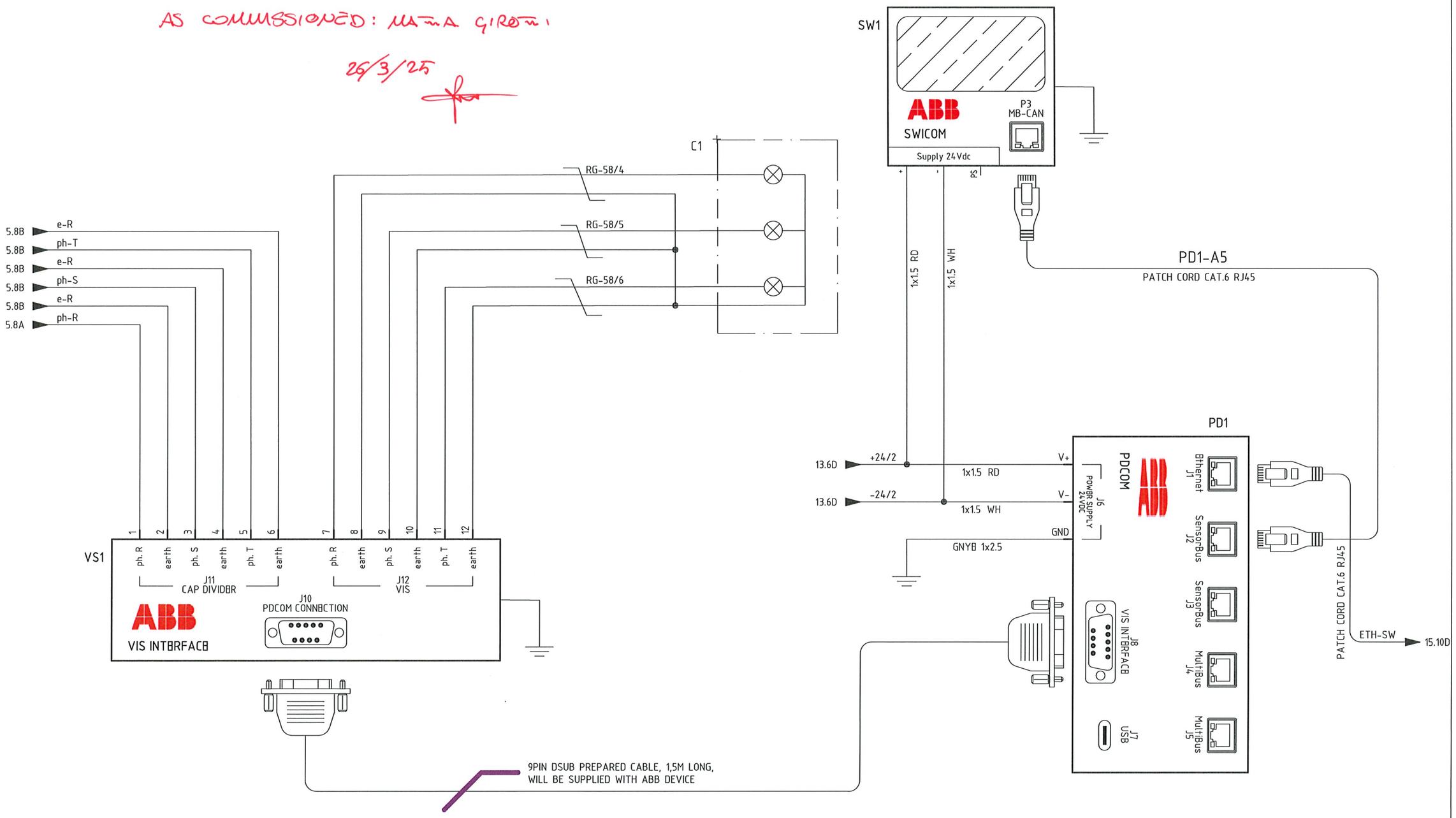
F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

NO MARK UP

AS COMMISSIONED: MARIA GIROTTI

26/3/25



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+A5							
DWG n°: 231151/SD/16	3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)	
Item n°: PF1113279	2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)	
	1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)	
	REV.	DATE	DRN	CHKD	APPD	DESCRIPTION	

IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Partial discharge monitoring PDCOM

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

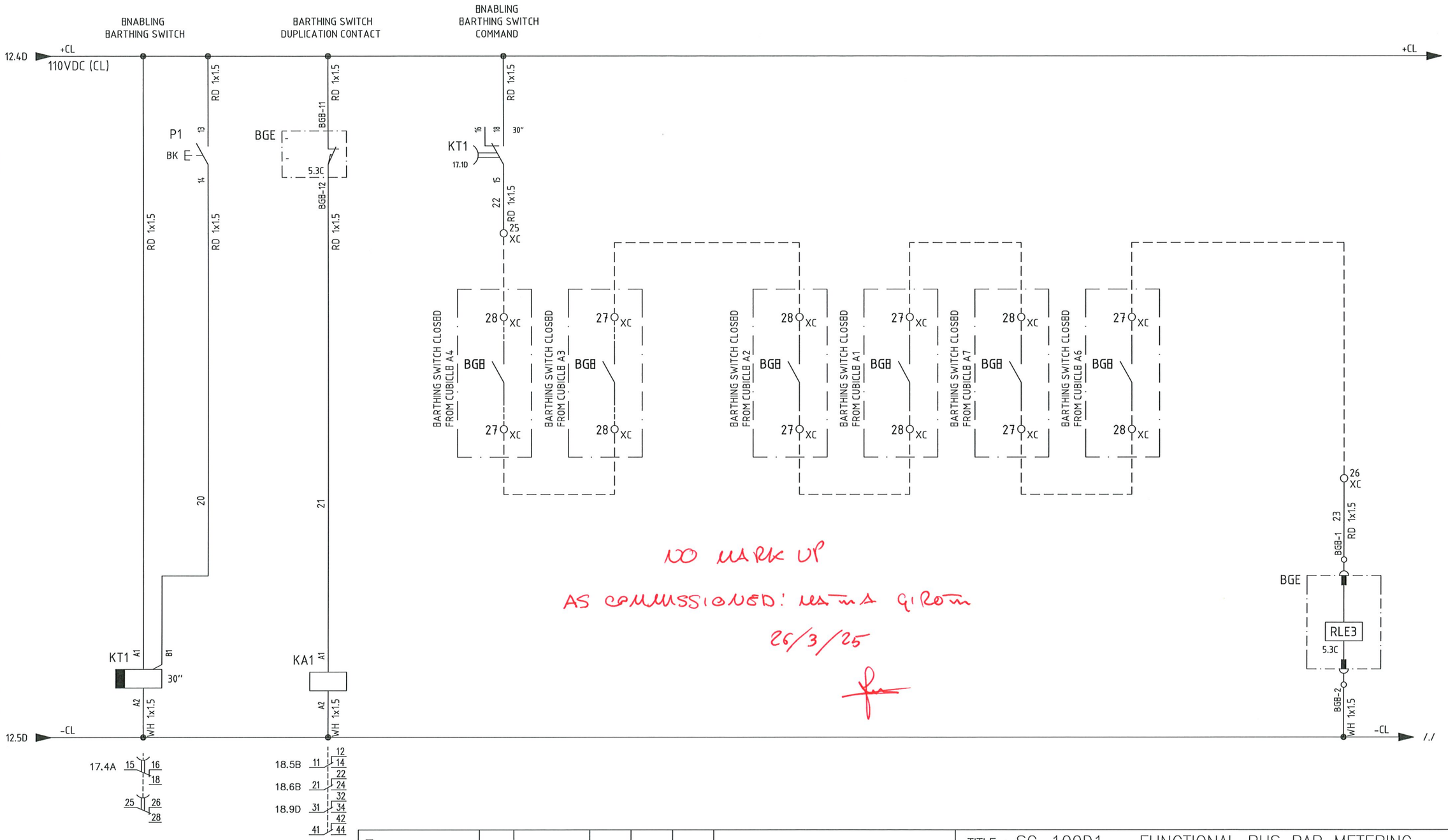
SHEET 16

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

COMMAND CIRCUITS



NO MARK UP

AS COMMISSIONED: MSMA GIROM

26/3/25

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+A5

DWG n° : 231151/SD/16

Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

ROSETTI MARINO

IMESA ELECTRICAL ENGINEERING

TITLE : SG-100D1 – FUNCTIONAL BUS BAR METERING

Command Circuit

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 17

REV. 03

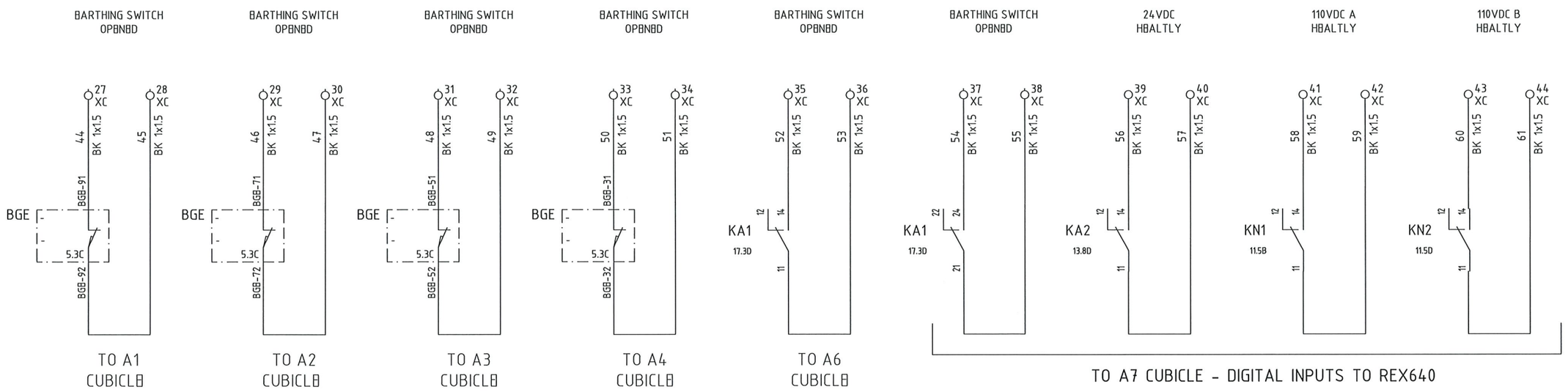
File Name : 1723002197-EL-DG-00016 Rev.03

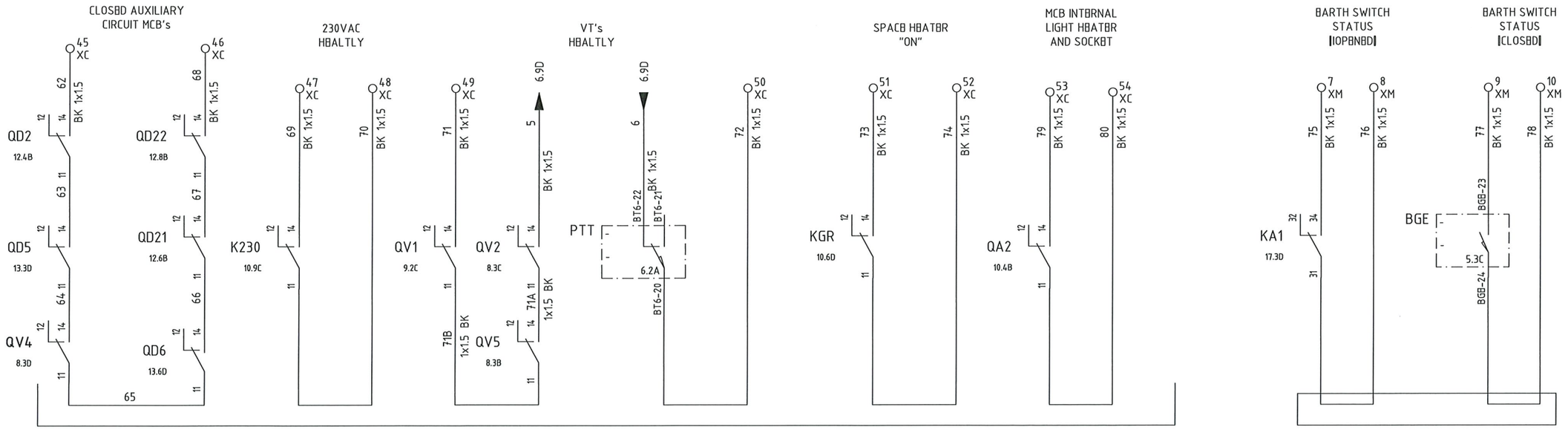
F.to UNI A3: 420mmx297mm

NO MARK UP

AS COMMISSIONED : MARIA GIROM 26/3/25

AVAILABLE SIGNALS





REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

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DWG n° : 231151/SD/16

Item n° : PF1113279

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Availables Signals

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 18

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

TYP - METERING

XC

Interconnection Terminals

NumM	Fg.	Sez.	Tipo	Costruttore	Descrizione
1	12.9A	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
2	12.9B	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
3	12.10A	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
4	12.10B	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
			HM321GR	Cabur	HMT.6/PT/GR End section - Grey
5	13.2C	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
6	13.2D	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
7	13.2C	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
8	13.2D	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
			HM321GR	Cabur	HMT.6/PT/GR End section - Grey
9	10.10A	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
10	10.10B	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
11	10.10A	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
12	10.10B	6	HM320GR	Cabur	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)
			HM321GR	Cabur	HMT.6/PT/GR End section - Grey
13	8.6B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
14	8.7D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
15	8.7B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
16	8.7D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
17	8.7B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
18	8.7D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
19	8.7B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
20	8.7D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
			HM251GR	Cabur	HMT.4/PT/GR End section - Grey
21	9.5B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
22	9.5C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
23	9.6B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
24	9.6C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
			HM251GR	Cabur	HMT.4/PT/GR End section - Grey
25	17.4B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
26	17.10C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
27	18.1A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
28	18.2A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
29	18.2A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
30	18.3A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
31	18.3A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
32	18.4A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
33	18.4A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
34	18.5A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
35	18.5A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
36	18.6A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type

TYP - METERING

XC

Interconnection Terminals

NumM	Fg.	Sez.	Tipo	Costruttore	Descrizione
37	18.6A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
38	18.7A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
39	18.7A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
40	18.8A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
41	18.9A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
42	18.9A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
43	18.10A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
44	18.10A	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
45	18.1C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
46	18.2C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
47	18.3C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
48	18.3C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
49	18.3C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
50	18.5C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
51	18.6C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
52	18.6C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
53	18.7C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
54	18.7C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
			HM251GR	Cabur	HMT.4/PT/GR End section - Grey

NO MARK UP

AS COMMISSIONED: MARIA GIROU

26/3/25

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DWG n°: 231151/SD/16

Item n°: PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Terminal Strips

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 19

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

TYP - METERING

XM

Interface Terminals

NumM	Fg.	Sez.	Tipo	Costruttore	Descrizione
1	11.1B	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
2	11.1B	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
			HM331GR	Cabur	HMT.10/PT/GR End section - Grey
3	11.1C	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
4	11.1D	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
			HM331GR	Cabur	HMT.10/PT/GR End section - Grey
5	10.1A	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
6	10.1B	10	HM330GR	Cabur	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)
			HM331GR	Cabur	HMT.10/PT/GR End section - Grey
7	18.9C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
8	18.9C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
9	18.10C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
10	18.10C	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
			HM251GR	Cabur	HMT.4/PT/GR End section - Grey
11	8.6D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
12	8.6D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
13	8.6D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
14	8.6D	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
15	8.6B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
16	8.6B	4	HM250GR	Cabur	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type
			HM251GR	Cabur	HMT.4/PT/GR End section - Grey

NO MARK UP
AS COMMISSIONED: MARIA GIROTTI
26/3/25

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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+A5					
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
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0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

ROSETTI MARINO

IMESA ELECTRICAL ENGINEERING

DWG n° : 231151/SD/16

Item n° : PF1113279

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Terminal strips

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 20

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

TYP - METERING

XV

Voltmetric Terminals

NumM	Fg.	Sez.	Tipo	Costruttore	Descrizione
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey
1	7.4D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
2	7.4D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
3	7.4D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
4	7.4C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey
5	8.5C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
6	8.5C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
7	8.5C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
8	8.5C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey
9	9.4C	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
10	9.4B	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey
11	8.5D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
12	8.5D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
13	8.5D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
14	8.5D	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey
15	8.5B	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
16	8.5B	6	HB210GR	Cabur	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type
			HB201GR	Cabur	HSCB.6/PT/GR End section - Grey

NO MARK UP

AS COMMISSIONED: MARIA GIROU

26/3/25

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DWG n° : 231151/SD/16

Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
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0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

CROSSWIND

IMESA ELECTRICAL ENGINEERING

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Terminal strip

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 21

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

Nome/Item	Fg/Sh	Tipo/Type	Q.tà	Descrizione/Description	Costruttore/Manufacturer	Ubicazione (descrizione)	Quadro (descrizione)
BGE	5	1VCF599700R0131	1	EARTHING SWITCH ST-E 17.31 150	ABB	A5	BUS BAR METERING
		1VCF599505R0001	1	5 AUX CONTACTS FOR EARTHING SWITCH	ABB	A5	BUS BAR METERING
		1VCF599504R0063	1	KEY LOCKS ON EARTHING SWITCH	ABB	A5	BUS BAR METERING
		1VCF599700R0290	1	EARTHING SWITCH OPERATING LEVER	ABB	A5	BUS BAR METERING
C1	16	43931118	1	VPIS 3,3÷36KV - DEVICE SIGNALLING VOLTAGE PRESENT KIT	ELECTRONSYSTEM	A5	BUS BAR METERING
DP1	15	900451	1	Alarm Relay Module XL (ARM XL) - 4.3" Touchscreen Display	Exertherm	A5	BUS BAR METERING
E1	10	74041	1	LED LAMP 4W 4000K 313x30x22	Beghelli	A5	BUS BAR METERING
E8	6	1VCF501000R0001	1	RESISTOR TR318 27R/J 27ohm 500W L=2,5M	ABB	A5	BUS BAR METERING
EH1	10	R1R150230	1	SPACE HEATER SKR 150W ALIM. 220VCA	Torresan	A5	BUS BAR METERING
FF1	6	1YMB751209M1502	1	FUSE-LINKS FOR VOLTAGE TRANSFORMER PROTECTION 6/12kV 2A 192x53mm - CEF-VT	ABB	A5	BUS BAR METERING
FF2	6	1YMB751209M1502	1	FUSE-LINKS FOR VOLTAGE TRANSFORMER PROTECTION 6/12kV 2A 192x53mm - CEF-VT	ABB	A5	BUS BAR METERING
FF3	6	1YMB751209M1502	1	FUSE-LINKS FOR VOLTAGE TRANSFORMER PROTECTION 6/12kV 2A 192x53mm - CEF-VT	ABB	A5	BUS BAR METERING
GS1	13	SPS151DX110C246	1	DC/DC CONVERTER 110VDC/24VDC 150W SPS151DX110C246	ADVEL	A5	BUS BAR METERING
HGR	10	TRT-10A230V-NC	1	Regolable Thermostat -10÷80°C 1NC IP20 DIN Mounting	Fandis	A5	BUS BAR METERING
K230	10	ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
		ER 552 0	1	CR-M230AC2L AUXILIARY RELAY 230VAC WITH 4 CONTACTS	ABB	A5	BUS BAR METERING
KA1	17	ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
		ER 589 2	1	CR-M110DC4L SUPPLY 110VDC 4C/O 250V/6A LED	ABB	A5	BUS BAR METERING
KA2	13	ER 545 4	1	CR-M024DC2L AUXILIRY RELAY 24VDC WITH 2 CONTACTS	ABB	A5	BUS BAR METERING
		ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
KGR	10	ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
		ER 552 0	1	CR-M230AC2L AUXILIARY RELAY 230VAC	ABB	A5	BUS BAR METERING
KN1	11	ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
		ER 589 2	1	CR-M110DC4L SUPPLY 110VDC 4C/O 250V/6A LED	ABB	A5	BUS BAR METERING
KN2	11	ER 686 6	1	CR-M4SS SOCKET STANDARD X 2/4 C/O(CR-M)	ABB	A5	BUS BAR METERING
		ER 728 6	1	CR-MH1 METAL RETAINING JUMPER	ABB	A5	BUS BAR METERING
		ER 589 2	1	CR-M110DC4L SUPPLY 110VDC 4C/O 250V/6A LED	ABB	A5	BUS BAR METERING
KT1	17	H3DKM2ACDC24240	1	MULTIFUNCTION TIMER RELAY Vaux=24÷240Vac/dc - 2SC	Omron	A5	BUS BAR METERING
L1I	15	801100	1	IR.06-EM.SC Sensor, ΔT, ABS Housing, 10mtr Cable	Exertherm	A5	BUS BAR METERING
L1MS	15	801100	1	IR.06-EM.SC Sensor, ΔT, ABS Housing, 10mtr Cable	Exertherm	A5	BUS BAR METERING
L2I	15	801100	1	IR.06-EM.SC Sensor, ΔT, ABS Housing, 10mtr Cable	Exertherm	A5	BUS BAR METERING
L3I	15	801100	1	IR.06-EM.SC Sensor, ΔT, ABS Housing, 10mtr Cable	Exertherm	A5	BUS BAR METERING
L3MS	15	801100	1	IR.06-EM.SC Sensor, ΔT, ABS Housing, 10mtr Cable	Exertherm	A5	BUS BAR METERING
LS	10	Z15GW2-1-1453270	1	MICROSWITCH 1sc	Omron	A5	BUS BAR METERING
		APB-PG	1	COVER TO MICRO-SWITCH	Omron	A5	BUS BAR METERING
P1	17	KW 080 2	1	MP1-10B BLACK PUSH BUTTON UNSTABLE	ABB	A5	BUS BAR METERING
		EO 569 7	1	MCBH-00 FIXING SUPPORT 3 CONTACTS	ABB	A5	BUS BAR METERING
		EO 570 5	1	MCB-10 CONTACT NO FOR PUSHBUTTONS	ABB	A5	BUS BAR METERING
PD1	16	1VC123000074Q02	1	PDCOM	ABB	A5	BUS BAR METERING

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DWG n° : 231151/SD/16
Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
3	08/08/2024	Giulietti	Flamminio	Sigismondi	As-Built (ASB)
2	27/06/2024	Giulietti	Flamminio	Sigismondi	Accepted for Construction (AFC)
1	14/05/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)
0	04/04/2024	Giulietti	Flamminio	Sigismondi	Issued for review (IFR)

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Bill of Materials

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK | SCALE : NTS

A3 | DRAWING NO. 1723002197-EL-DG-00016 | SHEET 22 | REV. 03

File Name : 1723002197-EL-DG-00016 Rev.03

F.to UNI A3: 420mmx297mm

NO MARK UP
AS COMMISSIONED: [illegible] 26/3/25

Nome/Item	Fg/Sh	Tipo/Type	Q.tà	Descrizione/Description	Costruttore/Manufacturer	Ubicazione (descrizione)	Quadro (descrizione)
PTT	6	1VCF498412R0100	1	TV/F COMPARTMENT 12/17kV IP4X L=590mm OUTLET ON THE BACK WITH N°3 VT + N°14 MAIN CONTACTS + N°2+2 SERVICE/ISOLATED POSITION CONTACTS	ABB	A5	BUS BAR METERING
		1VCF499800R0302	1	NAMEPLATE IN ENGLISH LANGUAGE FOR TV/F	ABB	A5	BUS BAR METERING
PU1	7	F96EVXYYYXC1	1	VOLTMETER 96x96 90° SCALE 0÷8kV ON TV 6,6kV/110V	FRER	A5	BUS BAR METERING
QA1	10	A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
		S600613	1	M.C.B. S202 M - D32A	ABB	A5	BUS BAR METERING
QA2	10	A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
		S550284	1	S202M C10 AUTOMATIC CIRCUIT-BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
		B427917	1	DDA202 AC 25A 300MA RCD BLOCK 2P	ABB	A5	BUS BAR METERING
QD1	12	S600422	1	S202M D 4 AUTOMATIC CIRCUIT-BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD01	11	S600545	1	S202M D25 AUTOMATIC CIRCUIT-BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD2	12	S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
		B427917	1	DDA202 AC 25A 300MA RCD BLOCK 2P	ABB	A5	BUS BAR METERING
QD02	11	S600545	1	S202M D25 AUTOMATIC CIRCUIT-BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD4	13	S600446	1	S202M D 6 AUTOMATIC CIRCUIT-BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD5	13	A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
		S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD6	13	A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
		S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD21	12	S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QD22	12	S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
QV1	9	S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
		A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
QV2	8	S550680	1	S204M C 2 AUTOMATIC CIRCUIT-BREAKER 10KA 4P	ABB	A5	BUS BAR METERING
		A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
QV3	7	S550383	1	S203M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 3P	ABB	A5	BUS BAR METERING
		A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT	ABB	A5	BUS BAR METERING
QV4	8	S550680	1	S204M C 2 AUTOMATIC CIRCUIT-BREAKER 10KA 4P	ABB	A5	BUS BAR METERING
		A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
QV5	8	S550239	1	S202M C 2 AUTOMATIC CIRCUIT BREAKER 10KA 2P	ABB	A5	BUS BAR METERING
		A563819	1	S2-CS/H6R AUXILIARY STATE CONTACT 1CO	ABB	A5	BUS BAR METERING
SK1	14	2900682	1	UMK-RJ45/S/8PTDA Modul VARIOFACE	Phoenix Contact	A5	BUS BAR METERING
SK2	14	2900682	1	UMK-RJ45/S/8PTDA Modul VARIOFACE	Phoenix Contact	A5	BUS BAR METERING
SK3	15	2900682	1	UMK-RJ45/S/8PTDA Modul VARIOFACE	Phoenix Contact	A5	BUS BAR METERING
SPW	15	M-FAST SFP-TX/RJ45	1	SFP TX Fast Ethernet Transceiver with RJ45	HIRSCHMANN	A5	BUS BAR METERING
SU1	7	CA10-A004-600-FT2	1	VOLTMETER SWITCH PH-PH 4 POSITION	KRAUS & NAIMER	A5	BUS BAR METERING
SW1	16	1VCF681000R0101	1	SWICOM INTERFACE TO ETHERNET SWTCH	ABB	A5	BUS BAR METERING
SWH.A	14	RSP25-11003Z6TT-SK9V9HHE2S09.0.02	1	Managed Industrial Switch for DIN Rail, fanless design Fast Ethernet Type - Enhanced (PRP, Fast MRP, HSR, NAT with L3 type) - 8 x RJ45	HIRSCHMANN	A5	BUS BAR METERING
SWH.B	14	RSP25-11003Z6TT-SK9V9HHE2S09.0.02	1	Managed Industrial Switch for DIN Rail, fanless design Fast Ethernet Type - Enhanced (PRP, Fast MRP, HSR, NAT with L3 type) - 8 x RJ45	HIRSCHMANN	A5	BUS BAR METERING
SWH.C	15	RSPS25-06002Z6YT-SK9Z9HHE2S07.1.05	1	Managed Industrial Switch for DIN Rail, fanless design Fast Ethernet Type - Enhanced (PRP, Fast MRP, HSR, NAT with L3 type) - 2 x RJ45; 4 x SFP - V=48V÷320VDC -88÷265VAC)	HIRSCHMANN	A5	BUS BAR METERING

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DWG n° : 231151/SD/16

Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

NO MARK UP
AS COMMISSIONED: MARINA GIROTTI 26/3/25

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Bill of Materials

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 23

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

Nome/Item	Fg/Sh	Tipo/Type	Q.tà	Descrizione/Description	Costruttore/Manufacturer	Ubicazione (descrizione)	Quadro (descrizione)
TR1	15	800208	1	MODBUS DATACARD 8 CHANNELS	Exertherm	A5	BUS BAR METERING
TU-L1	6	TJP4.3_002	1	VT ON RESIN 7,2KV 50-60Hz 6600:r3/110:r3-110:r3-110:3 Cl.0,5-3P Pr.20VA, Cl.0,5-3P Pr.30VA, Cl.3P Pr.30VA	ABB	A5	BUS BAR METERING
TU-L2	6	TJP4.3_002	1	VT ON RESIN 7,2KV 50-60Hz 6600:r3/110:r3-110:r3-110:3 Cl.0,5-3P Pr.20VA, Cl.0,5-3P Pr.30VA, Cl.3P Pr.30VA	ABB	A5	BUS BAR METERING
TU-L3	6	TJP4.3_002	1	VT ON RESIN 7,2KV 50-60Hz 6600:r3/110:r3-110:r3-110:3 Cl.0,5-3P Pr.20VA, Cl.0,5-3P Pr.30VA, Cl.3P Pr.30VA	ABB	A5	BUS BAR METERING
VC1	11	KBPC5006	1	SILICON BRIDGE RECTIFIER 400-600V 50A	GENERIC	A5	BUS BAR METERING
VC2	11	KBPC5006	1	SILICON BRIDGE RECTIFIER 400-600V 50A	GENERIC	A5	BUS BAR METERING
VS1	16	1VCF681000R0104	1	INTERFACE BETWEEN PDCOM AND CAPACITIVE ISOLATORS	ABB	A5	BUS BAR METERING
XC		HM250GR	42	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type	Cabur	A5	BUS BAR METERING
		HM320GR	12	HMM.6/GR Feed-through Terminal Block - Grey (6 mmq)	Cabur	A5	BUS BAR METERING
		HM251GR	3	HMT.4/PT/GR End section - Grey	Cabur	A5	BUS BAR METERING
		HM321GR	3	HMT.6/PT/GR End section - Grey	Cabur	A5	BUS BAR METERING
XM		HM250GR	10	HMM.4/GR Feed-through Terminal Block - Grey (4 mmq) - spring type	Cabur	A5	BUS BAR METERING
		HM330GR	6	HMM.10/GR Feed-through Terminal Block - Grey (10 mmq)	Cabur	A5	BUS BAR METERING
		HM251GR	2	HMT.4/PT/GR End section - Grey	Cabur	A5	BUS BAR METERING
		HM331GR	3	HMT.10/PT/GR End section - Grey	Cabur	A5	BUS BAR METERING
XS1	10	E 9447 7	1	SOCKET	ABB	A5	BUS BAR METERING
XV		HB210GR	16	HSCB.6/GR Disconnect by slide link Terminal Block - Grey (6 mmq) - Spring type	Cabur	A5	BUS BAR METERING
		HB201GR	6	HSCB.6/PT/GR End section - Grey	Cabur	A5	BUS BAR METERING

NO MARK UP
AS COMMISSIONED: MA MA GIROTTI
26/3/25

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DWG n° : 231151/SD/16
Item n° : PF1113279

REV.	DATE	DRN	CHKD	APPD	DESCRIPTION
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IMESA ELECTRICAL ENGINEERING

CROSSWIND

ROSETTI MARINO

TITLE : SG-100D1 - FUNCTIONAL BUS BAR METERING

Bill of Materials

CONTRACT NO./TITLE CW-I-WP4-2023-05/HOLLANDSE KUST NOORD WIND PARK

SCALE : NTS

A3

DRAWING NO. 1723002197-EL-DG-00016

SHEET 24

REV. 03

F.to UNI A3: 420mmx297mm

File Name : 1723002197-EL-DG-00016 Rev.03

Section 8 LIST OF MODIFICATIONS

NOT APPLICABLE

Section 8.1 List of changes

NOT APPLICABLE

Section 9 SUPPORTING DOCUMENTS

NOT APPLICABLE