	NW – Generators Phase 1	Telecommunications
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NW – Generators Phase 1

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Ltd**

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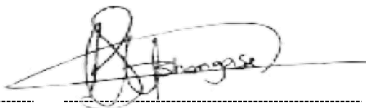
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Date: 22 April 2026

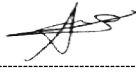
**Functional
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Date: 06/05/2026

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1. Introduction

Eskom NTCSA is responsible for providing telecommunication service to all Eskom divisions like Distribution, Transmission and Generation Group IT. The Eskom Telecommunications (ET) network is currently undergoing large scale changes influenced by the need to align with the national electricity grid expansion, growing demand of bandwidth requirements due to customer projects, Smart Grid, growing need of video surveillance requirements by Security Division and Group IT. The changes include refurbishment, expansion, strengthening and upgrade of existing network to keep abreast with latest technology expectations and to support the growing needs of the organisation

Eskom NTCSA Telecommunications had identified two radio sites in Northwest Region of which are part of the regional backbone. The radio sites are situated on top of a hill or a mountain. The access roads to these sites are normally a two-track dirt road. A 4x4 vehicle is required to access some of these radio sites.

Radio sites in the region are equipped with standby supply. This standby supply is supposed to takeover when the AC supply fails. The AC supply could be received from a Municipal or Eskom. During AC failure Telecoms OPS section take mobile generator to site to restore service.

The principle for DC standby and diesel generators at the radio sites is governed by the following document: **240-118870219: Standby power systems topology and autonomy**

The maintenance sections in region have procured mobile diesel generators to take to the radio site where there is an AC power failure. And extended delays in the repairs of the AC power are experienced; to keep the radio site up and running while the AC power is not available. However, some of this radio sites are challenging in terms of Safety to take a mobile generator to the radio site, especially during and after a heavy storm. As a result, the network could be at risk if the AC power fails, until such time that the road is safe or repaired, or the AC power being restored to the radio site.

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The region has identified the problematic radio sites whereby Fixed Diesel Generators are required in order to mitigate the power failure as well as the Network risk during adverse weather conditions. Projects was raised to install Fixed Diesel Generators at these two sites.

2. Scope

This document is prepared to describe the detail design plan for the North-West Generators Project Phase 1 as per the approved 10-year plan. This report contains a summary of the wiring that will be done between the chargers, generators and the intermediate distribution frame (IDF). Also the future programming of the Cordex charger so that it monitors the AC supply and battery voltage in order to start and stop the generators.

2.1.1 Purpose

This document outlines the detailed design of generators installation in the North-West Region

2.1.2 Applicability

This document shall apply throughout Transmission Telecoms NW region.

2.1.3 Effective date

This document is effective upon Telecommunications Design Review Team (TDRT) committee approval date.

2.2 Normative/Informative References

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- 240-118870219: Standby power systems topology and autonomy _ Rev2
- 240-62772907: Stationary Generator Technical Schedules A & B _ Rev4
- 240-84979963 - DC Systems Design Guide for Telecommunications _ Rev2
- 240-108614750 - Acceptance and Commissioning of DC Power Equipment Standard _ Rev1
- 240-62772907 Specification for Stationary Diesel Generators Systems _ Rev4
- 240-103031952 Application of Certificate of Compliance (CoC) and Safety Clearance Certificate on Electrical Installations in Generating Power Plant Work Instruction _ Rev1
- 240-56872313 - Radio Station Earthing and Bonding Standard _ Rev4

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- 240-110412152 Quality Assurance Tick Sheet for Projects _Rev3
- 240-75340750 EAS Design and Implementation Guide _Rev4

2.2.2 Informative

- ISO 9001 - Quality Management Systems
- 240-70044602 - Risk Assessment Template _ Rev3
- Act No. 85 Occupational Health and Safety Act, 1993

2.3 Definitions

None.

2.4 Abbreviations

Abbreviation	Explanation
NPAE	National Planning and Application Engineering
NTCSA	National Transmission Company South Africa
TDRT	Telecommunications Design Review Team
COC	Certificate of Compliance
ATP	Acceptance Test Procedures
AC	Alternative Current
ATS	Automatic Transfer Switch
AVR	Automatic Voltage Regulator
HMI	Human–Machine Interface
HV	High Voltage
I/Os	Inputs and outputs
MCCB	Moulded Case Circuit-breaker
FAT	Factory Acceptance Test
OEM	Original Equipment Manufacturer
PRP	Prime Power (SANS 8528 abbreviation description)
RMS	Root Mean Square
SAE	Society of Automotive Engineers
SANS	South African National Standards
SAT	Site Acceptance Test
LTP	Limited-Time Power (SANS 8528 abbreviation description)
ESP	Emergency Standby Power (SANS 8528 abbreviation description)
COP	Continuous Power (SANS 8528 abbreviation description)
pF	Power Factor
RPM	Revolutions Per Minute
DC	Direct Current

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2.5 Roles and Responsibilities

The compiler of the document is responsible to ensure that the approval is obtained.

Stakeholder table and contact details

Designation	Name	Contact Number
Project Planner	Mojalefa Thulare	+27 83 633 2645
Project Manager	Morake Maboane	+27 82 926 2952
Ops and FS Manager	Sandy Nxumalo	+27 81045 3340
Ops and FS Supervisor	Titus Nematswerani	+27 83 536 5113
Ops and FS Supervisor	Vossie Smit	+27 18 464 6599
KAM	Claude Solomon	+27 51 404 2058
Senior Engineer	Lindinkosi Ntshangase	+27 17 648 0068

2.6 Process for Monitoring

- The project engineer shall be responsible to ensure that this design follows technical governance and authorisation process.
- The Project Management shall monitor and manage the implementation of the design to completion.
- The TDRT committee shall carry the responsibility of ensuring that the proposed design is technically viable.
- This engineering report will be stored on Open text upon authorization and sign-off of the

Application Design for: NW DC Generator Project Phase 1 (ERA)

240-139189094 Guideline for Project Supporting Template _Rev2

240-139189078 Project Supporting Template _ Rev4

2.7 Document Content

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3. Application Design for: NW DC Generator Project Phase 1 (ERA)

The telecommunications network is designed to achieve an overall availability of 99.999%. To achieve this availability several layers of redundancy are built into the design to prevent catastrophic failure. This includes dual redundancy on the equipment as well as redundancy on the circuits to a point of presence (a point where customers can connect to the telecommunication network). Generally, the fibre backbone will consist of multiple self-healing rings that will reduce the probability of losing service to a particular point of presence. If full visibility was lost from National Control Centre the network could still be monitored and controlled from the Standby National Control Centre and the Distribution Control Centres. It was therefore concluded that such an event cannot be used to justify a telecommunications project.

Statutory investments:

Governance/Legal impacts on this project

- The project is needed to remain grid code compliant as documented in
 - South African Grid Code System Operation Grid Code Version 10.1 (January 2022), Section 2.1.4 (5):

“To achieve a high degree of service reliability, the System Operator shall ensure adequate reliable communication between System Ops Control Centre and other control centres, power stations and substations”.
 - This allows the System Operator to achieve a dedicated high degree of service reliability.

Strategic investments:

This investment justification is in line with the following document:

- 240-133946686 Telecommunications Network Development Plan
- *the applicable roadmap*
- *the applicable Platform Asset Health Report*

Investment Classification

- The project is motivated on Statutory/Strategic investment.
- Not implementing this project will compromise the requirements associated with operating

Dependent Projects

North-West DC Refurbishment Phase1

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3.3 Detailed Design

This Detailed Design is done in accordance with the latest standards and documentation relevant to Stationary Diesel Generator System **240 - 62772907**. The design was looked at from a network reliability perspective considering the specific site requirements. Existing infrastructure was also considered, to ensure that where applicable existing equipment suitable for the application, could be reused to ensure that optimal and cost-effective designs were done. The design was done with reference to the Eskom document **240-118870219** Standby Power Systems Topology and Autonomy for Eskom Sites.

3.3.1.1 Standby Time

The total required standby time (T-total) is a combination of the energy storage standby time (TES) normally provided by battery banks and the extended backup standby time (TEB) normally provided by a diesel generator, as indicated in Equation 1 below.

Equation 1: $T\text{-total} = T_{ES} + T_{EB}$

Telecommunication Site (Radio/ Fibre)

Site / Area	System	Topology	Standby Time [h]	
			System ¹⁾	Total
Telecommunications Site (μ Wave / Fibre) ³⁾	48V DC	2N / 2(N+1)	48	168 ²⁾
	Generators	N	T_{EB}	

Notes:
 1) T_{EB} indicates the standby time covered by the generator fuel capacity as discussed in 3.8 j). The other figures indicated refers to the standby time covered by the battery banks (T_{ES}) as discussed in 3.8 j).

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DC Calculation

Site Name	DC Final load as per Calculator (Amps)	New battery selected @C10 (Amp Hour)	Closest Amp Hour per bank @ C10 (selected)	Cell/Block Voltage	Number of strings/banks per charger	Standby time for site achieved for selected battery	Charger current based on C10	New Charger selected	Charger configuration	Topology	Site AC incoming upgrade required	New AC Supply
Hekpoort RS	72.69	3920	3920	2V	2	43	509	600	Dual	N48	Yes	63A
Britskop RS	82.08	N/A	N/A	N/A	N/A	N/A	691	700	Dual	N48	Yes	63A

The Current Chargers and Batteries at both sites will be upgraded.

Both the current and future DC requirements of the radio sites were considered.

3.3.1.2 Scope of Work

3.3.1.3 Hekpoort RS

3.3.1.4 Site information

- a) Site Owner or contact person: Titus Nematswerani
- b) Contact no: 083 536 5113
- c) Site coordinates: 25°51'37.0"S, 27°31'49.1"E
- d) Vehicle Access: 4x4
- e) Closest Town: Magaliesburg (approximately 15km)
- f) The fence is currently 39 × 34 m
- g) Existing brick building housing the equipment room and battery 7 x 3 m

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Figure 1: Mobile Generator positioned in the selected position for new generator plinth and shelter

3.3.1.4.1 Civil work Specification for Hekpoort RS

- Concrete plinth and generator shelter design guide is approved and attached as supporting document: **Scope of Work Unique Identifier: 559 – 165698355**

3.3.1.4.2 Site Meeting for Hekpoort RS

- A site establishment meeting is compulsory before commencing of the site works for Hekpoort radio site.
- **Installation of Generator for Hekpoort RS**
- Supply, Install and Commission 100kVA Generator. (Weatherproof Genset) according to “240-62772907 Standard for stationary diesel generator systems”
- Generator will be mounted on to Plinth using suitably sized bolts, to ensure it is secured.

CONTROLLED DISCLOSURE

- Assemble and fasten (with chemical anchors) the secured, non-corrosive (galvanized or rust-proof paint) enclosure on the 3m x 4m cement plinth. Secure the roof on the secured enclosure to protect the generator installation.
- Supply, Install and commission a 100A 3-Phase Motorized Automatic Transfer Switch in the Diesel Generator Panel Supply and Install two 4 core 35mm armoured cables between the AC DB in the radio room and the 100A 3-Phase Motorized Automatic Transfer Switch in the generator.
- 10m of 4 core 35 mm armoured cable will be required from Radio Room AC DB 1 to generator. Routing should be done so as to prevent theft of cable. Preferably as far underground as possible
- Supply and install a 70mm² bare copper cable for earthing.
- Supply and install a 20 Pair, 20m armoured alarm cable from generator to the inside of the Radio Room (IDF).
- Connect and Commission the cable on the generator, in co-operation with Eskom who will wire the cable on the Environmental Alarm System on site.
- Supply and Install 5m of (75mm) Galvanised Steel trunking on the outside of the building from the overhead racking to the generator for this alarm cable. The exact position will be discussed during the site meeting for both sites

All cables shall be labelled at all terminations with suitable and approved indelible labels indicating:

- Origin / Destination
- Cable size and number of cores
- Conductor type

Training will have to be provided to staff so as to be able to perform first line fault finding on system.

Provide full details of system, including test results, diagrams, cable layout and mechanical components.

CONTROLLED DISCLOSURE

- Earth the Genset and Weatherproof canopy according to spec (240-56872313 Radio Station Earthing and Bonding_Rev23). All earth connections must be done below ground level where possible and must be inspected and approved by NTCSA Telecoms before backfilling. All earthing on site shall comply with the requirements SANS 10142 and that of local authority.

Reinstate the Radio Site to the existing condition.

The complete Generator set must have a minimum 2-year warranty.

Service Plan for the Generator set to be provided.

Diesel Generator control philosophy

It is of the utmost importance that the controller of the generator offered will be able to conform to the control philosophy as described below. Basically, the generator must not start immediately on mains failure but must wait in “standby” until the charger triggers the remote start input of the controller, then it must start and close the generator output contactor. It must continue to run on generator even if the mains have returned until the charger releases the remote start signal and then only must the generator transfer the load to mains and run cool down. If possible, the generator must monitor the mains return for amplitude and rotation and must give a separate dry contact to be used by the Eskom control wiring as described below.

- When the mains fail both the batteries will start discharging and supply the load. The generator should not come on at this time yet.
- Battery 1 and 2 will supply the load for a period dependant on the condition of the battery and the load demand and not a fixed or determined period before the generator starts up.
- Each charger is equipped with 10 x 4.6kw SMRs, with one phase supplying 3 SMRs. Each SMR draws 21A at 220Vac. If the voltage is lower, the current will not exceed 21A due to derating. This results in a maximum current of 63A per phase.
- The voltage at which the charger gives the start signal to the generator shall be determined by the HOS taking in consideration the distance to be travelled to site and the cut-off voltage of the telecommunication equipment.
- These settings are close to the end-of-discharge voltage of the batteries but could still give some back-up time in the case of the generator not successfully starting and give NTCSA Telecoms staff some time to respond.

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Once the start command is given the generator will have three attempts to start and if;

- Successful the generator will continue to operate until the charger sends the stop signal.
- Unsuccessful the generator will give common alarm to control.

The generator must have two sets of contacts per alarm relay. All alarms will have a wetting supply from the EAS for alarms to National Control and a select few alarms will get a wetting supply from the charger control circuit.

Codex Charger Alarms

Additional ADIO card will be installed and commission by PTM

This card will give Start and Stop output signal to the generator.

K13 - Start Output to be add by Com10

K14 - Stop Output to be add by Com10

Diesel Gen Alarms

Start Input

Stop Input

Common Alarm

Generator Running

Fuel Low

The Start and Stop signals will require an open contact to briefly close to execute the function. The signals will be a pulse only.

The generators shall be equipped with electrical fuel transfer pumps with build it over fuel Protection

CONTROLLED DISCLOSURE

Hekpoort RS DC Calculator Results

Load Calculation			
Total Current drawn by Equipment (incl Growth factor)	72.69	A	
ampère-hour Load per Day	1744.5	Ah	
Information as to Site & Battery Requirements			
SLA Requirements	Standby	48	Hours
	Recovery	10	Hours
Number of Hours Standby Required	38	Hours	
Recovery Time in Hours	10	Hours	
Growth Factor	10%	%	
Calculations when Mains Sites Selected			
Recovery Current	426.33	A	
Charger Current Required + 0% Inefficiencies	499.02	A	
Current Available for Charging	427.3	A	
Battery Efficiency (Depends on Type of Cells & if Aircon fitted or not)	90%	%	
Battery Capacity Required	Dual 48V battery bank,i.e 2 banks X	3837	Ah
Charger Capacity Required	Dual 48V Charger	500	A
NEW Battery Bank Installed/Actual size to be installed		3920	Ah
NEW Charger Current required based on installed battery		509	A
NEW Standby Time on new batteries		43.0	Ah
CURRENT Battery Bank capacity		3174	Ah
CURRENT Standby Time on current Battery		35.0	Hours

The calculated load current for the site is **72.69A**, standby time is 43Hrs (2N configuration) with an additional 10% growth factor and a 10-hour recharge time. For more detail on calculation

CONTROLLED DISCLOSURE

3.3.1.4.3 Britskop RS

3.3.1.4.3 Site Information:

- a) Site Owner or contact person: Vossie Smit
- b) Contact no: 083 297 7556
- c) Site coordinates: 26°45'58"S, 26°57'00"E
- d) Vehicle Access: LDV
- e) Closest Town: Potchefstroom (approximately 15km)
- f) The fence is currently 30 × 20 m
- g) Existing brick building housing the equipment room and battery 7 x 3 m



Figure 2: Proposed Generator Plinth and Shelter on Position marked with an X

3.3.1.4.4 Civil work Specification Britskop RS

- Concrete plinth and generator shelter will be constructed in accordance with Document Unique Identifier: 559 – 165698355

3.3.1.4.5 Site Meeting for Britskop RS

CONTROLLED DISCLOSURE

A site establishment meeting is compulsory before commencing of the site works for both radio sites.

- **Installation of Generator for Britskop RS**
- Supply, Install and Commission 100kVA Generator. (Weatherproof Genset) according to “240-62772907 Standard for stationary diesel generator systems”
- Generator will be mounted on to Plinth using suitably sized bolts, to ensure it is secured.
- Assemble and fasten (with chemical anchors) the secured, non-corrosive (galvanized or rust-proof paint) enclosure on the 3m x 4m cement plinth. Secure the roof on the secured enclosure to protect the generator installation.
- Supply, Install and commission a 100A 3-Phase Motorized Automatic Transfer Switch in the Diesel Generator Panel Supply and Install two 4 core 35mm armoured cables between the AC DB in radio room and the 100A 3-Phase Motorized Automatic Transfer Switch in the generator.
- 50m of 4 core 35 mm armoured cable will be required from Radio Room AC DB 1 to generator. Routing should be done so as to prevent theft of cable. Preferably as far underground as possible
- Supply and install a 70mm² bare copper cable for earthing.
- Supply and install a 20 Pair, 30m armoured alarm cable from generator to the inside of the Radio Room (IDF).
- Connect and Commission the cable on the generator, in co-operation with Eskom who will wire the cable on the Environmental Alarm System on site.
- Supply and Install 50m of (75mm) Galvanised Steel trunking on the outside of the building from the overhead racking to the generator for this alarm cable. The exact position will be discussed during the site meeting for both sites.
- All cables shall be labelled at all terminations with suitable and approved indelible labels indicating
 - Origin / Destination
 - Cable size and number of cores
 - Conductor type
- Training will provide to staff to be able to perform first line fault finding on system.
- Provide full details of system, including test results, diagrams, cable layout and mechanical components.

CONTROLLED DISCLOSURE

- Earth the Genset and Weatherproof canopy according to spec (240-56872313 Radio Station Earthing and Bonding_Rev23). All earth connections must be done below ground level where possible and must be inspected and approved by Eskom Telecoms before backfilling. All earthing on site shall comply with the requirements SANS 10142 and that of local authority.

- Reinstate the Radio Site to the existing condition.

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It is of the utmost importance that the controller of the generator offered will be able to conform to the control philosophy as described below. Basically, the generator must not start immediately on mains failure but must wait in “standby” until the charger triggers the remote start input of the controller, then it must start and close the generator output contactor. It must continue to run on generator even if the mains have returned until the charger releases the remote start signal and then only must the generator transfer the load to mains and run cool down. If possible, the generator must monitor the mains return for amplitude and rotation and must give a separate dry contact to be used by the Eskom control wiring as described below.

- When the mains fail both the batteries will start discharging and supply the load. The generator should not come on at this time yet.

- Battery 1 and 2 will supply the load for a period dependant on the condition of the battery and the load demand and not a fixed or determined period before the generator starts up.

- Each charger is equipped with 10 x 4.6kw SMRs, with one phase supplying 3 SMRs. Each SMR draws 21A at 220Vac. If the voltage is lower, the current will not exceed 21A due to derating. This results in a maximum current of 63A per phase.

- The voltage at which the charger gives the start signal to the generator shall be determined by the HOS taking in consideration the distance to be travelled to site and the cut-off voltage of the telecommunication equipment.

- These settings are close to the end-of-discharge voltage of the batteries but could still give some back-up time in the case of the generator not successfully starting and give NTCSA Telecoms staff some time to respond.

CONTROLLED DISCLOSURE

Once the start command is given the generator will have three attempts to start and if;

- Successful the generator will continue to operate until the charger sends the stop signal.
- Unsuccessful the generator will give common alarm to control.

The generator must have two sets of contacts per alarm relay. All alarms will have a wetting supply from the EAS for alarms to National Control and a select few alarms will get a wetting supply from the charger control circuit.

Codex Charger Alarms

Additional ADIO card will be installed and commission by PTM

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K13 - Start Output to be add by Com10

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Diesel Gen Alarms

Start Input

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Generator Running

Fuel Low

The Start and Stop signals will require an open contact to briefly close to execute the function. The signals will be a pulse only.

The generators shall be equipped with electrical fuel transfer pumps with build it over fuel Protection

CONTROLLED DISCLOSURE

Britskop RS DC Calculator results

Load Calculation		
Total Current drawn by Equipment (incl Growth factor)	82.08	A
ampère-hour Load per Day	1969.9	Ah
Information as to Site & Battery Requirements		
SLA Requirements	Standby 48	Hour s
	Recovery 10	Hour s
Number of Hours Standby Required	48	Hour s
Recovery Time in Hours	10	Hour s
Growth Factor	10%	%
Calculations when Mains Sites Selected		
Recovery Current	608.11	A
Charger Current Required + 0% Inefficiencies	690.19	A
Current Available for Charging	608.9	A
Battery Efficiency (Depends on Type of Cells & if Aircon fitted or not)	90%	%
Battery Capacity Required	Dual 48V battery bank, i.e. 2 banks X	Ah
Charger Capacity Required	Dual 48V Charger 691	A
NEW Battery Bank Installed/Actual size to be installed		Ah
NEW Charger Current required based on installed battery	691	A
NEW Standby Time on new batteries	53.0	Hour s
CURRENT Battery Bank capacity		Ah
CURRENT Standby Time on current Battery	37.0	Hour s

The calculated load current for the site is **82.08A**, standby time is 53Hrs (2N configuration) with an additional 10% growth factor and a 10-hour recharge time

CONTROLLED DISCLOSURE

General

All saddles, washers, bolts, etc. should be galvanised or stainless steel.

The generator fuel tank shall be filled up with diesel.

The new installation shall be certified, and a COC made part of the final documentation to be handed over to Eskom.

Any deviations from the requirements shall be listed in a separate deviation schedule for Eskom's consideration.

Project Management Scope

- Ensure that the orders have been placed for both Generators and Civil Works
- Assist with the Tender Clarification meeting
- Assist with Technical Evaluations
- Arrange access for the sites during implementation
- Ensure that the installations are done
- Assist with the Q&A
- Ensure that all relevant documentation is completed and returned.

PTM

- a) Assist with the Tender Clarification meeting
- b) Assist with the Technical Evaluation of the Generator Tender Returnable
- c) Witness the following tests:
 - Factory Acceptance Test
 - Site Acceptance Tests
- d) Complete and sign off the following documents:
 - Factory Checklist
 - Generator Test Sheet
 - Quality Control Snag List
 - Test Bay Checklist

CONTROLLED DISCLOSURE

- e) Assist with the commission and acceptance of the generators on site
- f) Programming of the Cordex charger software

The programming of the charger will do as per philosophy whereby the charger will monitor the AC supply together with the battery voltage in an event of AC failure.

O&FS

- Assist with access to the radio sites as and when required
- Assist with the Technical Evaluations
- Wiring of the generator alarms and controls to the EAS
- Assist with testing of the alarms to NMC and commissioning and acceptance of the generators.
- Acceptance of the civil works

Contractor

- The contractor is to ensure that all safety requirements are followed.
- The contractor is to submit a method statement and safe work procedure for each site
- The contractor is to ensure that generator specification documentation has been supplied – paper copy & digital copy
- Electrical contractor to supply and install all Electrical equipment including cables and all lugs and miscellaneous items required for the AC installation.
- The rest of the AC installation to be completed and COC signed off by an Installation electrician.
- Underground trunking for the cables to be installed along outside of buildings. Ensure that all metal parts are earthed and bonded.
- Supply and install the AC Cable 30m to the chargers with a new 4 Core -35mm
- Contractor to deliver and offload new generator at site
- 20 pair Telecommunications Cable to be installed for alarms.
- Factory Acceptance tests

CONTROLLED DISCLOSURE

- FAT defects correction
- Supply, Install and Commission a plinth and shelter for the generators as per **Scope of Work Unique Identifier: 559 - 165698355**
- Supply, Install and Commission generators.

Civil Engineer

- Assist with the Tender Clarification meeting
- Assist with the Technical Evaluation of the Civil Work Tender Returnable
- Acceptance of the Civil Works on site

NMC

To monitor sites alarms and give call out if necessary

NMC can start and stop the generators anytime as the wish. Care should be taken by NMC personnel to monitor the generator as not to consume a lot of diesel

SHEQ

- The SHEQ Team to assist with SHEQ tender evaluation
- Ensure that the contractor is abiding by all the requirements, including attendance of site meetings and site visits during and after construction of the two radio sites.

Procurement

- The open tender process will be followed to procure the necessary equipment and services.

Planer

- Assist with the Technical Evaluation of both the Generator and the Civil Work Tender Returnable
- Update records as per as build documentation were applicable
- Update Workplace with the new Generator information.

CONTROLLED DISCLOSURE

Completion

- Completion of the ERA stage of this project shall be determined based on completion of the scope of this phase (as defined in this document).

Acceptance

This document has been seen and accepted by TDRT workgroup participants:

Salome Morabe	Senior Technologist Engineer NW
Lindinkosi Ntshangase	Senior Engineer NW (Chairperson) NW
Hendrik Crafford	Senior Technologist Engineering NW
Mojalefa Thulare	Snr Technician Project Engineer NW
Morake Maboane	Project Management
Sandy Nxumalo	Manager Telecoms Network O&FS
Vossie Smit	Ops and FS NW
Thabo Morule	Manager Regional Network
Titus Nematswerani	Snr Supervisor Tech Technician NW
Tlokotsi Montsho	Snr Supervisor Tech Technician NW

Revisions

Date	Rev.	Compiler	Remarks
July 2024	7	Mojalefa Thulare	Project Planner

Development Team

The following people were involved in the development of this document:

- Mojalefa Thulare

Acknowledgements

- Marius Groenewald
- Vossie Smit
- Karabo Taunyane
- Wayne Pringle
- Khantse Mokhele

CONTROLLED DISCLOSURE

Appendix A – Annexure

- **Factory Checklist**
- **Generator Test Sheet**
- **Quality Control Snag List**
- **Test Bay Checklist**

CONTROLLED DISCLOSURE

Factory Checklist

Project Number:	
Contracts Engineer:	
Site:	

	Checklist	Signature	Date
1	Engine - check if correct		
2	Alternator - check if correct		
3	Coupling / Flex plate bolts		
4	Crank Shaft End Float		
5	Engine Mounting Bolts		
6	Alternator Mounting Bolts		
7	AVM Bolts		
8	Mount Heater		
9	Mount Fuel Tank		
10	Mount Water Trap		
11	Mount Electric Fuel Pump		
12	Mount Wing Pump		
13	Mount Sump Drain Pump		
14	Sump Drain Valve		
15	Electronic Governor		
16	Control Panel		
17	Exhaust System		
18	Exhaust System Stand		
19	Fuel Lines		
20	Fire Fuse		
21	Check Water Hose Clamps		
22	Check Fuel Hose Clamps		
23	Check Oil Hose Clamps		
24	Check Air Hose Clamps		
25	Lagging		
26	Battery Stand		
27	Drip Tray		

	Checklist	Signature	Date
28	Radiator Stub Duct		
29	Nalcool and Water		
30	Oil		

The above test checked and verified by:

Full Name	Signature	Date

CONTROLLED DISCLOSURE

Generator Test Sheet

(Factory Altitude 1750m.A.S.L.)

Site:		Project No.:
Represented By:		

Set Size	kVA	kW	V	P.F.	Set No:
Engine Make		Model No.		Serial No.	
Alternator Make		Model No.		Serial No.	
Control Unit Type				Serial No.	

Recorded Load Test Data											
Time In Minutes	Recorded Readings					Rad. Air Temp.		Charge Alt. (Amp)	Water Temp	Engine Oil	
	Volt	Amp	Hz	kW	PF	In	Out			Pressure	Temp
0											
10											
20											
30											
40											
50											
60											
70											

Protection Circuits Tested					
No.	Description	Sign	No.	Description	Sign
1	High Engine Coolant Temperature		11	Faulty Switch Position	
2	Low Oil Pressure		12	Low Water Level	
3	Underspeed		13	Emergency Stop	
4	Overspeed		14		
5	Alternator Abnormal Voltage		15		
6	Overload		16		
7	Overspeed Governor Locked		17		
8	Battery Charger Failure		18		
9	Low Fuel Level		19		
10	Engine Start Failure		20		

CONTROLLED DISCLOSURE

Quality Control Snag List

Site:	
Project No.	
Contracts Engineer	

Item	Description	Rectified	
		Y	N
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

	Full Name	Signature	Date
List Compiled By:			
List Issued To:			
Date Issued:			
List Received By:			
Date Received:			
Photographs Attached		Y	N

Additional Comments

CONTROLLED DISCLOSURE

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Test Bay Checklist

Project No.: _____

Site: _____

Date: _____

1	Confirm that the correct product drawings are used		
2	Check quality manufactured		
3	Confirm ratings to be tested		
4	Check water level		
5	Add inhibitor to cooling system where applicable (10% anti-freeze by volume)		
6	Check oil level (on maximum mark)		
7	Adjust oil make-up tank		
8	Check all gate valves		
9	Tighten all hose clamps		
10	Check "V" belt tension		
11	Check magnetic pickup locknut and plugs		
12	Check heater connections		
13	Adjust heater thermostat to 55° C		
14	Check terminal connections on engine control panel and governor.		
15	Check cable connections on battery and starter motor		
16	Check if correct lugs (HD 70) and boots are fitted		
17	Check cable connections on alternator		
18	Check cable connections in control panel		
19	Check terminal connections in control panel		
20	Check dummy load connections		
21	Check auxiliary supply	R/N	Volt
		Y/N	Volt
		B/N	Volt
22	Check mains sensing supply	R/N	Volt
		Y/N	Volt
		B/N	Volt
24	Check mains phase rotation (Cross out appropriate block)	Clockwise	
		Anti-clockwise	
25	Zero all indicating meters		
26	Switch on auxiliary supply circuit breaker		
27	Check operation of engine heater		
28	Check operation of battery charger		
29	Check adjustments of fuel solenoid		
30	Check adjustments (mechanical) of electronic governor		
31	Start engine in override		
32	Check correct functioning of all gauges		
33	Measure and adjust alternator Voltage to nominal value	R/N	Volt
		Y/N	Volt
		B/N	Volt

CONTROLLED DISCLOSURE

A.1 Scope of Work Generator Plinths and Shelter at Hekpoort RS and Britskop RS referre to Document Unique Identifier: 559 – 165698355

A.1.1 Hekpoort RS Generator Foundation

A.1.2 Briskop RS Generator Foundation

A.2 Radio Site ACDC Board

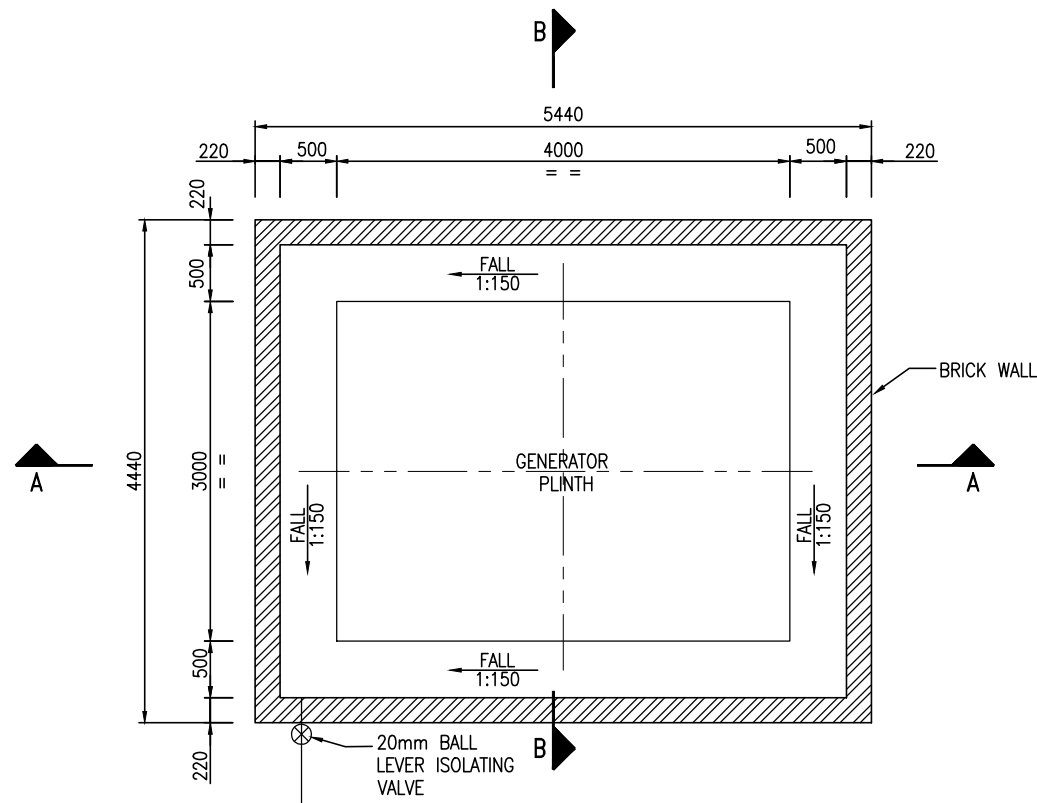
A.3 Specification: 240- 62772907, Specification for stationary diesel generator

A.4 Bitskop RS EAS Connections

A.5 Hekpoort RS EAS Connections

A.6 Sizing Calculator

CONTROLLED DISCLOSURE

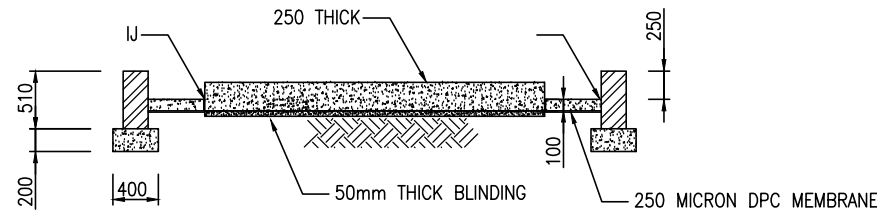


FOUNDATION PLAN
SCALE 1:10
(1 No. OFF)

20mm PVC PIPE
TO BE EXTENDED BEYOND SAFETY
FENCE. LOCATION TO BE CONFIRMED
ON SITE

PRICING PARAMETERS PER PLINTH			
CONCRETE VOLUME m ³	FORMWORK SURFACE AREA m ²	EXCAVATION VOLUME m ³	DOUBLE BRICK WALL m ²
4.4	2.8	5.0	10.0

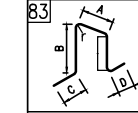
QUANTITIES ARE BASED ON DIMENSIONS OF DESIGN DRAWINGS
NO ALLOWANCES HAVE BEEN MADE FOR MATERIAL WASTAGE OR OVERBREAK



SECTION B
SCALE 1:10

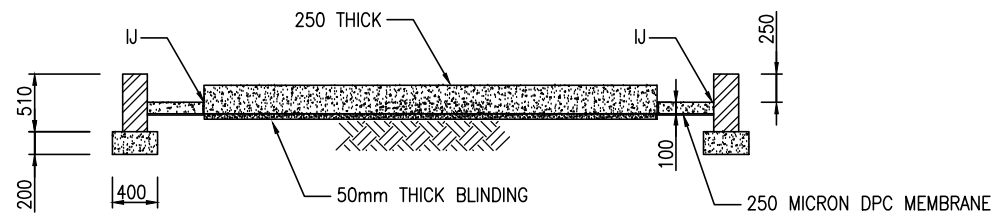
Member	Bar Mark	Type & Size	No. of Mbrs	No. of Bars in Each	Total No.	Length of each Bar mm	Shape Code	A mm	B mm	C mm	D mm
GENERATOR PLINTH	01	R10	1	10	10	890	83	350	130	200	200
DOUBLE LAYER MESH REF. 617, AREA 12m ² TOP AND BOTTOM. COVER TO BE 50mm TOP AND BOTTOM											
SURFACE BED AROUND PLINTH											
SINGLE LAYER - MESH REF. 617, AREA 8m ² . COVER TO BE 50mm TOP AND BOTTOM											

Applicable Shape code to sans 282 & 920

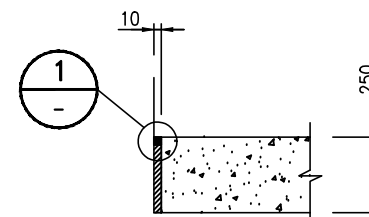


NOTES:

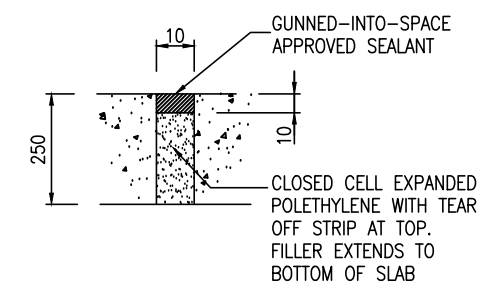
1. CONCRETE WORK TO BE IN ACCORDANCE WITH SANS 1200.
2. CONCRETE STRENGTH AT 28 DAYS = 25MPa.
3. CONCRETE STRENGTH FOR BLINDING LAYER AT 28 DAYS = 15MPa.
4. ALL TO EDGES OF FOUNDATION/PLINTH TO HAVE 20 X 20mm CHAMFER.
5. COMPACTION OF THE BOTTOM OF FOUNDATION SHALL BE COMPACTED TO 93% MOD. AASHTO.
6. OFF SHUTTER FINISH TO UPPER SIDES OF FOUNDATION TO EXTEND TO 100mm BELOW GROUND LEVEL.
7. ONLY STEEL SHUTTERING MAY BE USED.
8. ALL EARTHING TO CONFORM TO PROJECT SPECIFICATIONS.
9. REINFORCEMENT TO HAVE A MIN CONCRETE COVER OF 50mm.
10. ALL REINFORCEMENT SPLICED TO HAVE A LAPPED LENGTH OF 42 X DIAMETER OF REINFORCEMENT BAR.
11. ALL REINFORCEMENT BARS TO BE MEASURED & BENT IN ACCORDANCE TO SANS 1478.
12. NO CONCRETE TO BE POURED WHERE THE AIR TEMPERATURE WILL DROP BELOW 4 DEG CELSIUS IN 8 HOURS AFTER POURING OF CONCRETE UNLESS A SUITABLE APPROVED ADDITIVE IS ADDED TO THE CONCRETE MIX.



SECTION A
SCALE 1:10



ISOLATION JOINT (IJ) DETAIL AROUND PLINTHS AND BETWEEN SLAB AND WALL
SCALE 1:NTS



DETAIL 1
SCALE 1:NTS

REV	DATE	BY	CHKD	INDEX REF / INDEX VERW	INDEX REF / INDEX VERW	REFERENCE DRAWINGS
1	SD Jul 25					
0	SD Feb 25					

GENERAL REVISION
FIRST ISSUE / EERSTE UITREIKING

DRG. TEK. REGISTER

CHD. NAGES

SD MAR 2024

SB MAR 2024

AS_SHOWN

APPROVED
S_DUBAZANA

GOEDGEKEUR

06.02.2025

BRITSKOP
GENERATOR PLINTH

0.53/GEN BRI

REV 1

THIS DRAWING HAS BEEN CREATED ON A C.A.D. SYSTEM AND ANY AMENDMENT TO THE DRAWING MUST BE EFFECTED ONLY ON THE C.A.D. SYSTEM.

Specification: 240-, SPECIFICATION FOR STATIONARY DIESEL GENERATORS

ITEM	DESCRIPTION	SCHEDULE A	Unit	Mobile Diesel Generator	
				SCHEDULE B	Reference
AB.0.1	Local Agent Representation required	Yes / No	Yes (Provide Details)		
AB.0.2	Number of Years local representative exists in South Africa	Years	XXX		
AB.0.3	Supply Reference list with installations	Yes / No	Yes		
AB.0.4	Compliance with SANS (ISO) 9001:2008 required	Yes/No	Yes		
3	REQUIREMENTS				
3.1	General				
a)	Comply with requirements of SANS 8528	SANS 8528			
b)	Order of precedence for deviations	As specified			
c)	Vibrations and noise	SANS 60034 and BS 5514-5			
d)	Compliance to OHSAct	Yes - as specified			
3.2	Application and operating philosophy				
a)	Application - sites	Tellecomms Radio stations			
b)	Installation configuration	Fixed			
c)	Primary application	Extended backup			
d)	Synchronised generator	No			
e)	AC Generating sets	Yes - as specified			
3.3	Site Conditions				
a)	Site location	Land Use Inland			
b)	Information	As specified			
c)	Location of generator	Outside Installation with Protection			
d)	Information	As specified			
e)	1) Minimum ambient temperature	-10	°C		
	2) Maximum ambient temperature	50			
	3) Altitude	1700	m		
	4) Humidity	30 - 80	%		
	5) Air quality (dust or sand)	Dust			
	6) Marine environment	No			
	7) Shock and imposed vibration	No			
	8) Chemical pollution	No			
	9) Radiation	No			
	10) Cooling water/liquid	N/A			
3.4	Reliability				
a)	Expected operating life	35	yrs		
b)	Expected operating life (Engine running hours at rated loading)	15000	hrs		
c)	Information	Yes - as specified			
3.5	Maintainability				
a)	Low maintenance	Yes			
b)	Ergonomics	Yes - as specified			
c)	Modular assemblies	Yes - as specified			
d)	Built-in test facilities	Yes - as specified	°C		
e)	Component condition monitoring and alarming	Yes - as specified			
f)	Spares and parts availability	Yes - as specified			
g)	Warranty	2	yrs		
3.6	System definition				
3.6.1	Diesel Engine				
3.6.1.1	General				
a)	Diesel Engine Type	Diesel fuelled Cold start Water cooled			
b,c	Specific Fuel / Oil consumption - ISO 3046-1	Yes - as specified			
3.6.1.2	Rating				
a)	Performance Class	Class G2			
b)	Duty type	S1			
c)	Sizing input criteria:				
	System voltage	400	V		
	Highest single phase load current (by measurement or design)	60	A		
	Power factor (by measurement or design)	0.764	Cosφ/pf		
	THD current distortion	20			
d)	Calculated minimum required output power/alternator	59.0	kVA		
d)	Calculated minimum required output power/alternator	47.2	kW		
e)-f)	Engine rating	Specify (Rated for calculated alternator size and load requirements)	kW		
g)	Start-up time	Specify	s		
h)	Ability to deliver full load	As specified			
i)	De-rating in accordance with ISO 3046-1	As specified			
j)	Supply altitude related de-rating graphs	Yes - as specified			
k)	Engine performance classification - SANS 8528-1	Emergency Standby Power (ESP)			
l)	Mounting type	Fully Resilient			
m)	Diesel Generator (DG) operating under varying pf's (0.8 - 1)	Yes - as specified			
n)	DG single step load handling ability (≥ 50%)	Yes - as specified			
o)	DG single step load handling ability (110%)	N/A			
p)	Transient responses	Yes - as specified			
q)	Voltage and frequency deviation observed for m) - n)	Specify			
3.6.1.3	Governor				
a)	Mechanical/Electronic governor	Mechanical/Electronic			
b)	PI or PID	Specify			
3.6.1.4	Speed - 1500 rpm preferred	Specify	rpm		
3.6.1.5	Emissions				
	Noise at 1 m	85	dbA		
3.6.2	Alternator				
3.6.2.1	Type				
a)	Brushless type	As specified SANS 60034-1.8.9 + SANS 8528-3			

b)	Duty Type	S1		
3.6.2.2	Excitation			
a-b)	Permanent magnet /AVR	Both		
3.6.2.3	Heaters			
a-b)		Yes - as specified		
c)	Heater Power requirements	Specify		
3.6.2.4	Power output			
a)	Required output power	59.0	kVA	
	Power factor	0.8		
b)	Short circuit rating	Specify	kA	
c)	Alternator efficiencies	Yes - as specified		
d)	Continuous current capabilities and the regulation percentages	Specify		
3.6.2.5	Loading			
a)	Starting sequence and load schedules	Not available		
b)	Load types	As specified		
3.6.2.6	Voltage and frequency			
	Base Frequency	50	Hz	
	Continuous frequency operating range	48.5 to 51.5	Hz	
	Frequency deviation not more than 10 minute per incident	48 to 52	Hz	XXXXXXXXXXXXXXXX
	Frequency deviation not more than 1 minute per incident	47.5 to 52.5	Hz	
a)	Total Harmonic Distortion (THD) of HV side Voltage and % even harmonics		% / %	
	Adjustment Range on terminal voltage	±2.5	%	
	Adjustment range of terminal frequency	±1.5	%	
	Waveform deviation factor limit	<10	%	
	Total Harmonic Distortion relative to the fundamental	<5	%	
	Percentage of any one harmonic relative to the fundamental	<3	%	
b) - c)	Output performance	As specified		
3.6.2.6	Type of construction			
a)	Alternator cooling	Air-cooled		
b)	Alternator insulation class	H		
	Temperature rise	B		
3.6.3	Control, monitoring, alarms, indications and switchgear			
3.6.3.1	General			
a)	Electrically fail safe	Comply		
b)	Powered from DC	Comply		
c)	Operate on Alarm-only and Alarm-Shut down	Comply		
d)	Time and dat estamped	Comply		
3.6.3.2	Control panel controls (with synchronising capability)	No		
a)	Local control functions	No		
b)	Control panel functions	No		
c)	auto-synchronizer	No		
d)	manual synchronizer	No		
3.6.3.3	Control panel controls (without synchronising capability)			
a)	Local control functions	As specified		
b)	Control panel functions	Comply		
3.6.3.4	Control panel features			
a) 1)	Analogue Alternating Current (AC) Metering panel	No		
a) 2)	Adjustments	Yes - as specified		
a) 3)	Time/date stamped events	Yes - as specified		
a) 4)	Fault Present Indication - LED lamp	Yes - as specified		
a) 5)	Exersize switch	No		
a) 6)	Fault reset switch	Yes - as specified		
b) 1)	Emergency push button	Yes - as specified		
b) 2)	Mode selector switch	No		
3.6.3.5	Remote Control System interface (with synchronising capability)			
a)	Remote inputs	No		
b)	Remote outputs	No		
c)	Analogue and digutal inputs and outputs	No		
		No		
3.6.3.6	Remote Control System interface (without synchronising)			
a)	Remote inputs	No		
b)	Remote outputs	No		
c)	Analogue and digutal inputs and outputs	No		
		No		
3.6.3.7	Diesel generator local control panel indications			
a)	Indications	Yes - as specified		
3.6.3.8	Diesel generator annunciator alarms			
a)	Alarm list	Minimum items 1, 9, from standard applicable and following indications: Generator running Load on generator		
b)	GSM alarms	No		
3.6.3.9	Safety features			
a) 1)	Fail-safe engine stop solenoid	Yes - as specified		
a) 2)	Emergency stop push-button on the engine	No		
a) 3)	Emergency stop push-button on the control panel	Yes - as specified		
a) 4)	Remote emergency shutdown capability	No		
a) 5)	Over speed protection	Yes - as specified		
a) 6)	DG No load rundown functionality	Yes - as specified		
3.6.3.10	Control system functionality			
a)	Emergency stop	Yes - as specified		
b)	Automatic Voltage Regulator (AVR)	Yes - as specified		
c)	Control philosophy	Yes - as specified See URS		
3.6.3.11	Alarms and indications			
a)	Latch indication	Yes - as specified		
b)	Lamp/LED/Display	Yes - as specified		
c)	Reset button	Yes - as specified		
d)	Lamp test	Yes - as specified		
e)	Output contacts and event logs	No duplicate required		
3.6.3.12	Assemblies, Terminals, wiring and cabling	Yes - as specified		
3.6.3.13	Automatic Transfer switches			
a)-c)	ATS performance	Yes - as specified. As per URS.		
d)	Location of ATS	Internal		
3.6.3.14	Automatic Synchronizing Systems			

a)-f)	Synchronizing	No		
g)	Periodic testing	No		
h)	Operating, Control and Protection Philosophy	No		
3.6.4	Auxiliaries			
3.6.4.1	Cooling			
a)	Radiator	Yes - as specified		
b)	Canopy/room cooling	Yes - as specified		
c)	Water jacket heaters water system isolation	Yes - as specified		
d)	Water jacket heaters electrical isolation	Yes - as specified		
e)	Radiator shall be monitored for "low water level" alarm	Yes - as specified		
3.6.4.2	Starting			
a)	Starting method	Electric		
b)	Electric motor start philosophy	Method 1		
c)	Start failure	Yes - as specified		
3.6.4.3	Batteries			
a)	Battery type	Nical-Cadmium		
b) - c)	Battery performance	Yes - as specified		
d) - g)	Battery charging and system	Yes - as specified g - not required		
3.6.4.4	Battery charger			
a)-d)	Performance	Yes - as specified		
3.6.5	Fuel system			
3.6.5.1	General			
a)	Day tank	Yes - as specified		
a)	Bulk Tank	No		
b)	Run time	12 hrs		
c)	compliance to legislation	Yes - as specified		
d)	Fuel line materials	Yes - as specified		
e) h)	Water trap	Yes - as specified		
3.6.5.2	Fuel injection			
a)	Common rail injection?	Yes - as specified		
b)	Fuel system priming	Yes - as specified		
c)	Fuel system cooling	Yes - as specified		
d)	Fail-safe solenoid	Yes - as specified		
e)	Shutdown valve	Yes - as specified		
3.6.5.3	Day Fuel Tank			
a)	Position	Yes - as specified		
b)	Construction	Yes - as specified		
c)	Run time	12 hrs		
d)	Leak detection	Yes - as specified		
e)-f)	Fuel level alarms and shutdown	Yes - as specified		
g)	Gravity feed from Bulk tank	No		
h)	Fail safe fuel transfer system	No		
i)	Overfilling protection	No		
j)	Construction	No		
k)	Inlet and valve	No		
l)	Overflow	No		
m)	Inspection hole	Yes - as specified		
n)	Limitation	Yes - as specified		
3.6.5.4	Bulk Fuel Tank			
a)	Alarm levels	No		
3.6.5.5	Diesel fuel	Yes - as specified		
3.6.6	Lubrication			
a) - b)	Oil pressure sensor and gauge	Yes - as specified		
c) - d)	Oil filter	Yes - as specified		
e)	Other bearing types	Yes - as specified		
f)	Oil drain pump	No		
g)	Oil priming pump	No		
h)	Oil label	Yes - as specified		
i)	Auxiliary oil cooler/heater	No		
j)	Crank case breather exhaust	Yes - as specified		
3.6.7	Aspiration and cooling air intake			
a)	Dry type air filter	Yes - as specified		
b) - c)	Minimize intake of dust, vermin, etc.	Yes - as specified		
d)	Water drainage possible	Yes - as specified		
e)	Easy maintenance	Yes - as specified		
f)	Differential pressure high alarm	No		
g)	Minimise intake of exhaust gasses and hot air	Yes - as specified		
3.6.8	Earthing			
3.6.8.1	General			
a)	Earth Fault protection	Yes - as specified		
b)	Earth conductors	Yes - as specified		
c)	Indepandant earthing	Yes - as specified		
d)	Earth Mat provision	Yes - as specified		
e)	Earthing philosophy	Yes - as specified		
3.6.8.2	Generator neutral earthing			
a)-b)	Information	XXXXXX		
c)	Neutral earthing method	Solid earthing		
d)	Generator earth fault protection	Yes - as specified		
3.6.8.3	Earth and bonding of components			
a-c)	Earth conductor	25	mm ²	
d)	Battery negative earthing	Yes - as specified		
e)	DG frame earthed	Yes - as specified		
f)	Electrolytic corrosion prevention	Yes - as specified		
g)	Tank earthed	Yes - as specified		
h)-i)	Metal work	Yes - as specified		
3.6.8.4	Enclosures			
a)	Enclosure IP rating	IP 33		
b-f)	Doors and bonding	Yes - as specified		
g-h)	Earth connections	Yes - as specified		
i - j)	Gland plates	Yes - as specified		
k)	Bonding	Yes - as specified		
3.6.9	Mechanical build			
3.6.9.1	Coupling	Specify		
3.6.9.2	Base frames	Yes - as specified		
3.6.9.3	Vibration damping	Specify		
3.6.9.4	Exhaust system			
a) - g)	Design and positioning	Yes - as specified		

3	3A	
	3B	
4	4A	
	4B	

Digital Controls		
D/O	Kr#	Inputs
1	7A	Alarm Arm/Disarm
	7B	
2	8A	Electric Fence Arm/Disarm
	8B	
3	9A	Gate Open/Close
	9B	
4	10A	Configurable
	10B	

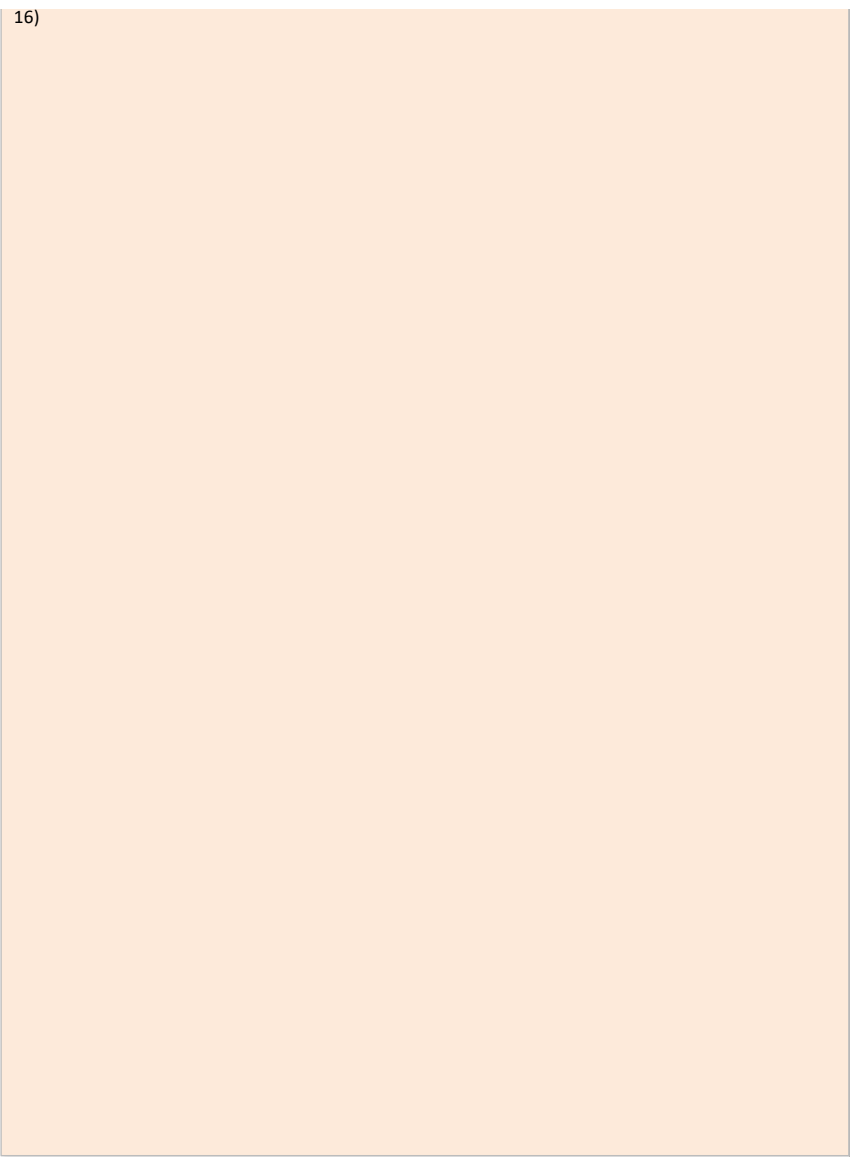
x	
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32 Digital Input no 1

Tick

In	Kr#	Inputs
33	1A	Indoor sensor Radio room
34	1B	Indoor sensor Aux. room
35	2A	Indoor sensor Batt. room
36	2B	Outdoor sensor 1
37	3A	Outdoor sensor 2
38	3B	Outdoor sensor 3/Outdoor sensor 5
39	4A	Outdoor sensor 4
40	4B	Alarm status
41	5A	Smoke detector Radio room
42	5B	Smoke detector Batt and Aux. room
43	6A	Burglary in Progress
44	6B	Door Alarms
45	7A	Inverter power failure
46	7B	Electric Fence intruder
47	8A	Gate status
48	8B	Configurable
49	1A	Configurable
50	1B	Configurable
51	2A	Configurable
52	2B	Configurable
53	3A	Configurable
54	3B	Configurable
55	4A	Configurable
56	4B	Configurable
57	5A	Configurable
58	5B	Configurable
59	6A	Configurable
60	6B	Configurable
61	7A	Configurable
62	7B	Configurable
63	8A	Configurable
64	8B	Configurable

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1	1A	
	1B	
2	2A	
	2B	
3	3A	
	3B	
4	4A	
	4B	

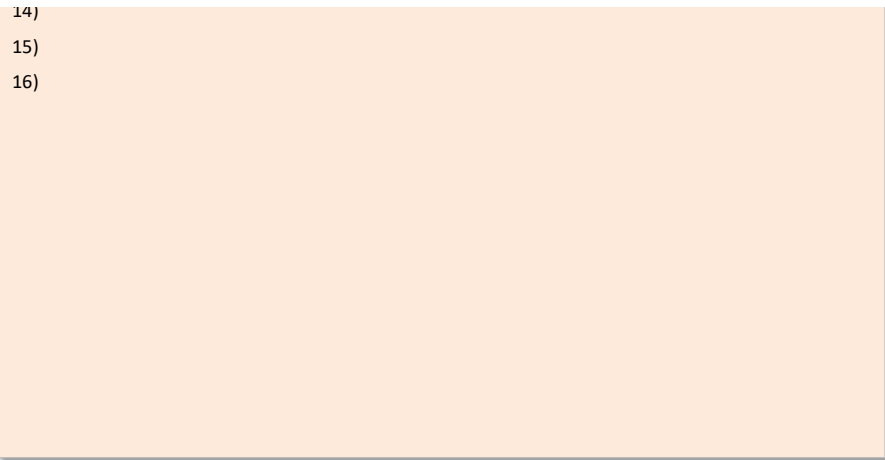
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15)

16)

Digital Controls		
D/O	Kr#	Inputs
1	7A	<i>Alarm Arm/Disarm</i>
	7B	
2	8A	<i>Electric Fence Arm/Disarm</i>
	8B	
3	9A	<i>Gate Open/Close</i>
	9B	
4	10A	<i>Configurable</i>
	10B	

x
x
x



SITE POWER REQUIREMENTS			
Available	V line	400 V	line voltage
	I line	84 A	highest line load demand
	CosΦ	0,8 pF	power factor
Calculate	S1=	58,2 kVA	Apparent power
	P=	46,6 kW	True Power
	Q1=	34,9 kVAr	Reactive component
	Site actual/design pF:	0,7 pF	
	Required kVA power to produce (S2)	66,5 kVA	
	P=	53,2 kW	
	Q2=	66,5 kVAr	
	Safe operation margin	1,25	Additional 25%
	Performance class	Class G3	Performance impact
	Factor	1,1	
	THD value	20 %THD	Current distortion factor
	Factor	1,05	
	Final alternator sizing	94,0 kVA	
		75,2 kW	

7 Performance classes

Four performance classes are defined in order to cover the various requirements of the systems as follows:

a) Class G1

This applies to generating set applications where the connected loads are such parameters of voltage and frequency need to be specified.

EXAMPLE General-purpose applications (lighting and other simple electrical loads).

b) Class G2

This applies to generating set applications where its voltage characteristics are very similar to the commercial public utility electrical power system with which it operates. When load there may be temporary but acceptable deviations of voltage and frequency.

EXAMPLE Lighting systems, pumps, fans and hoists.

c) Class G3

This applies to applications where the connected equipment makes severe demands on the level of the frequency, voltage and waveform characteristics of the electrical power generating set.

EXAMPLE Telecommunications and thyristor-controlled loads. It should be remembered that thyristor-controlled loads may need special consideration with respect to their effect on generator-voltage.

d) Class G4

This applies to applications where the demands made on the stability and level of the frequency and waveform characteristics of the electrical power supplied by the generating set are severe.

DRAWING SUMMARY

SHEET	TITLE	REVISION STATUS																									
		00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0	DRAWING SUMMARY SHEET	XX																									
1	CHARGER MAIN 1 SCHEMATIC DIAGRAM	XX																									
2	CHARGER 1 CONTROLLER SCHEMATIC	XX																									
3	CHARGER 1 ALARM SCHEMATIC	XX																									
4	CHARGER MAIN 2 SCHEMATIC DIAGRAM	XX																									
5	CHARGER 2 CONTROLLER SCHEMATIC	XX																									
6	CHARGER 2 ALARM SCHEMATIC	XX																									
7	LOAD TRANSFER SCHEMATIC DIAGRAM	XX																									
8	DISTRIBUTION BOARD MAIN 1 DB 1	XX																									
9	DISTRIBUTION BOARD MAIN 1 DB 2	XX																									
10	DISTRIBUTION BOARD MAIN 1 DB 3	XX																									
11	DISTRIBUTION BOARD MAIN 1 DB 4	XX																									
12	DISTRIBUTION BOARD MAIN 2 DB 1	XX																									
13	DISTRIBUTION BOARD MAIN 2 DB 2	XX																									
14	DISTRIBUTION BOARD MAIN 2 DB 3	XX																									
15	DISTRIBUTION BOARD MAIN 2 DB 4	XX																									
16	SYMBOL LEGEND SHEET	XX																									
17	INTER CONNECTION DIAGRAM	XX																									
18	SINGLE LINE DIAGRAM	XX																									
19	GENERAL ARRANGEMENT FRONT VIEW	XX																									
20	GENERAL ARRANGEMENT REAR VIEW	XX																									
21	GENERAL ARRANGEMENT TOP + BOTTOM	XX																									
22	GENERAL ARRANGEMENT LAYOUT	XX																									
23	GENERAL ARRANGEMENT TERMINAL LAYOUT	XX																									

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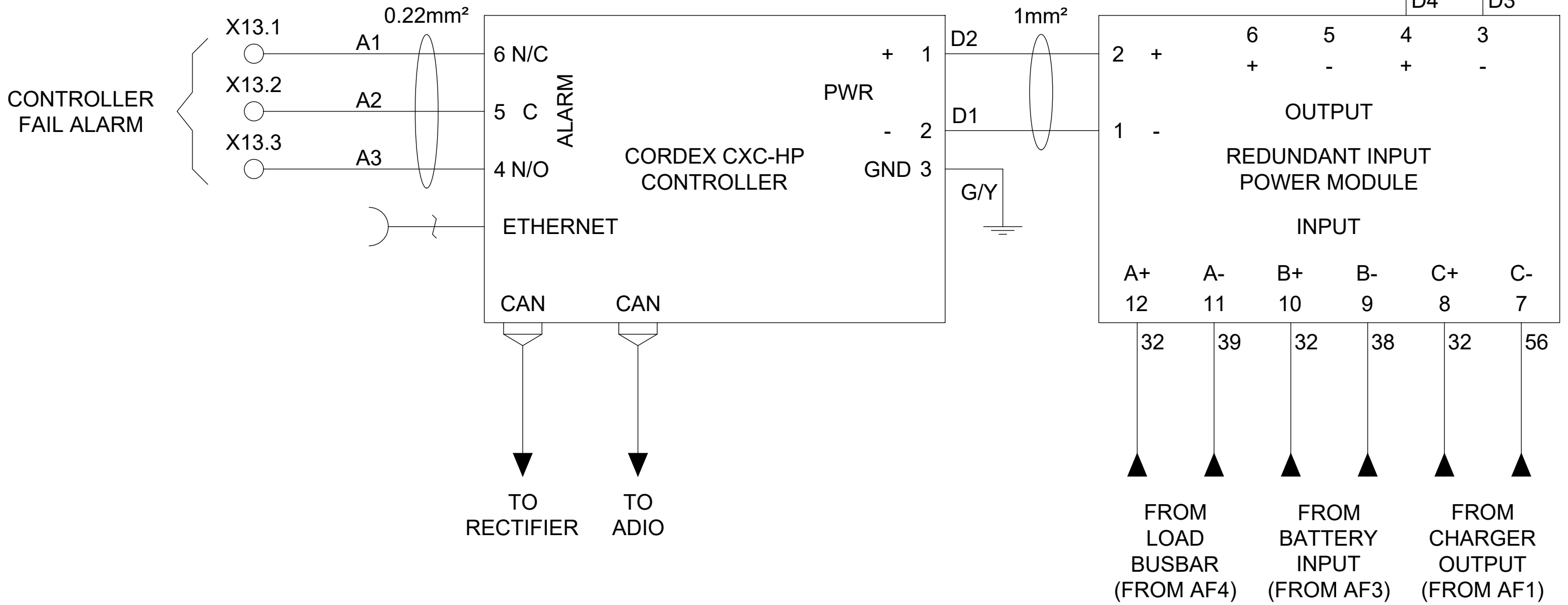


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APPROVED	P.JOUBERT
DATE	28/02/2025

SAP NO 673853 / 3V050600/CE003			
SHEET NUMBER	0	OF	23
TYPE NUMBER	3V050600/CET003		
SERIAL NUMBER	REV. 0		
50V 600A DUAL BATTERY CHARGER + DB			
DRAWING SUMMARY SHEET			

PROJECT APPROVED BY	DESIGN ACCEPTED BY		Eskom Holdings SOC Ltd Reg No 2002/015527/30		
DATE	DATE				
PROJECT CHECKED BY	DESIGN APPROVED BY	 P. Bebwele			
DATE	DATE 20-06-2025				
PROJECT DRAWN BY	DESIGN CHECKED BY	SCALE			
DATE	DATE 20/06/2025				
		SHEET NUMBER	REVISION		
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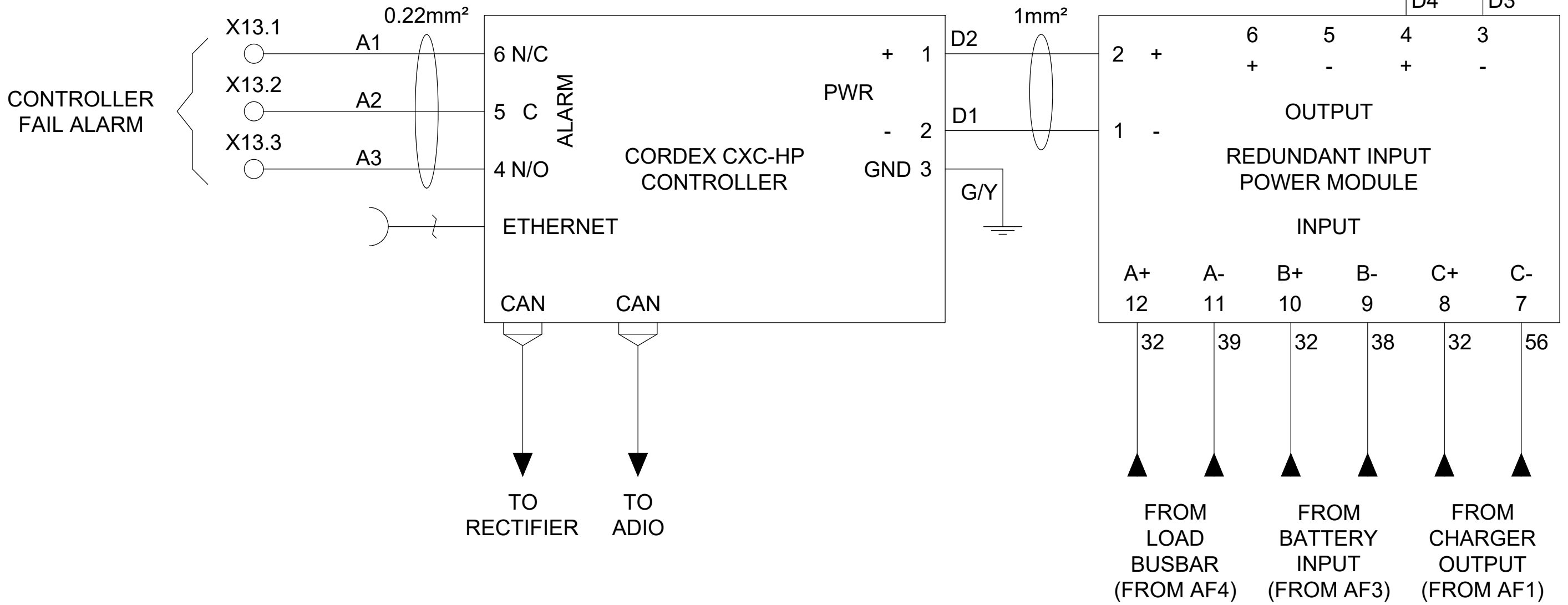
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DATE	DATE 20/06/2025	
SCALE	DESIGN DRAWN BY	DATE

SAP NO 673853 / 3V050600/CE003 SHEET NUMBER: 2 OF 23 SIZE: A3 TYPE NUMBER: 3V050600/CET003 SERIAL NUMBER: REV. 0 50V 600A DUAL BATTERY CHARGER + DB CHARGER 1 CONTROLLER SCHEMATIC DIAGRAM	DRAWN: F.TALJAARD DATE: 28/02/2025 CHECKED: E.TOTH DATE: 28/02/2025 APPROVED: P.JOUBERT DATE: 28/02/2025
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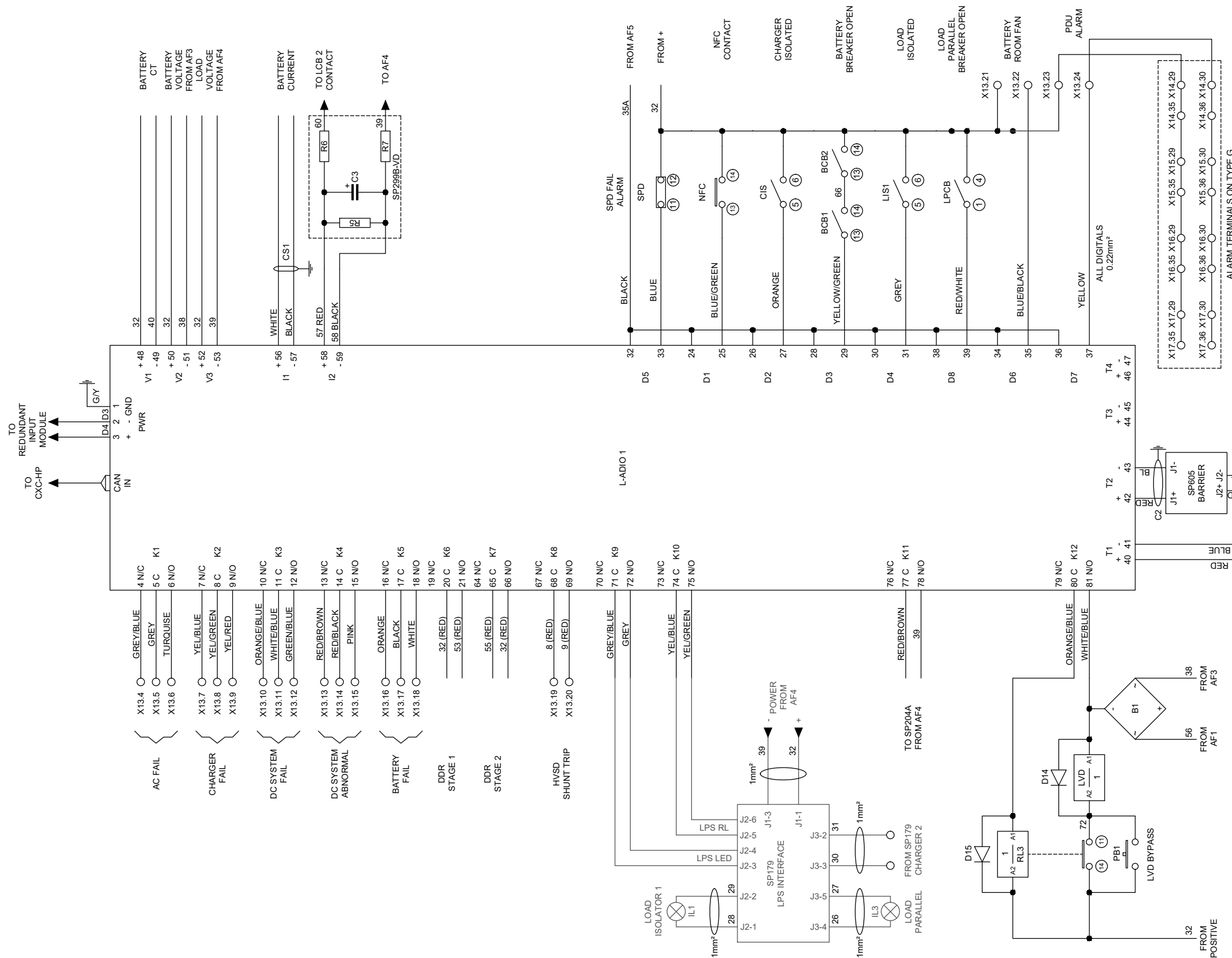
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		DRAWN: F.TALJAARD DATE: 28/02/2025 CHECKED: E.TOTH DATE: 28/02/2025 APPROVED: P.JOUBERT DATE: 28/02/2025	SAP NO 673853 / 3V050600/CE003 SHEET NUMBER: 5 OF 23 SIZE: A3 TYPE NUMBER: 3V050600/CET003 SERIAL NUMBER: 50V 600A DUAL BATTERY CHARGER + DB CHARGER 2 CONTROLLER SCHEMATIC DIAGRAM
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DATE	DATE	
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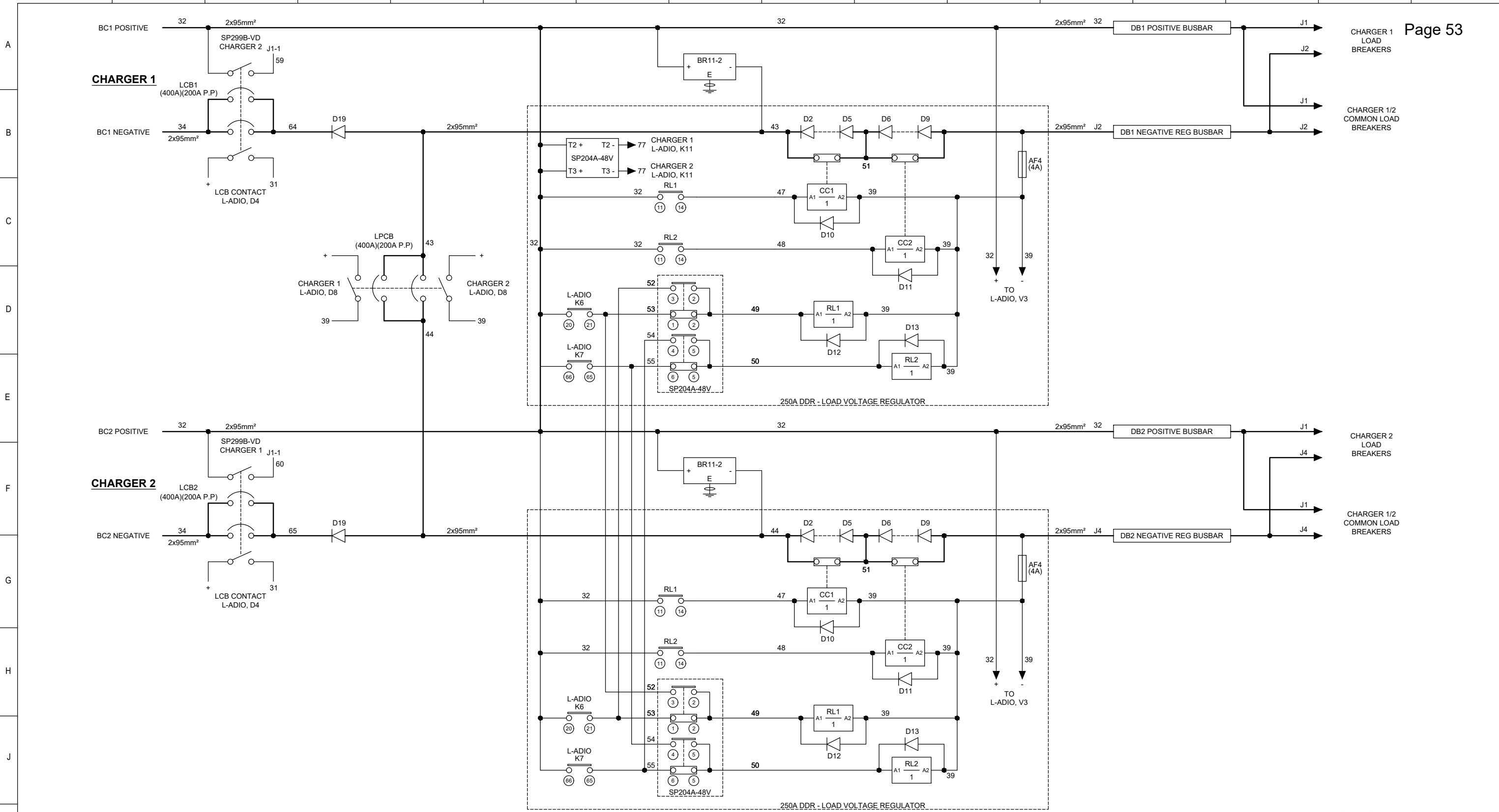
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SHEET NUMBER	6	OF	23	SIZE: A3
TYPE NUMBER:	3V050600/CET003			
SERIAL NUMBER:				
REV.	0			
50V 600A DUAL BATTERY CHARGER + DB CHARGER 2 ALARM SCHEMATIC DIGRAM				

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DATE	DATE 20-06-2025		
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DATE	DATE 20/06/2025		
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		DATE	


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6	0



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DATE	DATE	
SCALE		SHEET NUMBER: 7 REVISION: 0

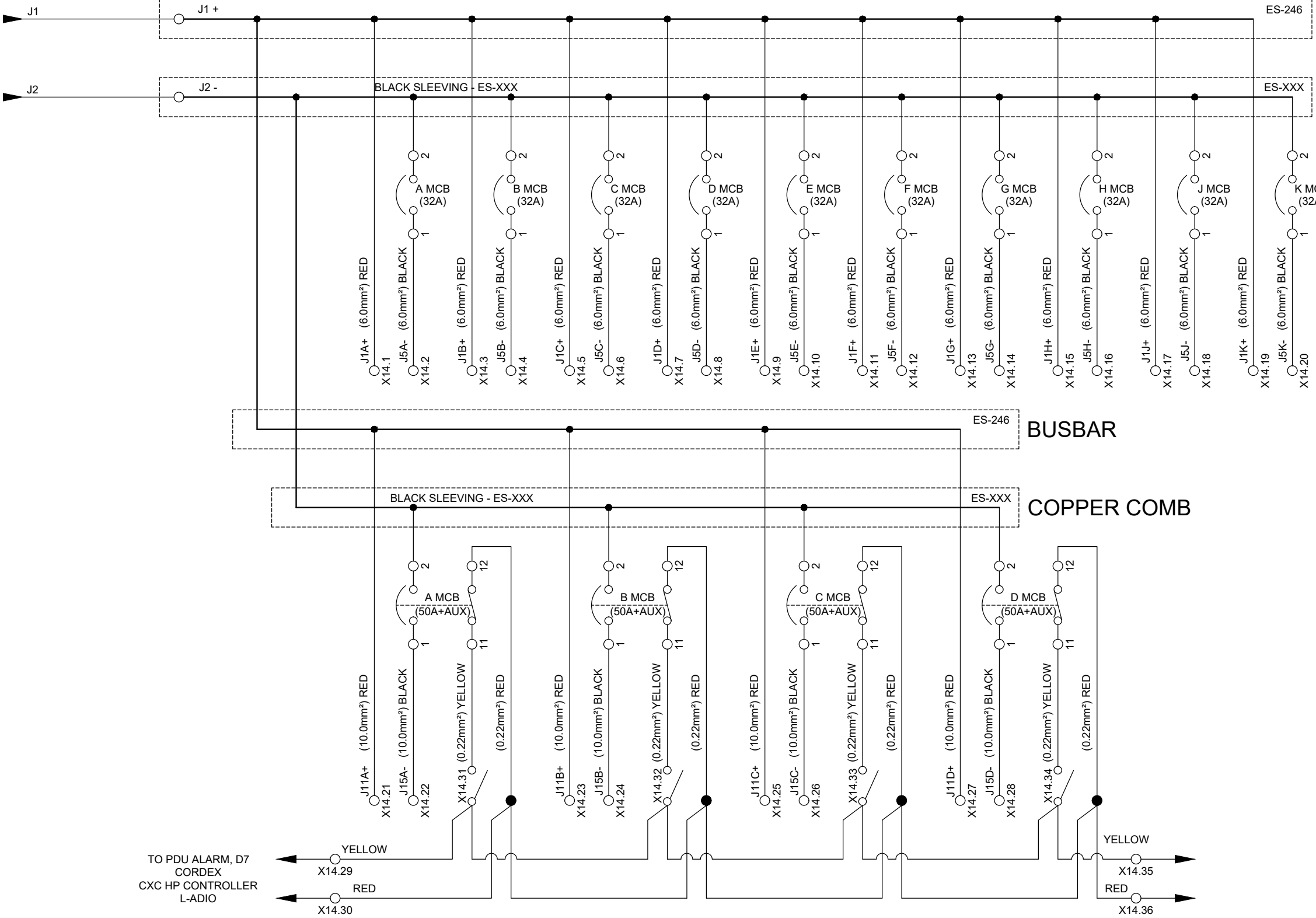
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FROM CHARGER 1 REGULATED LOAD



TO PDU ALARM, D7 CORDEX CXC HP CONTROLLER L-RADIO

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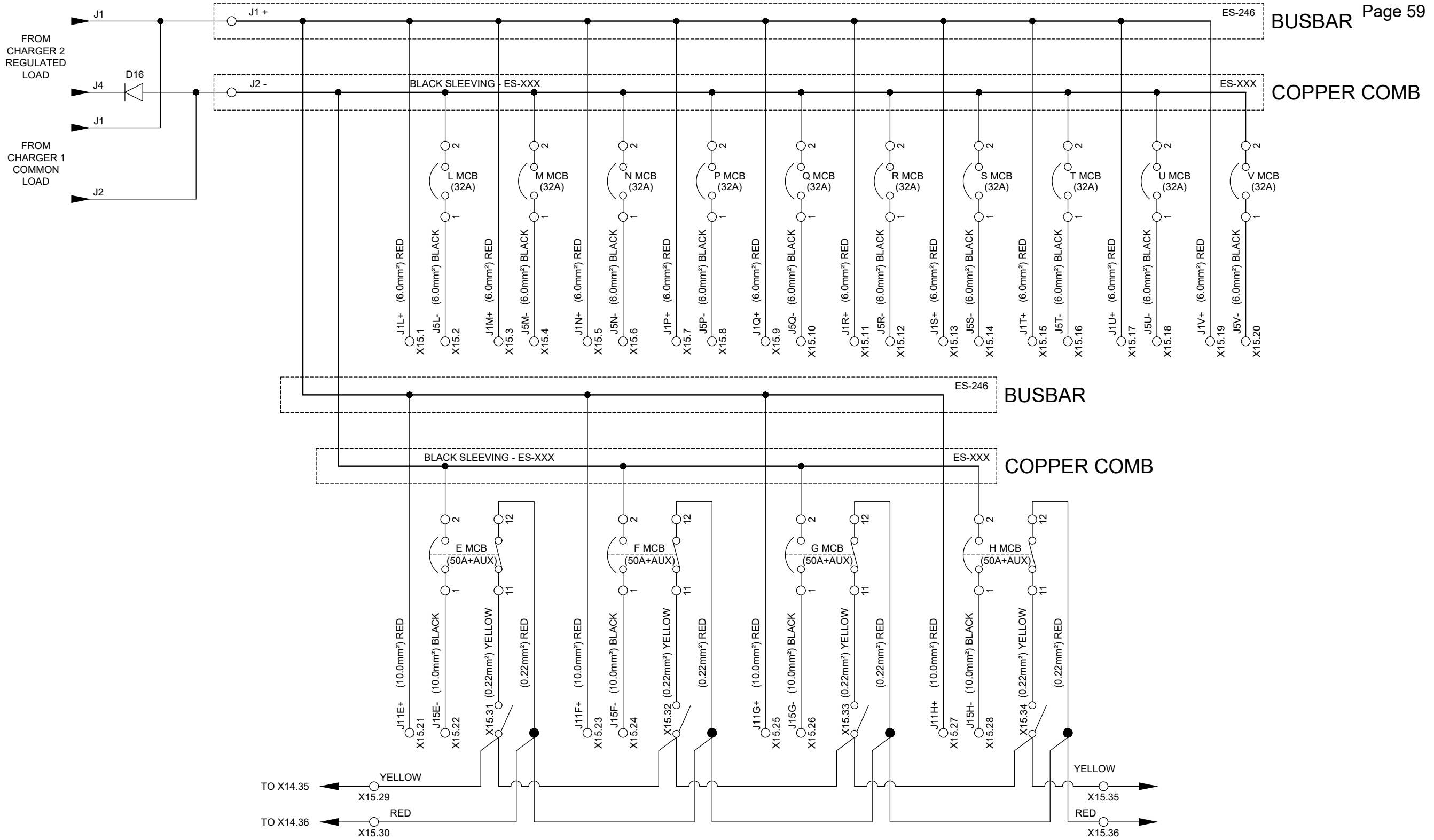
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APPROVED P.JOUBERT
DATE 28/02/2025

SAP NO 673853 / 3V050600/CE003
SHEET NUMBER 8 OF 23 SIZE: A3
TYPE NUMBER: 3V050600/CET003
SERIAL NUMBER:
50V 600A DUAL BATTERY CHARGER + DB
DISTRIBUTION BOARD MAIN 1 DB 1

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	DATE		

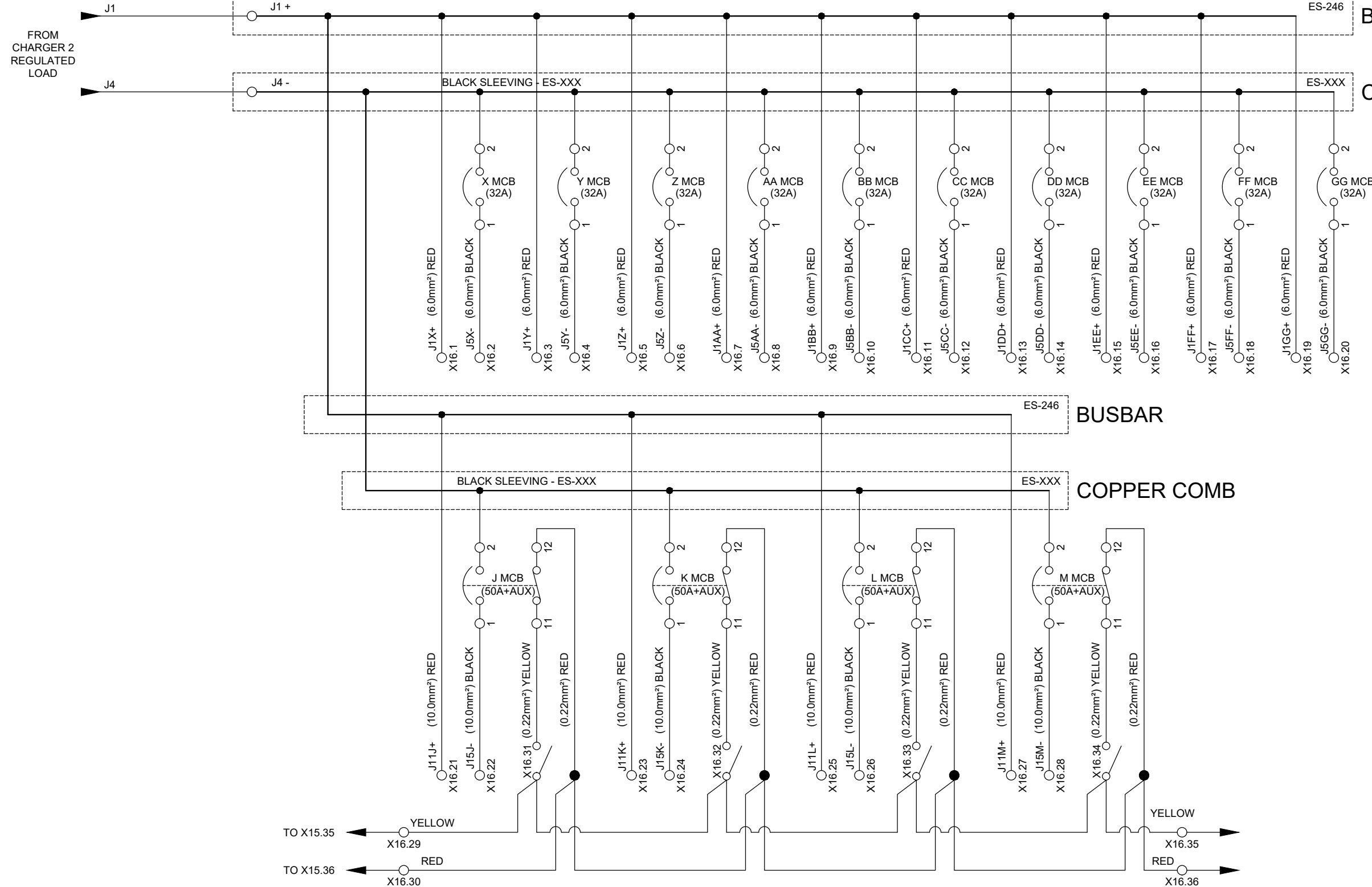
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DATE	28/02/2025	SHEET NUMBER 13 OF 23 SIZE: A3
CHECKED	E.TOTH	TYPE NUMBER: 3V050600/CET003
DATE	28/02/2025	SERIAL NUMBER: REV. 0
APPROVED	P.JOUBERT	50V 600A DUAL BATTERY CHARGER + DB
DATE	28/02/2025	DISTRIBUTION BOARD MAIN 2 DB 2

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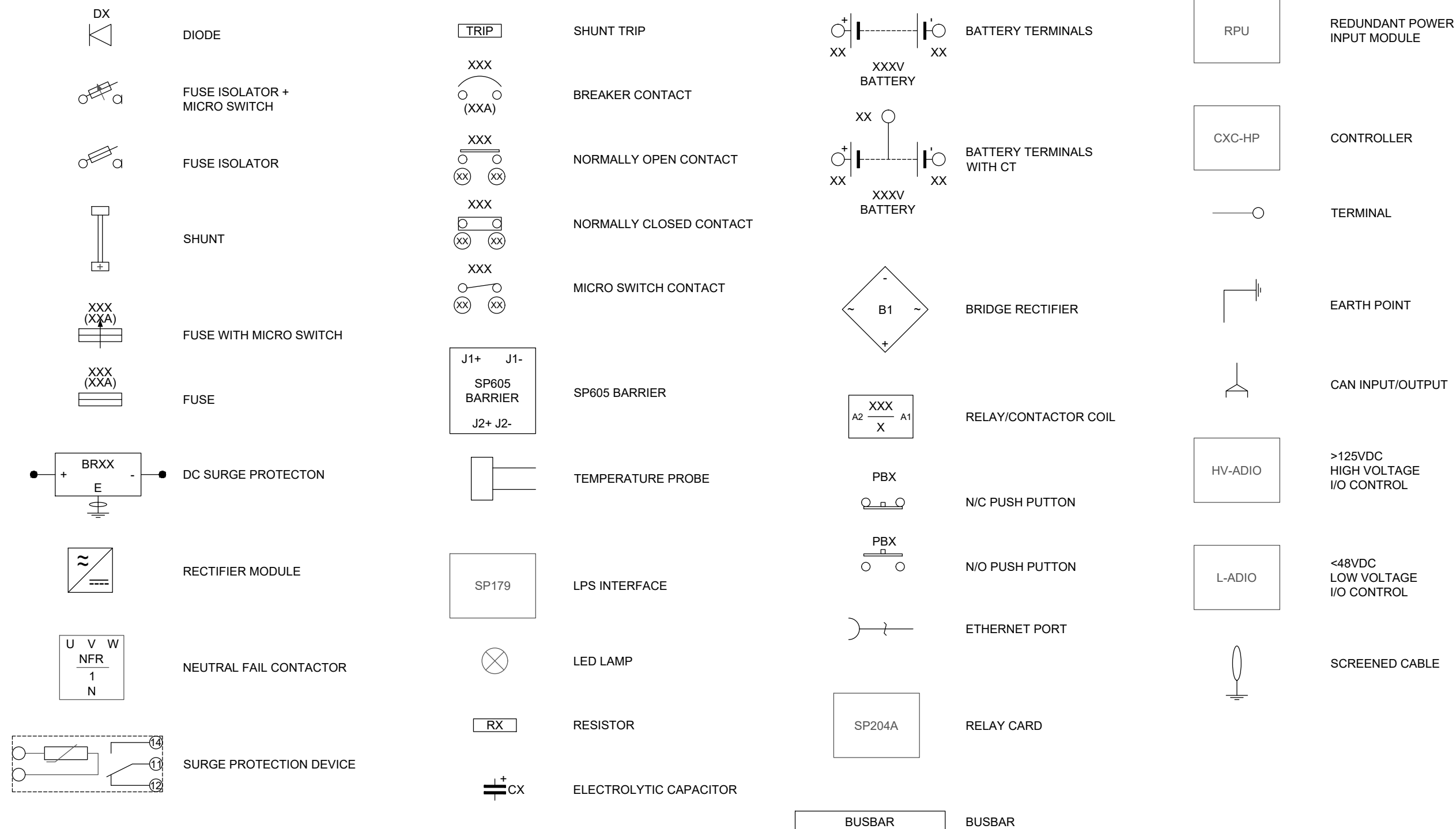
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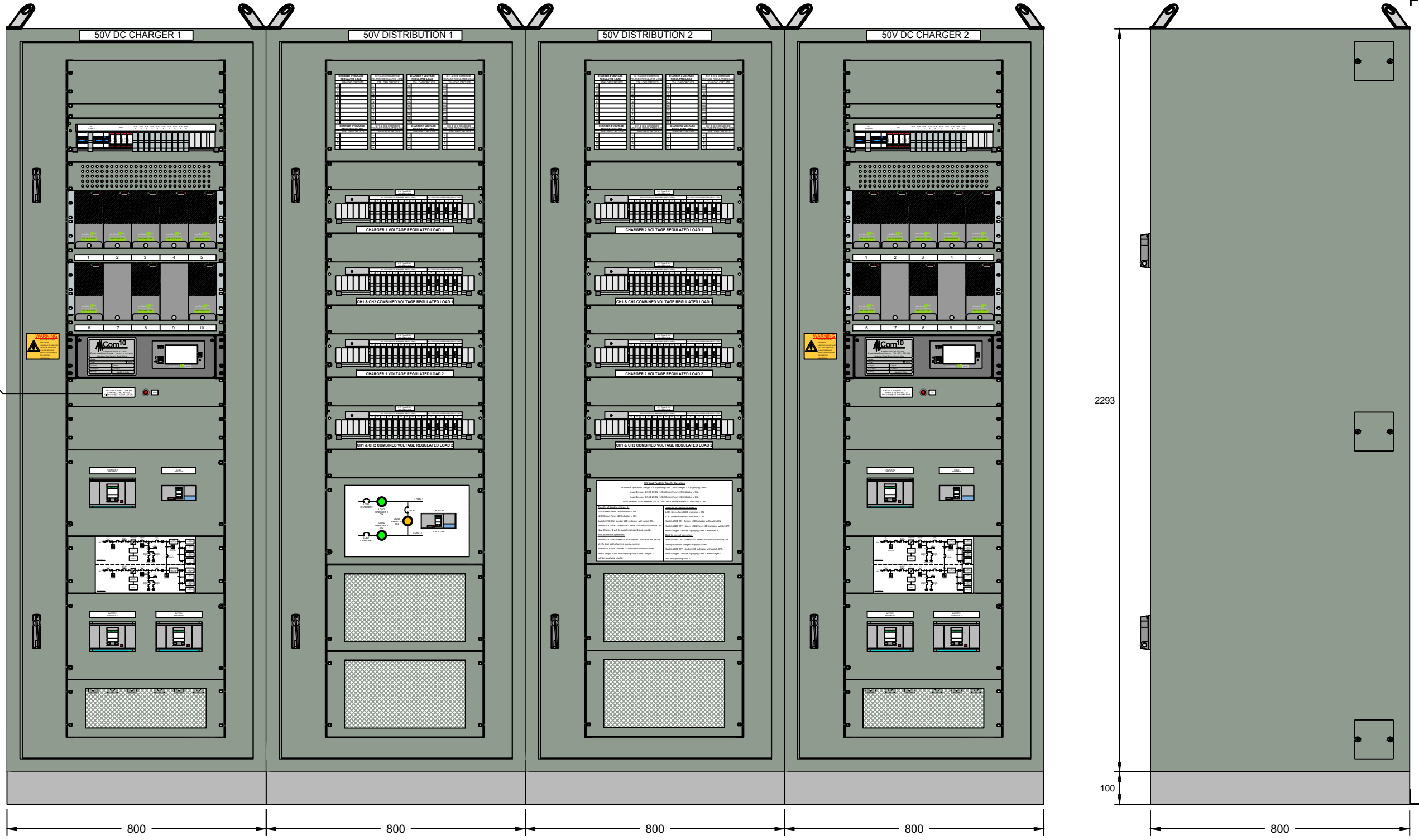

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DATE	28/02/2025	SHEET NUMBER	17 OF 23 SIZE:A3
CHECKED	E.TOTH	TYPE NUMBER:	3V050600/CET003
DATE	28/02/2025	SERIAL NUMBER:	
APPROVED	P.JOUBERT	REV.	0
DATE	28/02/2025	50V 600A DUAL BATTERY CHARGER + DB SYMBOL LEGEND SHEET	

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DATE	DATE	
SCALE	DESIGN DRAWN BY	DATE

SHEET NUMBER	REVISION
17	0



FRONT VIEW

RIGHT SIDE VIEW

CASE DETAIL:

- MATERIAL:** 1.6mm MILD STEEL
- DOOR:** 3.0mm MILD STEEL
- GLAND:** 2.0mm MILD STEEL BLUE ZINC PLATED
- BASE:** 2.0mm MILD STEEL CHANNEL

- COLOUR:** LIGHT GREY G29 (STRUCTURED)
- DFT:** 50uM MINIMUM, 75uM AVERAGE

- IP RATING:** IP20 (HIGHER RATING UPON REQUEST)

REV.	DATE	CHANGED	DESCRIPTION OF REVISION	REV.	DATE	CHANGED	DESCRIPTION OF REVISION

DRAWN	E.TOTH
DATE	28/02/2025
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DATE	28/02/2025
APPROVED	P.JOUBERT
DATE	28/02/2025

SAP NO 673853 / 3V050600/CE003
SHEET NUMBER: 19 OF 23 **SIZE:** A3
TYPE NUMBER: 3V050600/CET003
SERIAL NUMBER: **REV.** 0
50V 600A DUAL BATTERY CHARGER + DB
GENERAL ARRANGEMENT FRONT VIEW

REV.	REVISION DESCRIPTION	BY	CHKD	APP	DATE

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PROJECT CHECKED BY	DESIGN APPROVED BY		
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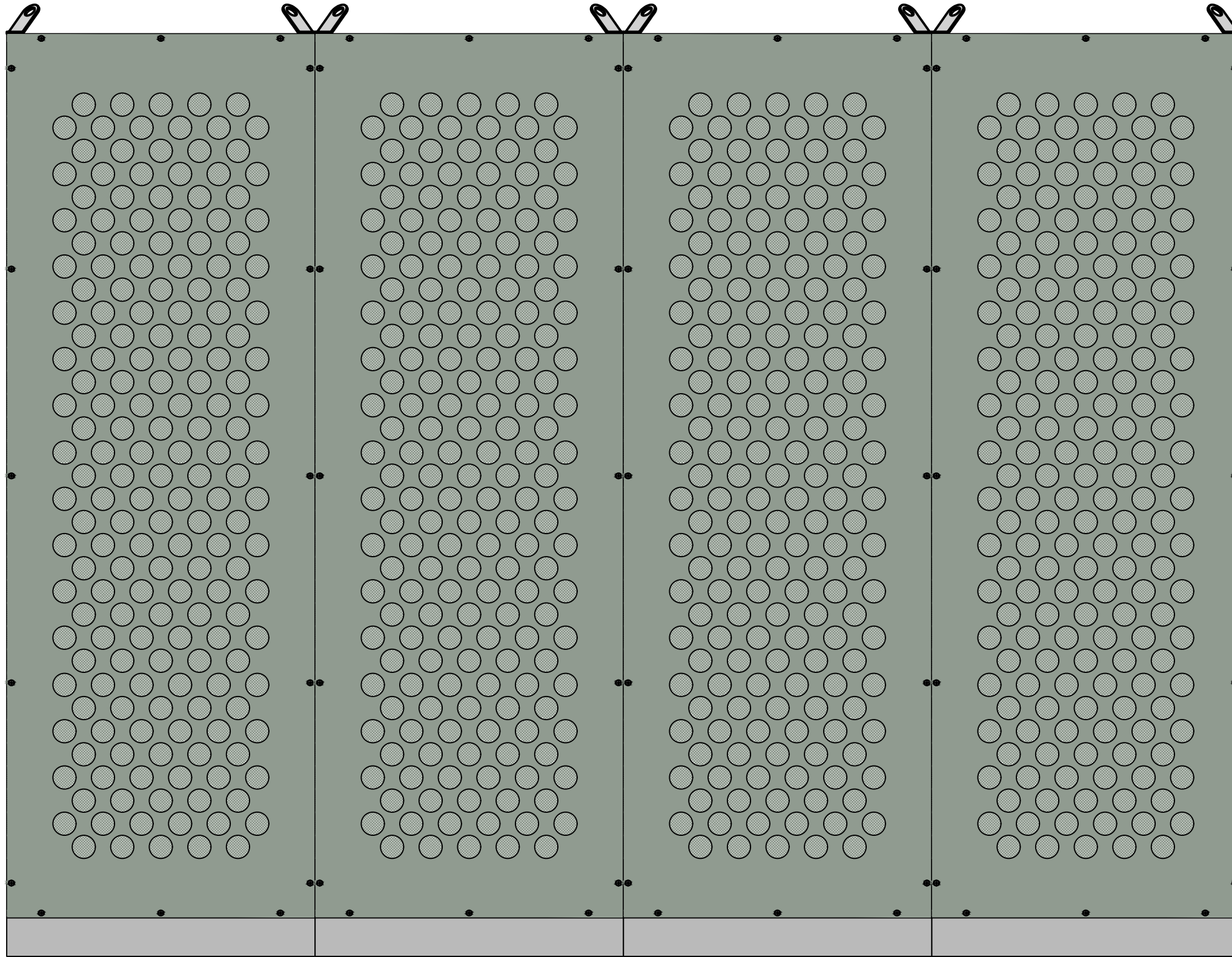
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CASE DETAIL:

MATERIAL: 1.6mm MILD STEEL
DOOR: 3.0mm MILD STEEL
GLAND: 2.0mm MILD STEEL BLUE ZINC PLATED
BASE: 2.0mm MILD STEEL CHANNEL

COLOUR: LIGHT GREY G29 (STRUCTURED)
DFT: 50uM MINIMUM, 75uM AVERAGE

IP RATING: IP20 (HIGHER RATING UPON REQUEST)



BACK VIEW

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DATE	DATE 20/06/2025		
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		DATE	

SAP NO 673853 / 3V050600/CE003		SHEET NUMBER: 20 OF 23	SIZE: A3
DRAWN	E.TOTH	TYPE NUMBER: 3V050600/CET003	
DATE	28/02/2025	SERIAL NUMBER: REV. 0	
CHECKED	F.TALJAARD	50V 600A DUAL BATTERY CHARGER + DB	
DATE	28/02/2025	GENERAL ARRANGEMENT REAR VIEW	
APPROVED	P.JOUBERT		
DATE	28/02/2025		

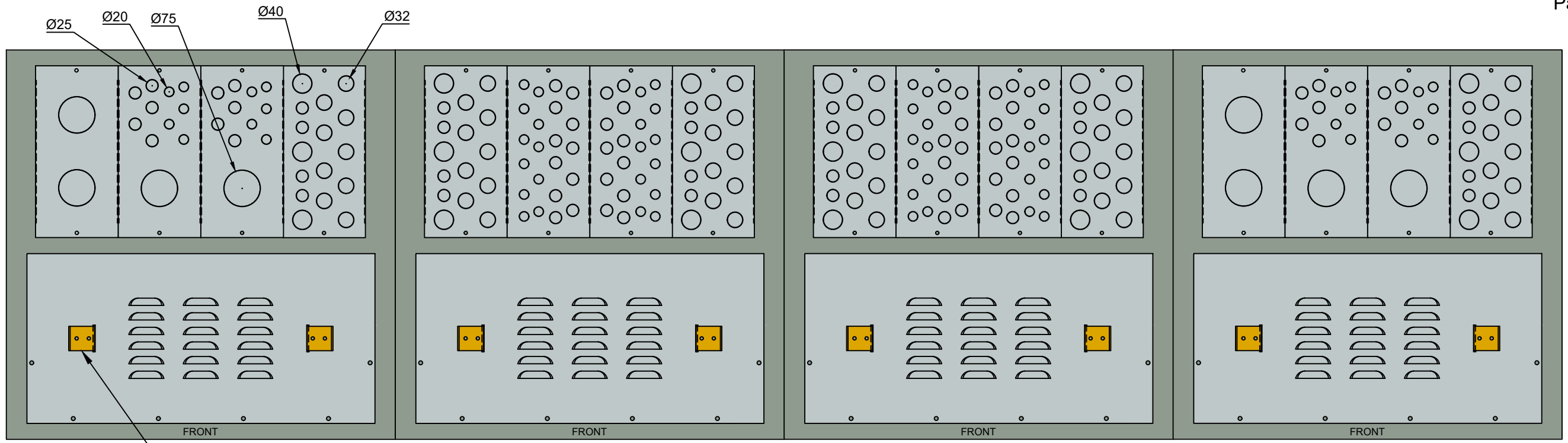
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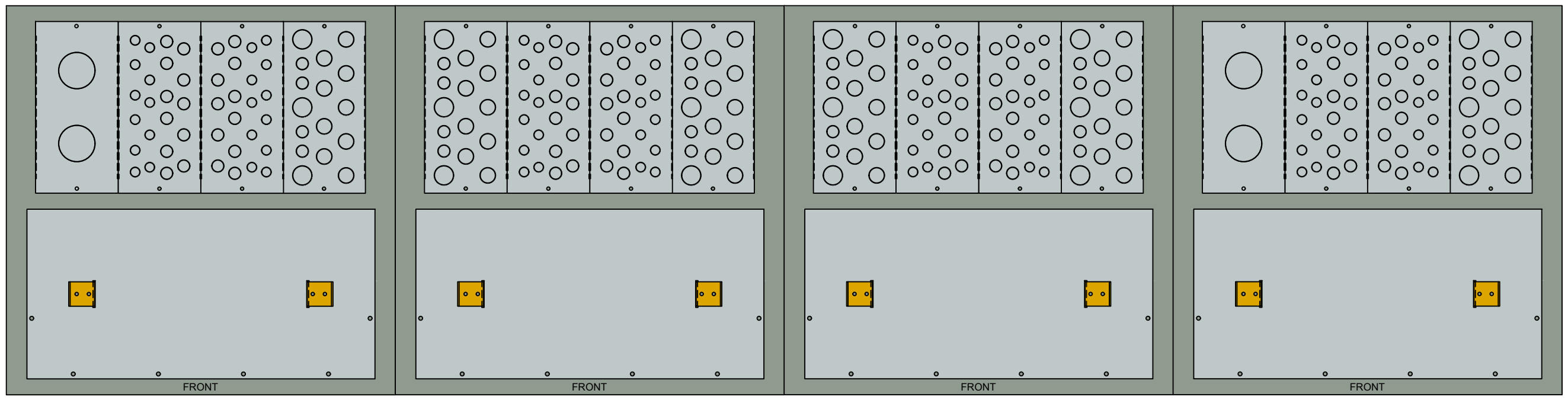
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SHEET NUMBER: 20 REVISION: 0



TOP VIEW

EARTH BAR
M6 HOLES FITTED WITH NUTS
BOLTS, WASHERS & SPRING
WASHERS




BASE VIEW

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PROJECT APPROVED BY	DESIGN ACCEPTED BY	 Eskom Holdings SOC Ltd Reg No 2002/015527/30
DATE	DATE	
PROJECT CHECKED BY	DESIGN APPROVED BY	B. Jonga
DATE	DATE 20-06-2025	
PROJECT DRAWN BY	DESIGN CHECKED BY	P. Bebele
DATE	DATE 20/06/2025	
SCALE		SHEET NUMBER 21
DATE		REVISION 0

REV.	DATE	CHANGED	DESCRIPTION OF REVISION	REV.	DATE	CHANGED	DESCRIPTION OF REVISION

 A Division of ACTOM (PTY) Ltd www.actom.co.za +27 11 397 5316	DRAWN E.TOTH DATE 28/02/2025 CHECKED F.TALJAARD DATE 28/02/2025 APPROVED P.JOUBERT DATE 28/02/2025	SAP NO 673853 / 3V050600/CE003 SHEET NUMBER: 21 OF 23 SIZE:A3 TYPE NUMBER: 3V050600/CET003 SERIAL NUMBER: 50V 600A DUAL BATTERY CHARGER + DB GENERAL ARRANGEMENT TOP + BOTTOM VIEW
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