2021

BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSNINESS DIVISION, BENGALURU
TENDER DOCUMENT

Name: Navit Mahajan

Designation: Dy. Manager

BHEL SBD Bangalore

NOTICE INVITING TENDER

1. BHEL/ SBD (A Govt. of India Enterprise) invites Tender for engaging a Contractor for **"Wiring contract for Hydro Panels (LV switchgear) at SBD CPBG shop floor"** in Malleswaram, Bangalore

2. The enquiry has been floated through e-procurement and offers shall be accepted through e-procurement only. BHEL shall neither entertain offers through hard copy nor provide any due date extension on account of the same. Interested vendors who do not have login ID and password are requested to register themselves on https://eprocurebhel.co.in through "Online Bidder Enrolment" link available on the portal.

3. Class-III, SHA2 2048 BIT – Signing & Encryption, Digital Signature Certificate (DSC) is required for bidders for authentication purpose (log in and bid submission). Vendors, who do not possess the DSC, are requested to obtain the same. The procedure for obtaining DSCs is detailed in the "Seller Manual" available on the above mentioned website.

E-procurement Event ID: 2021_BHEL_2084

For all clarifications/ issues related to the tender, please contact:

(i) Commercial:

Mr. Navit Mahajan, Dy. Manager / Works Engineering Contract, BHEL-SBD,
Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012
E-MAIL: navit@bhel.in
Ph. No. +91-080-22182216 Or
Mr. BM Hiremani, AGM / WEX & Works Contract Cell, BHEL-SBD,
Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012
E-MAIL: hiremani@bhel.in
Ph. No. +91-080-22182204

(ii) Technical:

Mr. Debashish Paul, Dy. Manager/ CPBG
BHEL-SBD, Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012
E-MAIL: debashish@bhel.in
Ph. No. +91-080-22182126 Or
Mr. P Samuthirapandi., Additional General Manager / CPBG
BHEL-SBD, Prof CNR Rao Circle, IISc Post, Malleswaram, Bangalore- 560 012
E-MAIL: pspandi@bhel.in
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TENDER DOCUMENT

PART – A

VOLUME - I

1.	GENERAL INFORMATION
2.	SCOPE OF WORK
3.	ELIGIBILITY CRITERIA
4.	PRICE VARIATION CLAUSE
5.	PAYMENT TERMS
6.	ANNEXURES

1.	**General Information**	
1.1.	Tender Reference Number :	**68313**
1.2.	Tender Name:	" **Wiring contract for Hydro Panels (LV switchgear) at SBD CPBG shop floor** "
1.3.	Tender System	Single Stage, Two Part Bid Part – A: Techno-Commercial & PQR Part – B: Price Bid
1.4.	Tender Type	Works Contract
1.5.	Estimated Value of Contract	Not Applicable
1.6.	Duration of Contract	06 Months
1.7.	Qualifying Requirement	As per NIT Terms & Conditions
1.8.	Earnest Money Deposit to accompany Tender	Rs. 71952/- in the form of a crossed Demand Draft/EFT favoring BHEL-SBD, Bengaluru. If submitted through DD, the DD in original should reach to the office of undersigned within 7 days of Part A bid opening.NO EXEMPTION FOR MSME / NSIC since it's a Works Contract.
1.9.	Security Deposit	5% of the contract value
1.10.	Cost of Tender documents	NIL
1.11.	Issue of tender documents	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.12.	Pre- BID Meeting	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.13.	Last date for Issue of tender documents	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.14.	Last date for submission of tender doc	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.15.	Date and time of opening of Tender (Part-A)	As per Enquiry / RFQ / Notification on www.bhel.com & https://eprocurebhel.co.in
1.16.	Tender Submission Place	Online at https://eprocurebhel.co.in
1.17.	Tender Opening Place	Online at https://eprocurebhel.co.in
1.18.	Dealing Officer (For any Clarifications)	Navit Mahajan, Dy. Manager – Works Contract Cell Contact No.: 080-2218-2216 Email: navit@bhel.in Hiremani B.M. Addl. General Manager – Works Contract Cell Contact No.: 080-2218-2204 Email: hiremani@bhel.in
2.	**SCOPE OF WORK**	
2.1.	Wiring contract for Hydro Panels (LV switchgear) at SBD CPBG shop floor. Details as per Annexure I	
3.	**ELIGIBILITY CRITERIA**	
3.1.	The Firm of contractor/independent contractor (Proprietor) should be registered and having at least three years existence in business consecutively for the past three financial years.	
3.2.	Bidder to submit declaration for obtaining the essential license under Contract Labor (Regulation & Abolition) Act 1970 after award of work. Form-5 will be issued to successful bidder by BHEL for applying the license. Successful bidder has to get the endorsement in the license for the areas and nature of work which they will be performing as part of the contract.	
3.3.	Bidder should have independent ESI Employer code under ESI Act 1948. Photocopy of letter from ESI Corp. to establish that bidder is independently registered as an employer under ESI to be produced.	
3.4.	Bidder should have independent PF code under Employee Provident Fund and Miscellaneous Provisions Act 1952. Photocopy of letter from PF Commissioner's Office to establish that bidder is independently registered as	

	an employer PF to be produced.
3.5.	Solvency Certificate: A Solvency Certificate from a Nationalized Bank/BHEL Consortium banks (State Bank of India, Canara Bank, Axis Bank, Bank of Baroda, Central Bank, Citi Bank N.A, Deutsche Bank**, Exim Bank, Federal Bank Limited, HDFC Bank Limited, Hong Kong and Shanghai Banking Corporation Ltd (HSBC), Indian Bank, ICICI Bank Limited, IDBI Bank Limited, Industrial Bank Limited, Indian, Overseas Bank, Kotak Mahindra Bank Limited, Punjab National Bank, RBL Bank Ltd, Standard Chartered Bank, Union Bank of India, Yes Bank Limited) should be produced regarding the tenderer's financial position. The Solvency Certificate should not be older than 12 months from the due date of Techno-commercial bid opening. **Value: 4.24 Lakhs**
3.6.	Average Annual Financial turnover during the last 3 years ending 31st March of the previous financial year, should be at least **Rs. 12.74 Lakhs incl. of GST** Audited Balance sheet and profit& Loss account OR Turn over Certificate from Chartered Accounted to be enclosed for the FY 2017-18, 2018-19 & 2019-20.
3.7.	Bidders who wish to participate should have experience of successfully completed "similar works" during last seven years ending last day of the month previous to the one in which applications/tenders are invited should be either of the following: 1. three "similar works" completed and costing not less than the amount of **Rs 16.98 Lakhs EACH**. OR 2. two "similar works" completed and costing not less than the amount of **Rs 21.22 Lakhs EACH**. OR 3. one "similar work" completed and costing not less than the amount of **Rs 33.96 Lakhs.** Bidder to submit relevant documents as proof of completion or execution of work like P. O with bills ack. Or certified note/email by third party/. customer etc. to establish that amount of work is completed and is of similar work as mentioned below.P.O copies/bills/completion certificates should indicate same or should have clear establishment of kind of work executed. a. The term "Similar works "means Wiring of switchgear/Control panels including 1. mounting of switchgear/Control panels components. AND 2. Wiring of switchgear component in switchboard or control panels b. The term 'executed' means the bidder should have achieved the criteria specified in the PQR even if the total contract has not been completed or closed. c. Bidder should not have been banned by "any BHEL unit" or "Government of India" or "Government of Karnataka" or Government of other states in India BHEL reserves the right for independent verification of Documents. Proof of Experience: Work Completion Certificate and Work Order Copy
3.8.	The bidder shall also mention the PAN Number issued by Income Tax Department, copy of the PAN card or PAN number allotment letter shall be submitted along with the tender documents.
3.9.	There should be no litigation or charge under investigation / enquiry / trial against the Tenderer, or conviction in a court of law or suspension or blacklisting by any organization on any ground. During the course of work, if any such information comes to light, the contract may be terminated.
3.10.	The opinion / decision of BHEL regarding the bid shall be final and conclusive. BHEL reserves the right to reject any or all the bids at any time without assigning any reason.
3.11.	In case the bidder has a relative employed in BHEL, the authority inviting tender shall be informed of this fact in writing at the time of submission of tender, failing which the tender may be disqualified, or if such fact comes to light subsequently, the contract may be terminated.
3.12.	If the bidder gives wrong information in his tender or creates conditions favorable for the acceptance of his tender, BHEL reserves the right to reject such tender at any stage.
3.13.	For the works which are continuous in nature, and which require regular interaction and monitoring, the bidder shall have an Office/Establishment in Bengaluru. Absence of such an arrangement may lead to disqualification of the Tenderer.
3.14.	**Start-ups registered with DIPP are exempt to fulfill the criteria of minimum turnover and minimum years of experience.**
4.	**PRICE VARIATION CLAUSE: Not Applicable**
5.	**PAYMENT TERMS**

5.1.	▪ The contractor shall raise the bill for payment as per the contractual terms & conditions mentioned in the contract, which should be duly certified by the BHEL Engineer- in charge of the contracted work and approved by HOD. ▪ Vendor has to raise RA bills as per rate schedule with duly mentioning detail of work and name of board. Separate Bills Shall Be Raised for Supply and Labour Portion Clearly Mentioning the HSN Codes ▪ Payment shall be made in stages for 5 or more boards.
5.2.	**Docs required with Labor Bill**: • The Contractor shall file the electronic return of PF/ESI and submit proof of payment of both the employers' and employees' contributions every month. Contractor shall submit the challan along with copy of a self-certified list of contract workers (bearing their names and PF/ESI No. and deductions made) for whom the contribution has been submitted by him for the last month paid period. • Bill in original with HSN code. • BHEL Mat code detail along with qty and rates as packing list. • PAYMENT WITH IN 45 Days from date of submission of Invoice and Verification of Work by BHEL
5.3.	**Docs required with supply bills:** ▪ Bill in original with HSN Code through BHEL Security entry on bill. ▪ b) BHEL Mat code detail along with qty and rates as packing list duly endorsed by BHEL Security at the time of entry. ▪ c) PAYMENT WITH IN 45 Days from date of submission of Invoice and Verification of Work by BHEL
5.4.	GST will be reimbursed to the contractor after the contractor pays GST, files return and submits a proof of the same to BHEL. GST TDS will be done @ 2%. Income Tax TDS will be done as applicable.
6	**Annexures**
6.1	Detailed Scope of Work – Annexure I
6.2	Techno-commercial Bid Application – Annexure II
6.3	Bidder Information – Annexure III
6.4	Qualification Requirement – Annexure IV
6.5	Declaration by Bidder-I – Annexure V
6.6	Declaration by Bidder-II – Annexure VI
6.7	Unpriced BID and HSN / SAC Codes - Annexure VII
6.8	PPP-MII Format- Annexure VIII
6.9	Non-Technical Deviations- Annexure IX
6.10	Technical Deviations- Annexure X
6.11	Drawings- Annexure XI

ANNEXURE – I SCOPE OF WORK

<table>
<tr><th colspan="2">SCOPE OF WORK:</th></tr>
<tr><td>The copper Bus bar, bus bar mounting/bending, hardware (nuts, bolts, spring washers and plain washers), sleeve/insulation, support insulator, power & control TBs, panel name plate/tag and name plates for all the door mounting components like instruments, indicating lamp, push button etc.</td><td>To be part of wiring contractor scope.</td></tr>
<tr><td>Wiring Consumables like wire, cable, TB, Din Rail, cable turf, fasteners, component legend plates, ferrule, cable tie, saddle, cable trough, lugs, links like earth link, neutral link, CT disconnecting link etc.</td><td>To be part of wiring contractor.</td></tr>
<tr><td>Additional Items to be supplied as loose items under this contract by Wiring Contractor</td><td>1. DC-DC CONVERTER 220VDC-24VDC 5A, RATING: 220VDC TO 24VDC,5A, QTY: 6 Nos
2. AC-DC CONVERTER 240VAC-24VDC 5A, RATING: 240VAC/24VDC, 5A, QTY: 6 NOS
3. DIODE O RING MODULE 2 I/P 24VDC, RATING: 2I/P: 24VDC, QTY: 3 NOS</td></tr>
<tr><td>Ferruling of wires as per approved schematics.</td><td>To be part of wiring contractor, TUBE TYPE, PRINTED FERRULES SHALL BE USED.</td></tr>
<tr><td>Fixing of safety stickers & caution plates as per approved GA/ general notes.</td><td>Supply by Wiring Contractor.</td></tr>
<tr><td>Crimping of insulated lugs to wires.</td><td>To be part of wiring contractor scope.</td></tr>
<tr><td>Approved lug make list for wiring inside board.</td><td>All lugs should of Tinned Copper. Lugs should be provided suitable to power cables and control cables for each hydro panel.</td></tr>
<tr><td>The Cables/Bus bar & Lugs Chart for each type and Rating of Feeder</td><td>To be part of wiring contractor scope:

1. Wiring sizes shall be as follows-
<table>
<tr><th>STARTER KW RATING</th><th>WIRE SIZE</th></tr>
<tr><td>DOL 0.75KW</td><td>6 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 1.5KW</td><td>6 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 3.6KW</td><td>6 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 7.5KW</td><td>6 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 22.5KW</td><td>16 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 24.0KW</td><td>16 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 30.0KW</td><td>25 SQ. MM. CU FRLS</td></tr>
<tr><td>DOL 55.0KW</td><td>35 SQ. MM. CU FRLS</td></tr>
<tr><td>S/D 93.0KW</td><td>25X10 CU</td></tr>
<tr><td>S/D 150.0KW</td><td>40X8 CU</td></tr>
<tr><td>S/D 187.0KW</td><td>40X8 CU</td></tr>
<tr><td>S/D 200.0KW</td><td>40X8 CU</td></tr>
<tr><td>S/D 235.0KW</td><td>40X8 CU</td></tr>
<tr><td>S/D 250.0KW</td><td>40X8 CU</td></tr>
</table></td></tr>
</table>

	2. Tinned Copper lugs suitable for carrying the full rated current of the feeder shall be used. The type of lugs (pin/ fork/ U etc. shall be as per equipment/component requirement). 3. 25 Sq. mm and above wires/cables shall be terminated using long barrel & heavy duty copper lugs only. 4. All CU wire/Cable shall be PVC FRLS Multi strand unarmored flexible. 5. Details of control wire dimension and type is mentioned in GA drawings of Each hydro panel. 6. Wires shall of IS-694, 1100 V-Grade, FRLS, PVC as per GN and data sheet.
Bus bar bending machine is available in SBD – CPBG Shop floor. However, wiring contractor must bring the necessary tools like die etc. for the punching purposes. However, vendor may visit the shop floor at BHEL SBD for suitable die dimension.	
All Hardware such as nuts, bolts, spring washers, plain washers etc. should be of zinc passivated of grade 8.8.	
Contractor needs to mount the switchgear components including CT, PT, CST, meters etc. & other free issued items by BHEL on the mounting plates supplied with the bare enclosure. All necessary fasteners, fix cable turf, DIN rail, resistance, diode shall be supplied by the contractor and wiring termination whenever required to be done by contractor.	
Contractor needs to bring their tools and tackles for the completion of the work on returnable basis. Tools shall be properly calibrated and calibration certificate to be provided at the start of work. BHEL shall provide storage facility of tools & contractor materials based on the availability of the space.	
However major materials like wires, cables shall be checked to ensure quality of material used as per specification. Vendor must submit the test certificates for the same.	
Wiring Contractor shall ensure/check and test the wiring of Hydro panels as per BHEL approved drawings before handing over to Quality for further testing and Customer Inspection.	
Manual wire pull test and wire continuity test in the scope of work of contractor	

Manpower Requirement:

i. The Contractor shall provide the required/skilled manpower for executing the wiring and integration. Requirement of manpower shall be decided by BHEL based on availibity of enclosures/material and customer requirement. The contractor shall not engage a person who is less than 18 years of age and more than 58 years of age. BHEL may demand any time for requisite number of manpower for faster execution of work to suit customer requirement and vendor has to adhere to same without any additional price implication.

ii. Skill of manpower may be tested at SBD shop floor on monthly/bi-monthly basis based on BHEL requirement.

iii. Skill testing shall include check of lugging quality, routing of wire bunches, alignment of components, link work clearances etc. related to scope of work.

iv. Skill test shall be jointly by Dealing Production engineer and CPBG quality, maximum of three warnings shall be given to wiremen or mechanical person and after that workmen shall be removed from wiring for minimum of 01 months till he passes the test.

v. The contractor, as the employer of his workmen, shall manage them. In the event of any dispute arising between the Contractor and his employees, the contractor alone is solely responsible for resolving the dispute between them, and BHEL will in no way be responsible for settling the dispute

either statutory or otherwise.

vi. The contractor will be solely responsible for executing the agreed work and the employees of BHEL will only oversee the proper execution of work. The contractor or his representative one supervisor shall be available in the factory to control and supervise his workers and take down instructions from the designated officials of BHEL. Supervisor shall not be diverted to any other work without written consent from BHEL.

vii. The contractor shall have full control over his employees including w.r.t determining service conditions, discharge, dismiss, or otherwise terminate their services at any time. The contractor shall be solely responsible for any claim arising out of employment or termination of employment of his employees and for statutory payments.

viii. The contractor shall employ only such personnel who are medically fit. The company has right to direct the contractor to remove from the premises such of his personnel who may be physically, hygienically, clinically or medically unfit.

ix. The contractor shall employ only such personnel who have not been found unfit for employment in Organizations such as Central/State/Public Undertakings by the Police authorities. Persons against whom criminal cases are pending or under investigation and persons found guilty of offences involving moral turpitude shall not be engaged for executing work.

x. The Contractor shall comply with all the operational rules and regulations, including safety and security rules framed by the company from time to time wherein the Contractor or his workmen happen to be operating/ working. In the event of any of the workmen of the contractor violating any of the said rules and regulations, the Contractor would be required to remove forthwith such workmen from the company's premises.

Working Hours:

1st Shift: 6:00 am to 2:00 pm
General Shift: 8:00 am to 4:30 pm
2nd Shift: 2:00 pm to 10:00 pm
Night Shift: 10:00 pm to 6:00 am

Manpower are required to be deployed in shifts as per BHEL requirement on all working days of the week.

Note: In case of emergencies, the work is to be attended on Sundays and Holidays also. Alternate shift of similar working hours will be intimated as and when required and will have to be arranged by the contractor within the quoted rates.

SCOPE MATRIX:

Sl.No	DESCRIPTION	Material		Labour		REMARKS
		BHEL	Contractor	BHEL	Contractor	
1.	Removal of packing for any switchgear	YES	NA	No	Yes	In-addition to these contractor needs to comply with cleanliness requirement of BHEL.
2.	Supply & Fixing of DIN rail, Cable Tray (Metallic &Plastic)for component fixing	No	Yes	No	Yes	All associated tools and accessories like cable tie, saddle, supporting clamps, fasteners, drilling machine, hacksaw, crimping tool, grinder; both material & labour are in the scope of contractor.
3.	Supply of Terminal Blocks (all types) & Fasteners (all types)	No	Yes	No	Yes	------DO-------
4.	Inter-locking wiring with supply of material	No	Yes	No	Yes	Done by the contractor with supply of requisite material.
5.	Fixing of busbars and outgoing power terminals to Bus bar as applicable	NO	YES	NO	YES	Fixing & BUSBAR WORK SHALL BE DONE BY wiring contractor.
6.	Supply of Wires / Cables	No	Yes	NA	Yes	Contractor has to supply wires / Cables as per tender requirement.
7.	Arrangement of Crimping Tools, Wire Cutting Tools & other tools required for wiring work	No	Yes	NA	Yes	Vendor to submit list before start of work.
8.	Handling of any type of Transformer	YES	NA	No	Yes	Contractor is solely responsible for handling of all type of transformers from issue of CPBG stores to fixing into panel. Except breaker feeders.
9.	Termination of wires / cables	No	Yes	No	Yes	Any wire / cable termination related to the panel as per scope IN THIS CONTRACT.

10.	Supply and mounting of MCCB/SFU (Fixed & Draw out)	Yes	No	No	YES	Supply of MCCB/SFU in the scope of BHEL. Any wire / cable termination related to the panel and necessary accessories are in the scope of wiring contract.
11.	WIRING WORK in MCCB /SFU as applicable	No	Yes	No	Yes	Any wire / cable termination related to the panel as per scope IN THIS CONTRACT.
12.	Mounting of all switchgear components other than Breaker	No	Yes	No	Yes	All type of mechanical work inclusive of supply of necessary materials and work is solely in the scope of the Contractor.
13.	Supply & Fixing of Shrouding of Live parts	No	Yes	No	Yes	Wherever components in-built shrouds are provided vendor shall be issued free of cost or else same is to be arranged by them for shrouding inside module. Breaker shrouds are excluded from this contract.
14.	Making & fixing of ferrules, identification stickers, TB markers	No	Yes	No	Yes	Contractor has to supply & fix all the related materials. Arranging ferrule printing machine is in contractor scope.
15.	Enumeration, Supply Legend plates for components	No	Yes	No	YES	Necessary drilling or modification required, if any, to be Done by the contractor.

Essential Scope of Work /Supply for the Contractor:

1	Execution of wiring/mounting layout based on IGA provided by BHEL whenever necessary
2	Receiving of BHEL free issue material from CPBG-stores.
3	Removal of packing of any component.
4	Mounting of all components with all labour and supply of all necessary materials including but not Limiting to all types of fasteners, cable-tray, cable-turf, DIN-rail with all types of operation like cutting- drilling-grinding-welding-soldering and any other necessary work, except breakers.
5	All types of wiring with link work with necessary crimping, ferruling & termination with supply of ferrule, lugs, sleeves (sleeves shall be heat shrinkable type at terminal end). Bringing & arranging all necessary tools like crimping tool, ferrule printing machine etc. are in the Scope of the contractor.
6	All types of inter-panel wiring both labour & material are solely in the scope of the contractor.

7	All drilling, opening, fixing, terminating from & to bus bars in the enclosure are in the scope of The contractor for /mounting of any components in tender scope.
8	Any kind of termination with related to any module, both in-terms of material & Labour are in the scope of the contractor.
9	Contractor needs to fix shrouding of proper size in all live parts. Inside modules.
11	Contractor needs to arrange for all types of mounting, wiring, fabrication or tools.
12	Contractor needs to enumerate, supply and fix all types of legend plates, name plates, identification stickers, danger, ear thing stickers or any other informative product as and when required by BHEL on the module door mounted components only.
13	Contractor needs to supply & fix bus bar link wherever required for feeder.
14	Contractor needs to wire all types of CT.
15	Contractor needs to supply & fix all types of CT supports and packing inside feeders except breaker feeder.
16	Contractor need to supply & fix all necessary terminal block & TB marker including those required for Inter-panel wiring with necessary support & mounting as required.
17	BHEL has Busbar cutting machine, punching machine & bending machine with compressor & same may be used by contractor without any extra charges. However, Any breakage due to mishandling shall be attributable to contractor. Vendor has to arrange necessary dies for punching.

GENERAL POINTS ON WIRING:

a) Tinned Copper Lugs suitable for carrying the full rated current of the feeder shall be used. The type of lugs (pin/fork/U etc. shall be as per equipment/component requirement).
b) 25Sqmm and above wires/cables shall be terminated using long barrel & heavy duty copper lugs only.
c) All CU wire/Cable shall be PVC, FRLS, Multi strand, unarmored flexible cables.
d) Each wire will be identified, at both ends, with permanent markers bearing wire Numbers as per schematic drawing.
e) Wire terminations will be made with crimping type connector with insulating sleeves.
f) Wires will not be spliced between terminals.
g) Terminal blocks will be 1100V grade box-clamp type with marking strips.
h) Terminals for C.T. secondary leads will have provision for shorting.
i) Power & control terminals will be segregated by end plate/ end stopper.
j) Power terminals will be stud type only.
k) Terminations of wires for CT connections & Numerical relay connections will be ring type terminals.
l) Each trip signal wire will be identified with red ferrule and letter "T" mentioned on the ferrule.
m) All the wires used for inter-panel wiring will have following identified on both the ends: Feeder location from where the wire started & Destination Feeder location of the wire.
n) Power connection will be done either by cables/ bus bars. Sizes of cables/ bus bars used for power connection and chart given in the scope of work (Annexure-I)
o) Mechanical safety interlock will be provided to prevent ACB from being racked in or out of the service position when ACB is closed if interlock is provided by BHEL.

NOTES:

a) Final color coding or size of cable/wire of general note/BHEL instruction shall prevail.

b) All wires/cable used shall be: material- Copper, FRLS, Voltage grade- min 1100 V grade, IS-694 or relevant as per BHEL instruction.

c) To have flexibility in arranging GA of modules, suitable rating links may also be used in higher rating modules in place of copper wire, but vendor has to maintain the clearance as per IS/BHEL Standard as well as the aesthetic look of the module and same shall be at the discretion of BHEL.

d) Wiring bunches shall be done using spirals covers. All fixed modules like BUS PT, CST, ACB feeders wiring shall be done with trough only. Any change if there shall be intimated by BHEL during execution.

e) All ferrules, lugs, screws, spirals etc. shall be in scope of this contract wherever it is required for execution of the work. All materials shall be BIS marks (as applicable), Zinc passivated (wherever necessary).

f) Diode circuit as per used in breaker circuit with resistor shall be in scope of wiring contractor within the quoted rate, specification shall be given by BHEL.

g) Customer approved drawing as given before or during course of execution shall be considered as final. Tentative drawings for the tender are attached herein for reference.

SPECIFIC MAKE RECOMMENDED FOR ITEMS:

Sl. No.	Description of Components	Make of Components
1	TERMINAL BLOCK	Standard makes like: ELMEX/ TOSHA/ CONTROLS & SWITCHGEAR / CONNECTWELL/ WAGO/ PHONEX/ ESSEN or Equivalent.
2	WIRES	ISI CERTIFIED
3	CABLE LUGS	Standard makes like: DOWELLS/ JAINSON/ 3D/ LOTUS or Equivalent
4	LINKS (EARTH LINK, NEUTRAL LINK, CT DISCONNECTING LINK)	Standard makes like: ELMEX/ CONNECTWELL/ L&T/ SIEMENS/ SCHENIDER or Equivalent
5	OTHER ITEMS	AS PER BHEL STANDARD

Note: Above list is only indicative, BHEL may further approve new makes and vendor may follow same upon approval from BHEL.

EXECUTION OF CONTRACT:

a. Contractor shall be required to submit a list of his workers to be deployed for the works contract giving details regarding Name of contract worker, Fathers Name, permanent and Present Address, Date of Birth, ESI No, PF No. etc. in advance for arranging gate passes.

b. BHEL shall be indemnified against all losses, Claims, prosecutions etc. under any law.

c. The contractor will maintain proper discipline of his workmen and will ensure that his workers do not cause any loss or theft or damage to any company's property. The contractor will also be responsible for the good conduct of his workmen.

d. The contractor shall ensure and maintain uninterrupted progress of the work in accordance with instructions given to him on behalf of BHEL Engineer In charge from time to time.

e. The Contractor, shall, without fail, give up-to-date information in writing of the attendance of the workers engaged by him. The Contractor will also submit the required documents and certificates as prescribed from time to time for the clearance and the payment of the Bill.

f. Whenever any sum of money is found to be recoverable from or payable by the contractor, the same will be deducted from any sum that may due or which at any time there after becomes due to the contractor under this contract or under any other contract or from his security deposit. In case the recoveries are not complete even after such deduction, the contractor shall pay the same or the balance thereof from the security deposit. The contractor shall immediately thereafter pay such further sums as may be required to replenish the shortage caused by such recoveries in the amount of security deposit.

g. During the execution of the contract, if the contractor is awarded any other work contract in BHEL, the contractor will have to execute the work with additional and exclusively separate manpower.

h. BHEL shall have the right to deduct any sum from the bill of the contractor for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract, Non- payment of wages or of deduction made from his or them wages which are not justified by the terms of the contract or non-observance of the said contract Lab our regulations.

i. All associated tools and accessories like cable tie, saddle, supporting clamps, fasteners, drilling machine, hacksaw, crimping tool, grinder; are in the scope of contractor within the quotes rates.

j. The contractor shall be responsible for safe custody of BHEL's property like materials, tools etc., entrusted to him and if necessary arrange insurance at his own expense.

k. The contractor shall be responsible to make good and rectify at his own expense any defect, which may develop or may be noticed within the period of the contract.

l. BHEL shall be entitled to recover any payment made on behalf of the contractor under any law or otherwise.

m. BHEL Engineer In-charge shall have the right to stop the work at any stage or at any time by giving the contractor seven days' notice in writing if work is not found satisfactory as per provision of the contract.

9.0 Bidder has to quote ONLY for overall price of the contract and not for the individual item. Weightage Percentage allocation (derived for item rate) against each item of the BOQ is disclosed in the tender document which becomes the basis for the allocation of item wise amount/rate against the total lump sum price for the entire contracted scope of BOQ. Evaluation of the L-1 offer shall be computed on overall lowest cost to BHEL basis. ("Cost to BHEL means-" Grand Total Price (including taxes, duties, freight, insurance ESI, PF etc.) for all the items indicated above" minus tax credit, if, any). As per the above process bidder with lowest grand total amount shall automatically become over all L1 or item rate wise L1.

<u>During the execution of the contract:</u>

1. Contractor will be held responsible for any damage caused to BHEL-property and suitable actions will be taken against for the same for recovery with overheads.

2. Contractor needs to arrange all tools, tackles, other materials including ferrule-printing machine, drilling-cutting-fastening tools etc.

3. Each contractor should engage one full-time independent supervisor for this contract. Supervisor need to submit his work-plan, material-status, commitment-for-completion- of-work, attendance-of-his-man-power etc. as and when demanded by BHEL. Supervisor should have full control over the man-power deployed and full command on the work. BHEL will also issue any working drawing/material etc. directly to the supervisor only.

4. Each contractor should arrange necessary arrangement to keep the workplace clean (preferably by engaging additional person for sweeping and cleaning). If any contractor fails to keep the workplace clean, suitable actions will be taken by BHEL e.g. recovery of cleaning expenditure from the contractor's bill.

5. For any workmen, qualifying all terms and conditions of NIT, gate passes will be issued. Details for new person or for renewal of gate passes contractor has to furnish all necessary details and document at least 3 working days before.

6. Material (in the scope of the contractor) entry to BHEL-SBD is only permissible on working days from 8:00hrs - 15:00hrs through material gate. Contractor needs to follow the BHEL standard security policy for material entry.

7. Contractor should arrange required security mechanism for his tools, tackle or materials. BHEL is not responsible for any damage.

8. BHEL will furnish the relevant IGA to the contractor any particular module, if required. No components (purchased by BHEL) will be allowed to take outside BHEL-SBD during the contract without permission of BHEL. Once approved other contractors doing the same type module have to follow the same.

9. Bidder has to confirm that throughout the project only one type of wiring methodology is followed or as per BHEL INSTRUCTION ONLY. Further:

   I. Wiring should be neatly arranged with the help cable-ties or suitable saddles or trough or other materials. Saddles should be of screw type.

II. Under normal circumstances, BHEL will provide all the materials in BHEL's scope required for wiring of a particular switchboard.

III. Incase certain material under BHEL's scope, is not made available to the wiring contractor at the time of handing over the enclosure; the following rules should apply: - Wiring contractor should leave the crimped-lugged-ferruled wire even if measuring instruments (digital and analog meters), indicating lamp & transducers are not made available to the wiring contractor at the time of handing over the enclosure.

IV. Unavailability of any other items other than measuring instruments (digital and analog meters), indicating lamp & transducers which is in BHEL's scope; delay due to such things will not be attributable to the contractor.

Scheme changes & Variations:

For any scheme change, final decision for rate shall be taken by BHEL Engineer In charge, concerned engineering executive & contractor representative for finalization of rate as per existing rate schedule.

Note: Chances of change in quantities are there and contract can be executed for similar work for variation up to 30 % of contract value with same rate

ANNEXURE – II TECHNO-COMMERCIAL BID APPLICATION

To,

Dy. Manager / WC
Bharat Heavy Electricals Limited
Solar Busniness Division,
IISc Post, Malleswaram,
Bengaluru – 560 012

Dear Sir,

I / We hereby offer to carry out the work **Wiring contract for Hydro Panels (LV switchgears) at SBD CPBG shop floor. Tender Ref. No. 68313**

I /We have carefully perused the all the clauses mentioned in NIT and agree to abide with the same.

1. Notice Inviting Tender – Part A Volume 1
2. Notice Inviting Tender – Part A Volume 2
3. Price Bid Format - Part – B

I/ We further agree to execute all the works referred to in the said documents.

I declare that, there was never / is no litigation or charge under investigation / enquiry / trial against me / us, nor conviction in a court of law or suspended or blacklisted by any organization on any grounds.

Signature of Tenderer
Date:

ANNEXURE – III: BIDDER INFORMATION

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)
1	Name of the Company	
2	Name of Authorized Signatory	
3	Name of Contact person for this tender	
4	Email-id of contact person	
5	Contact number	
6	Bank Account Details (Name of Bank, Branch and Account Number). Cancelled Cheque to be enclosed	
7	Details of Relatives employed in BHEL, Name Designation and Unit - Clause 3.11	
	Relative 1	
	Relative 2	
	Relative 3	

ANNEXURE – IV: QUALIFICATION REQUIREMENTS

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)	Whether proof / document enclosed (YES / NO)
1	Bidder's firm should be registered and should have at least three years' existence in business consecutively for the past three financial years. (Cl 3.1)		
2	Declaration for Labor License submitted (Cl. 3.2)		
2	ESI Registration No. Clause 3.3		
3	PF Registration No. Clause 3.4		
4	Average turnover of last 3 years - Clause 3.6		
5	Relevant Work Experience as per Clause 3.7 – 1		
	Relevant Work Experience – 2		
	Relevant Work Experience – 3		
6	PAN No. - Clause 3.8		
7	GST Registration Number		
8	MSME / NSIC Certificate to be enclosed (if applicable)		
9	EMD Details (DD No., Amount, Date & Bank)		
10	PPP-MII Format to be enclosed - Annexure VIII		

ANNEXURE – V: BIDDER DECLARATION - I

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)
1	I have carefully read the Tender Terms and Conditions and I submit my agreement for the same.	
2	I have completely understood the scope of work and submit my agreement to carry out the work as per mentioned in Tender document.	
3	I have quoted rates for the total scope of work mentioned in the tender document	
5	I have understood and accepted the payment terms of BHEL as per Cl.5	
6	I am responsible for the safety of workmen deployed and agree to fulfil the requirements as per tender terms	
7	I have understood the LD clause mentioned in this tender and submit my agreement for the same	
8	I agree to participate in the tender and carry out the work (if awarded) ethically and submit my agreement to various requirements in this contract.	
9	I have carefully read the Tender Terms and Conditions and I submit my agreement for the same.	
10	Signed and submitted the technical deviations sheet	
11	Signed and submitted the non-technical deviations sheet	

ANNEXURE – VI, BIDDER DECLARATION - II

I, ----------, aged----------Yrs., S/o ----------,

Residing at ----------

Hereby declare as follows:

(i) That my nationality is _____.
(ii) That I am a major and eligible to enter into contract / my firm / my company is competent to enter into an agreement.
(iii) I shall employ only such personnel who have not been found unfit for employment in Organizations such as Central / state / Public undertaking by the Police Authorities.
(iv) I shall not employ persons against whom Criminal cases are pending or under investigation.
(v) I shall also not employ persons found guilty of offences involving moral turpitude for executing work in BHEL contracts.
(vi) That there are no Criminal cases/Civil/Labor pending or under investigation against me or my firm or company.
(vii) I have not been found guilty of offences involving moral turpitude nor any of the company directors / partners of my firm have been found guilty of offences involving moral turpitude.
(viii) Neither I nor my firm nor my company has been declared insolvent in the past.
(ix) I have taken due care and efforts to furnish only information which are true in the tender document.
(x) I shall employ labor who is more than 18 years of age and less than 58 years and having sound physical and mental health.
(xi) I shall keep Photograph / identity proof / residential proof of the laborers to be employed against this tender and arrange for police verification.
(xii) I shall employ and deploy suitable qualified personnel for supervision of the work in each shift and additionally as required for monitoring compliance to process requirements and compliance to contract terms & conditions.

[Signature with Name & seal of the Tenderer]

Date :
Place :

ANNEXURE VII Unpriced BID and HSN / SAC Codes

Sl No	Material Code	Description	Supply/ Labor	SAC/UAN	Qty	UoM	Weightage calculation for each line item
1	ELPUNT03321FP	MCP FOR H.P. LUB .OIL PUMP AC 22.5 KW	Supply	To be filled by bidder	6	SET	1.33
2	ELPUNT03321FP	MCP FOR H.P. LUB .OIL PUMP AC 22.5 KW	Labor	To be filled by bidder	6	SET	0.8
3	ELPUNT03322FP	MCP FOR HP LUB OIL PUMP DC 22.5 KW	Supply	To be filled by bidder	6	SET	1.33
4	ELPUNT03322FP	MCP FOR HP LUB OIL PUMP DC 22.5 KW	Labor	To be filled by bidder	6	SET	0.8
5	ELPUNT03303FP	MCP FOR GENERATOR STATOR HEATERS-24KW	Supply	To be filled by bidder	6	SET	1.33
6	ELPUNT03303FP	MCP FOR GENERATOR STATOR HEATERS-24KW	Labor	To be filled by bidder	6	SET	0.8
7	ELPUNT03304FP	MCP FOR BRAKE DUST COLLECTOR 7.46KW	Supply	To be filled by bidder	6	SET	1.33
8	ELPUNT03304FP	MCP FOR BRAKE DUST COLLECTOR 7.46KW	Labor	To be filled by bidder	6	SET	0.8
9	ELPUNT03305FP	MCPFOR GOV OPU OIL PUMPS 2X30KW+3.6KW	Supply	To be filled by bidder	2	SET	0.67
10	ELPUNT03305FP	MCPFOR GOV OPU OIL PUMPS 2X30KW+3.6KW	Labor	To be filled by bidder	2	SET	0.44
11	ELPUNT03306FP	MCPFOR MIV OPU OIL PUMPS 2X55KW	Supply	To be filled by bidder	6	SET	2.40
12	ELPUNT03306FP	MCPFOR MIV OPU OIL PUMPS 2X55KW	Labor	To be filled by bidder	6	SET	2.13
13	ELPUNT03307FP	MCP FOR OIL LEAKAGE PUMPS FOR GOV OPU	Supply	To be filled by bidder	2	SET	0.67
14	ELPUNT03307FP	MCP FOR OIL LEAKAGE PUMPS FOR GOV OPU	Labor	To be filled by bidder	2	SET	0.44
15	ELPUNT03308FP	MCP FOR OIL LEAKAGE PUMPS FOR MIV OPU	Supply	To be filled by bidder	2	SET	0.67
16	ELPUNT03308FP	MCP FOR OIL LEAKAGE PUMPS FOR MIV OPU	Labor	To be filled by bidder	2	SET	0.44
17	ELPUNT03309FP	MCP FOR TOP COVER DRAINAGE PUMP 2X0.75KW	Supply	To be filled by bidder	6	SET	1.33
18	ELPUNT03309FP	MCP FOR TOP COVER DRAINAGE PUMP 2X0.75KW	Labor	To be filled by bidder	6	SET	0.80
19	ELPUNT03310FP	MCP FOR PRIMARY COOLING	Supply	To be filled by bidder	6	SET	8.01

		WATER PUMP 2X1506.67					
20	ELPUNT03310FP	MCP FOR PRIMARY COOLING WATER PUMP 2X150	Labor	To be filled by bidder	6	SET	6.67
21	ELPUNT03311FP	MCP FOR SECONDARY COOLING WATER 2X200KW	Supply	To be filled by bidder	6	SET	8.01
22	ELPUNT03311FP	MCP FOR SECONDARY COOLING WATER 2X200KW	Labor	To be filled by bidder	6	SET	6.67
23	ELPUNT03312FP	MCP FOR MIV SEAL POWER PACK PUMP 2X3.7KW	Supply	To be filled by bidder	4	SET	0.89
24	ELPUNT03312FP	MCP FOR MIV SEAL POWER PACK PUMP 2X3.7KW	Labor	To be filled by bidder	4	SET	0.53
25	ELPUNT03313FP	MCP FOR BOOSTER PUMPS 2X250KW	Supply	To be filled by bidder	1	SET	1.33
26	ELPUNT03313FP	MCP FOR BOOSTER PUMPS 2X250KW	Labor	To be filled by bidder	1	SET	1.11
27	ELPUNT03314FP	MCP FOR DEWATERING PUMPS 4X187KW	Supply	To be filled by bidder	1	SET	2.00
28	ELPUNT03314FP	MCP FOR DEWATERING PUMPS 4X187KW	Labor	To be filled by bidder	1	SET	1.78
29	ELPUNT03315FP	MCP FOR DRAINAGE PUMPS 2X 187KW	Supply	To be filled by bidder	1	SET	1.33
30	ELPUNT03315FP	MCP FOR DRAINAGE PUMPS 2X 187KW	Labor	To be filled by bidder	1	SET	1.11
31	ELPUNT03316FP	MCP FOR FLOOD DEWATERING PUMPS 2X235KW	Supply	To be filled by bidder	1	SET	1.33
32	ELPUNT03316FP	MCP FOR FLOOD DEWATERING PUMPS 2X235KW	Labor	To be filled by bidder	1	SET	1.11
33	ELPUNT03318FP	MCP FOR PENSTOCK VALVE OPU 2X22KW	Supply	To be filled by bidder	3	SET	0.67
34	ELPUNT03318FP	MCP FOR PENSTOCK VALVE OPU 2X22KW	Labor	To be filled by bidder	3	SET	0.40
35	ELPUNT03319FP	MCP FOR OIL LEAKAGE PUMP FOR PV OPU2X1.5	Supply	To be filled by bidder	1	SET	0.22
36	ELPUNT03319FP	MCP FOR OIL LEAKAGE PUMP FOR PV OPU2X1.5	Labor	To be filled by bidder	1	SET	0.13
37	ELPUNT03323FP	MCP FOR HVAC PUMPS-2X93KW	Supply	To be filled by bidder	1	SET	0.44

38	ELPUNT03323FP	MCP FOR HVAC PUMPS-2X93KW	Labor	To be filled by bidder	1	SET	0.33
39	ELPUNTMIV00601 FP	ELECTRICAL CONTROL PANEL FOR MIV	Supply	To be filled by bidder	6	EA	14.68
40	ELPUNTMIV00601 FP	ELECTRICAL CONTROL PANEL FOR MIV	Labor	To be filled by bidder	6	EA	12.01
41	ELPUNTBFV0060 3FP	ELECTRICAL CONTROL PANEL FOR BFV	Supply	To be filled by bidder	3	EA	6.00
42	ELPUNTBFV0060 3FP	ELECTRICAL CONTROL PANEL FOR BFV	Labor	To be filled by bidder	3	EA	4.67
		TOTAL					

Note:
Bidder to fill the Price Bid online only on the Price Bid provided on https://eprocurebhel.co.in . Do not fill any rates in this format. Write “Quoted”.

Contractor has to ensure payment of minimum wages to his workmen as per Govt. norms.

Bidder to indicate SAC / HSN Code

ANNEXURE VIII, PPP-MII Format

FORMAT FOR VERIFICATION OF LOCAL CONTENT UNDER PREFERENCE TO MAKE IN INDIA ORDER
(To be submitted with the offer)
[Applicable for procurement value from Rs. 5.00 Lac to Rs. 10.00 Crore]
Self-certification giving the percentage of local content, in line with PPP-MII order, if applicable [to be submitted on the letter head of the issuer.]
Item Name **Wiring contract for Hydro Panels (LV switchgears) at SBD CPBG shop floor**
Enquiry No. : **68313**
Project : **Wiring contract for Hydro Panels (LV switchgears) at SBD CPBG shop floor**
Applicable percentage of Local Content……
(Bidder to indicate local content in percentage)
We have read and understood the provisions of "Public Procurement (Preference to Make in India) Order, 2017" dated 15/06/2017, its revision dated 28/05/2018 and any subsequent modifications/Amendments, if any [hereinafter, "PPP-MII Order"] issued by Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India.
In line with the provisions of the PPP-MII Order, We, M/s. …… [Enter the name of the Bidder] [hereinafter, "Local Supplier"] submits self-certification to M/s. Bharat Heavy Electricals Limited [hereinafter, BHEL] regarding Local Content in Goods/Services/Works to be supplied by the Local Supplier **Wiring contract for Hydro Panels (LV switchgears) at SBD CPBG shop floor** (Enter the name of the Equipment/Item for Project), wherein we have agreed to abide by the terms and conditions of the PPP-MII Order.
Details of location at which local value addition will be made is as follows:

_____
_____
__
_____
__
_____
__
We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.
For and on behalf of, Date:
Authorized Signatory
(With Company Seal & Signature)
Note: This is a guiding format. In case the bidder submits the certificate in a format different from the above, the same may be considered provided it meets the intent and purpose, as may be ascertained by BHEL.

ANNEXURE IX, NON-TECHNICAL DEVIATION

Sl No.	Volume	Part/Clause Sl no.	NIT requirement	Bidder's Deviation

Total No. of deviations proposed by the Bidder- _____ nos.

BIDDER'S SIGN & SEAL:

Note: The Offers should be in full conformity with the terms and conditions of this tender. Incorrect and incomplete tenders are liable to be rejected. Deviations, if any, should only be mentioned as per formats for Non-Technical Deviations (i.e. General Terms & Conditions, Commercial Terms etc.) & Technical Deviations (i.e. Scope of Work, Modalities of Contract etc.). BHEL at its discretion whether to give any further chance to a bidder in case of any deviation or reject the same offer.

ANNEXURE X, TECHNICAL DEVIATION

Sl No.	Volume	CLAUSE NO.	NIT requirement	Bidder's Deviation

Total No. of deviations proposed by the Bidder-_____ NOS.

Place: Date:

Signature & Seal of the bidder:

Note: The Offers should be in full conformity with the terms and conditions of this tender. Incorrect and incomplete tenders are liable to be rejected. Deviations, if any, should only be mentioned as per formats for Non-Technical Deviations (i.e. General Terms & Conditions, Commercial Terms etc.) & Technical Deviations (i.e. Scope of Work, Modalities of Contract etc.). BHEL at its discretion whether to give any further chance to a bidder in case of any deviation or reject the same offer.

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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TITLE : - HP LUB OIL PUMP(AC) MCP (1x18.65 KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-001 REV. 02

DWG. NO. : - EP-3-CS-033-001 REV. 01

DWG. NO. : - EP-3-BM-033-001 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF
HP LUB OIL PUMP(AC) MCP (1x18.65 KW)

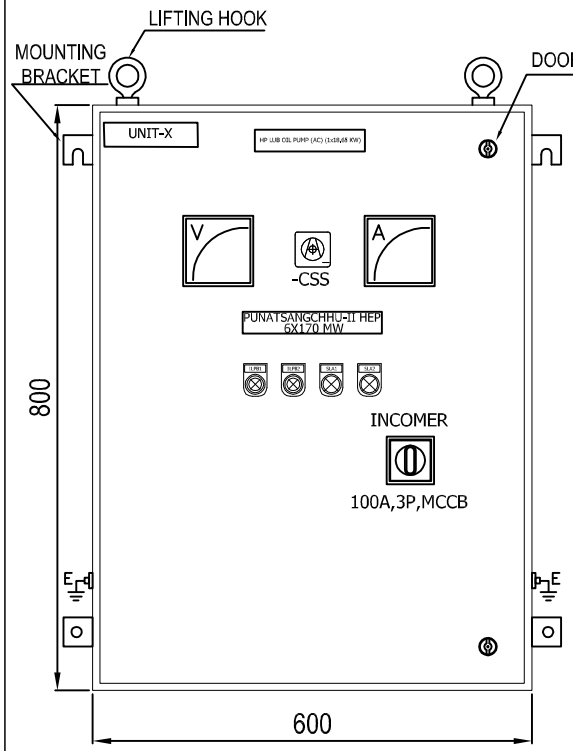
NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

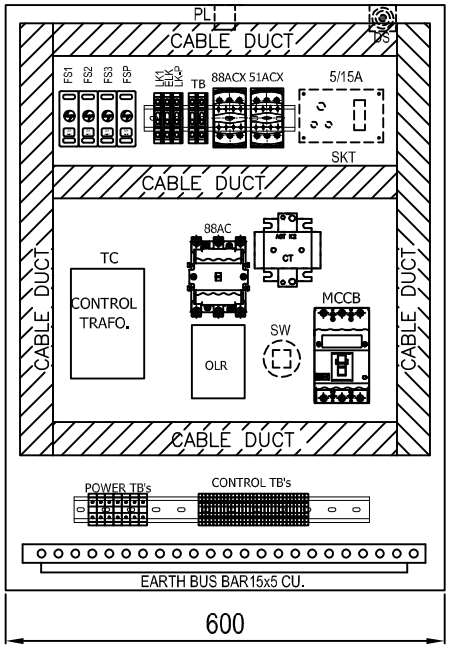
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

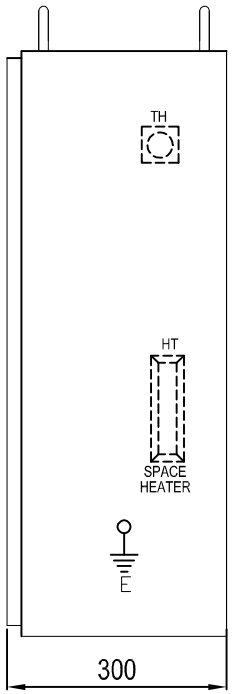
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FRONT VIEW



INTERNAL LAYOUT

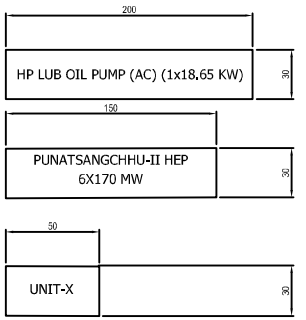


SIDE VIEW

FRONT

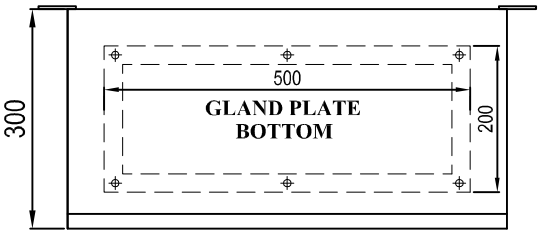
GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	175KG	

PANEL NAME PLATE



X REFERS TO 1,2,3,4,5 &6

Qty-6Nos



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

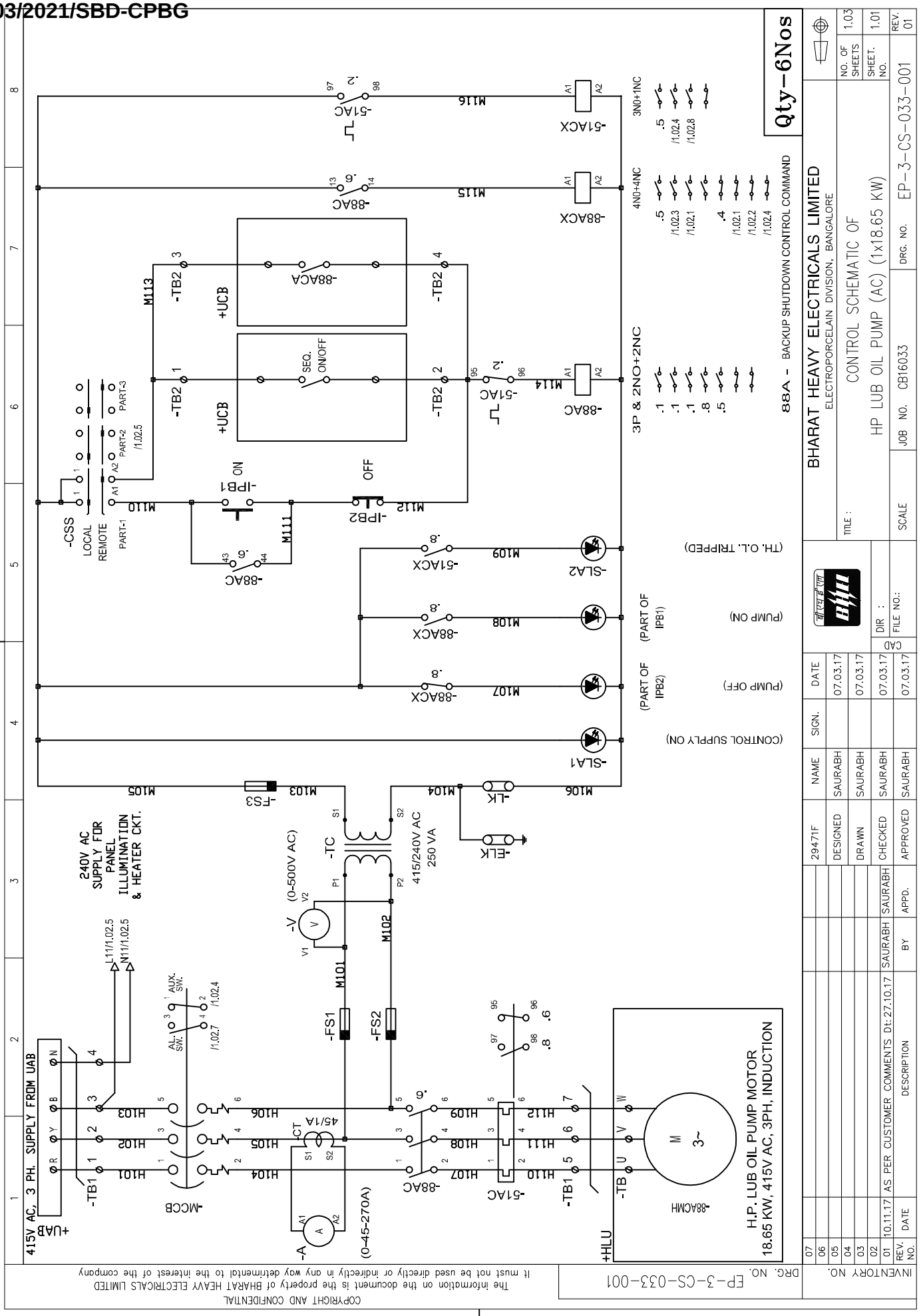
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF HP LUB OIL PUMP (AC) (1x18.65 KW)

NO. OF SHEETS 01.1 | SHEET. NO. 01.1

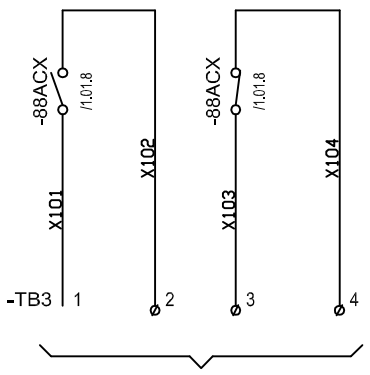
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-001 | REV. 02

INVENTORY NO. | DRG. NO. EP-3-GA-033-001

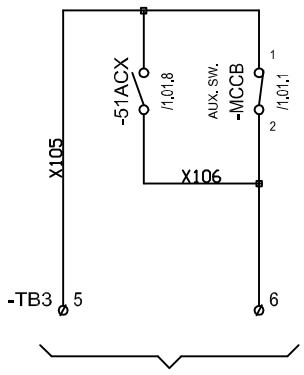

ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
HP LUB OIL PUMP (AC) (1x18.65 KW)
Qty-6Nos
88A - BACKUP SHUTDOWN CONTROL COMMAND
3P & 2NO+2NC
4NO+4NC
3NO+1NC
415V AC, 3 PH. SUPPLY FROM UAB
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
415/240V AC 250 VA
(0-500V AC)
(0-45-270A)
H.P. LUB OIL PUMP MOTOR
18.65 KW, 415V AC, 3PH, INDUCTION
-MCCB
-TC
-FS1
-FS2
-FS3
-LK
-ELK
-CSS
-IPB1
-IPB2
-SLA1
-SLA2
-TB1
-TB2
-TB
-51AC
-51ACX
-88AC
-88ACX
-88ACA
-88ACMH
+UCB
+HLU
-A
-V
-CT
(CONTROL SUPPLY ON)
(PUMP OFF)
(PUMP ON)
(TH. O.L. TRIPPED)
(PART OF IPB2)
(PART OF IPB1)
LOCAL
REMOTE
ON
OFF
SEQ. ON/OFF
AUX. SW.
AL. SW.
PART-1
PART-2
PART-3
29471F
DESIGNED
DRAWN
CHECKED
APPROVED
SAURABH
07.03.17
CAD
DIR :
FILE NO.:
TITLE :
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-001
NO. OF SHEETS 1.03
SHEET. NO. 1.01
REV. 01
10.11.17 AS PER CUSTOMER COMMENTS Dt: 27.10.17
DESCRIPTION
BY
APPD.
INVENTORY NO.
DRG. NO. EP-3-CS-033-001
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

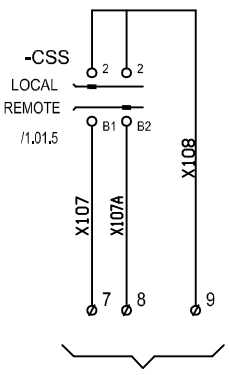
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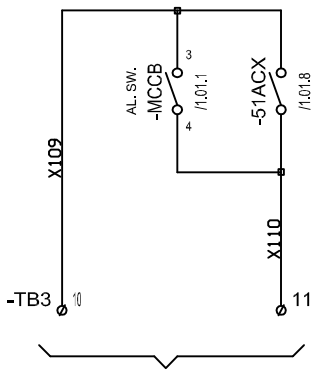
(H. P. LUB OIL PUMP ON/OFF)
(TO UCB)



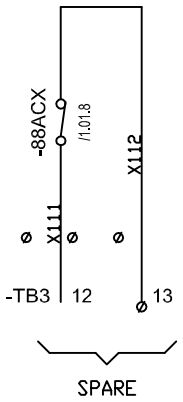
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(TO UCB)



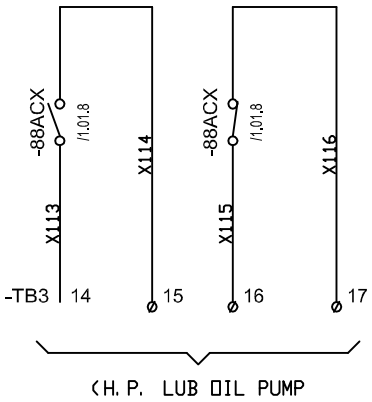
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(TO UCB)



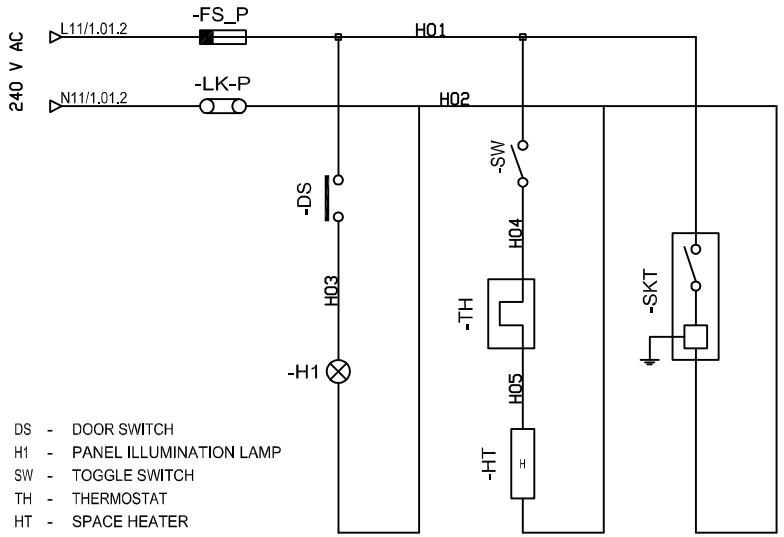
(H. P. LUB OIL PUMP MOTOR TH. O. L. /MCCB TRIPPED)
(TO UCB)



SPARE



(H. P. LUB OIL PUMP ON/OFF) SPARE



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT - SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-001

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HP LUB OIL PUMP (AC) (1x18.65 KW)

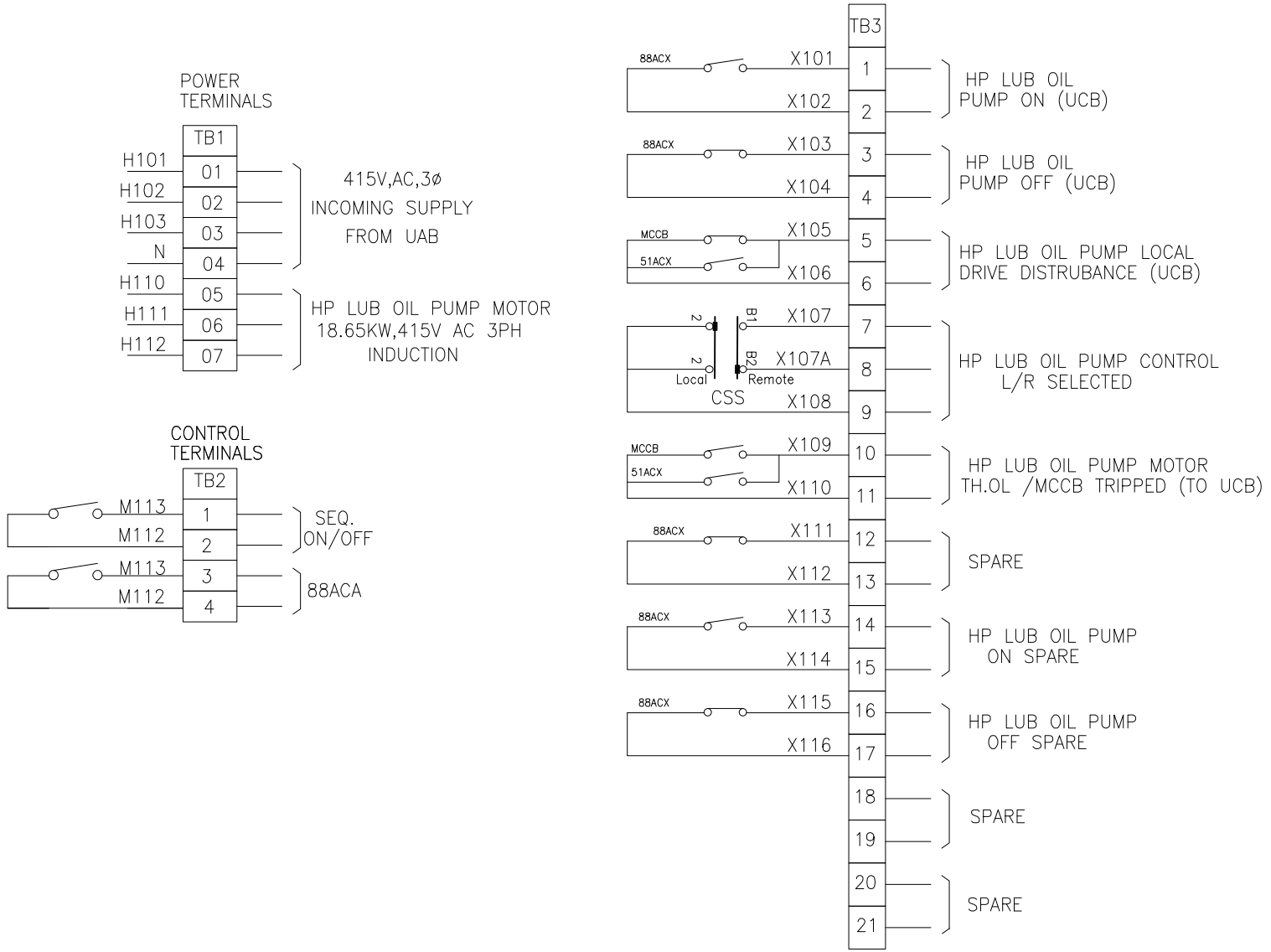
NO. OF SHEETS 1.03 | SHEET. NO. 1.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-001 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-001



Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

INVENTORY NO.

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HP LUB OIL PUMP (AC) (1x18.65 KW)

NO. OF SHEETS 1.03 | SHEET. NO. 1.03

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-001 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-001

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB	Moulded Case Circuit Breaker	100A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOKO	L&T	1	6
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	1	6
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	1	6
04	88AC	Power contactor	50A, 3P, Power Contactor with 240V AC coil,aux Supp	CS97075BOOO	L&T	1	6
05	-	Power contactor Acc	Add-on contact 2NO+2NC for 50A P.cont	CS94114	L&T	1	6
06	51ACX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	1	6
07	88ACX	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	1	6
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	1	6
09	51AC	Overload Relay	30-50A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94136OOGO	L&T	1	6
10	CSS	Local/Remote Slection	6A, Local/Remote selector switch,3pole 2way withoutOFF	61039	Salzer	1	6
12	CT	Current Transformer	45/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
13	V	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	1	6
14	A	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 45/1A Acc. CL:1,Range:0-45-270A with suppressed scale	-	AE/ Meco	1	6
15	IPB1	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Flush type, with 1NO+1NC addon contact	EG03FDLR240A	L&T	1	6
16	-	IPB Acc	Illumination Module- 240VAC- Red	-	L&T	1	6
17	IPB2	Green Push button	Green, illuminated actuator with holder for contact block 22.5mm Dia, Flush type, with 1NO+1NC addon contact	EG03FDLG240A	L&T	1	6
18	-	IPB Acc	Illumination Module- 240VAC- Green	-	L&T	1	6

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
HP LUB OIL PUMP (AC) (1x18.65 KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-001 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
19	SLA1,SLA2	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	2	12
20	FS1-FS3 & FS-P	Control Fuse base	20A Control Fuse Base	ST30772	L&T	4	24
21	FS1-FS3	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	3	18
22	FS-P	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	1	6
23	TC	Control Transformer	Single phase, 250VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
24	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	1	6
25	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	1	6
26	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	1	6
27	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	1	6
28	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	1	6
29	LK1,LK-P	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
30	ELK	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	6
31	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	7	42
32	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
33	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
34	SW	TOGGLE SWITCH	230V AC 5A Toggle switch	-	Suraj	1	6
35	-	Panel Enclosure	Enclosure Size - H800 x W600 x D300mm	-	BHEL	1	6

DRG. NO. EP-3-BM-033-001

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
HP LUB OIL PUMP (AC) (1x18.65 KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-001 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE :- HP LUB OIL PUMP(DC) MCP (1x18.65 KW)

PROJECT :- 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER:- PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO.:- EP-3-GA-033-002 REV. 02

DWG. NO.:- EP-3-CS-033-002 REV. 01

DWG. NO.:- EP-3-BM-033-002 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF HP LUB OIL PUMP(DC) MCP (1x18.65 KW)

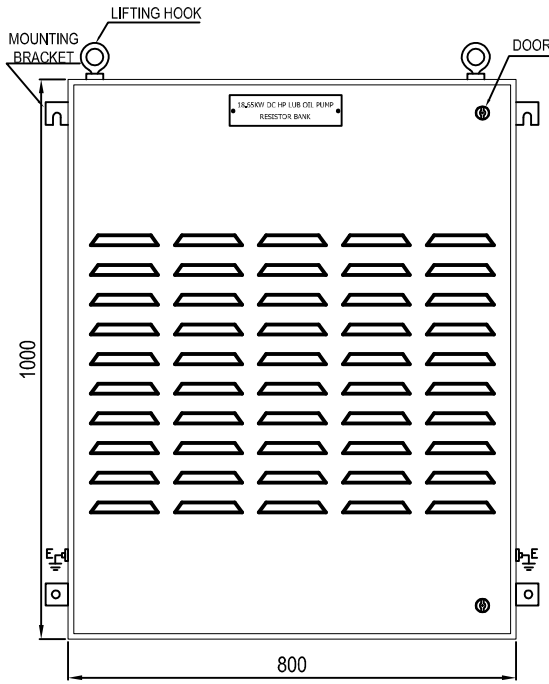
NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

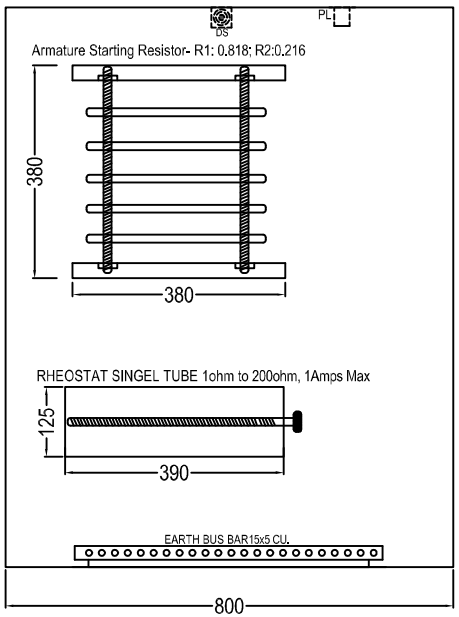
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

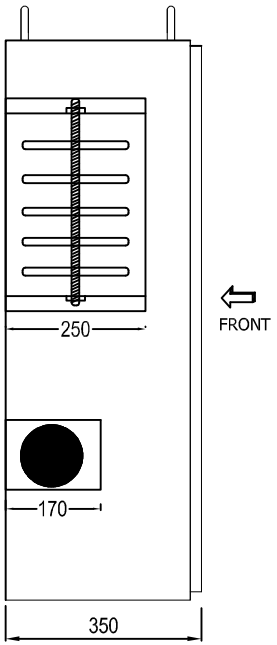
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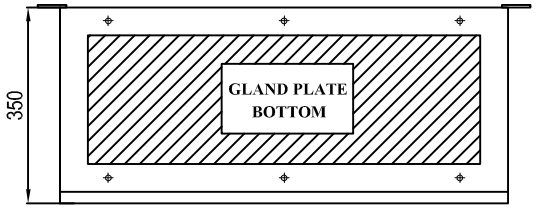
FRONT VIEW



INTERNAL LAYOUT



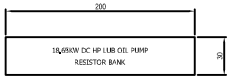
SIDE VIEW



BOTTOM VIEW

GENERAL NOTES		
Degree of protection	IP42 with Louvers IP54 without Louvers	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finsh	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	

PANEL NAME PLATE



Qty-6Nos

DRG. NO. EP-3-GA-033-002

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF HP LUB OIL PUMP (DC) (1x18.65 KW)

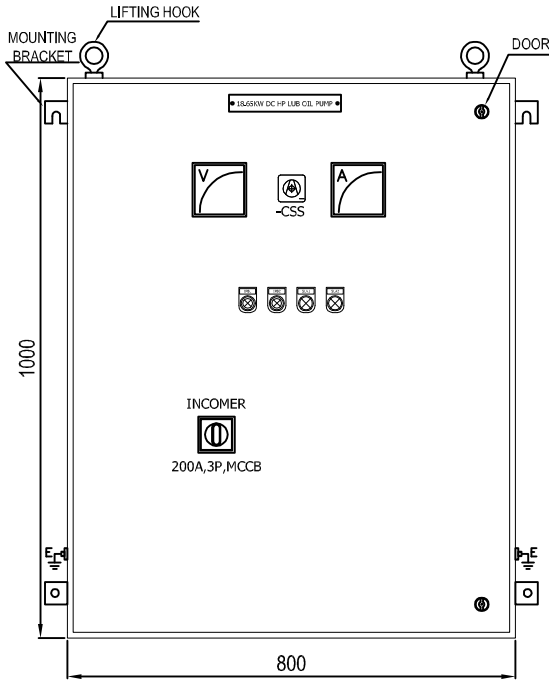
NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-002 | REV. 02

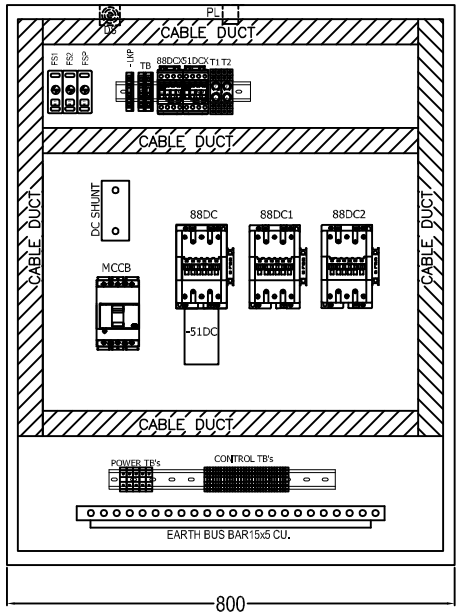
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

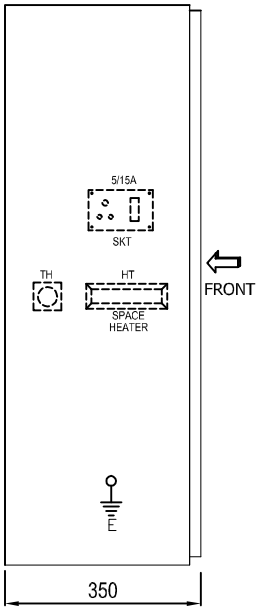
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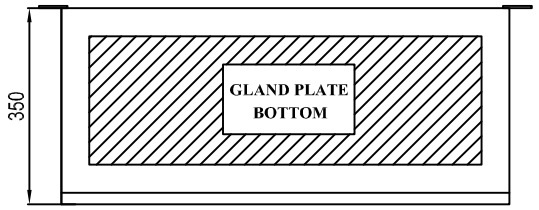
FRONT VIEW



INTERNAL LAYOUT



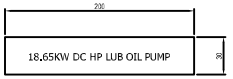
SIDE VIEW



BOTTOM VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finsh	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	

PANEL NAME PLATE



Qty-6Nos

DRG. NO. EP-3-GA-033-002

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

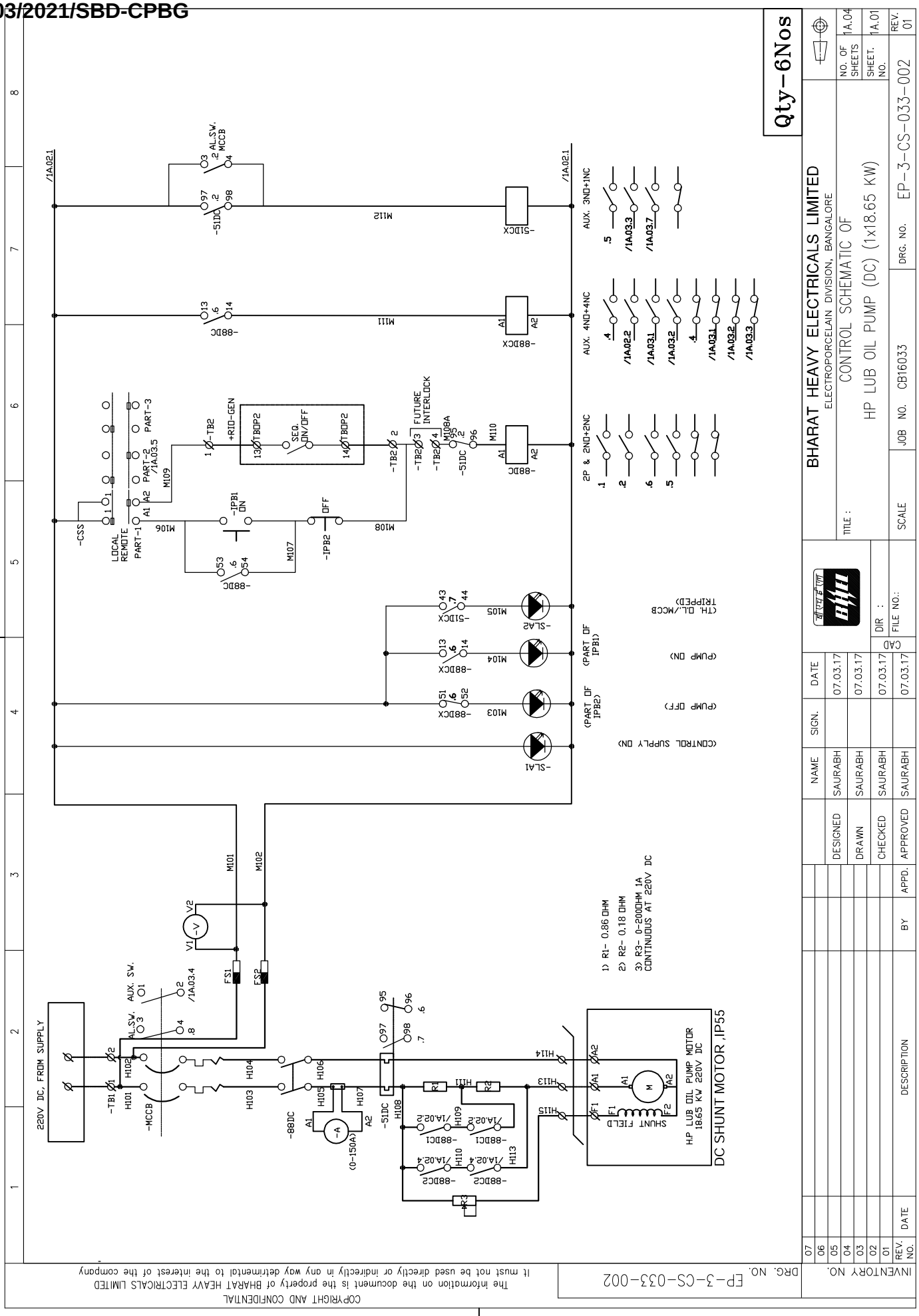
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF HP LUB OIL PUMP (DC) (1x18.65 KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-002 | REV. 02

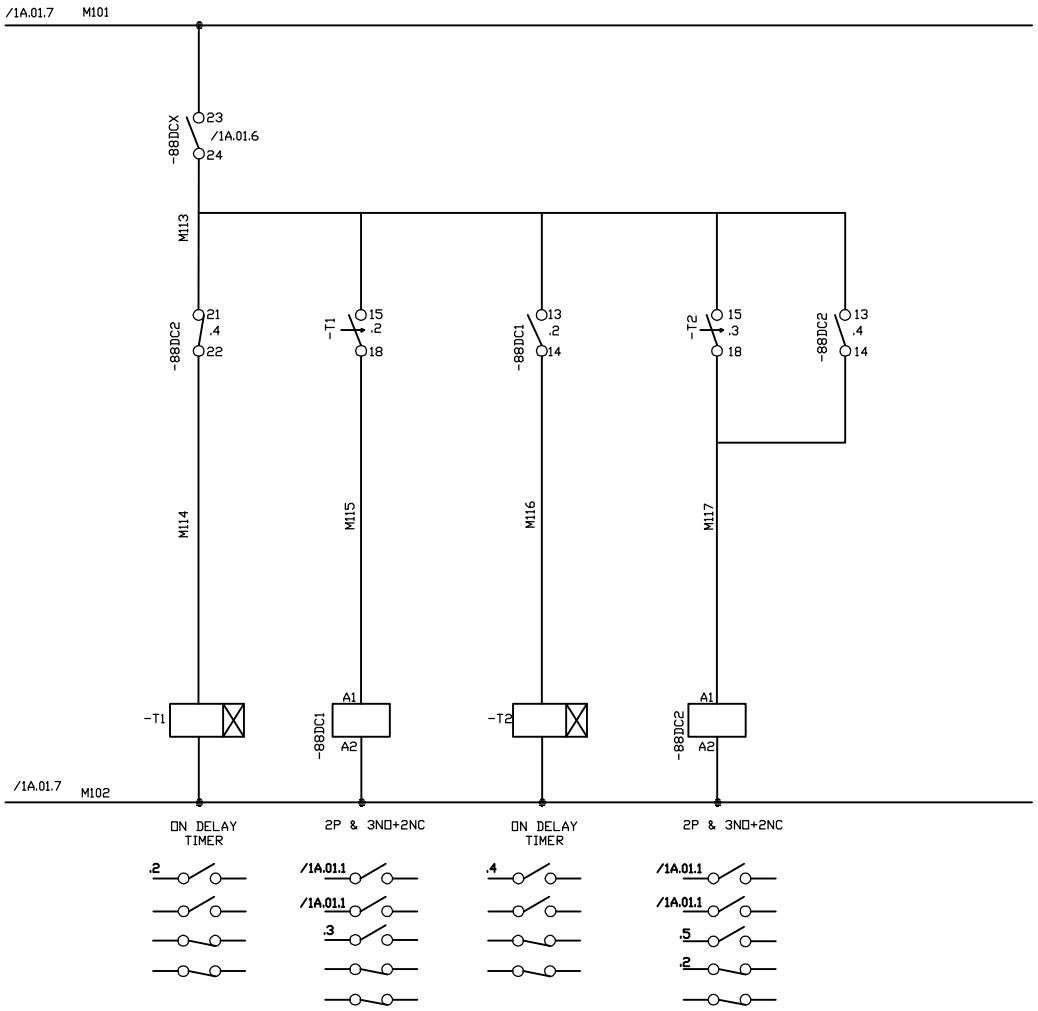
198203/2021/SBD-CPBG



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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-002

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

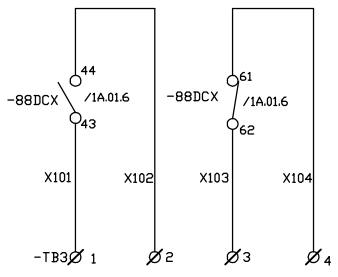
TITLE : CONTROL SCHEMATIC OF
HP LUB OIL PUMP (DC) (1x18.65 KW)

NO. OF SHEETS 1A.04
SHEET NO. 1A.02

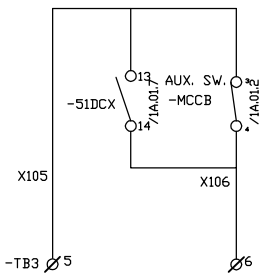
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-002 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

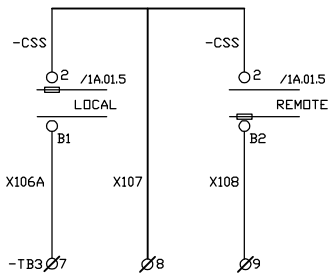
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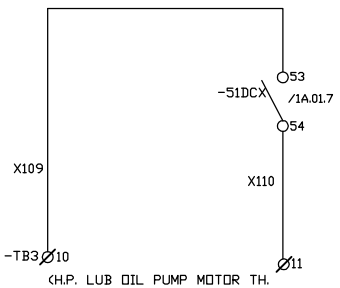
(H.P. LUB OIL PUMP ON/OFF)(DC)
(TO UCB)



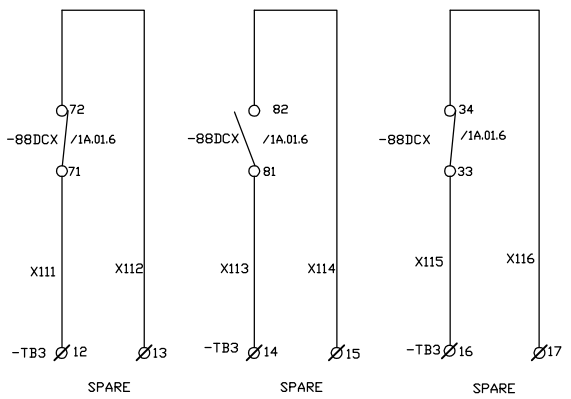
(H.P. LUB OIL PUMP LOCAL DRIVE DISTURBANCE)(DC)
(TO UCB)



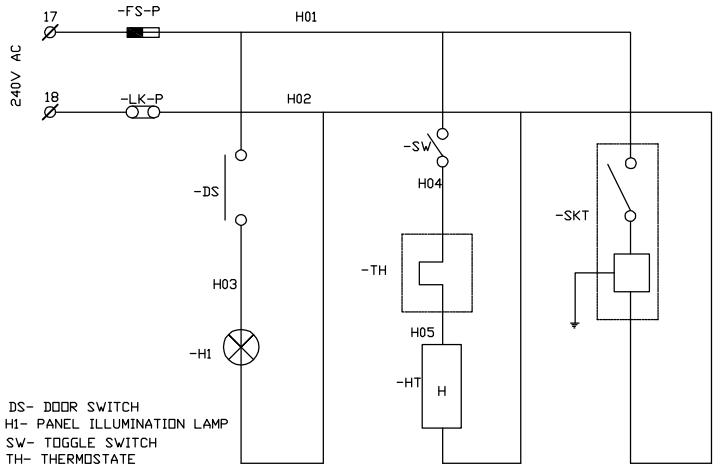
(H.P. LUB OIL PUMP REMOTE/LOCAL SELECTED)(DC)
(TO UCB)



(H.P. LUB OIL PUMP MOTOR TH. O.L.TRIPPED)(DC)
(TO UCB)



SPARE | SPARE | SPARE



DS- DOOR SWITCH
H1- PANEL ILLUMINATION LAMP
SW- TOGGLE SWITCH
TH- THERMOSTATE
HT- SPACE HEATER
SKT- SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-002

INVENTORY NO.

REV. NO.	DATE		BY	APPD.
07				
06				
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HP LUB OIL PUMP (DC) (1x18.65 KW)

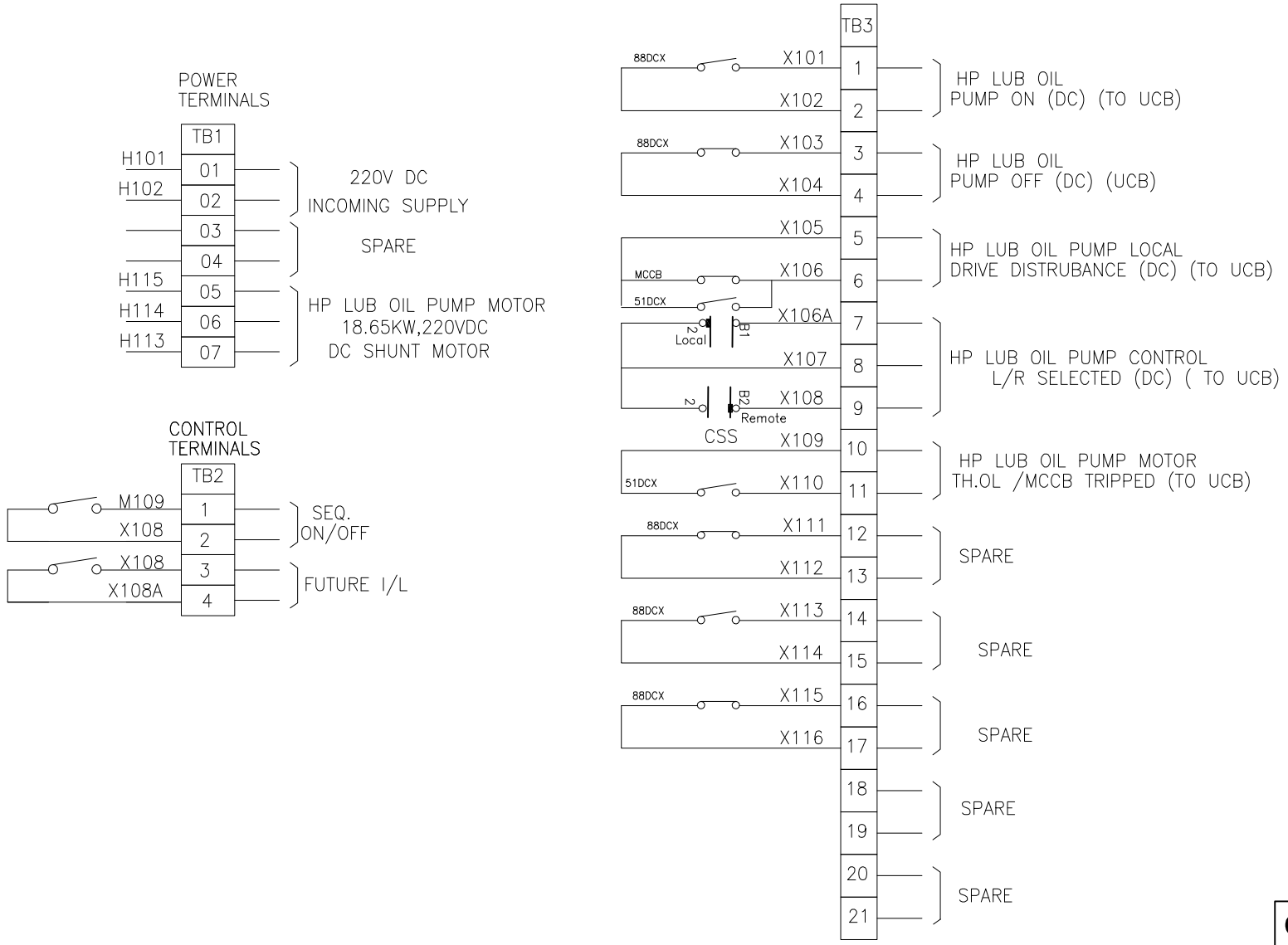
NO. OF SHEETS 1A.04
SHEET NO. 1A.03

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-002 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-001



Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

INVENTORY NO.

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HP LUB OIL PUMP (AC) (1x18.65 KW)

NO. OF SHEETS 1A.04
SHEET. NO. 1A.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-001 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

SL.NO	Tag	Component	Technical Specification	Make	Unit Qty	Total Qty
1	MCCB	Moulded Case Circuit Breaker	200A 2P, 20kA 220VDC, MCCB, with Motor protection type, Magnetic releases	ABB	1	6
2	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO) 220VDC	ABB	1	6
3	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities 220VDC	ABB	1	6
4	88DC	Power contactor	125A, 2P, Power Contactor with 220V DC coil,aux 2NO+2NC contacts	ABB	3	18
5	88DCX	Aux Contactor	10A, Auxilary contactor with 2NO+2NC, 220VDC coil	L&T	1	6
6	-	Contactor Acc	Addon contact 2NO+2NC for Aux cont 2NO+2NC 220VDC	L&T	1	6
7	51DCX	Aux Contactor	10A, Auxilary contactor with 3NO+1NC, 220VDC coil	L&T	1	6
8	51DC	Overload Relay	90-120A Bimetal Overload Relay, Direct Mounting (Class 10),	L&T	1	6
9	CSS	Local/Remote Slection	6A, Local/Remote selector switch,2pole 3way withoutOFF ***220VDC***	Salzer	1	6
10	V	Analogue Voltmeter	Analogue DC Voltmeter, Moving Iron Type, 96Sqmm,90º Scale, 0-220V, class-1, flush mounting type	AE/MECO	1	6
11	A	Analogue Ammeter	Analogue DC Ammeter, Moving Iron Type, 96Sqmm,90º Scale, Shunt:75mV, Acc. CL:1, Range:0-150A	AE/MECO	1	6
12	Sh	Shunt	75mV Shunt for 150A (DC Application)	Adarsha	1	6
13	IPB1	Red illuminated Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Flush type, with 1NO+1NC addon contact	L&T	1	6
14	-	IPB1 acc	Illumination Module- 220VDC- Red	L&T	1	6
15	IPB2	Green illuminated Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Flush type, with 1NO+1NC addon contact	L&T	1	6
16	-	IPB2 acc	Illumination Module- 220VDC-Green	L&T	1	6
17	SLA1	Indicating lamps	Red Indicating lamp assembly with 220VDC holder & LED type lamp.	L&T	1	6
18	SLA2	Indicating lamps	Amber Indicating lamp assembly with 220VDC holder & LED type lamp.	L&T	1	6
19	FS1-FS2	Control Fuse base	20A Control Fuse Base 220VDC	SIEMENS	2	12
20	-	Control Fuse	4A Control fuse link BS type 220V DC	SIEMENS	2	12
21	FSP	Control Fuse base	20A Control Fuse Base 415V AC	SIEMENS	1	6
22	-	Control Fuse	16A Control fuse link BS type 415V AC	SIEMENS	1	6
23	TI-T2	On-delay Timer	0-10sec, On delay timer 2C/O Contact Aux. Supply 220VDC	L&T	2	12
24	TC	R1-Starting Resistor	Cast Iron grid of suitable rating for starting DC motor - 0.741Ohm	KWK	1	6
25	TC	R2-Starting Resistor	Cast Iron grid of suitable rating for starting DC motor - 0.167Ohm	KWK	1	6
26	TC	R3-Field Resistor	Wire wound , Slide band Type variaable for starting DC motor - 0-200Ohm 1A continuous at 220VDC	KWK	1	6
27	HT	Space Heater	60W Space Heater, Aux. supply 240VAC	Girish	1	6
28	PH	Thermostat	30-90 Deg Cel Thermostat , Aux. Supply : 240VAC	Girish	1	6
29	H1	Panel Lamp	Panel Illumination Lamp,240VAC,05 Watt CFL with holder	Phillips	1	6
30	DS	Limit switch	Door Limit switch 1NO+1NC	Kaycee	1	6
31	SKT	Power Socket	15A, 5pin socket with switch	Anchor	1	6
32	LK_P	Neutral Link	Disconnecting type terminal block for neutral link	Elmex/Connectwell	1	6
33						
34	TB1	Power TB	Power terminal block suitable cable size	Elmex/Connectwell	14	42
35	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	Elmex/Connectwell	Lot	Lot
36	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	Adarsha	1	3
37	-	Panel Enclosure	Enclosure Size - H1000 x W800 x D350mm	BHEL	1	3

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DRG. NO. EP-3-BM-033-002

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

29471F	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL OF
HP LUB OIL PUMP (DC) (1x18.65 KW)

NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-002 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - GENERATOR STATOR HEATER MCP (1x24kW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-003 REV. 02

DWG. NO. : - EP-3-CS-033-003 REV. 01

DWG. NO. : - EP-3-BM-033-003 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

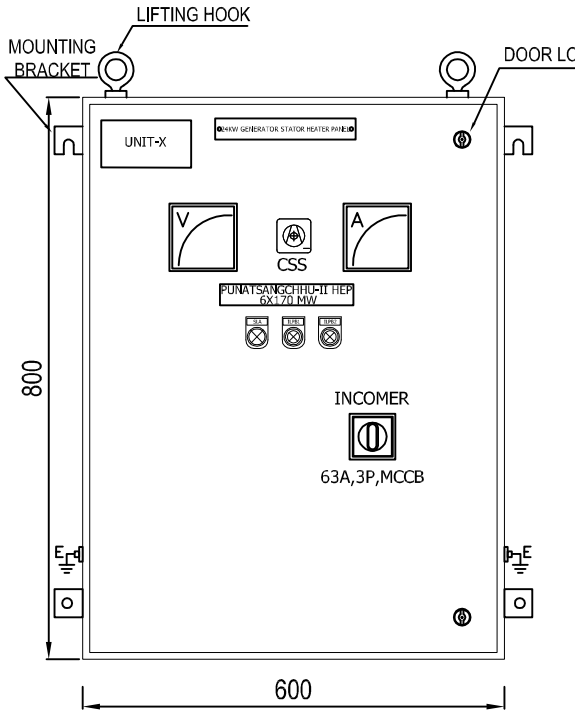
TITLE : COVER SHEET OF GENERATOR STATOR HEATER MCP (1x24kW)

NO. OF SHEETS 01 | SHEET. NO. 01

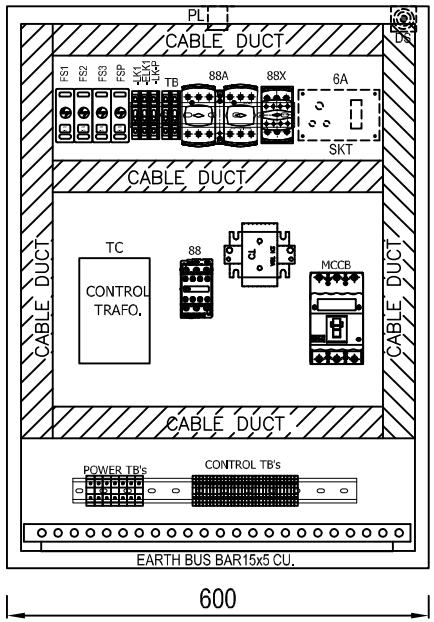
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

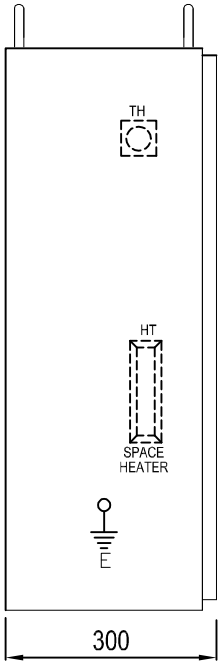
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FRONT VIEW

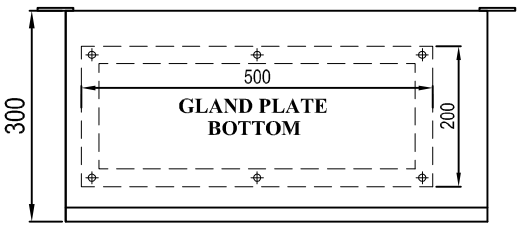


INTERNAL LAYOUT



SIDE VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	577.0	
TENTATIVE WEIGHT		
WEIGHT	175KG	

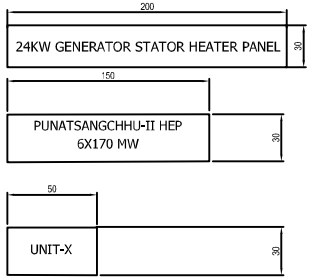


MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

INVENTORY NO.

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

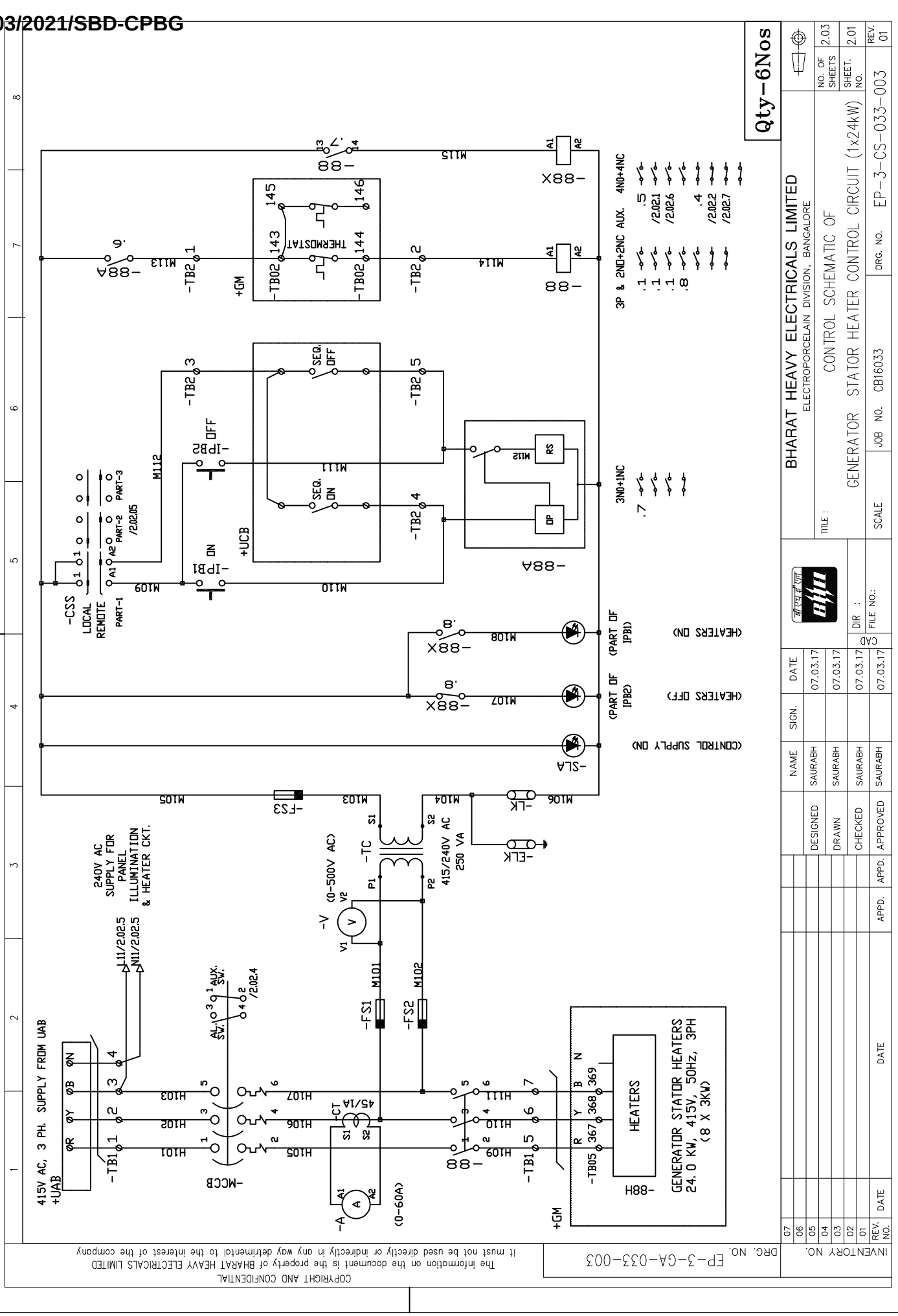
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)

NO. OF SHEETS 02.1 | SHEET. NO. 02.1

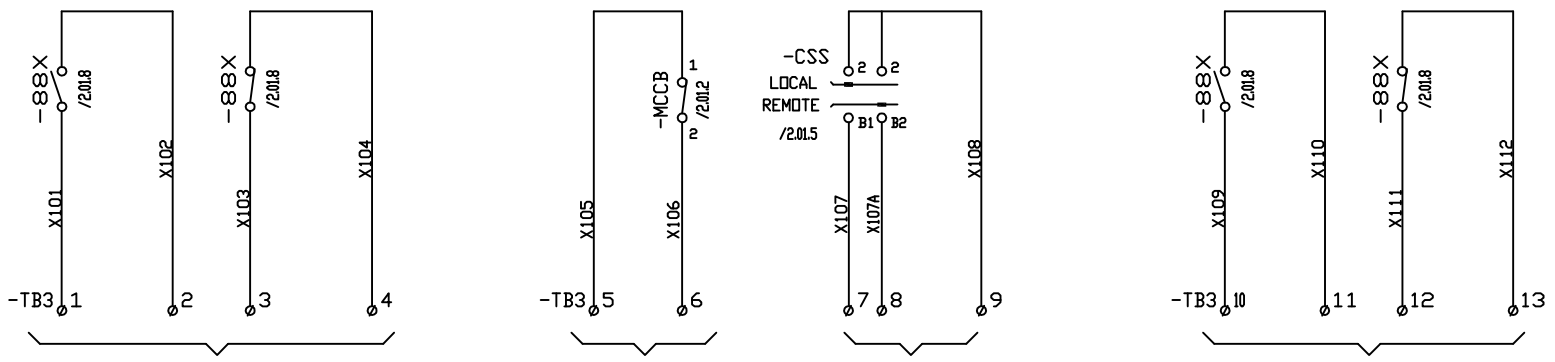
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-003 | REV. 02

DRG. NO. EP-3-GA-033-003


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-003
SCALE
NO. OF SHEETS 2.03
SHEET NO. 2.01
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
415V AC, 3 PH. SUPPLY FROM UAB
+UAB
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
GENERATOR STATOR HEATERS
24.0 KW, 415V, 50Hz, 3PH
(8 X 3KW)
HEATERS
-TB1
-TB05
-MCCB
-FS1
-FS2
-FS3
-TC
-V
-A
-CSS
LOCAL
REMOTE
-IPB1
-IPB2
+UCB
+GM
-TB02
THERMOSTAT
SEQ. ON
SEQ. OFF
-SLA
(CONTROL SUPPLY ON)
(HEATERS OFF)
(HEATERS ON)
3P & 2ND+2NC AUX. 4NO+4NC
3NO+1NC
-LK
-ELK
-88A
-88H
-88X
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
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DRG. NO. EP-3-GA-033-003
INVENTORY NO.

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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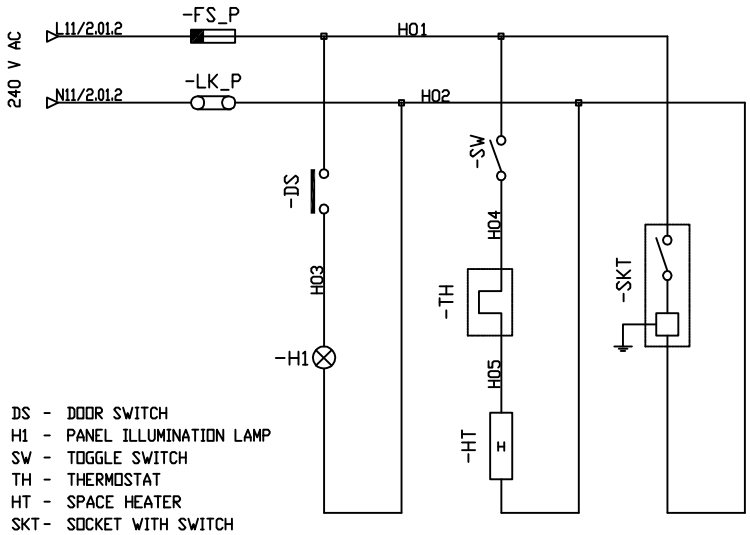


(GENERATOR STATOR HEATERS ON/OFF)
(TO UCB)

(GEN. STATOR HEATERS
LOCAL DRIVE DISTURBANCE)
(TO UCB)

(GEN. STATOR HEATERS
CONTROL LOCAL/REMOTE SELECTED)
(TO UCB)

(GENERATOR STATOR HEATERS ON/OFF)
SPARE



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT - SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-GA-033-003

INVENTORY NO.

REV. NO.	DATE		APPD.	APPD.
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05				
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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

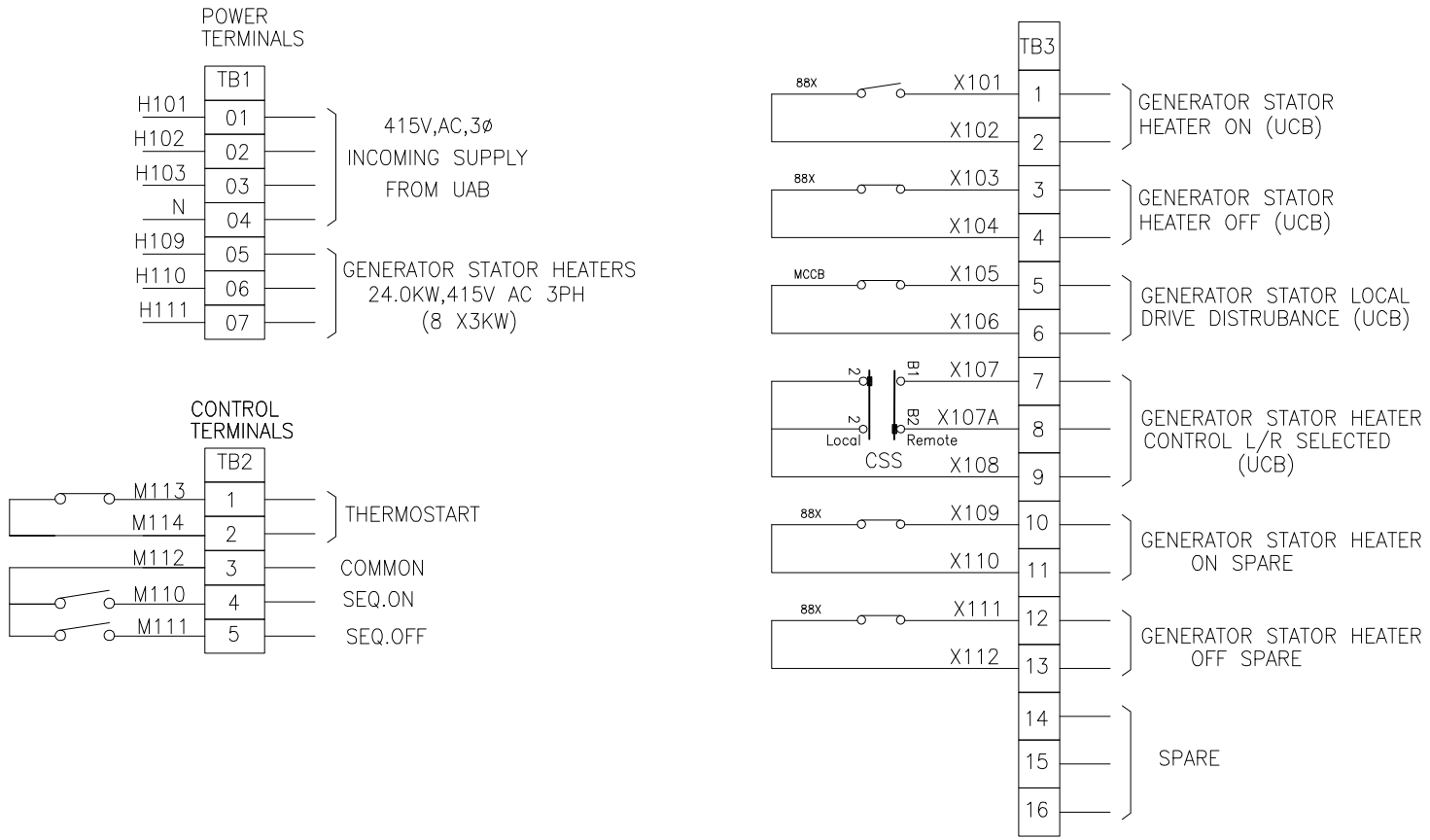
TITLE : CONTROL SCHEMATIC OF GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)

NO. OF SHEETS 2.03
SHEET NO. 2.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-003 | REV. 01

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Qty–6Nos

DRG. NO. EP–3–GA–033–003

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)

NO. OF SHEETS 2.03 | SHEET. NO. 2.03

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–CS–033–003 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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DRG. NO. EP-3-BM-033-003

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB	Moulded Case Circuit Breaker	63A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOHO	L&T	1	6
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	1	6
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	1	6
04	88	Power contactor	80A, 3P, Power Contactor with 240V AC coil,aux Supply	S97077BOOO	L&T	1	6
05	-	Power contactor Acc	Add-on contact 2NO+2NC for 80A P.cont	CS94114	L&T	1	6
06	88A	Latch relay	Latch relay with 3NO+1NC, 240VAC coil aux supply with mechanical interlock electrical reset	3RH2131-1AP00	Siemens	1	6
07	88X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	1	6
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	1	6
09	CSS	Local/Remote Slection	6A, Local/Remote selector switch,3pole 2way without OFF	61039	Salzer	1	6
10	CT	Current Transformer	45/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
11	V	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	1	6
12	A	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 45/1A Acc. CL:1,Range:0-60A scale	-	AE/ Meco	1	6
13	IPB1	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	1	6
14	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	1	6
15	IPB2	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	1	6
16	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	1	6

INVENTORY NO.

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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)

NO. OF SHEETS 02 | SHEET. NO. 01 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-003

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-003

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
17	SLA	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	1	6
18	FS1-FS3 & FS-P	Control Fuse base	20A Control Fuse Base	ST30772	L&T	4	24
19	FS1-FS3	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	3	18
20	FS-P	Control Fuse	16A Control fuse link 230V AC	ST30729	L&T	1	6
21	TC	Control Transformer	Single phase, 250VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
22	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	1	6
23	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	1	6
24	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	1	6
25	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	1	6
26	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	1	6
27	LK1,LK_P	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
28	ELK	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	6
29	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	7	42
30	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
31	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
32	SW	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	1	6
33	-	Panel Enclosure	Enclosure Size - H800 x W600 x D300mm	-	BHEL	1	6

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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
GENERATOR STATOR HEATER CONTROL CIRCUIT (1x24kW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-003 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - BRAKE DUST COLLECTOR MCP (1x7.46KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-004 REV. 02

DWG. NO. : - EP-3-CS-033-004 REV. 01

DWG. NO. : - EP-3-BM-033-004 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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05				
04				
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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF BRAKE DUST COLLECTOR MCP (1x7.46KW)

NO. OF SHEETS 01 | SHEET. NO. 01

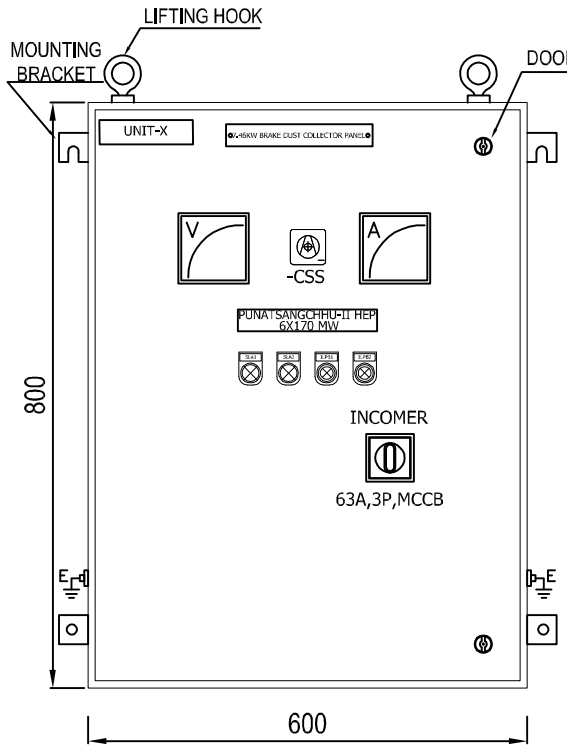
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

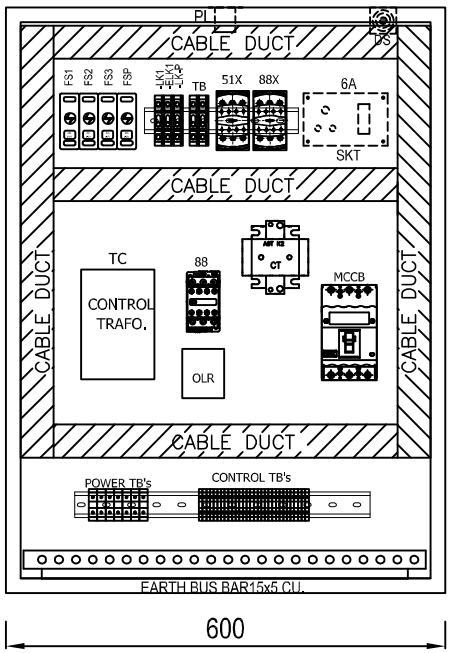
101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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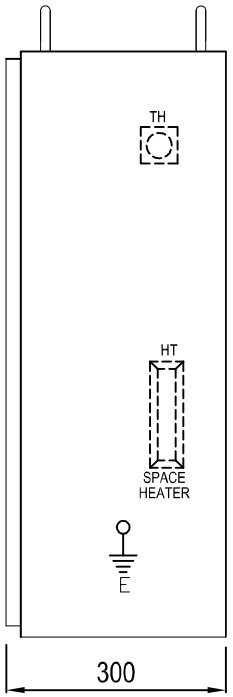
DRG. NO. EP-3-GA-033-004



FRONT VIEW



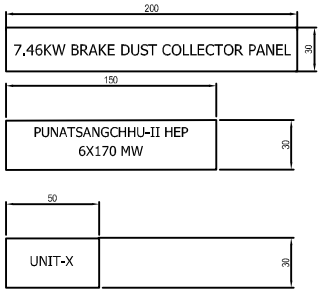
INTERNAL LAYOUT



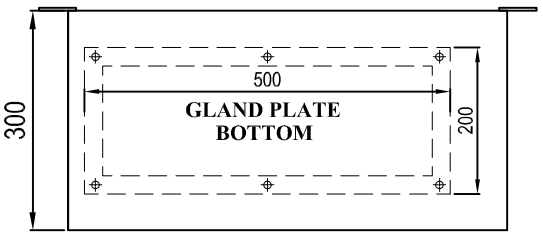
SIDE VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	175KG	

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty-6Nos

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03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

INVENTORY NO.

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DRAWN	SAURABH		07.03.17
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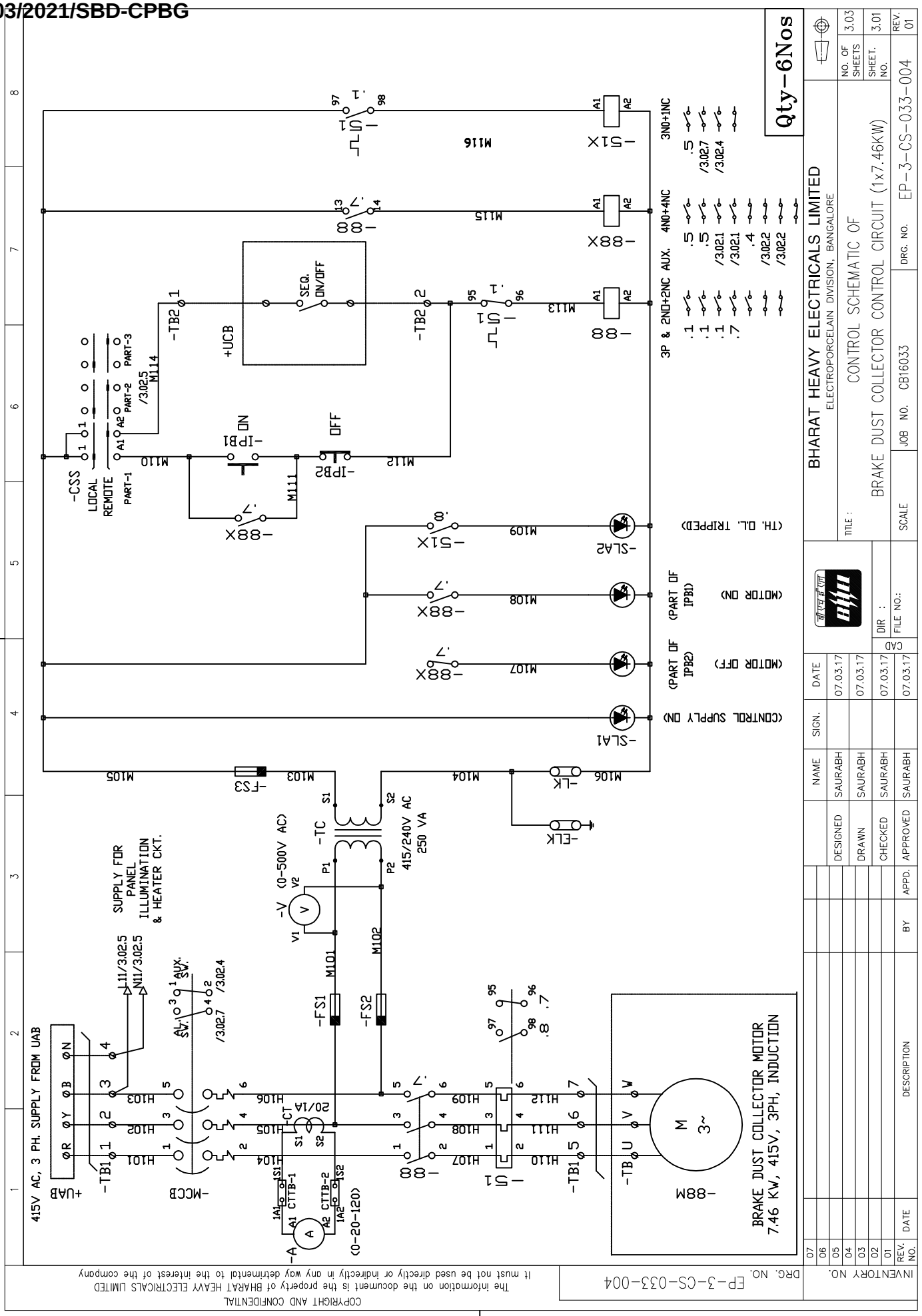
CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)

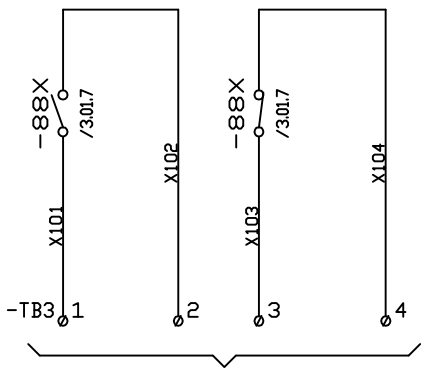
NO. OF SHEETS 03.1 | SHEET. NO. 03.1

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-004 | REV. 02


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-004
SCALE
NO. OF SHEETS 3.03
SHEET. NO. 3.01
REV. 01
415V AC, 3 PH. SUPPLY FROM UAB
BRAKE DUST COLLECTOR MOTOR
7.46 KW, 415V, 3PH, INDUCTION
SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
415/240V AC 250 VA
(0-500V AC)
(0-20-120)
3P & 2ND+2NC AUX.
4ND+4NC
3ND+1NC
(CONTROL SUPPLY ON)
(MOTOR OFF) (PART OF IPB2)
(MOTOR ON) (PART OF IPB1)
(TH. O.L. TRIPPED)
LOCAL REMOTE
SEQ. ON/OFF
ON
OFF
+UCB
-MCCB
-88M
-TC
-FS1
-FS2
-FS3
-ELK
-SLA1
-SLA2
-IPB1
-IPB2
-CSS
-TB1
-TB2
-A
-V
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
CAD DIR :
FILE NO.:
DESCRIPTION
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INVENTORY NO.
DRG. NO. EP-3-CS-033-004
FIRST ANGLE PROJECTION
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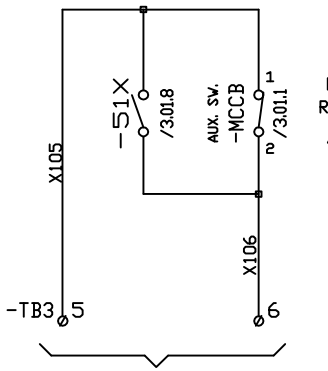
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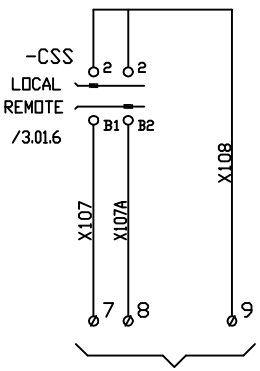
(BRAKE DUST COLLECTOR MOTOR ON/OFF)

(TO UCB)



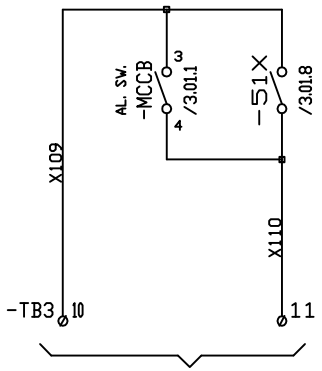
(BRAKE DUST COLLECTOR LOCAL DRIVE DISTURBANCE)

(TO UCB)



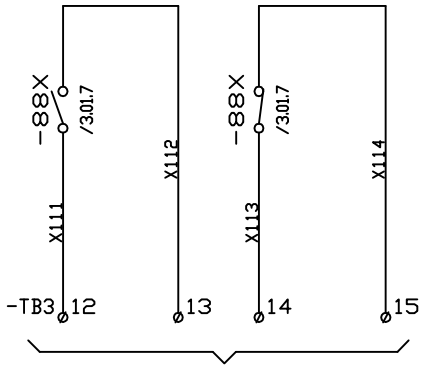
(BRAKE DUST COLLECTOR CONTROL LOCAL/REMOTE SELECTED)

(TO UCB)



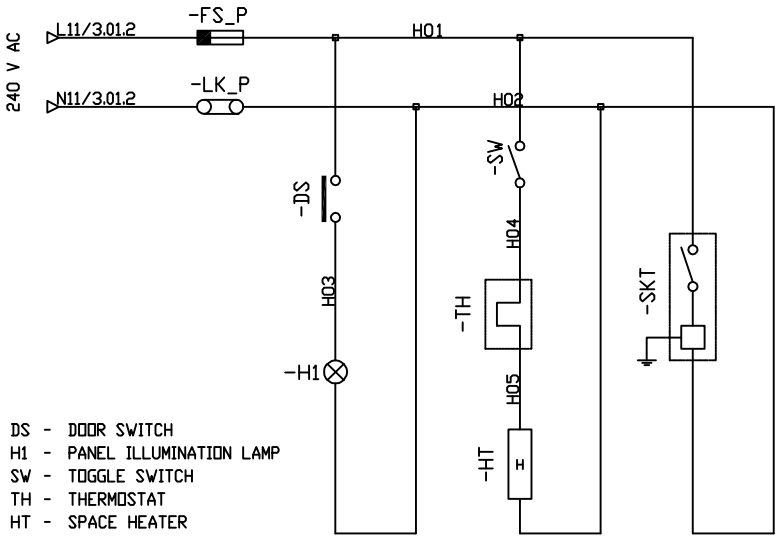
(BRAKE DUST COLLECTOR MOTOR TH. O. L. /MCCB TRIPPED)

(TO UCB)



(BRAKE DUST COLLECTOR MOTOR ON/OFF)

SPARE



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT - SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-004

INVENTORY NO.

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02				
01				

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

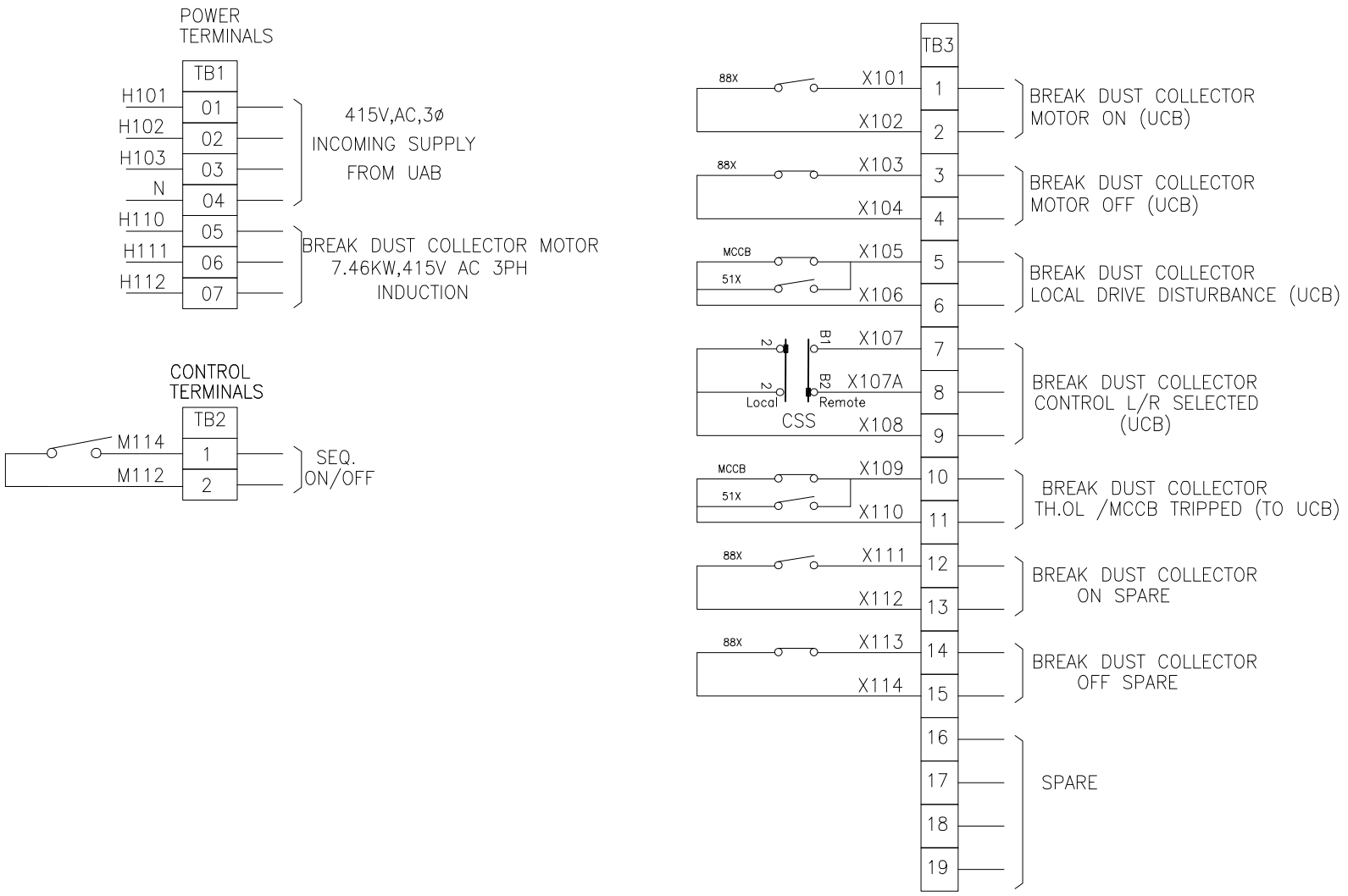
TITLE : CONTROL SCHEMATIC OF BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)

NO. OF SHEETS 3.03
SHEET. NO. 3.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-004 | REV. 01

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TITLE : CONTROL SCHEMATIC OF
BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)

NO. OF SHEETS 3.03 | SHEET. NO. 3.03

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-004 | REV. 02

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1 2 3 4 5 6 7 8

			BILL OF MATERIAL				
Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB	Moulded Case Circuit Breaker	63A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOHO	L&T	1	6
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	1	6
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	1	6
04	88	Power contactor	32A, 3P, Power Contactor with 240V AC coil,aux Supply	CS94111BOOO	L&T	1	6
05	-	Power contactor Acc	Add-on contact 2NO+2NC for 32A P.cont	CS94114	L&T	1	6
06	51X	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	1	6
07	88X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	1	6
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	1	6
09	-51	Overload Relay	9-15A,415V Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94142OOBO	L&T	1	6
10	CSS	Local/Remote Slection	6A, Local/Remote selector switch,3pole 2way without OFF	61039	Salzer	1	6
12	CT	Current Transformer	20/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
13	V	Analogue Voltmeter	Analogue 415V AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	1	6
14	A	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 20/1A Acc. CL:1,Range:0-20-120A with suppressed scale.	-	AE/ Meco	1	6
15	IPB1	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia,Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	1	6
16	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	1	6
17	IPB2	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	1	6
18	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	1	6
19	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	1	6

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DRG. NO. EP-3-BM-033-004

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-004 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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DRG. NO. EP-3-BM-033-004

INVENTORY NO.

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1 & SLA2	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	2	12
21	FS1-FS3 & FS-P	Control Fuse base	20A Control Fuse Base	ST30772	L&T	4	24
22	FS1-FS3	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	3	18
23	FS-P	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	1	6
24	TC	Control Transformer	Single phase, 250VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	1	6
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	1	6
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	1	6
28	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	1	6
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	1	6
30	LK1,LK_P	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
31	ELK	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	6
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	7	42
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
36	-	Panel Enclosure	Enclosure Size - H800 x W600 x D300mm	-	BHEL	1	6

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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
BRAKE DUST COLLECTOR CONTROL CIRCUIT (1x7.46KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-004 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - GOVERNOR OPU OIL PUMP MCP (2x30KW+1X3.6KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-005 REV. 02

DWG. NO. : - EP-3-CS-033-005 REV. 01

DWG. NO. : - EP-3-BM-033-005 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF GOVERNOR OPU OIL PUMP MCP (2x30KW+1X3.6KW)

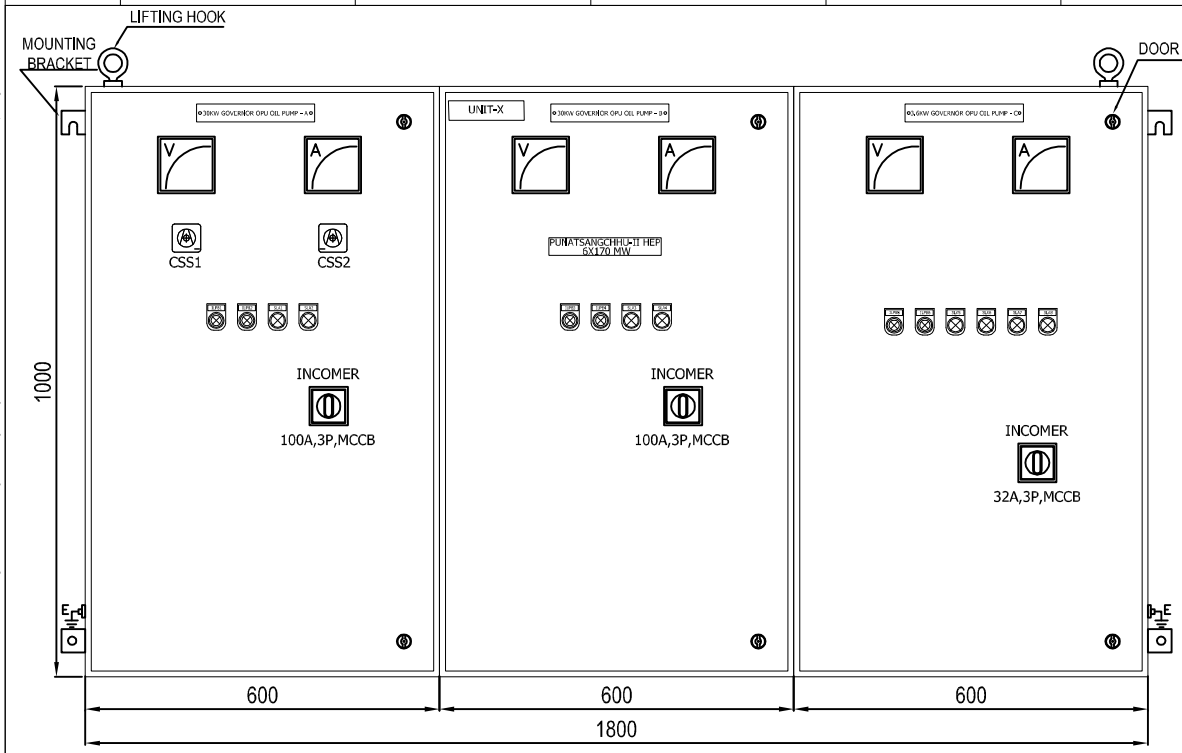
NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

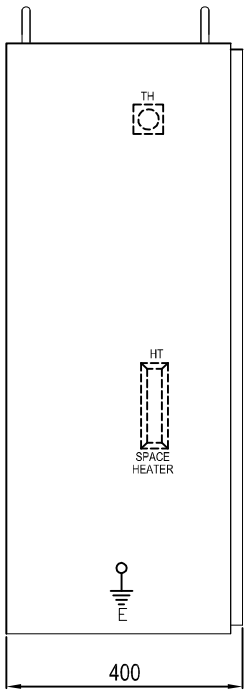
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

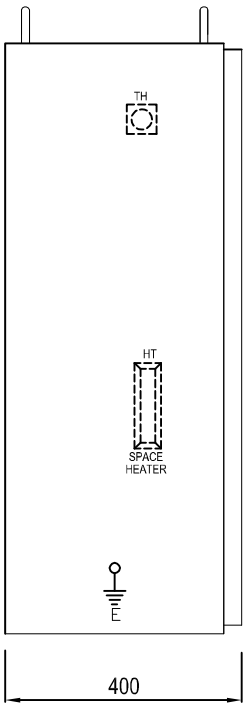
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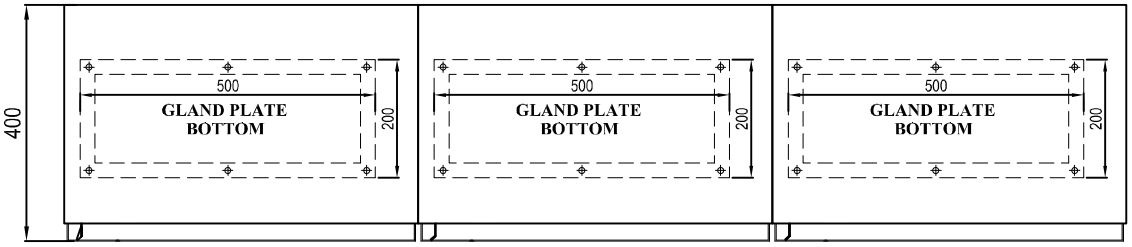
FRONT VIEW



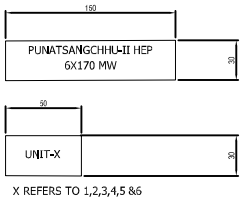
SIDE VIEW LHS SIDE

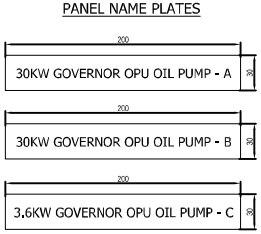


SIDE VIEW RHS SIDE



MOUNTING DETAILS - PANEL BOTTOM





ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty–6Nos

DRG. NO. EP–3–GA–033–005

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.3.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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INVENTORY NO.

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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

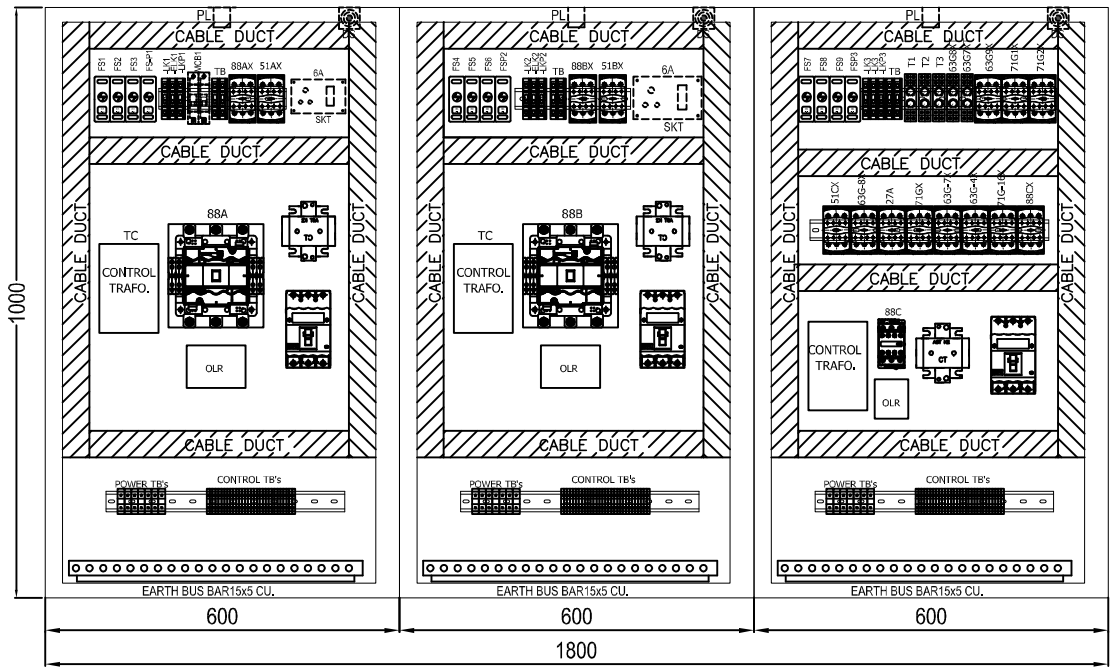
NO. OF SHEETS 04.2
SHEET. NO. 04.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–005 | REV. 02

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	600KG	

Qty-6Nos

DRG. NO. EP-3-GA-033-005

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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04				
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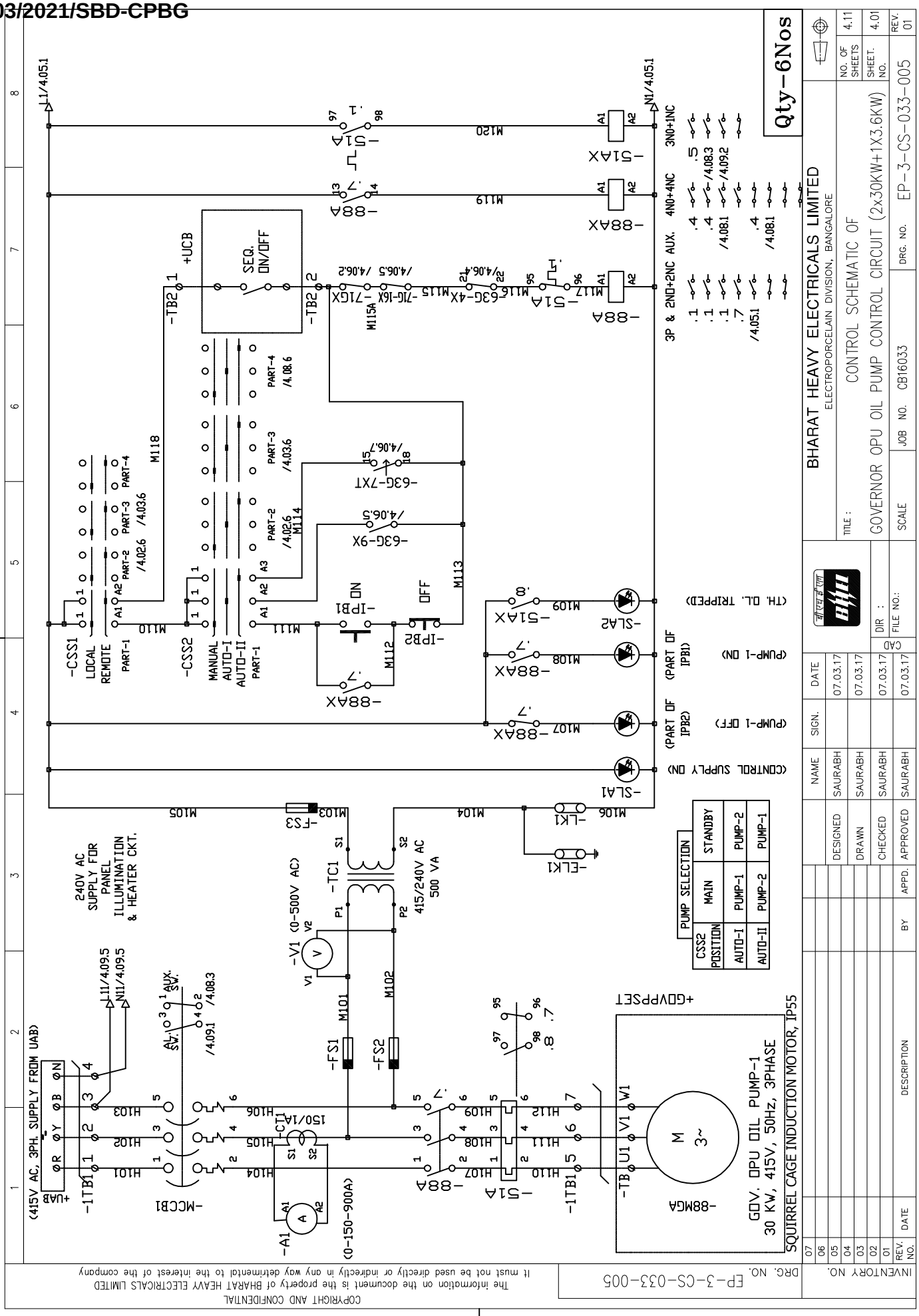
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FILE NO.:

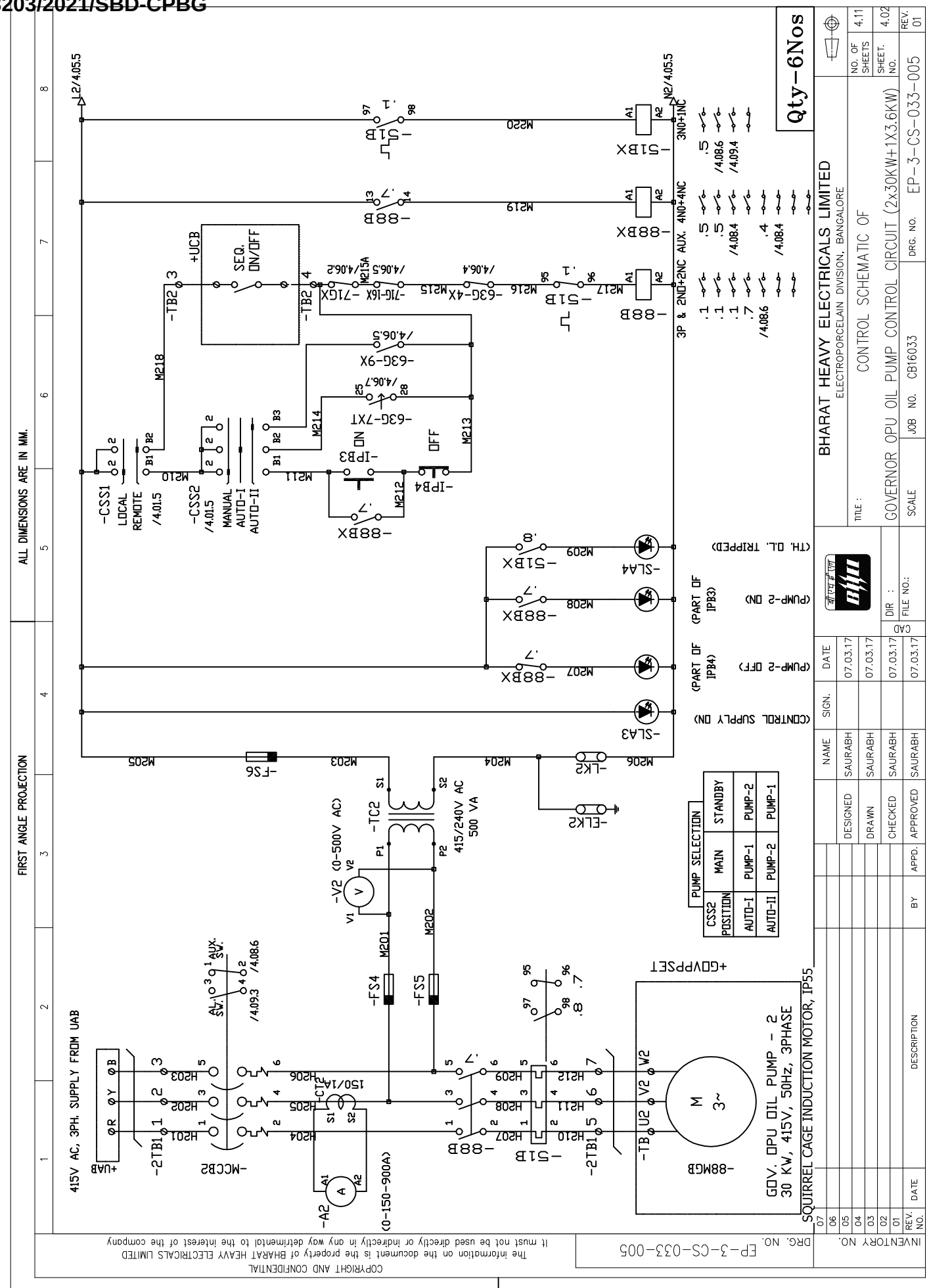
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

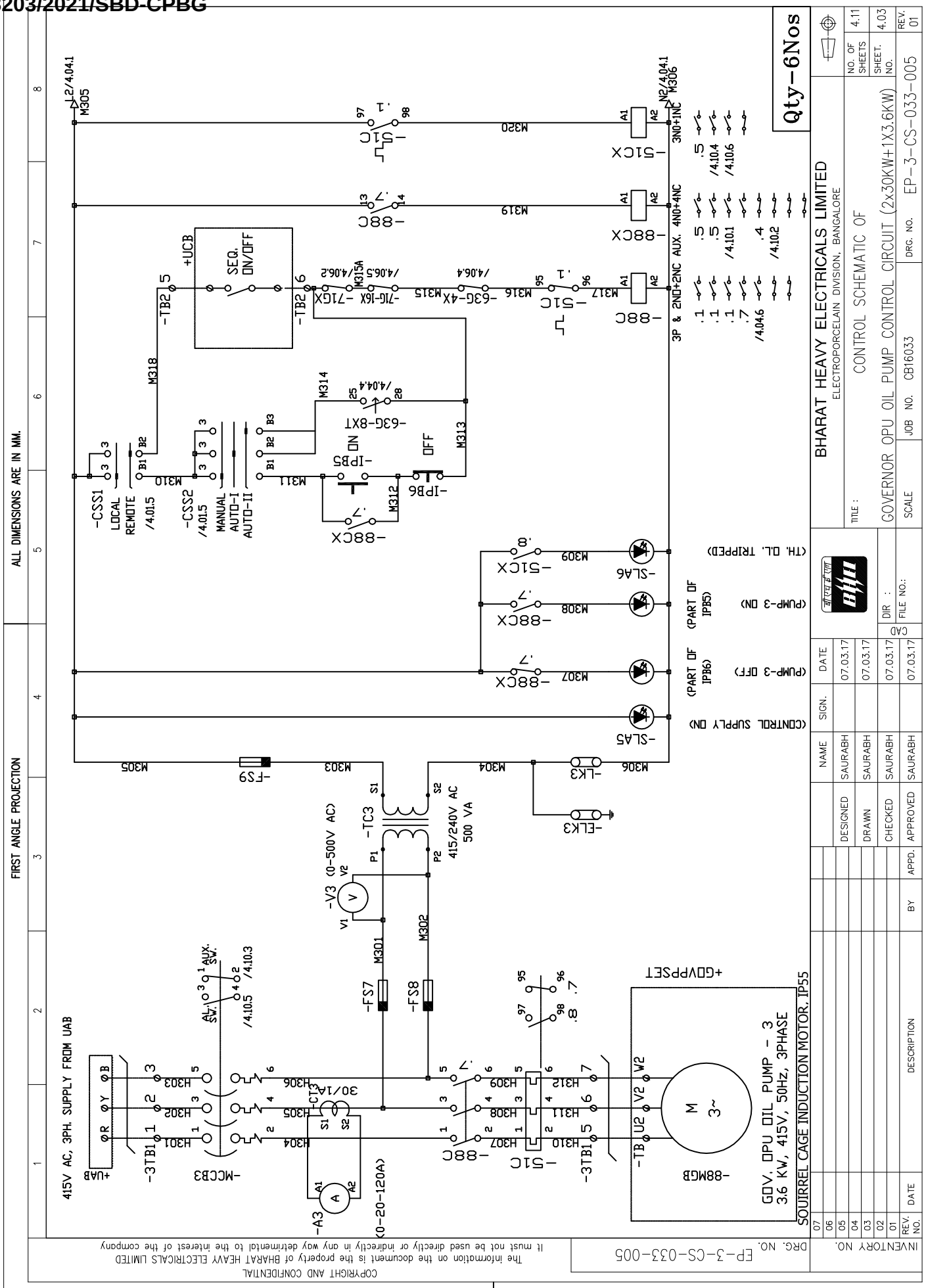
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SHEET. NO. 04.2

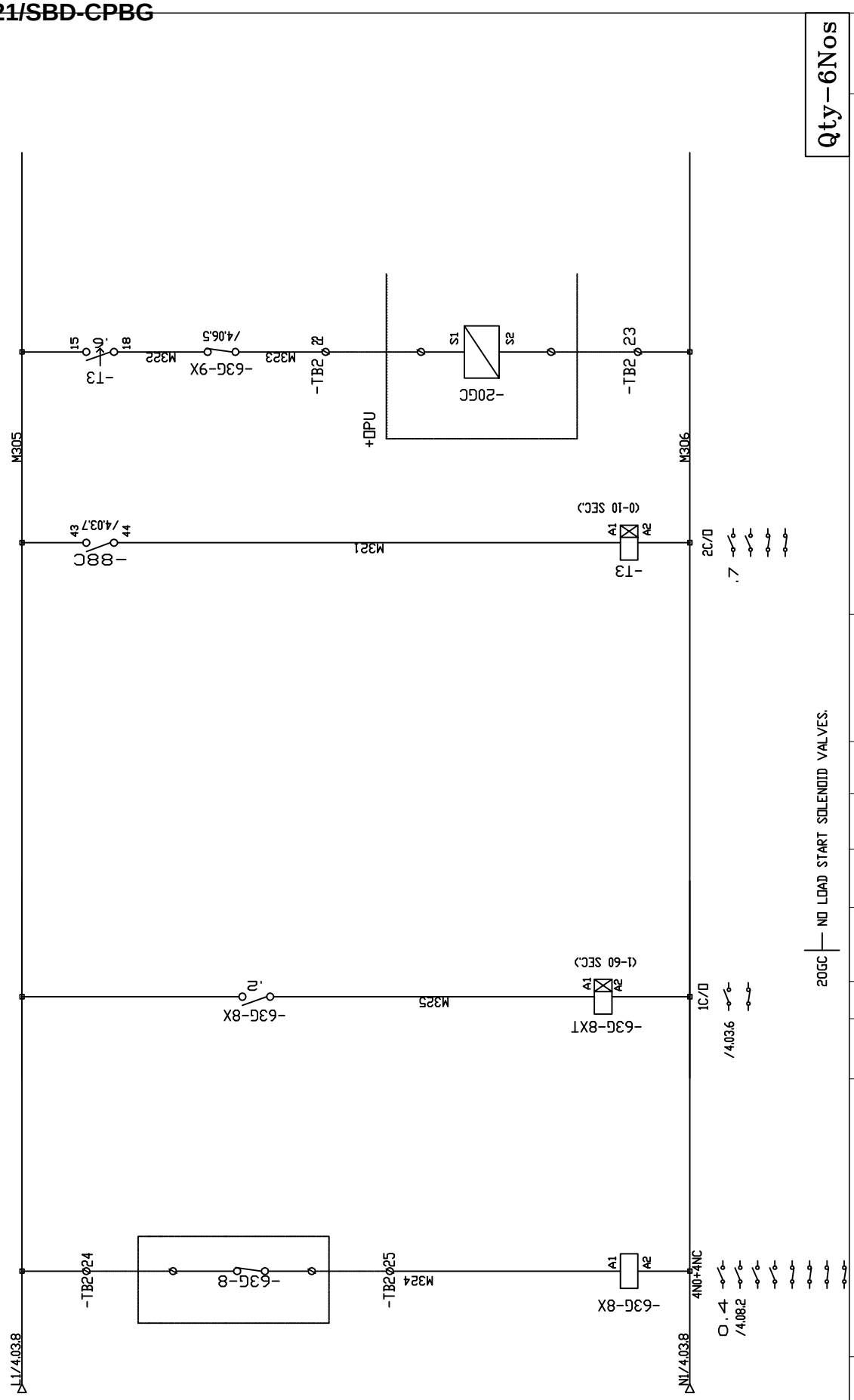
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-005 | REV. 02


BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-005
NO. OF SHEETS 4.11
SHEET NO. 4.01
REV. 01
Qty-6Nos
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
(415V AC, 3PH. SUPPLY FROM UAB)
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
GOV. OPU OIL PUMP-1
30 KW, 415V, 50Hz, 3PHASE
SQUIRREL CAGE INDUCTION MOTOR, IP55
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
PUMP-1
PUMP-2
AUTO-I
AUTO-II
(CONTROL SUPPLY ON)
(PUMP-1 OFF)
(PUMP-1 ON)
(TH. OL. TRIPPED)
3P & 2ND+2NC AUX. 4NO+4NC 3NO+1NC
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DRG. NO. EP-3-CS-033-005
INVENTORY NO.
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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-005
NO. OF SHEETS 4.11
SHEET. NO. 4.02
REV. 01
Qty-6Nos
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415V AC, 3PH. SUPPLY FROM UAB
GOV. OPU OIL PUMP - 2
30 KW, 415V, 50Hz, 3PHASE
SQUIRREL CAGE INDUCTION MOTOR, IP55
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
AUTO-I
PUMP-1
PUMP-2
AUTO-II
PUMP-2
PUMP-1
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
BY
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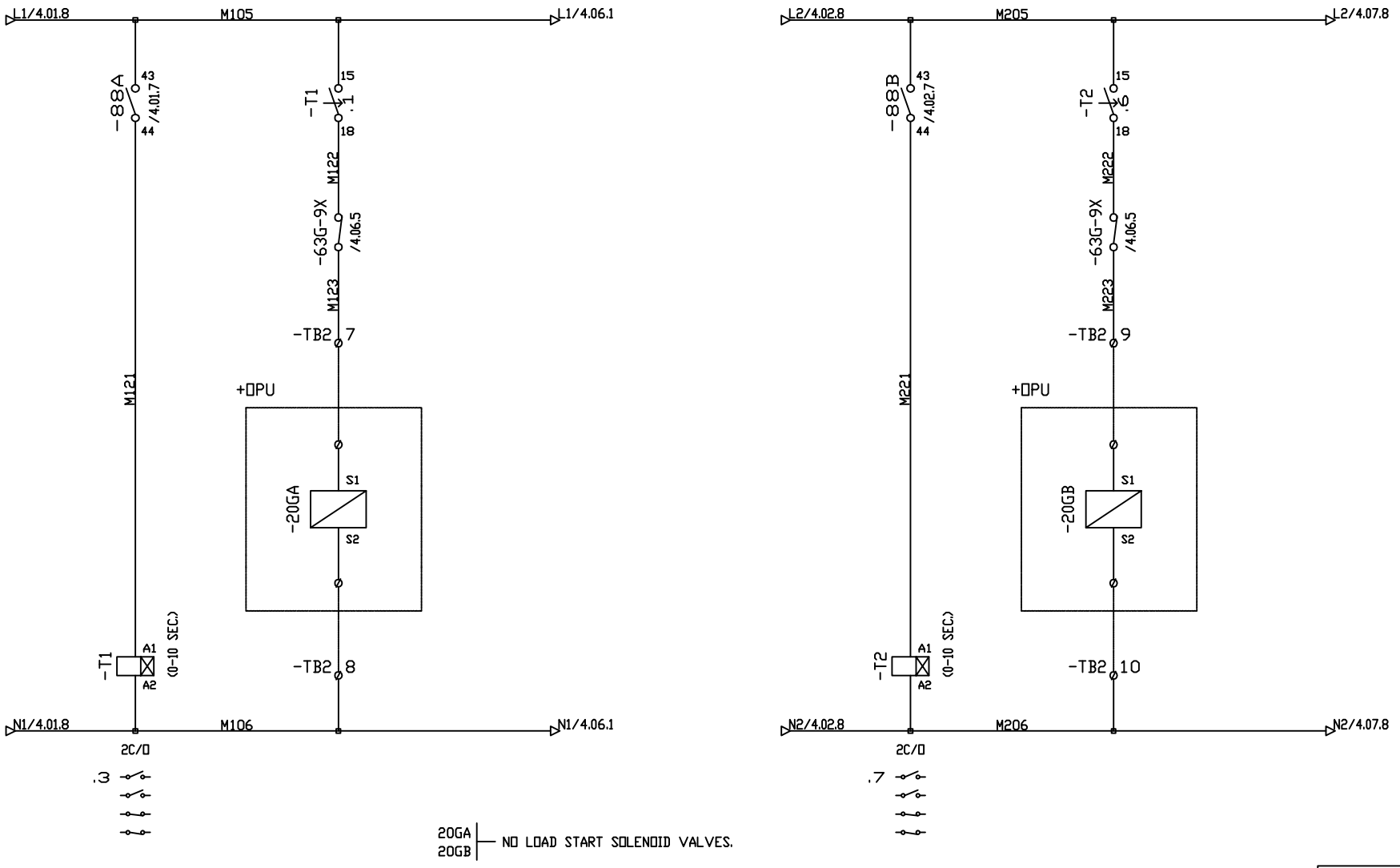
198203/2021/SBD-CPBG




Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-005
NO. OF SHEETS 4.11
SHEET NO. 4.04
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DIR :
FILE NO.:
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
2OGC — NO LOAD START SOLENOID VALVES.
-63G-8X
-63G-8XT
-63G-9X
-20GC
-88C
-T3
-TB2Ø24
-TB2Ø25
-TB2 22
-TB2 23
+OPU
M305
M306
M321
M322
M323
M324
M325
4NO+4NC
1C/O
2C/O
L1/4.03.8
N1/4.03.8
/4.03.6
/4.08.2
/4.03.7
/4.06.5
(0-10 SEC.)
(1-60 SEC.)
DRG. NO. EP-3-CS-033-005
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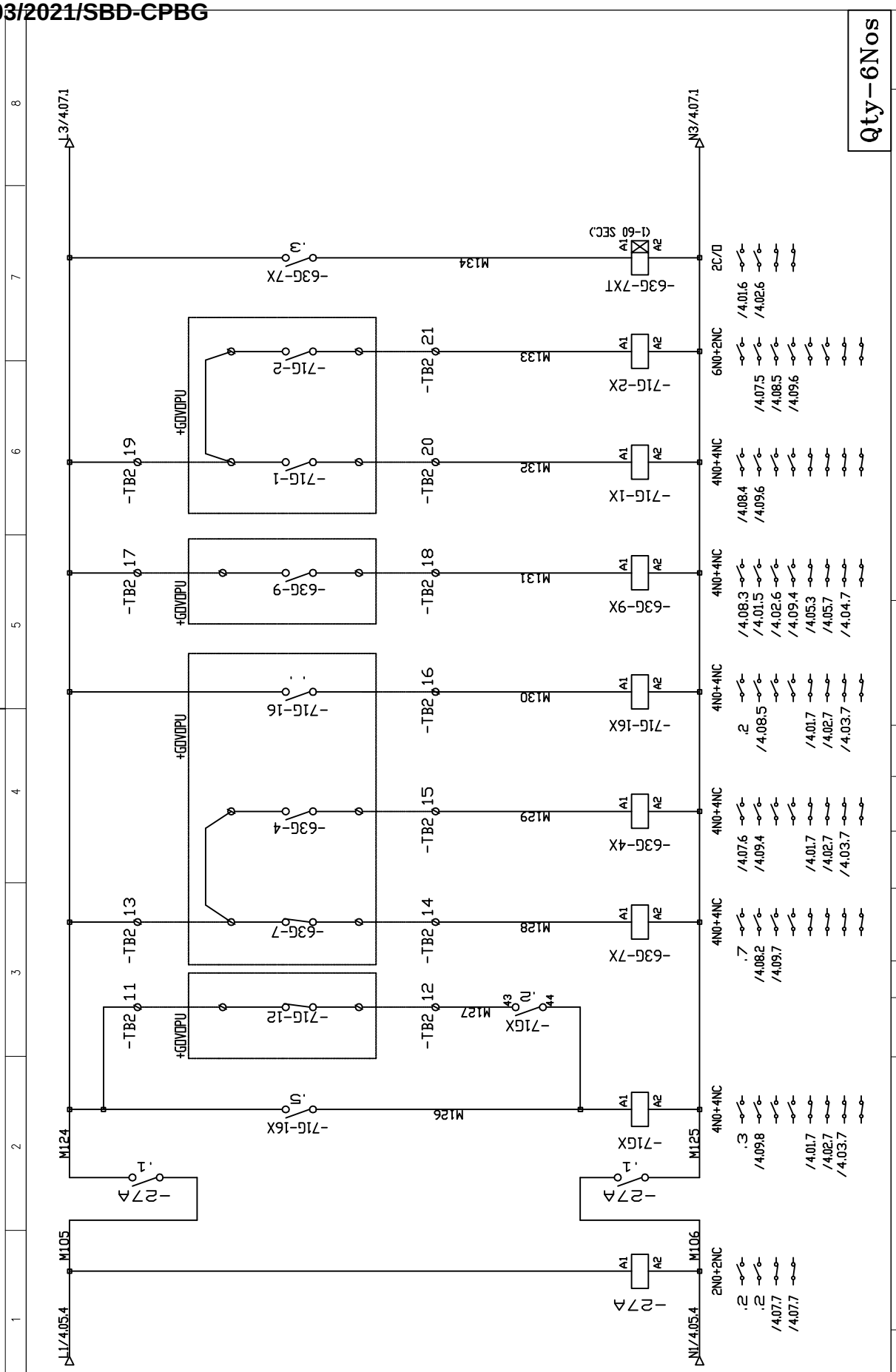
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

NO. OF SHEETS 4.11
SHEET. NO. 4.05

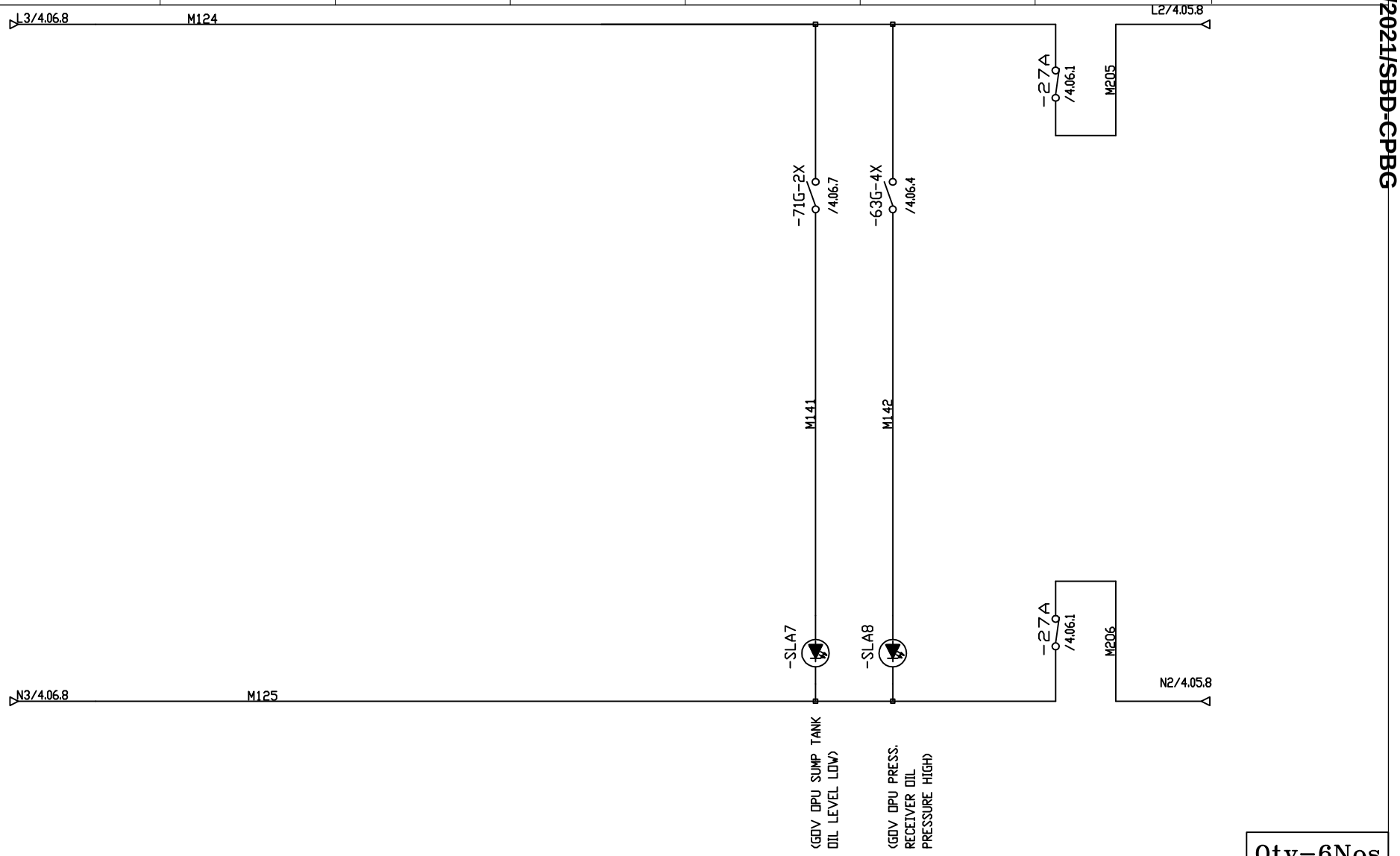
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-005 | REV. 01

198203/2021/SBD-CPBG



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ELECTROPORCELAIN DIVISION, BANGALORE

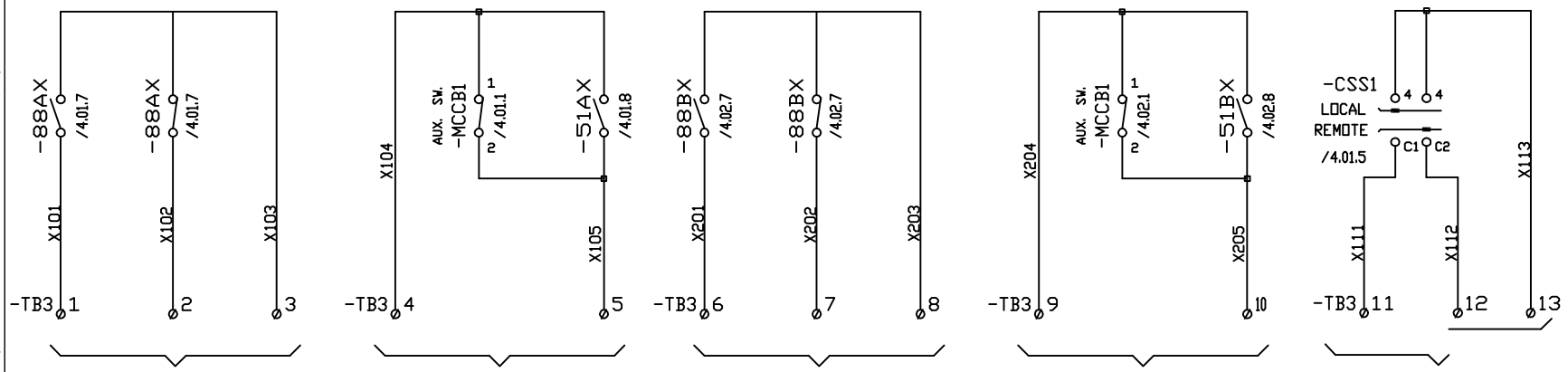
TITLE : CONTROL SCHEMATIC OF
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-005

NO. OF SHEETS 4.11
SHEET. NO. 4.07
REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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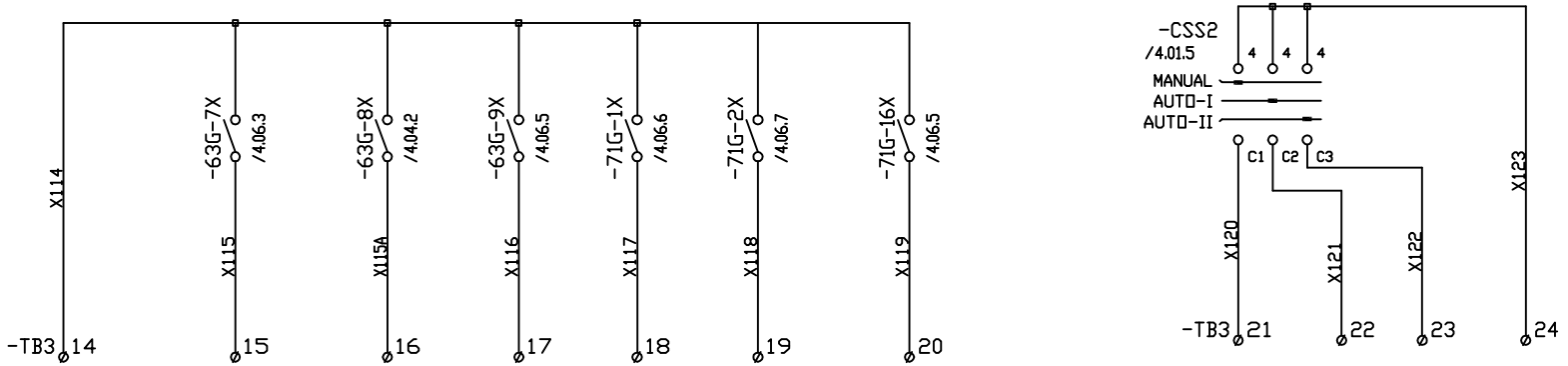
(GOV. OIL PUMP-1 ON/OFF) (TO UCB)

(GOV. OIL PUMP-1 LOCAL DRIVE DISTURBANCE) (TO UCB)

(GOV. OIL PUMP-2 ON/OFF) (TO UCB)

(GOV. OIL PUMP-2 LOCAL DRIVE DISTURBANCE) (TO UCB)

(GOV. OIL PUMPS CONTROL LOCAL/REMOTE SELECTION) (TO UCB)



(GOV. OIL PRESS LOW TO START/STOP STANDBY PUMP) (TO UCB)

(GOV. OIL PRESS LOW TO START/STOP MAIN PUMP) (TO UCB)

(GOV. OPU SUMP TANK OIL LEVEL HIGH) (TO UCB)

(GOV. OPU SUMP TANK OIL LEVEL LOW) (TO UCB)

(GOV. OPU SUMP TANK OIL LEVEL VERY LOW) TO STOP (TO UCB)

(GOV. OIL PUMPS CONTROL MANUAL/AUTO-I/AUTO-II SELECTION) (TO UCB)

Qty-6Nos

DRG. NO. EP-3-CS-033-005

INVENTORY NO.

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CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

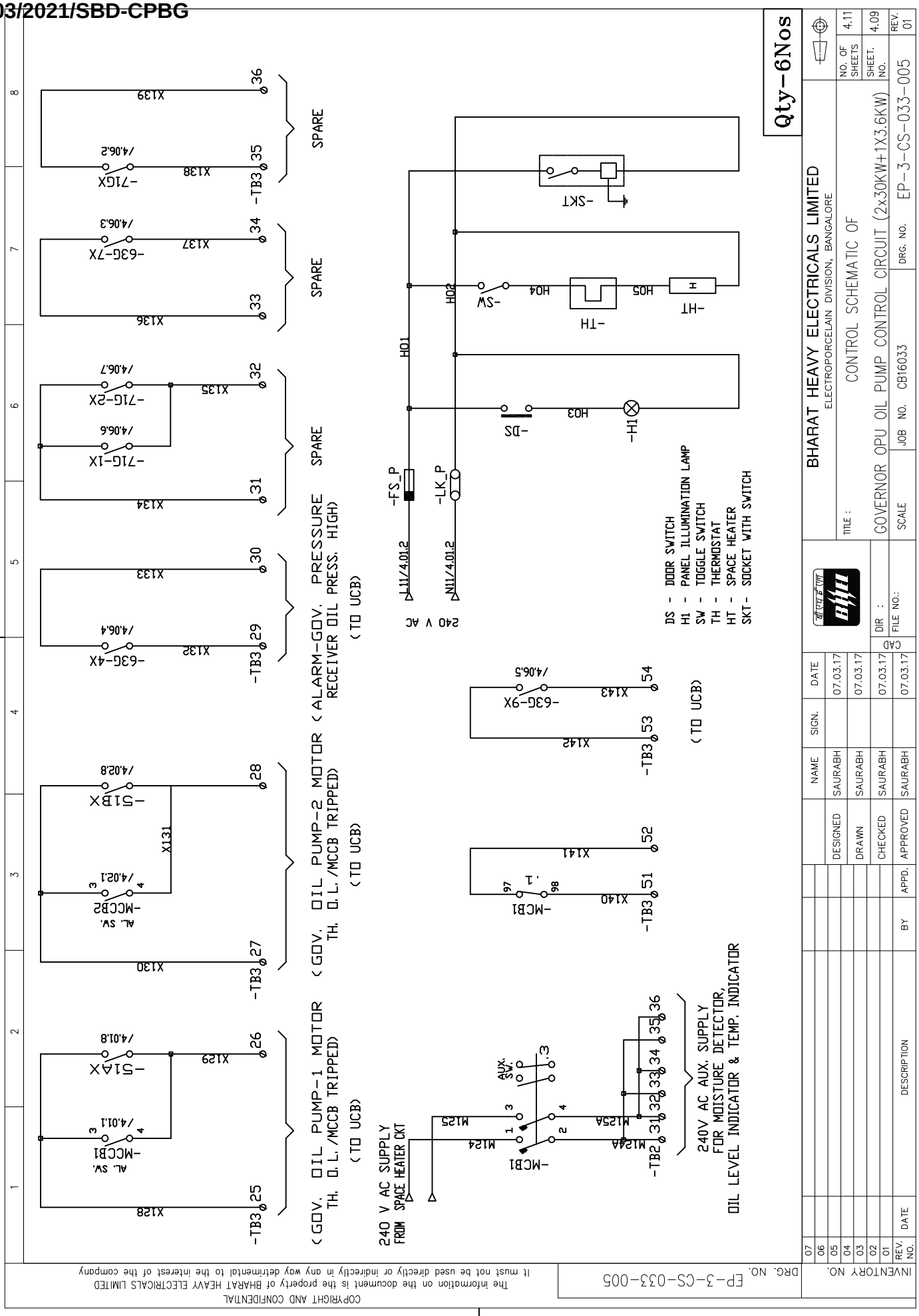
CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-005

NO. OF SHEETS 4.11
SHEET. NO. 4.08
REV. 01



REV. NO.	DATE	DESCRIPTION	BY	APPD.
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02				
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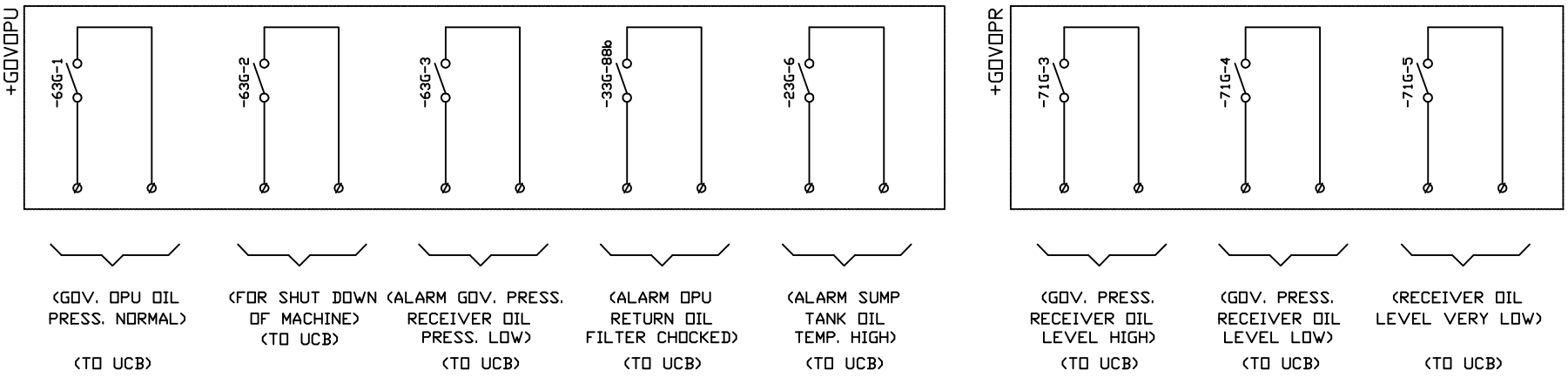
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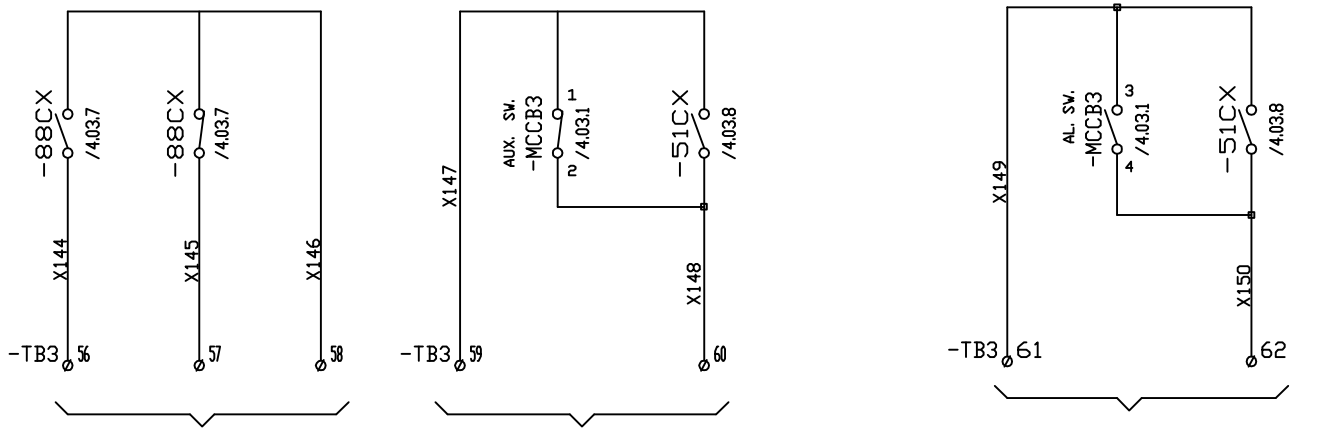
DRG. NO. EP-3-CS-033-005

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Qty-6Nos

DRG. NO. EP-3-CS-033-005

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
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01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

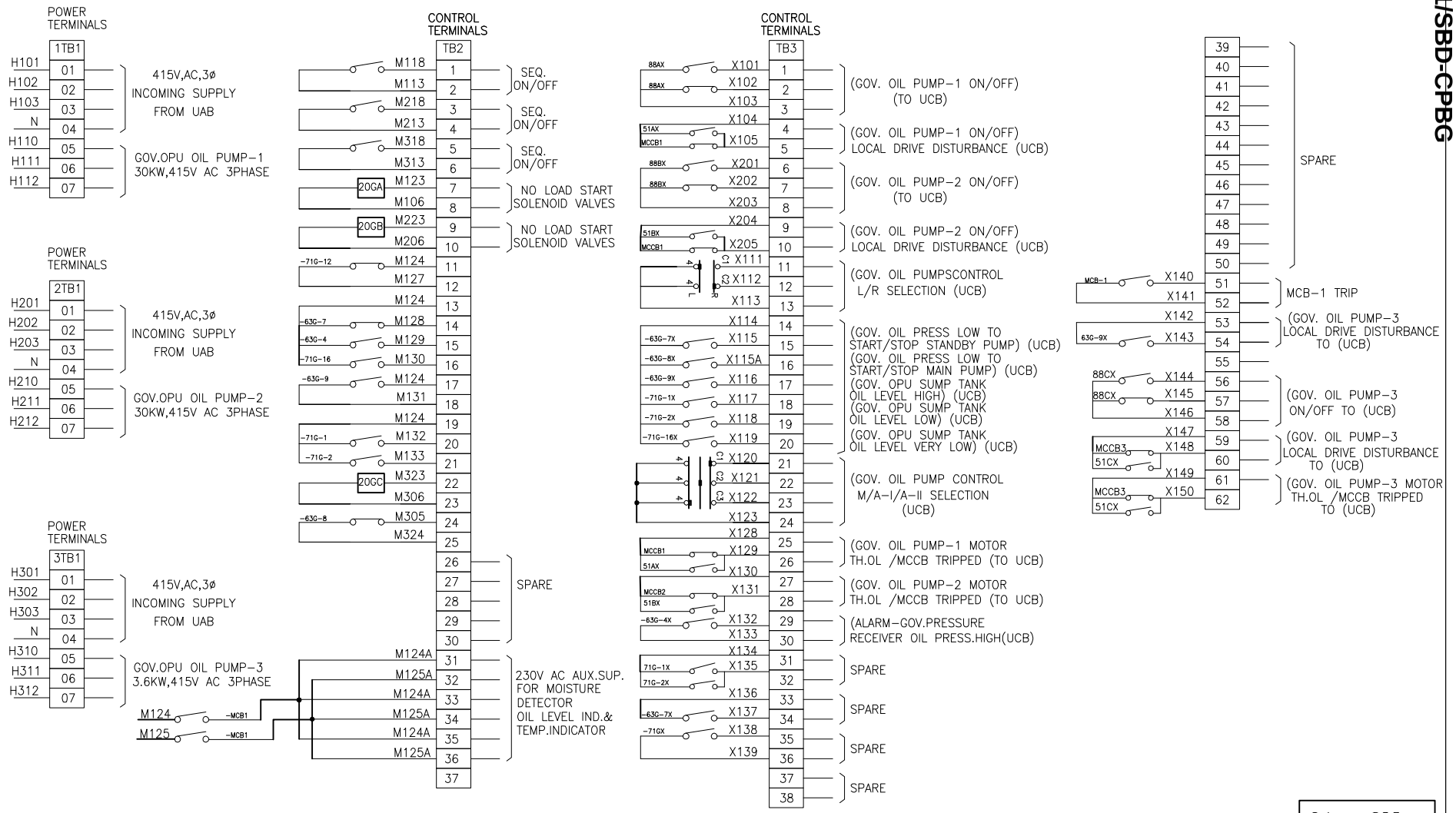
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-005

NO. OF SHEETS 4.11 | SHEET. NO. 4.10 | REV. 01

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Qty-6Nos

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04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

NO. OF SHEETS 4.11
SHEET. NO. 4.11

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-005 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	100A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOKO	L&T	2	12
02	MCCB3	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOEO	L&T	1	6
03	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	3	18
04	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	3	18
05	88A,88B	Power contactor	110A,415V,3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94137BOOO	L&T	2	12
06	88C	Power contactor	32A,415V,3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94111BOOO	L&T	1	6
07	88C	Power contactor Acc	Add-on contact 2NO+2NC for 32A P.cont	CS94114	L&T	1	6
08	51AX,51BX & 51CX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	3	18
09	88AX,88BX,88CX,63G8X,-27A -71GX,-63G-7X,-63G-4X,-71G -16X,-63G-9X,-71G-1X, -71G-2X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	12	72
10	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	10	60
11	71G-2X	Aux Contactor Acc	Addon contact 4NO	CS94594	L&T	1	6
12	51A&51B	Overload Relay	45-75A Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94137OOJO	L&T	2	12
13	-51C	Overload Relay	5-16A,415V Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94135OOBO	L&T	1	6
14	T1,T2&T3	On-delay Timer	0.1sec - 30Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	3	18
15	63G-8XT&63G-7XT	On-delay Timer	0.1sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	12
16	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way without OFF	61040	Salzer	1	6
17	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way without OFF	61120	Salzer	1	6
18	CT1&CT2	Current Transformer	150/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
19	CT3	Current Transformer	30/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	6
20	V1,V2,V3	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	3	18
21	A1 & A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 150/1A Acc. CL:1,Range:0-150-900A with suppressed scale	-	AE/ Meco	2	12
22	A3	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 30/1A Acc. CL:1,Range:0-20-120A with suppressed scale	-	AE/ Meco	1	6

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DRG. NO. EP-3-BM-033-005

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

NO. OF SHEETS 2 | SHEET. NO. 1 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-005

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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DRG. NO. EP-3-BM-033-005

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
23	IPB1,IPB3&IPB5	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	3	18
24	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	3	18
25	IPB2,IPB4&IPB6	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	3	18
26	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	3	18
27	SLA1,SLA2,SLA3,SLA4,SLA5 SLA6,SLA7 &SLA8	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	8	48
28	FS1-FS9 & FSP1-FSP3	Control Fuse base	20A Control Fuse Base	ST30772	L&T	12	72
29	FS1-FS9	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	9	56
30	FSP1-FSP3	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	3	18
31	MCB 1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	6
32	-	MCB Accessories	1NO+1NC Auxiliary contact for MCB	BZA11006	L&T	1	6
33	TC1,TC2&TC3	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	3	18
34	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
35	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
36	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	3	18
37	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	3	18
38	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
39	LK1-LK3,LKP1-LKP3	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	5	30
40	ELK 1-3	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	3	18
41	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	21	126
42	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
43	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
44	-	Panel Enclosure	Enclosure Size - H1000 x W1800 x D400mm	-	BHEL	1	6
45	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	2	12

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
GOVERNOR OPU OIL PUMP CONTROL CIRCUIT (2x30KW+1X3.6KW)

NO. OF SHEETS 2 | SHEET. NO. 2

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-005 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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TITLE : - MIV OPU OIL PUMP MCP (2x55KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-006 REV. 02

DWG. NO. : - EP-3-CS-033-006 REV. 01

DWG. NO. : - EP-3-BM-033-006 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

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07				
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF MIV OPU OIL PUMP MCP (2x55KW)

NO. OF SHEETS 01 | SHEET. NO. 01

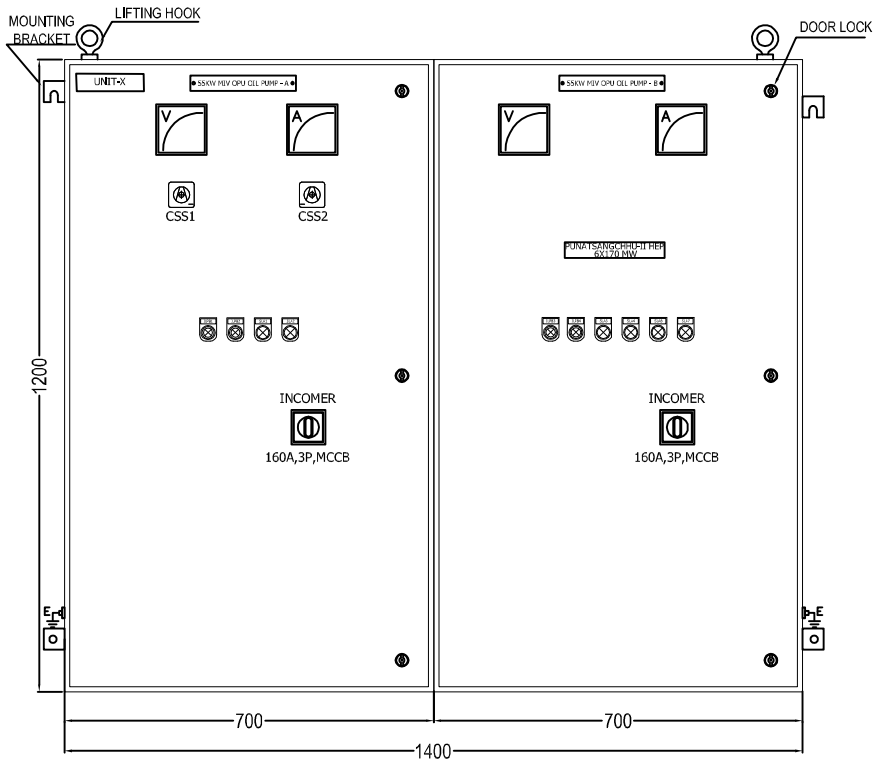
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

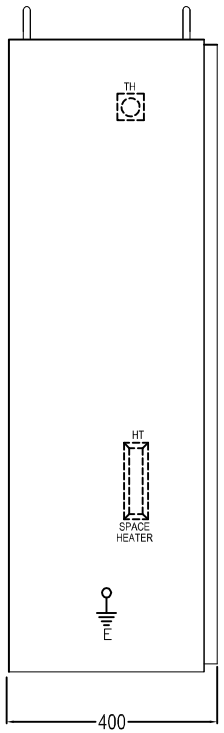
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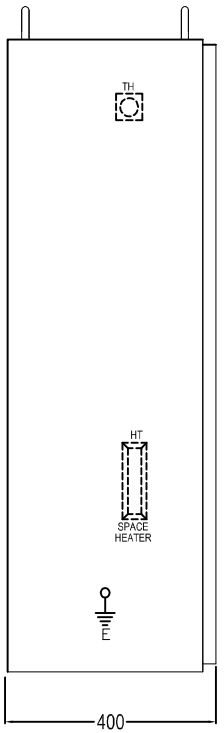
DRG. NO. EP-3-GA-033-006



FRONT VIEW

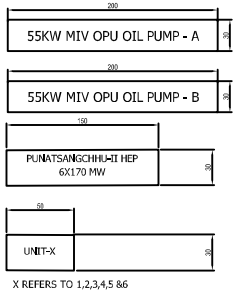


SIDE VIEW
LHS SIDE

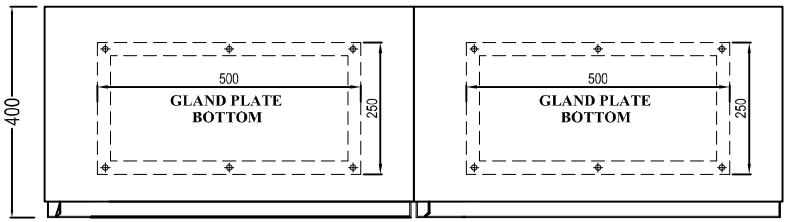


SIDE VIEW
RHS SIDE

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.3.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

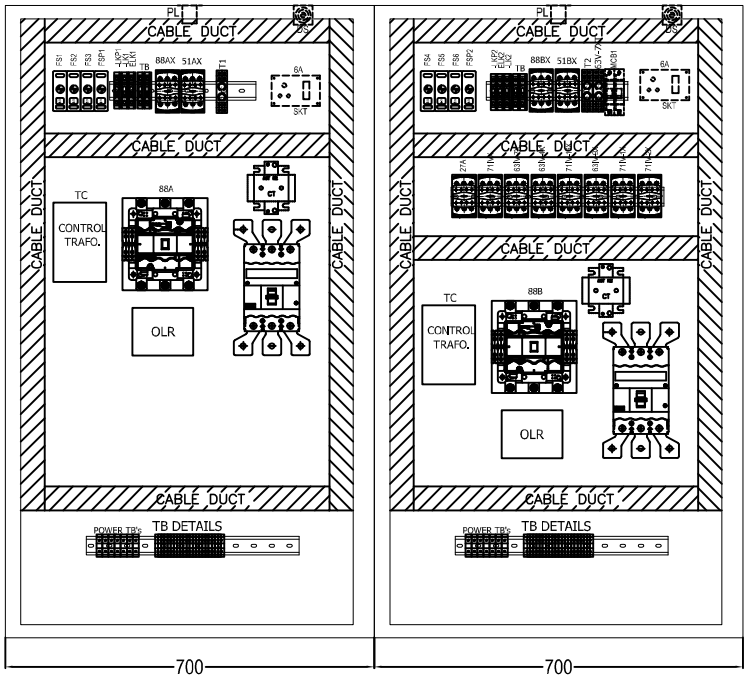
NO. OF SHEETS 05.2 | SHEET. NO. 05.1 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-006

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3.0mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	500KG	

Qty-6Nos

DRG. NO. EP-3-GA-033-006

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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06				
05				
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03	22.3.18	AS BUILT DRAWING	SAURABH	SAURABH
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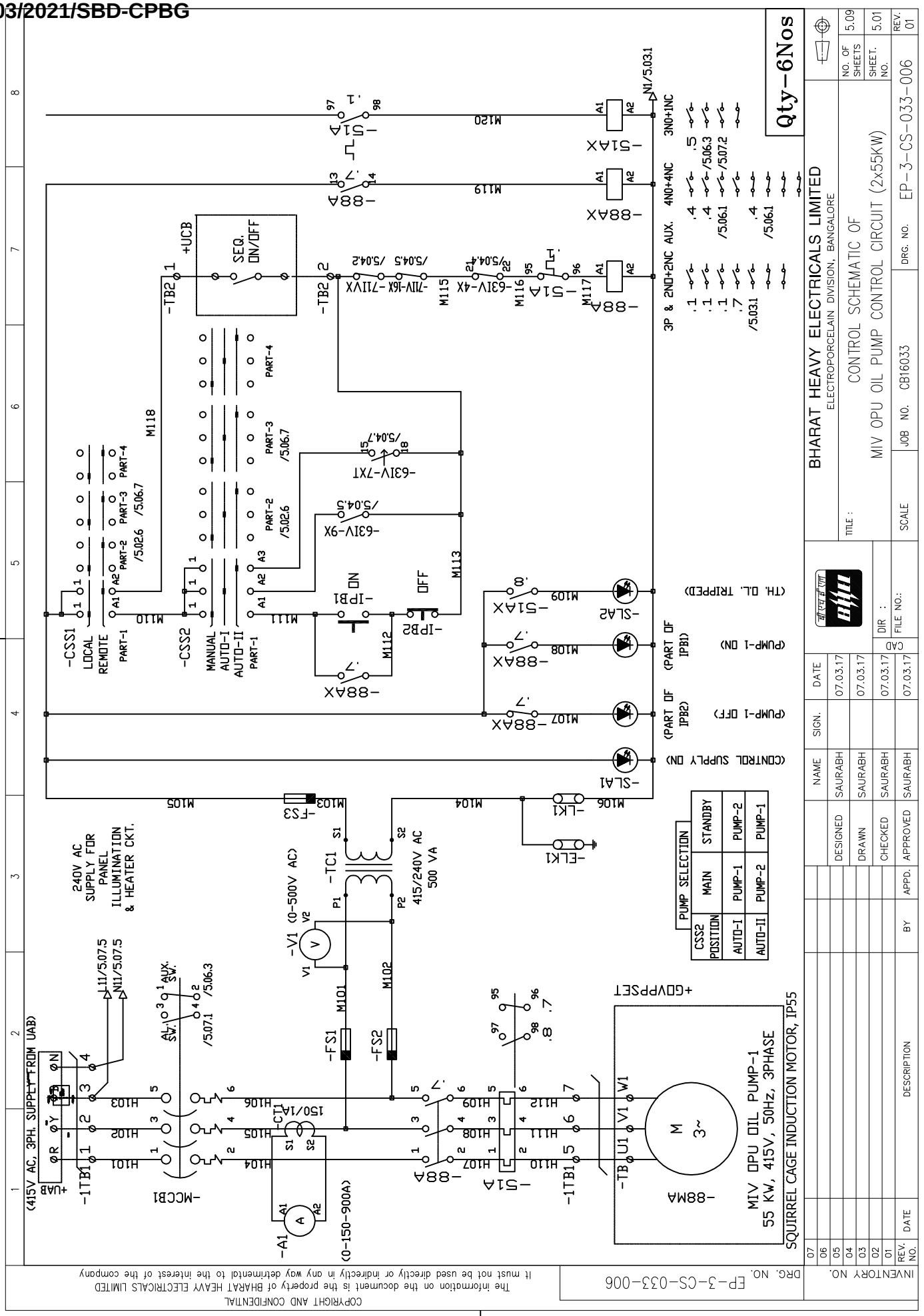
CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

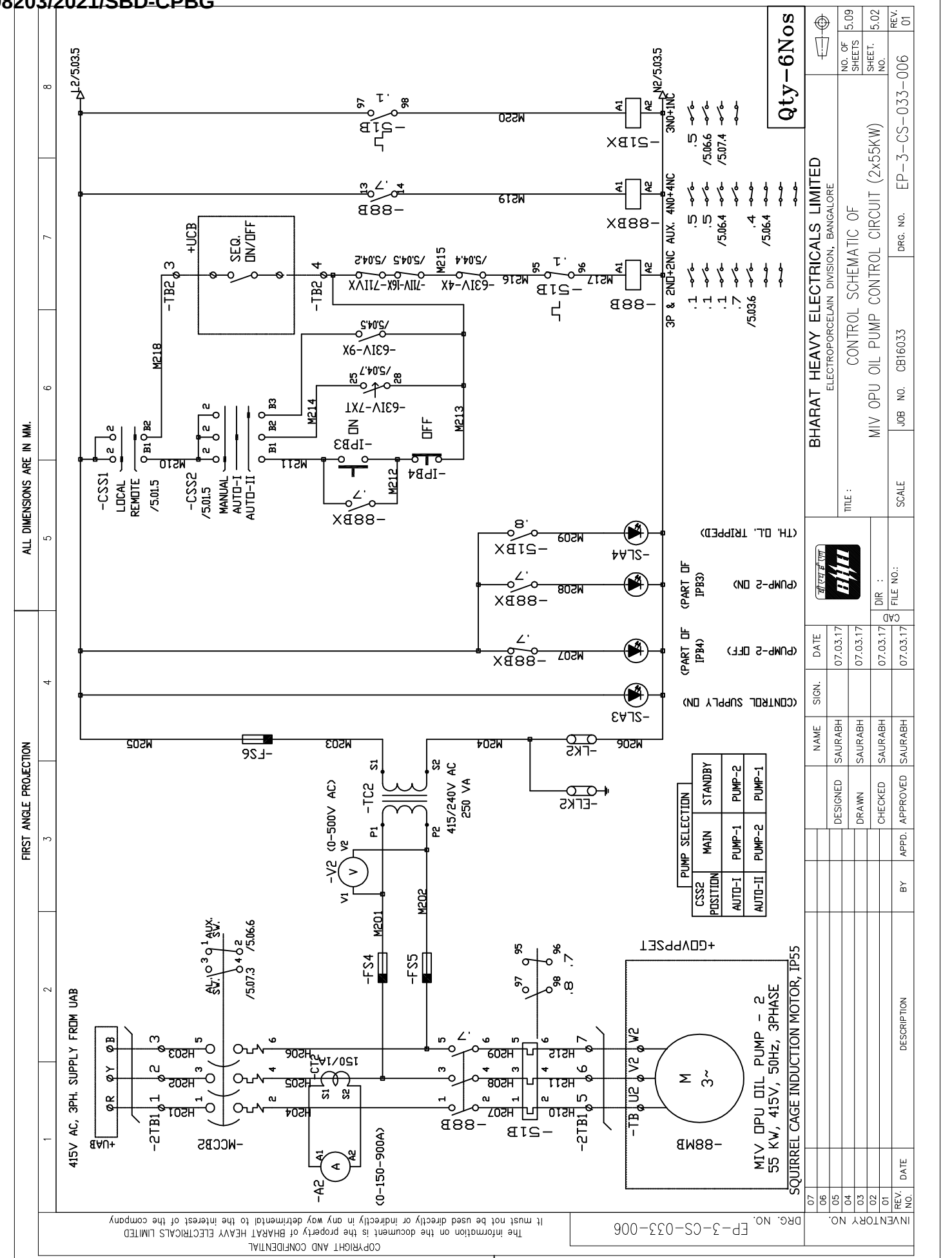
TITLE : GENERAL ARRANGEMENT OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 05.2 | SHEET. NO. 05.2

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-006 | REV. 02

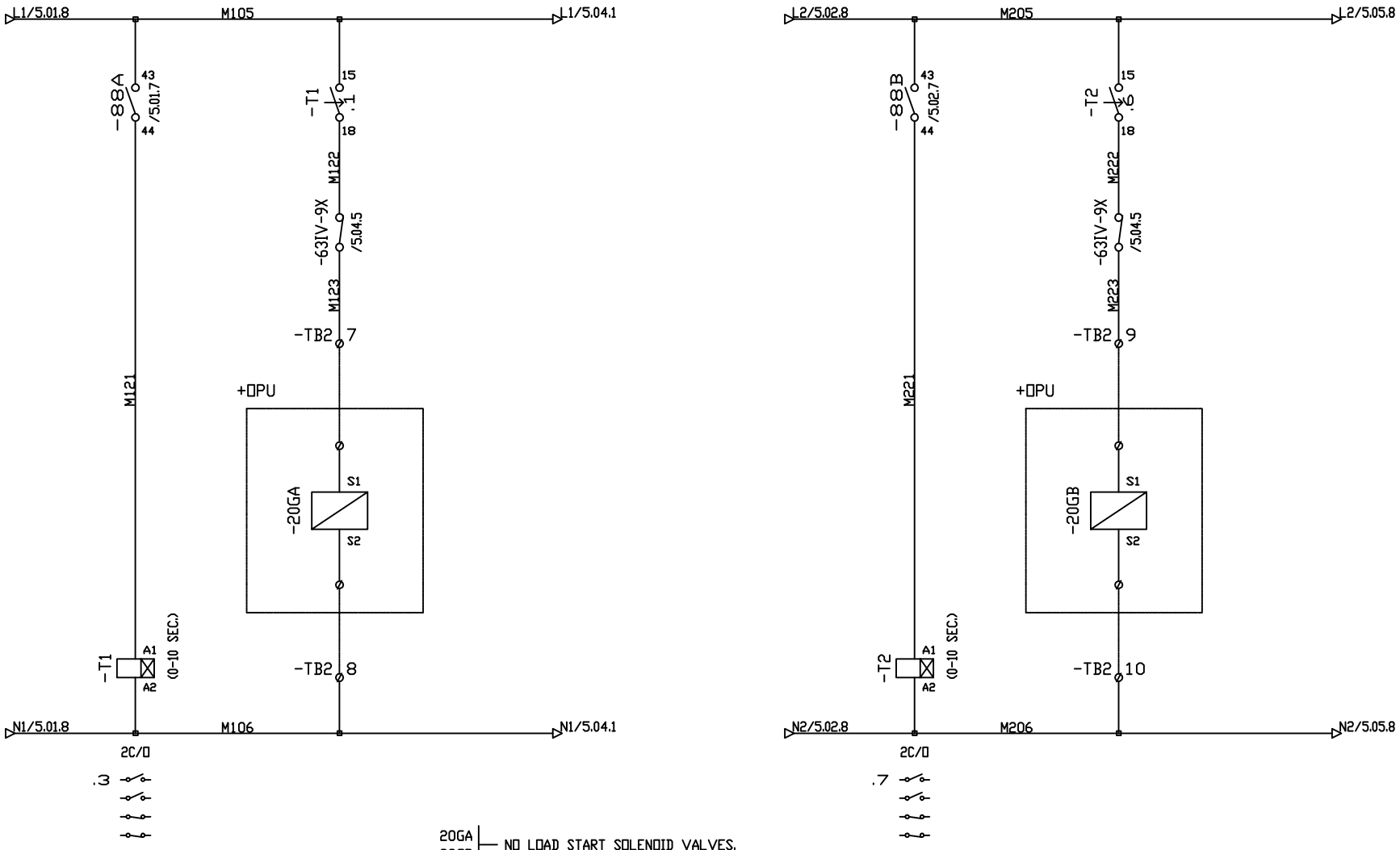

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-006
Qty-6Nos
MIV OPU OIL PUMP-1
55 KW, 415V, 50Hz, 3PHASE
SQUIRREL CAGE INDUCTION MOTOR, IP55
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
415/240V AC 500 VA
PUMP SELECTION
CSS2 POSITION
AUTO-I
AUTO-II
MAIN
STANDBY
PUMP-1
PUMP-2
-CSS1
-CSS2
-TB2
-1TB1
-TB
-MCCB1
-TC1
-TC2
-FS1
-FS2
-FS3
-LK1
-IPB1
-IPB2
-SLA1
-SLA2
-88A
-88AX
-88MA
-S1A
-S1AX
-A1
-V1
+UCB
+UAB
+GOVPPSET
SEQ. ON/OFF
LOCAL
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MANUAL
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DRG. NO. EP-3-CS-033-006
INVENTORY NO.

198203/2021/SBD-CPBG



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Qty-6Nos

DRG. NO. EP-3-CS-033-006

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

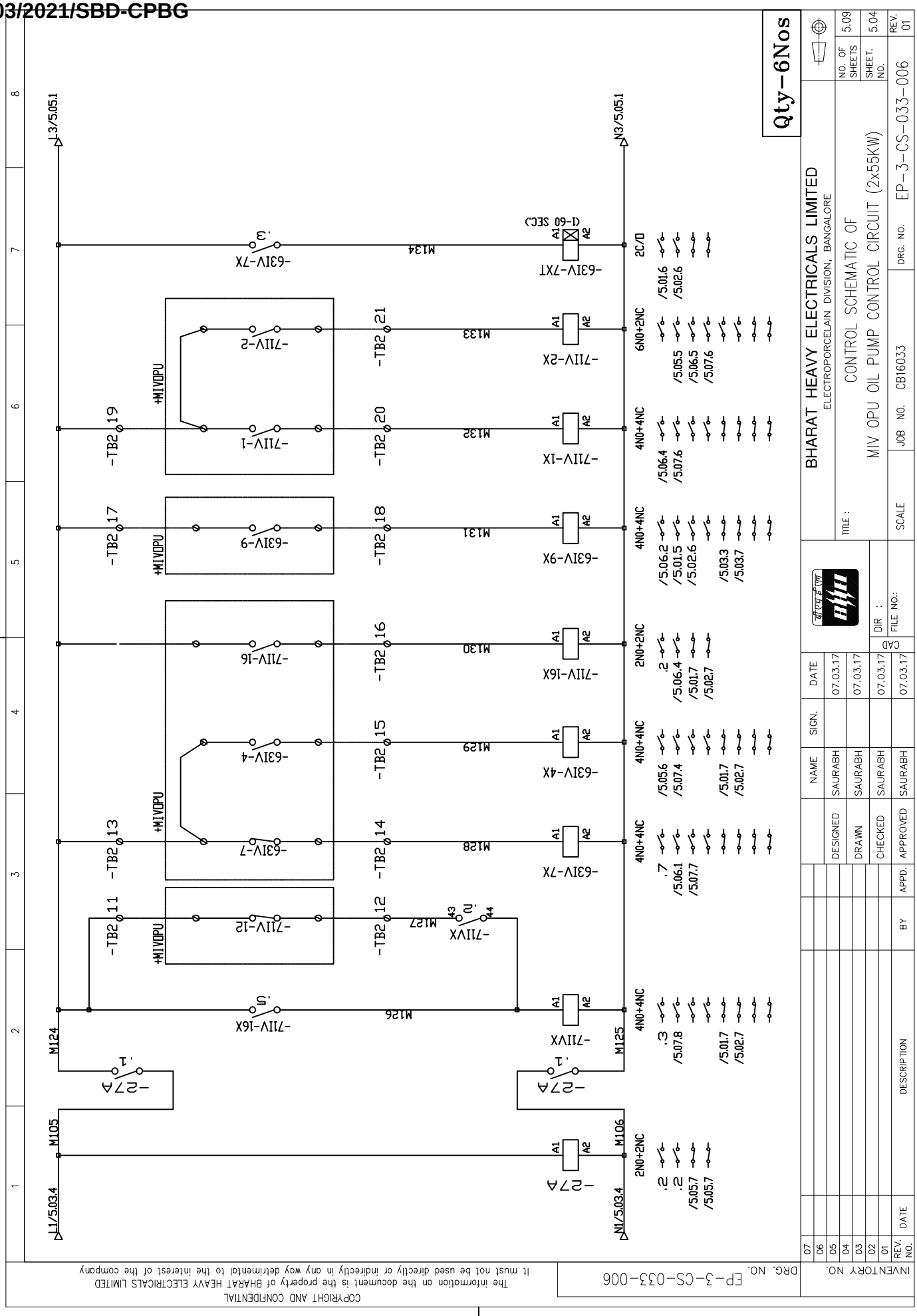
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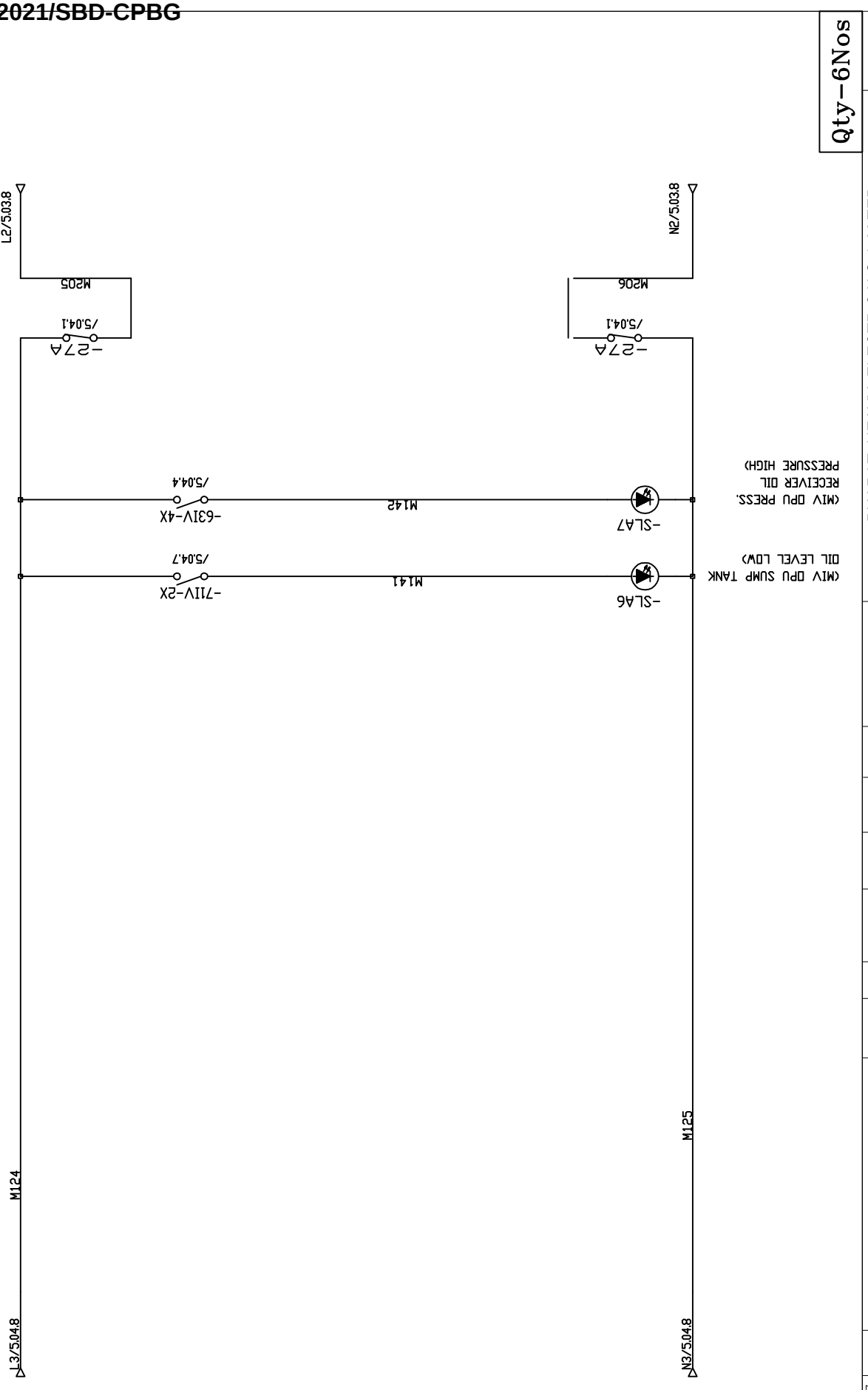
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 5.09 | SHEET. NO. 5.03 | REV. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-006
SCALE
NO. OF SHEETS 5.09
SHEET NO. 5.04
REV. 01
FIRST ANGLE PROJECTION
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DRG. NO. EP-3-CS-033-006
INVENTORY NO.
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
-27A
-71IVX
-71IV-16X
-63IV-7X
-63IV-4X
-63IV-9X
-71IV-1X
-71IV-2X
-63IV-7XT
-63IV-7X
-71IV-12
-71IV-16
-63IV-7
-63IV-4
-63IV-9
-71IV-1
-71IV-2
-63IV-7X
-TB2 11
-TB2 12
-TB2 13
-TB2 14
-TB2 15
-TB2 16
-TB2 17
-TB2 18
-TB2 19
-TB2 20
-TB2 21
+MIVOPU
M124
M125
M126
M127
M128
M129
M130
M131
M132
M133
M134
M105
M106
L1/5.03.4
N1/5.03.4
L3/5.05.1
N3/5.05.1
2NO+2NC
4NO+4NC
6NO+2NC
2C/O
(1-60 SEC.)



FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

			NAME	SIGN.	DATE
		DESIGNED	SAURABH		07.03.17
		DRAWN	SAURABH		07.03.17
		CHECKED	SAURABH		07.03.17
		APPROVED	SAURABH		07.03.17

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 5.09 | SHEET. NO. 5.05 | REV. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006

CAD DIR : FILE NO:

INVENTORY NO.

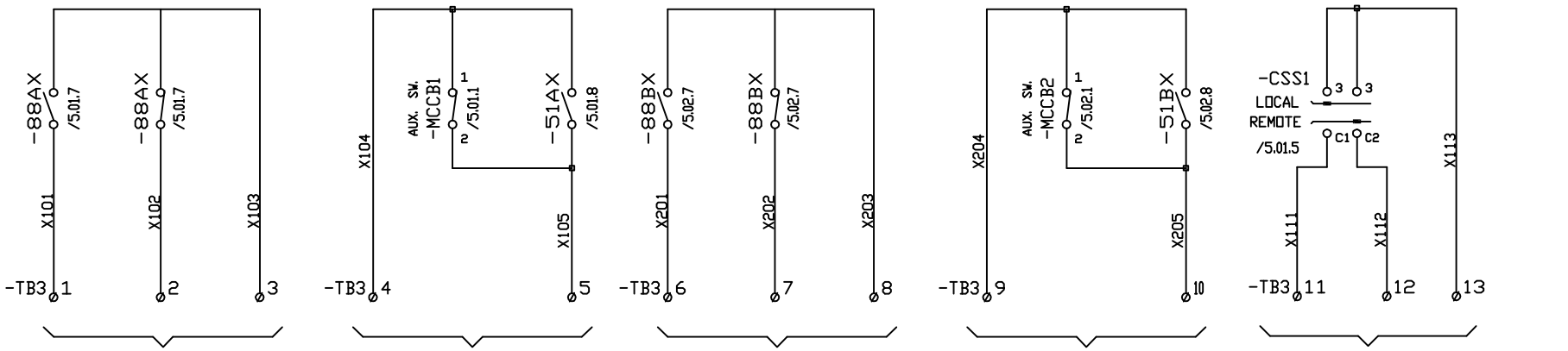
DRG. NO. EP-3-CS-033-006

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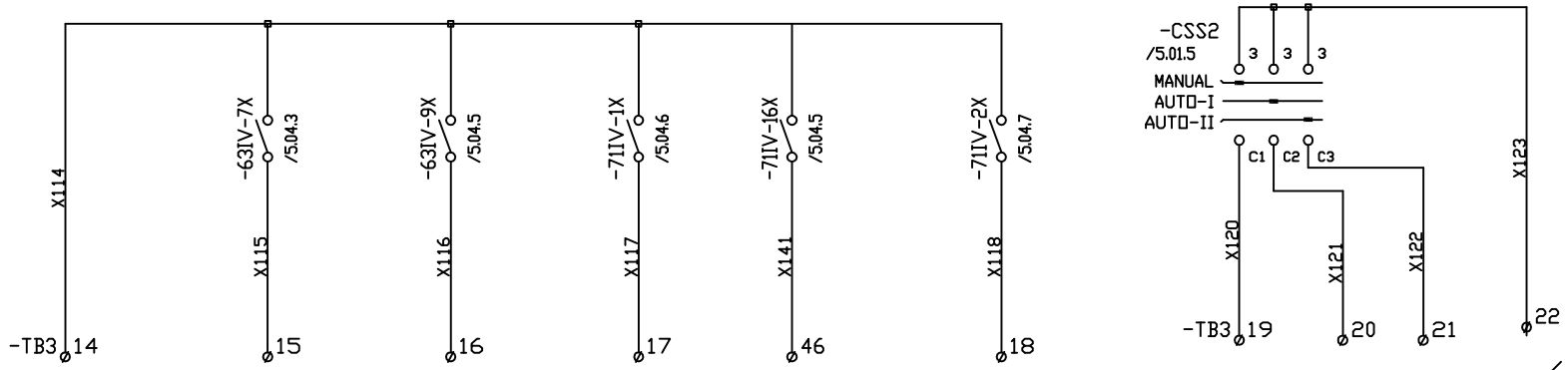
(MIV. OIL PUMP-1 ON/OFF) (TO UCB)

(MIV. OIL PUMP-1 LOCAL DRIVE DISTURBANCE) (TO UCB)

(MIV. OIL PUMP-2 ON/OFF) (TO UCB)

(MIV. OIL PUMP-2 LOCAL DRIVE DISTURBANCE) (TO UCB)

(MIV. OIL PUMPS CONTROL LOCAL/REMOTE SELECTION) (TO UCB)



(MIV. OIL PRESS LOW TO START/STOP STANDBY PUMP) (TO UCB)

(MIV. OIL PRESS LOW TO START/STOP MAIN PUMP) (TO UCB)

(MIV. OPU SUMP TANK OIL LEVEL HIGH) (TO UCB)

(MIV. OPU SUMP TANK OIL LEVEL VERY LOW TO STOP) (TO UCB)

(MIV. OPU SUMP TANK OIL LEVEL LOW) (TO UCB)

(MIV. OIL PUMPS CONTROL MANUAL/AUTO-I/AUTO-II SELECTION) (TO UCB)

Qty-6Nos

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

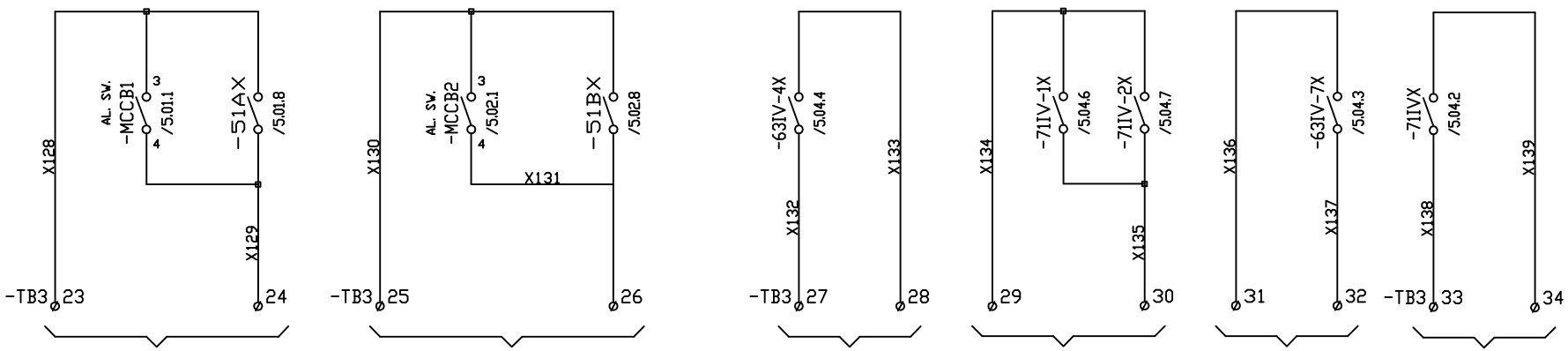
TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 5.09 | SHEET. NO. 5.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006 | REV. 01

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(MIV OIL PUMP-1 MOTOR TH. O.L./MCCB TRIPPED) (TO UCB)

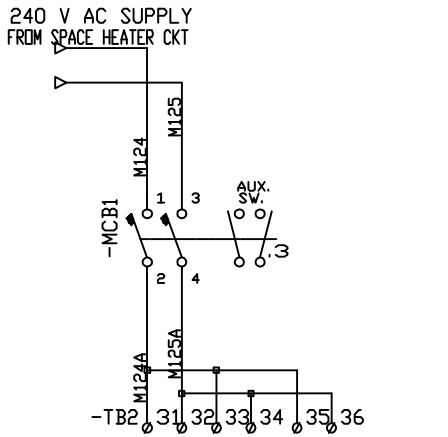
(MIV OIL PUMP-2 MOTOR TH. O.L./MCCB TRIPPED) (TO UCB)

(ALARM- MIV PRESSURE RECEIVER OIL PRESS. HIGH) (TO UCB)

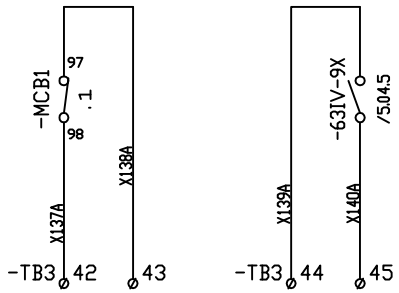
SPARE

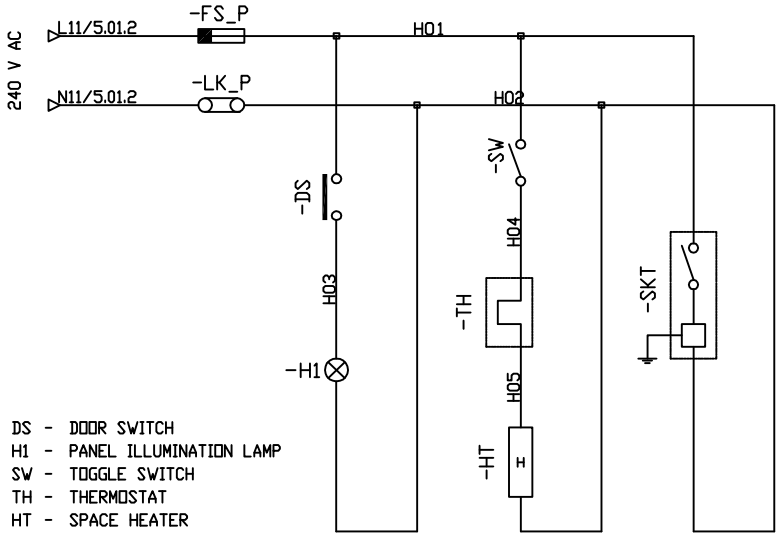
SPARE

SPARE



240V AC AUX. SUPPLY FOR MOISTURE DETECTOR, OIL LEVEL INDICATOR & TEMP. INDICATOR





DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT- SOCKET WITH SWITCH

Qty-6Nos

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

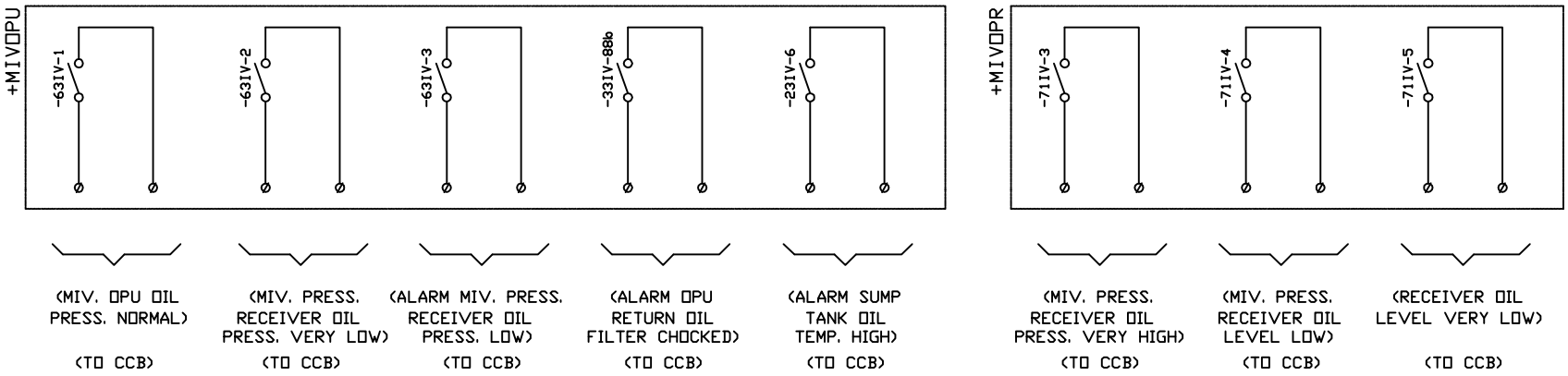
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006

NO. OF SHEETS 5.09 | SHEET. NO. 5.07 | REV. 01

DRG. NO. EP-3-CS-033-006

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8



(MIV. OPU OIL PRESS. NORMAL)	(MIV. PRESS. RECEIVER OIL PRESS. VERY LOW)	(ALARM MIV. PRESS. RECEIVER OIL PRESS. LOW)	(ALARM OPU RETURN OIL FILTER CHOCKED)	(ALARM SUMP TANK OIL TEMP. HIGH)
(TO CCB)	(TO CCB)	(TO CCB)	(TO CCB)	(TO CCB)

(MIV. PRESS. RECEIVER OIL PRESS. VERY HIGH)	(MIV. PRESS. RECEIVER OIL LEVEL LOW)	(RECEIVER OIL LEVEL VERY LOW)
(TO CCB)	(TO CCB)	(TO CCB)

Qty-6Nos

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DRG. NO. EP-3-CS-033-006

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 5.09
SHEET. NO. 5.08

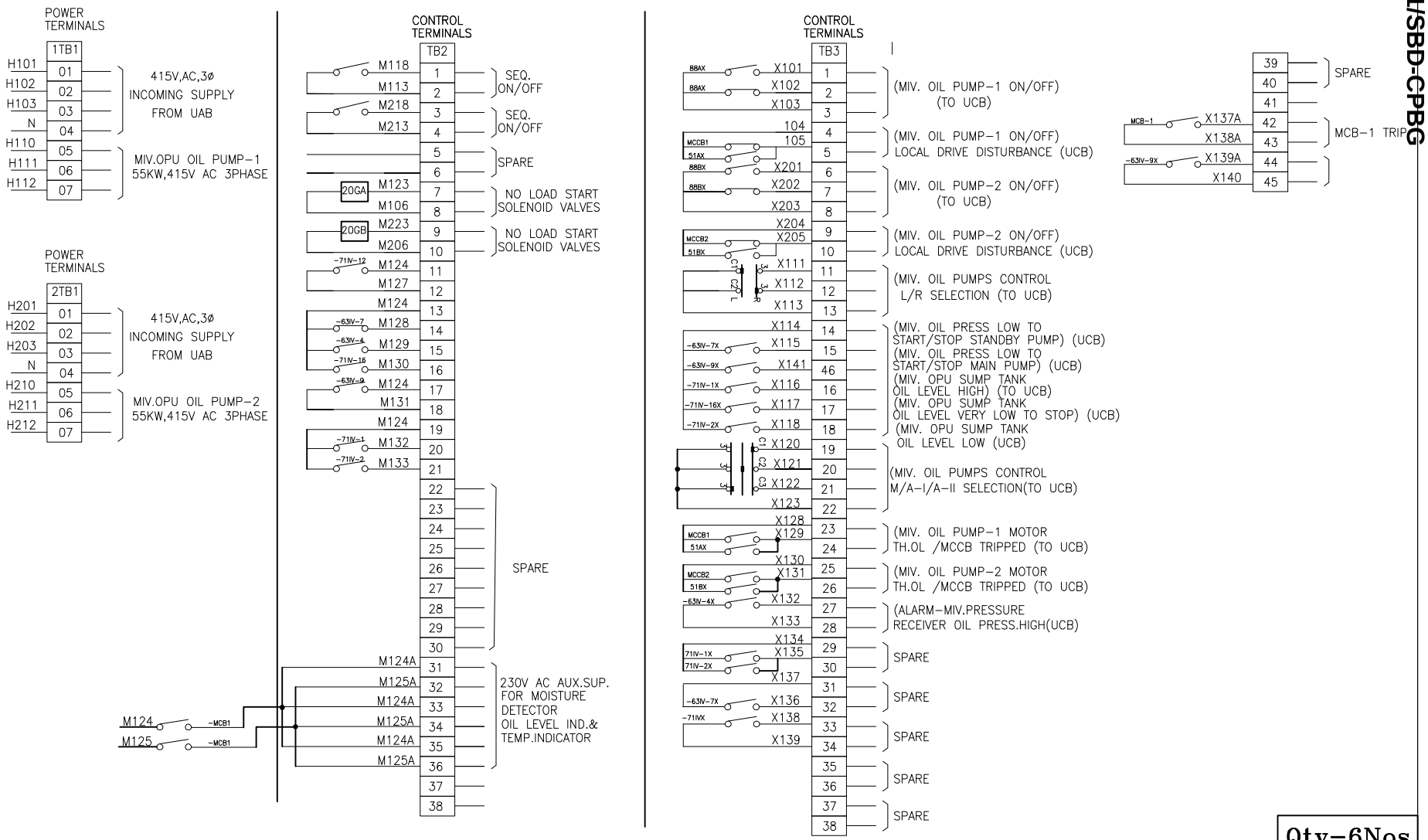
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006 | REV. 01

FIRST ANGLE PROJECTION

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Qty-6Nos

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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

INVENTORY NO.

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DRAWN	SAURABH		07.03.17
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APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 5.09
SHEET. NO. 5.09

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-006 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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DRG. NO. EP-3-BM-033-006

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	160A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM90345OOMO	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM98041OOOO	L&T	2	12
04	88A,88B	Power contactor	185A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94139BOOO	L&T	2	12
05	51AX & 51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
06	88AX,88BX,63IV-7X,27A 71IVX,63IV-4X,71IV16X 63IV-9X,71IV-1X, 71IV2X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	10	60
07	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	7	42
08	-	Aux Contactor Acc	Addon contact 4NO for aux cont	CS94594	L&T	1	6
09	51A&51B	Overload Relay	90-150A Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94138OOMO	L&T	2	12
10	T1&T2	On-delay Timer	1sec - 10sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	12
11	63IV-7XT	On-delay Timer	1sec - 60sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	1	6
12	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way without OFF	61040	Salzer	1	6
13	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way without OFF	61120	Salzer	1	6
14	CT1&CT2	Current Transformer	150/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
15	V1 & V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	2	12
16	A1 & A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 150/1A Acc. CL:1,Range:0-150-900A with suppressed scale	-	AE/ Meco	2	12
17	IPB1,IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
18	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12
19	IPB2,IPB4	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
20	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 02 | SHEET. NO. 01 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-006

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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DRG. NO. EP-3-BM-033-006

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
21	SLA1,SLA2,SLA3,SLA4 SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	6	36
22	FS1-FS6 & FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
23	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
24	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
25	MCB 1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	6
26	-	MCB Accessories	1NO+1NC Auxiliary contact for MCB	BZA11006	L&T	1	6
27	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
28	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
29	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
30	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	12
31	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	2	12
32	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
33	LK1-LK2,LKP1 - LKP2	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
34	ELK 1-2	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
35	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	84
36	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
37	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
38	-	Panel Enclosure	Enclosure Size - H1200 x W1400 x D400mm	-	BHEL	1	6
39	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	2	12

INVENTORY NO.

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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH
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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
MIV OPU OIL PUMP CONTROL CIRCUIT (2x55KW)

NO. OF SHEETS 02 | SHEET. NO. 02 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-006

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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TITLE : - OIL LEAKAGE PUMP FOR GOV OPU MCP (2X1.5KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-007 REV. 02

DWG. NO. : - EP-3-CS-033-007 REV. 01

DWG. NO. : - EP-3-BM-033-007 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

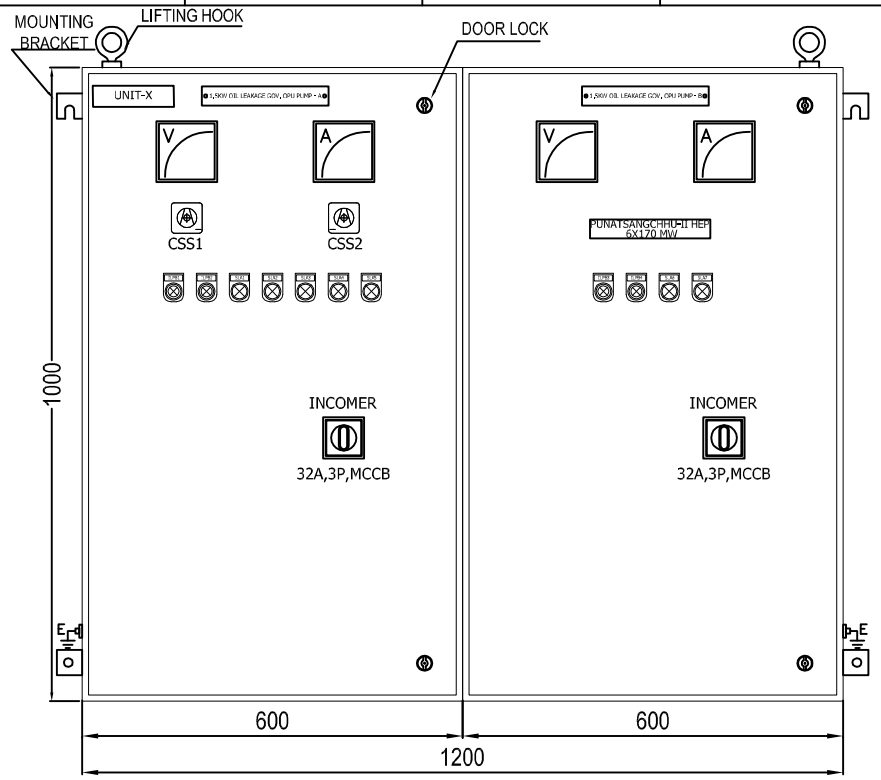
TITLE : COVER SHEET OF OIL LEAKAGE PUMP FOR GOV OPU MCP (2X1.5KW)

NO. OF SHEETS 01 | SHEET. NO. 01

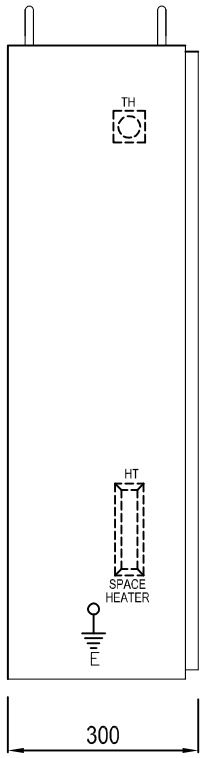
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

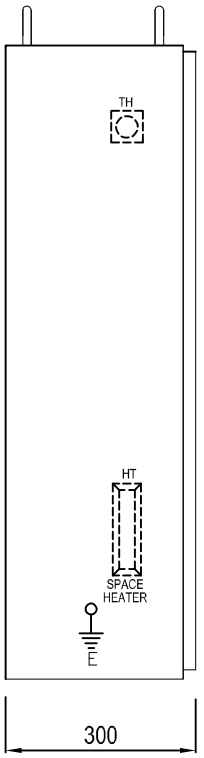
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FRONT VIEW

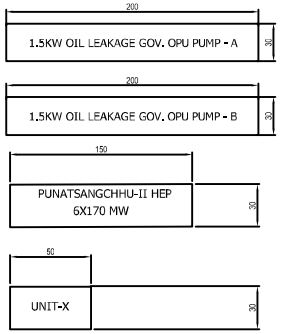


SIDE VIEW LHS SIDE

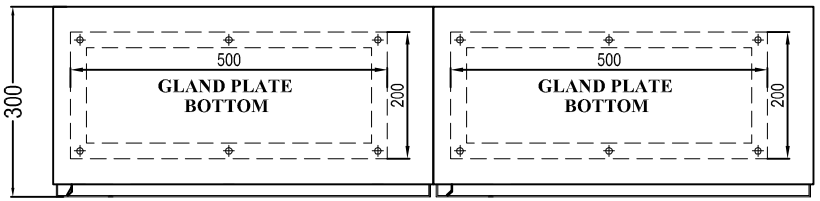


SIDE VIEW RHS SIDE

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty-6Nos

DRG. NO. EP-3-GA-033-007

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : GENERAL NOTES FOR OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

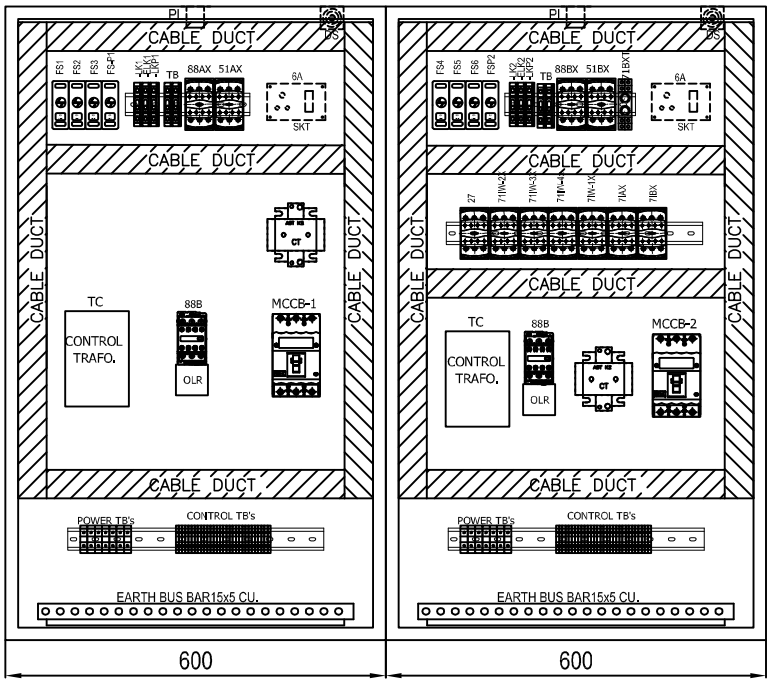
NO. OF SHEETS 06.2 | SHEET. NO. 06.1 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-007

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8



FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	569.0	
TENTATIVE WEIGHT		
WEIGHT	350KG	

Qty-6Nos

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DRG. NO. EP-3-GA-033-007

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 1402.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : GENERAL NOTES FOR OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

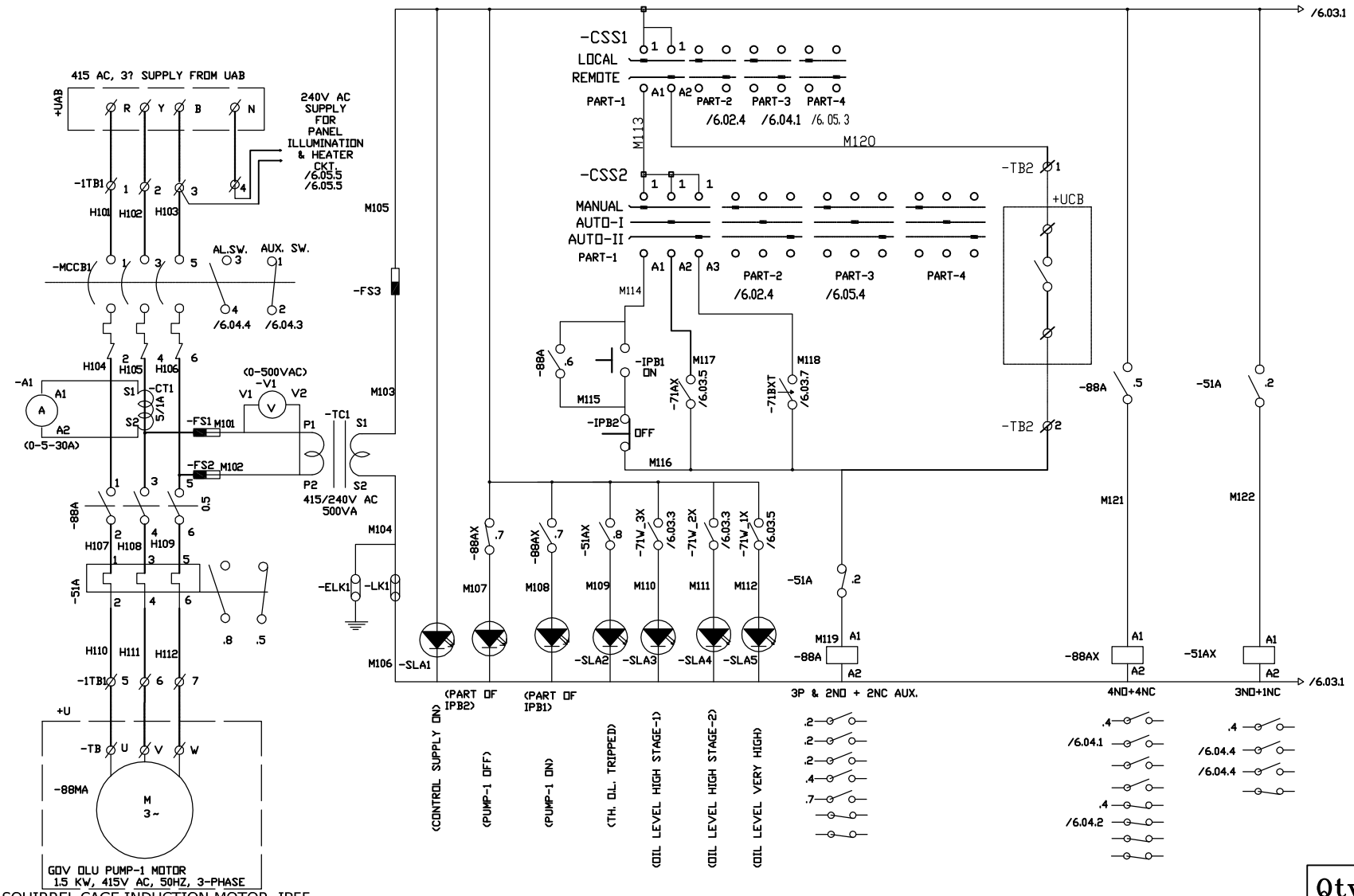
NO. OF SHEETS 06.2 | SHEET. NO. 06.2

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-007 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-007

INVENTORY NO.

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DESIGNED	SAURABH		07.03.17
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CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

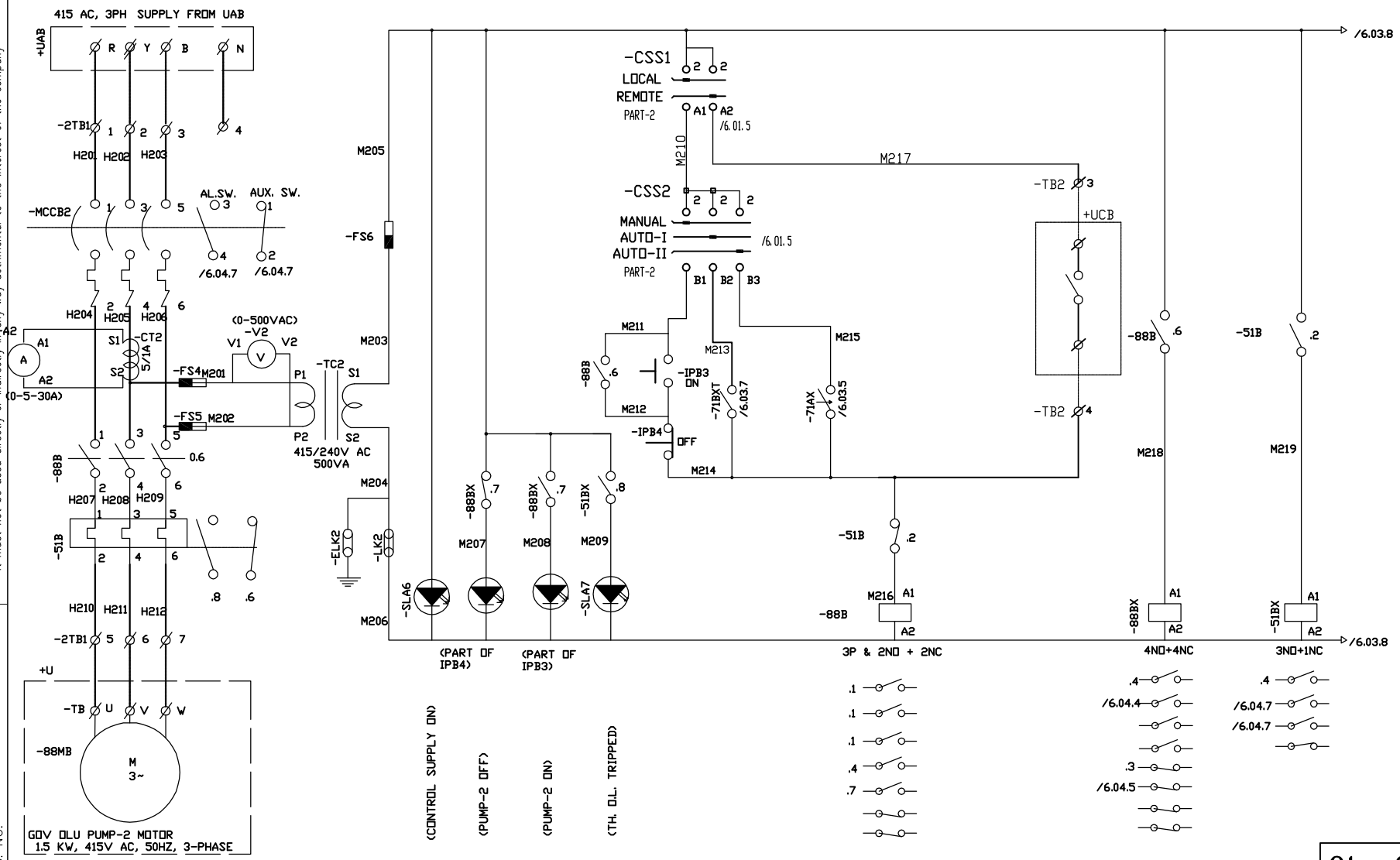
TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 6.06
SHEET. NO. 6.01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

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Qty-6Nos

DRG. NO. EP-3-CS-033-007

INVENTORY NO.

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01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

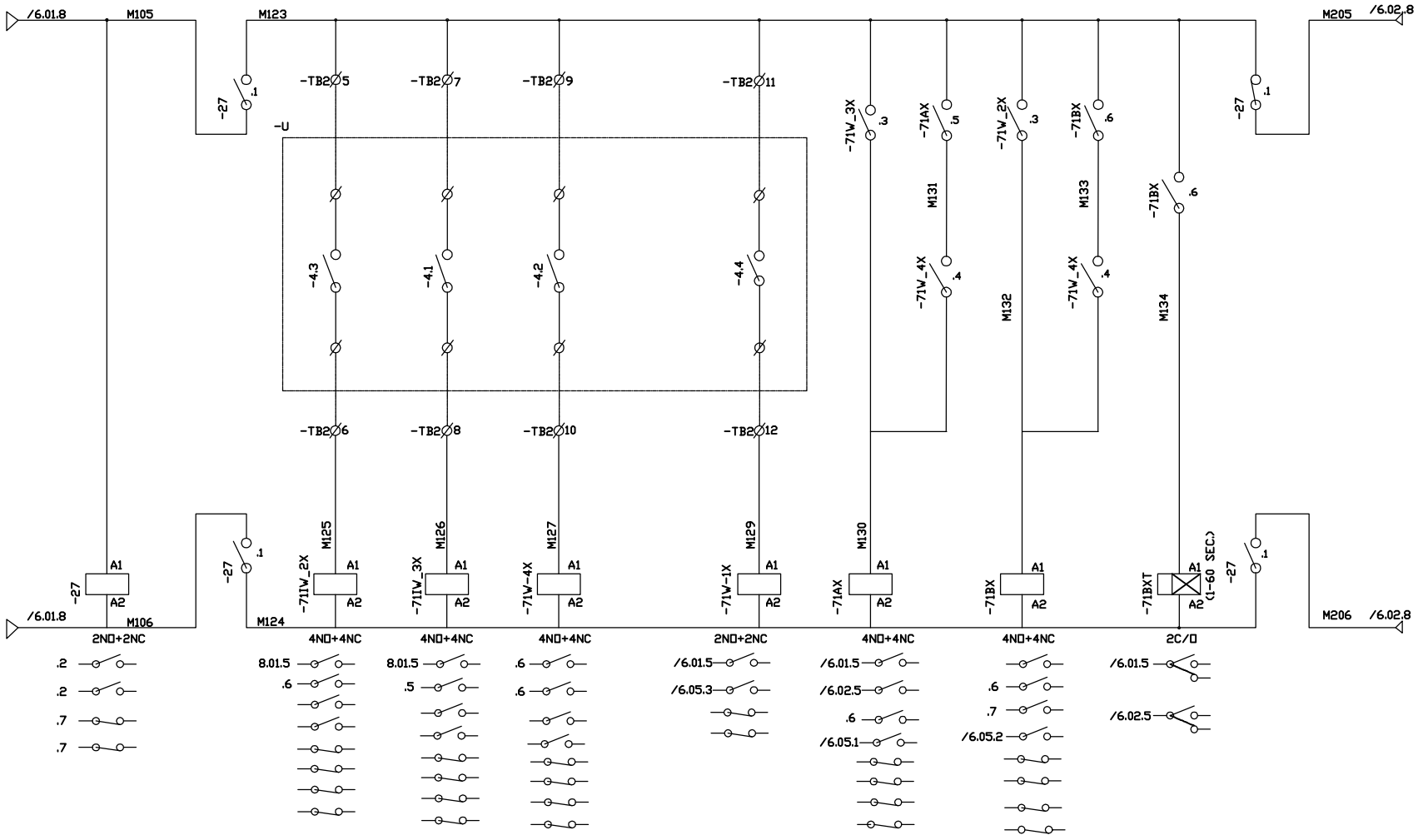
TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 6.06
SHEET. NO. 6.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

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Qty-6Nos

DRG. NO. EP-3-CS-033-007

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03				
02				
01				

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DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
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ELECTROPORCELAIN DIVISION, BANGALORE

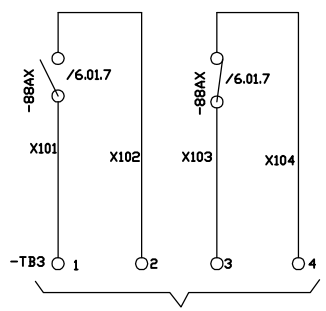
TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 6.06
SHEET. NO. 6.03

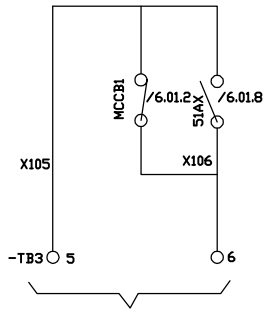
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

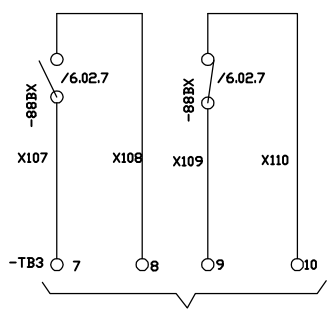
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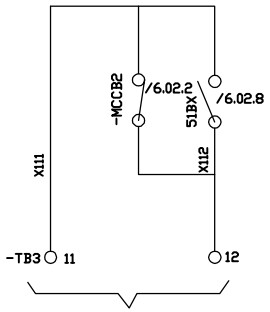
GOV OLU
PUMP-1 ON/OFF
(TO UCB)



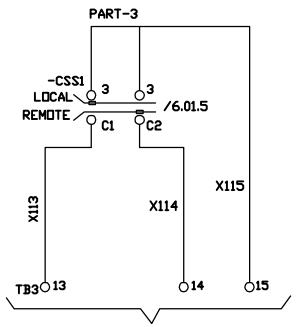
GOV OLU
PUMP-1 LOCAL
DRIVE DISTURBANCE
(TO UCB)



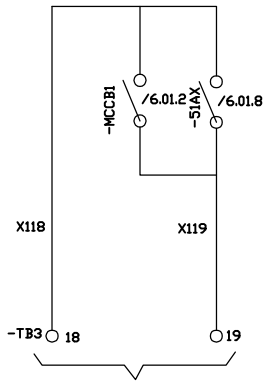
GOV OLU
PUMP-2 ON/OFF
(TO UCB)



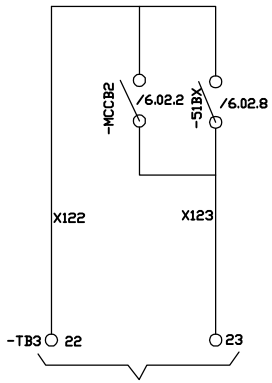
GOV OLU
PUMP-2 LOCAL
DRIVE DISTURBANCE
(TO UCB)



GOV OLU
CONTROL LOCAL/REMOTE
SELECTED
(TO UCB)



GOV OLU
PUMP-1 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)



GOV OLU
PUMP-2 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)

Qty-6Nos

DRG. NO. EP-3-CS-033-007

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

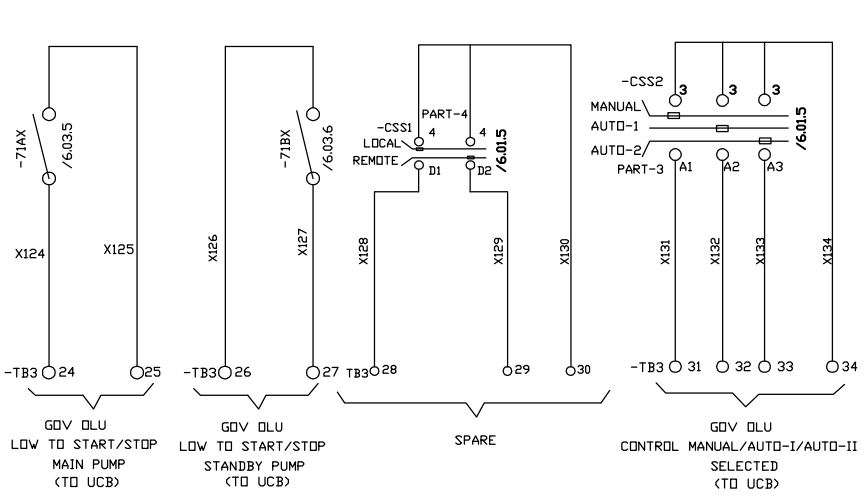
NO. OF SHEETS 6.06 | SHEET. NO. 6.04

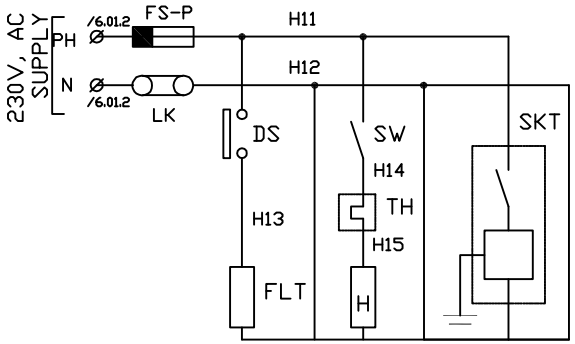
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

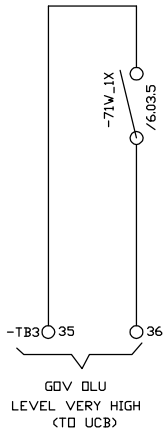
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-007

INVENTORY NO.

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04				
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01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 6.06
SHEET. NO. 6.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-CS-033-007

POWER TERMINALS

1TB1

H101	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H102	02	
H103	03	
N	04	
H110	05	GOV.OLU PUMP-1 1.5KW,415V AC 3PHASE
H111	06	
H112	07	

POWER TERMINALS

2TB1

H201	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H202	02	
H203	03	
N	04	
H210	05	GOV.OLU PUMP-2 1.5KW,415V AC 3PHASE
H211	06	
H212	07	

CONTROL TERMINALS

TB2

M120	1	+UCB
M116	2	
M217	3	
M214	4	
-71W-2 M123	5	SPARE
M125	6	
-71W-3 M123	7	
M126	8	
-71W-4 M123	9	
M127	10	
-71W-1 M123	11	
M129	12	
	10	SPARE
	11	
	12	

CONTROL TERMINALS

TB3

88AX X101	1	TO GOV OLU PUMP-1 ON
X102	2	
88AX X103	3	TO GOV OLU PUMP-1 OFF
X104	4	
X105	5	TO GOV OLU PUMP-1 LOCAL DRIVE DISTURBANCE
51AX MCCB1 X106	6	
88BX X107	7	TO GOV OLU PUMP-2 ON
X108	8	
88BX X109	9	TO GOV OLU PUMP-2 OFF
X110	10	
X111	11	TO GOV OLU PUMP-2 LOCAL DRIVE DISTURBANCE
51BX MCCB2 X112	12	
L 3 3 C1 X113	13	TO GOV OLU CONTROL L/R SELECTED
3 C3 X114	14	
R X115	15	
	16	SPARE
	17	
X118	18	TO GOV OLU PUMP-1 MOTOR TH.OL /MCCB TRIPPED
51AX MCCB1 X119	19	
	20	SPARE
	21	
X122	22	TO GOV OLU PUMP-2 MOTOR TH.OL /MCCB TRIPPED
51BX MCCB2 X123	23	
X124	24	TO GOV OLU LOW TO START/STOP MAIN PUMP
-71AX X125	25	
X126	26	TO GOV OLU LOW TO START/STOP STANDBY PUMP
-71BX X127	27	
4 D1 X128	28	SPARE
L 4 D2 X129	29	
R X130	30	
3 A1 X131	31	(TO GOV. OLU CONTROL M/A-I/A-II SELECTION
3 A2 X132	32	
3 A3 X133	33	
X134	34	
-71W-1X X135	35	TO GOV OLU LEVEL VERY HIGH
X136	36	
	37	SPARE
	38	
	39	
	40	

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

INVENTORY NO.

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : CONTROL SCHEMATIC FOR OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 6.06 | SHEET. NO. 6.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-007 | REV. 01

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-007

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOEO	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	12
04	88A,88B	Power contactor	32A, 3P, Power Contactor with 240V AC coil,aux Supply	CS94111BOOO	L&T	2	12
05	-	Power contactor Acc	Add on contact 2NO+2NC for 32A P.Cont	CS94114	L&T	2	12
06	51AX & 51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
07	88AX,88BX,27 7I1W-2X,7I1W3X 71W-4X,71W-1X,71AX&71BX	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	9	54
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	7	42
09	51A&51B	Overload Relay	3-5A Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94141OOSO	L&T	2	12
10	71BXT	On-delay Timer	0.1sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	1	6
11	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way without OFF	61040	Salzer	1	6
12	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way without OFF	61120	Salzer	1	6
13	CT1&CT2	Current Transformer	5/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
14	V1 & V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	2	12
15	A1 & A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 5/1A Acc. CL:1,Range:0-5-30A with suppressed scale.	-	AE/ Meco	2	12
16	IPB1,IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
17	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12
18	IPB2,IPB4	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
19	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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06				
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04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-007 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3,SLA4 SLA5,SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	7	42
21	FS1-FS6 & FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
22	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
23	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
24	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	12
28	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	2	12
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
30	LK1-LK2,LKP1-LKP2	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
31	ELK 1-2	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	84
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
35	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	6
36	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	2	12

DRG. NO. EP-3-BM-033-007

INVENTORY NO.

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ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR GOV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 02 | SHEET. NO. 02

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FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - OIL LEAKAGE PUMP FOR MIV OPU MCP (2X1.5KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-008 REV. 02

DWG. NO. : - EP-3-CS-033-008 REV. 01

DWG. NO. : - EP-3-BM-033-008 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF OIL LEAKAGE PUMP FOR MIV OPU MCP (2X1.5KW)

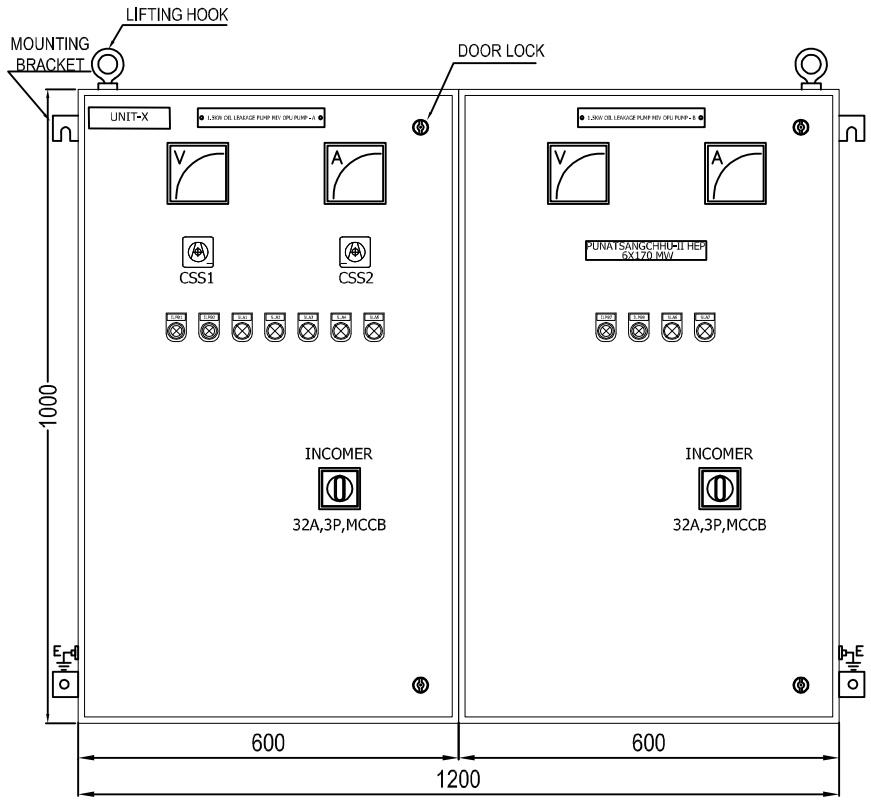
NO. OF SHEETS 01 | SHEET. NO. 01 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO.

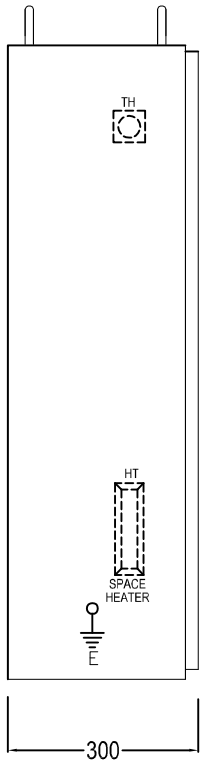
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6

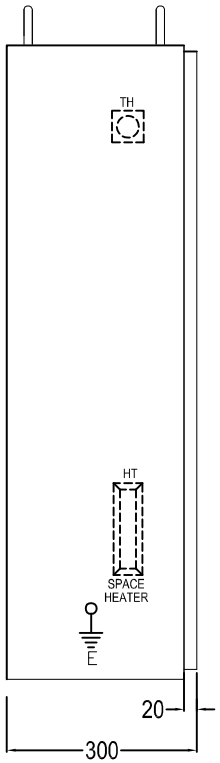
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FRONT VIEW

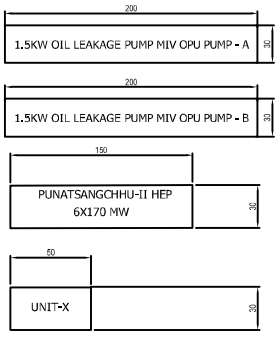


SIDE VIEW LHS SIDE

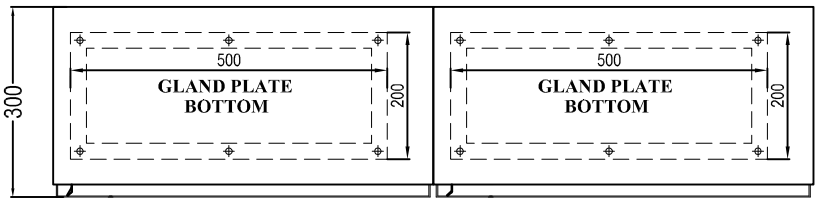


SIDE VIEW RHS SIDE

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty-6Nos

DRG. NO. EP-3-GA-033-008

INVENTORY NO.

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BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : GENERAL NOTES FOR OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 07.2 | SHEET. NO. 07.1

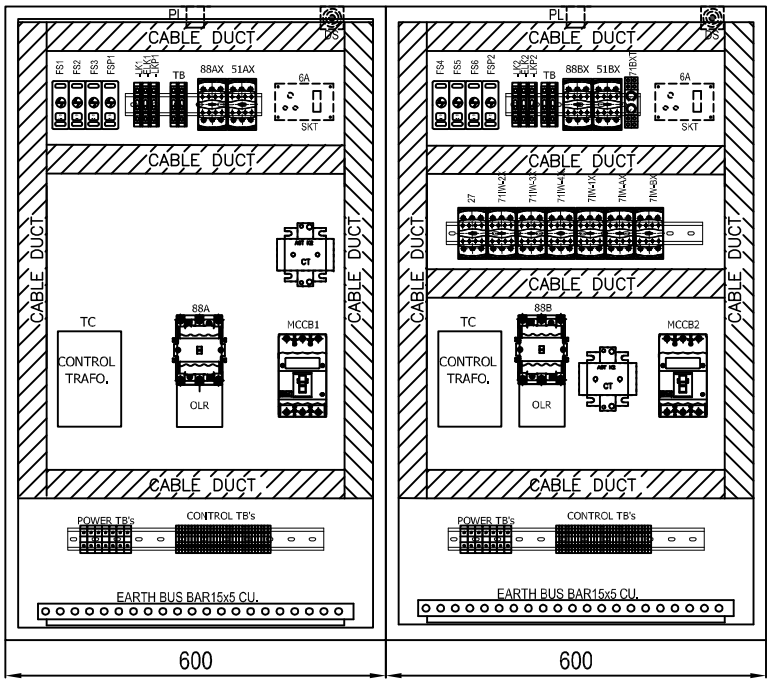
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-008 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	569.0	
TENTATIVE WEIGHT		
WEIGHT	350KG	

Qty–6Nos

DRG. NO. EP–3–GA–033–008

INVENTORY NO.

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ELECTROPORCELAIN DIVISION BANGALORE

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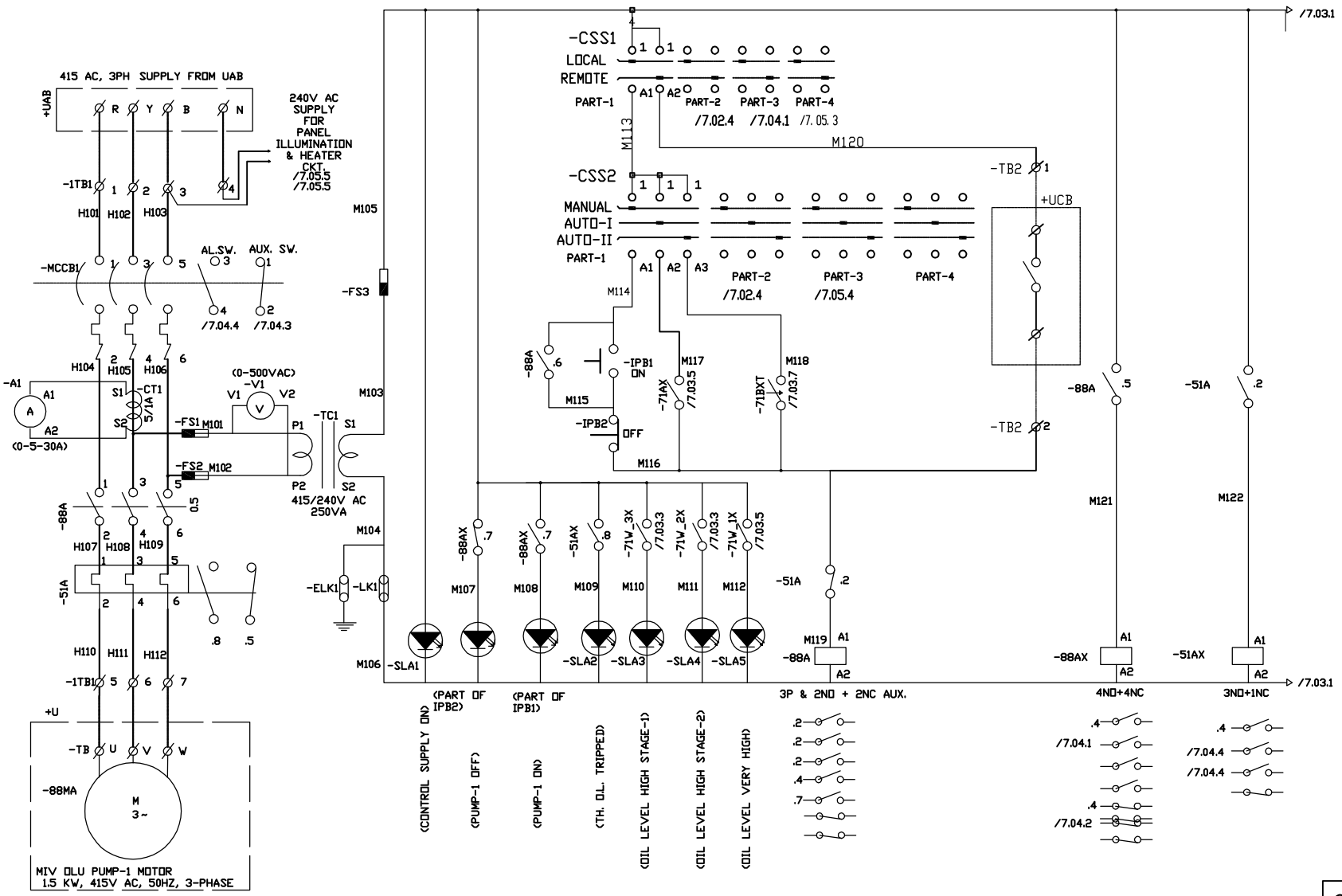
NO. OF SHEETS 07.2 | SHEET. NO. 07.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–008 | REV. 02

FORM 66–301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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SQUIRREL CAGE INDUCTION MOTOR ,IP55

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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INVENTORY NO.

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CAD DIR :
FILE NO.:

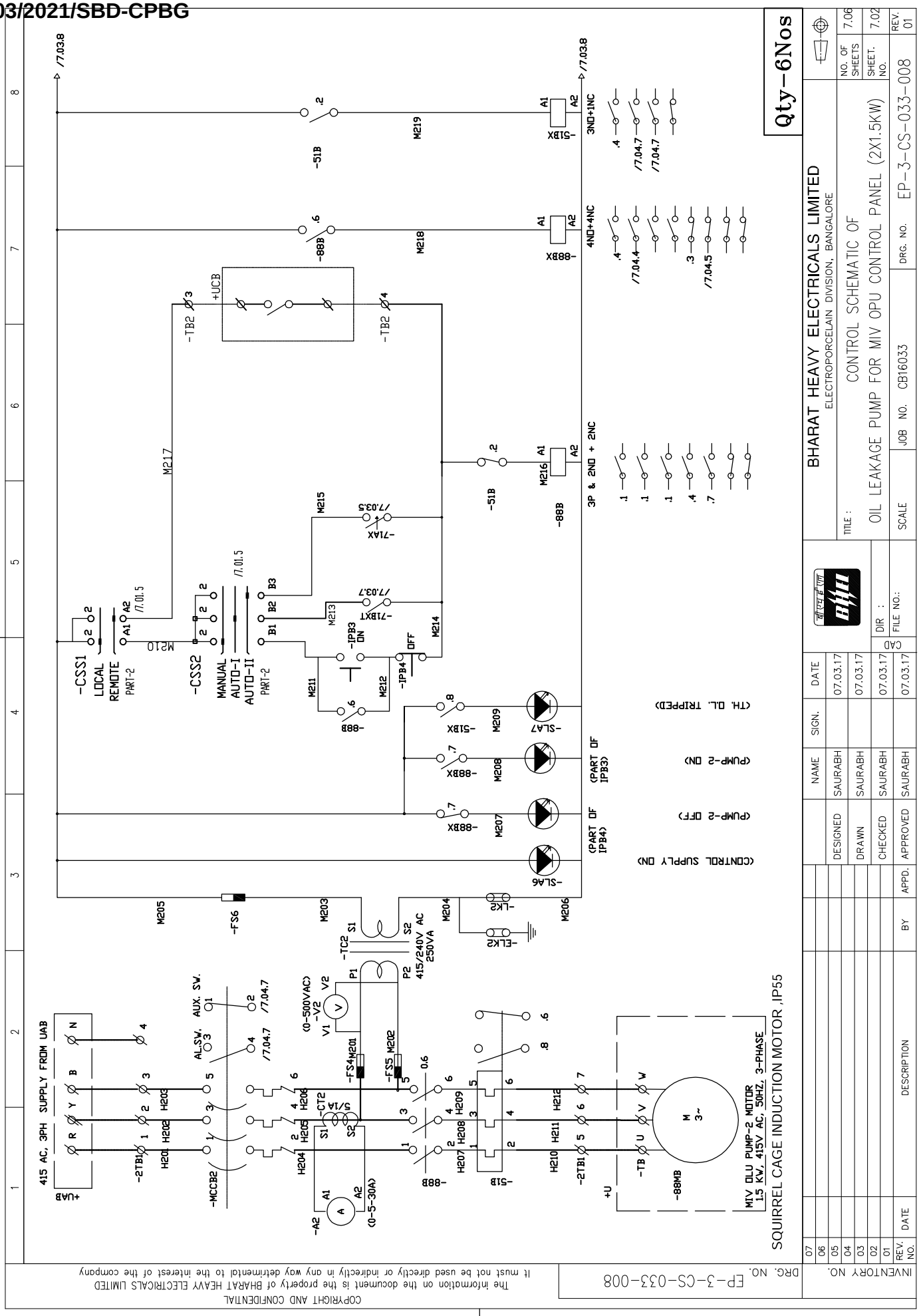
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

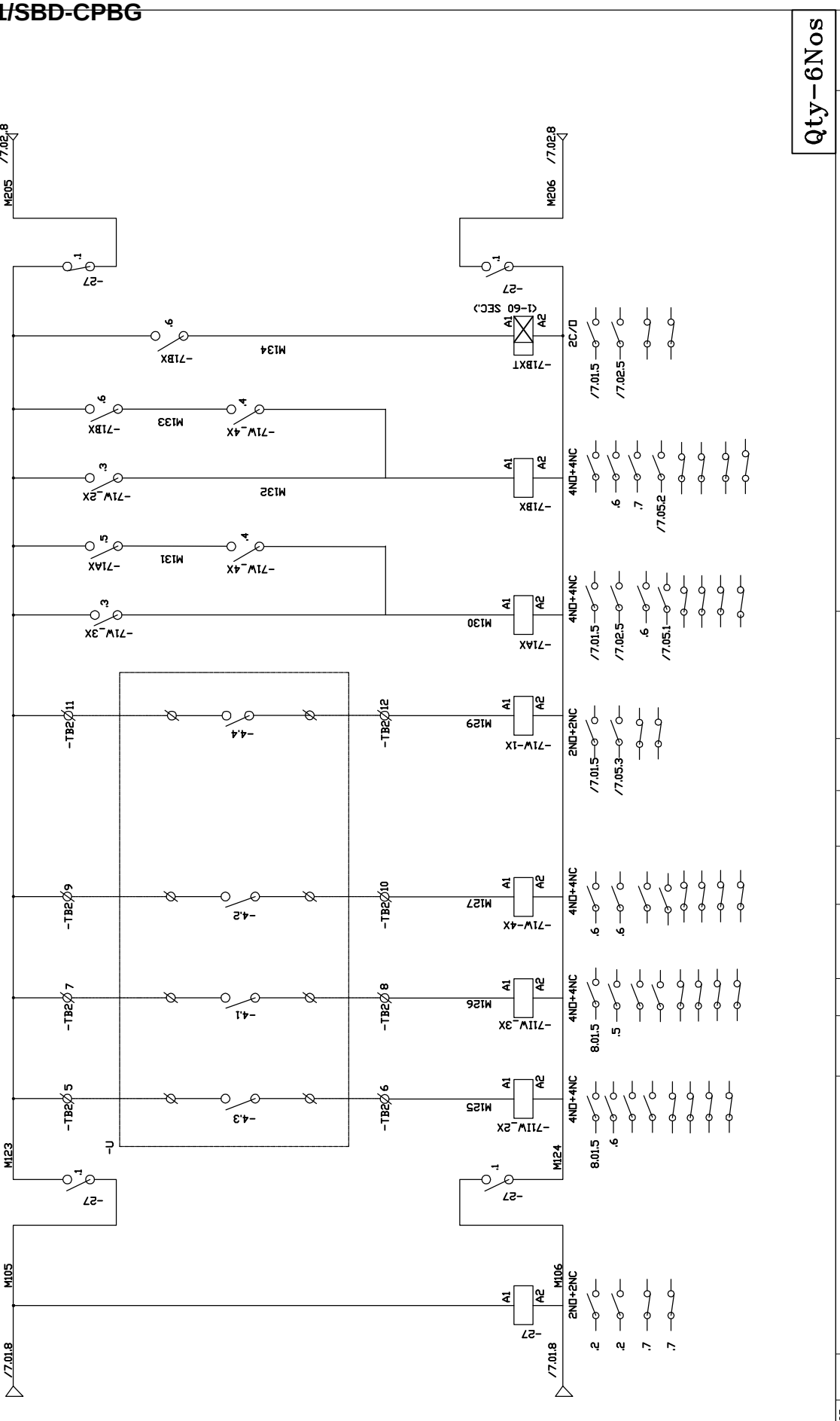
NO. OF SHEETS	7.06
SHEET. NO.	7.01
REV.	01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-008

DRG. NO. EP-3-CS-033-008


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-008
NO. OF SHEETS 7.06
SHEET NO. 7.02
REV. 01
DESIGNED SAURABH 07.03.17
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APPROVED SAURABH 07.03.17
CAD DIR :
FILE NO.:
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
415 AC, 3PH SUPPLY FROM UAB
SQUIRREL CAGE INDUCTION MOTOR, IP55
MIV OLU PUMP-2 MOTOR
1.5 KW, 415V AC, 50HZ, 3-PHASE
-CSS1 LOCAL REMOTE PART-2
-CSS2 MANUAL AUTO-I AUTO-II PART-2
-IPB3 ON
-IPB4 OFF
-TC2 415/240V AC 250VA
-MCCB2
-FS4 M201
-FS5 M202
-FS6
-CT2 5/1A
-TB2
+UCB
-51B
-88B
-71AX
-71BXT
-51BX
-88BX
-88MB
-SLA6 (CONTROL SUPPLY ON)
-SLA7 (TH. O.L. TRIPPED)
(PUMP-2 OFF)
(PUMP-2 ON)
(PART OF IPB4)
(PART OF IPB3)
3P & 2ND + 2NC
4ND+4NC
3ND+1NC
AUX. SW.
AL SW.
(0-500VAC)
(0-5-30A)
/7.03.8
/7.01.5
/7.04.7
/7.04.4
/7.04.5
/7.03.5
/7.03.7
M205
M203
M204
M206
M207
M208
M209
M210
M211
M212
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M214
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DRG. NO. EP-3-CS-033-008
INVENTORY NO.

198203/2021/SBD-CPBG



FIRST ANGLE PROJECTION

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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-008

NO. OF SHEETS 7.06 | SHEET. NO. 7.03 | REV. 01

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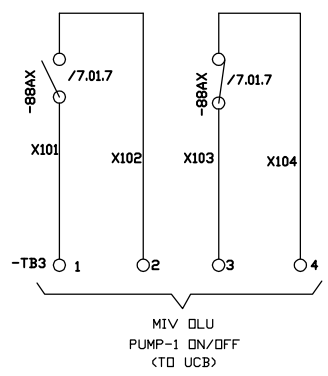
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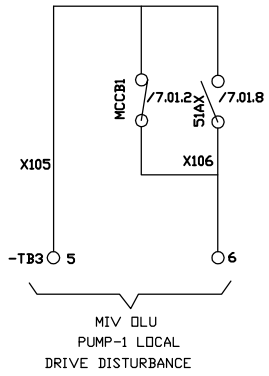
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

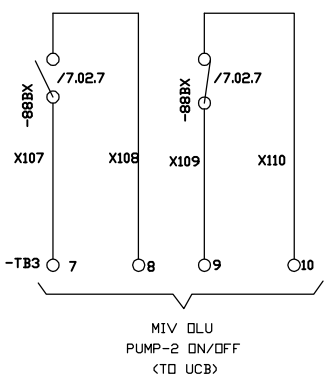
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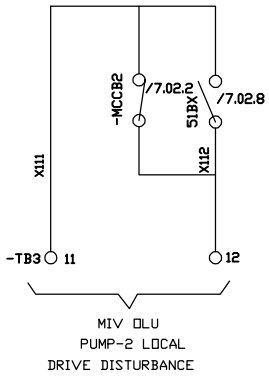
MIV OLU
PUMP-1 ON/OFF
(TO UCB)



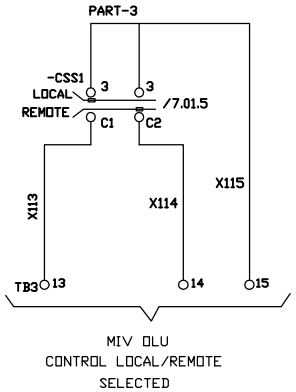
MIV OLU
PUMP-1 LOCAL
DRIVE DISTURBANCE
(TO UCB)



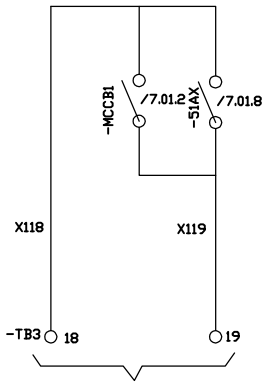
MIV OLU
PUMP-2 ON/OFF
(TO UCB)



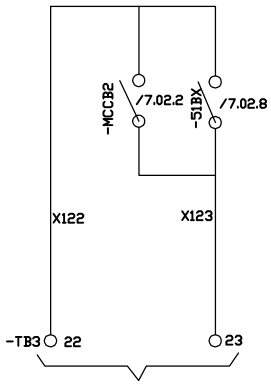
MIV OLU
PUMP-2 LOCAL
DRIVE DISTURBANCE
(TO UCB)



MIV OLU
CONTROL LOCAL/REMOTE
SELECTED



MIV OLU
PUMP-1 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)



MIV OLU
PUMP-2 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)

Qty-6Nos

DRG. NO. EP-3-CS-033-008

INVENTORY NO.

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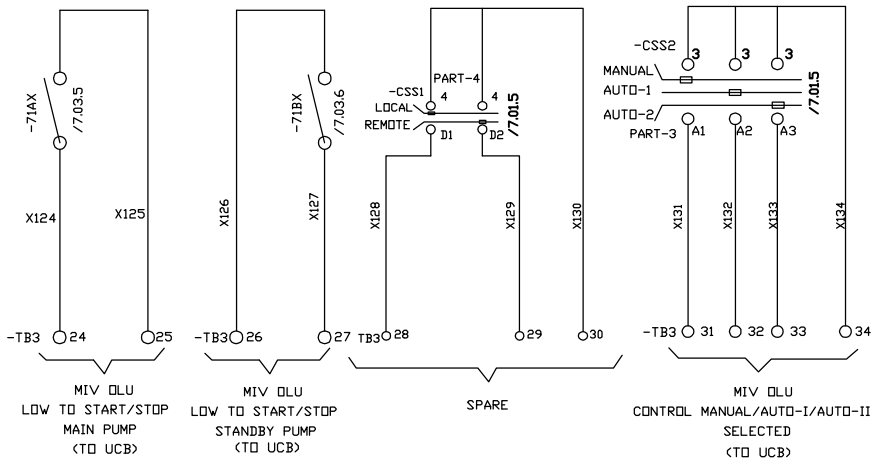
TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

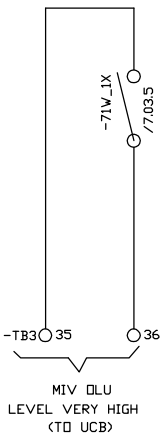
NO. OF SHEETS 7.06
SHEET. NO. 7.04

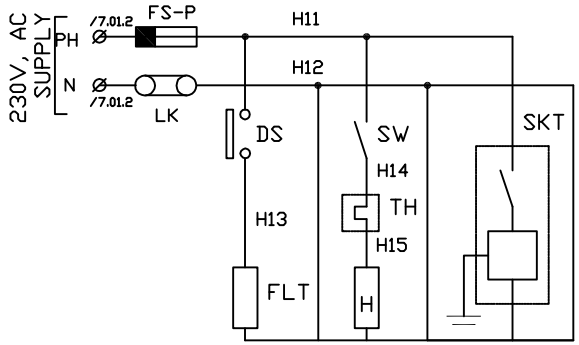
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-008 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-008

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 7.06
SHEET. NO. 7.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-008 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-008

POWER TERMINALS

1TB1

H101	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H102	02	
H103	03	
N	04	
H110	05	GOV.OLU PUMP-1 1.5KW,415V AC 3PHASE
H111	06	
H112	07	

POWER TERMINALS

2TB1

H201	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H202	02	
H203	03	
N	04	
H210	05	GOV.OLU PUMP-2 1.5KW,415V AC 3PHASE
H211	06	
H212	07	

CONTROL TERMINALS

TB2

M120	1	+UCB
M116	2	
M217	3	+UCB
M214	4	
-71W-2 M123	5	
M125	6	
-71W-3 M123	7	
M126	8	
-71W-4 M123	9	
M127	10	
-71W-1 M123	11	
M129	12	

CONTROL TERMINALS

TB3

88AX X101	1	TO MIV OLU PUMP-1 ON
X102	2	
88AX X103	3	TO MIV OLU PUMP-1 OFF
X104	4	
X105	5	TO MIV OLU PUMP-1 LOCAL DRIVE DISTURBANCE
51AX MCCB1 X106	6	
88BX X107	7	TO MIV OLU PUMP-2 ON
X108	8	
88BX X109	9	TO MIV OLU PUMP-2 OFF
X110	10	
X111	11	TO MIV OLU PUMP-2 LOCAL DRIVE DISTURBANCE
51BX MCCB2 X112	12	
3 L C1 X113	13	TO MIV OLU CONTROL L/R SELECTED
3 L C2 R X114	14	
X115	15	
	16	SPARE
	17	
X118	18	TO MIV OLU PUMP-1 MOTOR TH.OL /MCCB TRIPPED
51AX MCCB1 X119	19	
	20	SPARE
	21	
X122	22	TO MIV OLU PUMP-2 MOTOR TH.OL /MCCB TRIPPED
51BX MCCB2 X123	23	
X124	24	TO MIV OLU LOW TO START/STOP MAIN PUMP
-71AX X125	25	
X126	26	TO MIV OLU LOW TO START/STOP STANDBY PUMP
-71BX X127	27	
4 L D1 X128	28	SPARE
4 L D2 R X129	29	
X130	30	
3 C A1 X131	31	(TO MIV. OLU CONTROL M/A-I/A-II SELECTION
3 C A2 X132	32	
3 C A3 X133	33	
X134	34	
-71W-1X X135	35	TO MIV OLU LEVEL VERY HIGH
X136	36	
	37	SPARE
	38	
	39	
	40	

Qty-6Nos

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01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

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BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : CONTROL SCHEMATIC FOR OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 7.06 | SHEET. NO. 7.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-008 | REV. 01

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOEO	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	12
04	88A,88B	Power contactor	32A, 3P, Power Contactor with 240V AC coil,aux Supply	CS94111BOOO	L&T	2	12
05	-	Power contactor Acc	Add on contact 2NO+2NC for 32A P.Cont	CS94114	L&T	2	12
06	51AX & 51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
07	88AX,88BX,27 7I1W-2X,7I1W3X 71W-4X,71W-1X,71AX&71BX	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	9	54
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	7	42
09	51A&51B	Overload Relay	3-5A Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94141OOSO	L&T	2	12
10	71BXT	On-delay Timer	1sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	1	6
11	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way without OFF	61040	Salzer	1	6
12	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way without OFF	61120	Salzer	1	6
13	CT1&CT2	Current Transformer	5/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
14	V1 & V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	2	12
15	A1 & A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 5/1A Acc. CL:1,Range:0-5-30A with suppressed scale.	-	AE/ Meco	2	12
16	IPB1,IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
17	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12
18	IPB2,IPB4	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
19	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12

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DRG. NO. EP-3-CS-033-008

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-008 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-008

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3,SLA4 SLA5,SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	7	42
21	FS1-FS6 & FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
22	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
23	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
24	TC1&TC2	Control Transformer	Single phase, 250VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	12
28	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	2	12
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
30	LK1-LK2,LKP1-LKP2	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
31	ELK 1-2	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	84
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
35	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	6
36	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	2	12

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR MIV OPU CONTROL PANEL (2X1.5KW)

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-008

NO. OF SHEETS 02 | SHEET. NO. 02 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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TITLE : - TOP COVER DRAINAGE PUMP MCP (2X0.75KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-009 REV. 02

DWG. NO. : - EP-3-CS-033-009 REV. 01

DWG. NO. : - EP-3-BM-033-009 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

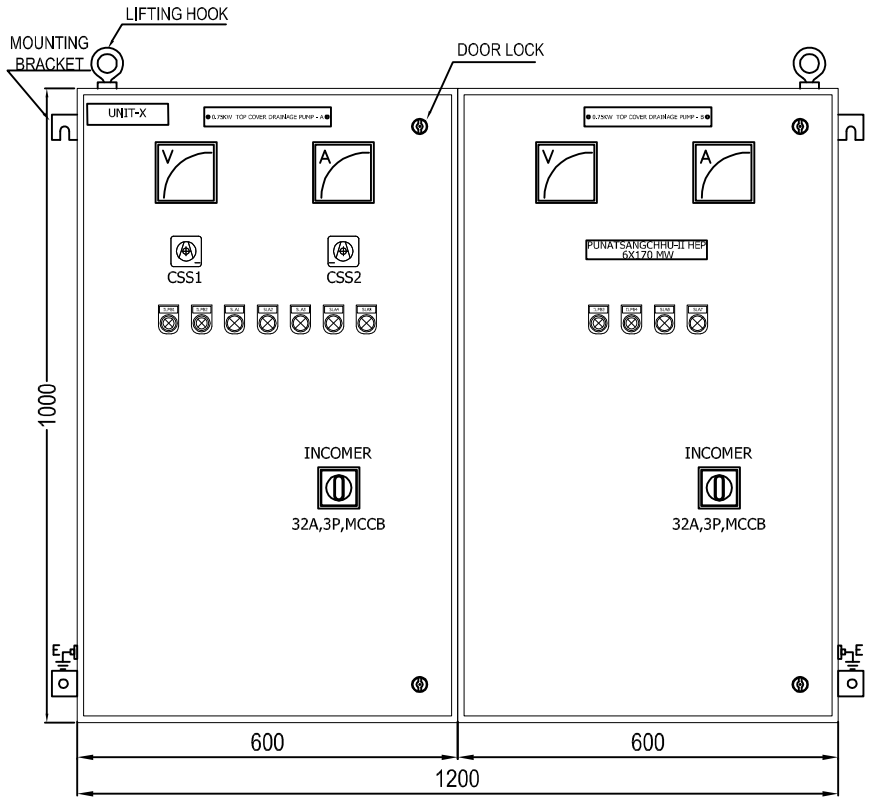
TITLE : COVER SHEET OF TOP COVER DRAINAGE PUMP MCP (2X0.75KW)

NO. OF SHEETS: 01 | SHEET. NO.: 01

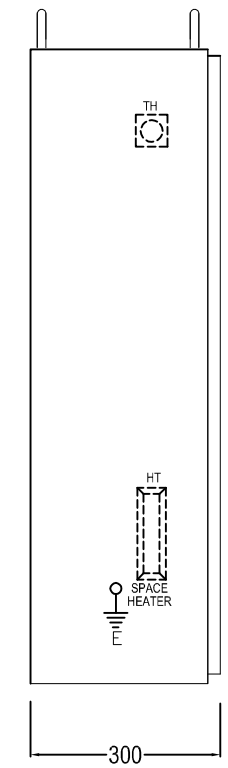
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

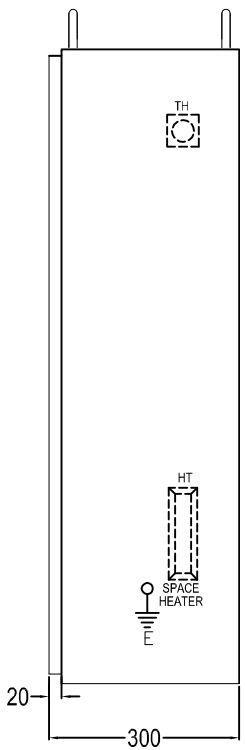
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FRONT VIEW

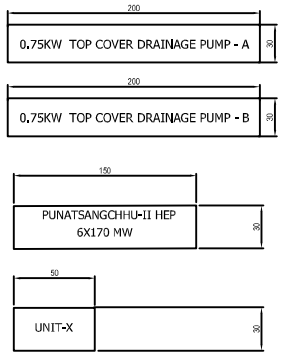


SIDE VIEW LHS SIDE

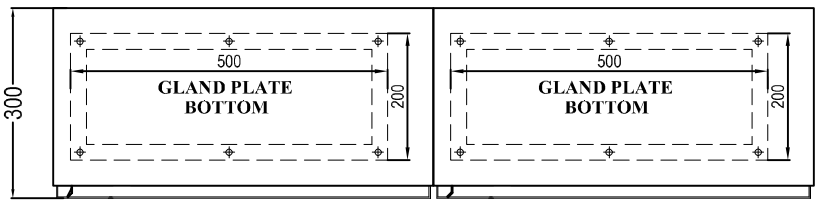


SIDE VIEW RHS SIDE

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty–6Nos

DRG. NO. EP–3–GA–033–009

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
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INVENTORY NO.

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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : GENERAL NOTES FOR TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

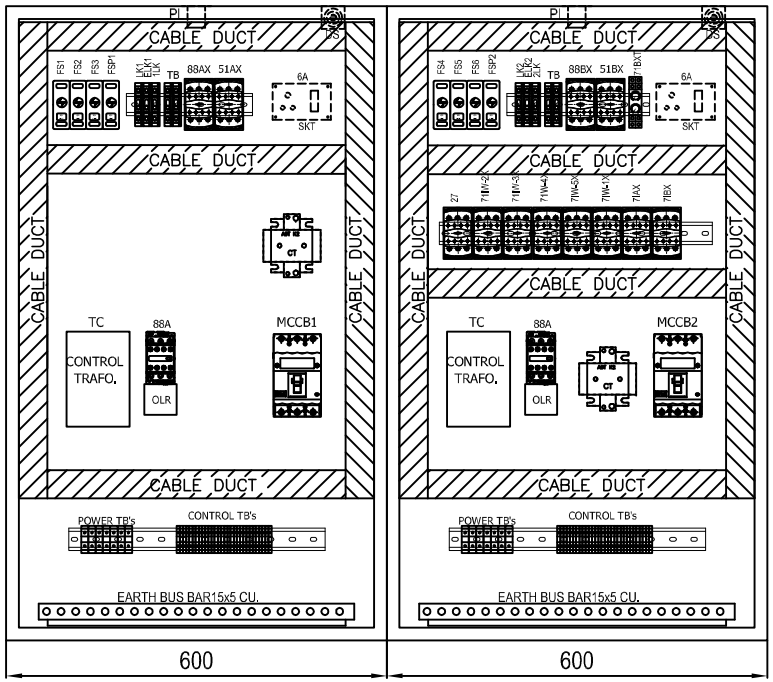
NO. OF SHEETS 08.2 | SHEET. NO. 08.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–009 | REV. 02

FORM 66–301 A

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	350KG	

DRG. NO. EP-3-GA-033-009

Qty-6Nos

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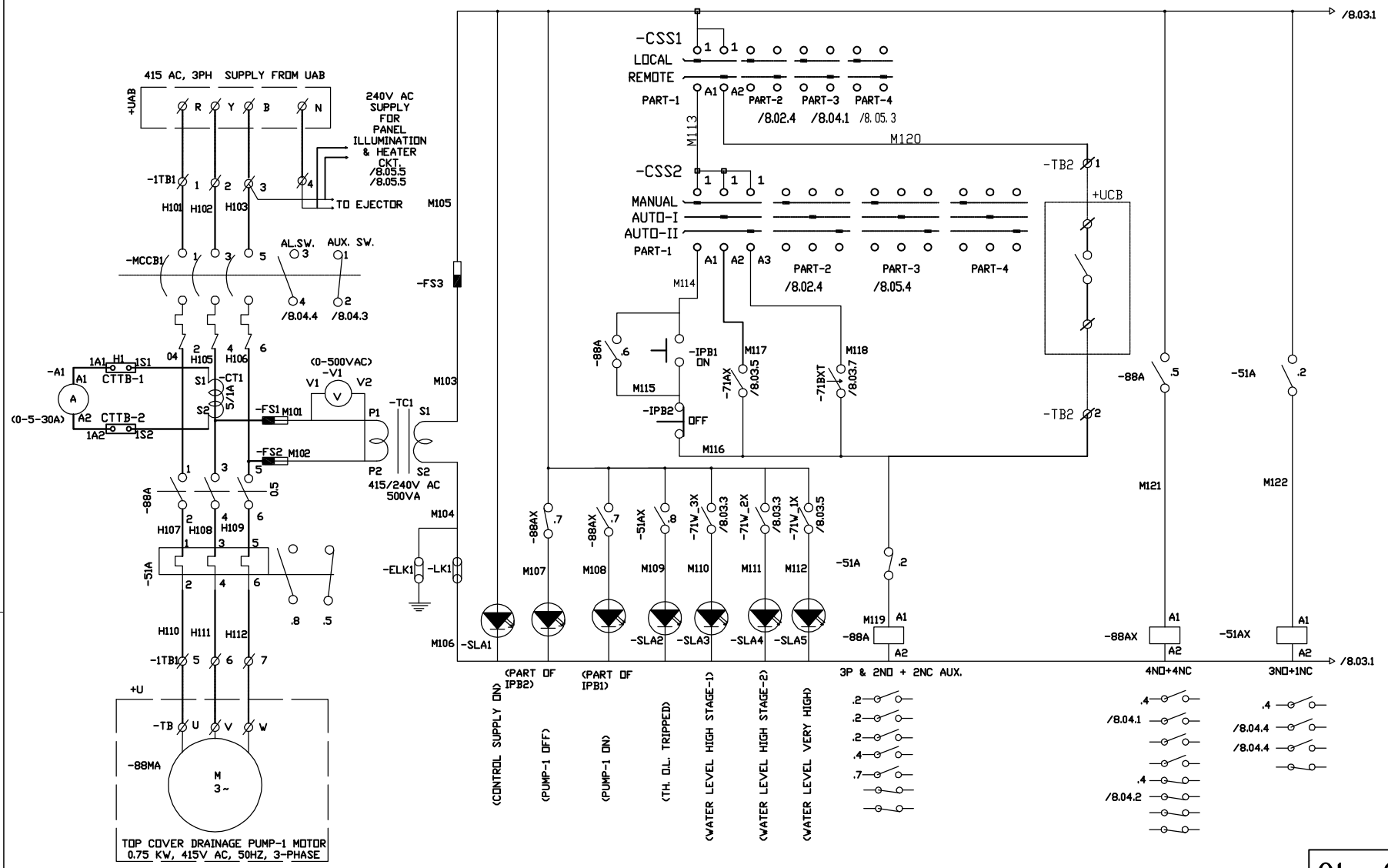
NO. OF SHEETS 08.2 | SHEET. NO. 08.2

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FORM 66-301 A

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CAD DIR : FILE NO.:

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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

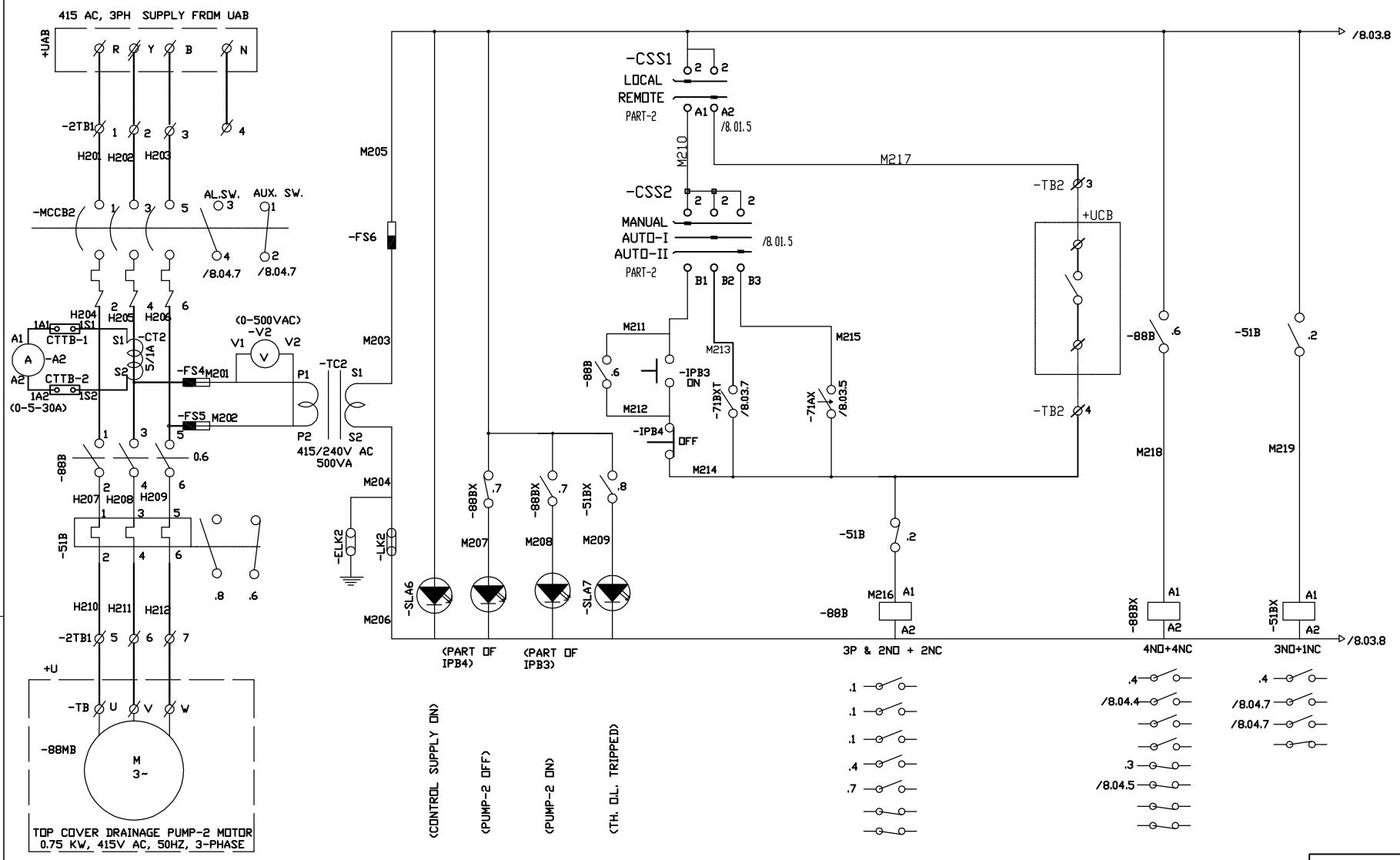
NO. OF SHEETS 8.06 | SHEET. NO. 8.01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 01

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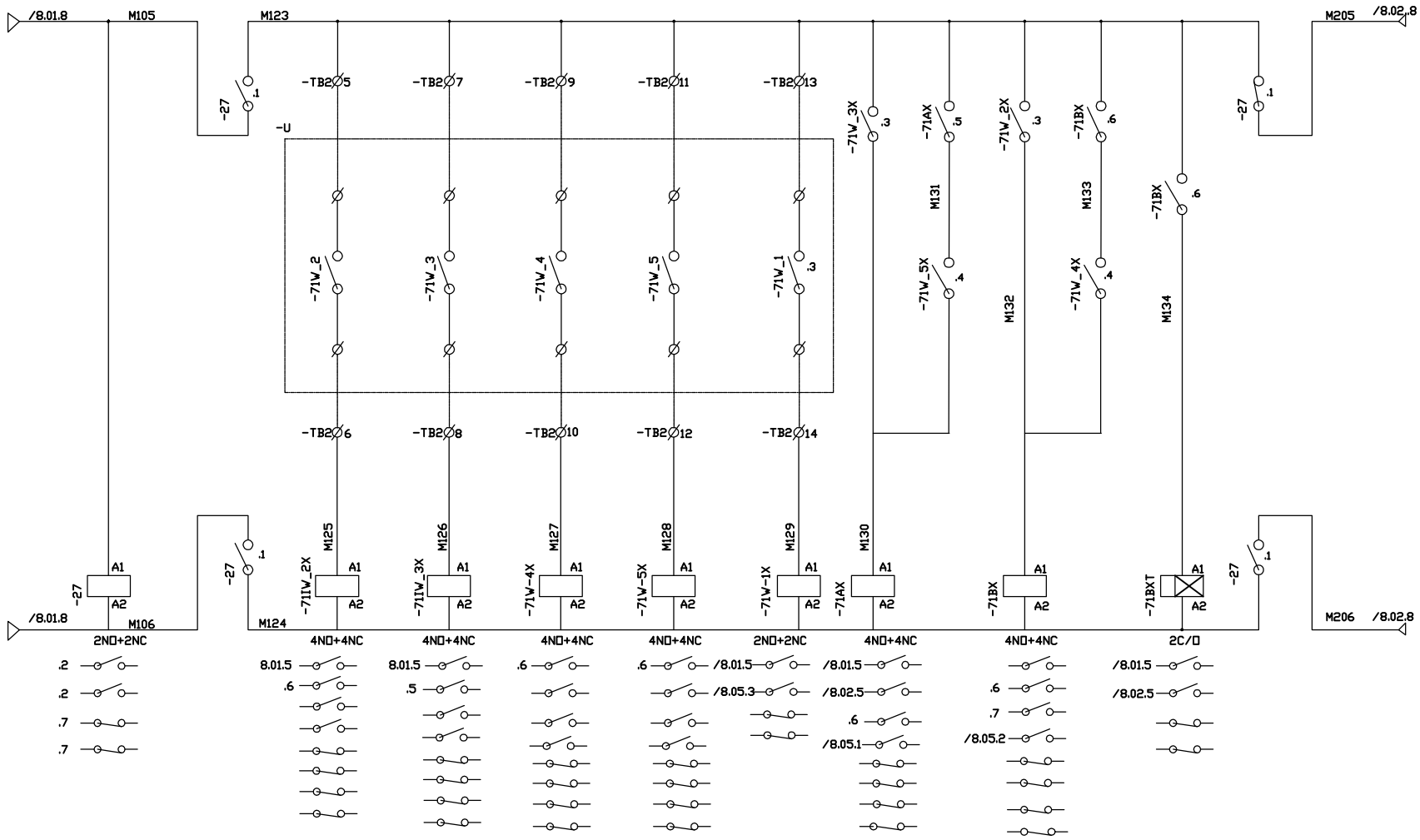
TITLE : CONTROL SCHEMATIC OF TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 8.06
SHEET. NO. 8.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-009

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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04				
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02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

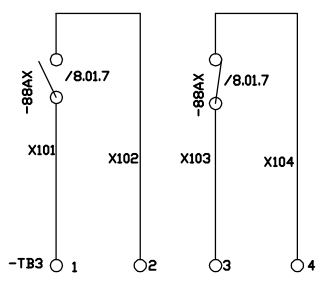
TITLE : CONTROL SCHEMATIC OF
TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 8.06 | SHEET. NO. 8.03

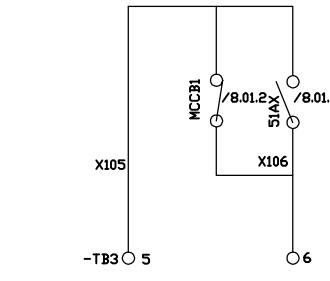
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

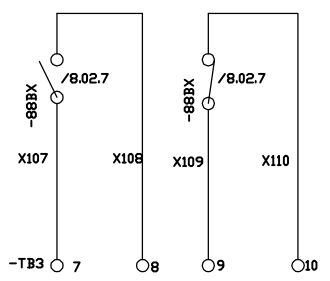
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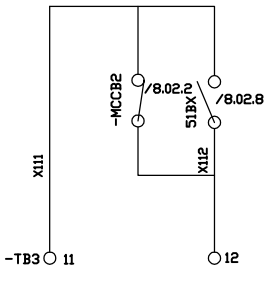
TOP COVER
PUMP-1 ON/OFF
(TO UCB)



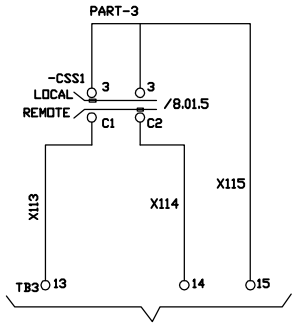
TOP COVER
PUMP-1 LOCAL
DRIVE DISTURBANCE
(TO UCB)



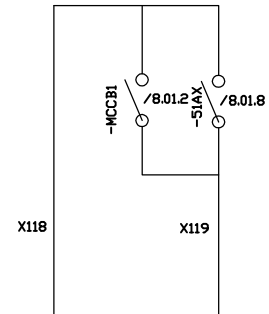
TOP COVER
PUMP-2 ON/OFF
(TO UCB)



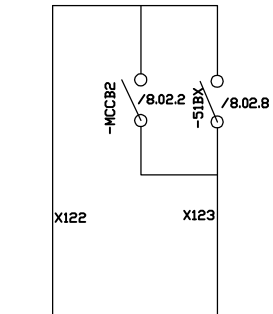
TOP COVER
PUMP-2 LOCAL
DRIVE DISTURBANCE
(TO UCB)



TOP COVER
CONTROL LOCAL/REMOTE
SELECTED
(TO UCB)



TOP COVER
PUMP-1 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)



TOP COVER
PUMP-2 MOTOR TH. O.L./MCCB
TRIPPED
(TO UCB)

Qty-6Nos

DRG. NO. EP-3-CS-033-009

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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02				
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INVENTORY NO.

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

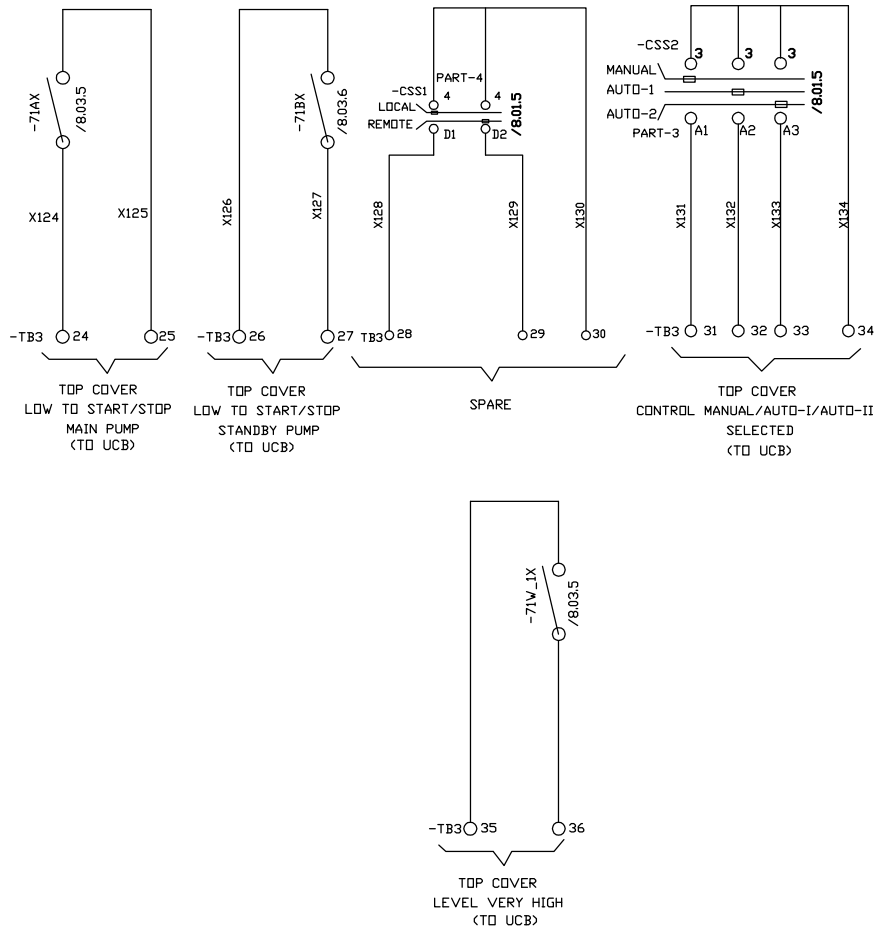
TITLE : CONTROL SCHEMATIC OF
TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

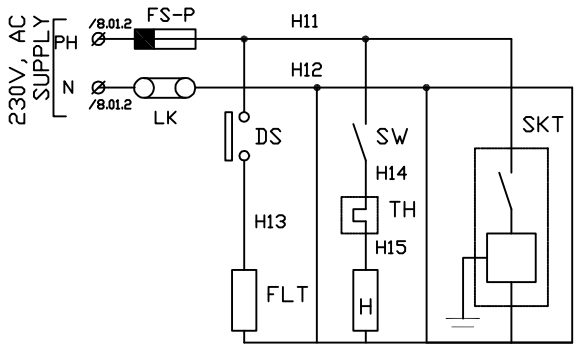
NO. OF SHEETS 8.06
SHEET. NO. 8.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-009

INVENTORY NO.

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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 8.06
SHEET. NO. 8.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-009

POWER TERMINALS

	1TB1	
H101	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H102	02	
H103	03	
N	04	
H110	05	TOP COVER DRAINAGE PUMP-1 MOTOR 0.75KW,415V AC 3PHASE
H111	06	
H112	07	

POWER TERMINALS

	2TB1	
H201	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H202	02	
H203	03	
N	04	
H210	05	TOP COVER DRAINAGE PUMP-2 MOTOR 0.75KW,415V AC 3PHASE
H211	06	
H212	07	

CONTROL TERMINALS

	TB2	
M120	1	+UCB
M116	2	
M217	3	+UCB
M214	4	
-71W-2X M123	5	
M125	6	
-71W-3X M123	7	
M126	8	
-71W-4X M123	9	
M127	10	
-71W-5X M123	11	
M128	12	
-71W-1X M123	13	
M129	14	

CONTROL TERMINALS

	TB3	
88AX X101	1	TO TOP COVER PUMP-1 ON
X102	2	
88AX X103	3	TO TOP COVER PUMP-1 OFF
X104	4	
X105	5	TO TOP COVER PUMP-1 LOCAL DRIVE DISTURBANCE
51AX MCCB1 X106	6	
88BX X107	7	TO TOP COVER PUMP-2 ON
X108	8	
88BX X109	9	TO TOP COVER PUMP-2 OFF
X110	10	
X111	11	TO TOP COVER PUMP-2 LOCAL DRIVE DISTURBANCE
51BX MCCB2 X112	12	
3 C1 X113	13	TO TOP COVER CONTROL L/R SELECTED
3 C2 X114	14	
L R X115	15	
	16	SPARE
	17	
X118	18	TO TOP COVER PUMP-1 MOTOR TH.OL /MCCB TRIPPED
51AX MCCB1 X119	19	
	20	SPARE
	21	
X122	22	TO TOP COVER PUMP-2 MOTOR TH.OL /MCCB TRIPPED
51BX MCCB2 X123	23	
X124	24	TO TOP COVER LOW TO START/STOP MAIN PUMP
-71AX X125	25	
X126	26	TO TOP COVER LOW TO START/STOP STANDBY PUMP
-71BX X127	27	
4 D1 X128	28	SPARE
4 D2 X129	29	
L R X130	30	
3 A1 X131	31	(TO TOP COVER CONTROL M/A-I/A-II SELECTION
3 A2 X132	32	
3 A3 X133	33	
X134	34	
-71W-1X X135	35	TO TOP COVER LEVEL VERY HIGH
X136	36	
	37	SPARE
	38	
	39	
	40	

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

INVENTORY NO.

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : CONTROL SCHEMATICS FOR TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 8.06 | SHEET. NO. 8.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-009 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-009

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOEO	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	12
04	88A,88B	Power contactor	32A, 3P, Power Contactor with 240V AC coil,aux Supply	CS94111BOOO	L&T	2	12
05	-	Power contactor Acc	Add on contact 2NO+2NC for 32A P.Cont	CS94114	L&T	2	12
06	51AX & 51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
07	88AX,88BX,27 7I1W-2X,7I1W3X,71W-4X 71W-5X,71AX,71BX,71W-1X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	10	60
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	8	48
09	51A&51B	Overload Relay	1.4-2.3A Bimetal Overload Relay, Direct Mounting (Class 10) 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94141OOPO	L&T	2	12
10	71BXT	On-delay Timer	1sec - 30sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC		L&T	1	6
11	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way without OFF	61040	Salzer	1	6
12	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way without OFF	61120	Salzer	1	6
13	CT1&CT2	Current Transformer	5/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
14	V1 & V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale 0-500V class-1, flush mounting type	-	AE/ Meco	2	12
15	A1 & A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 5/1A Acc. CL:1,Range:0-5-30A with suppressed scale.	-	AE/ Meco	2	12
16	IPB1,IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
17	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12
18	IPB2,IPB4	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
19	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	12

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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-009 | REV. 02

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-009

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3,SLA4 SLA5,SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	7	42
21	FS1-FS6 & FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
22	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
23	FSP1- FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
24	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	12
28	DS	Limit switch	Door Limit switch 1A,230V 1NO+1NC	-	Kaycee	2	12
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
30	LK1,LK2,1LK,2LK	Neutral Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
31	ELK 1-2	Earth Link	16A With Base Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	12
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	84
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
35	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	6
36	sw	Toggle Switch	230V AC 5A Toggle switch	-	Suraj	2	12

INVENTORY NO.

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ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
TOP COVER DRAINAGE PUMP CONTROL PANEL (2X0.75KW)

NO. OF SHEETS 02 | SHEET. NO. 02

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FORM 66-301 A

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TITLE : - PRIMARY COOLING WATER PUMP MCP (2X150KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-010 REV. 02

DWG. NO. : - EP-3-CS-033-010 REV. 01

DWG. NO. : - EP-3-BM-033-010 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF PRIMARY COOLING WATER PUMP MCP (2X150KW)

NO. OF SHEETS 01 | SHEET. NO. 01

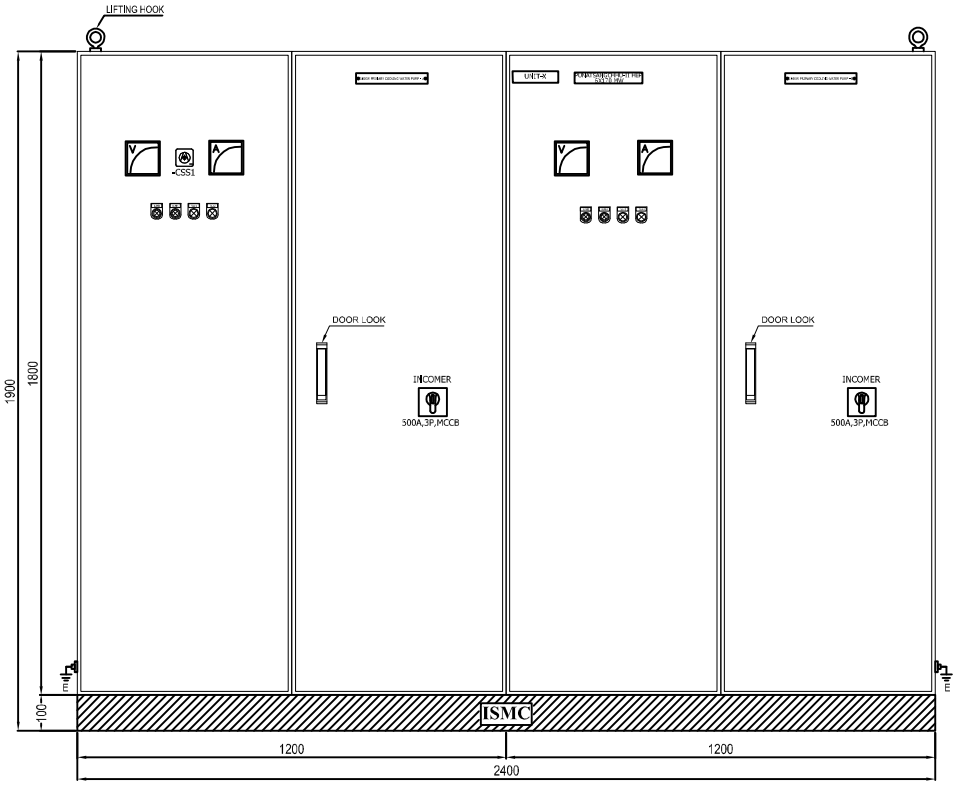
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

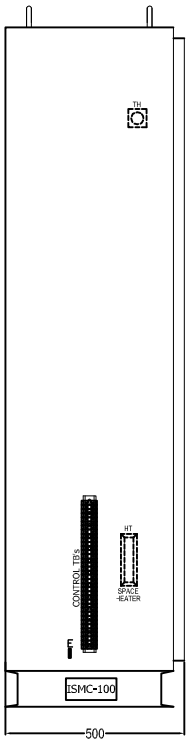
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101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

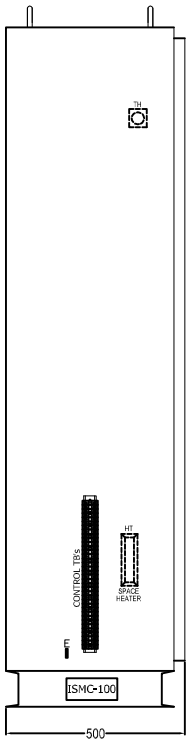
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FRONT VIEW

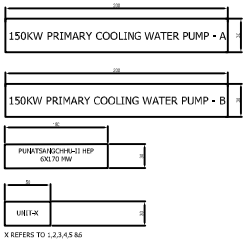


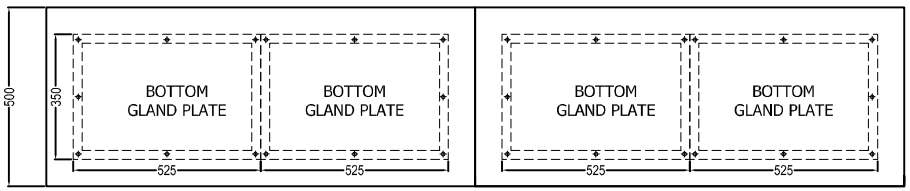
SIDE VIEW
DOOR - 1



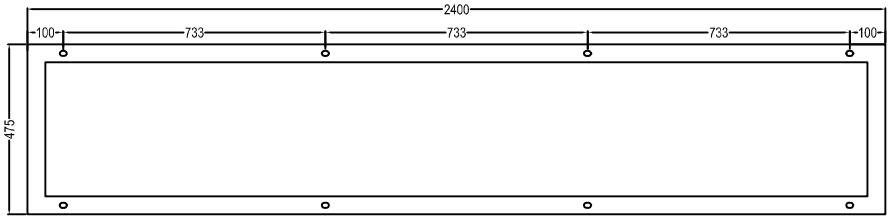
SIDE VIEW
DOOR - 2

PANEL NAME PLATES





MOUNTING DETAILS - PANEL BOTTOM



FOUNDATION DETAILS

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL

Qty–6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 09.2
SHEET. NO. 09.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–010 | REV. 02

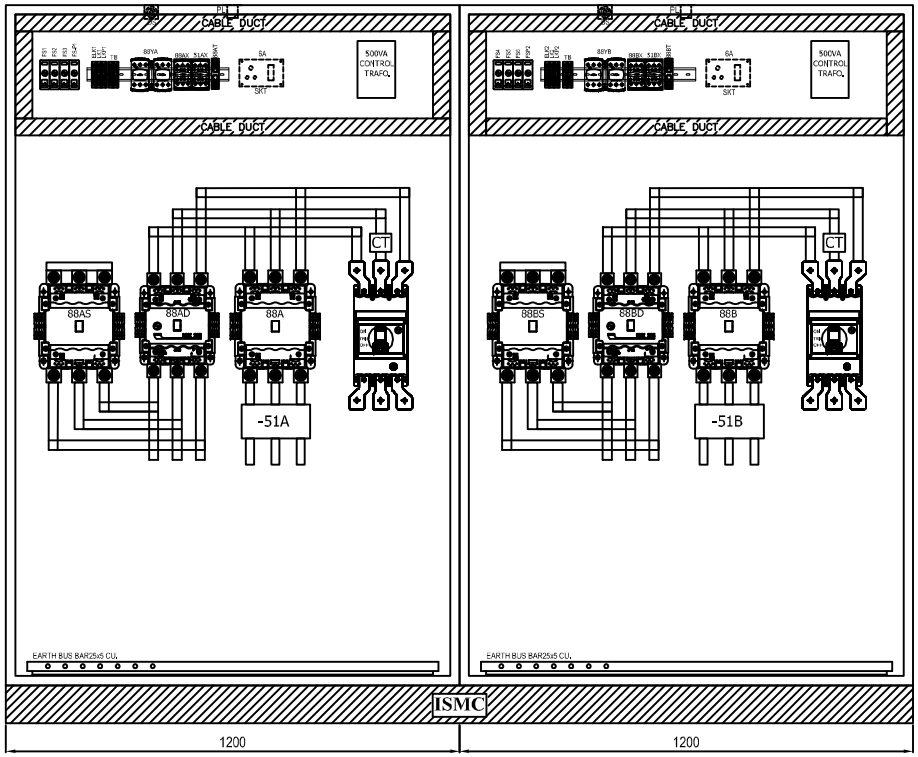
INVENTORY NO.

DRG. NO. EP–3–GA–033–010

FIRST ANGLE PROJECTION

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	572	
TENTAVIVE WEIGHT		
WEIGHT	600 KG	

Qty-6Nos

DRG. NO. EP-3-GA-033-010

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	17.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

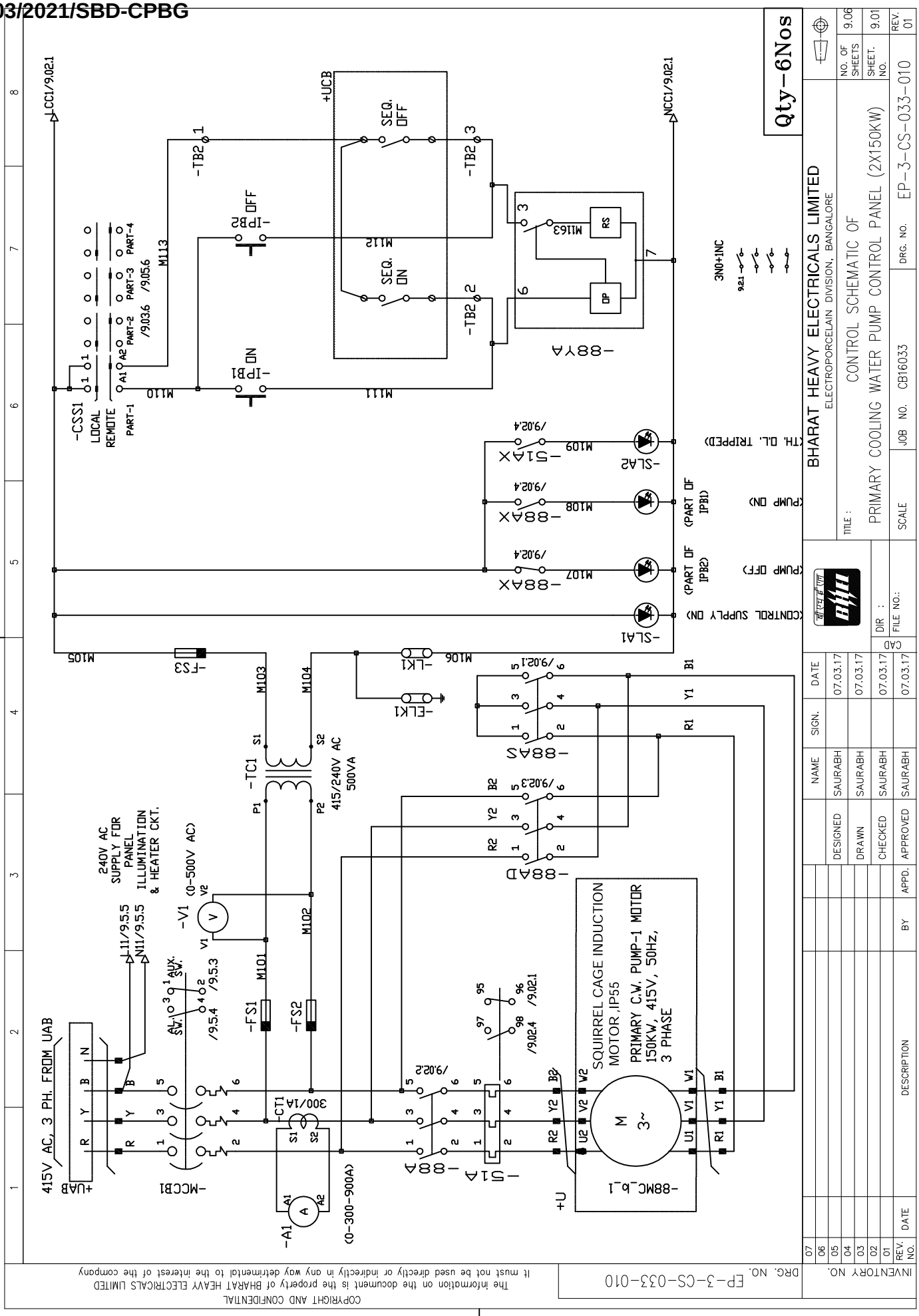
CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 09.2
SHEET. NO. 09.2

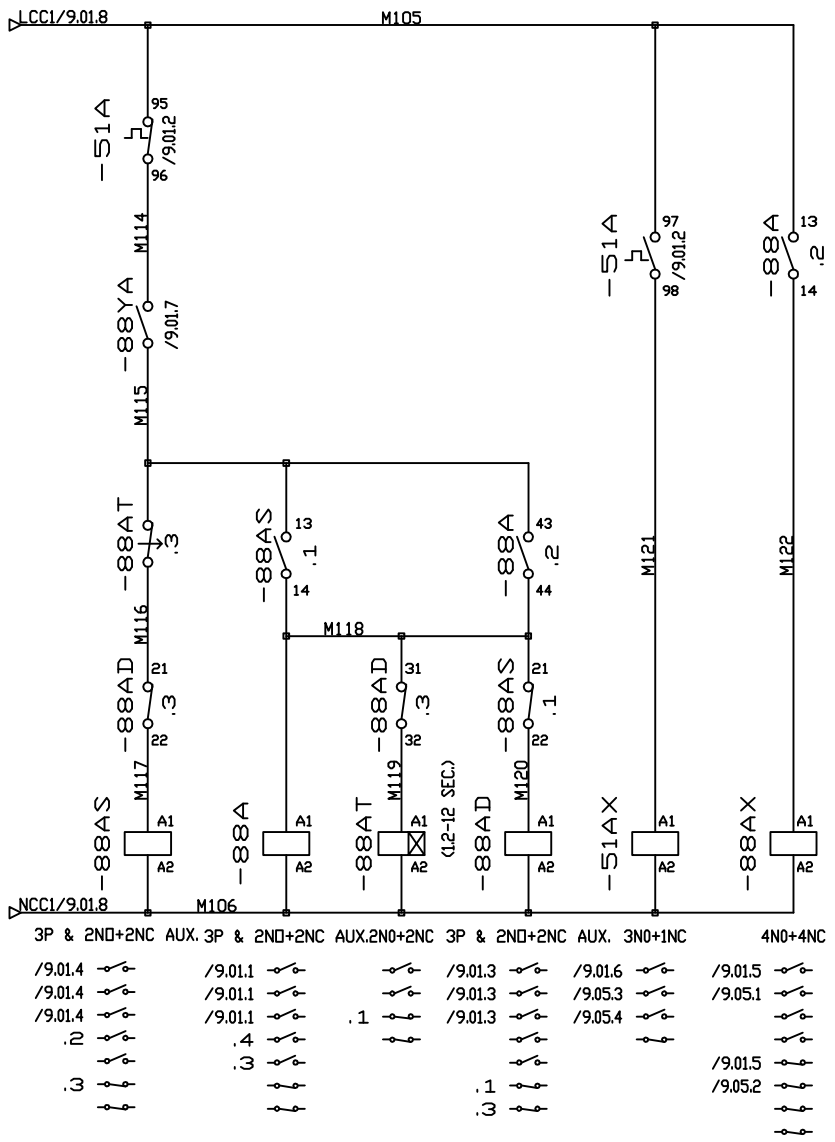
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-010 | REV. 02



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Qty-6Nos

DRG. NO. EP-3-CS-033-010

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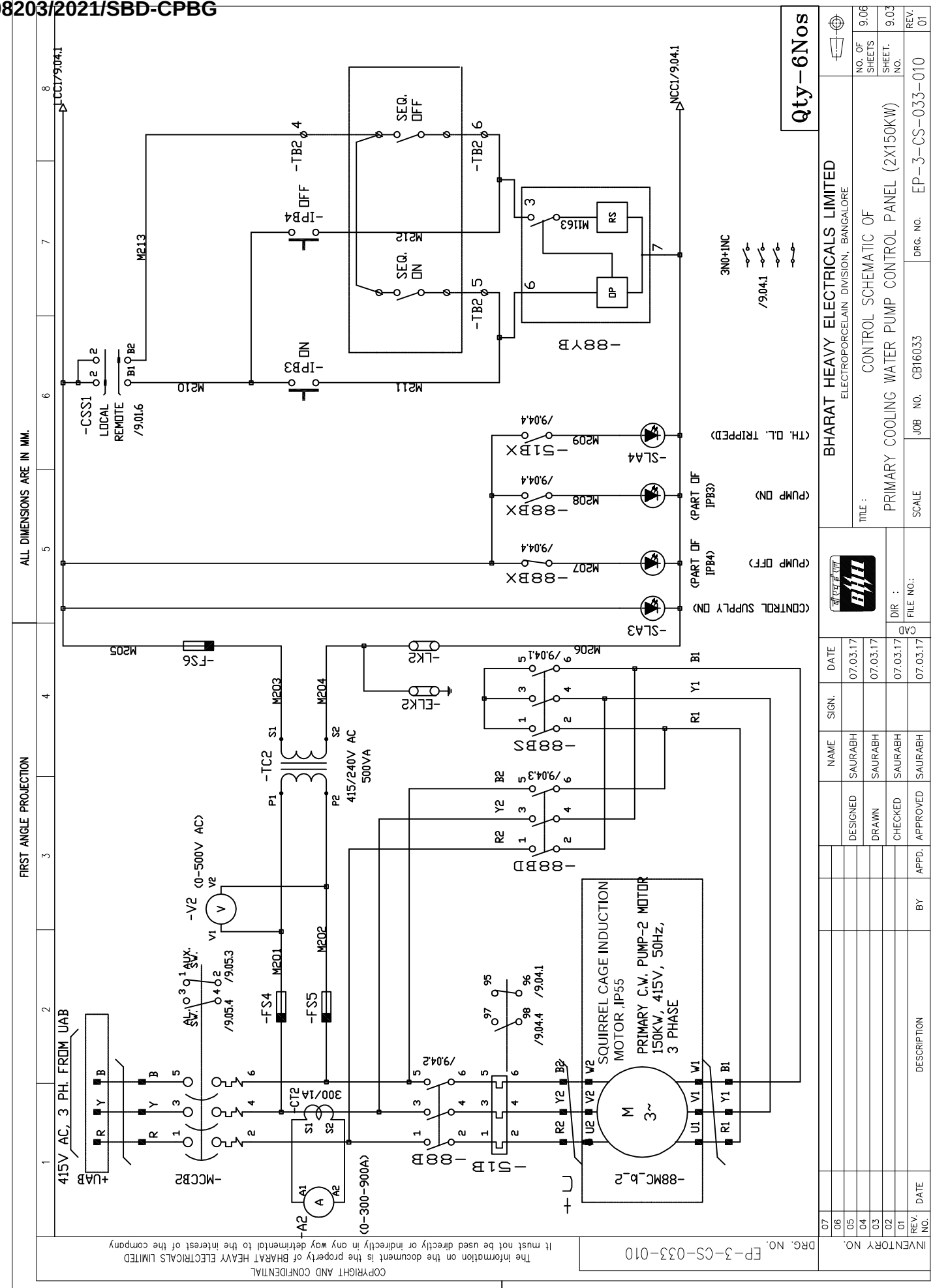
CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

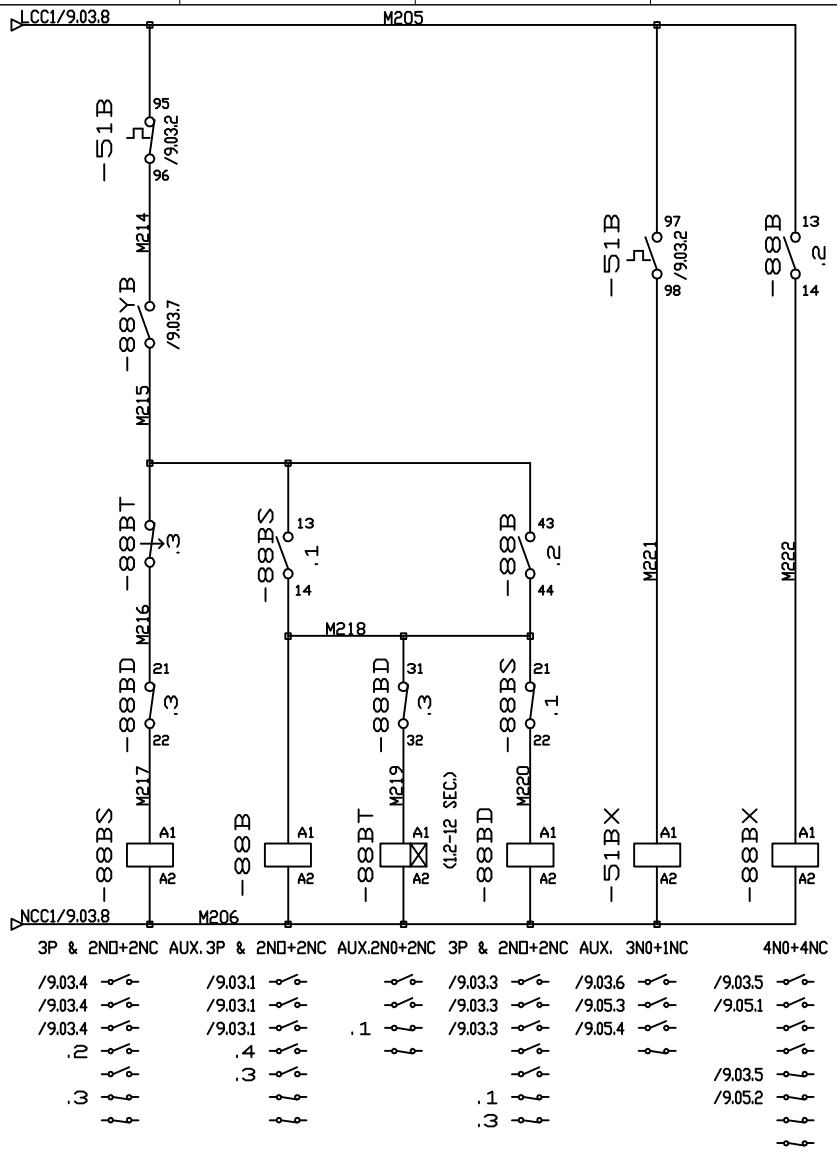
NO. OF SHEETS 9.06 | SHEET. NO. 9.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-010 | REV. 01


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-010
SCALE
NO. OF SHEETS 9.06
SHEET. NO. 9.03
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
BY
APPD.
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
415V AC, 3 PH. FROM UAB
+UAB
-MCCB2
-CSS1 LOCAL REMOTE /9.01.6
-IPB4 OFF
-IPB3 ON
SEQ. OFF
SEQ. ON
-TB2
M213
M210
M211
M212
-88YB
M1163
RS
DP
3NO+INC
/9.04.1
-SLA4 (TH. O.L. TRIPPED)
-SLA3 (CONTROL SUPPLY ON)
-88BX (PUMP ON) (PART OF IPB3)
-88BX (PUMP OFF) (PART OF IPB4)
-51BX
/9.04.4
M209
M208
M207
M205
-FS6
-LK2
-ELK2
M206
/9.04.1
-88BS
-88BD
/9.04.3
-TC2
415/240V AC
500VA
M203
M204
S1
S2
P1
P2
-V2 (0-500V AC)
M201
M202
-FS4
-FS5
AUX. SW.
/9.05.3
/9.05.4
-CT2
300/1A
(0-300-900A)
-A2
/9.04.2
-51B
-88B
/9.04.4
95
96
97
98
-88MC_b_2
SQUIRREL CAGE INDUCTION MOTOR, IP55
PRIMARY C.W. PUMP-2 MOTOR
150KW, 415V, 50Hz,
3 PHASE
M
3~
U1
V1
W1
U2
V2
W2
R1
Y1
B1
R2
Y2
B2
NCC1/9.04.1
CCC1/9.04.1
DRG. NO. EP-3-CS-033-010
INVENTORY NO.
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ELECTROPORCELAIN DIVISION, BANGALORE

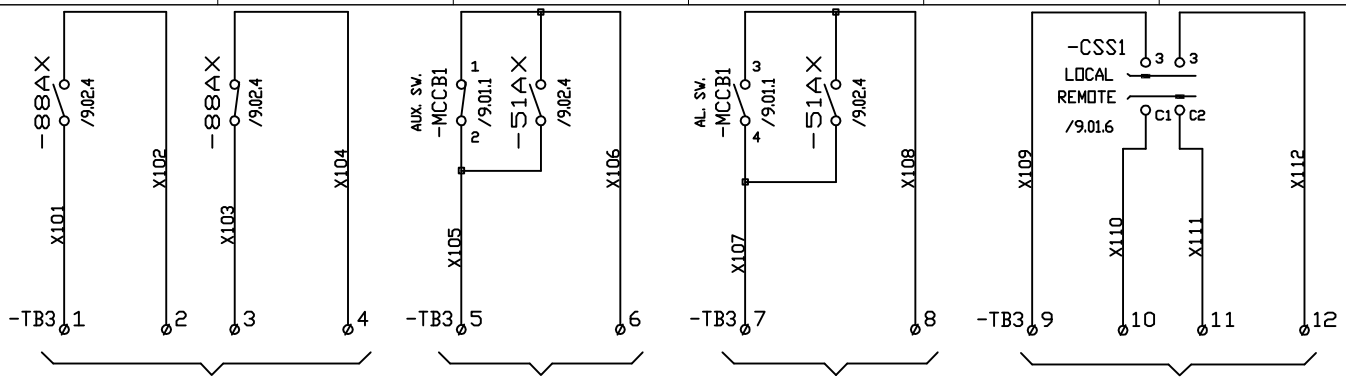
TITLE : CONTROL SCHEMATIC OF PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 9.06 | SHEET. NO. 9.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-010 | REV. 01

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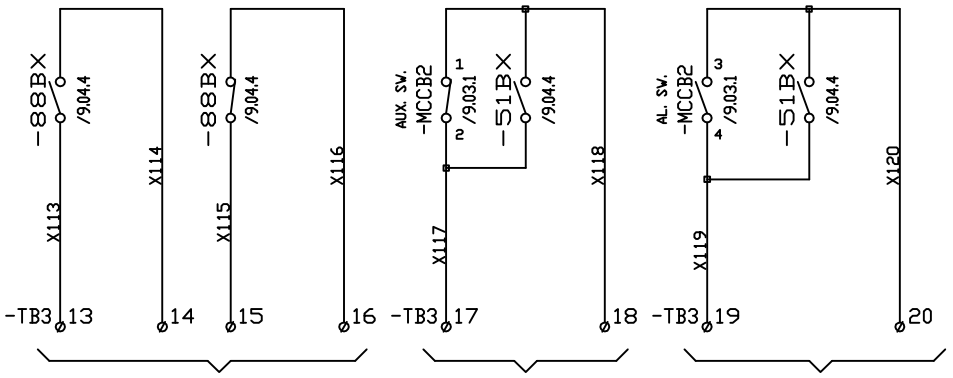


(PRIMARY C. W. PUMP-1 ON/OFF) (TO UCB)

(PRIMARY C. W. PUMP-1 LOCAL DRIVE DISTURBANCE) (TO UCB)

(PRIMARY C. W. PUMP-1 TH. O. L. /MCCB TRIPPED) (TO UCB)

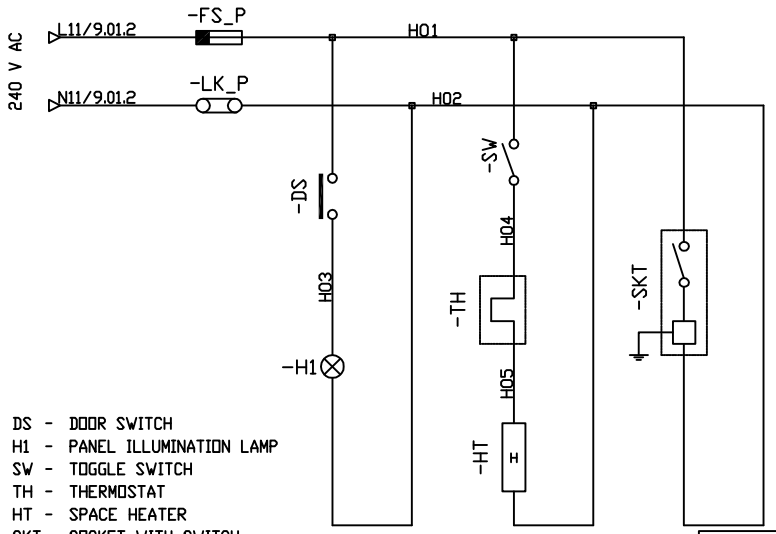
(PRIMARY C. W. PUMPS MOTOR CONTROL LOCAL/REMOTE SELECTED) (TO UCB)



(PRIMARY C. W. PUMP-2 ON/OFF) (TO UCB)

(PRIMARY C. W. PUMP-2 LOCAL DRIVE DISTURBANCE) (TO UCB)

(PRIMARY C. W. PUMP-2 TH. O. L. /MCCB TRIPPED) (TO UCB)



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT- SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-010

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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DRAWN	SAURABH		07.03.17
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APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 9.06
SHEET. NO. 9.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-010 | REV. 01

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POWER TERMINALS

1TB1

R	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
Y	02	
B	03	
N	04	
R2	05	BOO PUMP-2 MOTOR 150KW,415V,50Hz AC 3PHASE
Y2	06	
B2	07	
U1	08	
V1	09	
W1	10	

POWER TERMINALS

1TB2

R	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
Y	02	
B	03	
N	04	
R2	05	PRIMARY C.W. PUMP-2 MOTOR 150KW,415V,50Hz AC 3PHASE
Y2	06	
B2	07	
U1	08	
V1	09	
W1	10	

CONTROL TERMINALS

TB2

M113	1	+UCB
M111	2	
M112	3	
M213	4	+UCB
M211	5	
M212	6	

CONTROL TERMINALS

TB3

88AX X101	1	PRIMARY C.W PUMP-1 ON (TO UCB)
X102	2	
88AX X103	3	PRIMARY C.W PUMP-1 OFF (TO UCB)
X104	4	
MCCB1 51AX X105	5	PRIMARY C.W PUMP-1 LOCAL DRIVE DISTURBANCE (TO UCB)
X106	6	
MCCB1 51AX X107	7	PRIMARY C.W PUMP-1 TH.OL /MCCB TRIPPED
X108	8	
X109	9	PRIMARY C.W PUMPS MOTOR LOCAL/REMOTE SELECTED (TO UCB)
S1 X110	10	
S2 X111	11	
S3 X112	12	
88BX X113	13	PRIMARY C.W PUMP-2 ON (TO UCB)
X114	14	
88BX X115	15	PRIMARY C.W PUMP-2 OFF (TO UCB)
X116	16	
MCCB2 51BX X117	17	PRIMARY C.W PUMP-2 LOCAL DRIVE DISTURBANCE (TO UCB)
X118	18	
MCCB2 51BX X119	19	PRIMARY C.W PUMP-2 TH.OL /MCCB TRIPPED
X120	20	

Qty-6Nos

DRG. NO. EP-3-CS-033-010

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01	17.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

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CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 9.06
SHEET. NO. 9.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-010 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-010

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB	Moulded Case Circuit Breaker	500A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOSOOG	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO)	CM99804OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	2	12
04	88A,88AD,88B,88BD	Power contactor	550A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94145BOOO	L&T	4	24
05	88AS&88BS	Power contactor	185A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94139BOOO	L&T	2	12
06	88YA&88YB	Latch relay	Latch relay with 3NO+1NC, 240VAC coil aux supply with mechnical interlock electrical reset	3RH2131-1AP00	Siemens	2	12
07	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
08	AE/MECO	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	2	12
09		Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	2	12
10	AE/MECO 51A&51B	Overload Relay	135-225A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94138OOPO	L&T	2	12
11	88AT&88BT	Timer	1sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	12
12	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	6
13	CT1&CT2	Current Transformer	300/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
14	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/Rishabh Meco	2	12
15	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 300/1A, Acc. CL:1,Range:0-300-1800A with suppressed scale.	-	AE/Rishabh Meco	2	12
16	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
17	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12
18	IPB2&IPB4	Green illuminated Push button	Green, illuminated actuator with holder for contact block 22.5mm Dia, 1NO+1NC addon contact	EG03FDLG240A	L&T	2	12
19	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12

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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	18.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 01 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-010 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-010

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3 SLA4	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	4	24
21	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
22	FS1- FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
23	FSP1- FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
24	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 11Watt CFL with holder	-	Phillips	2	12
28	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	12
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
30	LK1,2,LKP1-LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
31	ELK1,2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	12
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	-	-
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	6
35	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	12
36	-	Panel Enclosure	Enclosure Size - H1900 x W2400 x D500mm	-	BHEL	1	6

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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
PRIMARY COOLING WATER PUMP CONTROL PANEL (2X150KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-010 | REV. 02

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TITLE : - SECONDARY COOLING WATER PUMP MCP (2X200KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-011 REV. 02

DWG. NO. : - EP-3-CS-033-011 REV. 01

DWG. NO. : - EP-3-BM-033-011 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF SECONDARY COOLING WATER PUMP MCP (2X200KW)

NO. OF SHEETS 01 | SHEET. NO. 01

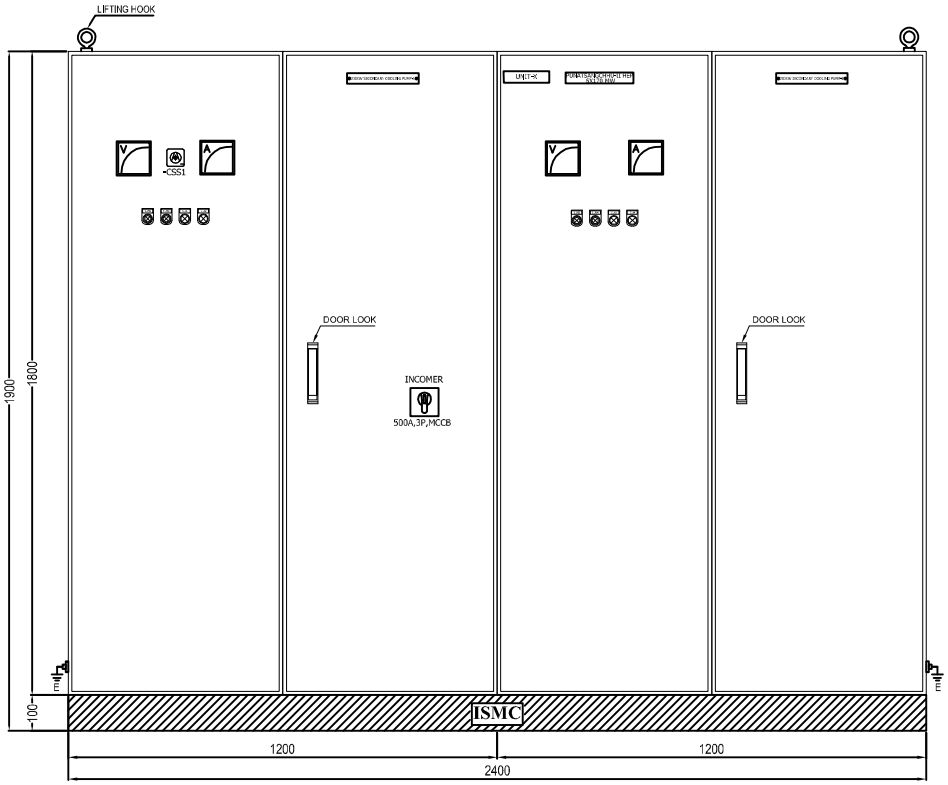
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

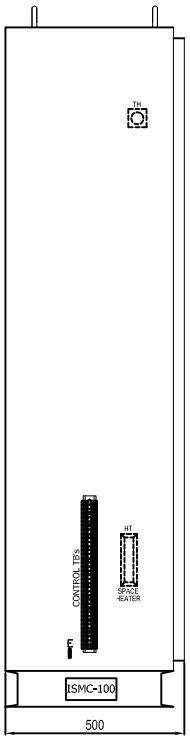
ALL DIMENSIONS ARE IN MM.

101	102	103	104	105	106	107	108

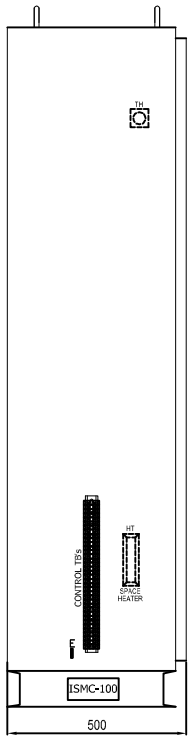
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FRONT VIEW



SIDE VIEW DOOR - 1



SIDE VIEW DOOR - 2

PANEL NAME PLATES

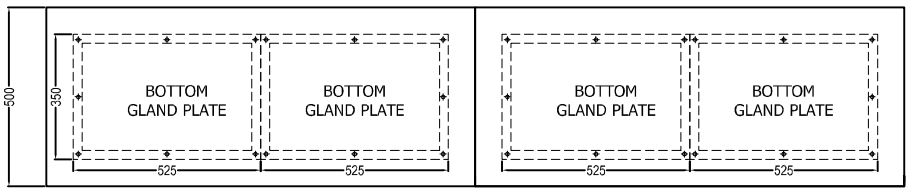
200KW SECONDARY COOLING PUMP-A

200KW SECONDARY COOLING PUMP-B

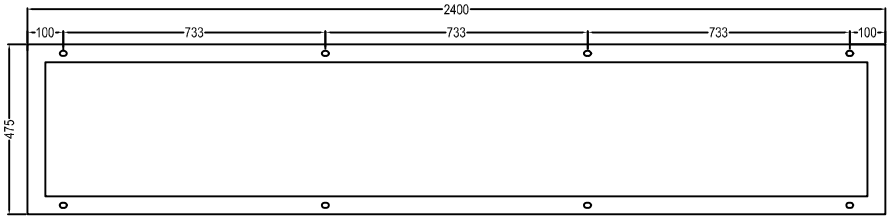
PUNATSANGCHHU-II HEP 6X170 MW

UNIT-X

X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM



FOUNDATION DETAILS

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL

Qty–6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	17.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 10.2
SHEET. NO. 10.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–011 | REV. 02

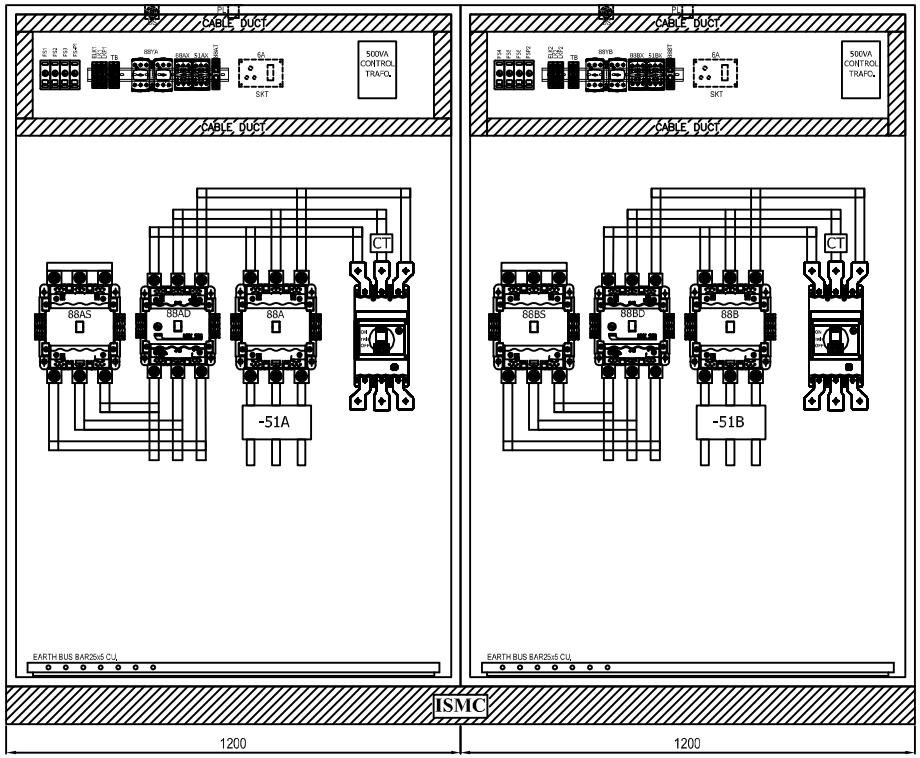
INVENTORY NO.

DRG. NO. EP–3–GA–033–011

FIRST ANGLE PROJECTION

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	572	
TENTAVIVE WEIGHT		
WEIGHT	700 KG	

Qty-6Nos

DRG. NO. EP-3-GA-033-011

INVENTORY NO.

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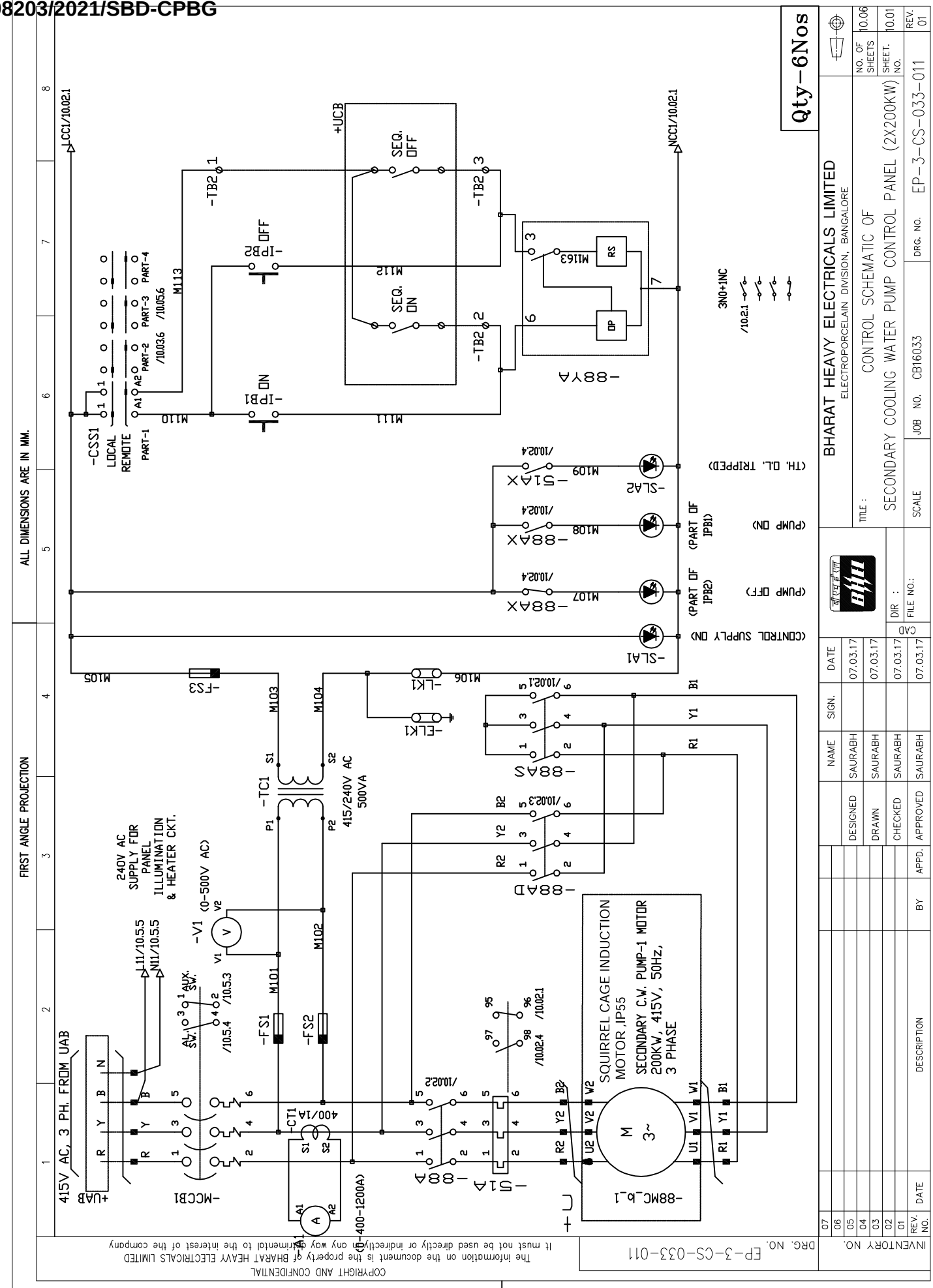
CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

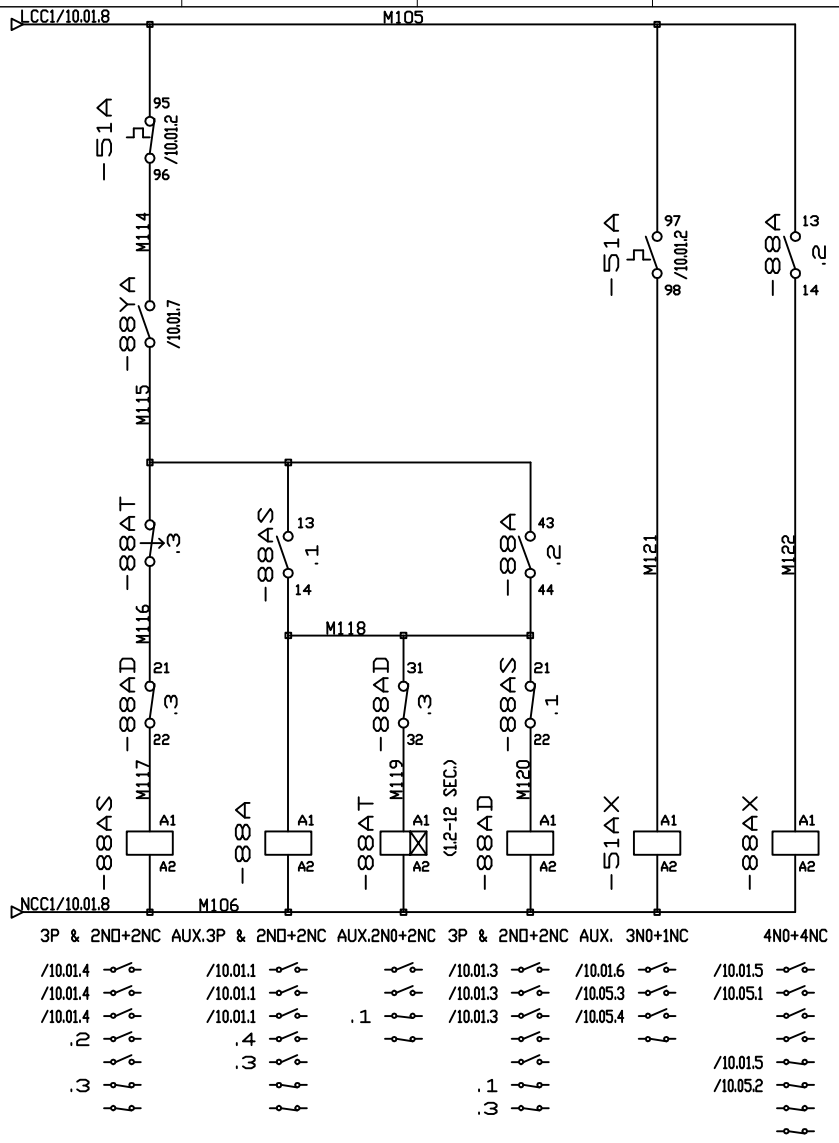
NO. OF SHEETS 10.2
SHEET. NO. 10.2

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-011 | REV. 02


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-011
NO. OF SHEETS 10.06
SHEET. NO. 10.01
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
CAD DIR :
FILE NO.:
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
415V AC, 3 PH. FROM UAB
+UAB
-MCCB1
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
-TC1 415/240V AC 500VA
-V1 (0-500V AC)
-FS1
-FS2
-CT1 400/1A
-A1 (0-400-1200A)
-U1A
-88A
-88AS
-88AD
-88AX
-88Y
-88MC_b_1
SQUIRREL CAGE INDUCTION MOTOR, IP55
SECONDARY C.W. PUMP-1 MOTOR
200KW, 415V, 50Hz, 3 PHASE
-CSS1 LOCAL REMOTE
-IPB1 ON
-IPB2 OFF
SEQ. ON
SEQ. OFF
+UCB
-TB2
-FS3
-LK1
-SLA1
-SLA2
(CONTROL SUPPLY ON)
(PUMP OFF) (PART OF IPB2)
(PUMP ON) (PART OF IPB1)
(TH. OL. TRIPPED)
3NO+1NC
LCC1/10.02.1
NCC1/10.02.1
DRG. NO. EP-3-CS-033-011
INVENTORY NO.
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

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	02				
	01				

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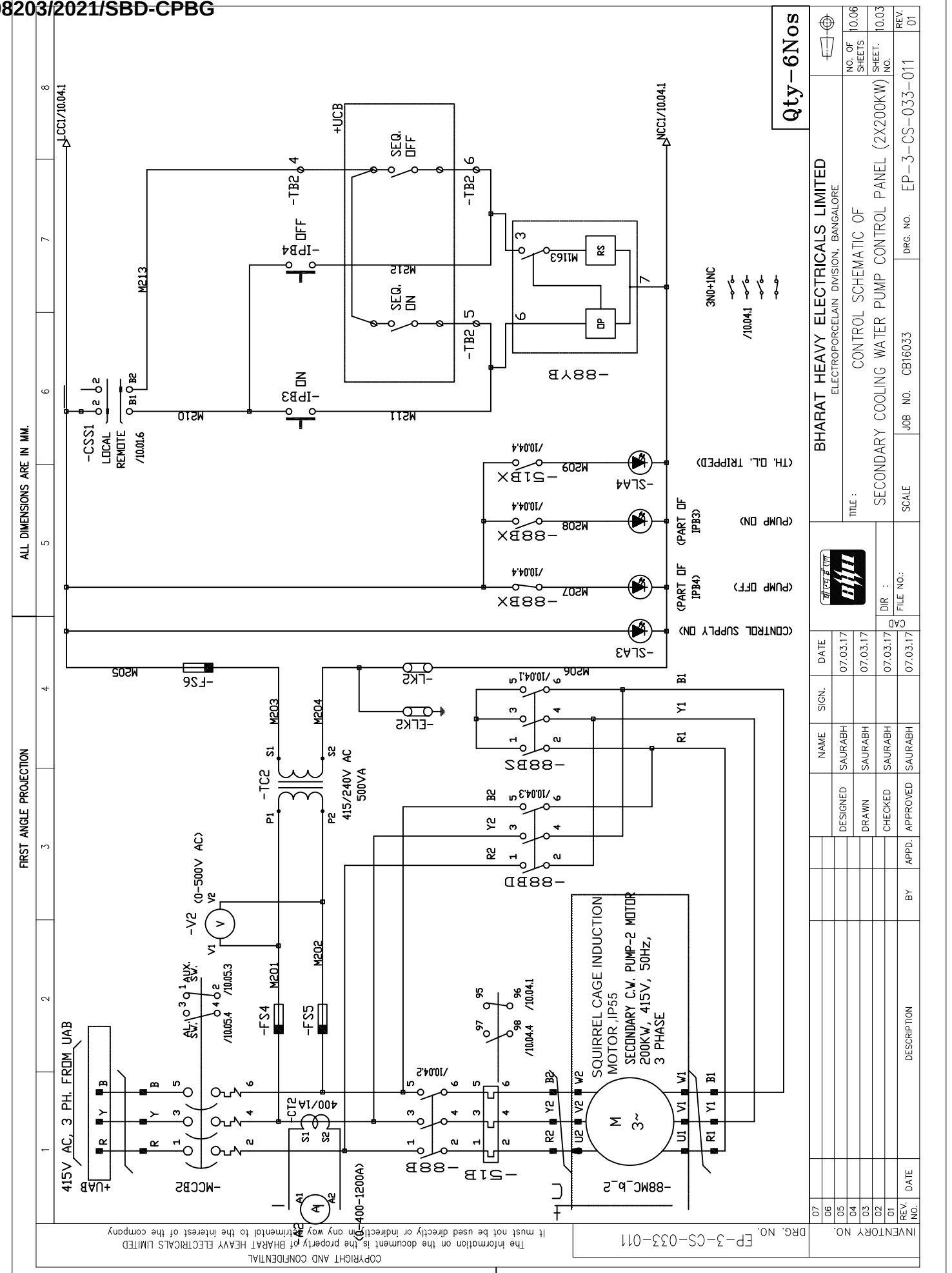
CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 10.06 | SHEET. NO. 10.02

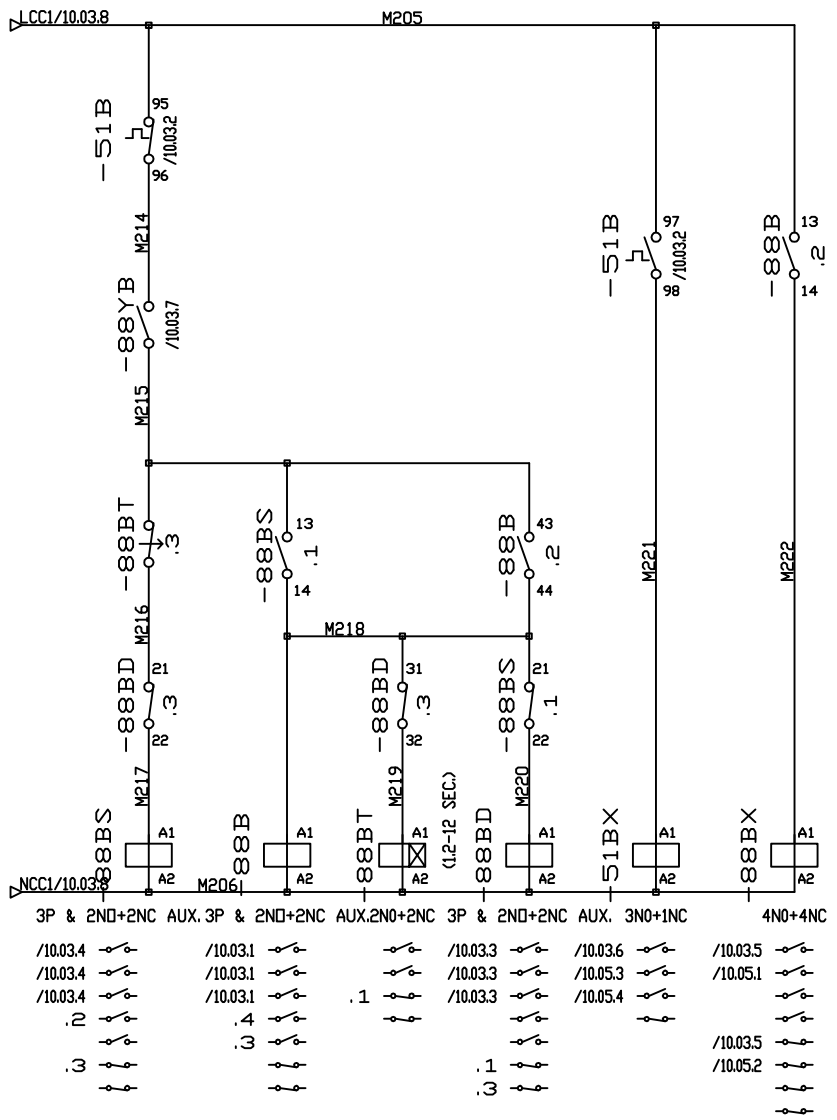
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-011 | REV. 01


Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-011
NO. OF SHEETS 10.06
SHEET NO. 10.03
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DIR :
FILE NO.:
CAD
DESCRIPTION
DATE
BY
APPD.
415V AC, 3 PH. FROM UAB
+UAB
-MCCB2
SQUIRREL CAGE INDUCTION MOTOR, IP55
SECONDARY C.W. PUMP-2 MOTOR
200KW, 415V, 50Hz, 3 PHASE
-88MC_b_2
-88B
-51B
-88BS
-88BD
-88BX
-88YB
-SLA3
-SLA4
-TC2
415/240V AC
500VA
-V2
(0-500V AC)
-FS4
-FS5
-FS6
-FLK2
-CSS1
LOCAL
REMOTE
-IPB3
-IPB4
SEQ. ON
SEQ. OFF
+UCB
-TB2
-CT2
400/1A
(0-400-1200A)
3NO+INC
(CONTROL SUPPLY ON)
(PUMP OFF)
(PUMP ON)
(TH. O.L. TRIPPED)
(PART OF IPB4)
(PART OF IPB3)
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
INVENTORY NO.
DRG. NO. EP-3-CS-033-011
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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Qty-6Nos

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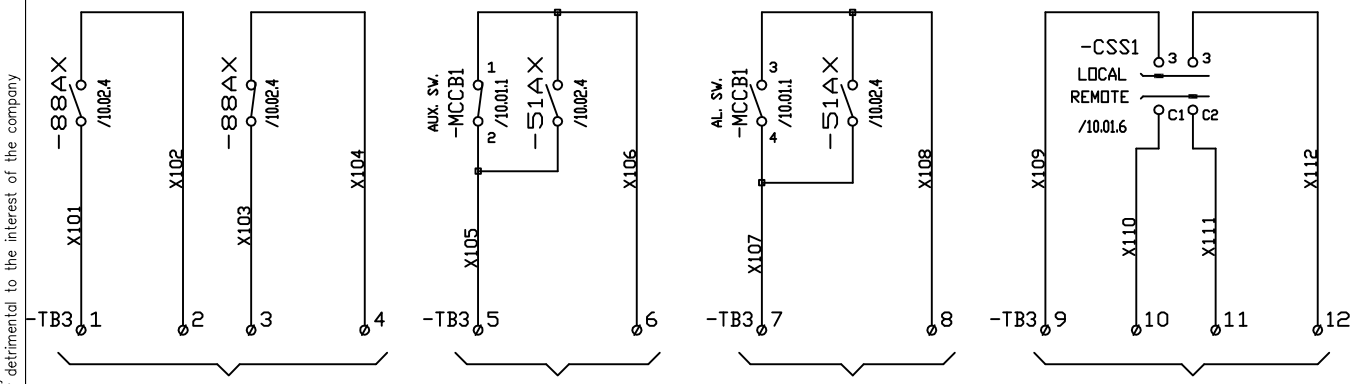
TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 10.06
SHEET. NO. 10.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-011 | REV. 01

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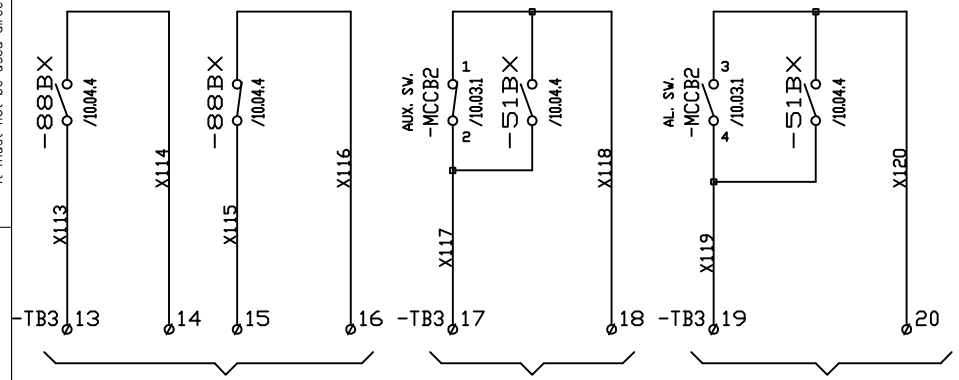


(SECONDARY C.W. PUMP-1 ON/OFF) (TO UCB)

(SECONDARY C.W. PUMP-1 LOCAL DRIVE DISTURBANCE) (TO UCB)

(SECONDARY C.W. PUMP-1 TH. O.L./MCCB TRIPPED) (TO UCB)

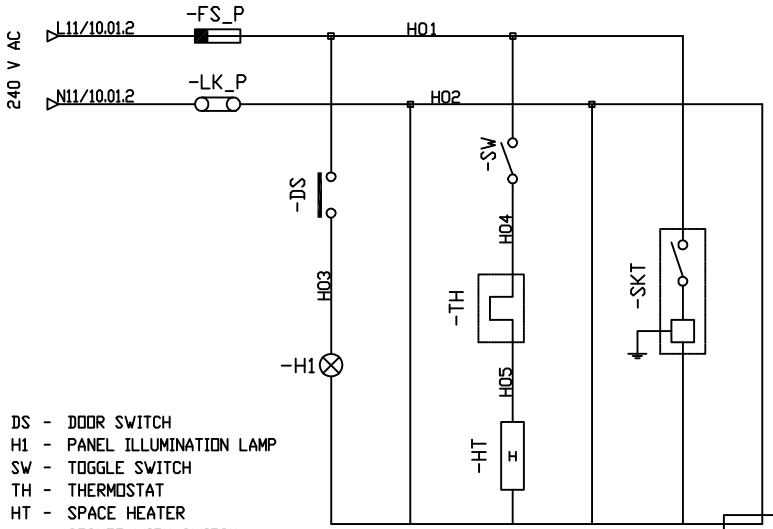
(SECONDARY C.W. PUMPS MOTOR CONTROL LOCAL/REMOTE SELECTED) (TO UCB)



(SECONDARY C.W. PUMP-2 ON/OFF) (TO UCB)

(SECONDARY C.W. PUMP-2 LOCAL DRIVE DISTURBANCE) (TO UCB)

(SECONDARY C.W. PUMP-2 TH. O.L./MCCB TRIPPED) (TO UCB)



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT - SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-011

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 10.06
SHEET. NO. 10.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-011 | REV. 01

FIRST ANGLE PROJECTION

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DRG. NO. EP-3-CS-033-011

POWER TERMINALS

1TB1

R	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
Y	02	
B	03	
N	04	
U1	05	SECONDARY C.W. PUMP-1 MOTOR 200KW,415V,50Hz AC 3PHASE
V1	06	
W1	07	
U2	08	
V2	09	
W2	10	

POWER TERMINALS

1TB2

R	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
Y	02	
B	03	
N	04	
U1	05	SECONDARY C.W. PUMP-2 MOTOR 200KW,415V,50Hz AC 3PHASE
V1	06	
W1	07	
U2	08	
V2	09	
W2	10	

CONTROL TERMINALS

TB2

M113	1	+UCB
M111	2	
M112	3	
M213	4	+UCB
M211	5	
M212	6	

CONTROL TERMINALS

TB3

88AX X101	1	SECONDARY C.W PUMP-1 ON (TO UCB)
X102	2	
88AX X103	3	SECONDARY C.W PUMP-1 OFF (TO UCB)
X104	4	
MCCB1 X105 / 51AX X106	5	SECONDARY C.W PUMP-1 LOCAL DRIVE DISTURBANCE (TO UCB)
	6	
MCCB1 X107 / 51AX X108	7	SECONDARY C.W PUMP-1 TH.OL /MCCB TRIPPED
	8	
X109	9	SECONDARY C.W PUMPS MOTOR LOCAL/REMOTE SELECTED (TO UCB)
S1 S2 S3 X110	10	
L R X111	11	
X112	12	
88BX X113	13	SECONDARY C.W PUMP-2 ON (TO UCB)
X114	14	
88BX X115	15	SECONDARY C.W PUMP-2 OFF (TO UCB)
X116	16	
MCCB2 X117 / 51BX X118	17	SECONDARY C.W PUMP-2 LOCAL DRIVE DISTURBANCE (TO UCB)
	18	
MCCB2 X119 / 51BX X120	19	SECONDARY C.W PUMP-2 TH.OL /MCCB TRIPPED
	20	

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	17.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

INVENTORY NO.

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DRAWN	SAURABH		07.03.17
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 10.06

SHEET. NO. 10.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-011 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-011

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB	Moulded Case Circuit Breaker	500A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOSOOG	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO)	CM99804OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	2	12
04	88A,88AD,88B 88BD	Power contactor	550A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94145BOOO	L&T	12	24
05	88AS&88BS	Power contactor	250A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94141BOOO	L&T	6	12
06	88YA&88YB	Latch relay	Latch relay with 3NO+1NC, 240VAC coil aux supply with mechnical interlock electrical reset	3RH2131-1AP00	Siemens	2	12
07	51AY&51BY	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
08	8(OCEM/AE	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	2	12
09	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	2	12
10	51AQ&51B AE/MECO	Overload Relay	180-300A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94139OOQO	L&T	2	12
11	88AT-88BT	Timer	1sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	12
12	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	6
13	CT1&CT2	Current Transformer	400/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
14	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/Rishabh Meco	2	12
15	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 400/1A, Acc. CL:1,Range:0-400-2400A with suppressed scale.	-	AE/Rishabh Meco	2	12
16	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
17	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12
18	IPB2&IPB4	Green illuminated Push button	Green, illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
19	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12

INVENTORY NO.

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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	18.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

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DRAWN	SAURABH		07.03.17
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APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 01 | SHEET. NO. 02 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-011

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-011

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3 SLA4	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	4	24
21	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
22	FS1- FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
23	FSP1- FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
24	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 11Watt CFL with holder	-	Phillips	2	12
28	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	12
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
30	LK1,2,LKP1-LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	24
31	ELK1,2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	12
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	-	-
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	6
35	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	12
36	-	Panel Enclosure	Enclosure Size - H1900 x W2400 x D500mm	-	BHEL	1	6

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	18.10.17	AS PER CUSTOMER COMMENTS Dt:13.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
SECONDARY COOLING WATER PUMP CONTROL PANEL (2X200KW)

NO. OF SHEETS 02 | SHEET. NO. 02 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-011

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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TITLE : - MIV SEAL POWER PACK PUMP MCP (2X3.7KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-012 REV. 02

DWG. NO. : - EP-3-CS-033-012 REV. 01

DWG. NO. : - 2-3-BM-033-012 REV. 02

ASBUILT DRAWING

Qty-6Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF MIV SEAL POWER PACK PUMP MCP (2X3.7KW)

NO. OF SHEETS 01 | SHEET. NO. 01

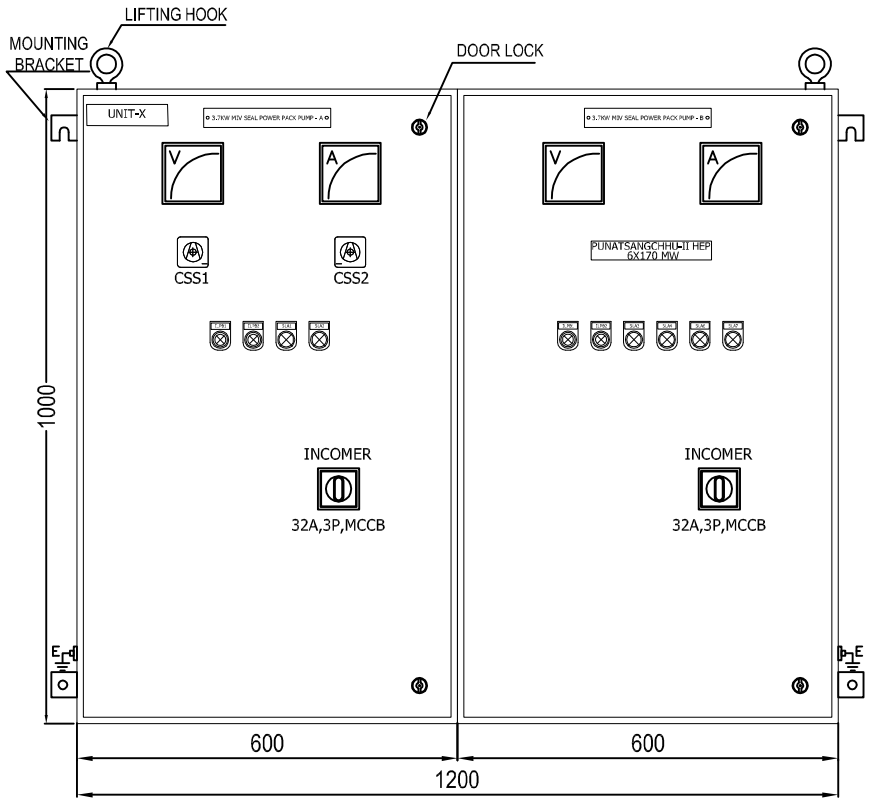
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

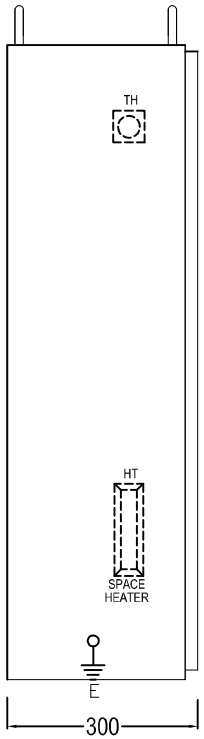
101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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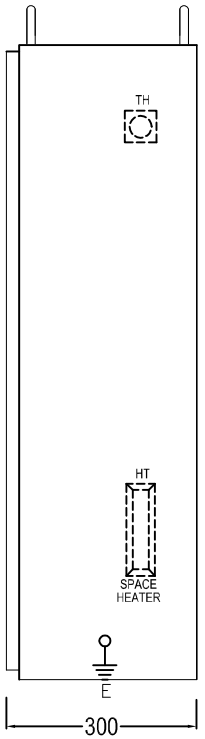
DRG. NO. EP-3-GA-033-012



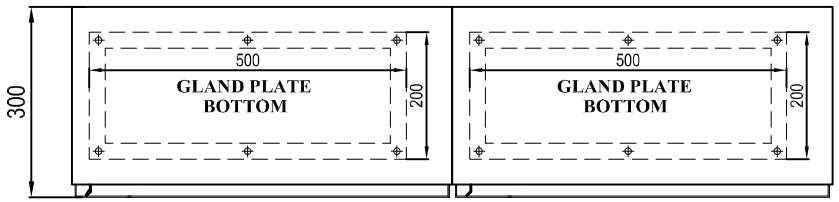
FRONT VIEW



SIDE VIEW LHS SIDE



SIDE VIEW RHS SIDE

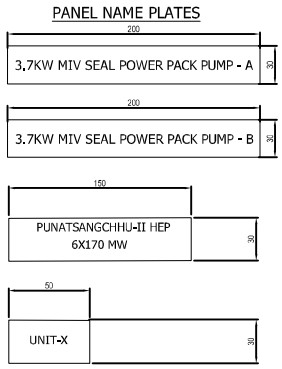


MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

PANEL NAME PLATES



X REFERS TO 1,2,3,4,5 &6

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

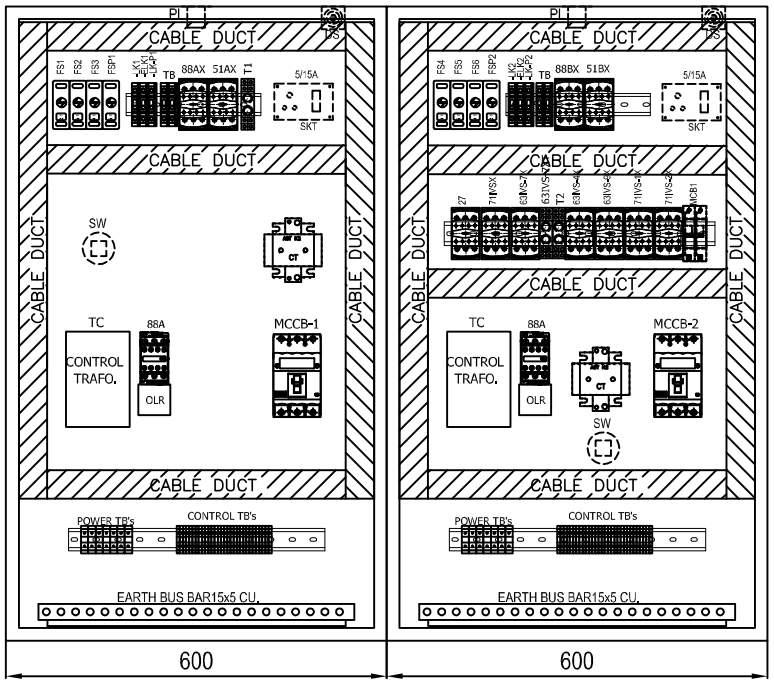
NO. OF SHEETS 11.2 | SHEET. NO. 11.1

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-012 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	350 KG	

Qty–6Nos

DRG. NO. EP–3–GA–033–012

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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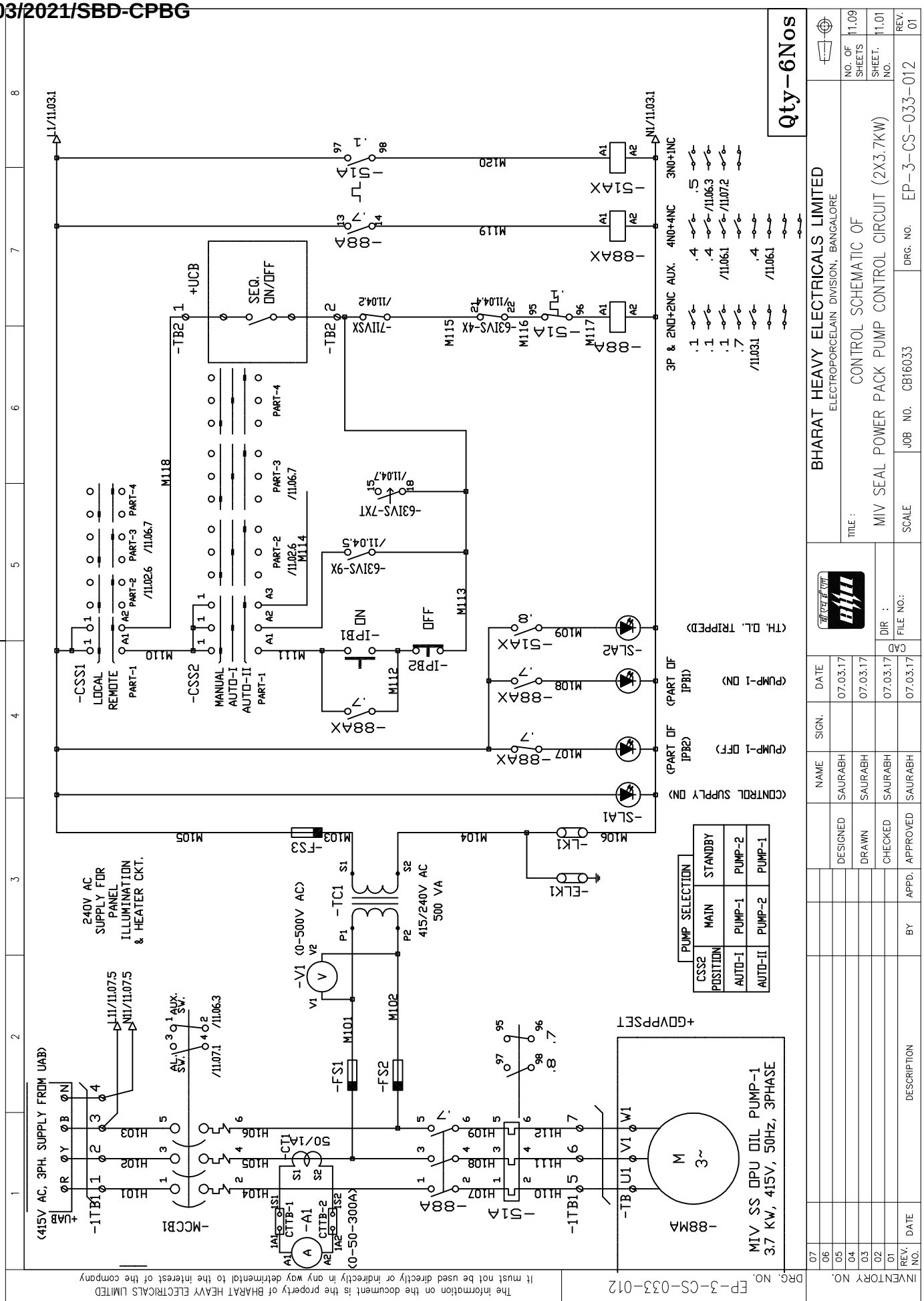
CAD | DIR : | FILE NO.:

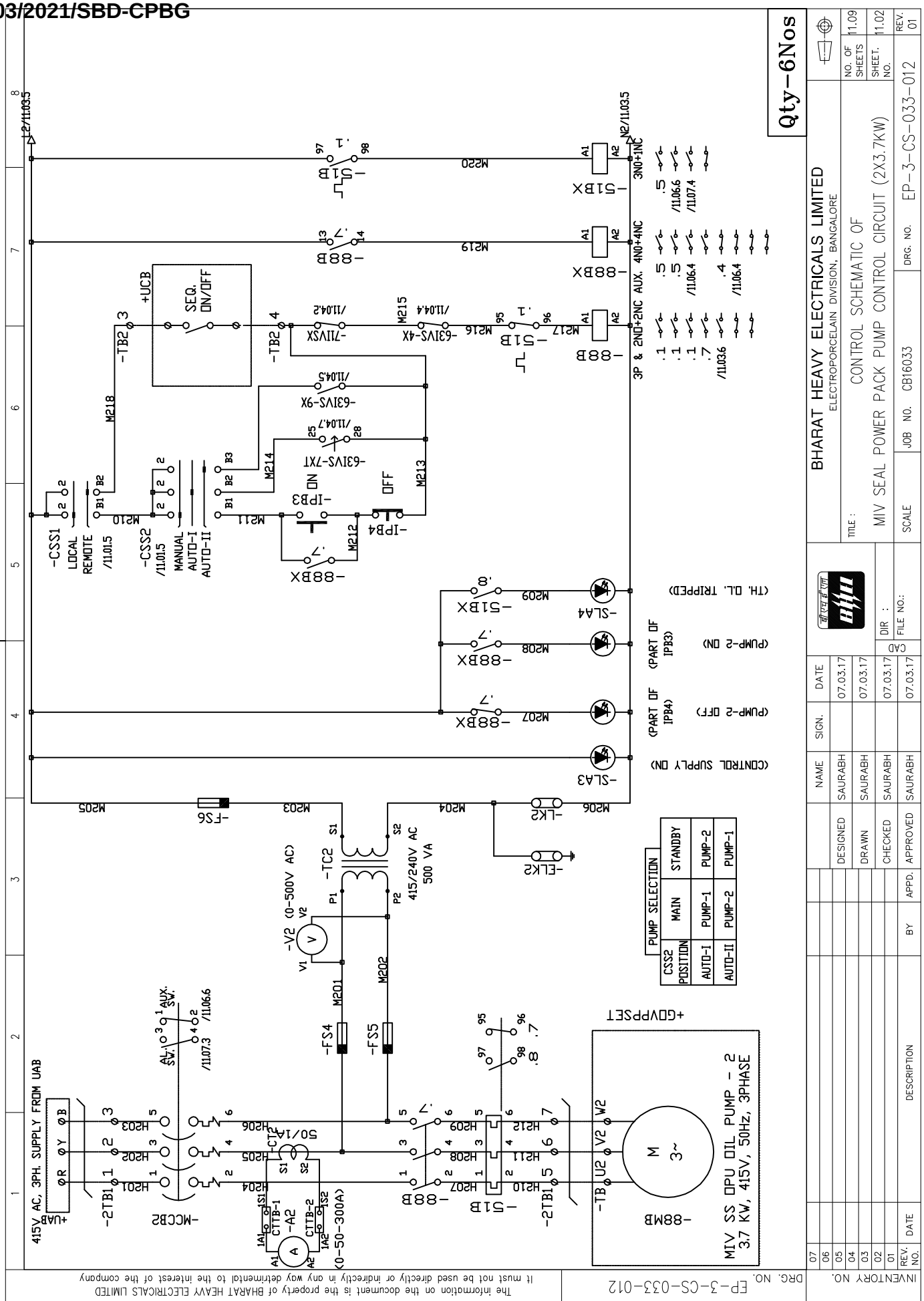
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.2 | SHEET. NO. 11.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–012 | REV. 02

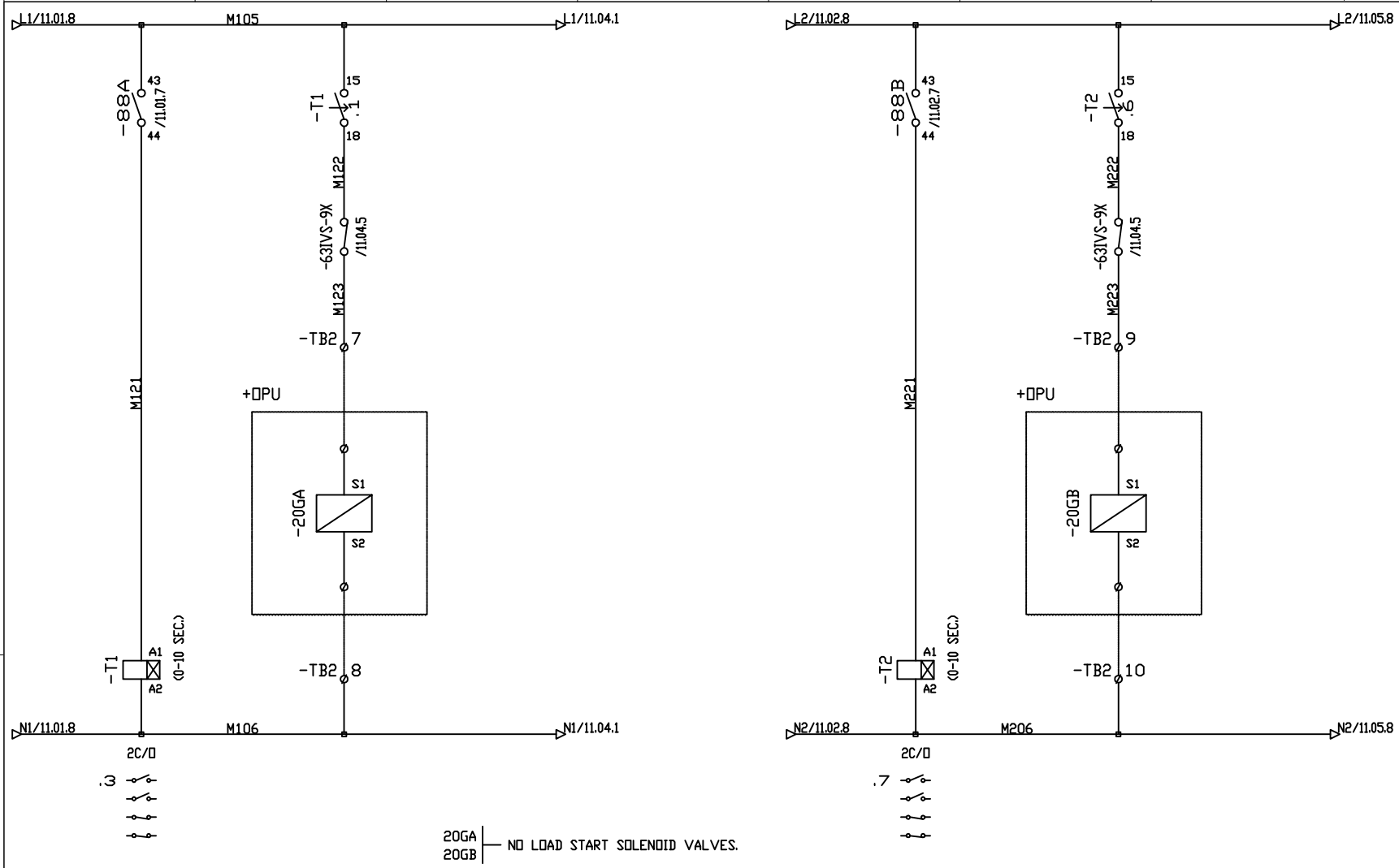

FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
Qty-6Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-012
NO. OF SHEETS 11.09
SHEET NO. 11.01
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
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(415V AC, 3PH. SUPPLY FROM UAB)
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
-1TB1
-MCCB1
-CSS1 LOCAL REMOTE
-CSS2 MANUAL AUTO-I AUTO-II
-TB2
+UCB
SEQ. ON/OFF
-IPB1 ON
-IPB2 OFF
-88AX
-51AX
-51A
-88A
-63IVS-9X
-63IVS-7XT
-63IVS-4X
-7IIVSX
-SLA1 (CONTROL SUPPLY ON)
-SLA2 (TH. O.L. TRIPPED)
(PUMP-1 OFF) (PART OF IPB2)
(PUMP-1 ON) (PART OF IPB1)
-FS1
-FS2
-FS3
-TC1 415/240V AC 500 VA
-V1 (0-500V AC)
-FLK1
-1K1
-CT1 50/1A
-A1 (0-50-300A)
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
PUMP-1
PUMP-2
AUTO-I
AUTO-II
+GOVPPSET
-88MA
-TB
MIV SS OIL PUMP-1
3.7 KW, 415V, 50Hz, 3PHASE
3P & 2ND+2NC AUX.
4NO+4NC
3NO+1NC


BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-012
NO. OF SHEETS 11.09
SHEET NO. 11.02
REV. 01
Qty-6Nos
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415V AC, 3PH. SUPPLY FROM UAB
MIV SS OPU OIL PUMP - 2
3.7 KW, 415V, 50Hz, 3PHASE
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
AUTO-I
PUMP-1
PUMP-2
AUTO-II
PUMP-2
PUMP-1
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
BY
APPD.
INVENTORY NO.
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FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

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20GA
20GB — NO LOAD START SOLENOID VALVES.

Qty-6Nos

DRG. NO. EP-3-CS-033-012

INVENTORY NO.

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02				
01				

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APPROVED	SAURABH		07.03.17

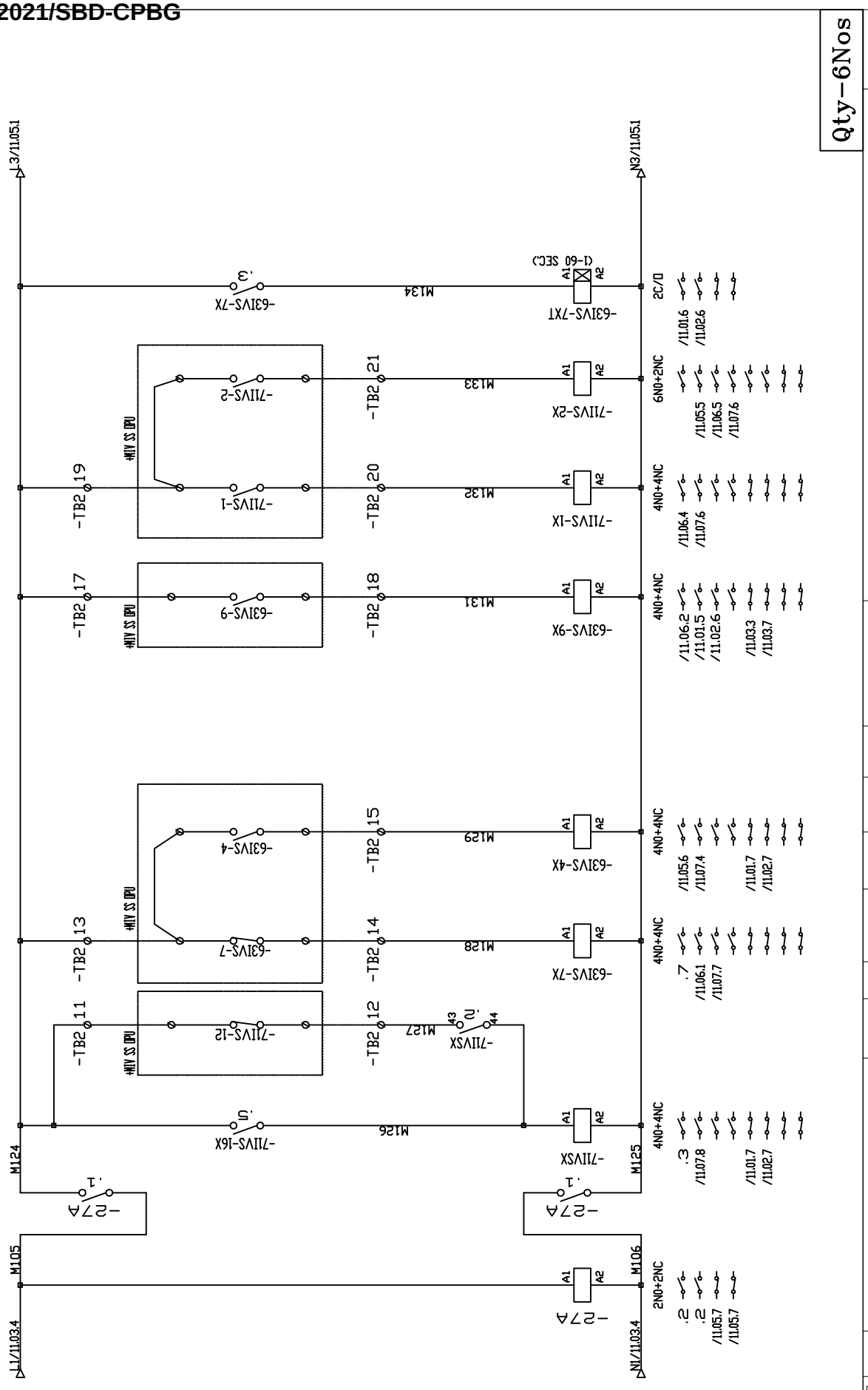
CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

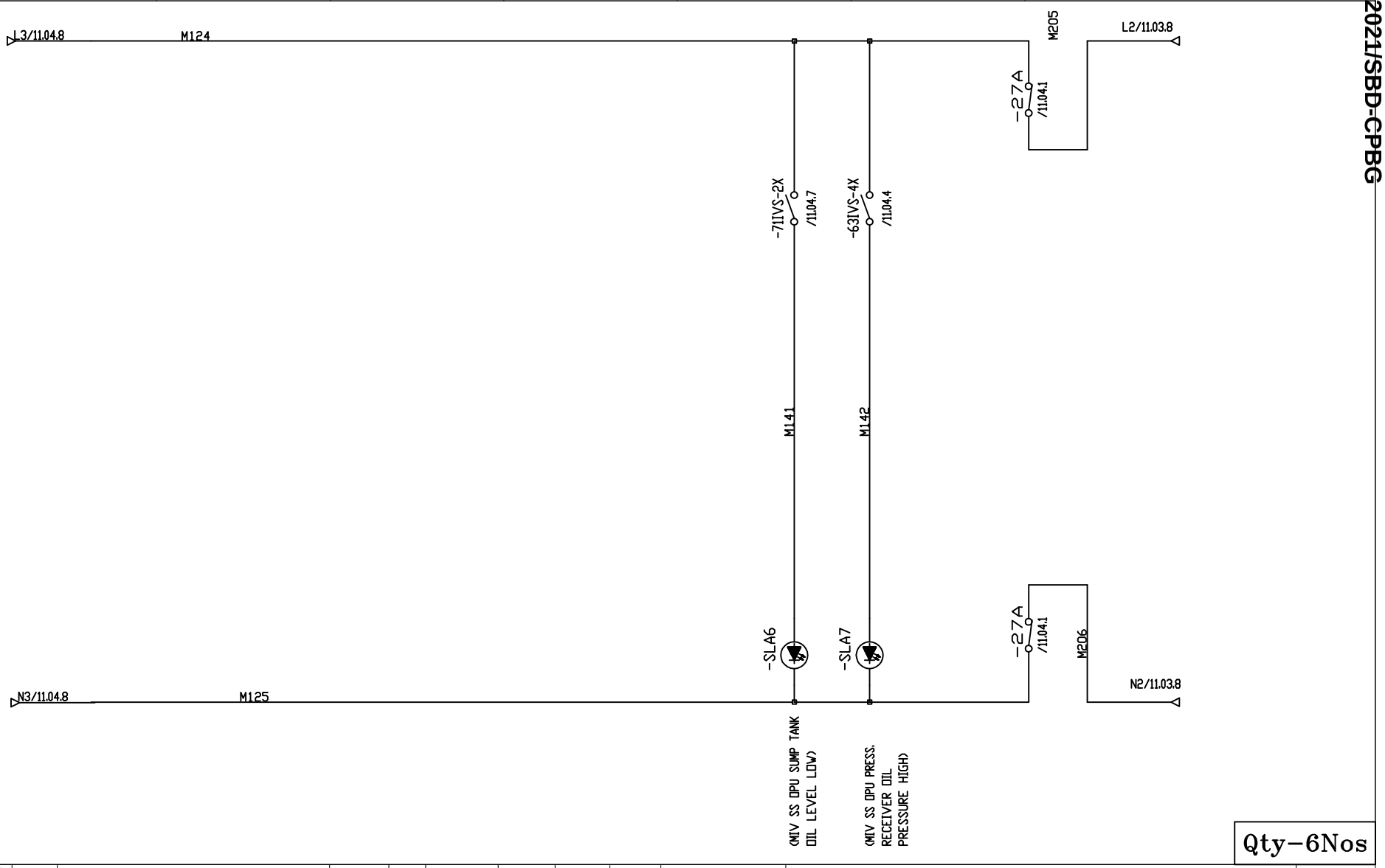
NO. OF SHEETS 11.09
SHEET. NO. 11.03

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 01


Qty-6Nos
L3/11.05.1
N3/11.05.1
L1/11.03.4
N1/11.03.4
-27A
-71IVSX
-71IVS-12
-71IVS-16X
-63IVS-7
-63IVS-4
-71IVS-1
-71IVS-2
-63IVS-9
-63IVS-7X
-63IVS-7XT
-71IVS-1X
-71IVS-2X
-63IVS-4X
-63IVS-9X
-TB2 11
-TB2 12
-TB2 13
-TB2 14
-TB2 15
-TB2 17
-TB2 18
-TB2 19
-TB2 20
-TB2 21
M105
M106
M124
M125
M126
M127
M128
M129
M131
M132
M133
M134
2NO+2NC
4NO+4NC
6NO+2NC
2C/O
(1-60 SEC.)
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-012
NO. OF SHEETS 11.09
SHEET NO. 11.04
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
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FILE NO.:
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DRG. NO. EP-3-CS-033-012

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02				
01				

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ELECTROPORCELAIN DIVISION, BANGALORE

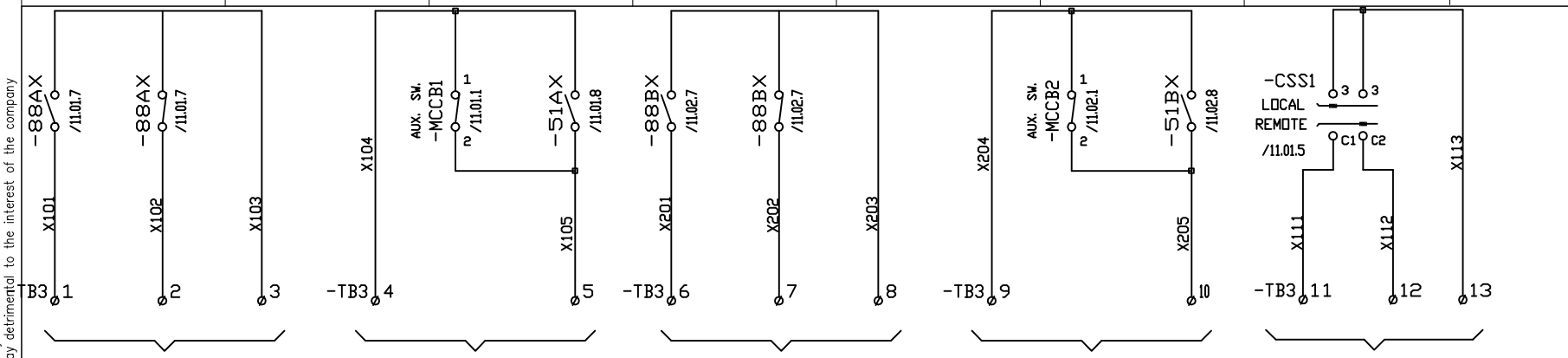
TITLE : CONTROL SCHEMATIC OF
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.09
SHEET. NO. 11.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 01

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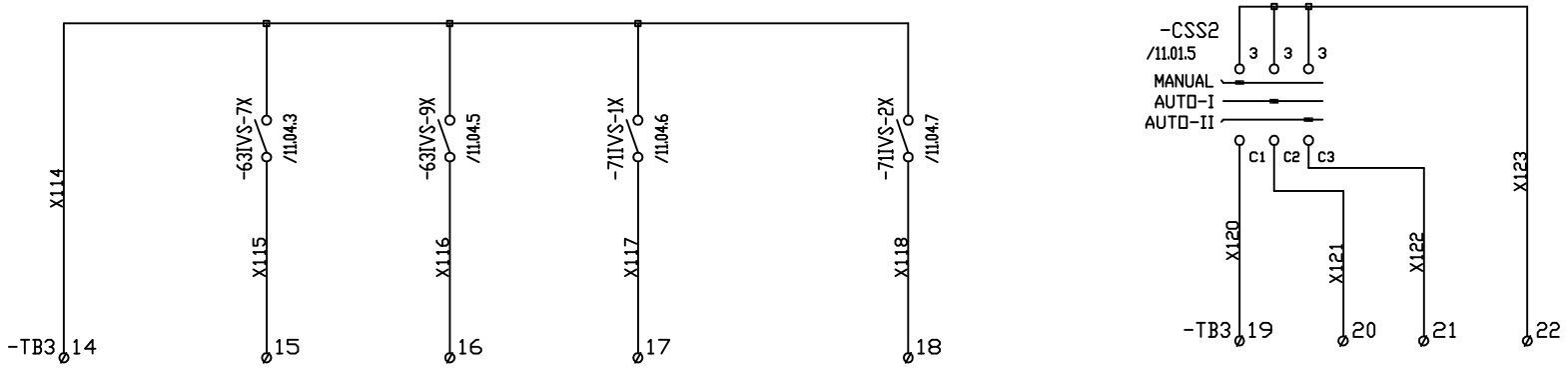
(MIV. SS OIL PUMP-1 ON/OFF) (TO UCB)

(MIV. SS OIL PUMP-1 LOCAL DRIVE DISTURBANCE) (TO UCB)

(MIV. SS OIL PUMP-2 ON/OFF) (TO UCB)

(MIV. SS OIL PUMP-2 LOCAL DRIVE DISTURBANCE) (TO UCB)

(MIV. SSOIL PUMPS CONTROL LOCAL/REMOTE SELECTION) (TO UCB)



(MIV. SS OIL PRESS LOW TO START/STOP STANDBY PUMP) (TO UCB)

(MIV. SS OIL PRESS LOW TO START/STOP MAIN PUMP) (TO UCB)

(MIV. SS OPU SUMP TANK OIL LEVEL HIGH) (TO UCB)

(MIV. SS OPU SUMP TANK OIL LEVEL LOW) (TO UCB)

(MIV. SS OIL PUMPS CONTROL MANUAL/AUTO-I/AUTO-II SELECTION)

Qty-6Nos

DRG. NO. EP-3-CS-033-012

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07				
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03				
02				
01				

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ELECTROPORCELAIN DIVISION, BANGALORE

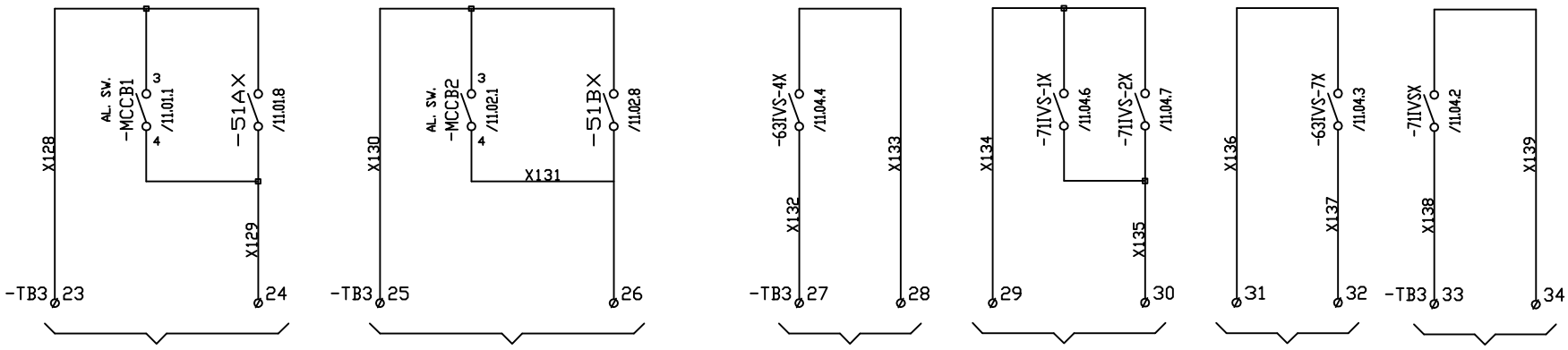
TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.09
SHEET. NO. 11.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 01

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(MIV. SS OIL PUMP-1 MOTOR TH. O.L./MCCB TRIPPED) (TO UCB)

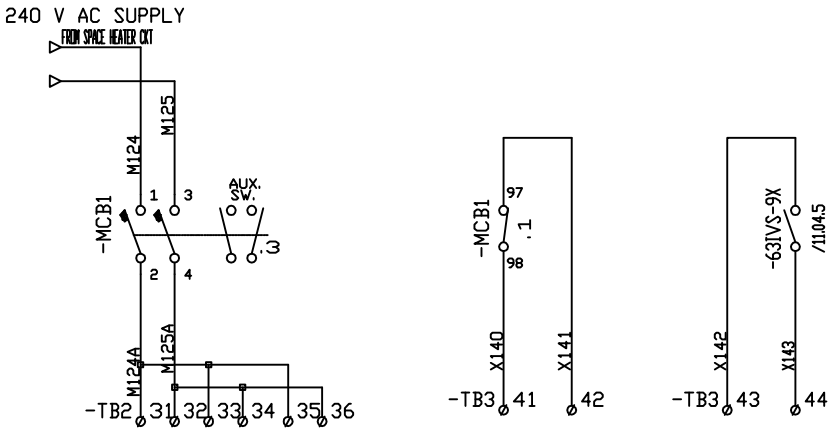
(MIV. SS OIL PUMP-2 MOTOR TH. O.L./MCCB TRIPPED) (TO UCB)

(ALARM- MIV. SS PRESSURE RECEIVER OIL PRESS. HIGH) (TO UCB)

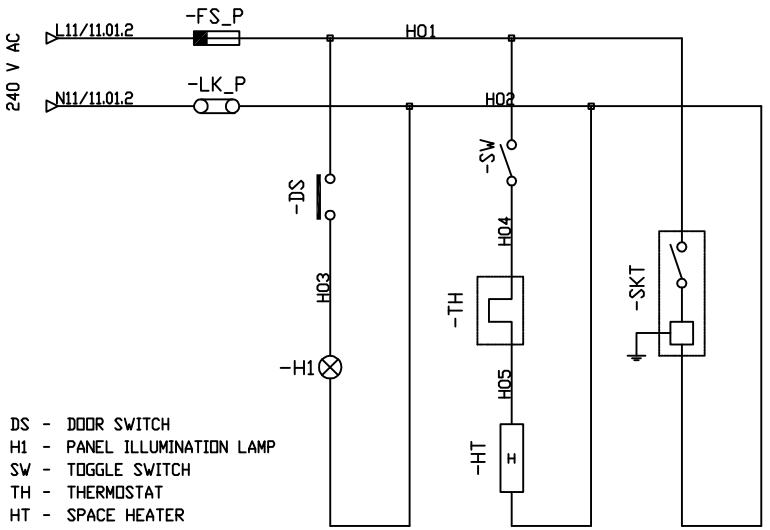
SPARE

SPARE

SPARE



240V AC AUX. SUPPLY FOR MOISTURE DETECTOR, OIL LEVEL INDICATOR & TEMP. INDICATOR



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT- SOCKET WITH SWITCH

Qty-6Nos

DRG. NO. EP-3-CS-033-012

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

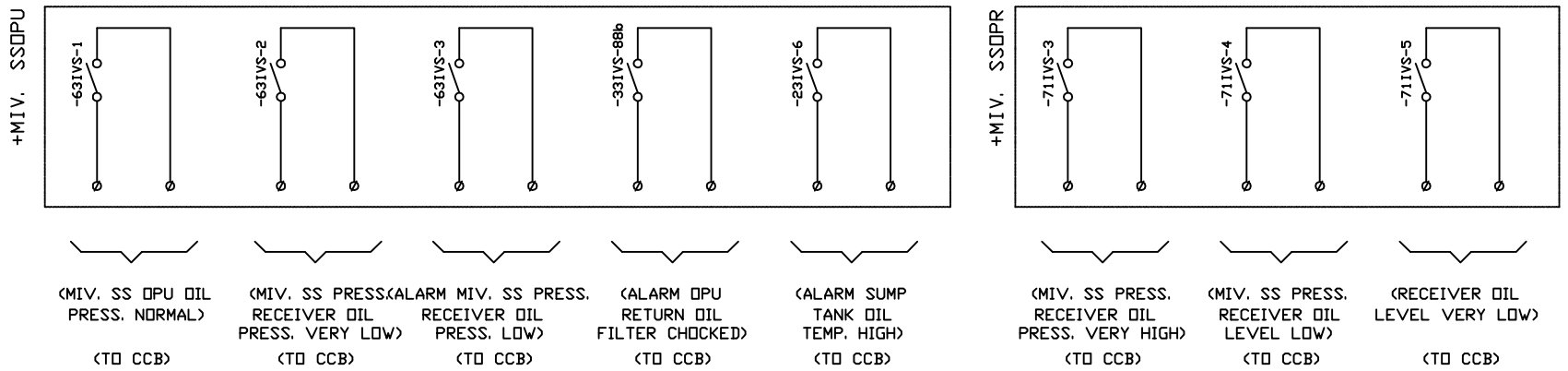
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.09
SHEET. NO. 11.07

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.



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DRG. NO. EP-3-CS-033-012

Qty-6Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

INVENTORY NO.

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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

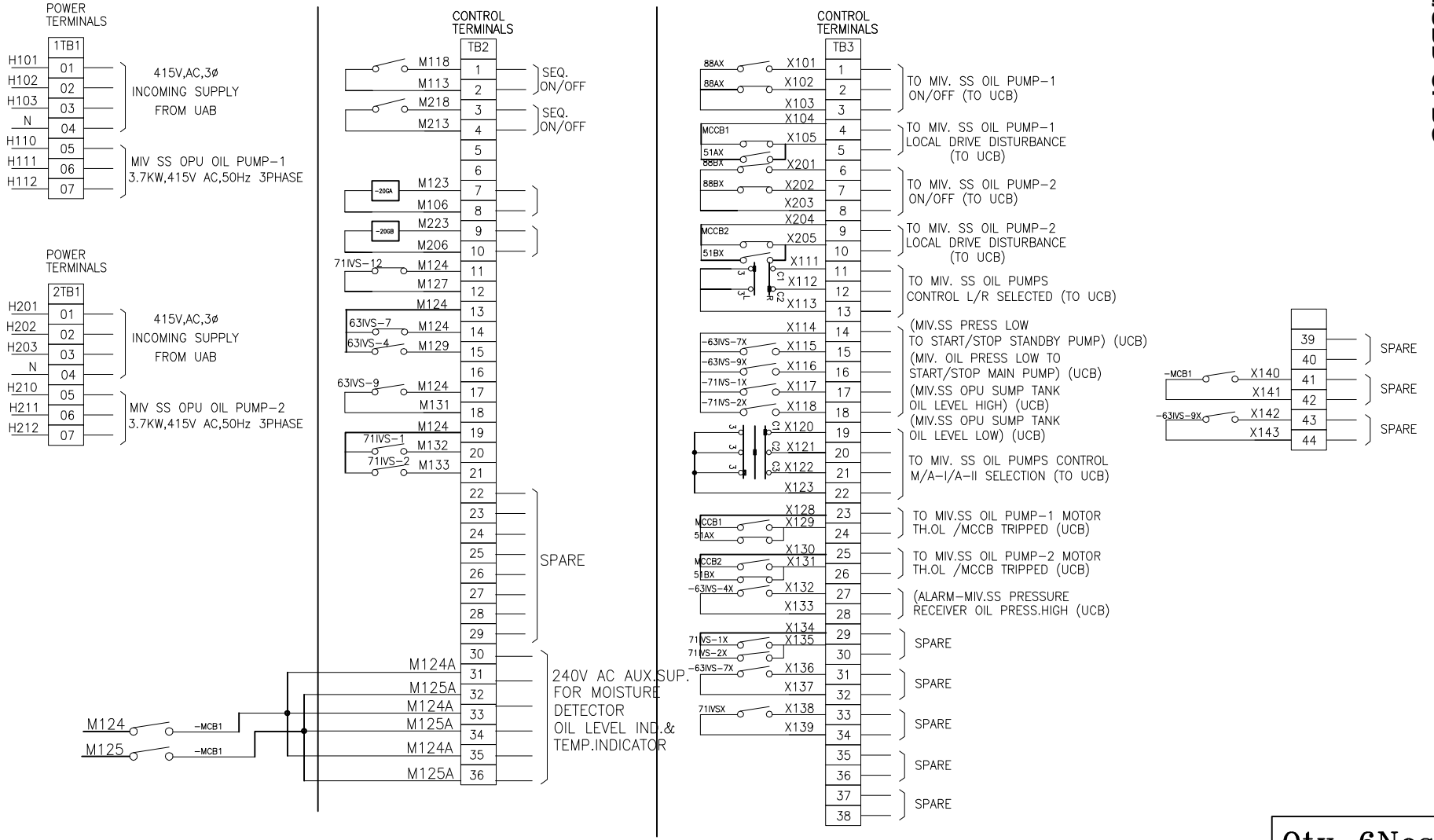
TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.09 | SHEET. NO. 11.08

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-6Nos

DRG. NO. EP-3-CS-033-012

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 11.09
SHEET. NO. 11.09

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-012 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-012

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOEO	L&T	2	12
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO)	CM97890OOOO	L&T	2	12
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	12
04	88A&88B	Power contactor	32A, 3P, Power Contactor with 240V AC coil,aux Supply	CS94111BOOO	L&T	2	12
05	-	Power contactor Acc	Addon contact 2NO+2NC for 32A P.Cont	-	L&T	2	12
06	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	12
07	88AX,88BX,27A,71IVSX 63IVS-7X,63IVS-4X,63IVS-9X 71IVS-1X,71IVS-2X	Aux Contactor	Auxilary contactor with 2NO+2NC, 240VAC coil	CS94826BOOO	L&T	9	54
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	7	42
09	-	Aux Contactor ACC	Addon contact 4NO for Aux cont	CS94594	L&T	1	6
10	51A&51B	Overload Relay	6-10A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94142OOVO	L&T	2	12
11	T1&T2	On-delay Timer	0sec - 10Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	12
12	63IVS-7XT	On-delay Timer	0sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	1	6
13	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	6
14	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,3Position 4pole 4way withoutOFF	61121	L&T	1	6
15	CT1&CT2	Current Transformer	50/1A, Metering Current Transformer 10VA, Class -0.5, cast resin insulated type cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
16	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	12
17	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 50/1A, Acc. CL:1,Range:0-50-300A with suppressed scale.	-	AE/ Meco	2	12

INVENTORY NO.

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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-012 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
18	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	12
19	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12
20	IPB2&IPB4	Green illuminated Push button	Green illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	12
21	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	12
22	SLA1,SLA2,SLA3 SLA4,SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	6	36
23	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	48
24	FS1- FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	36
25	FSP1- FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	12
26	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	12
27	MCB1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	6
28	-	MCB Accessories	1NO+1NC Alram contact for MCB	BZA11006	L&T	1	6
29	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	12
30	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	12
31	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	12
32	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	12
33	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	12
34	LK1,2,LK_P	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	3	18
35	ELK1,2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	12
36	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	84
37	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
38	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	6
39	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	12
40	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	6

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DRG. NO. EP-3-BM-033-012

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
MIV SEAL POWER PACK PUMP CONTROL CIRCUIT (2X3.7KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-012 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE :- BOOSTER PUMP MCP (2X250KW)

PROJECT :- 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER:- PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. :- EP-3-GA-033-013 REV. 02

DWG. NO. :- EP-3-CS-033-013 REV. 01

DWG. NO. :- EP-3-BM-033-013 REV. 02

ASBUILT DRAWING

Qty-1Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF BOOSTER PUMP MCP (2X250KW)

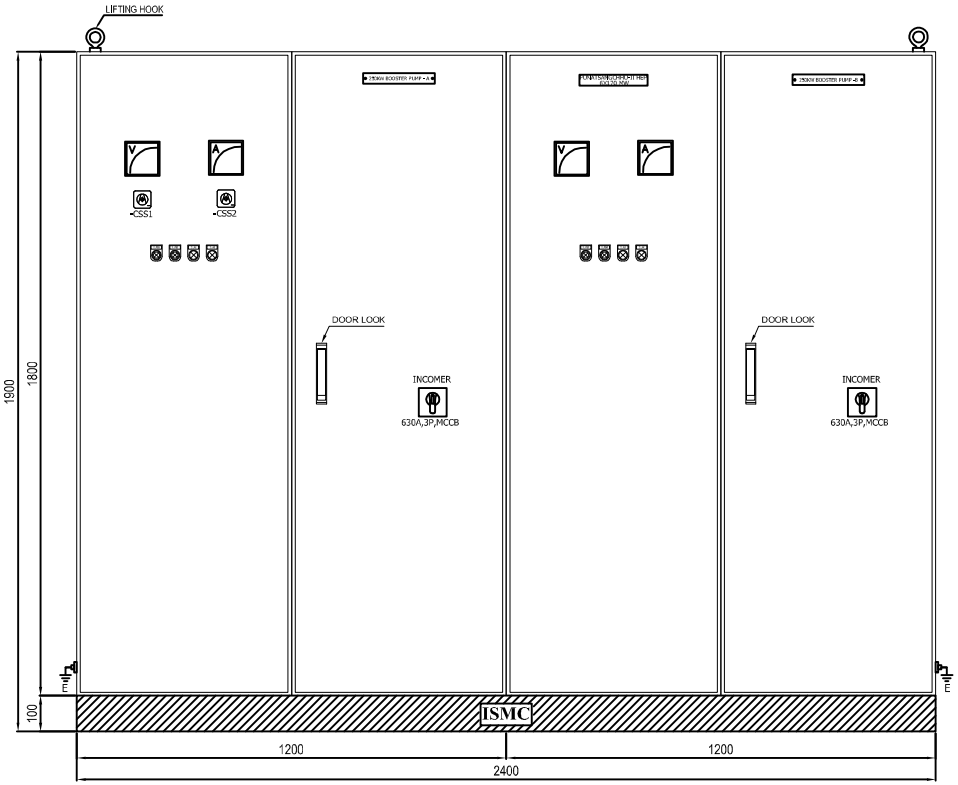
NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

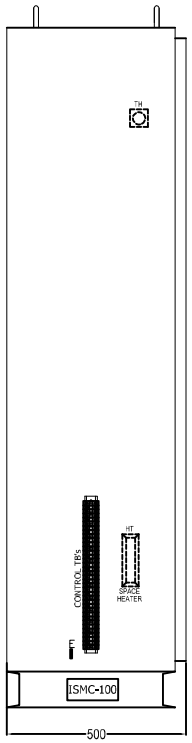
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106

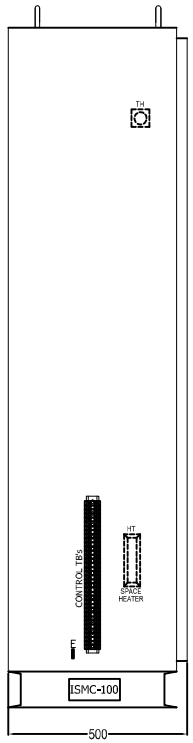
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FRONT VIEW

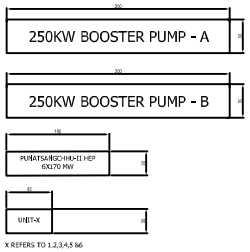


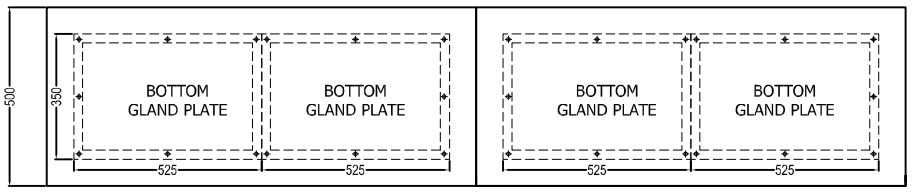
SIDE VIEW LHS SIDE



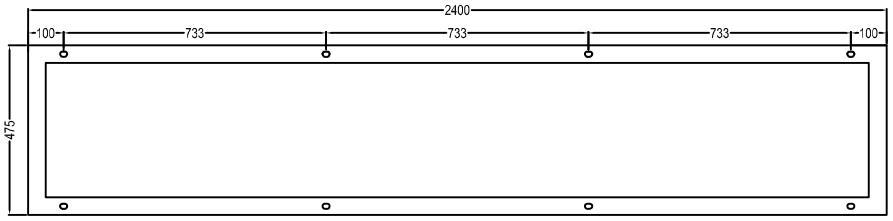
SIDE VIEW RHS SIDE

PANEL NAME PLATES





MOUNTING DETAILS - PANEL BOTTOM



FOUNDATION DETAILS

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL

Qty–1No

DRG. NO. EP–3–GA–033–013

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
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APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF BOOSTER PUMP CONTROL PANEL (2X250KW)

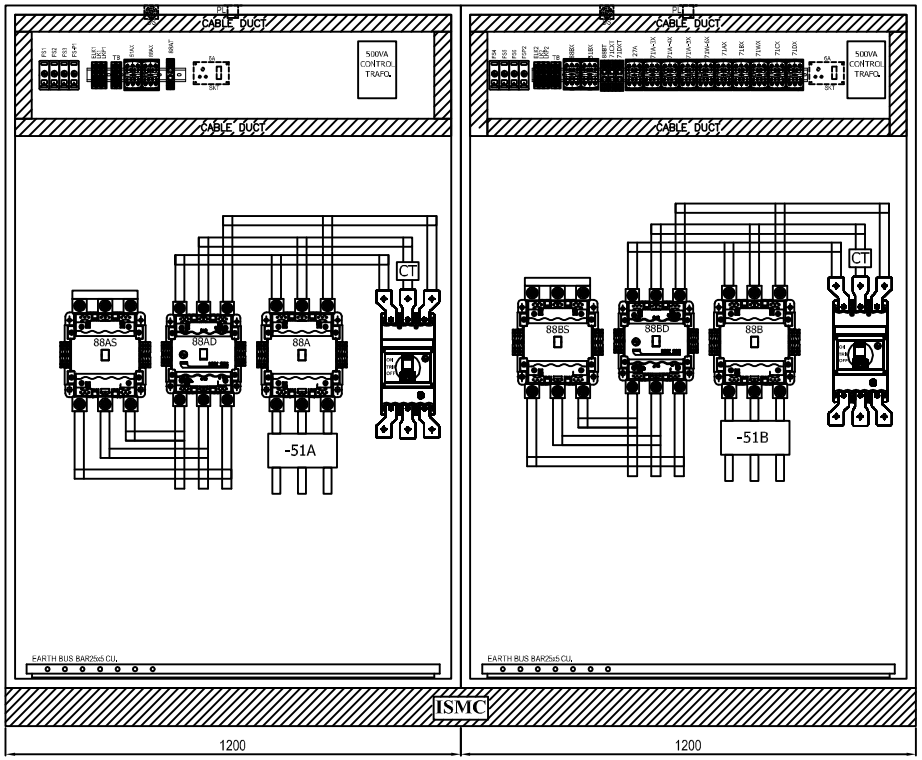
NO. OF SHEETS 12.2 | SHEET. NO. 12.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–013 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	External: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	750 KG	

Qty–1No

DRG. NO. EP–3–GA–033–013

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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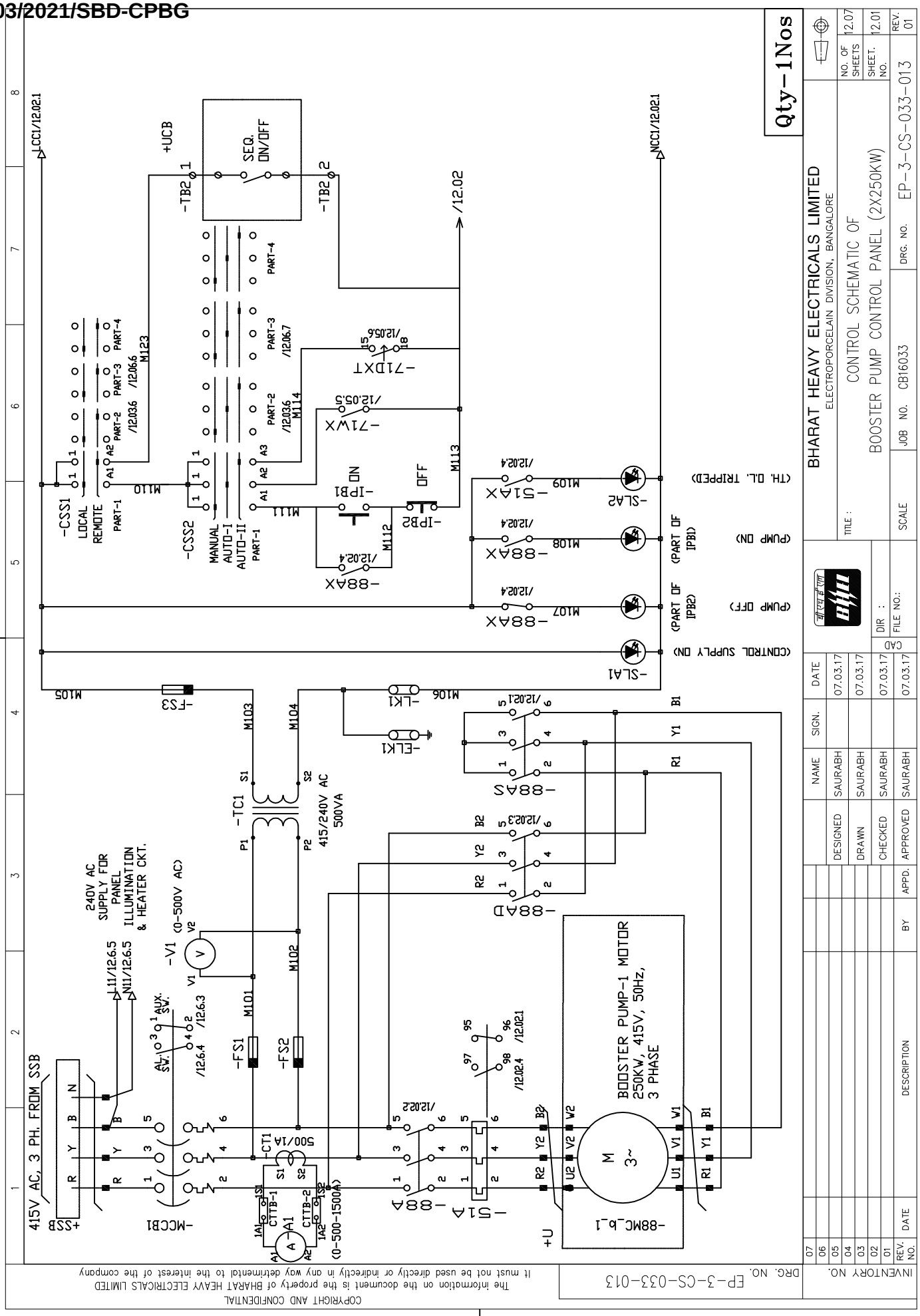
CAD | DIR : | FILE NO.:

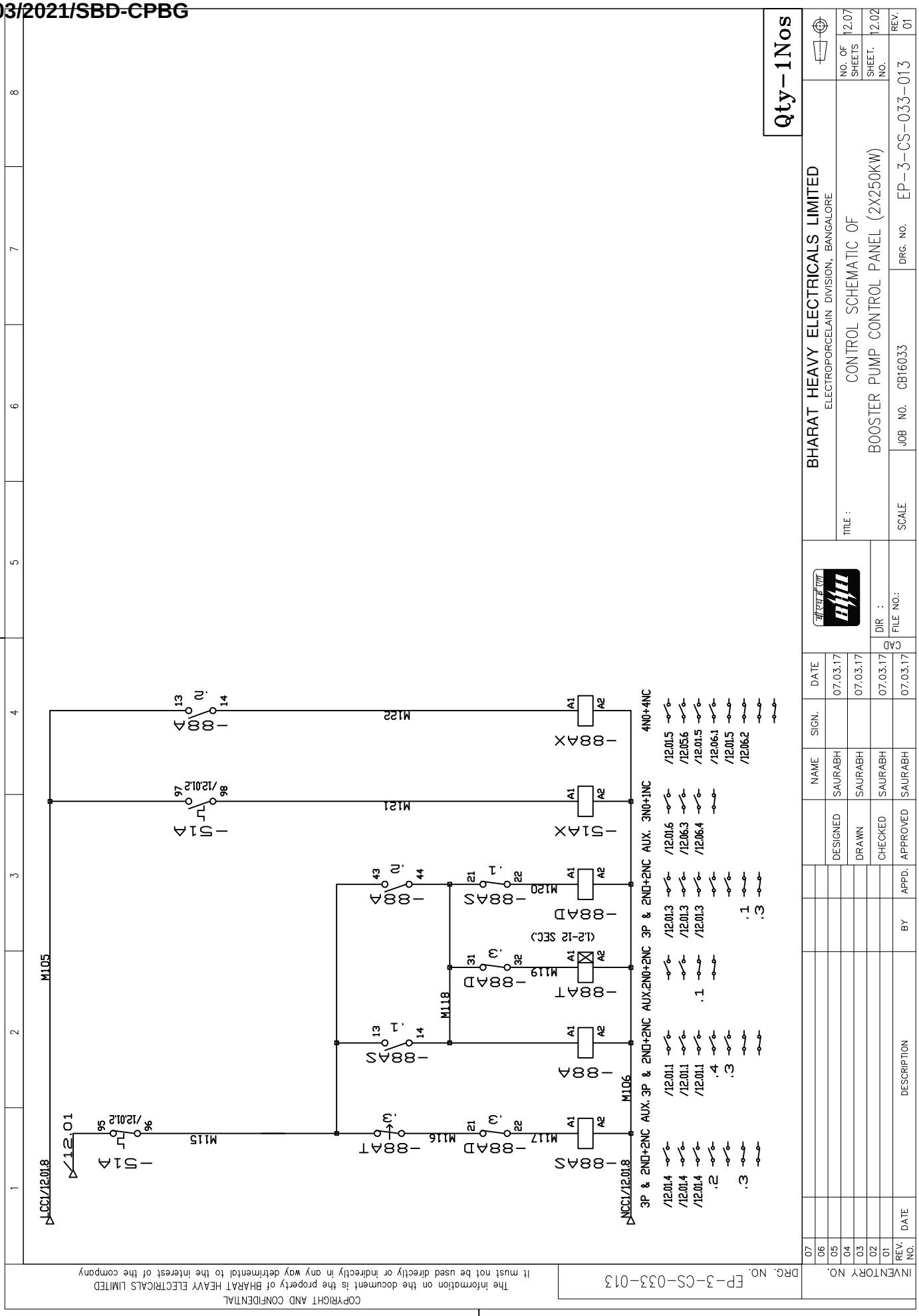
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

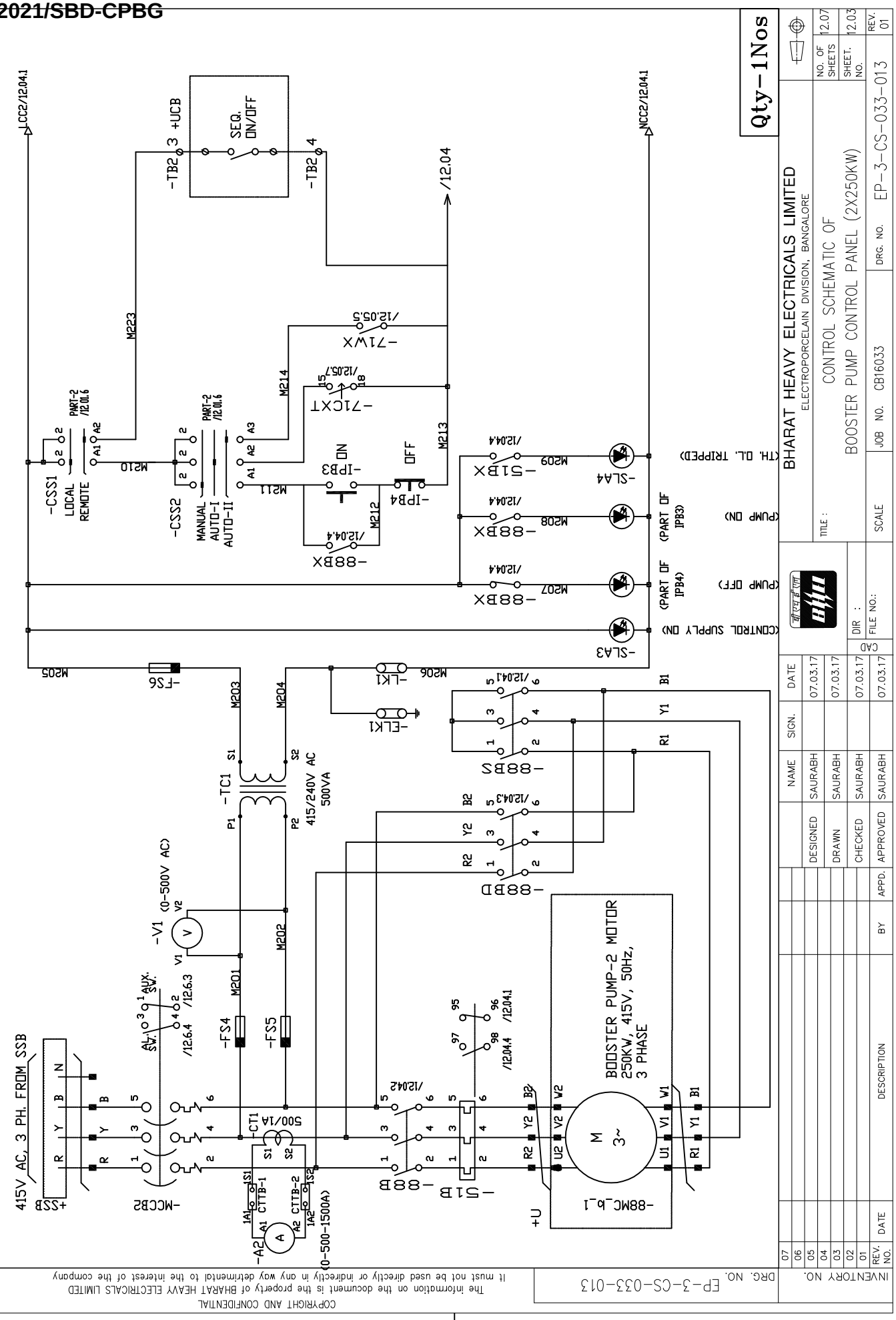
TITLE : GENERAL ARRANGEMENT OF BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 12.2 | SHEET. NO. 12.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–013 | REV. 02

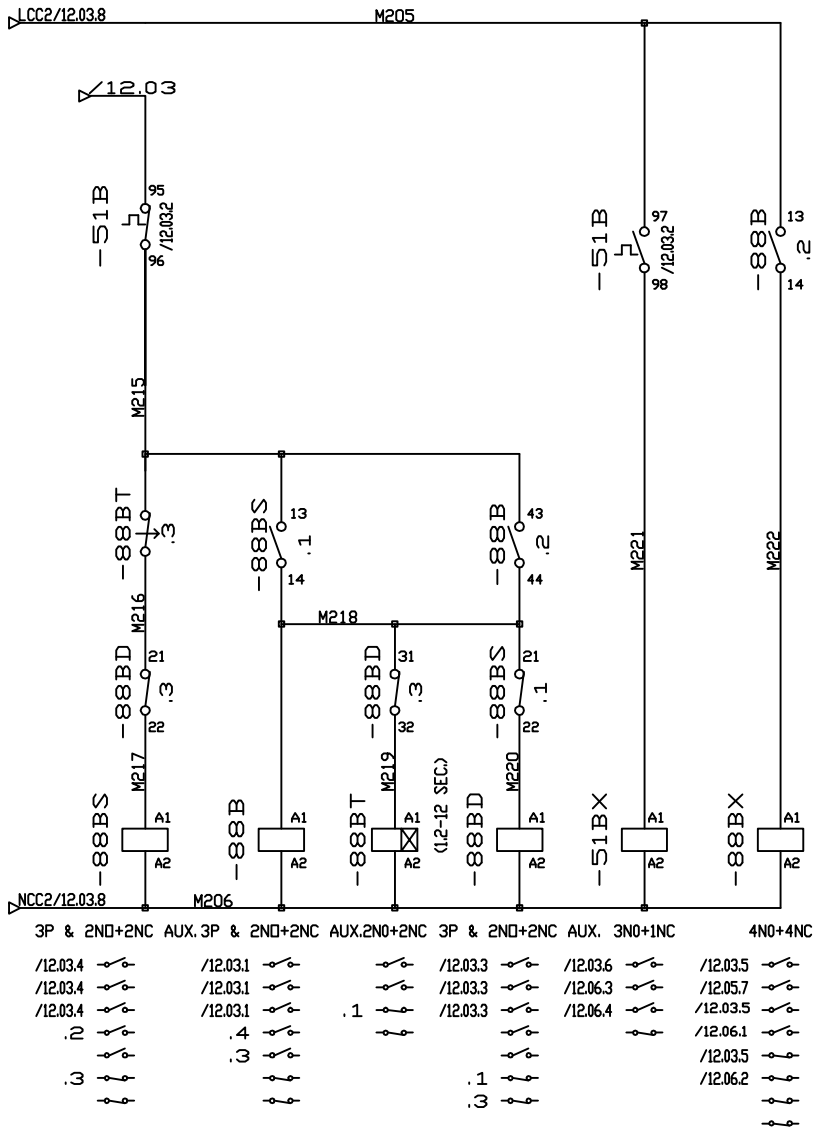

Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
BOOSTER PUMP CONTROL PANEL (2X250KW)
DRG. NO. EP-3-CS-033-013
JOB NO. CB16033
SCALE
NO. OF SHEETS 12.07
SHEET NO. 12.01
REV. 01
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415V AC, 3 PH. FROM SSB
-MCCB1
-FS1
-FS2
-FS3
-TC1
500VA
-V1
-CT1
500/1A
-CSS1
LOCAL
REMOTE
-CSS2
MANUAL
AUTO-I
AUTO-II
-TB2
SEQ. ON/OFF
-71DXT
-71WX
-IPB1
-IPB2
-51AX
-88AX
-88AS
-88AD
-51A
-88A
-SLA1
-SLA2
-ELK1
-LK1
BOOSTER PUMP-1 MOTOR
250KW, 415V, 50Hz,
3 PHASE
-88MC_b_1
(CONTROL SUPPLY ON)
(PUMP OFF)
(PUMP ON)
(TH. O.L. TRIPPED)
240V AC
SUPPLY FOR
PANEL
ILLUMINATION
& HEATER CKT.
LCC1/12.02.1
NCC1/12.02.1
/12.02
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
BY
APPD.
INVENTORY NO.
DRG. NO. EP-3-CS-033-013
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Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
BOOSTER PUMP CONTROL PANEL (2X250KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-013
SCALE
NO. OF SHEETS 12.07
SHEET. NO. 12.02
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
CAD DIR :
FILE NO.:
DESCRIPTION
DATE
BY
APPD.
INVENTORY NO.
DRG. NO. EP-3-CS-033-013
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
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LCC1/12.01.8
NCC1/12.01.8
M105
M106
M115
M116
M117
M118
M119
M122
M121
M120
3P & 2ND+2NC AUX. 3P & 2ND+2NC AUX.2NO+2NC 3P & 2ND+2NC AUX. 3NO+1NC 4NO+4NC
(12-12 SEC.)


Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
BOOSTER PUMP CONTROL PANEL (2X250KW)
DRG. NO. EP-3-CS-033-013
JOB NO. CB16033
SCALE
NO. OF SHEETS 12.07
SHEET NO. 12.03
REV. 01
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415V AC, 3 PH. FROM SSB
BOOSTER PUMP-2 MOTOR
250KW, 415V, 50Hz,
3 PHASE
415/240V AC
500VA
(0-500V AC)
500/1A
(0-500-1500A)
-SLA3
-SLA4
-88BX
-88BS
-88BD
-88MC_b_1
-TC1
-V1
-A2
-FS4
-FS5
-FS6
-LK1
-ELK1
-MCCB2
-88B
-51B
-CSS1
-CSS2
-TB2
+UCB
SEQ. ON/OFF
-71WX
-71CXT
-1PB3
-1PB4
-51BX
CONTROL SUPPLY ON)
(PUMP OFF)
(PART OF IPB4)
(PUMP ON)
(PART OF IPB3)
TH. O.L. TRIPPED)
LOCAL
REMOTE
MANUAL
AUTO-I
AUTO-II
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
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Qty-1Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
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01				

INVENTORY NO.

DRG. NO. EP-3-CS-033-013

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

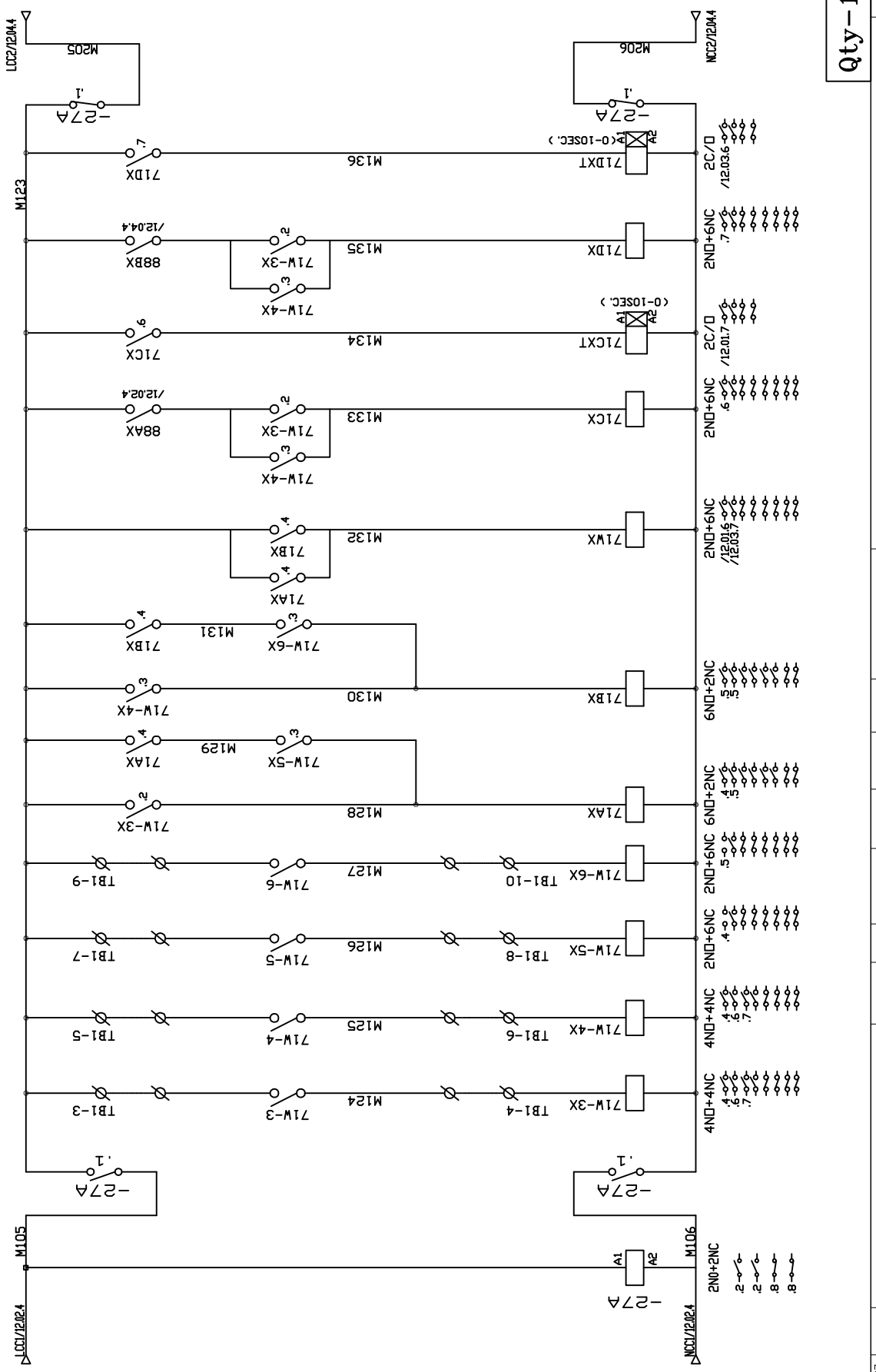
CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 12.07 | SHEET. NO. 12.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-013 | REV. 01



BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 12.07
SHEET. NO. 12.05
REV. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-013

CAD DIR : FILE NO.:

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

REV. NO.	DATE	DESCRIPTION	BY	APPD.
01				
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06				
07				

INVENTORY NO.

DRG. NO. EP-3-CS-033-013

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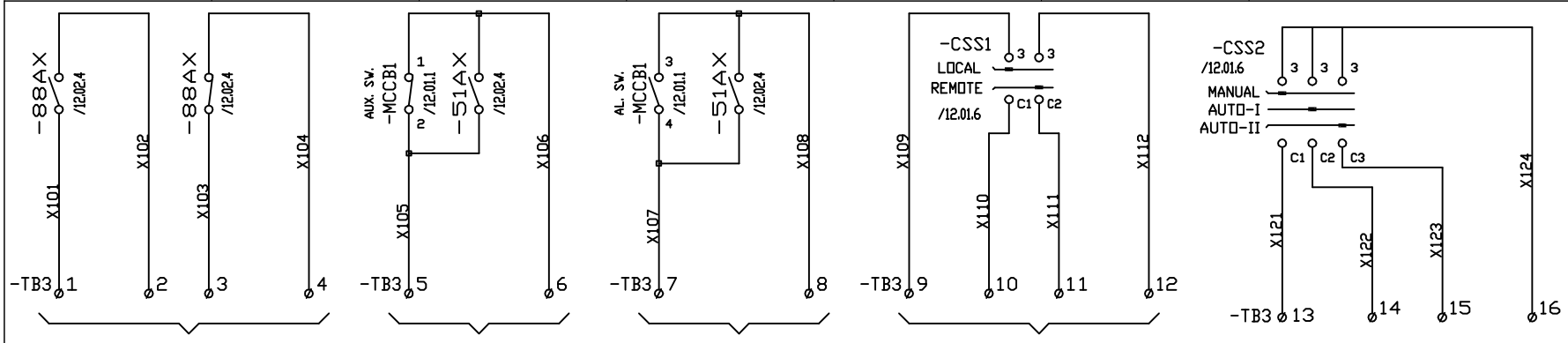
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

FIRST ANGLE PROJECTION

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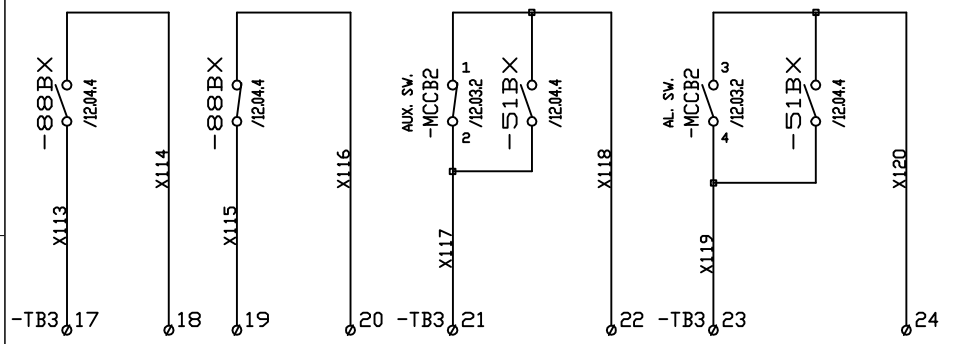
(BOOSTER PUMP-1 ON/OFF) (TO CCB)

(BOOSTER PUMP-1 LOCAL DRIVE DISTURBANCE) (TO CCB)

(BOOSTER PUMP-1 TH. O. L. /MCCB TRIPPED) (TO CCB)

(BOOSTER PUMPS MOTOR CONTROL LOCAL/REMOTE SELECTED) (TO CCB)

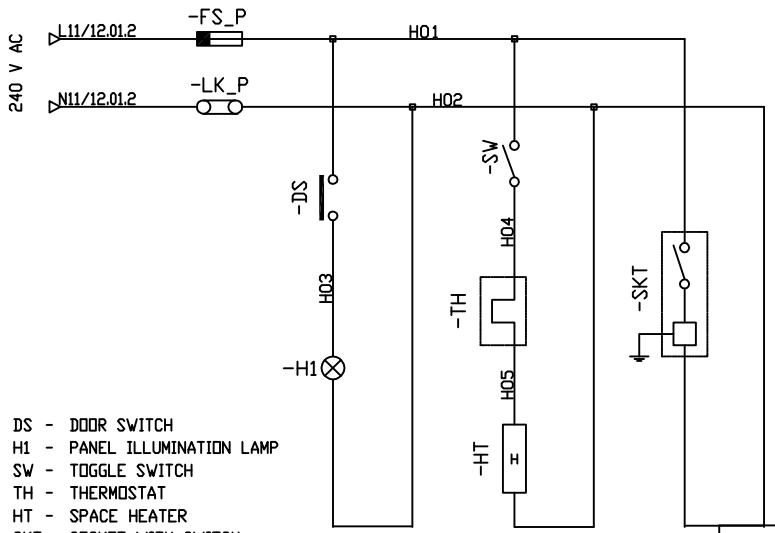
(BOOSTER PUMPS MOTOR CONTROL MANUAL/AUTO-I/AUTO-II SELECTION) (TO CCB)



(BOOSTER PUMP-2 ON/OFF) (TO CCB)

(BOOSTER PUMP-2 LOCAL DRIVE DISTURBANCE) (TO CCB)

(BOOSTER PUMP-2 TH. O. L. /MCCB TRIPPED) (TO CCB)



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT SOCKET WITH SWITCH

Qty-1Nos

DRG. NO. EP-3-CS-033-013

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
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01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 12.07
SHEET. NO. 12.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-013 | REV. 01

FIRST ANGLE PROJECTION

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POWER TERMINALS

1TB1

R	01	415V,AC,3ø INCOMING SUPPLY FROM SSB
Y	02	
B	03	
N	04	
R2	05	BOOSTER PUMP−1 250KW,415V,50Hz AC 3PHASE
Y2	06	
B2	07	
U1	08	
V1	09	
W1	10	

POWER TERMINALS

1TB2

R	01	415V,AC,3ø INCOMING SUPPLY FROM SSB
Y	02	
B	03	
N	04	
R2	05	BOOSTER PUMP−2 250KW,415V,50Hz AC 3PHASE
Y2	06	
B2	07	
U1	08	
V1	09	
W1	10	

CONTROL TERMINALS

TB1

	1	SPARE
71W-3 M123	2	
M124A	3	
71W-4 M123	4	
M125	5	
71W-5 M123	6	
M126	7	
71W-6 M123	8	
M127	9	
	10	

CONTROL TERMINALS

TB2

M123	1	SEQ ON/OFF FROM UCB
M113	2	
M223	3	SEQ ON/OFF FROM UCB
M213	4	

CONTROL TERMINALS

TB3

88AX X101	1	BOOSTER PUMP−1 ON (TO CCB)
X102	2	
88AX X103	3	BOOSTER PUMP−1 OFF (TO CCB)
X104	4	
MCCB1 X105	5	BOOSTER PUMP−1 LOCAL DRIVE DISTURBANCE (TO CCB)
51AX X106	6	
MCCB1 X107	7	BOOSTER PUMP−1 TH.OL /MCCB TRIPPED
51AX X108	8	
X109	9	BOOSTER PUMPS MOTOR CONTROL LOCAL/REMOTE SELECTED (TO CCB)
3 C1 X110	10	
3 C2 X111	11	
3 L HR X112	12	
3 A1 X121	13	(TO BOOSTER PUMPS MOTOR CONTROL M/A−I/A−II SELECTION (TO CCB)
3 A2 X122	14	
3 A3 X123	15	
X124	16	
88BX X113	17	BOOSTER PUMP−2 ON (TO CCB)
X114	18	
88BX X115	19	BOOSTER PUMP−2 OFF (TO CCB)
X116	20	
MCCB2 X117	21	BOOSTER PUMP−2 LOCAL DRIVE DISTURBANCE (TO CCB)
51BX X118	22	
MCCB2 X119	23	BOOSTER PUMP−2 TH.OL /MCCB TRIPPED
51BX X120	24	

Qty−1No

DRG. NO. EP−3−CS−033−013

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 12.07
SHEET. NO. 12.07

SCALE | JOB NO. CB16033 | DRG. NO. EP−3−CS−033−013 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-013

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	630A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOTOOG	L&T	2	2
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO)	CM99804OOOO	L&T	2	2
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	2	2
04	88A,88AD,88B 88BD	Power contactor	650A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS96327BOOO	L&T	4	4
05	88AS&88BS	Power contactor	300A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS90280BOOO	L&T	2	2
06	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	2
07	88AX,88BX,27A,71W-3X,71W-4X 71W-5X,71W-6X,71AX,71BX 71CX,71WX&71DX	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	12	12
08	71W3X-BX	Aux Contactor	Auxilary contactor with 4NO, 240VAC coil	CS94825BOOO	L&T	4	4
09	-	Aux Contactor ACC	Addon contact 2NO+2NC for Aux cont	CS94596	L&T	4	4
10	-	Aux Contactor Acc	Addon contact 4NO for Aux cont	CS94594	L&T	2	2
11	-	Aux Contactor Acc	Addon contact 4NC for Aux cont	CS94598	L&T	5	5
12	51A&51B	Overload Relay	180-300A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94139OOQO	L&T	2	2
13	88AT&88BT	Timer	1.2sec - 12Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	2
14	71CXT&71DXT	Timer	0sec - 10Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	-	L&T	2	2
15	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	1
16	CSS2	Auto-1/Auto-2/Man Slectio	6A, Auto1/Auto2/Man selector switch,4pole 3way withoutOFF	61120	L&T	1	1
17	CT1&CT2	Current Transformer	500/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
18	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	2
19	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 500/1A, Acc. CL:1,Range:0-500-3000A with suppressed scale	-	AE/ Meco	2	2

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-013 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	2
21	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
22	IPB2&IPB4	Green illuminated Push button	Green illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	2
23	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
24	SLA1,SLA2,SLA3 SLA4	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EIL240VAC	L&T	4	4
25	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772	L&T	8	8
26	FS1- FS6	Control Fuse	4A Control fuse link 415V AC	ST30726	L&T	6	6
27	FSP1- FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729	L&T	2	2
28	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
29	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	1	2
30	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	1	2
31	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	1	2
32	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	1	2
33	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	1	2
34	LK1,2,LKP1-LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	4
35	ELK1-2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	2
36	TB1	Power TB	Power terminal suitable busbar link	-	Connectwell Elmex	Lot	Lot
37	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
38	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	1
39	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	1	2
40	-	Panel Enclosure	Enclosure Size - H1900 x W2400 x D500mm	-	BHEL	1	1
41							
42							

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DRG. NO. EP-3-BM-033-013

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
BOOSTER PUMP CONTROL PANEL (2X250KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-013 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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TITLE :- DEWATERING PUMP MCP (4X187KW)

PROJECT :- 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER:- PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. :- EP-3-GA-033-014 REV. 02

DWG. NO. :- EP-3-CS-033-014 REV. 01

DWG. NO. :- EP-3-BM-033-014 REV. 02

ASBUILT DRAWING

Qty-1Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF DEWATERING PUMP MCP (4X187KW)

NO. OF SHEETS 01 | SHEET. NO. 01

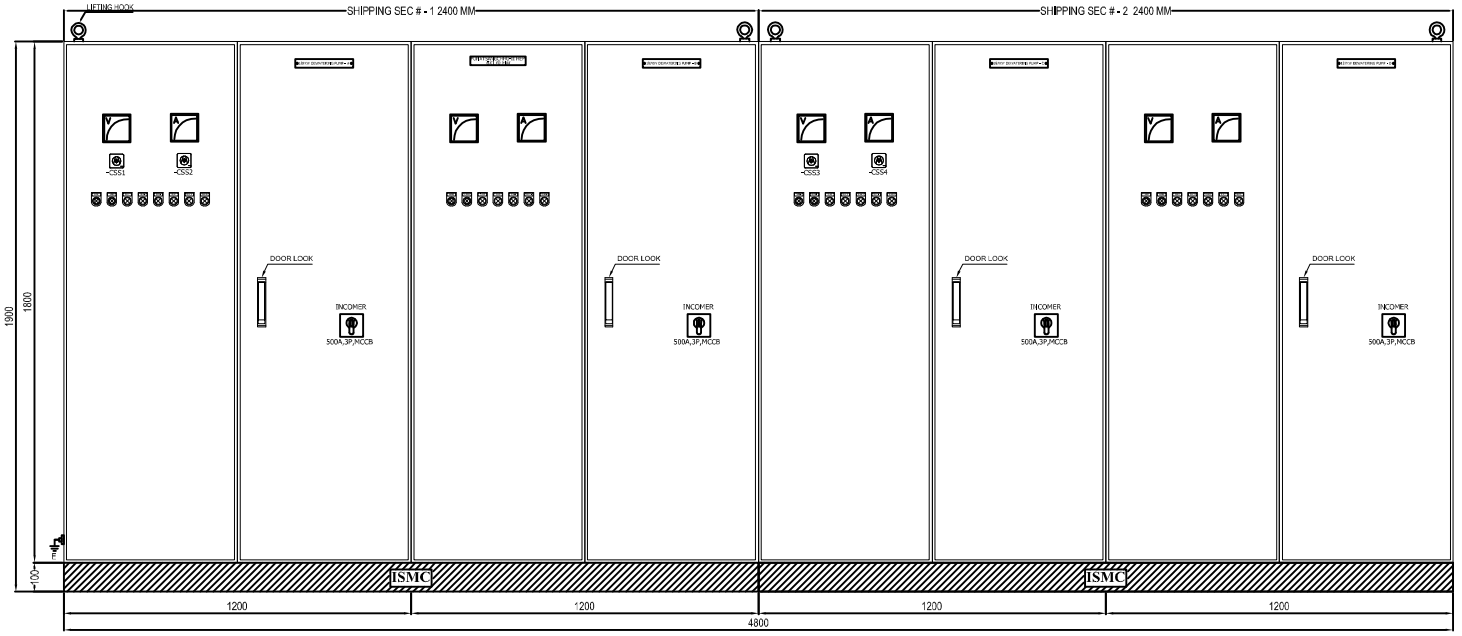
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

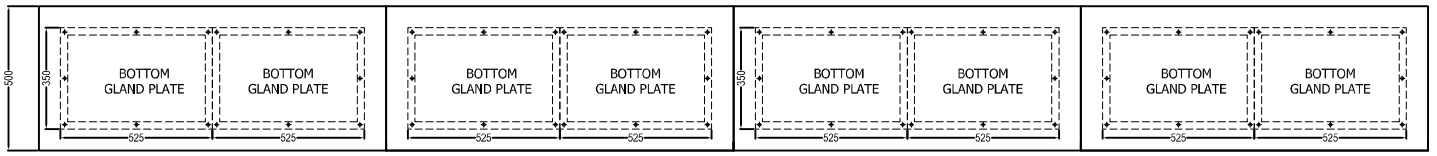
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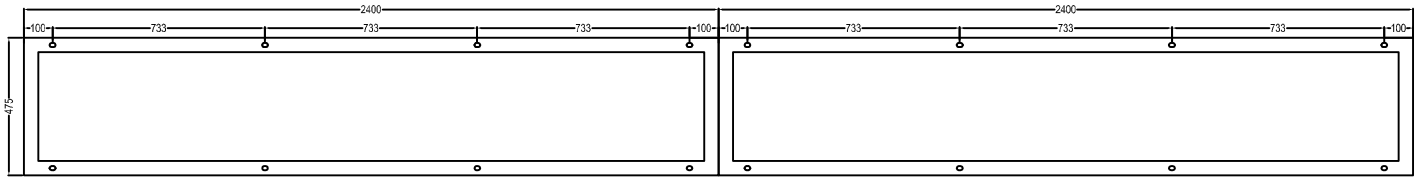


FRONT VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness in mm
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	582.0	
TENTAVIVE WEIGHT		
WEIGHT	1500 KG	



MOUNTING DETAILS - PANEL BOTTOM

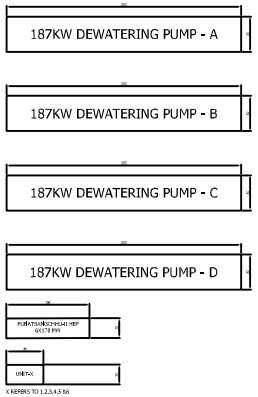


FOUNDATION DETAILS

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 16 NO'S EACH PANEL

PANEL NAME PLATE



Qty–1No

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 13.2 | SHEET. NO. 13.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–014 | REV. 02

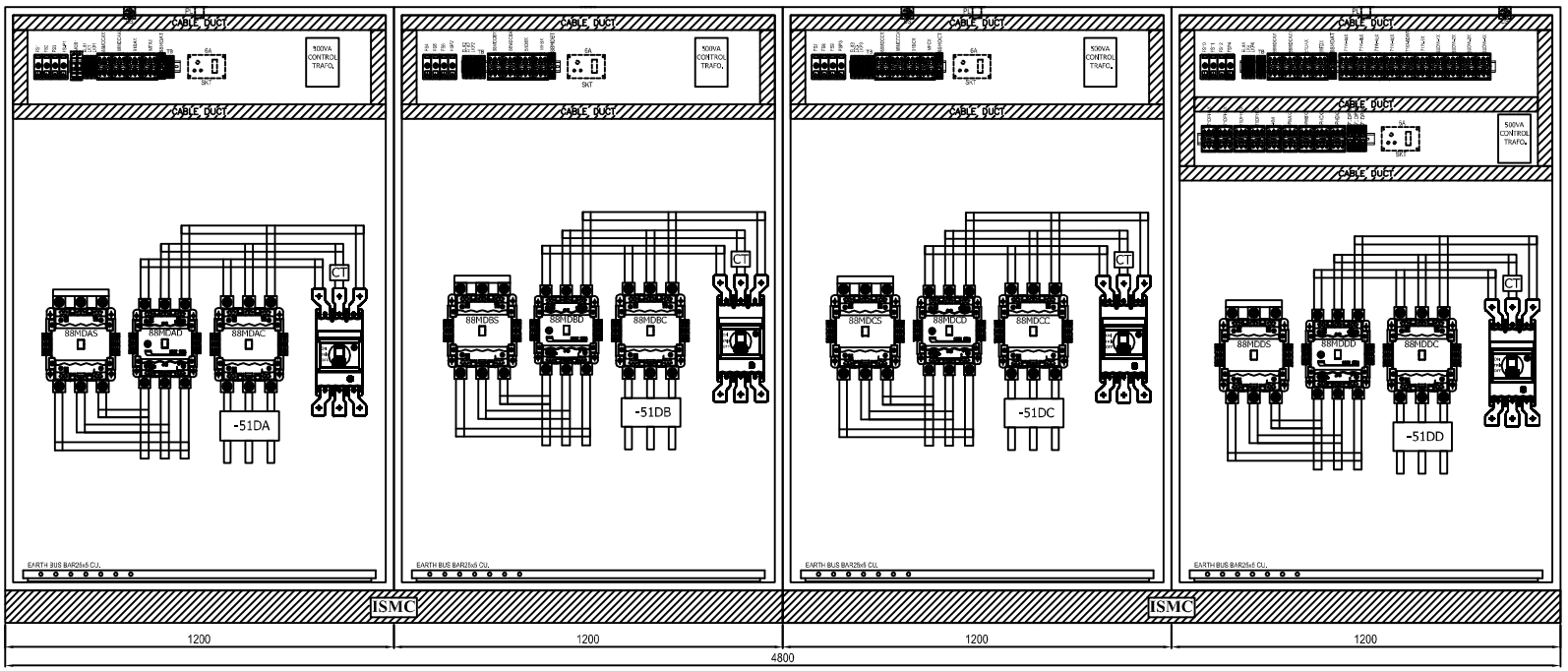
INVENTORY NO. | DRG. NO. EP–3–GA–033–014

FIRST ANGLE PROJECTION

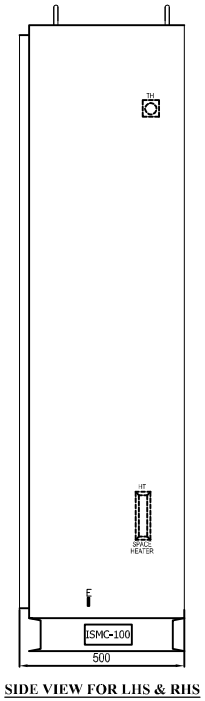
ALL DIMENSIONS ARE IN MM.

101	102	103	104	105	106	107	108

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FRONT INTERNAL VIEW



SIDE VIEW FOR LHS & RHS

FRONT

Qty-1No

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

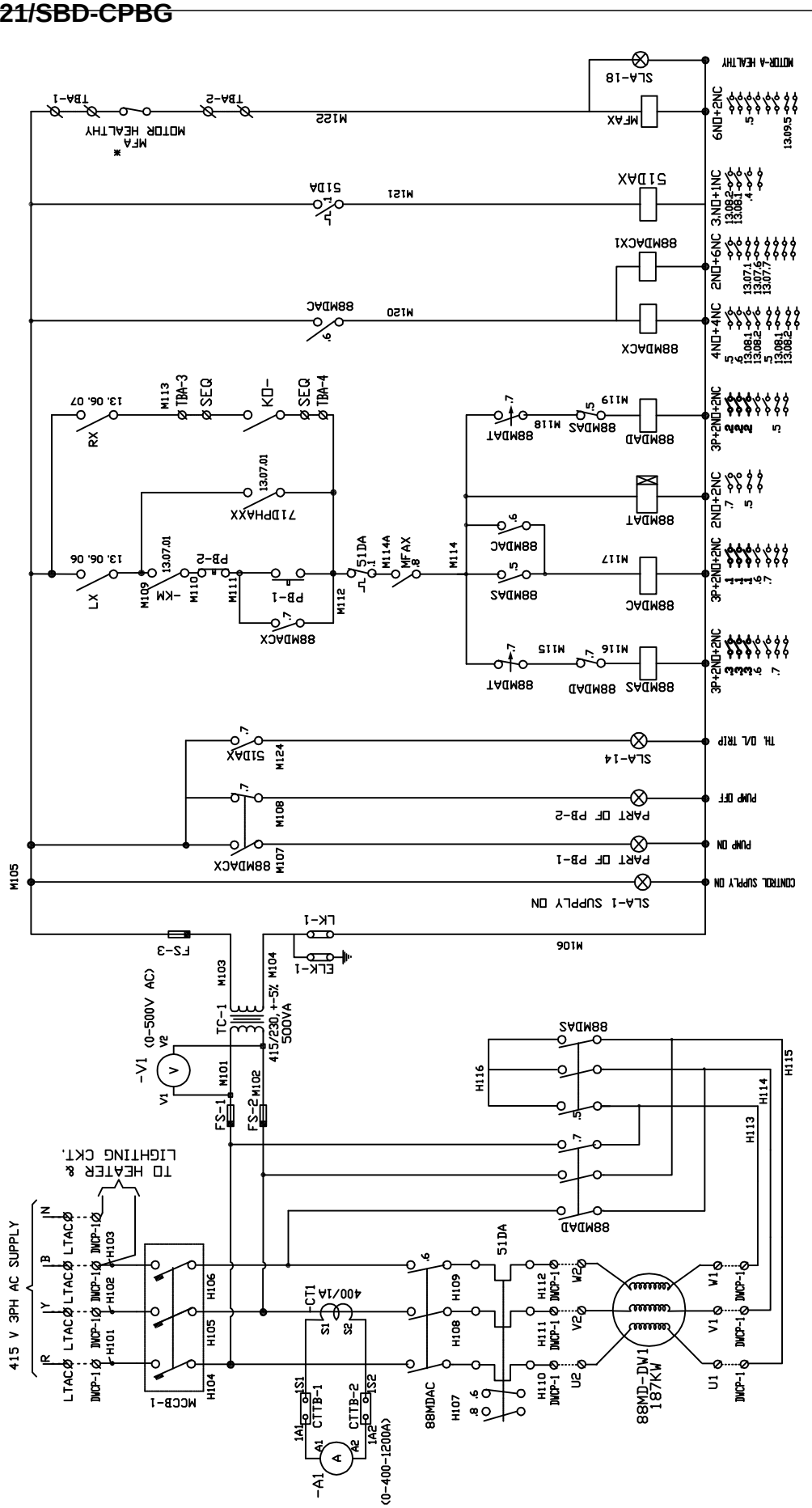
NO. OF SHEETS 13.2
SHEET. NO. 13.2

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-GA-033-014 | REV. 02

INVENTORY NO.

DRG. NO. EP-3-GA-033-014

198209/2021/SBD-CPBG



03											
02	23.3.18	As-Built Drawing	SAURABH	SAURABH		DESIGNED	SAURABH	07.03.17	CAD DIR :	BHARAT HEAVY ELECTRICALS LIMITED	NO. OF SHEETS 13.10
01	07.3.18	For Approval	SAURABH	SAURABH		DRAWN	SAURABH	07.03.17		ELECTROPORCELAIN DIVISION, BANGALORE	SHEET. NO. 13.01
REV. NO.	DATE	DESCRIPTION	BY	APPD.		CHECKED	SAURABH	07.03.17	FILE NO.:	TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)	REV. 02
						APPROVED	SAURABH	07.03.17		SCALE JOB NO. CB16033 DRG. NO. EP-3-CS-033-014	

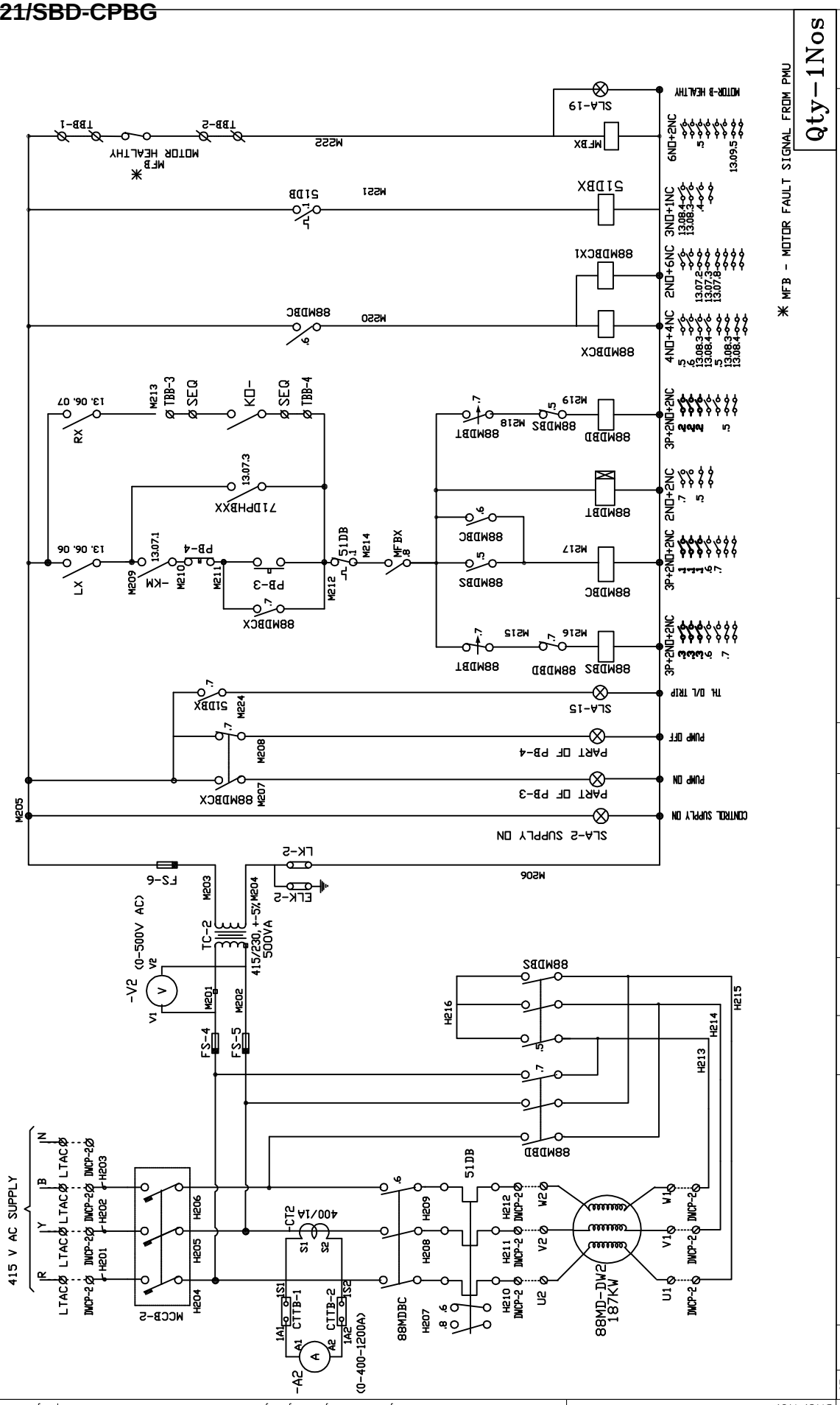
FIRST ANGLE PROJECTION

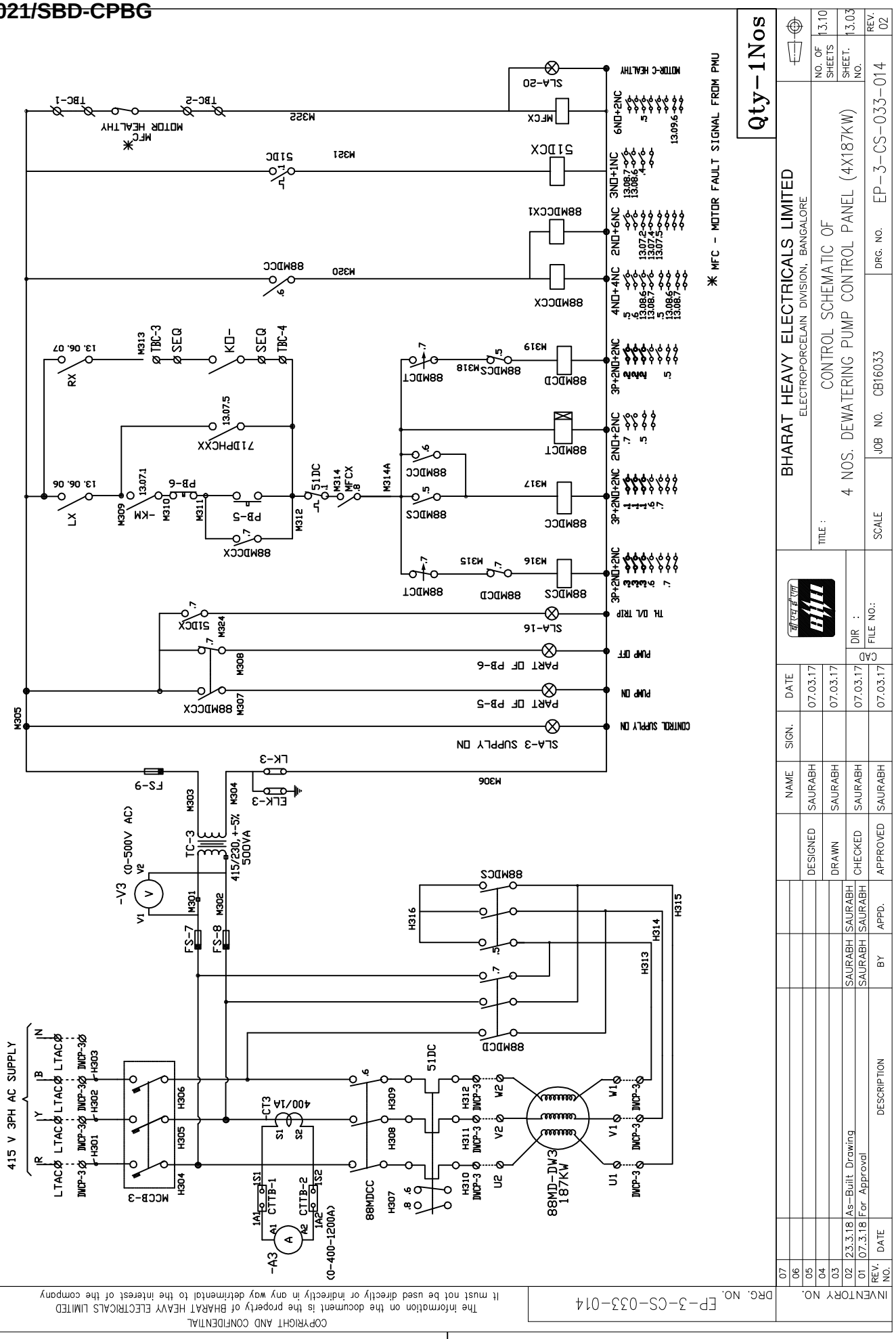
ALL DIMENSIONS ARE IN MM.

INVENTORY NO.

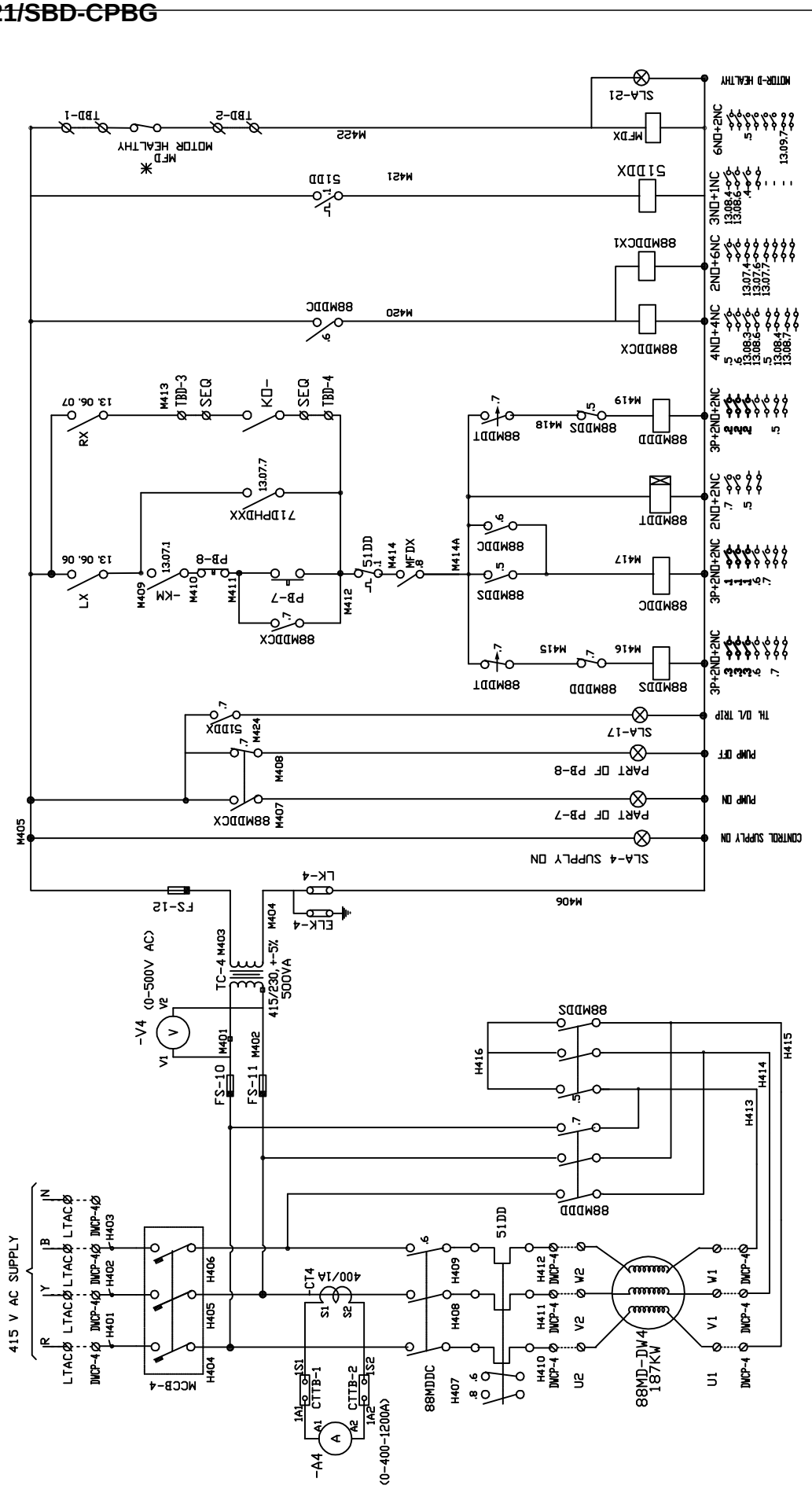
DRG. NO. EP-3-CS-033-014

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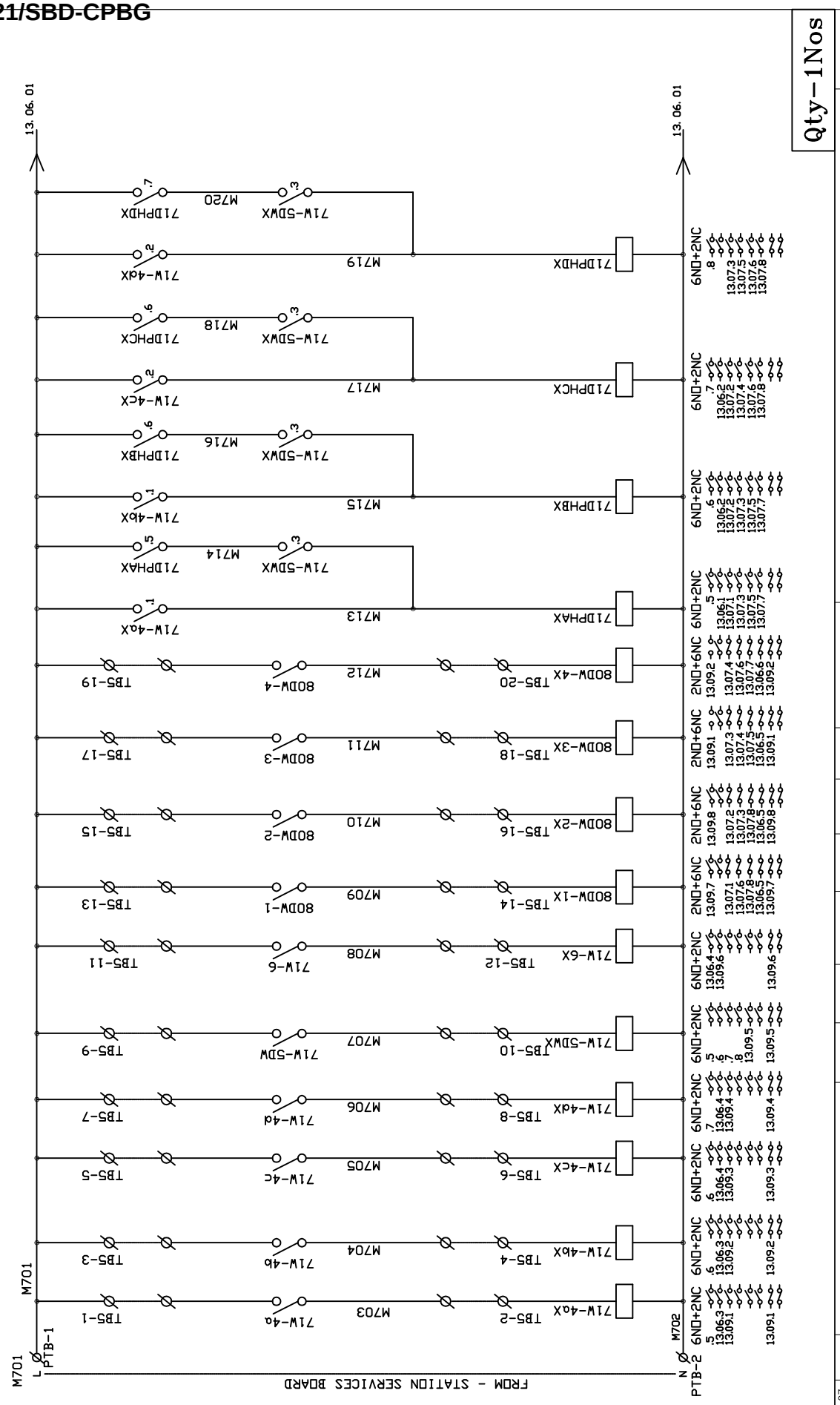

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)
Qty-1Nos
NO. OF SHEETS 13.10
SHEET. NO. 13.02
REV. 02
SCALE
DRG. NO. EP-3-CS-033-014
JOB NO. CB16033
DIR :
FILE NO.:
CAD
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DATE
SIGN.
NAME
BY APPD.
23.03.18 As-Built Drawing SAURABH SAURABH
07.03.18 For Approval SAURABH SAURABH
DESCRIPTION
DATE
REV. NO.
INVENTORY NO.
DRG. NO. EP-3-CS-033-014
* MFB - MOTOR FAULT SIGNAL FROM PMU
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415 V AC SUPPLY
MCCB-2
88MDBC
88MD-DW2
187KW
-A2
(0-400-1200A)
CT2
400/1A
TC-2
415/230, +-5% M204
500VA
-V2
(0-500V AC)
FS-4
FS-5
FS-6
LK-2
ELK-2
51DB
51DBX
88MDBCX1
88MDBCX
88MDBD
88MDBS
88MDBT
MFBX
MFB
MOTOR HEALTHY
TBB-1
TBB-2
RX
LX
KM
KD
SEQ
TBB-3
TBB-4
71DPHBXX
PB-3
PB-4
SLA-19
SLA-15
SLA-2 SUPPLY ON
PART OF PB-3
PART OF PB-4
TH. O/L TRIP
PUMP ON
PUMP OFF
CONTROL SUPPLY ON
MOTOR-B HEALTHY
6ND+2NC
3ND+1NC
2ND+6NC
4ND+4NC
3P+2ND+2NC
2ND+2NC
13.09.5
13.08.4
13.08.3
13.07.2
13.07.3
13.07.8
13.07.1
13.07.3
13, 06, 07
13, 06, 06
M205
M206
M207
M208
M209
M210
M211
M212
M213
M214
M215
M216
M217
M218
M219
M220
M221
M222
M224
H201
H202
H203
H204
H205
H206
H207
H208
H209
H210
H211
H212
H213
H214
H215
H216
IA1
IA2
IS1
IS2
A1
A2
S1
S2
U1
U2
V1
V2
W1
W2
IN
R
Y
B
LTAC
DWCP-2
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Qty-1Nos
* MFD - MOTOR FAULT SIGNAL FROM PMU
MOTOR-D HEALTHY
SLA-21
MFDX
6ND+2NC
51DDX
3ND+1NC
88MDDCX1
2ND+6NC
88MDDC
88MDDCX
4ND+4NC
88MDDT
88MDDS
88MDDD
3P+2ND+2NC
TBD-1
TBD-2
MOTOR HEALTHY
MFD
M422
M421
M420
M419
M418
M417
M416
M415
M414
M414A
M413
M412
M411
M410
M409
M408
M407
M406
M405
M404
M403
M402
M401
M424
M427
M428
M429
M430
M431
M432
M433
M434
M435
M436
TBD-3
SEQ
KD-
SEQ
TBD-4
RX
LX
-KM
PB-8
PB-7
71DPHDXX
51DD
MFDX
13.07.7
13.07.1
13.3, 06, 07
13.3, 06, 06
TH. O/L TRIP
SLA-17
PUMP OFF
PART OF PB-8
PUMP ON
PART OF PB-7
CONTROL SUPPLY ON
SLA-4 SUPPLY ON
FS-12
LK-4
ELK-4
TC-4
415/230, +-5%
500VA
-V4
(0-500V AC)
V2
V1
FS-10
FS-11
H401
H402
H403
H404
H405
H406
H407
H408
H409
H410
H411
H412
H413
H414
H415
H416
415 V AC SUPPLY
R
Y
B
N
LTAC
DMCP-4
MCCB-4
-CT4
400/1A
S1
S2
1S1
1S2
1A1
1A2
CTTB-1
CTTB-2
-A4
(0-400-1200A)
88MDDC
51DD
88MD-DW4
187KW
U2
V2
W2
U1
V1
W1

| | | |



ALL DIMENSIONS ARE IN MM.

FIRST ANGLE PROJECTION

REV. NO.	DATE	DESCRIPTION	BY	APPD.
01	07.3.18	For Approval	SAURABH	SAURABH
02	23.3.18	As-Built Drawing	SAURABH	SAURABH
03				
04				
05				
06				
07				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

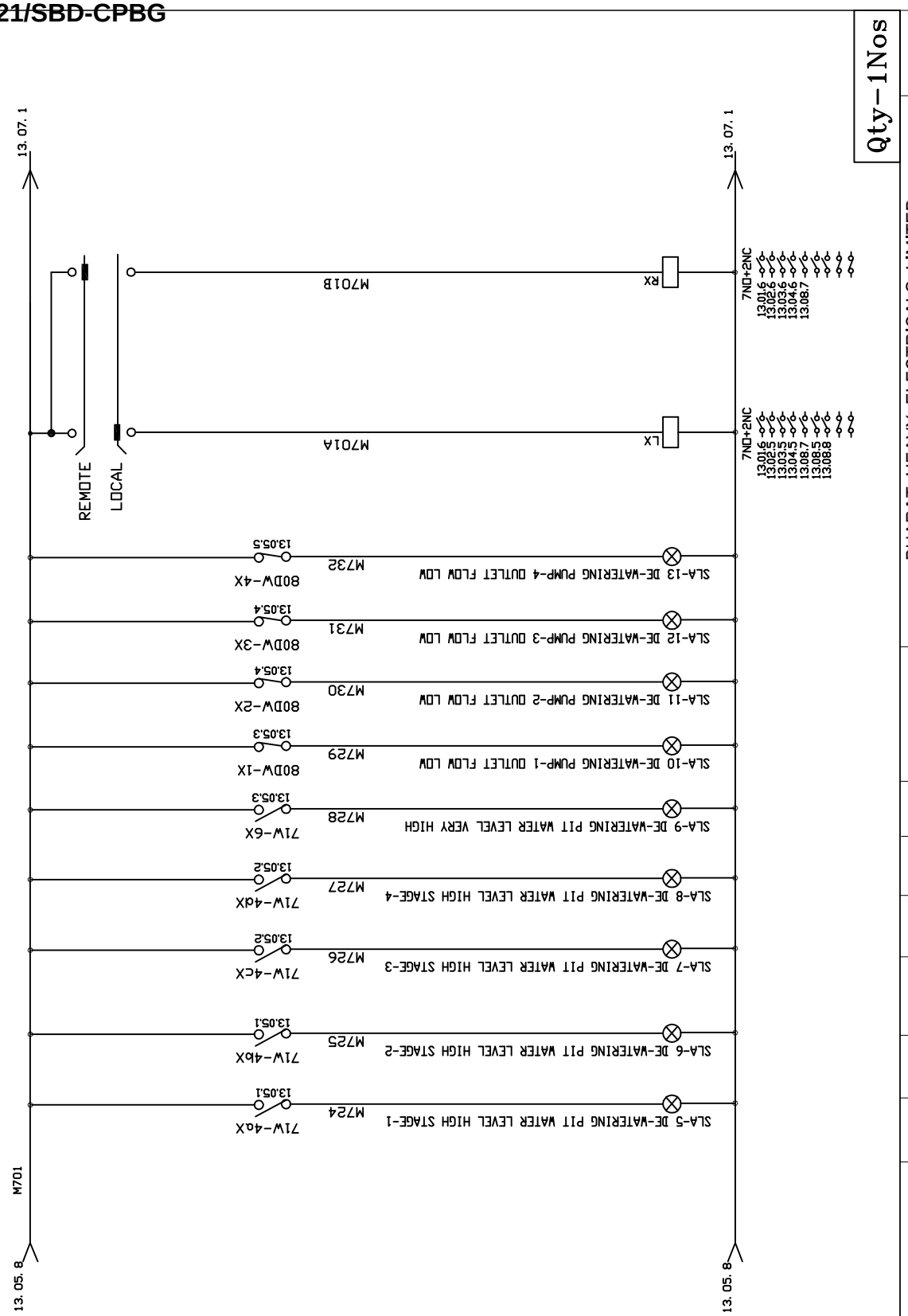
CAD DIR :

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-014 | NO. OF SHEETS 13.10 | SHEET NO. 13.05 | REV. NO. 02

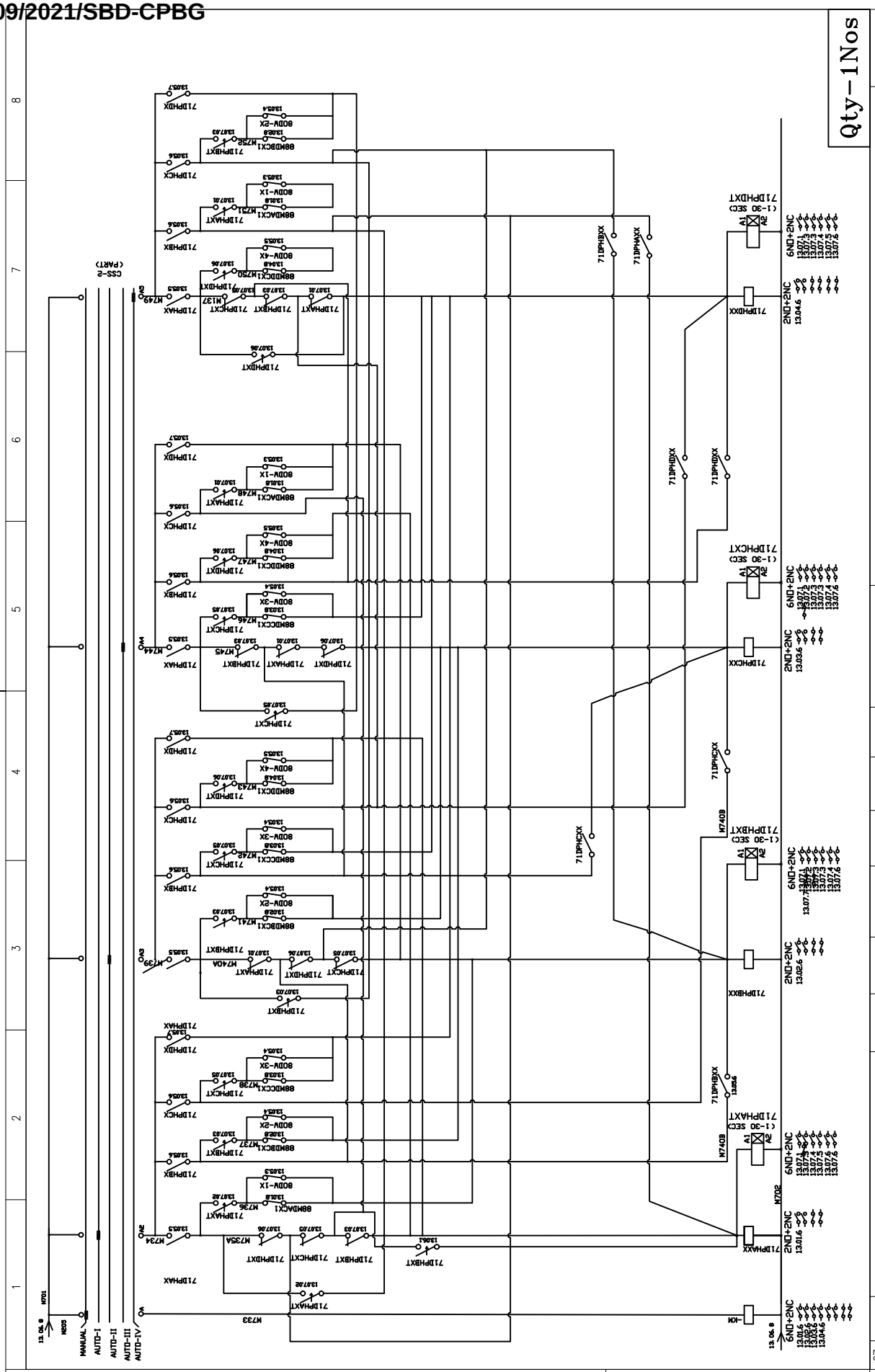
INVENTORY NO.

DRG. NO. EP-3-CS-033-014

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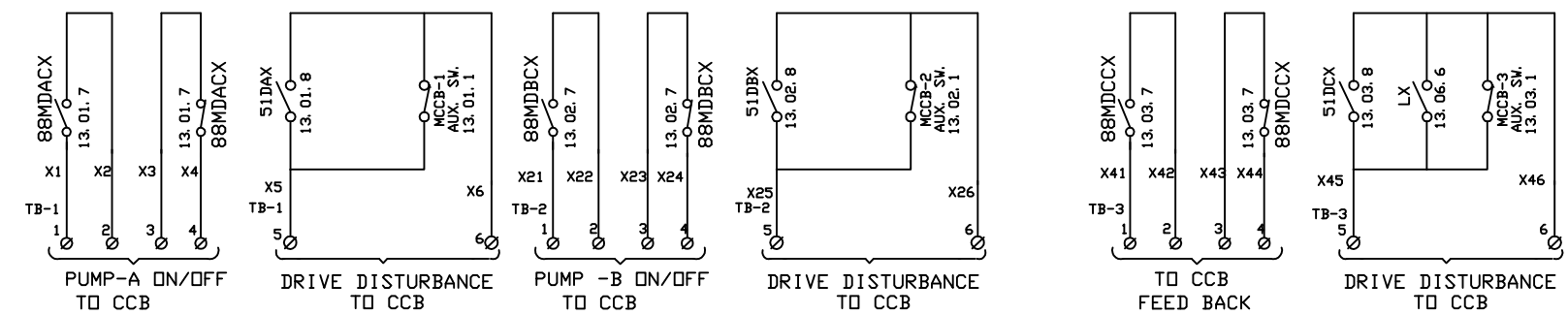

Qty-1Nos
13.07.1
13.07.1
M701B
RX
7ND+2NC
13.01.6
13.02.6
13.03.6
13.04.6
13.08.7
M701A
LX
7ND+2NC
13.01.6
13.02.5
13.03.5
13.04.5
13.08.7
13.08.5
13.08.8
REMOTE
LOCAL
SLA-13 DE-WATERING PUMP-4 OUTLET FLOW LOW
M732
13.05.5
80DW-4X
SLA-12 DE-WATERING PUMP-3 OUTLET FLOW LOW
M731
13.05.4
80DW-3X
SLA-11 DE-WATERING PUMP-2 OUTLET FLOW LOW
M730
13.05.4
80DW-2X
SLA-10 DE-WATERING PUMP-1 OUTLET FLOW LOW
M729
13.05.3
80DW-1X
SLA-9 DE-WATERING PIT WATER LEVEL VERY HIGH
M728
13.05.3
71W-6X
SLA-8 DE-WATERING PIT WATER LEVEL HIGH STAGE-4
M727
13.05.2
71W-4dX
SLA-7 DE-WATERING PIT WATER LEVEL HIGH STAGE-3
M726
13.05.2
71W-4cX
SLA-6 DE-WATERING PIT WATER LEVEL HIGH STAGE-2
M725
13.05.1
71W-4bX
SLA-5 DE-WATERING PIT WATER LEVEL HIGH STAGE-1
M724
13.05.1
71W-4aX
M701
13.05.8
13.05.8

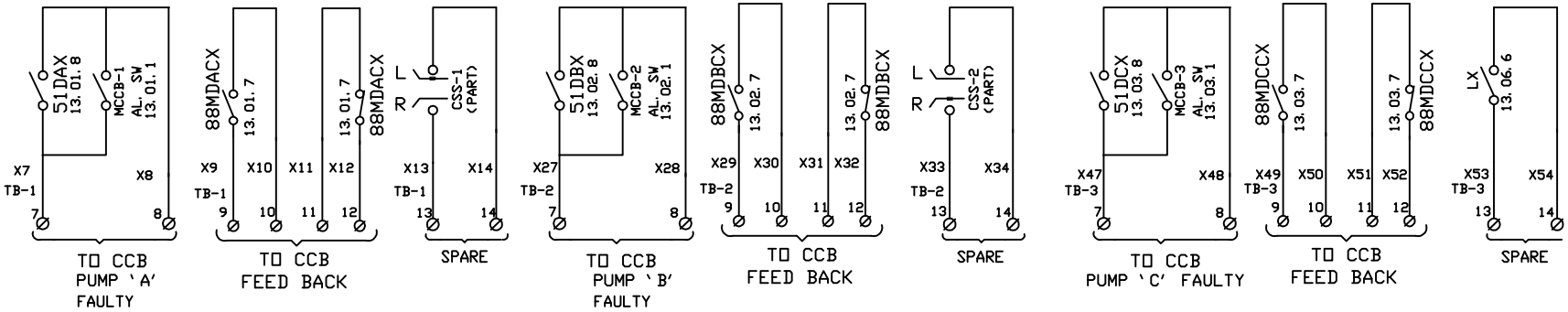
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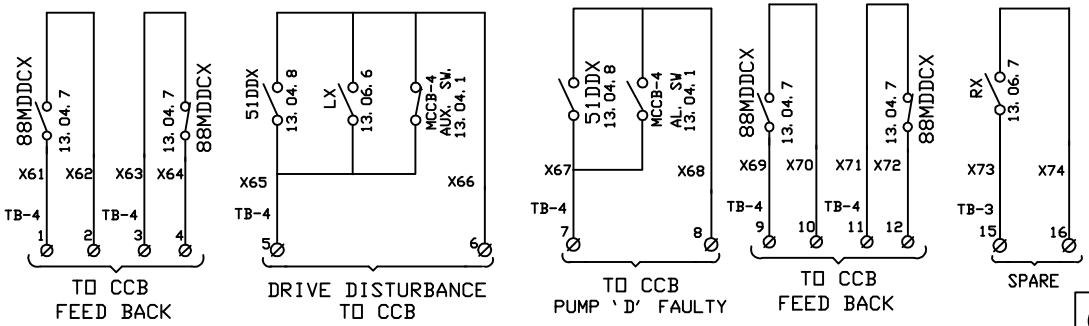

Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)
NO. OF SHEETS 13.10
SHEET. NO. 13.07
REV. 02
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-014
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
CAD DIR :
FILE NO.:
REV. NO. DATE DESCRIPTION BY APPD.
02 23.3.18 As-Built Drawing SAURABH SAURABH
01 07.3.18 For Approval SAURABH SAURABH
INVENTORY NO.
DRG. NO. EP-3-CS-033-014
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FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
MANUAL
AUTO-I
AUTO-II
AUTO-III
AUTO-IV
CSS-2 (PART)
71DPHAXT
71DPHBXT
71DPHCXT
71DPHDXT
71DPHAX
71DPHBX
71DPHCX
71DPHDX
88MDACX1
88MDBCX1
88MDCCX1
88MDDCX1
80DV-1X
80DV-2X
80DV-3X
80DV-4X
71DPHBXX
71DPHDXX
71DPHCXX
71DPHAXX
2ND+2NC
6ND+2NC
(1-30 SEC)
M702
M740B
M740A
M733
M734
M735A
M736
M738
M739
M741
M742
M743
M744
M745
M746
M747
M748
M749
M750
M751
M752
M137

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

CONTACTS GOING TO OTHER CIRCUITS







CCB -COMMON CONTROL BOARD
LTAC -LTAC SUPPLY DISTRIBUTION BOARD
DWCP -DEWATERING PUMP MOTOR CONTROL PANEL
R -SELECTOR SWITCH IN REMOTE
L -SELECTOR SWITCH IN LOCAL
Ø -TERMINAL

Qty-1Nos

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DRG. NO. EP-3-CS-033-014

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	23.3.18	As-Built Drawing	SAURABH	SAURABH
01	07.3.18	For Approval	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

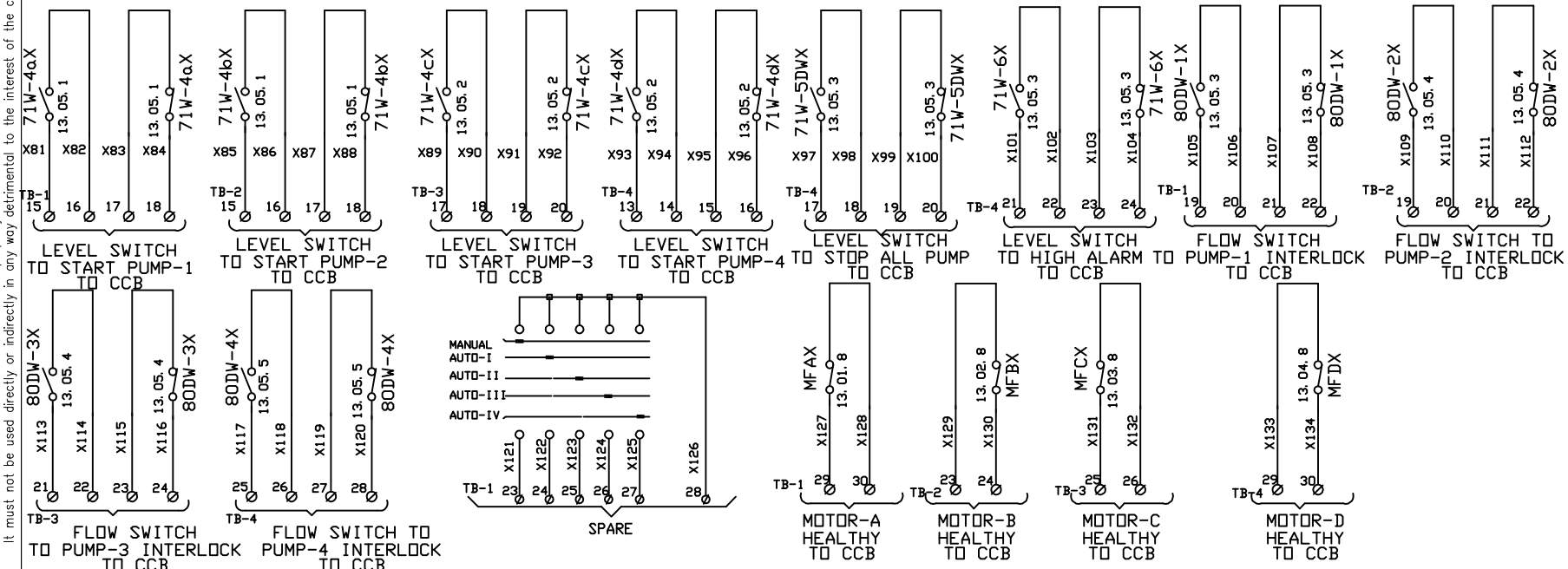
TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 13.10
SHEET. NO. 13.08

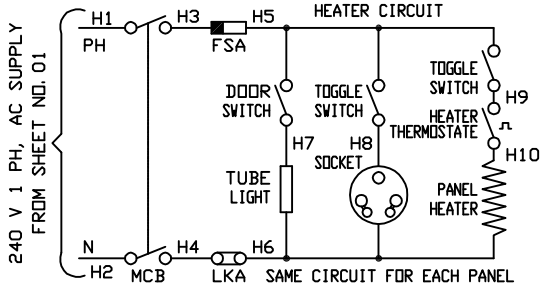
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-014 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

CONTACTS GOING TO OTHER CIRCUITS



CCB -COMMON CONTROL BOARD
LTAC -LTAC SUPPLY DISTRIBUTION BOARD
DWCP -DEWATERING PUMP MOTOR CONTROL PANEL
R -SELECTOR SWITCH IN REMOTE
L -SELECTOR SWITCH IN LOCAL
Ø -TERMINAL



Qty-1Nos

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DRG. NO. EP-3-CS-033-014

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	23.3.18	As-Built Drawing	SAURABH	SAURABH
01	07.3.18	For Approval	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 13.10
SHEET. NO. 13.09

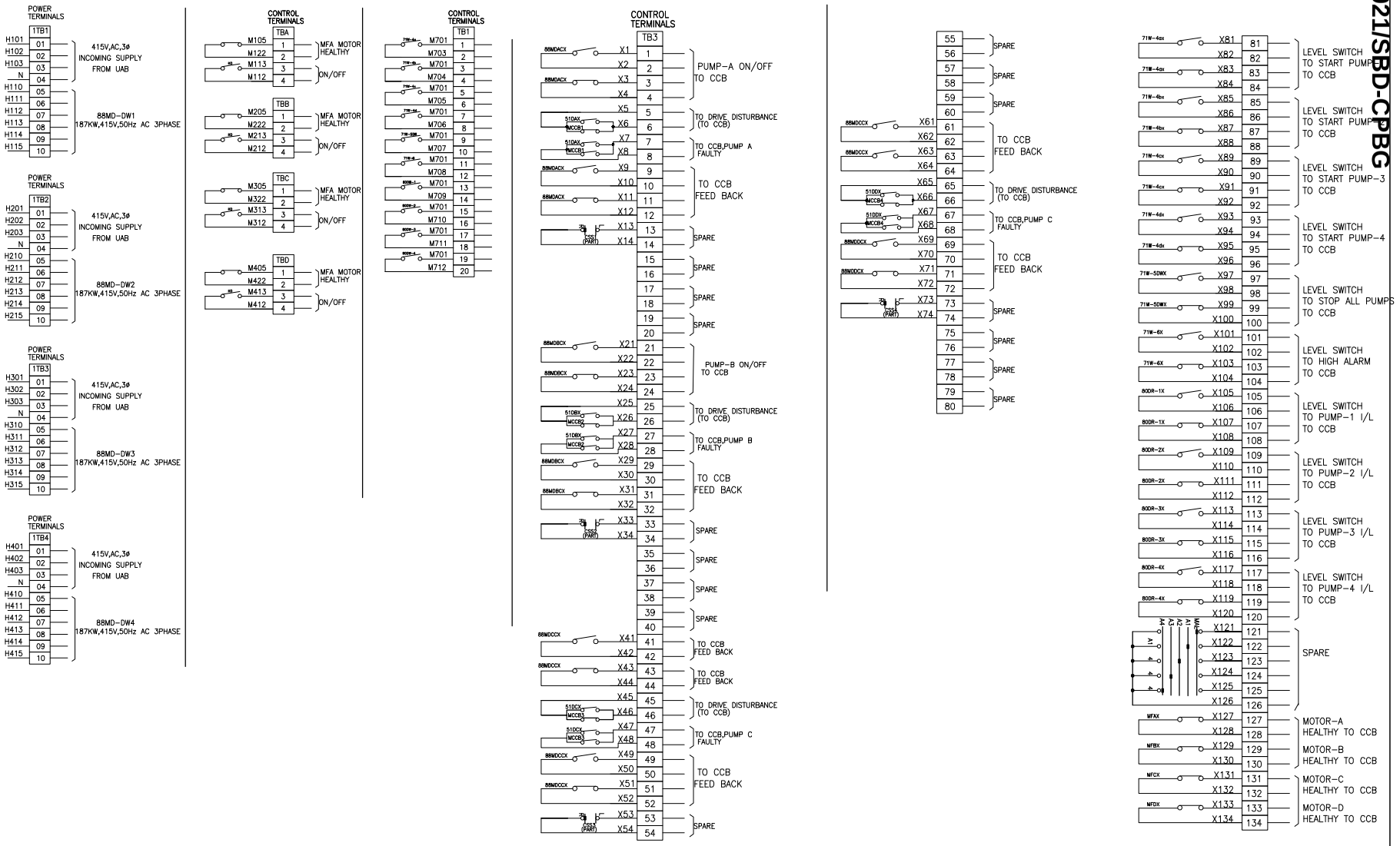
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-014 | REV. 02

FIRST ANGLE PROJECTION

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DRG. NO. EP-3-CS-033-014



Qty-1No

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
	01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

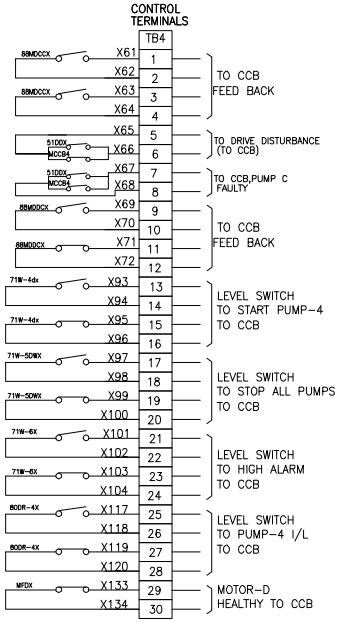
TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 13.10
SHEET. NO. 13.10

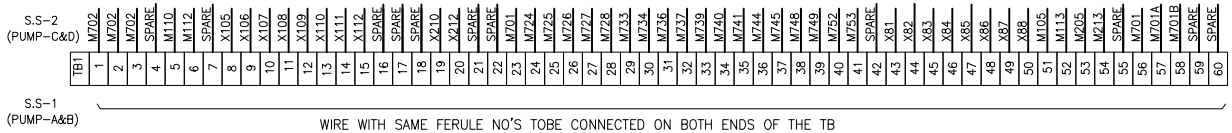
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-014 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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INTERNAL PANEL WIRING



WIRE WITH SAME FERULE NO'S TOBE CONNECTED ON BOTH ENDS OF THE TB

Qty-1No

DRG. NO. EP-3-CS-033-014

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF 4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 13.11 | SHEET. NO. 13.11

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-014 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-014

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1,MCCB2,MCCB3 & MCCB4	Moulded Case Circuit Breaker	500A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOSOOG	L&T	4	4
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO)	CM99804OOOO	L&T	4	4
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	2	2
04	88MDAC,88MDAD 88MDBC,88MDBD 88MDCC,88MDCD 88MDDC&88MDDD	Power contactor	550A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94145BOOO	L&T	8	8
05	88MDAS,88MDBS-88MDCS&88MDDS	Power contactor	250A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94141BOOO	L&T	4	4
06	51DAX,51DBX,51DCX&51DDX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	4	4
07	71W-4AX,71W-4BX,71W-4CX 71W-4DX,71W-5DX71W-6X 71DPHAX,71DPHBX,71DPHCX, 71DPHCX,71DPHDX,KM,MFAX, MFBX,MFCX,MFDC,71DPHAXX, 71DPHBXX,71DPHCXX,71DPHDXX, 88MDACX1,88MDBCX1,88MDCCX1, 88MDDCX1,80DW-1X,80DW-2X,80DW-3X, 80DW-4X	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	31	31
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	4	4
09	-	Aux Contactor Acc	Addon contact 4NO for Aux cont	-	L&T	15	15
09	-	Aux Contactor Acc	Addon contact 4NC for Aux cont	-	L&T	8	8
10	51DA,51DB,51DC&51DD	Overload Relay	160-250A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94139OOQO	L&T	4	4
11	88MDAT,88MDBT,88MDCT&88MDDT	Timer	1sec - 30Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	4	4
12	71DPHAXT,71DPHBXT,71DPHCXT	Timer	1sec - 30Sec Adjustable type, On delay Timer 6NO-2NC Aux Supply 240V AC	2AODT5	L&T	3	3
13	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,2position 4Pole withoutOFF	61040	L&T	1	1
14	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,5position 6Pole withoutOFF	61120	L&T	1	1
15	CT1&CT2	Current Transformer	400/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	4	4
16	V1,V2,V3&V4	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	4	4
17	A1,A2,A3&A4	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 400/1A, Acc. CL:1,Range:0-400-2400A with suppressed scale.	-	AE/ Meco	4	4
18	LX,RX	Aux Contactor	Auxilary contactor with 7NO+2NC , 240VAC coil	-	L&T	2	2

INVENTORY NO.

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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-014 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-014

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
19	IPB1,IPB3,IPB5&IPB7	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	4	4
20	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	4	4
21	IPB2,IPB4,IPB6&IPB8	Green illuminated Push button	Green illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	4	4
22	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	4	4
23	SLA1,SLA2,SLA3,SLA4,SLA5,SLA6 SLA7,SLA8,SLA9,SLA10,SLA11,SLA12 SLA13 SLA14,SLA15,SLA16&SLA17 SLA18, SLA19,SLA20&SLA21	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	21	21
24	FS1,FS2,FS3,FS4,FS5,FS6,FS7,FS8 FS9,FS10,FS11,FS12&FSP1-FSP4	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	16	16
25	FS1-FS12	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	12	12
26	FSP1-FSP4	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	1	1
27	TC1,TC2,TC3&TC4	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	4	4
28	MCB1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	1
29	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	4	4
30	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	4	4
31	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	4	4
32	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	4	4
33	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	4	4
34	LK1-LK4 LKP1-LKP4	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	8	8
35	ELK1-4	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	4	4
36	TB1	Power TB	Power terminal suitable busbar link	-	Connectwell Elmex	-	-
37	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
38	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	1
39	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	1	4
40	-	Panel Enclosure	Enclosure Size - H1900 x W4800 x D500mm	-	BHEL	1	1

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
4 NOS. DEWATERING PUMP CONTROL PANEL (4X187KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-014 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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TITLE :- DRAINAGE PUMP MCP (2X187KW)

PROJECT :- 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER:- PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. :- EP-3-GA-033-015 REV. 02

DWG. NO. :- EP-3-CS-033-015 REV. 01

DWG. NO. :- EP-3-BM-033-015 REV. 02

ASBUILT DRAWING

Qty-1Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

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DESIGNED	SAURABH		07.03.17
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APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 01 | SHEET. NO. 01

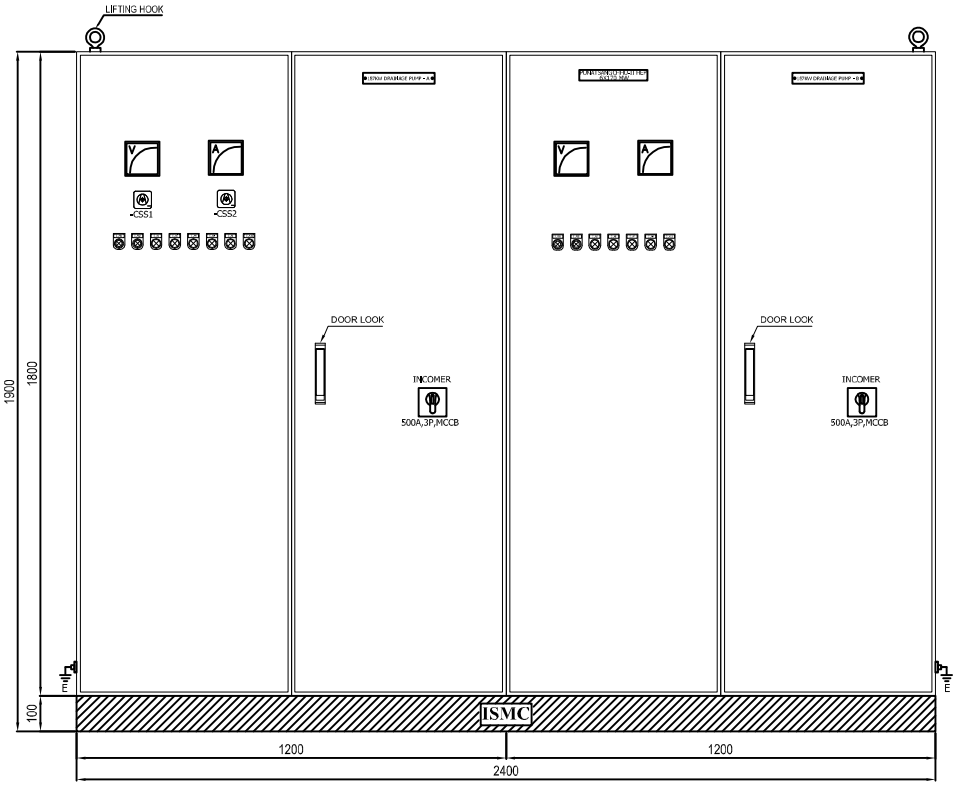
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

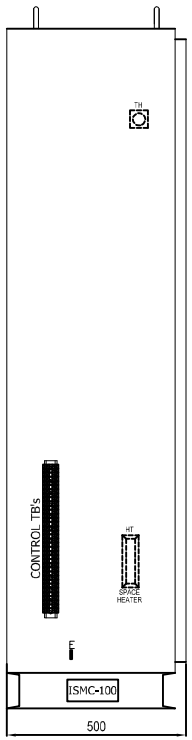
ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

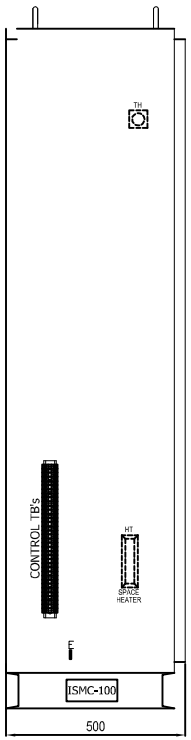
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FRONT VIEW



SIDE VIEW
LHS SIDE



SIDE VIEW
RHS SIDE

PANEL NAME PLATE

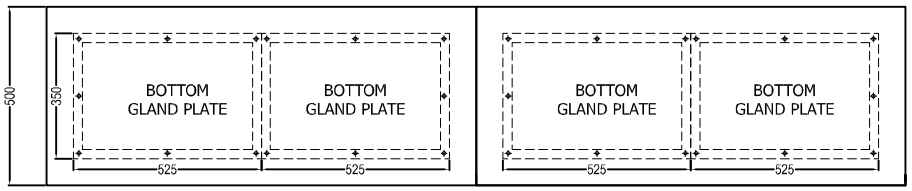
187KW DRAINAGE PUMP - A

187KW DRAINAGE PUMP - B

PUNATSANGCHU-II HEP
6X170 MW

UNIT-X

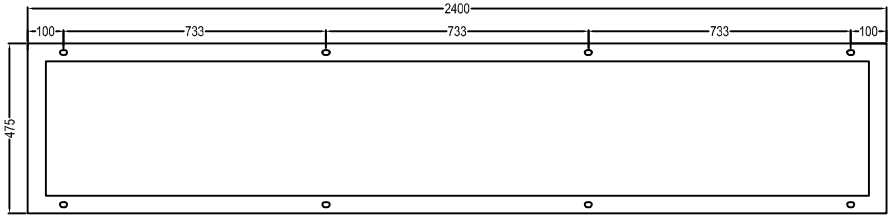
X REFERS TO 1,2,3,4,5 &6



MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL



FOUNDATION DETAILS

Qty–1No

DRG. NO. EP–3–GA–033–015

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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06				
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

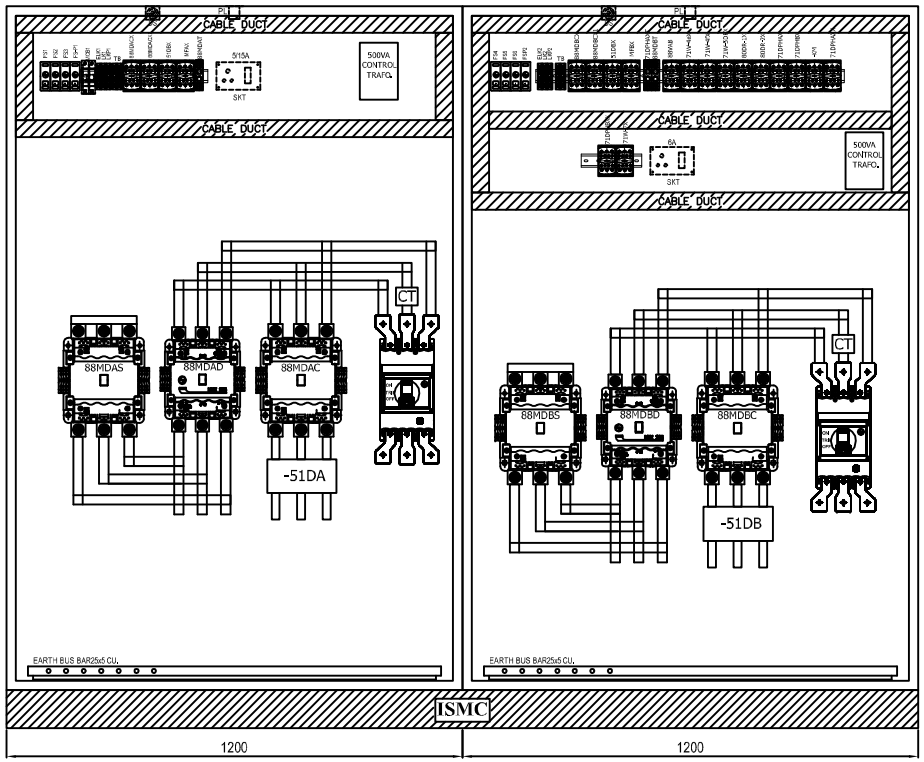
NO. OF SHEETS 14.2
SHEET. NO. 14.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–015 | REV. 02

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101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	582.0	
TENTATIVE WEIGHT		
WEIGHT	750 KG	

Qty–1No

DRG. NO. EP–3–GA–033–015

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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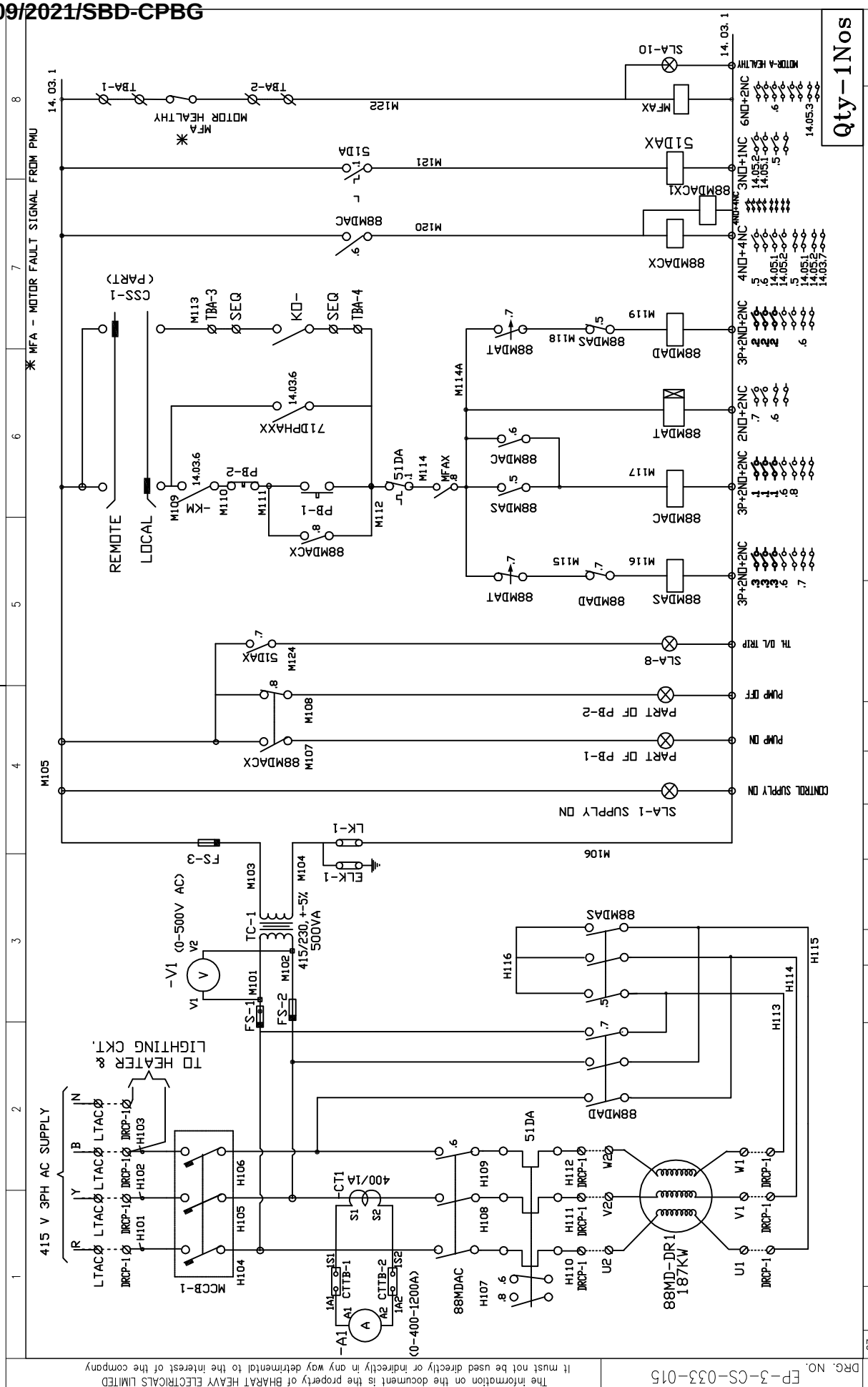
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

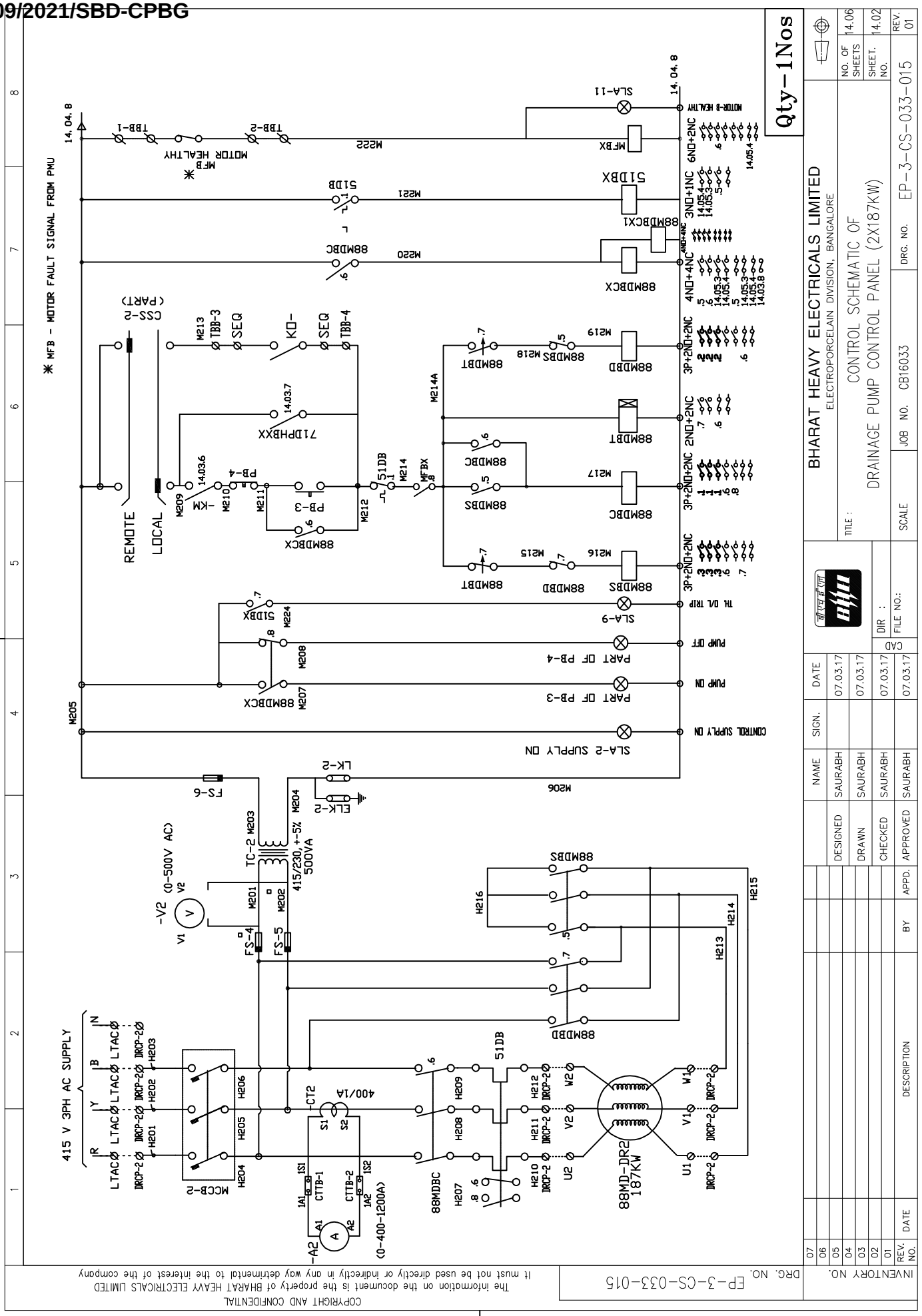
NO. OF SHEETS 14.2 | SHEET. NO. 14.2

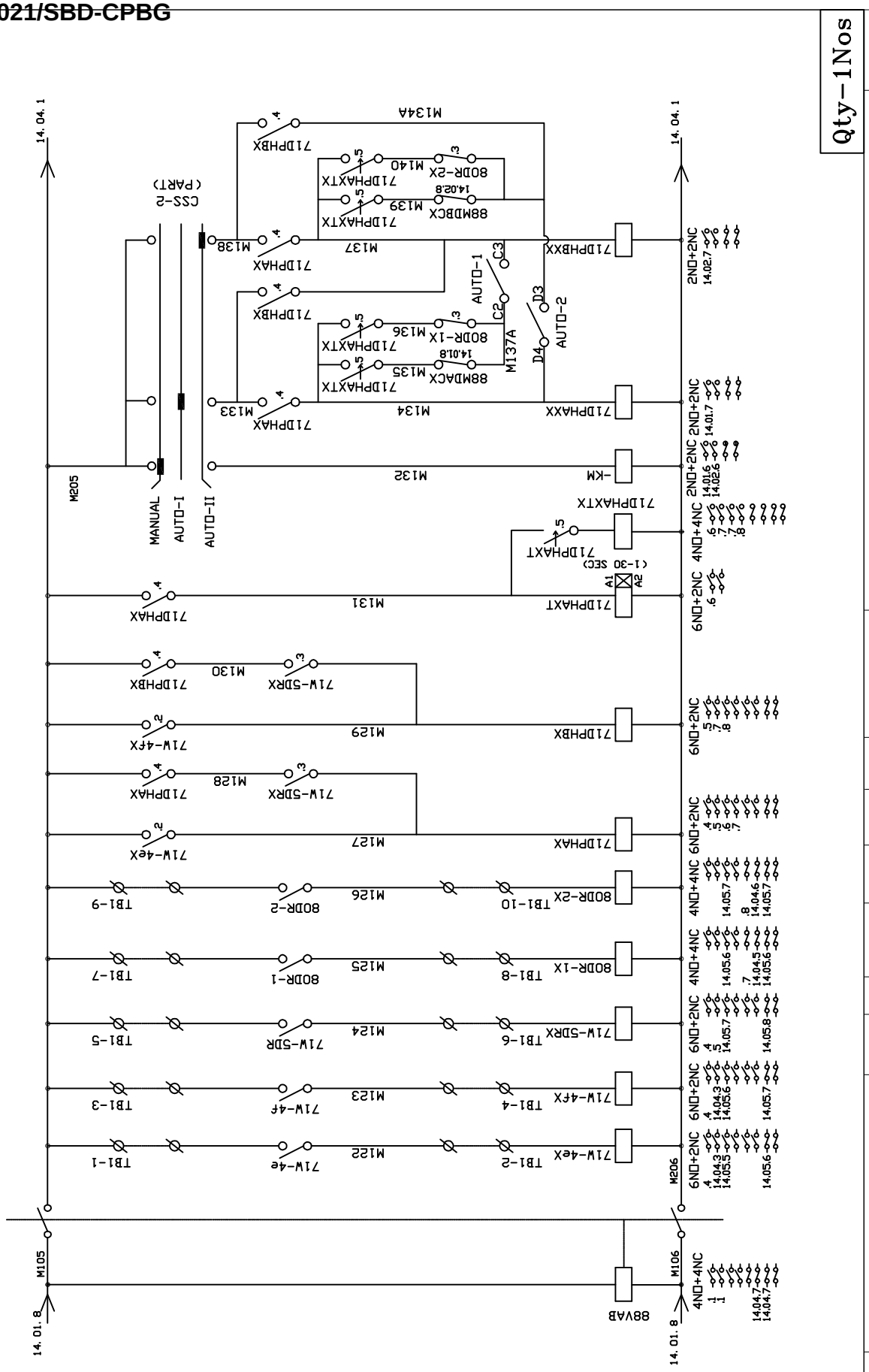
SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–015 | REV. 02

198209/2021/SBD-CPBG



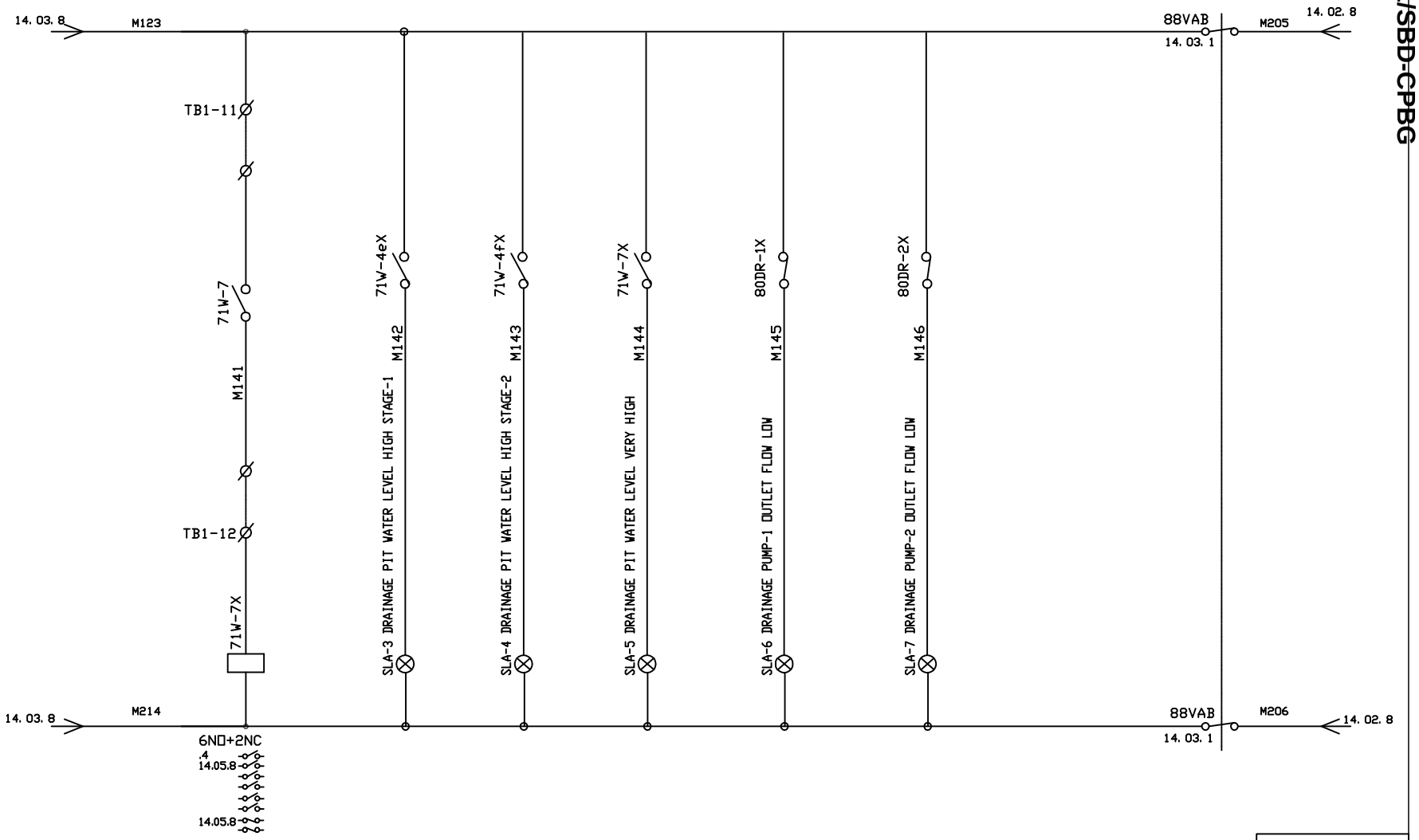
198209/2021/SBD-CPBG




Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
DRAINAGE PUMP CONTROL PANEL (2X187KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-015
NO. OF SHEETS 14.06
SHEET. NO. 14.03
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
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M205
MANUAL
AUTO-I
AUTO-II
CSS-2 (PART)
M105
M106
M206
88VAB
-KM
M132
M133
M134
M135
M136
M137
M137A
M138
M139
M140
M122
M123
M124
M125
M126
M127
M128
M129
M130
M131
M134A
AUTO-1
AUTO-2
(1-30 SEC)
80DR-2X
80DR-1X
80DR-2
80DR-1
71W-5DRX
71W-5DR
71W-4eX
71W-4e
71W-4fX
71W-4f
71DPHAX
71DPHBX
71DPHAXX
71DPHBXX
71DPHAXT
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TB1-1
TB1-2
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TB1-5
TB1-6
TB1-7
TB1-8
TB1-9
TB1-10
14.04.1
14.01.8
14.02.8
14.01.8
2ND+2NC
4ND+4NC
6ND+2NC

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Qty-1Nos

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	01				

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CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 14.06
SHEET. NO. 14.04

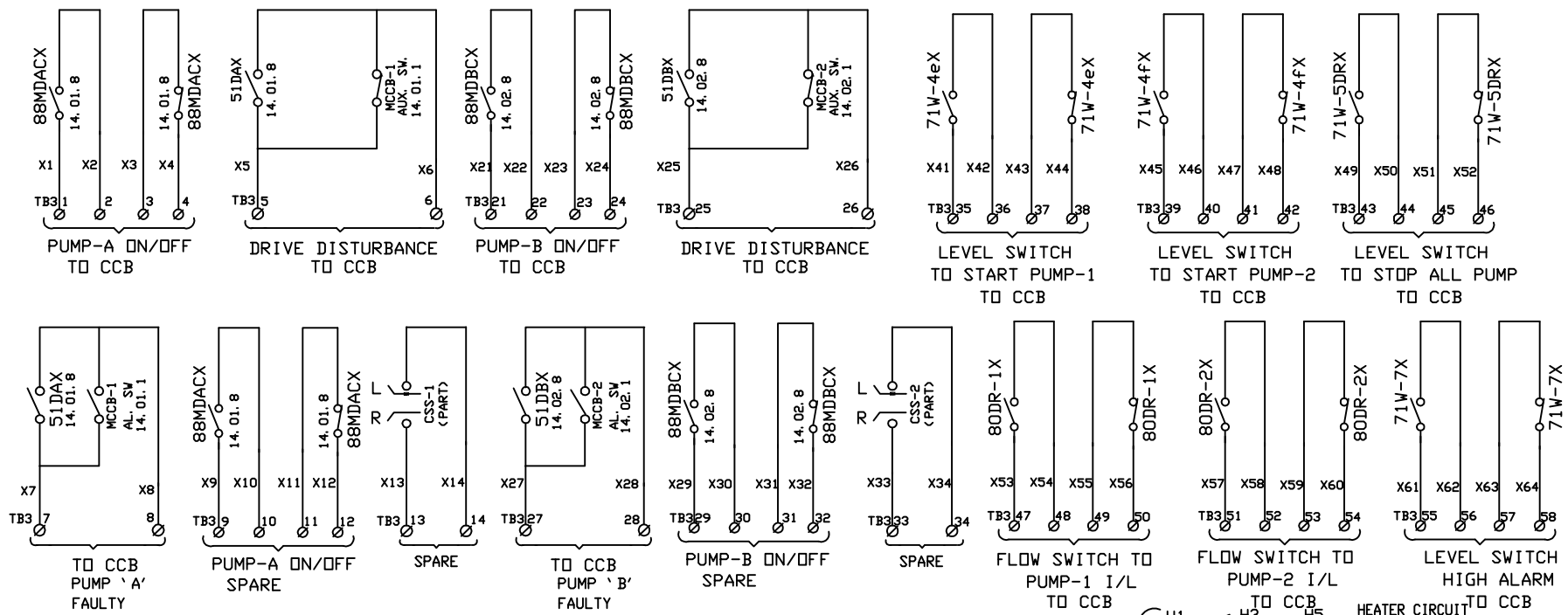
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-015 | REV. 01

DRG. NO. EP-3-CS-033-015

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

CONTACTS GOING TO OTHER CIRCUITS



CCB -COMMON CONTROL BOARD
LTAC -LTAC SUPPLY DISTRIBUTION BOARD
DRCP -DRAINAGE PUMP MOTOR CONTROL PANEL
R -SELECTOR SWITCH IN REMOTE
L -SELECTOR SWITCH IN LOCAL
Ø -TERMINAL

Qty-1Nos

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DRG. NO. EP-3-CS-033-015

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 14.06
SHEET. NO. 14.05

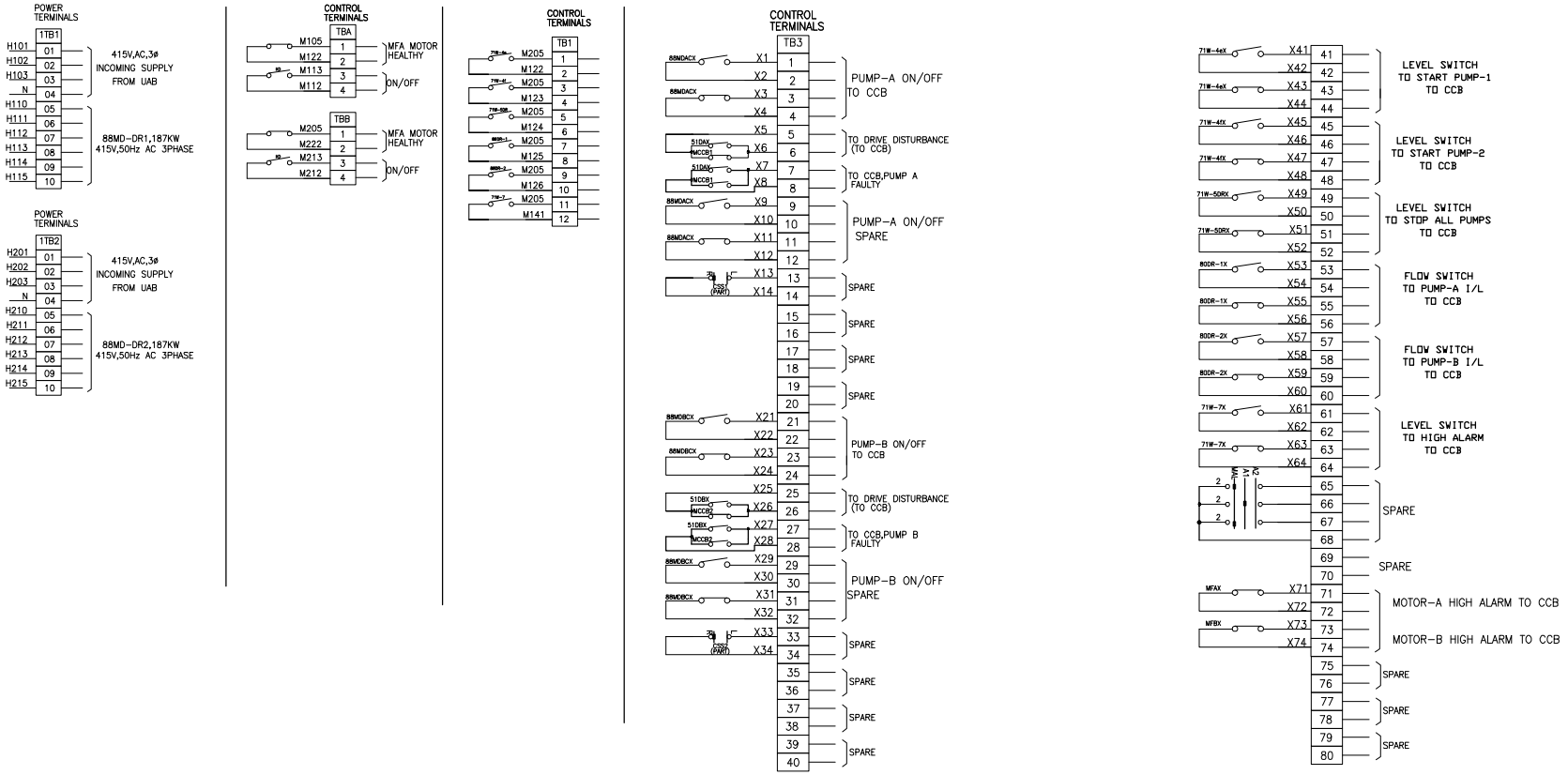
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-015 | REV. 01

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-015



Qty-1No

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

INVENTORY NO.

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 14.06
SHEET. NO. 14.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-015 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-015

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	500A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOSOOG	L&T	2	2
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM99804OOOO	L&T	1	2
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	1	2
04	88MDAC,88MDAD,D88MDBC&88MDBD	Power contactor	550A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94145BOOO	L&T	4	4
05	88MDAS&88MDBS	Power contactor	250A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94141BOOO	L&T	2	2
06	51DAX&51DBX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	2
07	88MDACX,88MDACX1,88MDBCX, 88MDBCX1,88VAB,80DR-1X,80DR-2X 71W-4EX,71W-4FX,71W-5DRX,71DPHAX, 71DPHBX,71W-7X,MAFX,MABX,KM, 71DPHAXX,71DPHBXX	Aux Contactor	Auxilary contactor with 3NO+2NC , 240VAC coil	CS94826BOOO	L&T	18	18
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	7	7
09	-	Contactor Acc	Addon contact 4NO for Aux cont	-	L&T	8	8
10	51DA&51DB	Overload Relay	180-300A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94139OOQO	L&T	2	2
11	88MDAT,88MDBT	Timer	0.1sec -30Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	2	2
12	71DPHAXT,71DPHAXTX	Timer	0.1sec - 30Sec Adjustable type, On delay Timer 6NO+2NC Aux Supply 240V AC	2AODT5	L&T	2	2
13	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	1
14	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way withoutOFF	61120	L&T	1	1
15	CT1&CT2	Current Transformer	400/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
16	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	2
17	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 400/1A, Acc. CL:1,Range:0-400-2400A with suppressed scale.	-	AE/ Meco	2	2

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-015 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
18	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	2
19	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
20	IPB2&IPB4	Green illuminated Push button	Green illuminated actuator with holder for contact block 22.5mm Dia, Ilumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	2
21	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
22	SLA1,SLA2,SLA3,SLA4 SLA5 SLA6,SLA7,SLA8&SLA9 SLA10&SLA11	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	11	11
23	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	8	8
24	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	6	6
25	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	2	2
26	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	2
27	MCB1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	1
28	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	1
29	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	2
30	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	2
31	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	2
32	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	2
33	LK1,2,LKP1-LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	4
34	ELK1,2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	2
35	TB1	Power TB	Power terminal suitable busbar link	-	Connectwell Elmex	Lot	Lot
36	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
37	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	1
38	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	1	2
	-	Panel Enclosure	Enclosure Size - H1900 x W2400 x D500mm	-	BHEL	1	1

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DRG. NO. EP-3-BM-033-015

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
DRAINAGE PUMP CONTROL PANEL (2X187KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-015 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - FLOOD DEWATWRING PUMP MCP (2X235KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-016 REV. 02

DWG. NO. : - EP-3-CS-033-016 REV. 01

DWG. NO. : - EP-3-BM-033-016 REV. 02

ASBUILT DRAWING

Qty-1Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

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DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF FLOOD DEWATWRING PUMP MCP (2X235KW)

NO. OF SHEETS 01 | SHEET. NO. 01

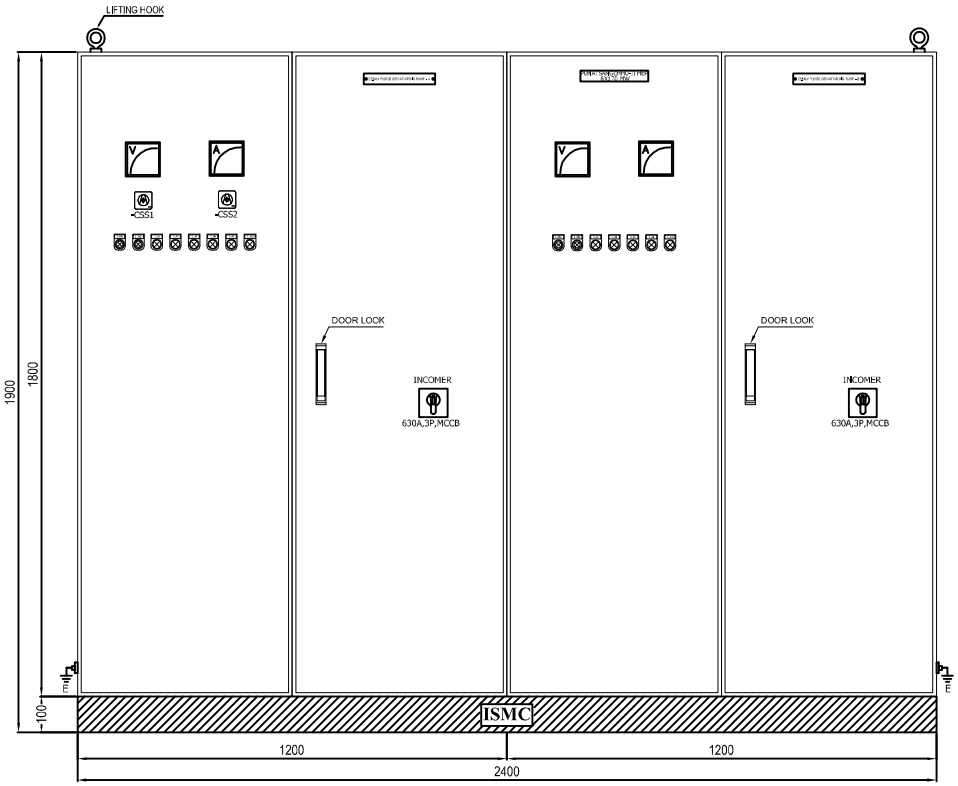
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

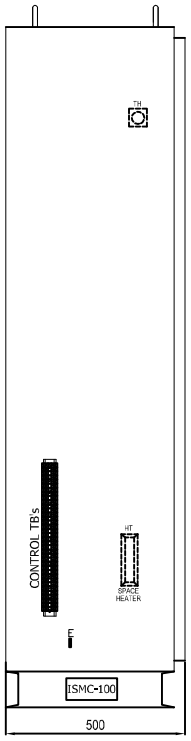
ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

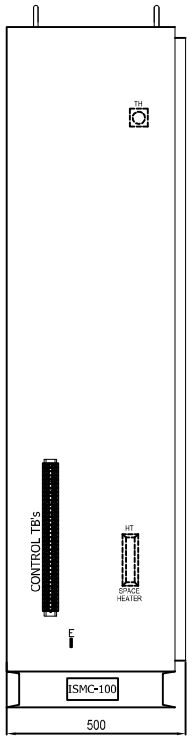
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FRONT VIEW

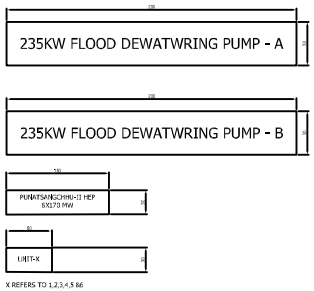


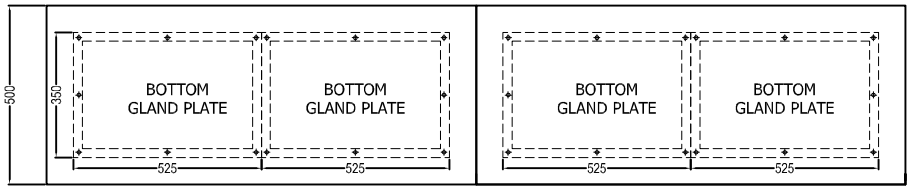
SIDE VIEW LHS SIDE



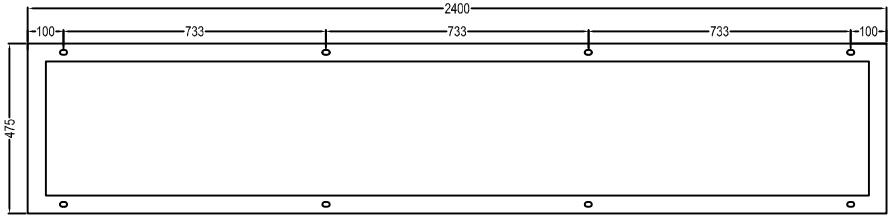
SIDE VIEW RHS SIDE

PANEL NAME PLATE





MOUNTING DETAILS - PANEL BOTTOM



FOUNDATION DETAILS

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL

Qty–1No

DRG. NO. EP–3–GA–033–016

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

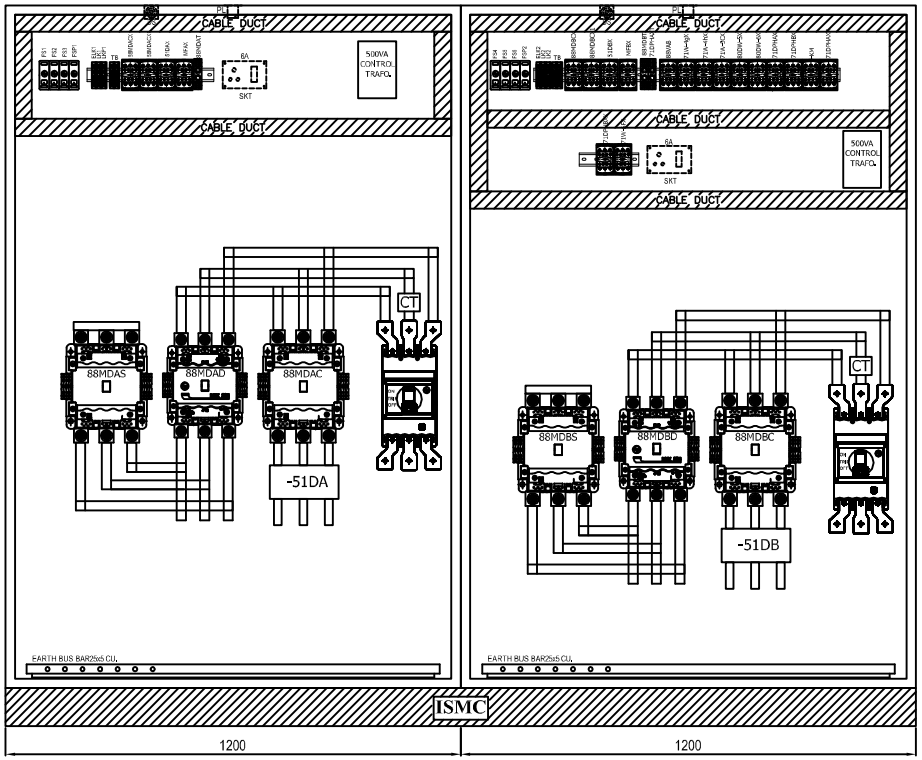
NO. OF SHEETS 15.2 | SHEET. NO. 15.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–016 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	40X8 Sqmm Copper Busbar	
LOCATION		
ELEVATION	582.0	
TENTATIVE WEIGHT		
WEIGHT	750 KG	

Qty–1No

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
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DRAWN	SAURABH		07.03.17
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CAD | DIR : | FILE NO.:

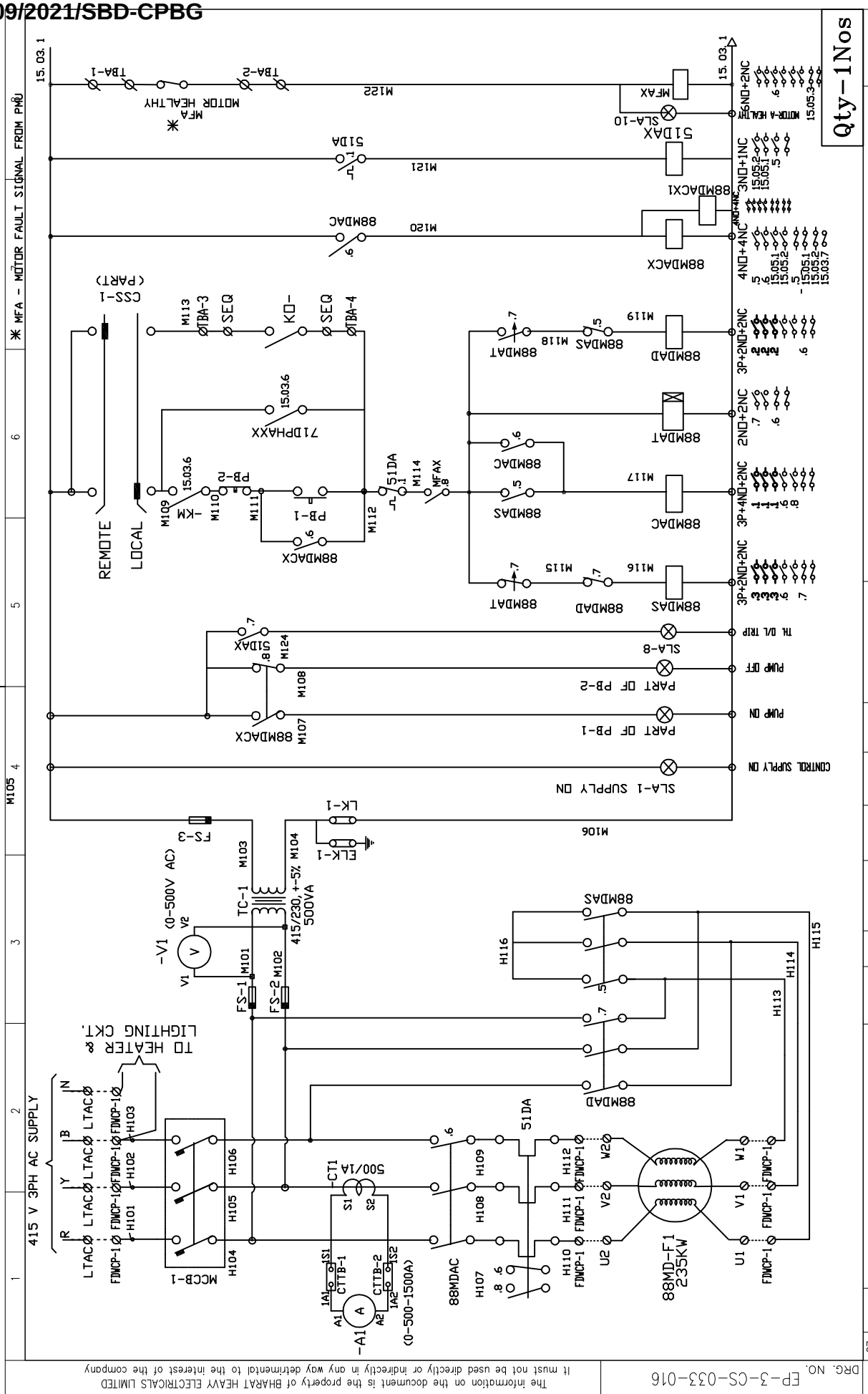
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

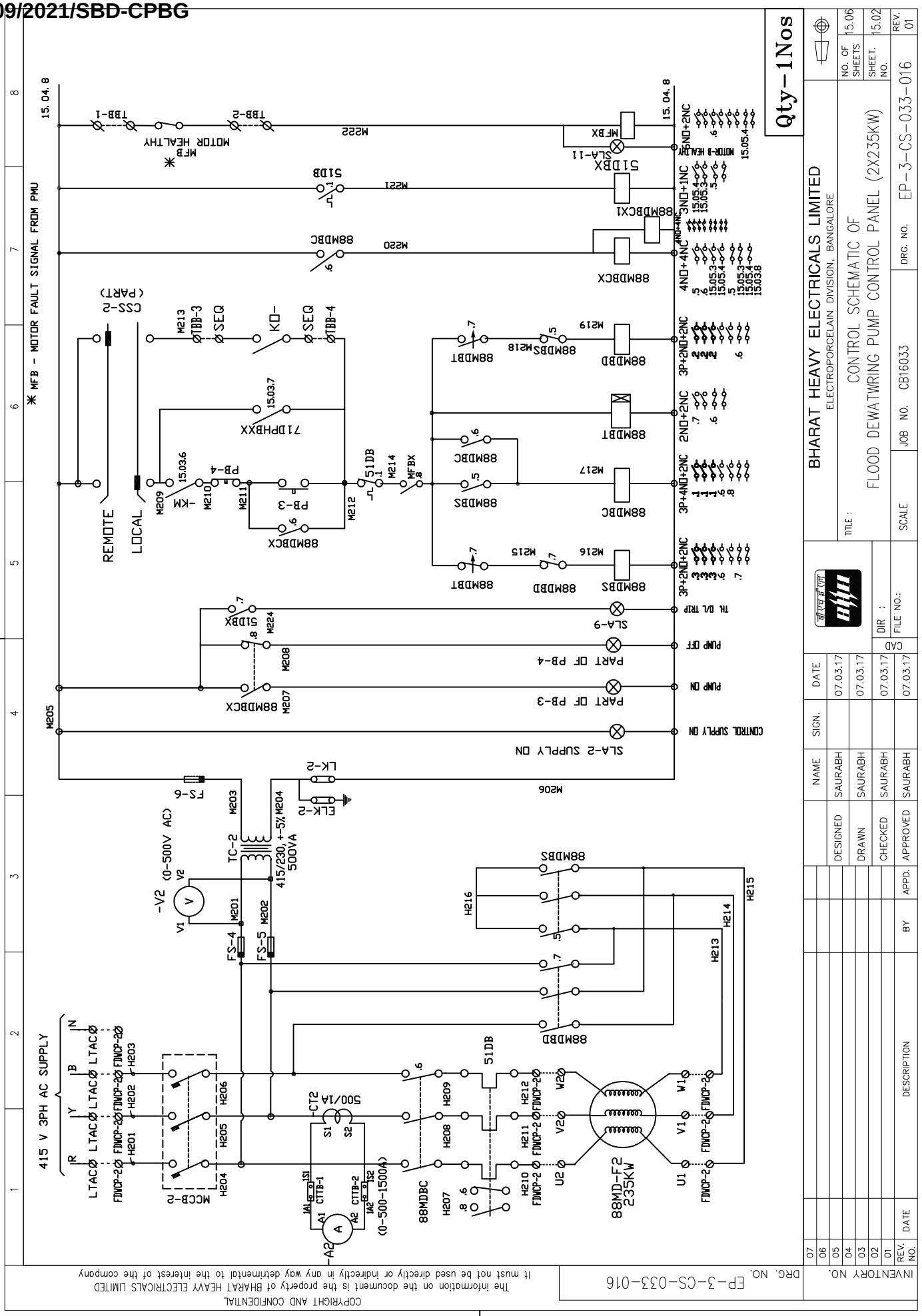
NO. OF SHEETS 15.2 | SHEET. NO. 15.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–016 | REV. 02

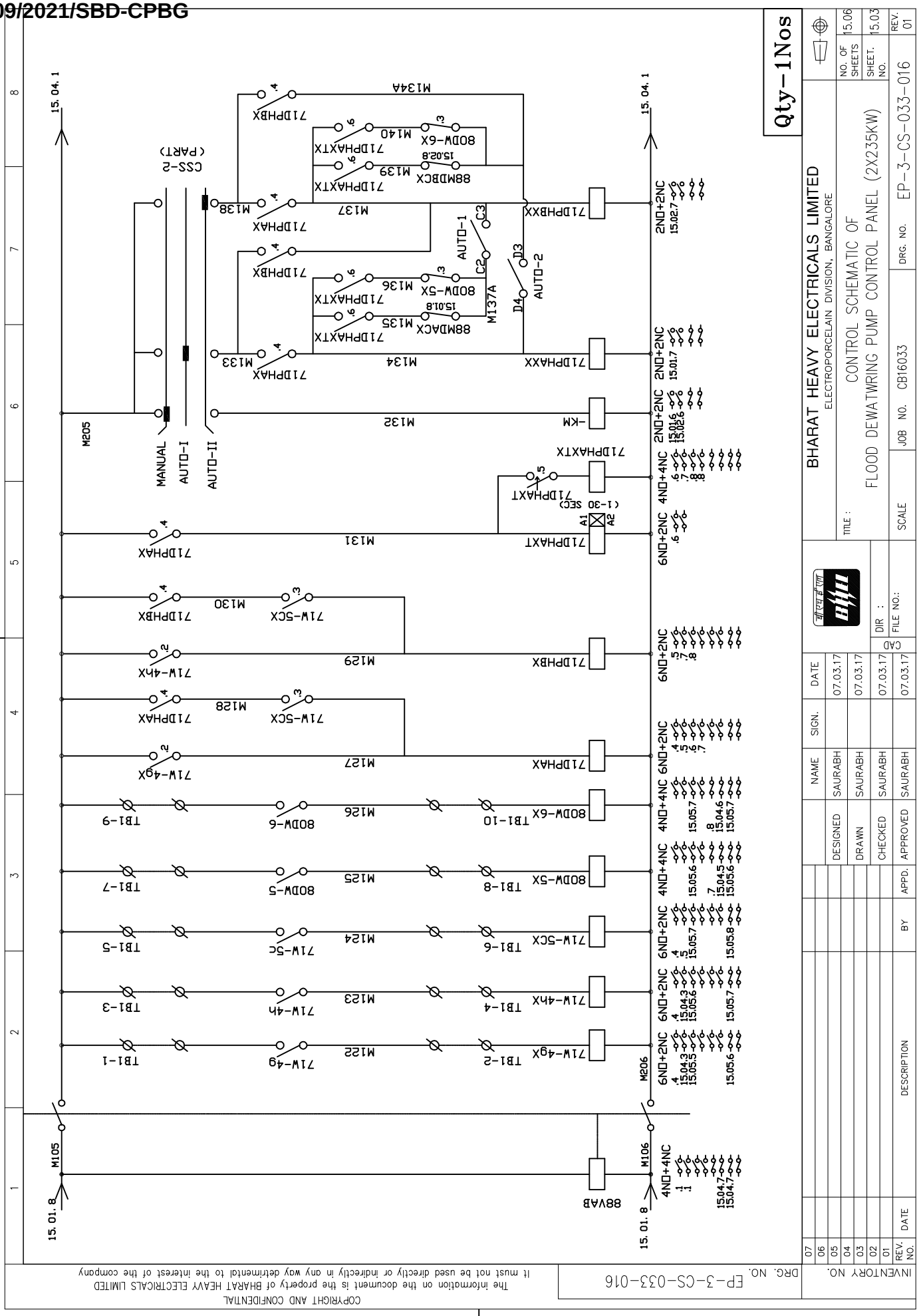
INVENTORY NO. | DRG. NO. EP–3–GA–033–016


Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)
DRG. NO. EP-3-CS-033-016
JOB NO. CB16033
SCALE
NO. OF SHEETS 15.06
SHEET NO. 15.01
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
415 V 3PH AC SUPPLY
MCCB-1
88MD-F1 235KW
88MDAC
88MDAS
88MDAT
88MDAD
88MDACX1
88MDACX
51DA
51DAX
71DPHAXX
MFA - MOTOR FAULT SIGNAL FROM PMD
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
TO HEATER & LIGHTING CKT.
REMOTE
LOCAL
MOTOR HEALTHY
SLA-1 SUPPLY ON
CONTROL SUPPLY ON
PUMP ON
PART OF PB-1
PART OF PB-2
PUMP OFF
TH. O/L TRIP
SLA-8
SLA-10
TC-1
415/230, +-5% 500VA
CT1 500/1A
CTTB-1
CTTB-2
(0-500-1500A)
(0-500V AC)
-V1
-A1
-KM
PB-1
PB-2
FS-1
FS-2
FS-3
LK-1
ELK-1
CSS-1 (PART)
SEQ
KO-
MFA
MFAX
4ND+2NC
4ND+4NC
3ND+1NC
3P+2ND+2NC
2ND+2NC
3P+4ND+2NC
3P+2ND+4NC
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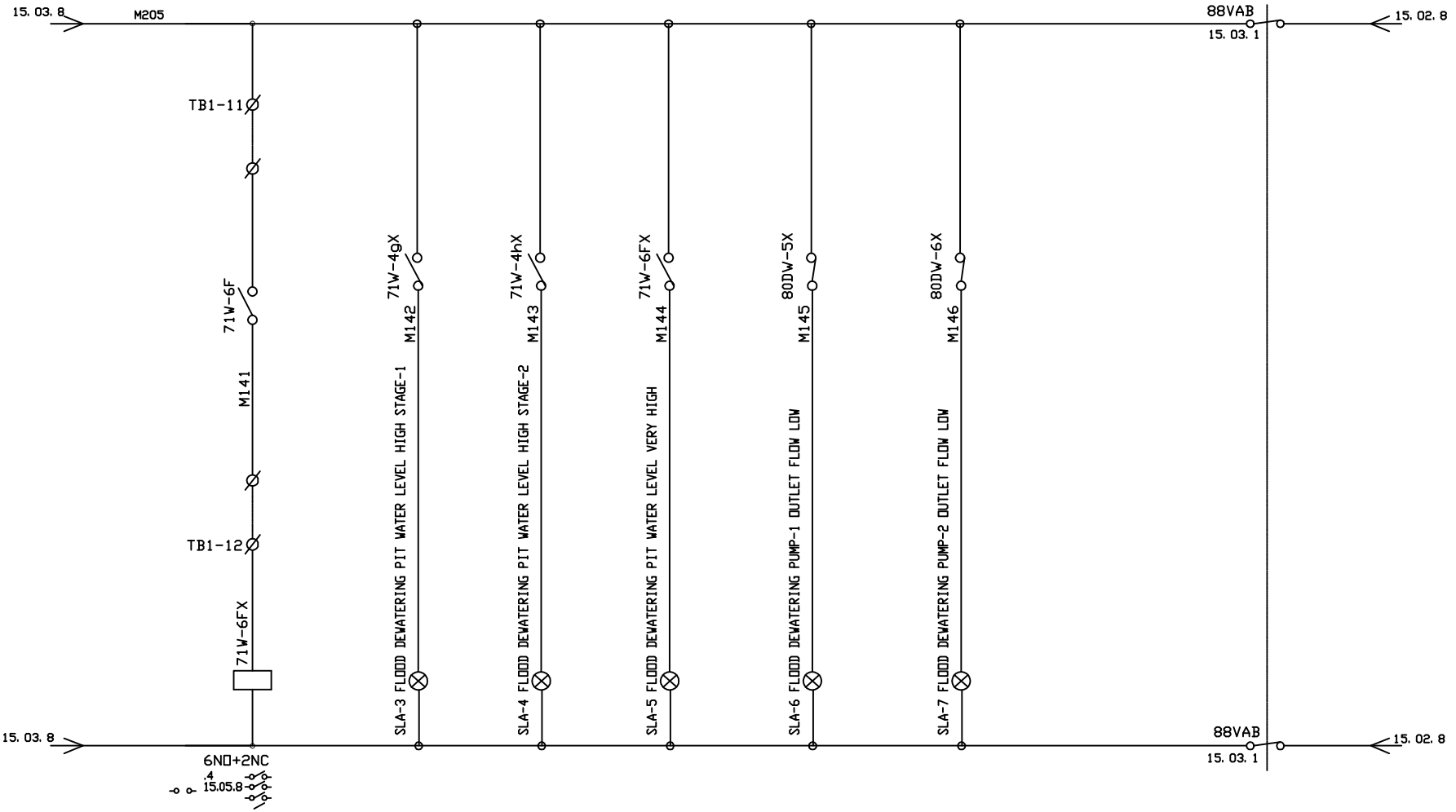
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-1Nos

DRG. NO. EP-3-CS-033-016

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02				
	01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

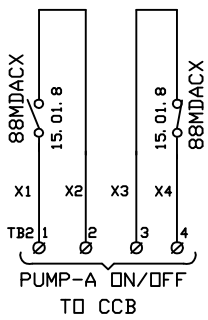
NO. OF SHEETS 15.06 | SHEET. NO. 15.04

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-016 | REV. 01

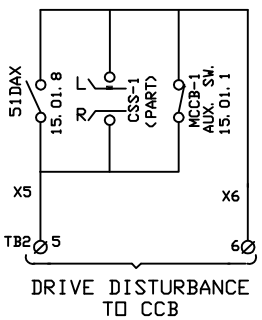
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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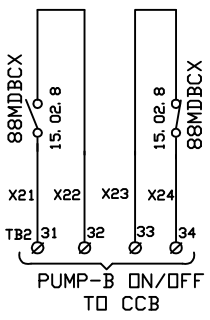
CONTACTS GOING TO OTHER CIRCUITS



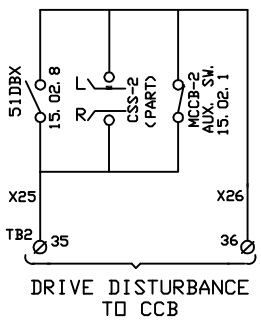
PUMP-A ON/OFF TO CCB



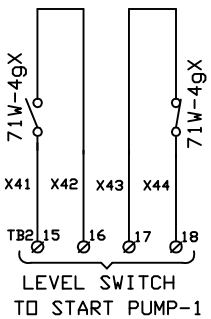
DRIVE DISTURBANCE TO CCB



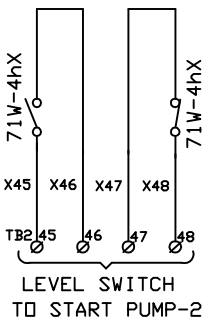
PUMP-B ON/OFF TO CCB



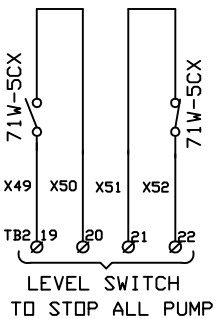
DRIVE DISTURBANCE TO CCB



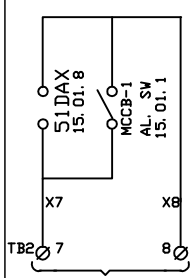
LEVEL SWITCH TO START PUMP-1 TO CCB



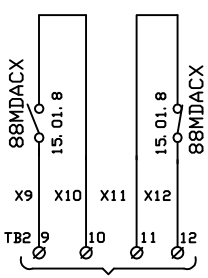
LEVEL SWITCH TO START PUMP-2 TO CCB



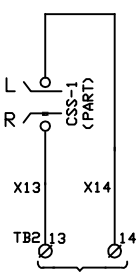
LEVEL SWITCH TO STOP ALL PUMP TO CCB



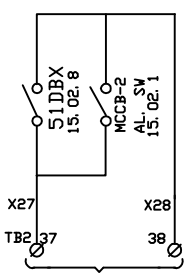
PUMP 'A' FAULTY



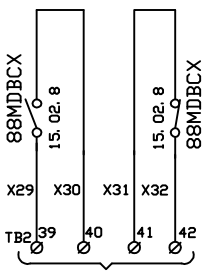
PUMP-A ON/OFF SPARE



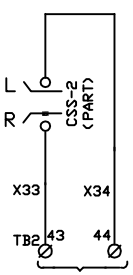
SPARE



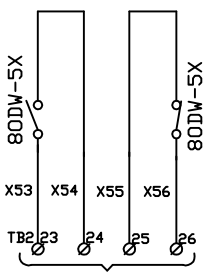
TO CCB PUMP 'B' FAULTY



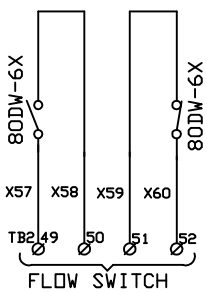
PUMP-B ON/OFF SPARE



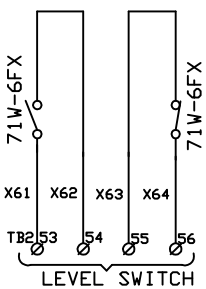
SPARE



FLOW SWITCH TO PUMP-1 I/L TO CCB



FLOW SWITCH TO PUMP-2 I/L TO CCB

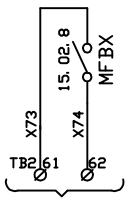


LEVEL SWITCH TO HIGH ALARM TO CCB

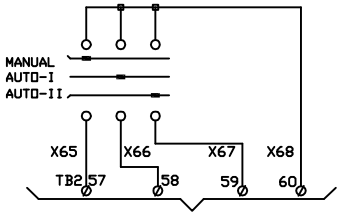
CCB -COMMON CONTROL BOARD
LTAC -LTAC SUPPLY DISTRIBUTION BOARD
FDWCP-FLOOD DEWATERING PUMP MOTOR CONTROL PANEL
R -SELECTOR SWITCH IN REMOTE
L -SELECTOR SWITCH IN LOCAL
Ø -TERMINAL



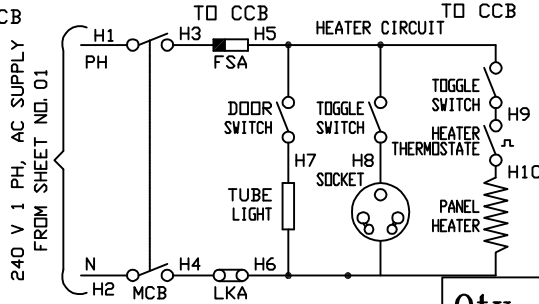
MOTOR-A HEALTHY TO CCB



MOTOR-B HEALTHY TO CCB



SPARE



SAME CIRCUIT FOR EACH PANEL

Qty-1Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

NO. OF SHEETS 15.06 | SHEET. NO. 15.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-016 | REV. 01

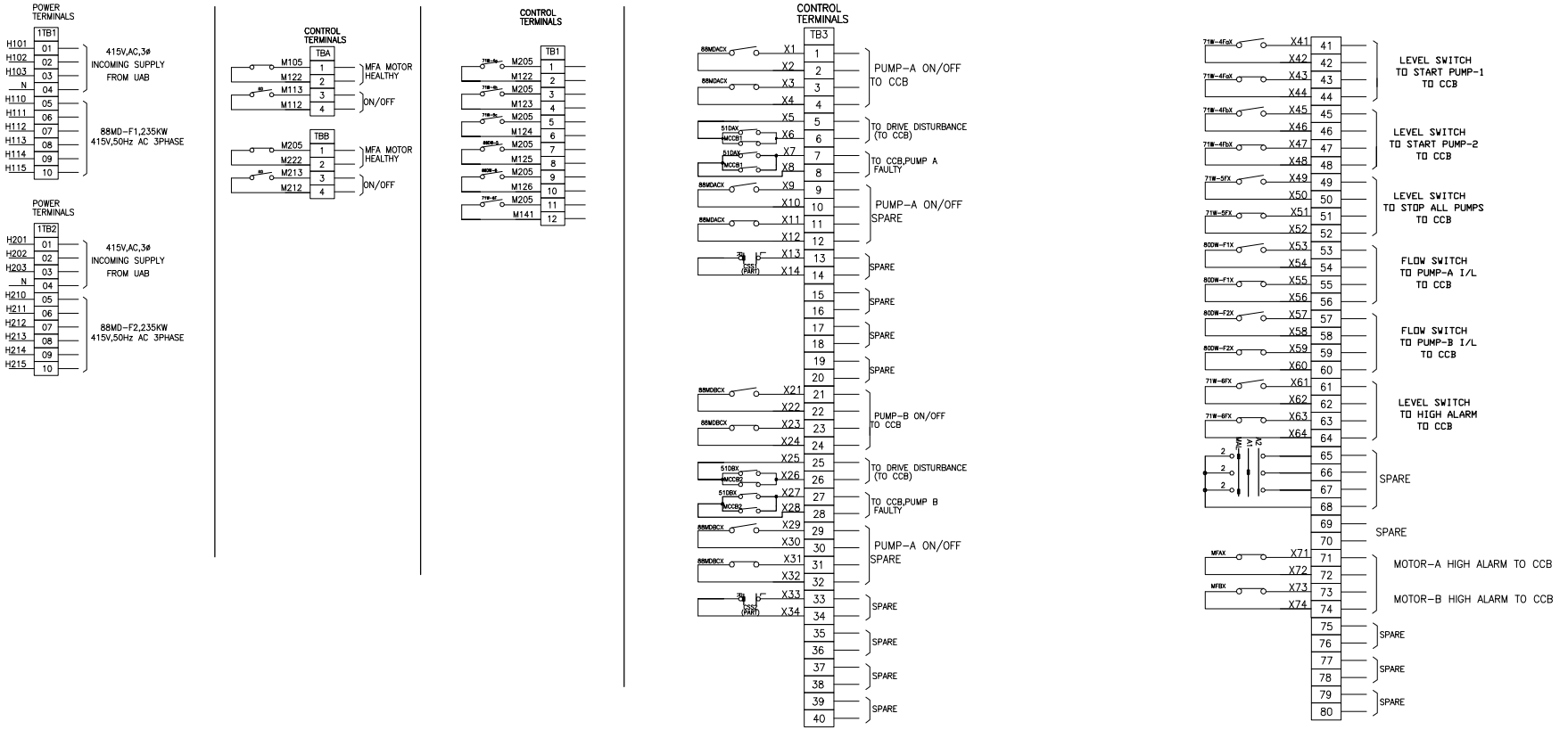
INVENTORY NO. | DRG. NO. EP-3-CS-033-016

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-CS-033-016



Qty-1No

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
	01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

NO. OF SHEETS 15.06
SHEET. NO. 15.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-016 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-BM-033-016

BILL OF MATERIAL

SI No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	630A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM94515OOTOOG	L&T	2	2
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM99804OOOO	L&T	1	2
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM99861OOOO	L&T	1	2
04	88MDAC,88MDAD 88MDBC&88MDBD	Power contactor	630A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS96327BOOO	L&T	4	4
05	88MDAS&88MDBS	Power contactor	300A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS90280BOOO	L&T	2	2
06	51DAX&51DBX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	2
07	88MDACX,88MDACX1,MFAX, 88MDBCX,88MDBCX1,MFBX,88VAB 71W-4gX,71W-4hX,71W-5CX 80DW-6X,71DPHAX,71DPHBX KM,71DPHAXX,71DPHBXX 71W-6FX,80DW-5X	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	18	18
08	-	Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	7	7
09	-	Contactor Acc	Addon contact 4NO for Aux cont	-	L&T	8	8
10	51DA&51DB	Overload Relay	180-300A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94139OOQO	L&T	2	2
11	88MDAT,88MDBT,	Timer	1sec - 30Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	2	2
12	71DPHXAT	Timer	1sec - 30Sec Adjustable type, On delay Timer 6NO+2NC Aux Supply 240V AC	2AODT5	L&T	1	1
13	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	L&T	1	1
14	CSS2	Local/Remote Slection	6A, Auto1/Auto2/Man selector switch,6pole 3way withoutOFF	61120	L&T	1	1
15	CT1&CT2	Current Transformer	500/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
16	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	2
17	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 500/1A, Acc. CL:1,Range:0-500-3000A with suppressed scale.	-	AE/ Meco	2	2

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-016 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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DRG. NO. EP-3-BM-033-016

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
18	IPB1&IPB3	Red illuminated Push button	Red, illuminated actuator with holder for contact block 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	2
19	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
20	IPB2&IPB4	Green illuminated Push button	Green illuminated actuator with holder for contact block 22.5mm Dia,Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	2
21	-	IPB Acc	1NO+1NC add on contact	EC1C&EC2C	L&T	2	2
22	SLA1,SLA2,SLA3,SLA4 SLA5 SLA6,SLA7,SLA8&SLA9 SLA10&SLA11	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	11	11
23	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	8	8
24	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	6	6
25	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	1	2
26	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	1	2
27	MCB1	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	1
28	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	1	2
29	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	1	2
30	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	1	2
31	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	1	2
32	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	1	2
33	LK1,2,LKP1- LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	4
34	ELK1,2	Earth Link	Disconnecting type terminal block for Earth link	-	Connectwell Elmex	2	2
35	TB1	Power TB	Power terminal suitable busbar link	-	Connectwell Elmex	Lot	Lot-
36	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
37	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	1
38	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	1	2
39	-	Panel Enclosure	Enclosure Size - H1900 x W2400 x D500mm	-	BHEL	1	1

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
FLOOD DEWATWRING PUMP CONTROL PANEL (2X235KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-016 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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TITLE : - PENSTOCK VALVE OPU PUMP MCP (2x22kW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-018 REV. 02

DWG. NO. : - EP-3-CS-033-018 REV. 01

DWG. NO. : - EP-3-BM-033-018 REV. 02

ASBUILT DRAWING

Qty-3Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF PENSTOCK VALVE OPU PUMP MCP (2x22kW)

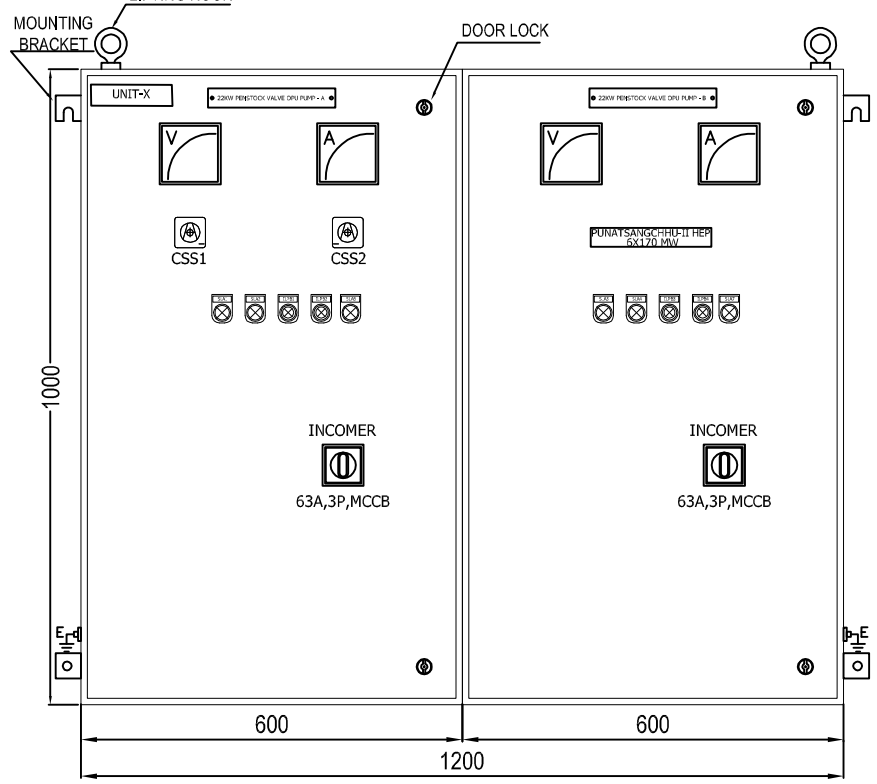
NO. OF SHEETS 01 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

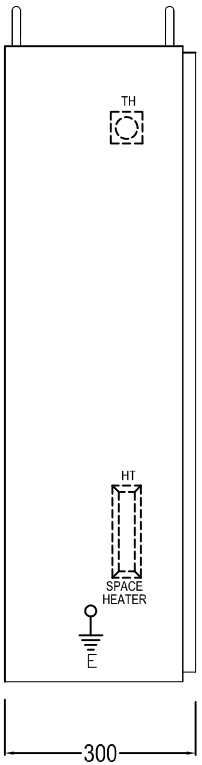
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 (200)

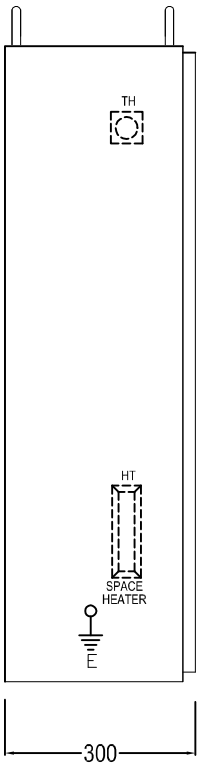
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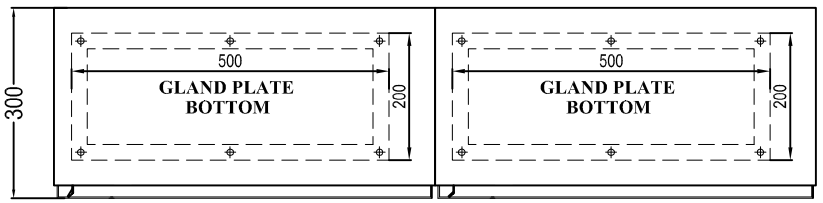
FRONT VIEW



SIDE VIEW LHS SIDE



SIDE VIEW RHS SIDE



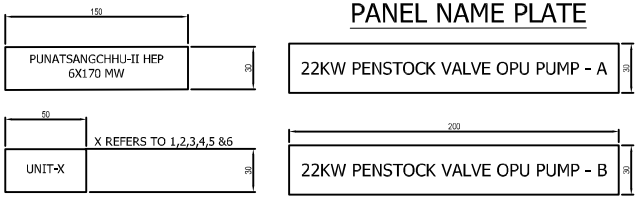
MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty–3Nos

PANEL NAME PLATE



REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2x22kW)

NO. OF SHEETS 17.2 | SHEET. NO. 17.1

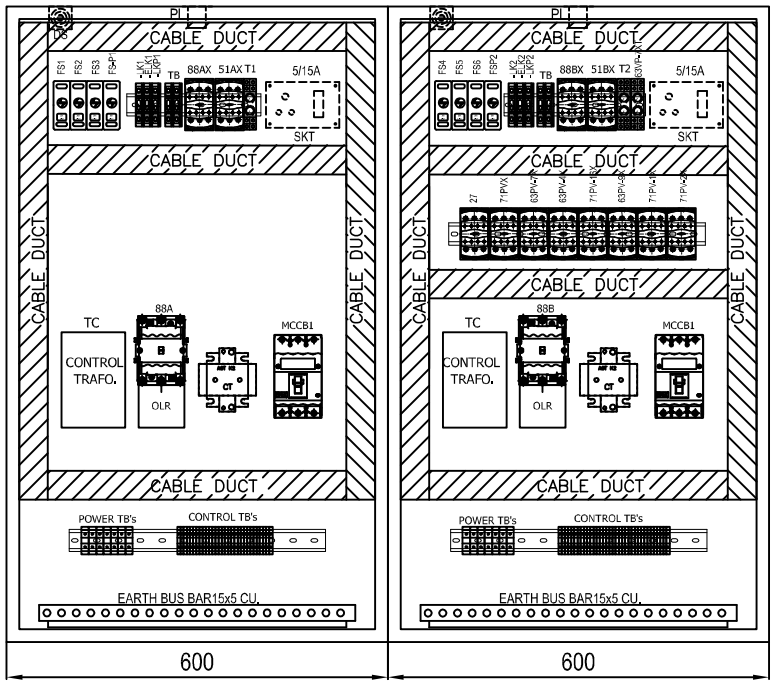
SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–018 | REV. 02

INVENTORY NO. | DRG. NO. EP–3–GA–033–018

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	BF VALVE HOUSE	
TENTATIVE WEIGHT		
WEIGHT	450 KG	

Qty–3Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

INVENTORY NO.

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

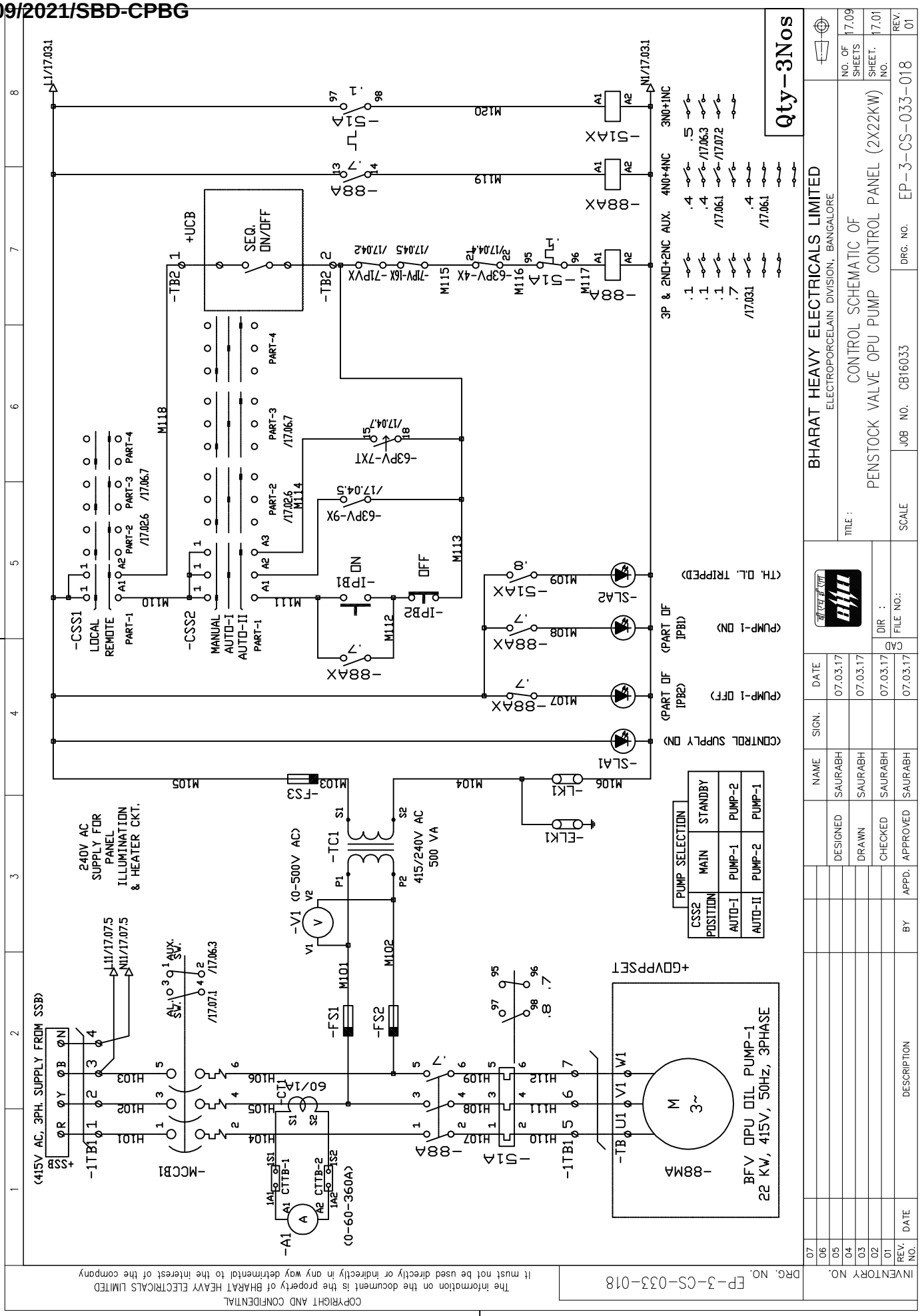
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

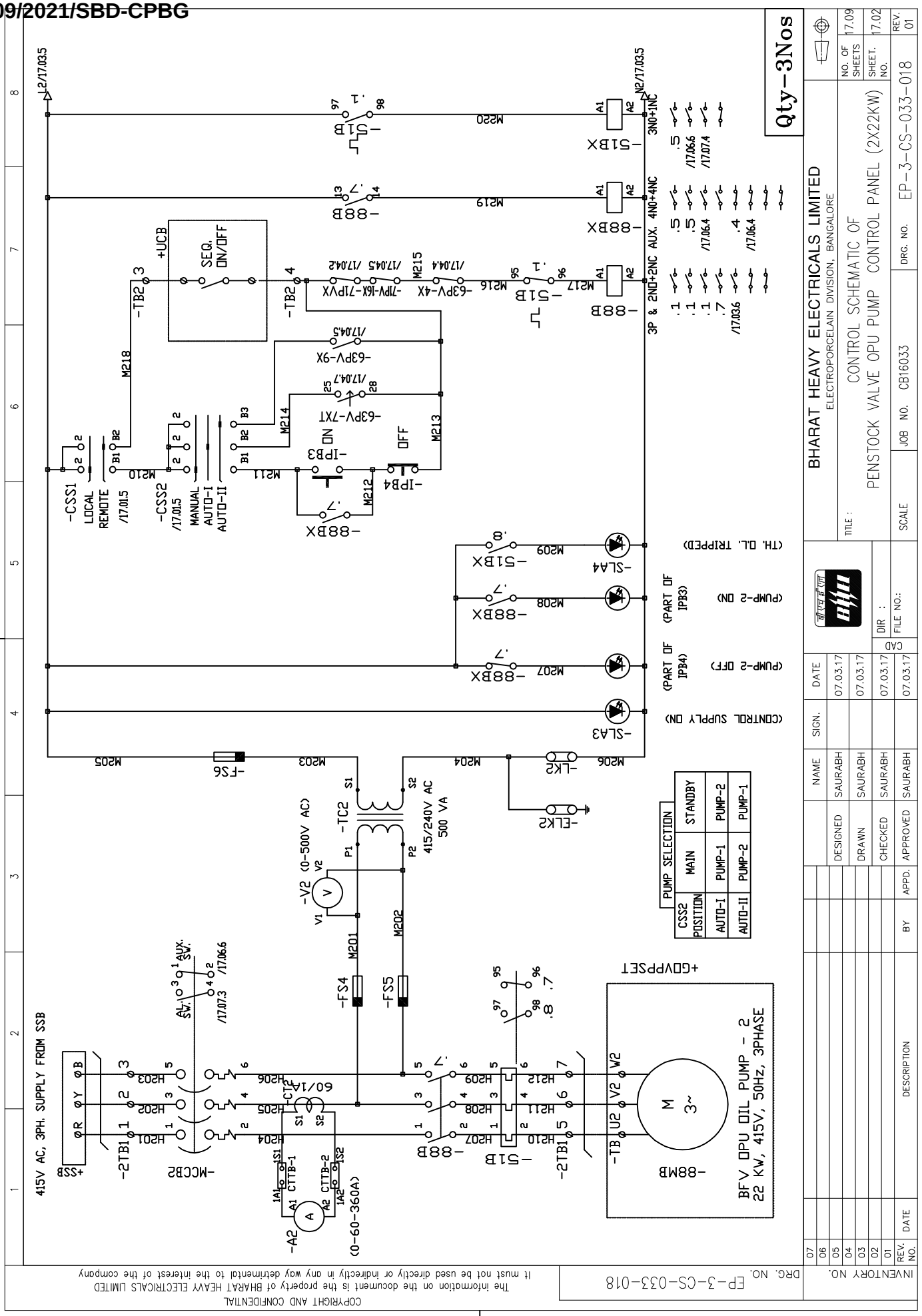
TITLE : GENERAL ARRANGEMENT OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2x22kW)

NO. OF SHEETS 17.2
SHEET. NO. 17.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–018 | REV. 02

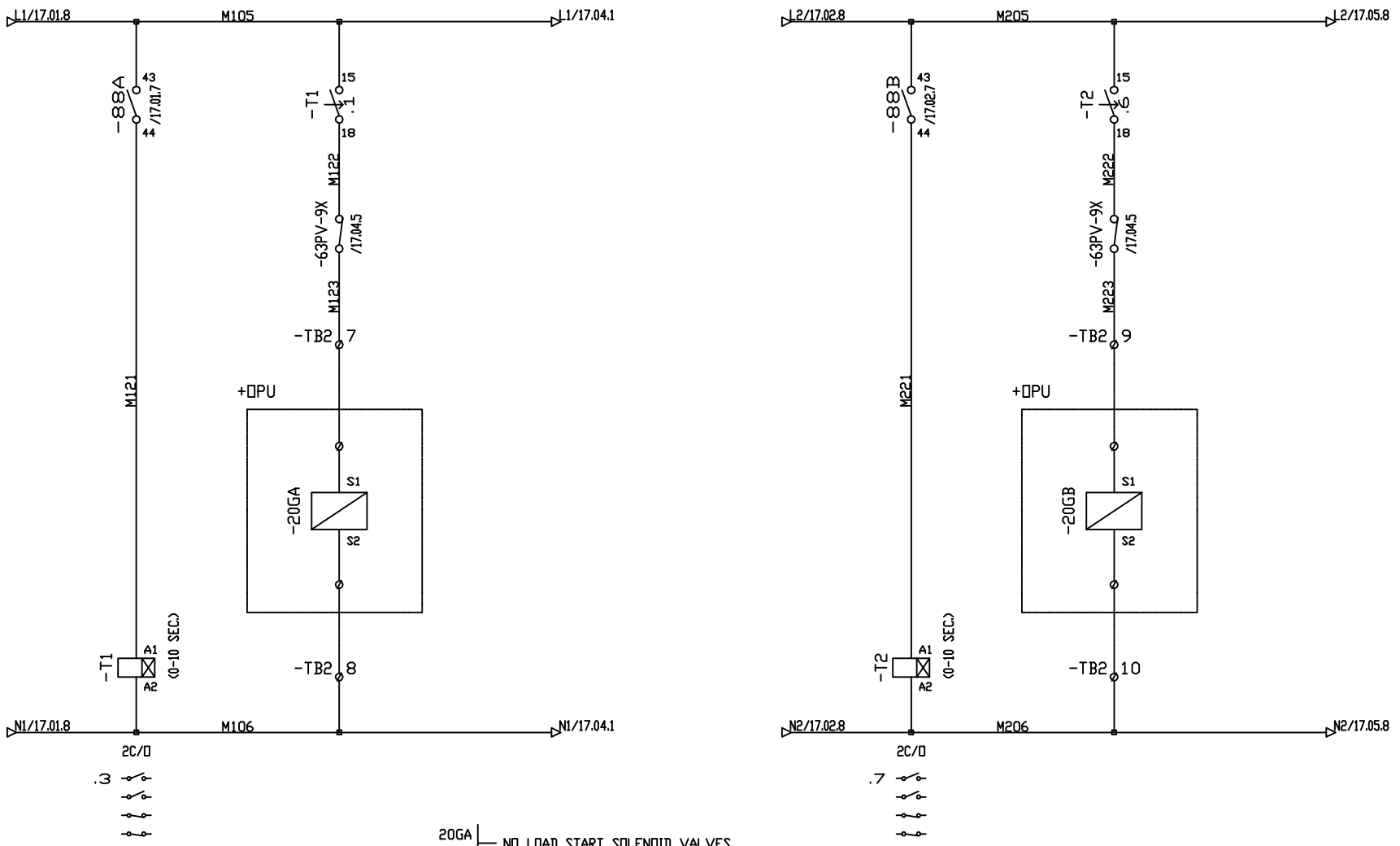
DRG. NO. EP–3–GA–033–018


BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)
SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-018
NO. OF SHEETS 17.09
SHEET. NO. 17.01
REV. 01
Qty-3Nos
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DIR :
FILE NO.:
CAD
DESCRIPTION
DATE
BY
APPD.
REV. NO.
INVENTORY NO.
DRG. NO. EP-3-CS-033-018
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-88MA
BFV OPU OIL PUMP-1
22 KW, 415V, 50Hz, 3PHASE
-MCCB1
-TC1
415/240V AC
500 VA
240V AC
SUPPLY FOR
PANEL
ILLUMINATION
& HEATER CKT.
(415V AC, 3PH. SUPPLY FROM SSB)
+SSB
-1TB1
-CSS1
LOCAL
REMOTE
-CSS2
MANUAL
AUTO-I
AUTO-II
-IPB1
-IPB2
-SLA1
-SLA2
-FS1
-FS2
-FS3
-FLK1
-LK1
-TB2
+UCB
SEQ.
ON/OFF
-63PV-7XT
-63PV-9X
-63PV-4X
-71PV-16X
-71PV-7X
-51A
-51AX
-88A
-88AX
-A1
(0-60-360A)
(CONTROL SUPPLY ON)
(PUMP-I OFF)
(PART OF IPB2)
(PUMP-I ON)
(PART OF IPB1)
(TH. O.L. TRIPPED)
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
AUTO-I
PUMP-1
PUMP-2
AUTO-II
PUMP-2
PUMP-1
+GOVPPSET
-TB
-CTI
60/1A
-V1 (0-500V AC)
3P & 2ND+2NC AUX.
4NO+4NC
3NO+1NC


Qty-3Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)
EP-3-CS-033-018
JOB NO. CB16033
SCALE
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
415V AC, 3PH. SUPPLY FROM SSB
BFV OPU OIL PUMP - 2
22 KW, 415V, 50Hz, 3PHASE
PUMP SELECTION
CSS2 POSITION
MAIN
STANDBY
AUTO-I
PUMP-1
PUMP-2
AUTO-II
PUMP-2
PUMP-1
415/240V AC
500 VA
(0-500V AC)
(0-60-360A)
(CONTROL SUPPLY ON)
(PUMP-2 OFF)
(PUMP-2 ON)
(TH. O.L. TRIPPED)
LOCAL
REMOTE
MANUAL
AUTO-I
AUTO-II
SEQ. ON/OFF
3P & 2ND+2NC AUX. 4NO+4NC
3NO+1NC
DESIGNED
DRAWN
CHECKED
APPROVED
SAURABH
07.03.17
DESCRIPTION
DATE
BY
APPD.
INVENTORY NO.
DRG. NO. EP-3-CS-033-018
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Qty-3Nos

DRG. NO. EP-3-CS-033-018

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

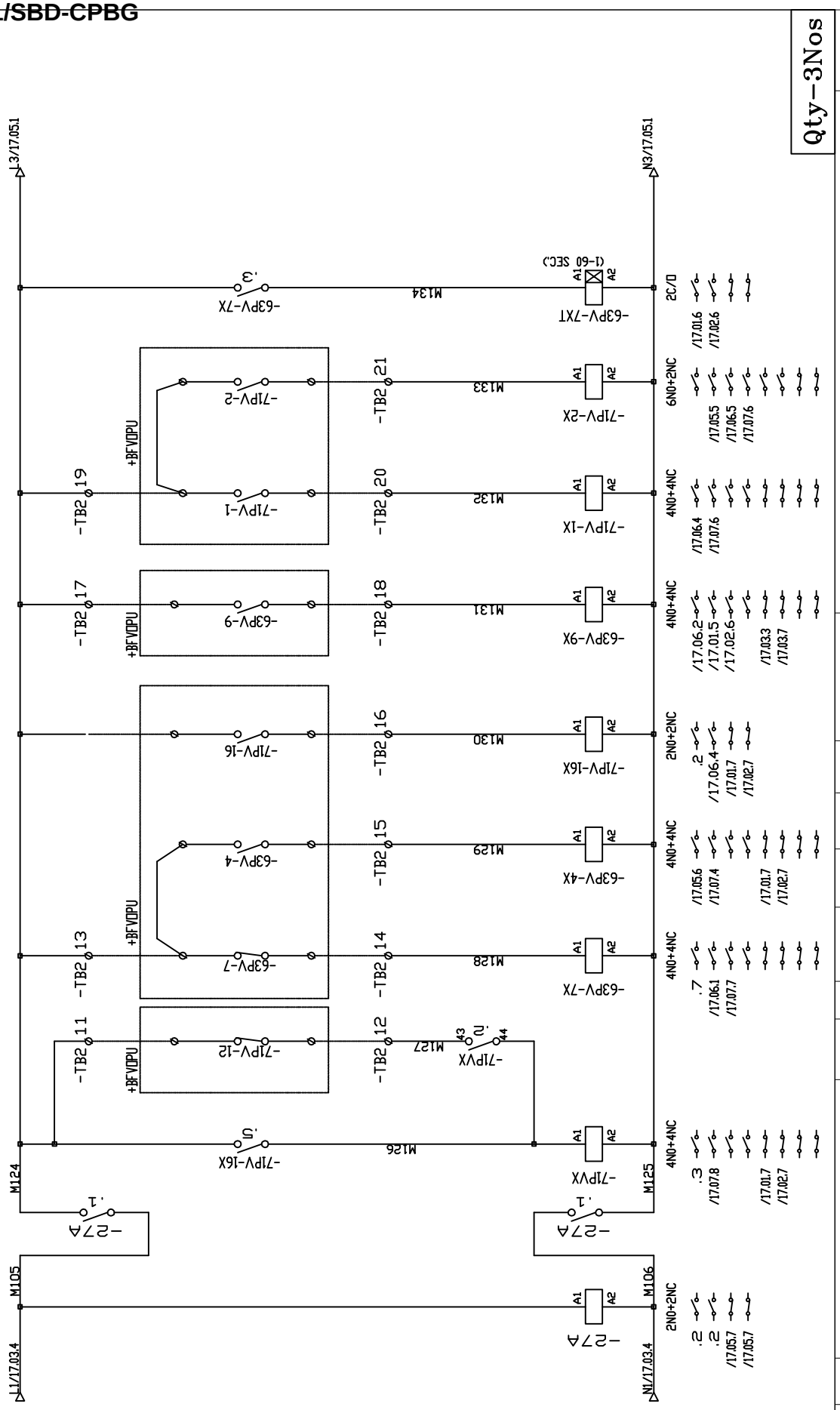
CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

NO. OF SHEETS 17.09
SHEET. NO. 17.03

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 01



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REV. NO.	DATE	DESCRIPTION	BY	APPD.							

		NAME	SIGN.	DATE
DESIGNED		SAURABH		07.03.17
DRAWN		SAURABH		07.03.17
CHECKED		SAURABH		07.03.17
APPROVED		SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018

NO. OF SHEETS 17.09 | SHEET NO. 17.04 | REV. 01

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

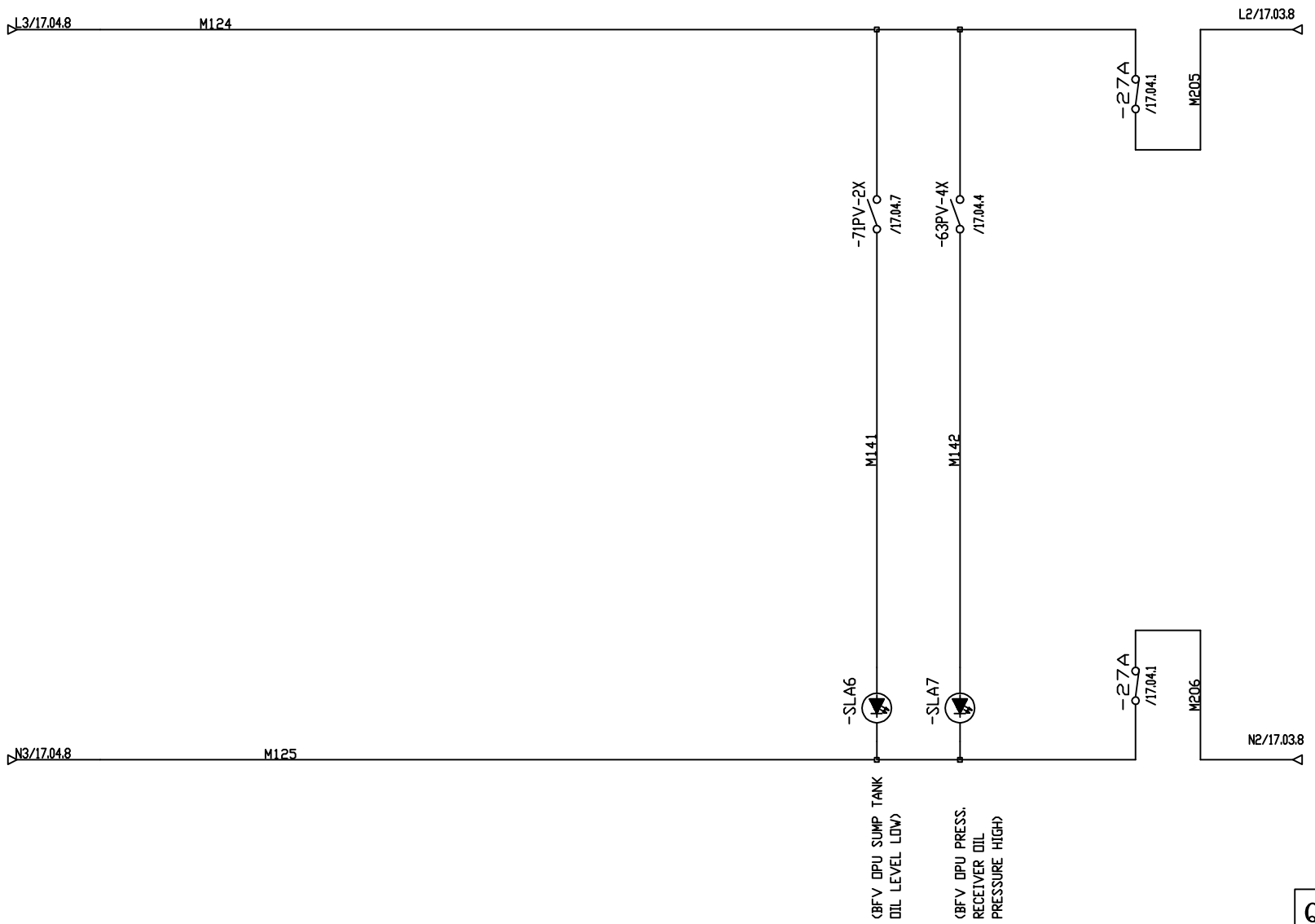
INVENTORY NO.

DRG. NO. EP-3-CS-033-018

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Qty-3Nos

DRG. NO. EP-3-CS-033-018

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

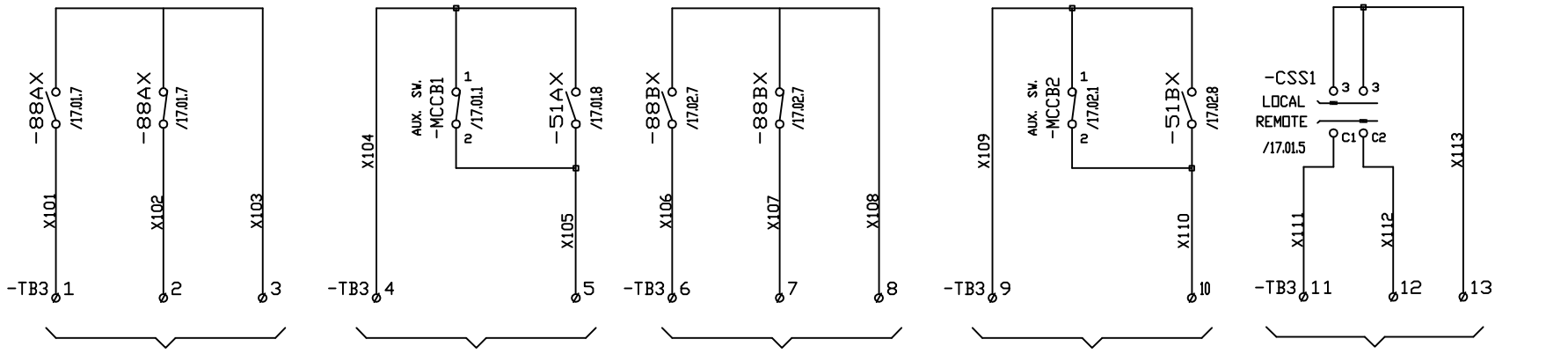
TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

NO. OF SHEETS 17.09
SHEET. NO. 17.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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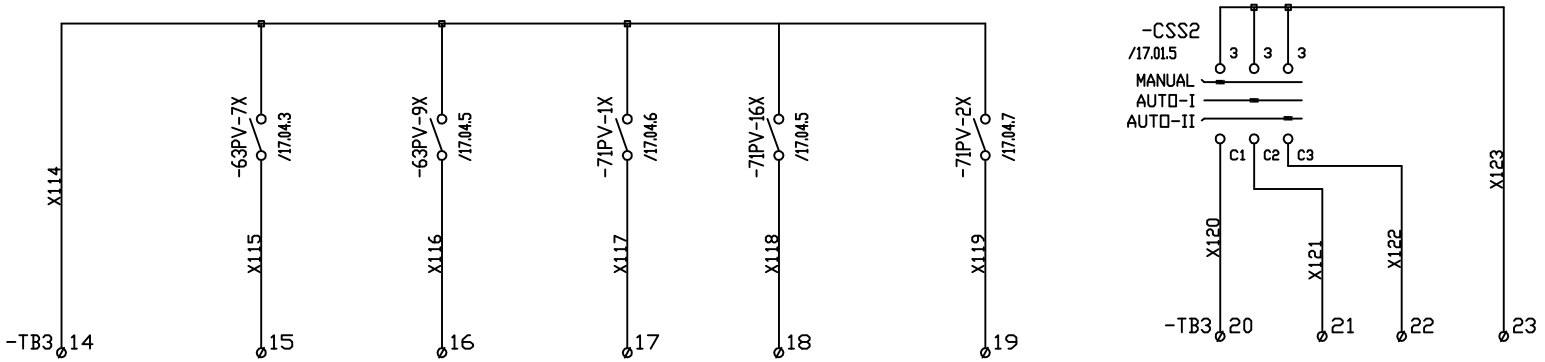
(BFV. OIL PUMP-1 ON/OFF) (TO CCB)

(BFV. OIL PUMP-1 LOCAL DRIVE DISTURBANCE) (TO CCB)

(BFV. OIL PUMP-2 ON/OFF) (TO CCB)

(BFV. OIL PUMP-2 LOCAL DRIVE DISTURBANCE) (TO CCB)

(BFV. OIL PUMPS CONTROL LOCAL/REMOTE SELECTION) (TO CCB)



(BFV. OIL PRESS LOW TO START/STOP STANDBY PUMP) (TO CCB)

(BFV. OIL PRESS LOW TO START/STOP MAIN PUMP) (TO CCB)

(BFV. OPU SUMP TANK OIL LEVEL HIGH) (TO CCB)

(BFV. OPU SUMP TANK OIL LEVEL VERY LOW TO STOP) (TO CCB)

(BFV. OPU SUMP TANK OIL LEVEL LOW) (TO CCB)

(BFV. OIL PUMPS CONTROL MANUAL/AUTO-I/AUTO-II SELECTION) (TO CCB)

Qty-3Nos

DRG. NO. EP-3-CS-033-018

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

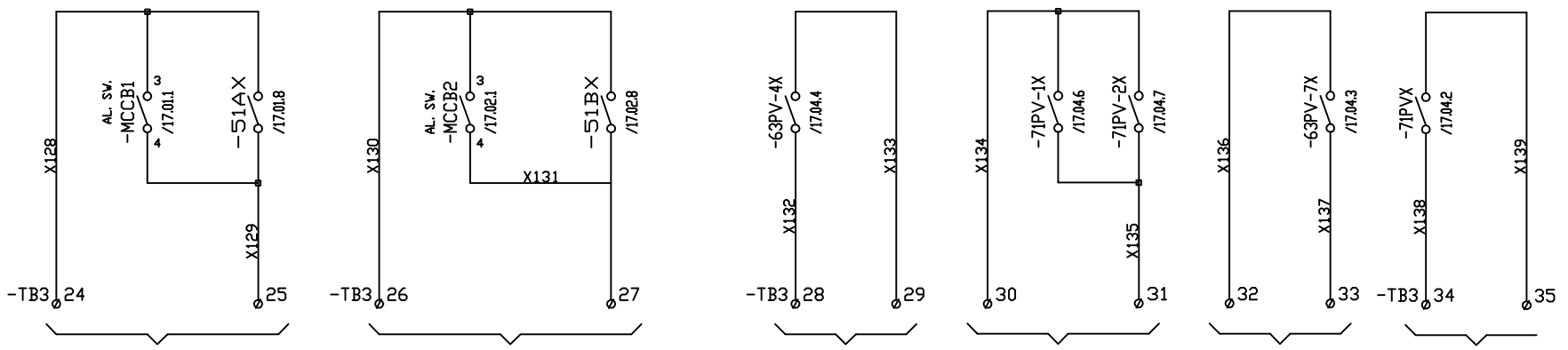
TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

NO. OF SHEETS 17.09
SHEET. NO. 17.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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(BFV OIL PUMP-1 MOTOR TH. O.L./MCCB TRIPPED) (TO CCB)

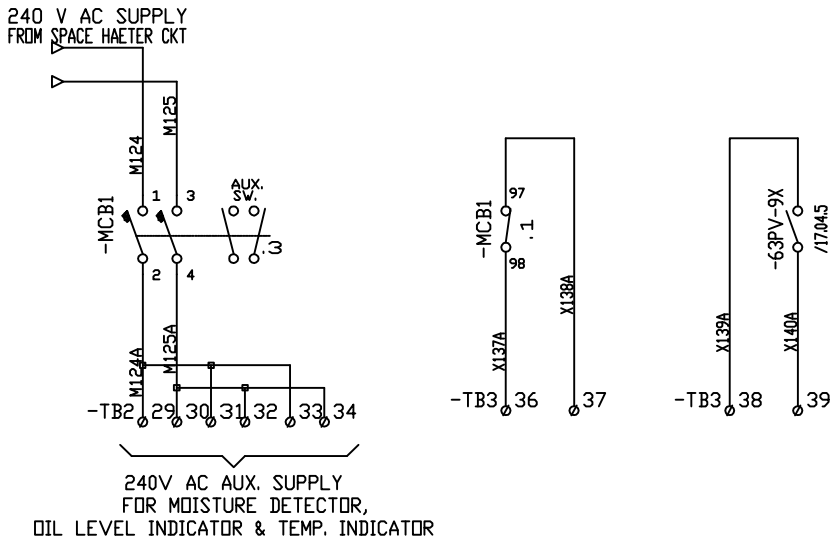
(BFV OIL PUMP-2 MOTOR TH. O.L./MCCB TRIPPED) (TO CCB)

(ALARM- BFV PRESSURE RECEIVER OIL PRESS. HIGH) (TO CCB)

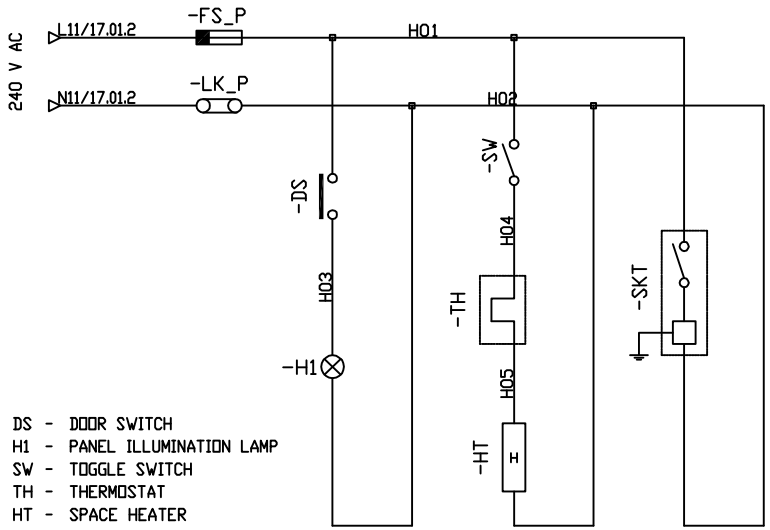
SPARE

SPARE

SPARE



240V AC AUX. SUPPLY
FOR MOISTURE DETECTOR,
OIL LEVEL INDICATOR & TEMP. INDICATOR



DS - DOOR SWITCH
H1 - PANEL ILLUMINATION LAMP
SW - TOGGLE SWITCH
TH - THERMOSTAT
HT - SPACE HEATER
SKT - SOCKET WITH SWITCH

Qty-3Nos

DRG. NO. EP-3-CS-033-018

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

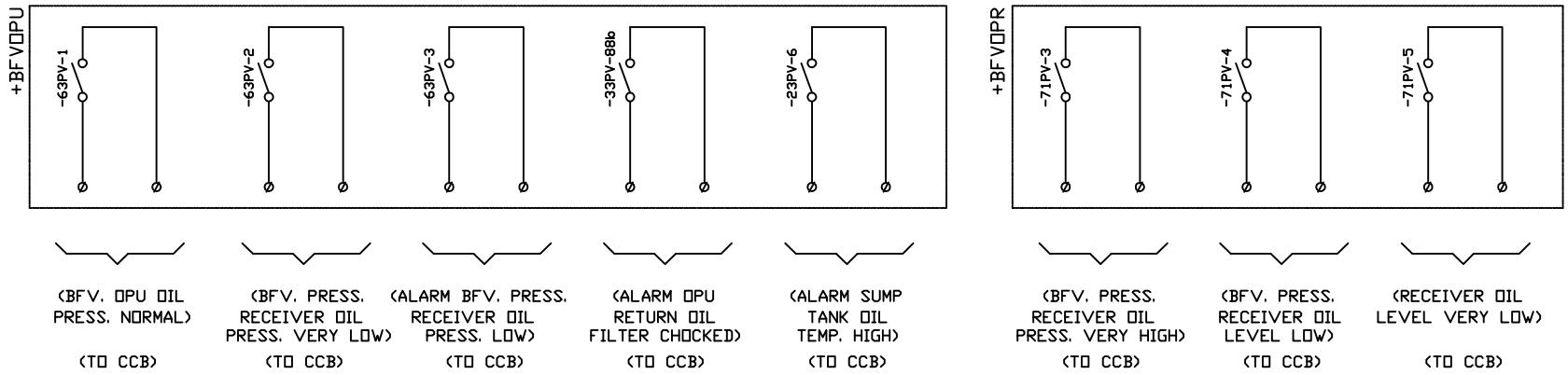
NO. OF SHEETS 17.09 | SHEET. NO. 17.07

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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Qty-3Nos

DRG. NO. EP-3-CS-033-018

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2X22KW)

NO. OF SHEETS 17.09 | SHEET. NO. 17.08

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 01

FIRST ANGLE PROJECTION

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DRG. NO. EP-3-CS-033-018

INVENTORY NO.

POWER TERMINALS

1TB1

H101	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H102	02	
H103	03	
N	04	
H110	05	BFV OPU OIL PUMP-1 22KW,415V AC 3PHASE
H111	06	
H112	07	

POWER TERMINALS

2TB1

H201	01	415V,AC,3ø INCOMING SUPPLY FROM UAB
H202	02	
H203	03	
N	04	
H210	05	BFV OPU OIL PUMP-2 22KW,415V AC 3PHASE
H211	06	
H212	07	

CONTROL TERMINALS

TB2

M118	1	SEQ. ON/OFF
M113	2	
M218	3	SEQ. ON/OFF
M213	4	
	5	
	6	
M123 (20GA)	7	
M106	8	
M223 (20GB)	9	
M206	10	
71PV-12 M124	11	
M127	12	
M124	13	
63PV-7 M128	14	
63PV-4 M129	15	
71PV-16 M130	16	
63PV-9 M124	17	
M131	18	
M124	19	
71PV-1 M132	20	
71PV-2 M133	21	
	22	SPARE
	23	
	24	SPARE
	25	
	26	SPARE
	27	
	28	
M124A	29	240V AC AUX.SUP. FOR MOISTURE DETECTOR OIL LEVEL IND.& TEMP.INDICATOR
M125A	30	
M124A	31	
M125A	32	
M124A	33	
M125A	34	

M124 —MCB1
M125 —MCB1

CONTROL TERMINALS

TB3

88AX X101	1	BFV OIL PUMP-1 ON/OFF
88AX X102	2	
X103	3	
X104	4	BFV OIL PUMP-1 LOCAL DRIVE DISTURBANCE(TO CCB)
MCCB1 51AX X105	5	
88BX X106	6	BFV OIL PUMP-2 ON/OFF
88BX X107	7	
X108	8	
X109	9	BFV OIL PUMP-2 LOCAL DRIVE DISTURBANCE(TO CCB)
MCCB2 51BX X110	10	
X111	11	BFV OIL PUMPS CONTROL LOCAL/REMOTE SELECTION (CCB)
CSS1 X112	12	
X113	13	
X114	14	BFV OIL PRESS LOW TO START/STOP STANDBY PUMP (CCB)
-63PV-7X X115	15	BFV OIL PRESS LOW TO START/STOP MAIN PUMP (CCB)
-63PV-9X X116	16	BFV OPU SUMP TANK OIL LEVEL HIGH (TO CCB)
-71PV-1X X117	17	BFV OPU SUMP TANK OIL LEVEL VERY LOW TO STOP (TO CCB)
-71PV-16X X118	18	BFV OPU SUMP TANK OIL LEVEL LOW (TO CCB)
-71PV-2X X119	19	
CSS2 X120	20	BFV OIL PUMPS CONTROL M/A-I/A-II SELECTION (TO CCB)
X121	21	
X122	22	
X123	23	
X128	24	BFV OIL PUMP-1 MOTOR TH.OL /MCCB TRIPPED (CCB)
MCCB1 51AX X129	25	
X130	26	BFV OIL PUMP-2 MOTOR TH.OL /MCCB TRIPPED (CCB)
MCCB2 51BX X131	27	
63PV-4X X132	28	ALARM BFV PRESSURE RCEIVER OIL PRESS.HIGH (TO CCB)
X133	29	
X134	30	SPARE
71PV-1X X135	31	
71PV-2X	32	SPARE
M136	33	
63PV-7X M137	34	SPARE
71PVX M138	35	
M139	36	MCB TRIP/OFF
MCB1 M137A	37	
M138A	38	BFV OIL PRESS LOW TO START/STOP MAIN PUMP (CCB)
M139A	39	
63PV-9X M140A	40	SPARE
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Qty-3Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR :
FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF PENSTOCK VALVE OPU PUMP CONTROL PANEL (2x22kW)

NO. OF SHEETS 17.09
SHEET. NO. 17.09

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-018 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 2 3 4 5 6 7 8

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DRG. NO. EP-3-BM-033-018

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	63A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM98944OOHO	L&T	2	6
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	6
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	6
04	88A&88B	Power contactor	80A, 3P, Power Contactor with 240V AC coil	CS97077BOOO	L&T	2	6
05	-	Power contactor Acc	Addon contact 2NO+2NC for 75A P.cont	-	L&T	2	6
06	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	6
07	88AX,88BX,27A,71PVX 63PV-7X ,63PV-4X,71PV-16X 63PV-9X,71PV-1X,71PV-2X	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	10	30
08	-	Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	7	21
09	-	Contactor Acc	Addon contact 4NO for Aux cont	-	L&T	1	3
10	51A&51B	Overload Relay	36-60A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94136OOTO	L&T	2	6
11	T1-T2	Timer	0 sec - 10Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	2	6
12	63PV-7XT	Timer	0 sec - 60Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	1	3
13	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	Salzer	1	6
14	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way withoutOFF	61120	Salzer	1	3
15	CT1&CT2	Current Transformer	60/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	6
16	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	6
17	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 60/1A Acc. CL:1,Range:0-60A-360A with 6 times suppressed scale.	-	AE/ Meco	2	6
18	IPB1&IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	6
19	-	IPB Acc	1NO+1NC addon contact	EC1C & EC2C	L&T	2	6
20	IPB2&IPB4	Green Push button	Green illuminated actuator with holder for contact block, 22.5mm Dia,Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	6

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
PENSTOCK VALVE OPU PUMP CONTROL PANEL (2x22kW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-018 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
21	-	IPB Acc	1NO+1NC addon contact	EC1C & EC2C	L&T	2	6
22	SLA1,SLA2,SLA3,SLA4 SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	6	18
23	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	8	24
24	-	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	6	21
25	-	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	2	3
26	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	3
27	MCB	Miniature circuit breaker	6A, 2P, 10kA C Curve MCB	BB20060C	L&T	1	3
28	-	MCB Accessories	1NO+1NC Alram contact for MCB	BZA11006	L&T	1	3
29	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	6
30	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	6
31	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	6
32	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	6
33	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	6
34	LK1,2,LKP1-LKP2	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	12
35	ELK1,2	Earth Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	6
36	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	4	21
37	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
38	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	3
39	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	6
40	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	3

DRG. NO. EP-3-BM-033-018

INVENTORY NO.

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
PENSTOCK VALVE OPU PUMP CONTROL PANEL (2x22kW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-018 | REV. 02

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TITLE : - OIL LEAKAGE PUMP FOR PENSTOCK VALVE MCP (2X1.5KW)

PROJECT : - 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER: - PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. : - EP-3-GA-033-019 REV. 02

DWG. NO. : - EP-3-CS-033-019 REV. 01

DWG. NO. : - EP-3-BM-033-019 REV. 02

ASBUILT DRAWING

Qty-3Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF
OIL LEAKAGE PUMP FOR PENSTOCK VALVE MCP (2X1.5KW)

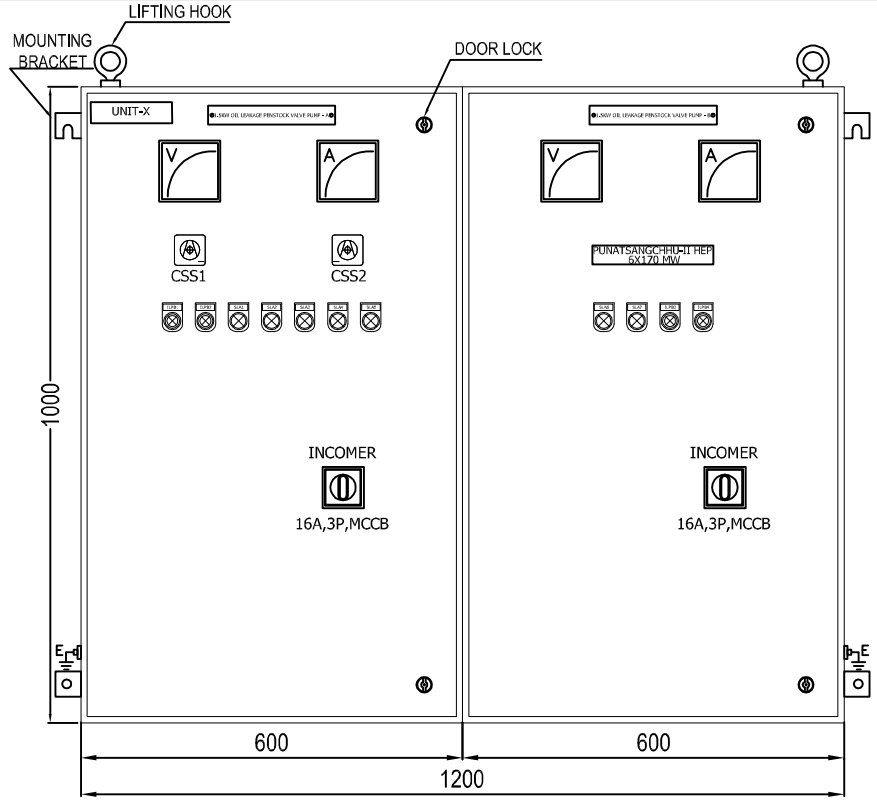
NO. OF SHEETS: 01 | SHEET. NO.: 01

SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

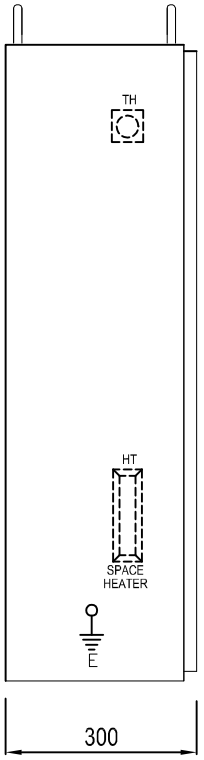
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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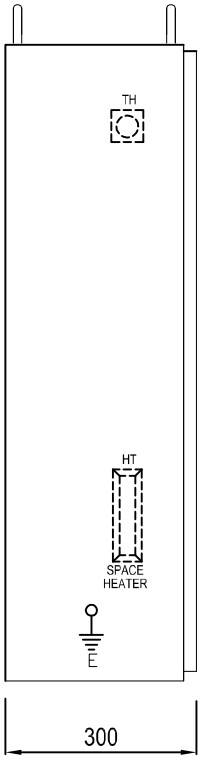
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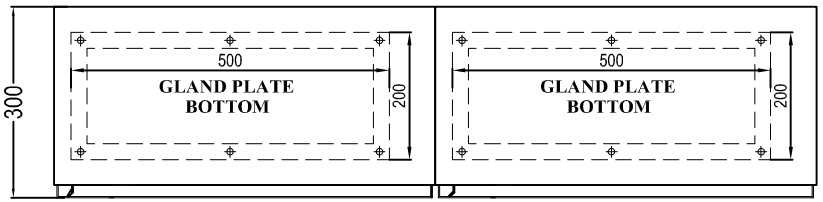
FRONT VIEW



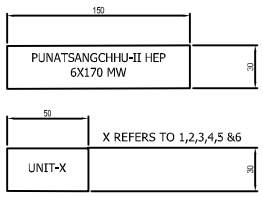
SIDE VIEW



SIDE VIEW

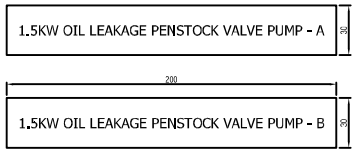


MOUNTING DETAILS - PANEL BOTTOM



ANCHOR BOLT DETAILS

PANEL NAME PLATE



ANCHOR EXPNASION BOLT M10X130: QTY 4 NO'S EACH PANEL

Qty–3Nos

DRG. NO. EP–3–GA–033–019

INVENTORY NO.

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29471K	NAME	SIGN.	DATE
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CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : GENERAL NOTES FOR OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

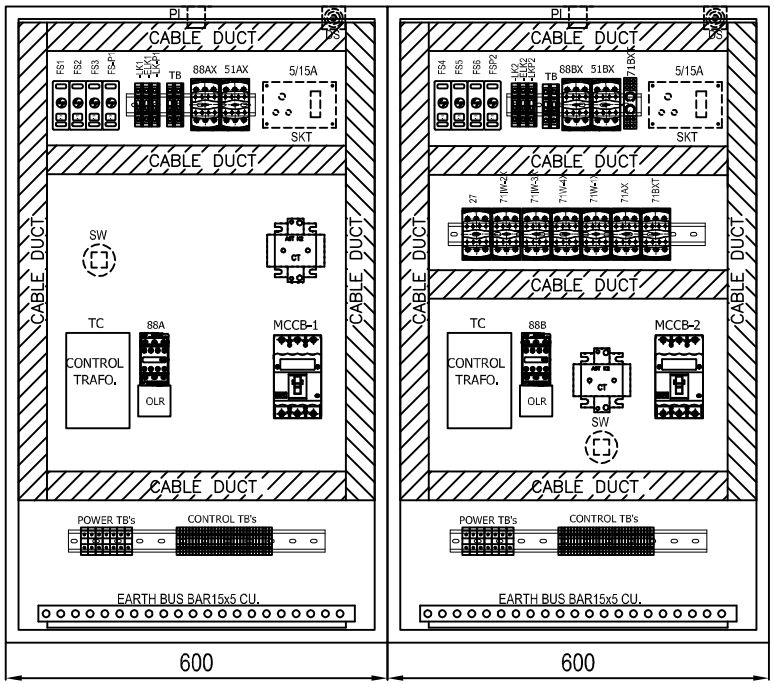
NO. OF SHEETS 18.2 | SHEET. NO. 18.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–019 | REV. 02

FORM 66–301 A

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FRONT INTERNAL VIEW

GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Wall mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
LOCATION		
ELEVATION	BF VALVE HOUSE	
TENTATIVE WEIGHT		
WEIGHT	450 KG	

DRG. NO. EP-3-GA-033-019

Qty-3Nos

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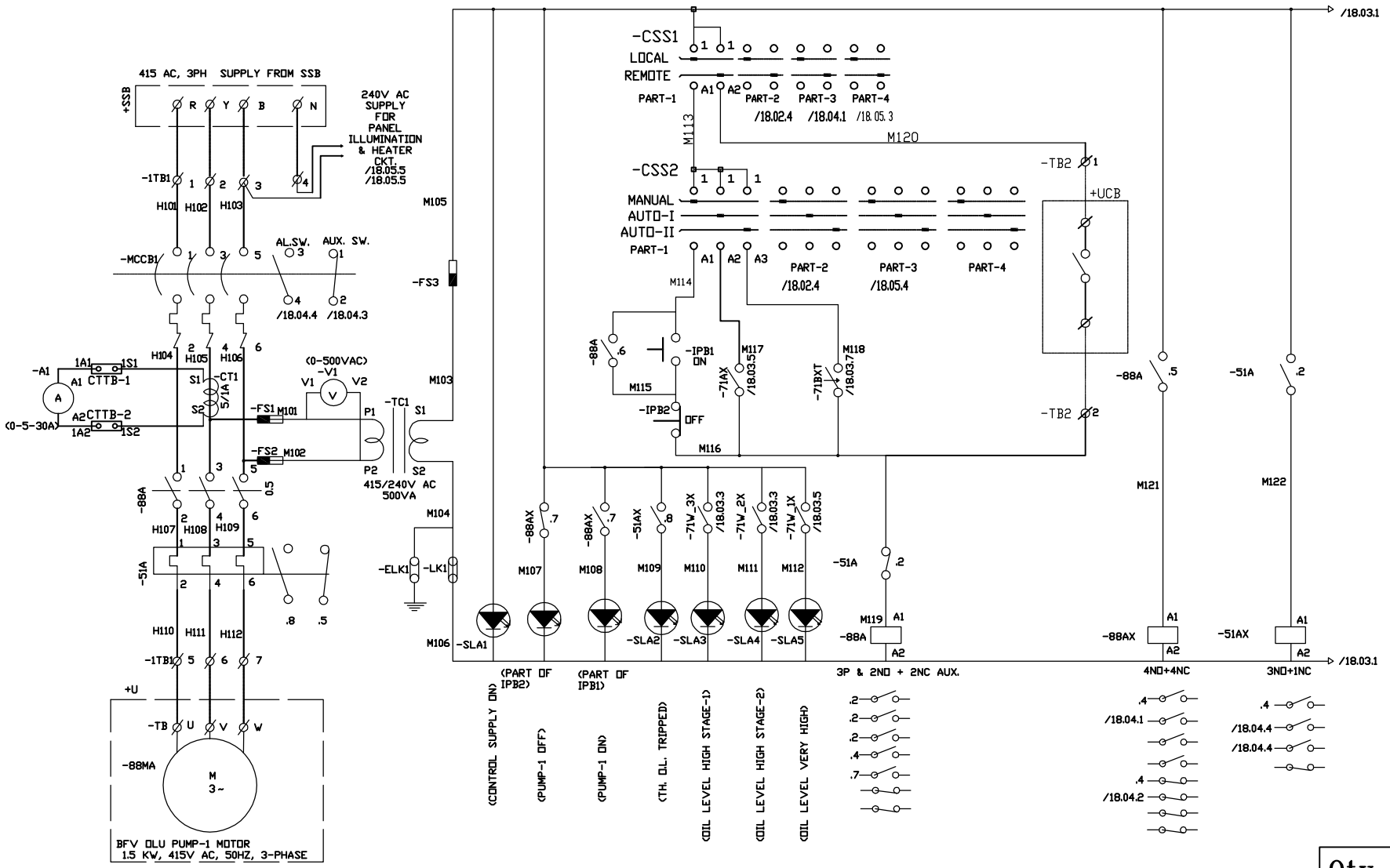
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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

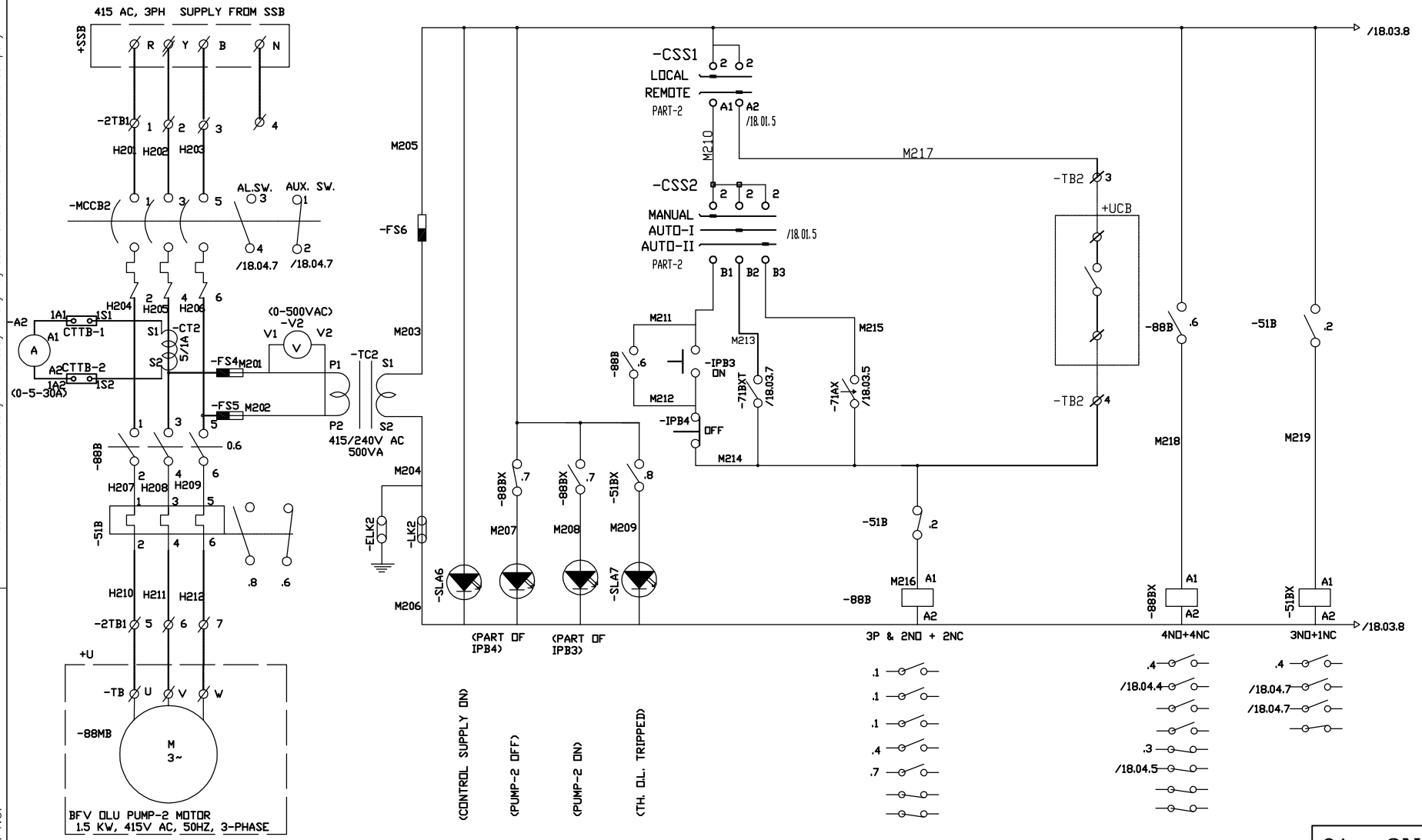
NO. OF SHEETS 18.06 | SHEET. NO. 18.01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-019 | REV. 01

DRG. NO. EP-3-CS-033-019

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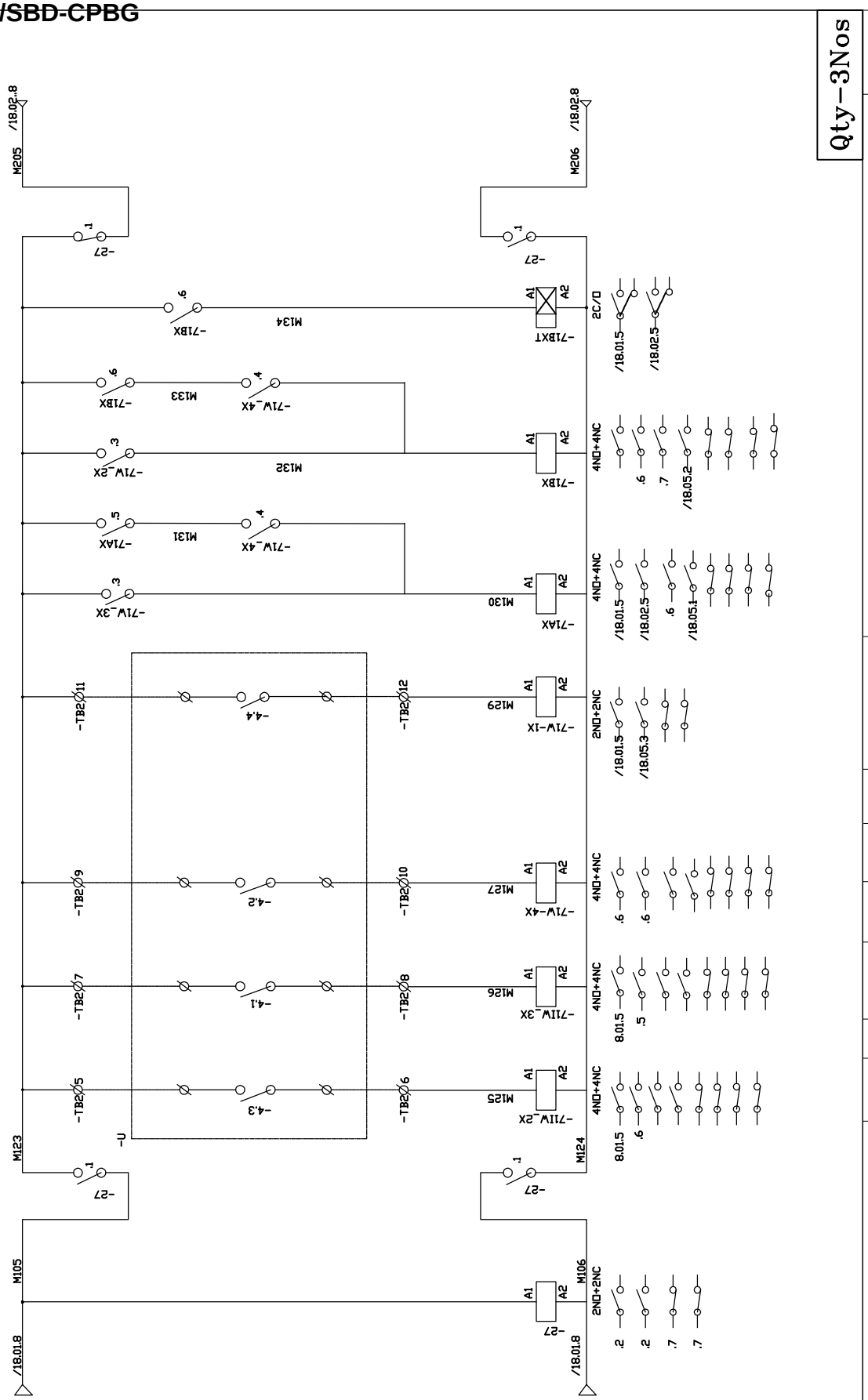
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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 18.06
SHEET. NO. 18.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-019 | REV. 01



BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 18.06
SHEET. NO. 18.03
REV. 01

SCALE
JOB NO. CB16033
DRG. NO. EP-3-CS-033-019

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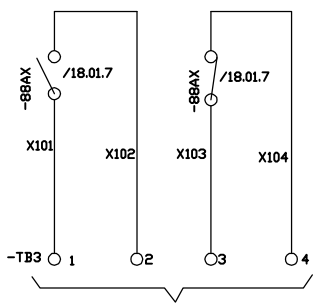
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FIRST ANGLE PROJECTION

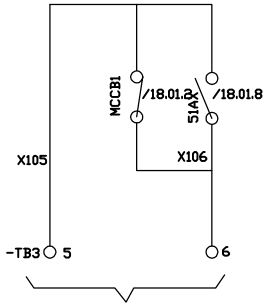
ALL DIMENSIONS ARE IN MM.

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

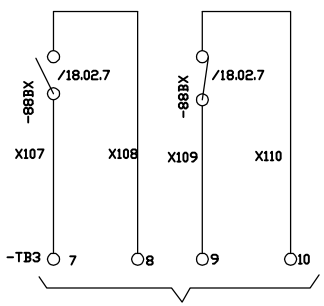
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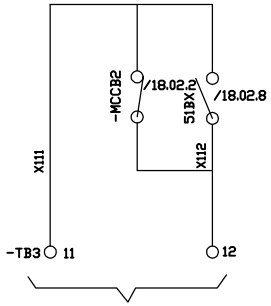
BFV OLU
PUMP-1 ON/OFF
(TO CCB)



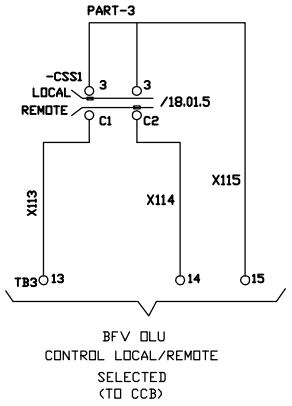
BFV OLU
PUMP-1 LOCAL
DRIVE DISTURBANCE
(TO CCB)



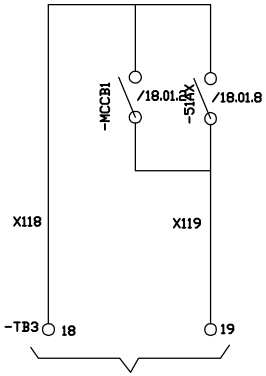
BFV OLU
PUMP-2 ON/OFF
(TO CCB)



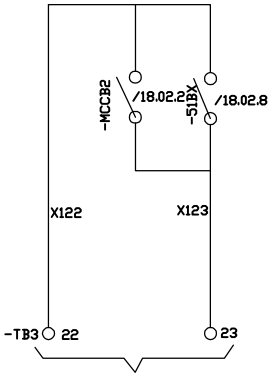
BFV OLU
PUMP-2 LOCAL
DRIVE DISTURBANCE
(TO CCB)



BFV OLU
CONTROL LOCAL/REMOTE
SELECTED
(TO CCB)



BFV OLU
PUMP-1 MOTOR TH. O.L./MCCB
TRIPPED
(TO CCB)



BFV OLU
PUMP-2 MOTOR TH. O.L./MCCB
TRIPPED
(TO CCB)

Qty-3Nos

DRG. NO. EP-3-CS-033-019

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

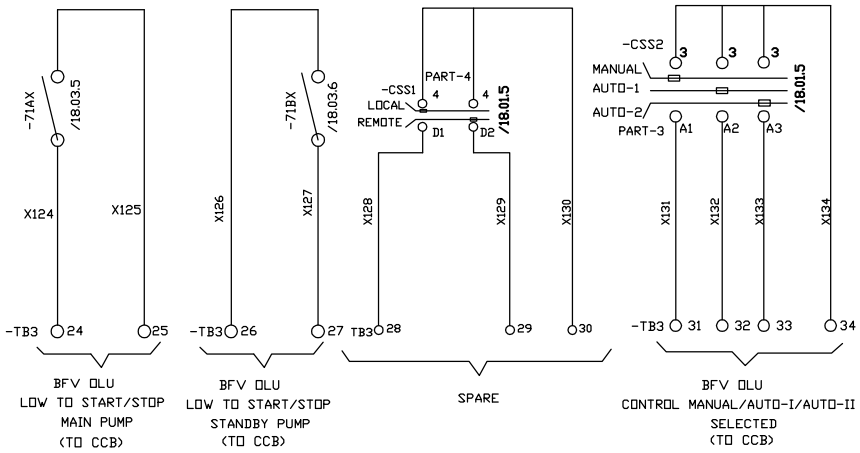
TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

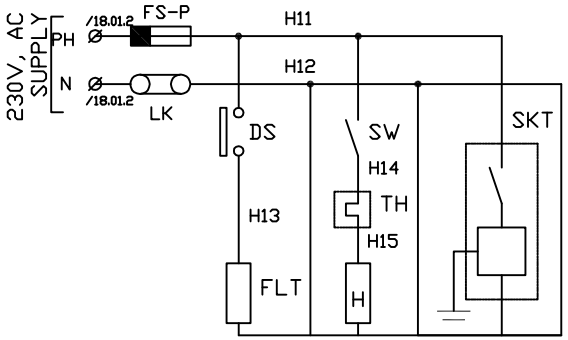
NO. OF SHEETS 18.06
SHEET. NO. 18.04

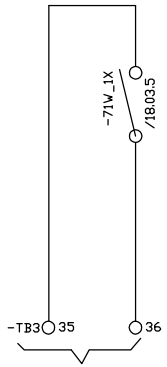
SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-019 | REV. 01

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-3Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 18.06 | SHEET. NO. 18.05

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-019 | REV. 01

INVENTORY NO. | DRG. NO. EP-3-CS-033-019

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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DRG. NO. EP-3-CS-033-019

POWER TERMINALS

1TB1

H101 — 01
H102 — 02
H103 — 03
N — 04
H110 — 05
H111 — 06
H112 — 07

415V,AC,3ø INCOMING SUPPLY FROM UAB

BFV.OLU PUMP-1,1.5KW 415V AC,50Hz,3-PHASE

POWER TERMINALS

2TB1

H201 — 01
H202 — 02
H203 — 03
N — 04
H210 — 05
H211 — 06
H212 — 07

415V,AC,3ø INCOMING SUPPLY FROM UAB

BFV.OLU PUMP-2,1.5KW 415V AC,50Hz,3-PHASE

CONTROL TERMINALS

TB2

KO — M120 — 1
M116 — 2
ON/OFF FOR MOTOR-1
KO — M217 — 3
M214 — 4
ON/OFF FOR MOTOR-2
71W-2 — M123 — 5
M125 — 6
71W-3 — M123 — 7
M126 — 8
71W-4 — M123 — 9
M127 — 10
71W-1 — M123 — 11
M129 — 12

CONTROL TERMINALS

TB3

88AX — X101 — 1
X102 — 2
BFV OLU PUMP-1 ON (TO CCB)
88AX — X103 — 3
X104 — 4
BFV OLU PUMP-1 OFF (TO CCB)
X105
MCCB1 51AX — X106 — 5
88BX — X107 — 6
BFV OLU PUMP-1 LOCAL DRIVE DISTURBANCE (TO CCB)
X108 — 7
BFV OLU PUMP-2 ON (TO CCB)
88BX — X109 — 8
X110 — 9
BFV OLU PUMP-2 OFF (TO CCB)
X111
MCCB2 51BX — X112 — 10
X113 — 11
BFV OLU PUMP-2 LOCAL DRIVE DISTURBANCE (TO CCB)
X114 — 12
X115 — 13
BFV OLU CONTROL L/R SELECTED (TO CCB)
14
15
16
17
X118
MCCB1 51AX — X119 — 18
BFV OLU PUMP-1 MOTOR TH.OL /MCCB TRIPPED (TO CCB)
19
20
21
X122
MCCB2 51BX — X123 — 22
X124 — 23
BFV OLU PUMP-2 MOTOR TH.OL /MCCB TRIPPED (TO CCB)
71AX — X125 — 24
BFV OLU LOW TO START/STOP MAIN PUMP (TO CCB)
X126
71BX — X127 — 25
BFV OLU LOW TO START/STOP STANDBY PUMP (TO CCB)
CSS1 — X128 — 26
X129 — 27
X130 — 28
SPARE
29
30
X131 — 31
X132 — 32
X133 — 33
BFV OLU CONTROL M/A-I/A-II SELECTION (TO CCB)
X134 — 34
X135
71W-1X — X136 — 35
BFV OLU LEVEL VERY HIGH (TO CCB)
36

Qty-3Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

INVENTORY NO.

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD — DIR : — FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : CONTROL SCHEMATIC FOR OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 18.06
SHEET. NO. 18.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-019 | REV. 02

FORM 66-301 A

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			BILL OF MATERIAL				
Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	32A 3P 50kA 415VAC, MCCB, with Magnetic release	CM98944OOEO	L&T	2	6
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM97890OOOO	L&T	2	6
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	CM97896OOOO	L&T	2	6
04	88A&88B	Power contactor	32A, 3P, Power Contactor with 240V AC coil	CS94111BOOO	L&T	2	6
05	-	Power contactor Acc	Addon contact 2NO+2NC for 32A P.cont	-	L&T	2	6
06	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	6
07	88AX,88BX,27,71BXT 71IW-2X,71IW-3X ,71W-4X, 71W-1X, 71AX& 71BX	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	9	27
08	-	Aux Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	7	21
09	51A&51B	Overload Relay	3-5A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC auxiliary contacts with built-in SPP (single phasing protection)	SS94141OOSO	L&T	2	6
10	71BXT	Timer	0.1sec - 10hr Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	1	3
11	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	Salzer	1	3
12	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way withoutOFF	61120	Salzer	1	3
13	CT1,CT2	Current Transformer	5/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	6
14	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	6
15	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale, CTR 5/1A Acc. CL:1,Range:0-5-30A with suppressed scale.	-	AE/ Meco	2	6
16	IPB1&IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	6
17	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	6
18	IPB2&IPB4	Green Push button	Green, illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	6
19	-	IPB Acc	1NO+1NC addon contact	EC1C&EC2C	L&T	2	6

DRG. NO. EP-3-BM-033-019

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 02 | SHEET. NO. 01 | REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-019

FORM 66-301 A

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			BILL OF MATERIAL				
Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
20	SLA1,SLA2,SLA3,SLA4 SLA5,SLA6&SLA7	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	7	21
21	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP3	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	8	24
22	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	6	21
23	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	2	6
24	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	6
25	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	6
26	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	6
27	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	6
28	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	6
29	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	6
30	LK1,2,LK_P	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	4	9
31	ELK1,2	Earth Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	6
32	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	14	42
33	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
34	-	Earth Bus	Earth busbar size -1R x 15 x 5mm,Cu	-	Adarsha	1	3
35	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	6
36	-	Panel Enclosure	Enclosure Size - H1000 x W1200 x D300mm	-	BHEL	1	3

DRG. NO. EP-3-BM-033-019

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

29471K	NAME	SIGN.	DATE
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APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICAL LIMITED
ELECTROPORCELAIN DIVISION BANGALORE

TITLE : BILL OF MATERIAL
OIL LEAKAGE PUMP FOR PENSTOCK VALVE CONTROL PANEL (2X1.5KW)

NO. OF SHEETS 02
SHEET. NO. 02
REV. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-019

FORM 66-301 A

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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TITLE :- HVAC PUMP MCP (2X93KW)

PROJECT :- 6 X 170 MW PUNATSANGCHHU-II HYDRO ELECTRIC PROJECT, BHUTAN

CUSTOMER:- PUNATSANGCHHU-II HYDROELECTRIC PROJECT AUTHORITY, BHUTAN

DWG. NO. :- 2-3-GA-033-017 REV. 02

DWG. NO. :- EP-3-CS-033-017 REV. 01

DWG. NO. :- EP-3-BM-033-017 REV. 02

ASBUILT DRAWING

Qty-1Nos

DRG. NO.

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	22.03.18	AS BUILT DRAWING	SAURABH	SAURABH
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
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DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : COVER SHEET OF HVAC PUMP MCP (2X93KW)

NO. OF SHEETS 01 | SHEET. NO. 01

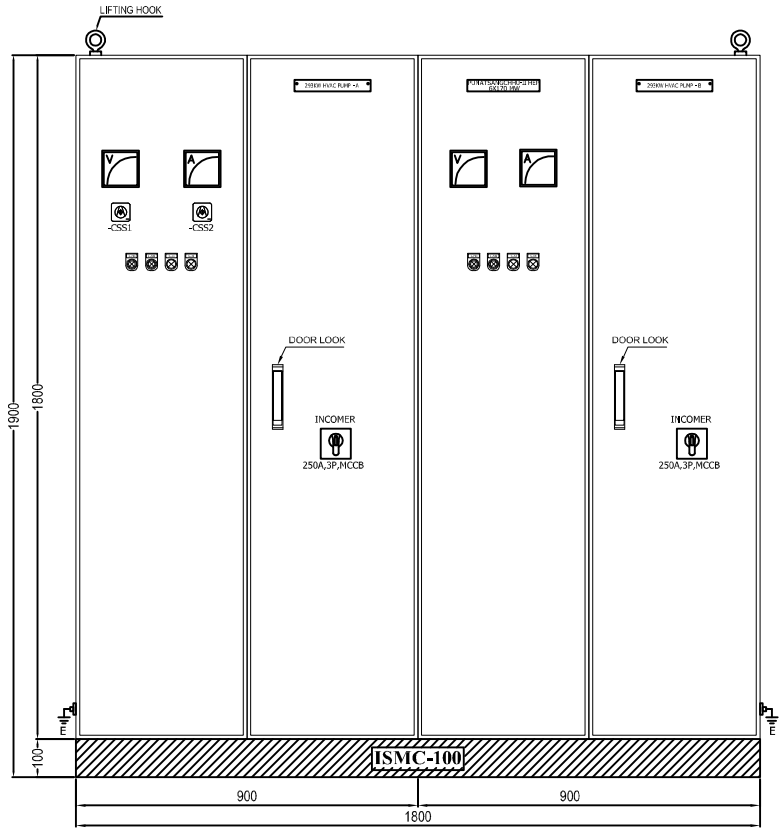
SCALE | JOB NO. CB16033 | DRG. NO. | REV. 02

FIRST ANGLE PROJECTION

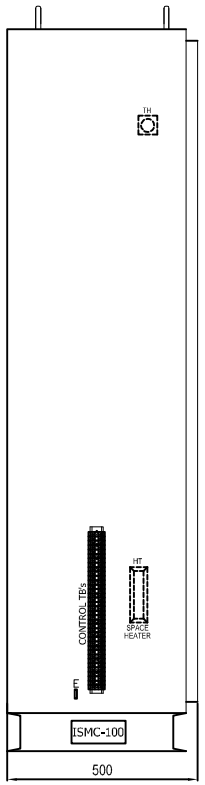
ALL DIMENSIONS ARE IN MM.

101 | 102 | 103 | 104 | 105 | 106 | 107 | 108

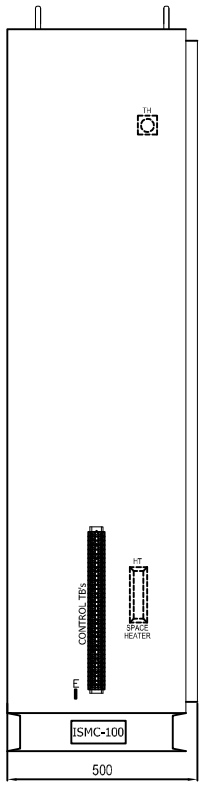
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FRONT VIEW

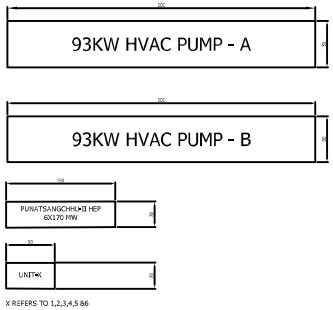


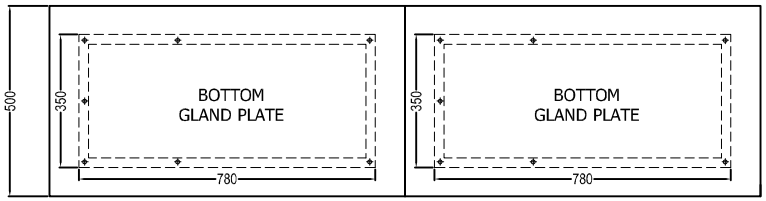
SIDE VIEW LHS SIDE



SIDE VIEW RHS SIDE

PANEL NAME PLATE

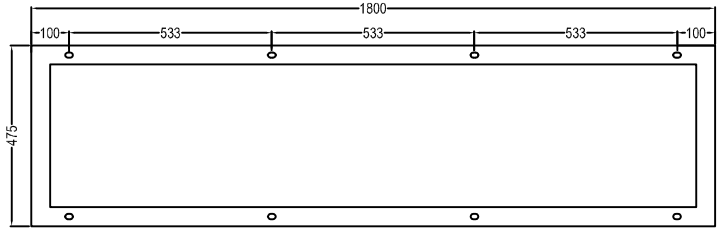




MOUNTING DETAILS - PANEL BOTTOM

ANCHOR BOLT DETAILS

ANCHOR EXPNASION BOLT M12X115: QTY 8 NO'S EACH PANEL



FOUNDATION DETAILS

Qty–1No

DRG. NO. EP–3–GA–033–017

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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05				
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT OF HVAC PUMP CONTROL PANEL (2X93KW)

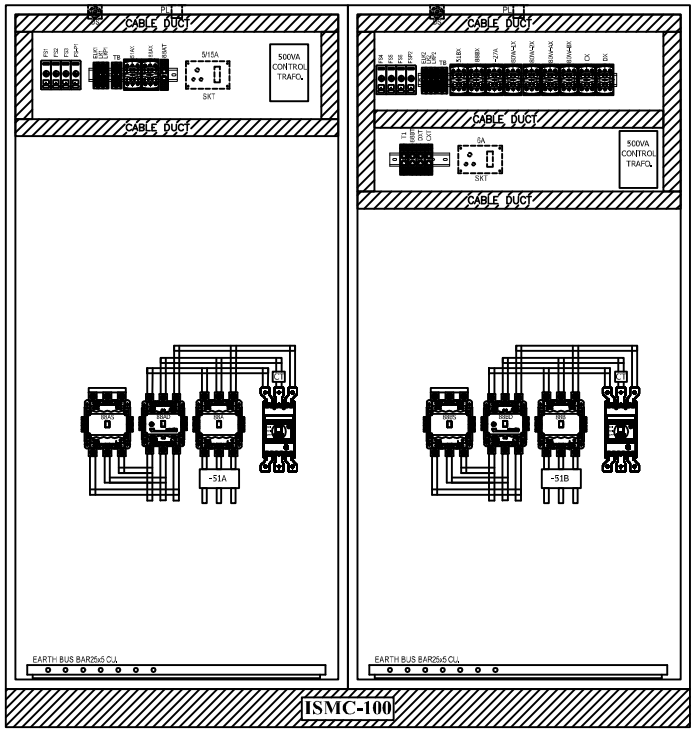
NO. OF SHEETS 16.2 | SHEET. NO. 16.1

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–017 | REV. 02

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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GENERAL NOTES		
Degree of protection	IP54	
Installation type	Indoor	
Mounting Arrangement	Floor mounting	
Cable / Entry	Bottom	
Paint Shade	Exterior: RAL 9002 Interior: White matt finish	
Enclosure construction		
Sheet material	CRCA SHEET	
Enclosure part	Type	Sheet thickness
Structural parts	CRCA	2.5mm
Gland plate	CRCA	3mm
Bottom and Top sheet	CRCA	2.5mm
Mounting plate	CRCA	2.5mm
Doors	CRCA	2.5mm
Internal cable details		
Control Wiring	2.5sqmm multistrand PVC FRLS Cable Grey & Black color	
Door earthing	2.5sqmm multistrand PVC FRLS Cable Yellow-Green color	
Power Busbar	25X10 Sqmm copper busbar	
LOCATION		
ELEVATION	572.0	
TENTATIVE WEIGHT		
WEIGHT	600 KG	

Qty–1No

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
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03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt: 14.02.18	SAURABH	SAURABH
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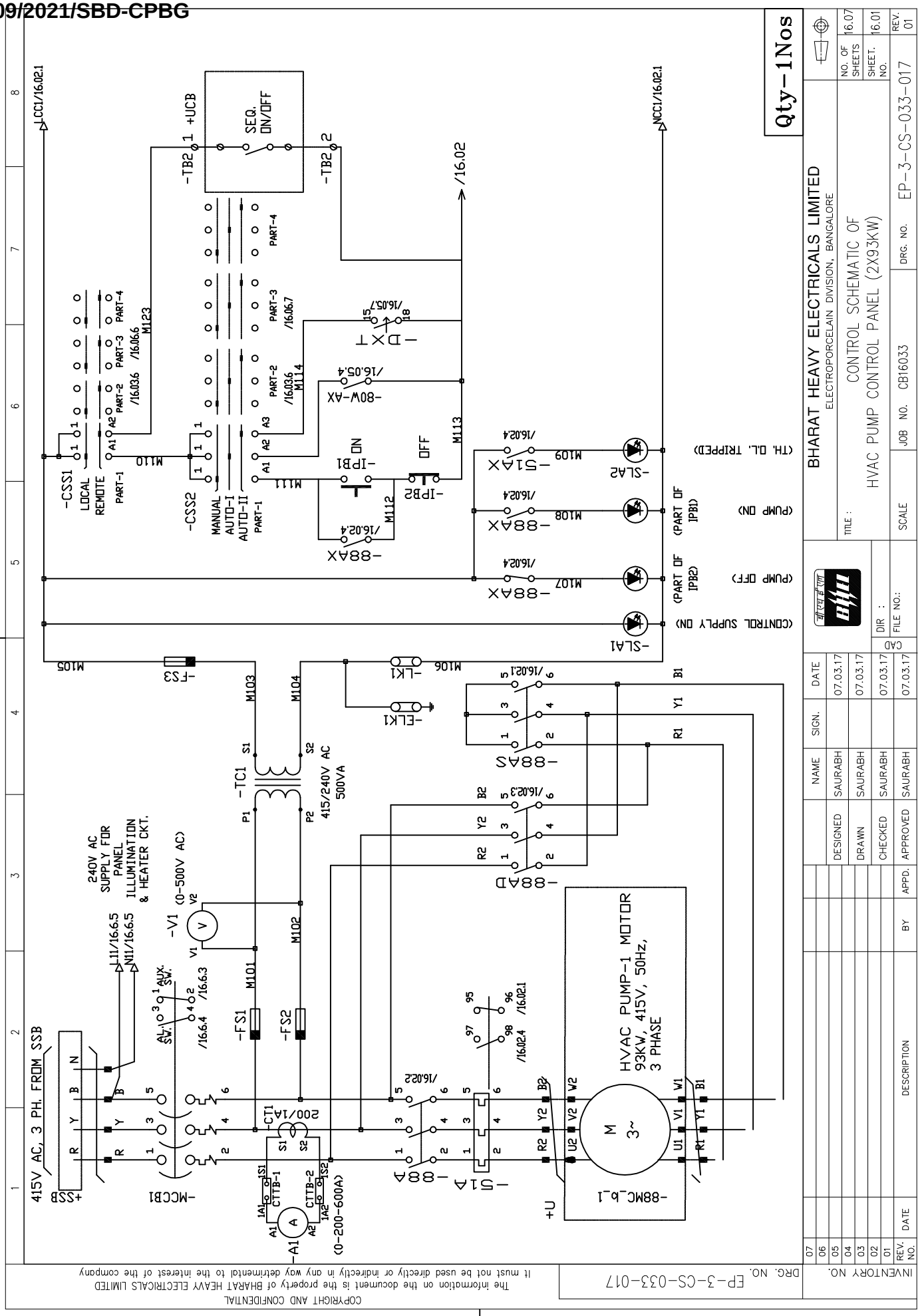
TITLE : GENERAL ARRANGEMENT OF HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 16.2
SHEET. NO. 16.2

SCALE | JOB NO. CB16033 | DRG. NO. EP–3–GA–033–017 | REV. 02

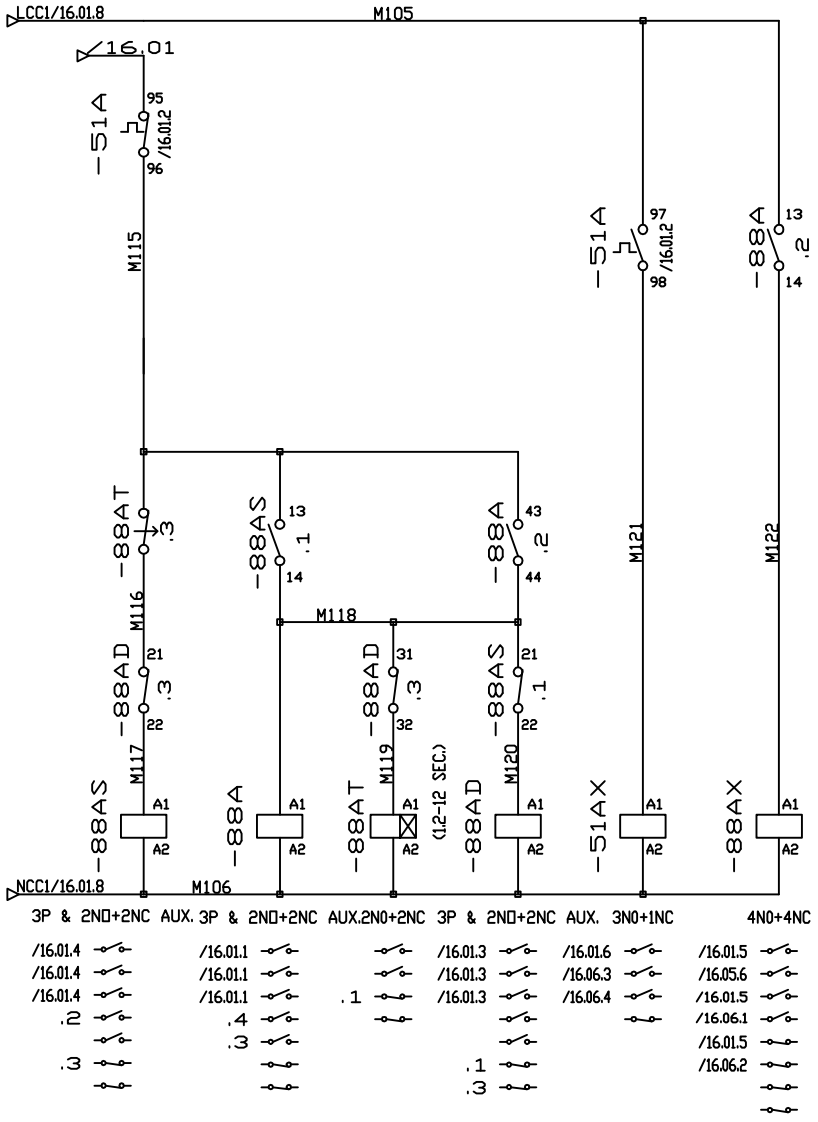
INVENTORY NO.

DRG. NO. EP–3–GA–033–017


Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
HVAC PUMP CONTROL PANEL (2X93KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-017
SCALE
NO. OF SHEETS 16.07
SHEET NO. 16.01
REV. 01
ALL DIMENSIONS ARE IN MM.
FIRST ANGLE PROJECTION
415V AC, 3 PH. FROM SSB
240V AC SUPPLY FOR PANEL ILLUMINATION & HEATER CKT.
HVAC PUMP-1 MOTOR 93KW, 415V, 50Hz, 3 PHASE
-CSS1 LOCAL REMOTE
-CSS2 MANUAL AUTO-I AUTO-II
-SEQ. ON/OFF
-MCCB1
-TC1 415/240V AC 500VA
-FS1
-FS2
-CT1 200/1A
-V1 (0-500V AC)
-A1 (0-200-600A)
-IPB1 ON
-IPB2 OFF
-SLA1 (CONTROL SUPPLY ON)
-SLA2 (TH. O.L. TRIPPED)
(PUMP ON) (PART OF IPB1)
(PUMP OFF) (PART OF IPB2)
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DRG. NO. EP-3-CS-033-017
INVENTORY NO.
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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-1Nos

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD | DIR : | FILE NO.:

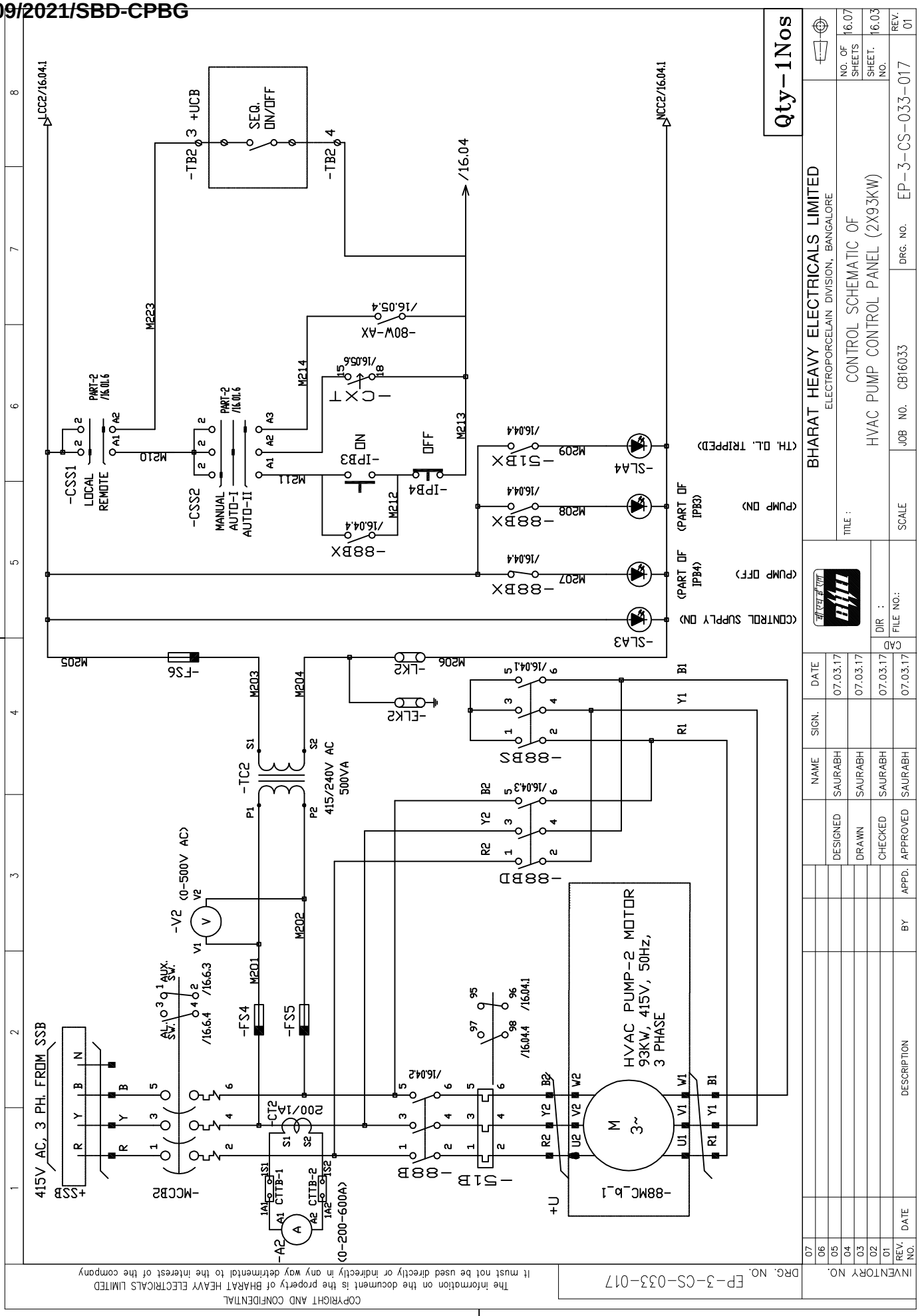
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

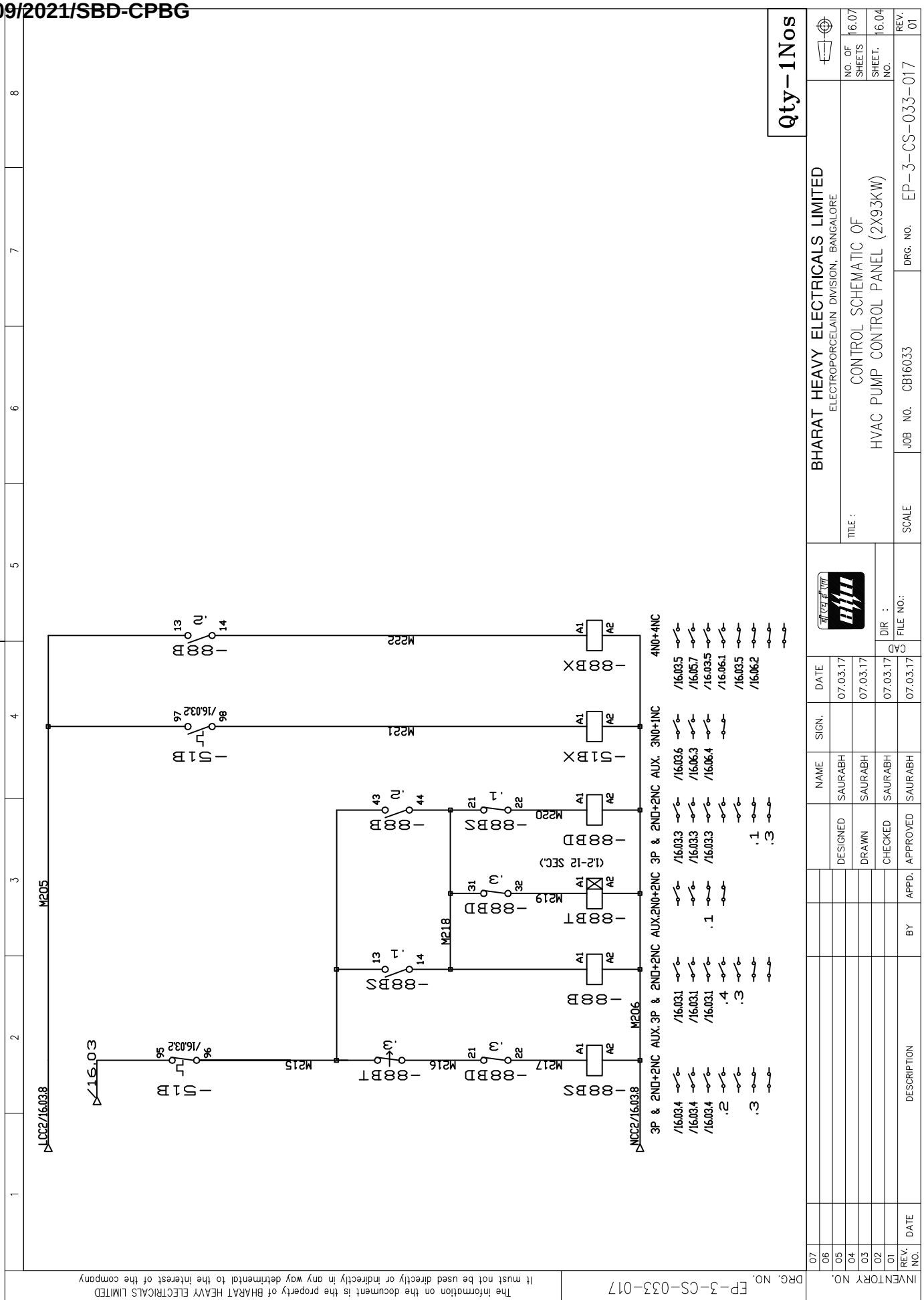
TITLE : CONTROL SCHEMATIC OF HVAC PUMP CONTROL PANEL (2X93KW)

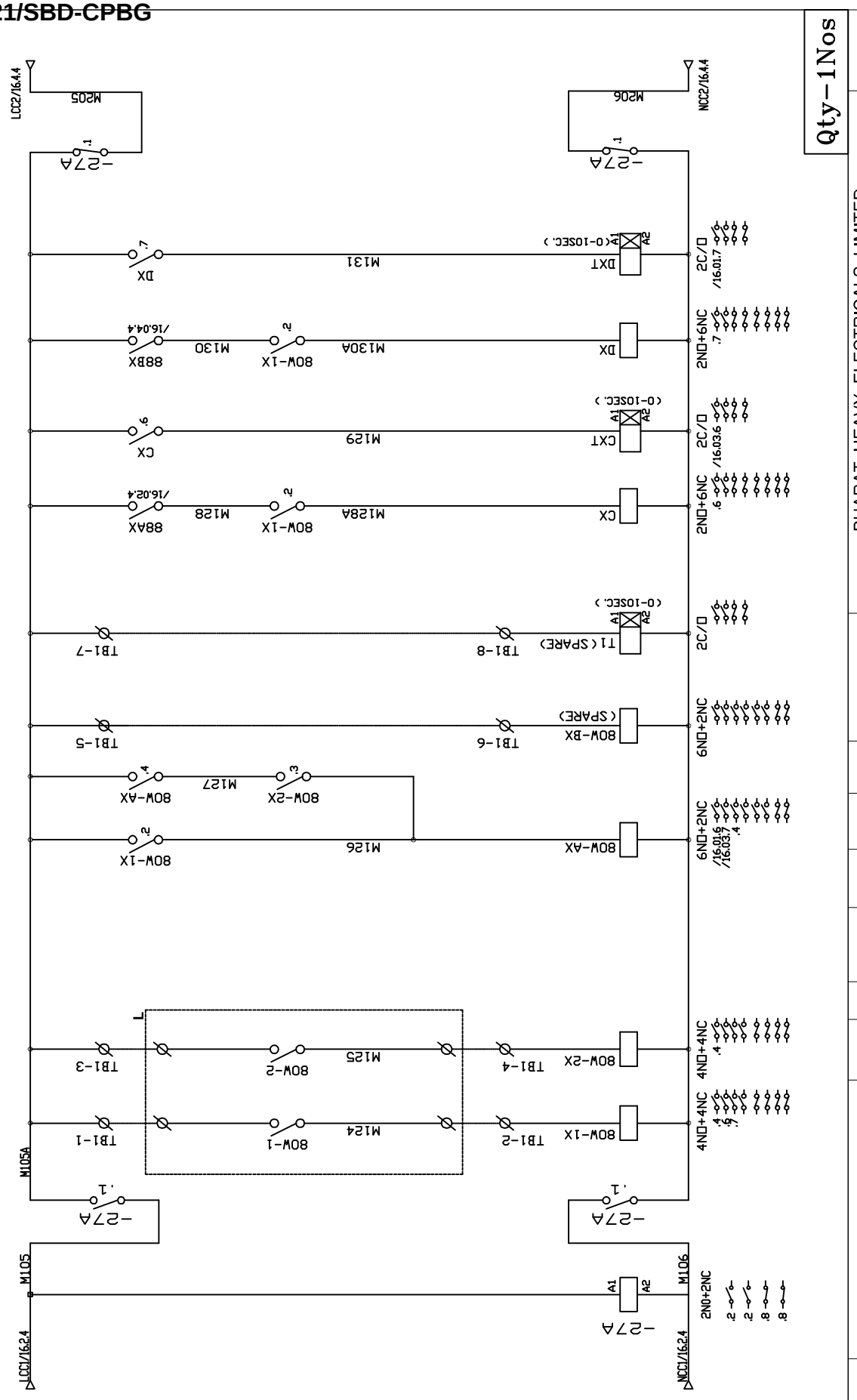
NO. OF SHEETS 16.07 | SHEET. NO. 16.02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-017 | REV. 01

INVENTORY NO. | DRG. NO. EP-3-CS-033-017


Qty-1Nos
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
CONTROL SCHEMATIC OF
HVAC PUMP CONTROL PANEL (2X93KW)
DRG. NO. EP-3-CS-033-017
JOB NO. CB16033
SCALE
TITLE :
NO. OF SHEETS 16.07
SHEET NO. 16.03
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DESCRIPTION
DATE
BY
APPD.
DRG. NO. EP-3-CS-033-017
INVENTORY NO.
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
415V AC, 3 PH. FROM SSB
HVAC PUMP-2 MOTOR
93KW, 415V, 50Hz,
3 PHASE
415/240V AC
500VA
(0-500V AC)
(0-200-600A)
(CONTROL SUPPLY ON)
(PUMP OFF)
(PUMP ON)
(TH. O.L. TRIPPED)
LOCAL
REMOTE
MANUAL
AUTO-I
AUTO-II
SEQ. ON/OFF
-TB2 3 +UCB
-TB2 4
/16.04
LCC2/16.04.1
NCC2/16.04.1
-CSS1
-CSS2
-IPB3
-IPB4
-CXT
-80W-AX
-88BX
-51BX
-SLA1
-SLA2
-SLA3
-FS6
-LK2
-ELK2
-TC2
-V2
-FS4
-FS5
-CT2
-88BS
-88BD
-51B
-88B
-88MC_b_1
-A2
-MCCB2
+SSB
+U
M
3~
AUX. SW.
CTTB-1
CTTB-2
PART-2 /16.01.6
/16.04.1
/16.04.2
/16.04.3
/16.04.4
/16.05.4
/16.05.6
/16.6.3
/16.6.4
M201
M202
M203
M204
M205
M206
M207
M208
M209
M210
M211
M212
M213
M214
M223
R200/1A
IPB3 (PART OF)
IPB4 (PART OF)
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Qty-1Nos
FIRST ANGLE PROJECTION
ALL DIMENSIONS ARE IN MM.
BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE
TITLE :
CONTROL SCHEMATIC OF
HVAC PUMP CONTROL PANEL (2X93KW)
JOB NO. CB16033
DRG. NO. EP-3-CS-033-017
SCALE
NO. OF SHEETS 16.07
SHEET. NO. 16.04
REV. 01
DESIGNED SAURABH 07.03.17
DRAWN SAURABH 07.03.17
CHECKED SAURABH 07.03.17
APPROVED SAURABH 07.03.17
DIR :
FILE NO.:
CAD
DESCRIPTION
DATE
BY
APPD.
INVENTORY NO.
DRG. NO. EP-3-CS-033-017
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-51B
-51BX
-88B
-88BX
-88BS
-88BD
-88BT
(1.2-12 SEC.)
3P & 2NO+2NC AUX.
4NO+4NC
3NO+1NC
2NO+2NC
M205
M206
M217
M216
M215
M218
M219
M220
M221
M222
LCC2/16.03.8
NCC2/16.03.8
/16.03.1
/16.03.3
/16.03.5
/16.03.6
/16.05.7
/16.06.1
/16.06.2
/16.06.3
/16.06.4



BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 16.07 | SHEET NO. 16.05 | REV. 01

SCALE | DRG. NO. EP-3-CS-033-017

JOB NO. CB16033

CAD DIR : FILE NO.:

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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07				

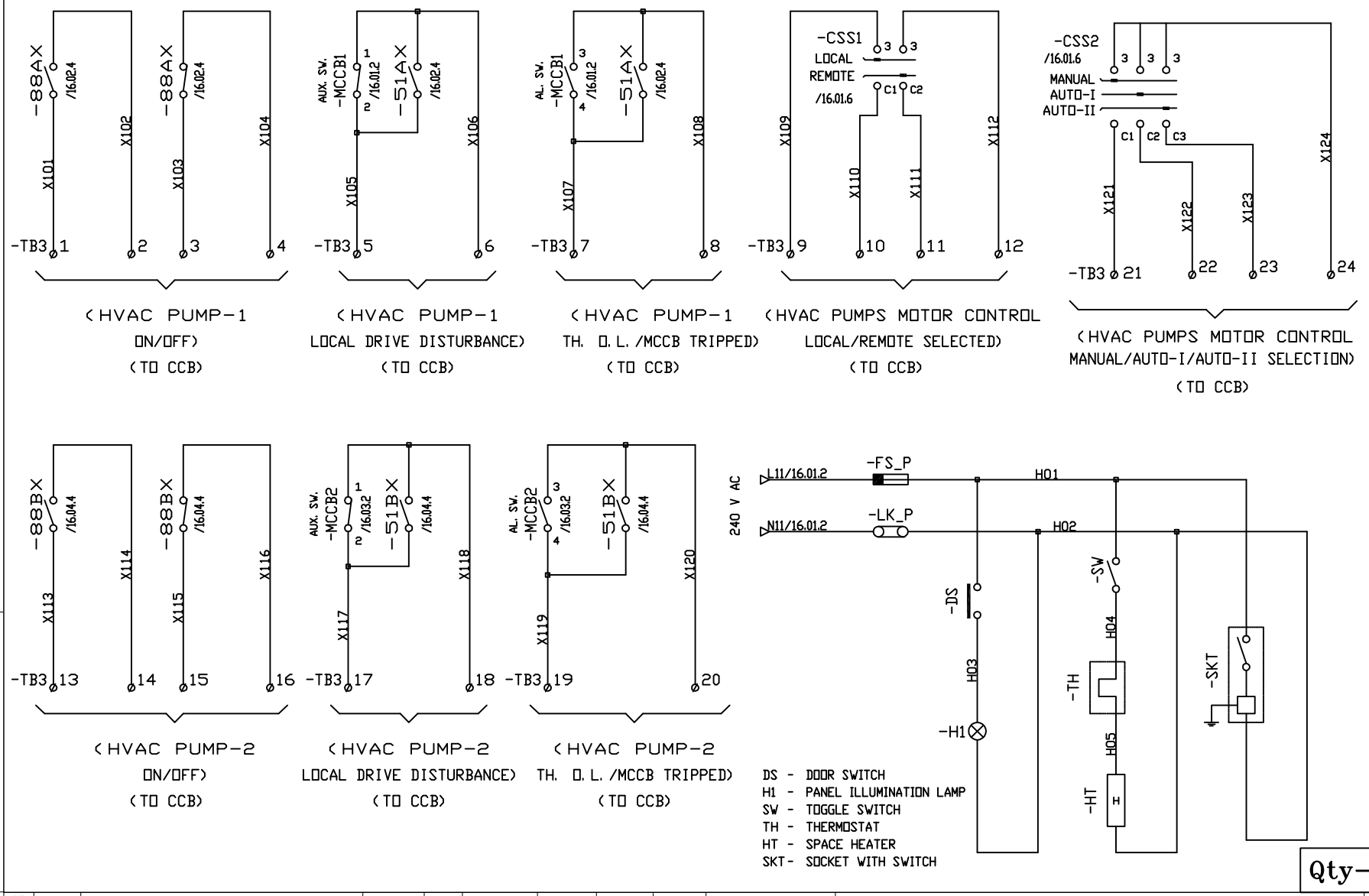
INVENTORY NO.

DRG. NO. EP-3-CS-033-017

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FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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Qty-1Nos

DRG. NO. EP-3-CS-033-017

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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05				
04				
03				
02				
01				

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 16.07
SHEET. NO. 16.06

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-CS-033-017 | REV. 01

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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POWER TERMINALS

1TB1

R 01
Y 02
B 03
N 04
R2 05
Y2 06
B2 07
R1 08
Y1 09
B1 10

415V,AC,3Ø INCOMING SUPPLY FROM UAB

HVAC PUMP−1 200KW,415V,50Hz AC 3PHASE

POWER TERMINALS

1TB2

R 01
Y 02
B 03
N 04
R2 05
Y2 06
B2 07
R1 08
Y1 09
B1 10

415V,AC,3Ø INCOMING SUPPLY FROM UAB

HVAC PUMP−2 200KW,415V,50Hz AC 3PHASE

CONTROL TERMINALS

TB2

RS M123 1
M113 2 +UCB
RS M223 3
M213 4 +UCB

CONTROL TERMINALS

TB1

80W−1 M105A 1
M124 2
80W−2 M105A 3
M125 4
80W−BX M105A 5
SPARE 6
T1 M105A 7
SPARE 8
9
10
11
12
13
14 SPARE
15
16
17
18
19
20

CONTROL TERMINALS

TB3

8BAX X101 1
X102 2 HVAC PUMP−1 ON (TO CCB)
8BAX X103 3
X104 4 HVAC PUMP−1 OFF (TO CCB)
MCCB1 X105 5
51AX X106 6 HVAC PUMP−1 LOCAL DRIVE DISTURBANCE (TO CCB)
MCCB1 X107 7
51AX X108 8 HVAC PUMP−1 TH.OL /MCCB TRIPPED
X109 9
CSS1 C1 C2 L X110 10
X111 11 HVAC PUMPS MOTOR CONTROL L/R SELECTED (TO CCB)
R X112 12
88BX X113 13
X114 14 HVAC PUMP−2 ON (TO CCB)
88BX X115 15
X116 16 HVAC PUMP−2 OFF (TO CCB)
MCCB2 X117 17
51BX X118 18 HVAC PUMP−2 LOCAL DRIVE DISTURBANCE (TO CCB)
MCCB2 X119 19
51BX X120 20 HVAC PUMP−2 TH.OL /MCCB TRIPPED
CSS2 C1 X121 21
C2 X122 22
C3 X123 23 HVAC PUMP−2 CONTROL M/A−I/A−II SELECTION (TO CCB)
X124 24
25
26
27
28 SPARE
29
30
31
32

Qty−1No

INVENTORY NO.	REV. NO.	DATE	DESCRIPTION	BY	APPD.
	07				
	06				
	05				
	04				
	03				
	02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
	01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : CONTROL SCHEMATIC OF HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 16.07
SHEET. NO. 16.07

SCALE | JOB NO. CB16033 | DRG. NO. EP−3−BM−033−017 | REV. 02

DRG. NO. EP−3−BM−033−017

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
01	MCCB1 & MCCB2	Moulded Case Circuit Breaker	250A 3P 50kA 415VAC, MCCB, with Magnetic releases	CM92171OOPOOG	L&T	2	2
02	-	MCCB Accessories	Auxiliary contacts (1NO+1NC) + Alarm switch (1NO	CM99804OOOO	L&T	2	2
03	-	MCCB Accessories	Door coupling Extended rotary operating mechanism & padlocking facilities	ST98053OOOO	L&T	2	2
04	88A,88AD,88B 88BD	Power contactor	225A, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94140BOOO	L&T	4	4
05	88AS&88BS	Power contactor	110, 3P, Power Contactor with 240V AC coil,aux 2NO+2NC contacts	CS94137BOOO	L&T	2	2
06	51AX&51BX	Aux Contactor	Auxilary contactor with 3NO+1NC, 240VAC coil	CS94826BOOO	L&T	2	2
07	88AX,88BX,27A,80W-1X 80W-2X 80W-AX 80W-BX CX,DX,	Aux Contactor	Auxilary contactor with 2NO+2NC , 240VAC coil	CS94826BOOO	L&T	9	9
08	-	Contactor Acc	Addon contact 2NO+2NC for Aux cont	-	L&T	4	4
09	-	Contactor Acc	Addon contact 4NO for Aux cont	-	L&T	2	2
10							
11	51A&51B	Overload Relay	70-120A Bimetal Overload Relay, Direct Mounting (Class 10), 1NO+1NC) auxiliary contacts with built-in SPP (single phasing protection	SS94138OOMO	L&T	2	2
12	88AT&88BT	Timer	1.2sec - 2Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	2	2
13	CXT,DXT,T1	Timer	0.1sec - 10Sec Adjustable type, On delay Timer 2C/O Aux Supply 240V AC	2AODT5	L&T	3	3
14	CSS1	Local/Remote Slection	6A, Local/Remote selector switch,4pole 2way withoutOFF	61040	Salzer	1	1
15	CSS2	Auto-1/Auto-2/Man Slection	6A, Auto1/Auto2/Man selector switch,4pole 3way withoutOFF	61120	Salzer	1	1
16	CT1&CT2	Current Transformer	200/1A, Metering Current Transformer 10VA, Class -0.5 cast resin insulated type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
17	V1&V2	Analogue Voltmeter	Analogue AC Voltmeter, Moving Iron Type, 96Sqmm,240° Scale, 0-500V class-1, flush mounting type	-	AE/ Meco	2	2
18	A1&A2	Analogue Ammeter	Analogue AC Ammeter, Moving Iron Type, 96Sqmm,240° Scale CTR 200/1A, Acc. CL:1,Range:0-200-1200A with suppressed scale.	-	AE/ Meco	2	2
19	IPB1&IPB3	Red Push button	Red, illuminated actuator with holder for contact block, 22.5mm Dia,Illumination Module- 240VAC- Red	EG03FDLR240A	L&T	2	2
20	-	IPB Acc	1NO+1NC add on contact	EC1C & EC2C	L&T	2	2

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DRG. NO. EP-3-BM-033-017

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt: 27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 02 | SHEET. NO. 01

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-017 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

BILL OF MATERIAL

Sl No	TAG NO	COMPONENT	TECHNICAL SPECIFICATION	CATALOGUE NO	MAKE	UNIT QTY	TOTAL QTY
21	IPB2&IPB4	Red Push button	Green illuminated actuator with holder for contact block, 22.5mm Dia, Illumination Module- 240VAC- Green	EG03FDLG240A	L&T	2	2
22	-	IPB Acc	1NO+1NC add on contact	EC1C & EC2C	L&T	2	2
22	SLA1,SLA2,SLA3 SLA4	Indicating lamps	Amber Indicating lamp assembly with 240VAC holder & LED type lamp.	EILA240A	L&T	4	4
23	FS1,FS2,FS3,FS4 FS5,FS6&FSP1-FSP2	Control Fuse base	20A Control Fuse Base	ST30772OOOO	L&T	8	8
24	FS1-FS6	Control Fuse	4A Control fuse link 415V AC	ST30726OOOO	L&T	6	6
25	FSP1-FSP2	Control Fuse	16A Control fuse link 415V AC	ST30729OOOO	L&T	2	2
26	TC1&TC2	Control Transformer	Single phase, 500VA, 415V/240VAC, dry type Air cooled control transformer, Resin cast type	-	Kalpa/Kappa AE/Precise G&M/Indcoil	2	2
29	HT	Space Heater	40W Space Heater, Aux. supply 240VAC	-	Girish	2	2
30	TH	Thermostat	20-85 Deg Cel Thermostat , Aux. Supply : 240VAC	-	Girish	2	2
31	H1	Panel Lamp	Panel Illumination Lamp,240VAC, 5Watt LED with holder	-	Phillips	2	2
32	DS	Limit switch	Door Limit switch 1NO+1NC	-	Kaycee	2	2
33	SKT	Power Socket	15A/5A, 5pin socket with built-in switch	-	Anchor	2	2
34	LK1,2,LK_P	Neutral Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	3	3
35	ELK1,2	Earth Link	Disconnecting type terminal block for neutral link	-	Connectwell Elmex	2	2
36	TB1	Power TB	Power terminal block suitable cable size	-	Connectwell Elmex	Lot	Lot
37	TB2,TB3	Control TB	Contro terminal block suitable for 2.5Sqmm cable	-	Connectwell Elmex	Lot	Lot
38	-	Earth Bus	Earth busbar size -1R x 25 x 5mm,Cu	-	Adarsha	1	1
39	SW	TOGGLE SWITCH	240V AC 5A	-	Suraj	2	2
39	-	Panel Enclosure	Enclosure Size - H1900 x W1800 x D500mm	-	BHEL	1	1

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DRG. NO. EP-3-BM-033-017

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03				
02	14.02.18	AS PER CUSTOMER COMMENTS Dt:14.02.18	SAURABH	SAURABH
01	10.11.17	AS PER CUSTOMER COMMENTS Dt:27.10.17	SAURABH	SAURABH

	NAME	SIGN.	DATE
DESIGNED	SAURABH		07.03.17
DRAWN	SAURABH		07.03.17
CHECKED	SAURABH		07.03.17
APPROVED	SAURABH		07.03.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : BILL OF MATERIAL
HVAC PUMP CONTROL PANEL (2X93KW)

NO. OF SHEETS 02 | SHEET. NO. 02

SCALE | JOB NO. CB16033 | DRG. NO. EP-3-BM-033-017 | REV. 02

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

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GENERAL ARRANGEMENT DRG. OF ELECTRICAL CONTROL PANEL FOR PUNATSANGCHHU HEP-II(PV),BHUTAN (REF SCHEMETIC NO.32170218802 REV00)

DRG. NO. EP-3-GA-003-02

PROJECT	6x170MW PUNATSANGCHHU-II HEP BHUTAN
CUSTOMER	PHPA-II, BHUTAN
CONSULTANT	WAPCOS LIMITED, GURGAON CENTRAL ELECTRICITY AUTHORITY, NEW DELHI
CONTRACTOR	M/S BHARAT HEAVY ELECTRICALS LIMITED BHOPAL
MDL	32170218801

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	31.12.18	AS BUILT		
02	19.09.18	CUSTOMER REQUIREMENT		
01	14.03.18	CUSTOMER REQUIREMENT		

	NAME	SIGN.	DATE
DESIGNED	SANTA		27.12.17
DRAWN			
CHECKED	JJM		27.12.17
APPROVED	JJM		27.12.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU-II(6x170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 01

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-02 | REV. 03

FORM 66-301 A4

19820/9/2021/SBD-CPBG

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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GENERAL NOTES FOR LT SWITCH BOARD:-

1. ALL DIMENSIONS ARE **IN MM.**
2. THE PANELS SHALL BE DUST & VERMIN PROOF, FREE STANDING, FLOOR MOUNTED AND COMPARTMENTALIZED.
3. THE PANEL SHALL BE SUITABLE FOR **3Ø, 4W, 415V AC, 50HZ SUPPLY.**
4. THE PANEL SHALL BE FABRICATED WITH
   - A. SIDE SHEET, FRONT/REAR DOOR/ REMOVABLE TOP & BOTTOM SHEET **- 2.0 CRCA.**
   - B. FEEDER PARTITION **- 2.0 CRCA.**
   - C. EQUIPMENT MOUNTING PLATE
   - D. INNER SIDE SHEET **- 2.0 MM. G.I.**
   - E. UNDRILLED REMOVABLE GLAND PLATE **- 3.0 MM. CRCA.**
   - F. BASE FRAME **- 3.0 MM. CRCA.**
   - G. LOAD BEARING MEMBER **- 2.5 MM. CRCA.**
   - H. BASE FRAME **- ISMC 75x40x6MM.**
5. NEOPRENE GASKET SHALL BE PROVIDED INSIDE THE DOORS TO MAKE THE PANEL DUST AND VERMIN PROOF.
6. THE PANEL SHALL BE PAINTED WITH **ELECTROSTATIC POWDER COATING PAINT** AFTER 10 TANK PROCESS.
7. BUS BAR SHALL BE OF **ELECTROLYTIC GRADE ALUMINIUM** SUPPORTED ON NON HYGROSCOPIC, NON CARBONISING, CORROSION RESISTANCE, SMC INSULATORS.
8. BUS BAR SHALL BE INSULATED **HEAT SHRINKABLE COLOURED PVC SLEEVES** RED, YELLOW, BLUE AND BLACK FOR IDENTIFICATION.
9. **EARTH BUS** SHALL BE PROVIDED THROUGHOUT THE PANEL LENGTH.
10. CONTROL WIRING SHALL BE CARRIED OUT WITH 1100V GRADE PVC INSULATED **FRLS COPPER FLEXIBLE WIRE** AND FOLLOWING COLOUR STANDARD.
    - A. AC VOLTAGE CIRCUIT **- 1.5 SQ MM RED, YELLOW, BLUE, BLACK**
    - B. CURRENT CIRCUIT **- 2.5 SQ MM RED, YELLOW, BLUE, BLACK**
    - C. AC CONTROL CKT. **- 1.5 SQ MM RED, BLACK**
    - D. DC CIRCUIT **- 2.5 SQ MM GREY**
    - E. INTER PANEL **- 1.0 SQ MM BLACK**
    - F. GROUNDING **- 2.5 SQ MM YELLOW - GREEN BICOLOUR**
11. THE MINIMUM CLEARANCE IN MAIN BUSBARS SHALL BE AS FOLLOWS:
    - A. BETWEEN PHASE TO PHASE **- 32 MM**
    - B. BETWEEN PHASE TO NEUTRAL **- 26 MM**
    - C. BETWEEN PHASE TO EARTH **- 26 MM**
    - D. BETWEEN NEUTRAL TO EARTH **- 26 MM**
12. BLACK ANODISED ALUMINIUM COMPUTERISED PRINTED NAME PLATE SHALL BE PROVIDED ON EACH FEEDER AND PANEL.
13. PANEL **DOOR LOCK** SHALL BE PROVIDED ON EACH DOOR.
14. **CABLE ENTRY** AS PER G.A. DRAWING.
15. **TPN/TP** MEANS TP SWITCHGEAR WITH REMOVABLE TYPE NEUTRAL LINK.
16. ALL kA RATTING MENTION IN B.O.M. ARE AT **415V AC.**
17. PAINT SHADE :– **EXTERNAL COLOUR - SEMI GLOSSY PASTEL GREEN (RAL-6019)**
    INTERNAL COLOUR - GLOSSY WHITE (RAL-9003)
18. DEGREE OF PROTECTION :– **IP 52 (INDOOR TYPE)**
19. EARTH BUS SHALL BE 25x6 SQ MM TINNED COPPER.
20. PANEL SHALL BE POWDER COATED WITH THICKNESS OF THE COATING OF THICKNESS IS GREATER THAN 95 MICRON
21 WEIGHT : Approx. weight of panel is 300Kg.

DRG. NO. EP-3-GA-003-01

INVENTORY NO. 19820/2021/SBD-CPBG

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	31.12.18	AS BUILT		
02	19.09.18	CUSTOMER REQUIREMENT		
01	14.03.18	CUSTOMER REQUIREMENT		

	NAME	SIGN.	DATE 27.12.17
DESIGNED	SANTA		27.12.17
DRAWN			
CHECKED	JJM		27.12.17
APPROVED	JJM		27.12.17

CAD | DIR : | FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU–II(6X170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 02

SCALE | JOB NO. CPB003 | DRG. NO. EP–3–GA–003–02 | REV. 03

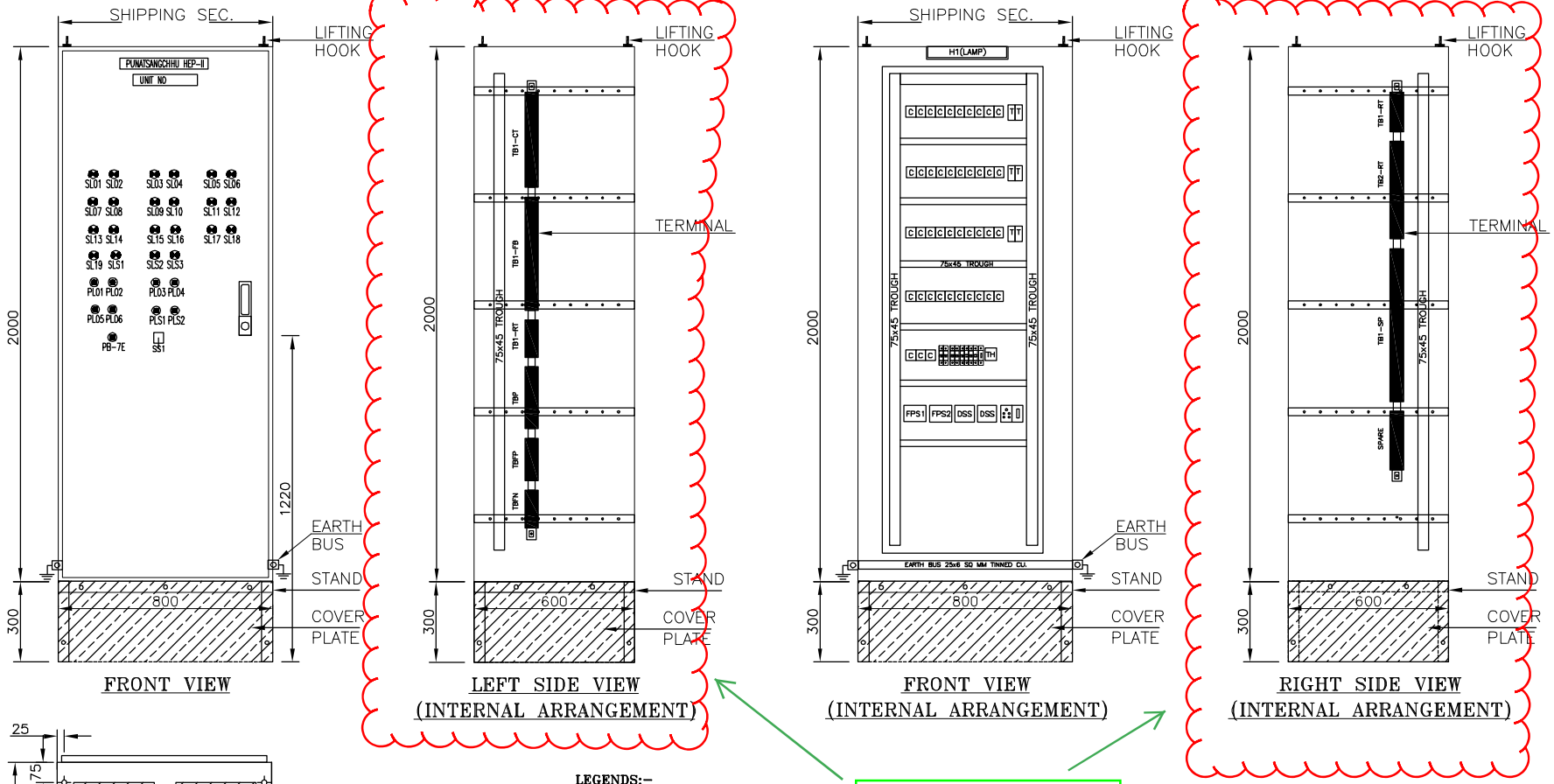
FORM 66–301 A4

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FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

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BUS BAR SIZE

EARTH : 1x25x06 Sq. mm./Eq. CU.

PANEL QTY-03 NOS

PANEL HEIGHT	2300 mm
PANEL DEPTH	600 mm
PANEL LENGTH	800 mm

CABLE ENTRY-TOP/BOTTOM

DRG. NO. EP-3-GA-003-02

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU-II(6X170MW), BHUTAN

NO. OF SHEETS 06

SHEET. NO. 03

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-02 | REV. 03

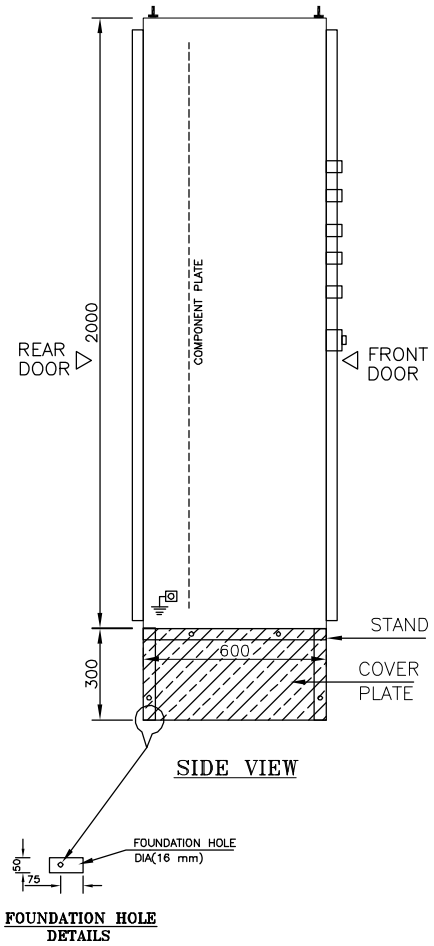
FORM 66-301 A4

19820/9/2021/SBD-CPBG

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

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SIDE VIEW

FOUNDATION HOLE DETAILS

PANEL QTY-03 NOS

DRG. NO. EP-3-GA-003-02

INVENTORY NO. 19820/9/2021/SBD-CPBG

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU-II(6X170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 04

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-02 | REV. 03

FRM 66-301 A4

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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LEGENDS:-	DESCRIPTION
PL01	BYPASS VALVE OPEN–'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PL02	BYPASS VALVE CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PL03	PV OPEN –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PL04	PV CLOSED –'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PL05	FUNCTIONAL GROUP PV RUNNING OPEN–'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PL06	FUNCTIONAL GROUP PV RUNNING CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PB–7E	EMERGENCY CLOSING LOCAL COMMAND 'R' PUSH BUTTON WITH 1NO+1NC CONTACT,240V AC(WITH PROTECTIVE COVER)
SL01	AC CONTROL SUPPLY OK –'A' INDICATION LAMP LED TYPE 240V AC
SL02	FUNCTIONAL GROUP PRESTART CHECK OK –'A' INDICATION LAMP LED TYPE 240V AC
SL03	SPARE–'A' INDICATION LAMP LED TYPE 240V AC
SL04	PV LOCKING PIN DISENGAGED –'A' INDICATION LAMP LED TYPE 240V AC
SL05	DOWN STREAM PRESSURE NORMAL –'G' INDICATION LAMP LED TYPE 240V AC
SL06	DIFF. PRESSURE NOT BALANCED IN SPECIFIED TIME –'R' INDICATION LAMP LED TYPE 240V AC
SL07	PV CREEPED TO 86"(PV OUT OF CONTROL)–'A' INDICATION LAMP LED TYPE 240V AC
SL08	PV CREEPED TO 84"(EMERGENCY CLOSING) –'R' INDICATION LAMP LED TYPE 240V AC
SL09	FLOOD LEVEL SWITCH OPERATED –'R' INDICATION LAMP LED TYPE 240V AC
SL10	AIR RELEASE VALVE CLOSED –'G' INDICATION LAMP LED TYPE 240V AC
SL11	AIR RELEASE VALVE OPEN –'R' INDICATION LAMP LED TYPE 240V AC
SL12	MIV & BYPASS CLOSED –'G' INDICATION LAMP LED TYPE 240V AC
SL13	PV EMERGENCY CLOSING OPERATED –'R' INDICATION LAMP LED TYPE 240V AC
SL14	DUPLEX FILTER CLOGGED –'A' INDICATION LAMP LED TYPE 240V AC
SL15	OVERVELOCITY TRIP DEVICE OPERATED –'R' INDICATION LAMP LED TYPE 240V AC
SL16	24VDC FIELD SUPPLY OK –'A' INDICATION LAMP LED TYPE 240V AC
SL17	PV OPU PR. NORMAL –'G' INDICATION LAMP LED TYPE 240V AC
SL18	PENSTOCK DRAIN VALVES CLOSED –'G' INDICATION LAMP LED TYPE 240V AC
SL19	SPARE –'A' INDICATION LAMP LED TYPE 240V AC
SLS1	SPARE –'R' INDICATION LAMP LED TYPE 240V AC
SLS2	SPARE –'G' INDICATION LAMP LED TYPE 240V AC
SLS3	SPARE –'A' INDICATION LAMP LED TYPE 240V AC
PLS1	SPARE– 'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
PLS2	SPARE– 'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.240V AC
SS1	2POSITIONS, 6POLE LOCAL/REMOTE 240V AC

CABLE ENTRY–TOP/BOTTOM

PANEL QTY–03 NOS

DRG. NO. EP–3–GA–003–02

INVENTORY NO. 19820/9/2021/SBD-CPBG

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BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU–II(6X170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 05

SCALE | JOB NO. CPB003 | DRG. NO. EP–3–GA–003–02 | REV. 03

FORM 66–301 A4

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

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BILL OF MATERIAL

SL. NO.	DEVICE NO.	DESCRIPTION	TECHNICAL SPECIFICATION	MAKE	QUANTITY
1	FPS1,FPS2	AC-DC CONVERTOR(SMPS)	INPUT: 240VAC, OUTPUT:24VDC, CURRENT RATING:5A	PHOENIX CONTACT/POWERTECH/ABB	02
2	DSS	DIODE ORING MODULE	2INPUT: 240 VDC, FOR REDUNDANCY OF FPS1 & FPS2	PHOENIX CONTACT/POWERTECH/ABB/ NANOTECH	01
3	80PV,4PVFGO,FGPVCX,BVOP,PVOP,PVOCMD,PVCP,PVCCMD, PVOOC,PVCREC,86PV-1,63W4-T6X, 33-53X-1, 33-53X-2,33-58AX,33-58BX,63W-4X, 33-79X,33-78X,71DO-18X, 33-SPIX, 33-88PVX, 88RDX	AUXILIARY CONTACTOR	COIL VOLTAGE 240V AC,AUXILIARY CONTACTS 4NO+2NC	SIEMENS/ABB/L&T/SCHNEIDER	23
4	PRX,86PV,33-52X-1,33-52X-2, 33-56X,33-56AX, 33-57X, 33-57AX, SP1,SP2	AUXILIARY CONTACTOR	COIL VOLTAGE 240V AC,AUXILIARY CONTACTS 4NO+4NC	SIEMENS/ABB/L&T/SCHNEIDER	10
5	FGPVOX,BPMIVCF,63PV-1X,PDVCFPH,33-52X4, 33-SP2X, 33-SP3X, 33-SP4X,33-SP5X	AUXILIARY CONTACTOR	COIL VOLTAGE 240V AC,AUXILIARY CONTACTS 6NO+2NC	SIEMENS/ABB/L&T/SCHNEIDER	09
6	80DCPV	AUXILIARY CONTACTOR	COIL VOLTAGE 24V DC ,AUXILIARY CONTACTS 4NO+2NC	SIEMENS/ABB/L&T/SCHNEIDER	01
7	T1,T2,T3,T4,T5	TIME DELAY RELAY	240V AC, ON DELAY, 0-60 SEC, 2NO+2NC CONTACT	SIEMENS/ L&T	05
8	T6	TIME DELAY RELAY	240V AC,ON DELAY,0-10HRS,2NO+2NC CONTACT	SIEMENS/ L&T	01
9	PL01,PL03,PL05,PLS1	ILLUMINATED PUSH BUTTON	1 NO+1NC CONTACT, COLOUR RED, LED TYPE, LAMP VOLTAGE 240V AC	SIEMENS/L&T/SCHNEIDER	04
10	PL02,PL04,PL06,PLS2	ILLUMINATED PUSH BUTTON	1 NO+1NC CONTACT, COLOUR GREEN, LED TYPE, LAMP VOLTAGE 240V AC	SIEMENS/L&T/SCHNEIDER	04
11	PB-7E	PUSH BUTTON	1 NO+1NC CONTACT, COLOUR RED, 240V AC (WITH PROTECTIVE COVER)	SIEMENS/L&T/SCHNEIDER	01
12	SL06,SL08,SL09,SL11,SL13,SL15,SLS1	SIGNAL LAMP	COLOUR RED, LED TYPE, LAMP VOLTAGE 240V AC	SIEMENS/L&T/SCHNEIDER	07
13	SL05,SL10,SL12,SL17,SL18,SLS2	SIGNAL LAMP	COLOUR GREEN, LED TYPE, LAMP VOLTAGE 220V AC	SIEMENS/L&T/SCHNEIDER	06
14	SL01,SL02,SL03,SL04,SL07,SL14,SL16,SL19,SLS3	SIGNAL LAMP	COLOUR AMBER LED TYPE, LAMP VOLTAGE 220V AC	SIEMENS/L&T/SCHNEIDER	09
15	SS1	SELECTOR SWITCH	2 Positions (Local/Remote), 6 Poles (For each Positions), Make Before Break & Stayput Type, Voltage 240 VAC,	KAYCEE/SAIZER/C&S/L&T/EE/SIEMENS	01
16	Q1,Q2	MCB	240 VAC 5 A, 2 Poles	SIEMENS/ABB/L&T/SCHNEIDER	02
17	Q3	MCB	240 VAC 10 A, 2 Poles	SIEMENS/ABB/L&T/SCHNEIDER	01
18	Q51,Q52	MCB	240 VAC 10 A, 1 Pole	SIEMENS/ABB/L&T/SCHNEIDER	02
19	LK1	LINK	16A AC With base	SIEMENS/ABB/L&T/SCHNEIDER/C&S	01
20	DS	DOOR SWITCH	240V AC,1 Amp.	KAYCEE/SIEMENS/VAISHNO/OMRON/TECHNIC/SURAJ /SULOCHNA	01
21	HI	PANEL ILLUMINATION LAMP	240 V AC, 11 Watt CFL	PHILIPS/BAJAJ/HAVELLS/CGL/WIPRO	01
22	HT	SPACE HEATER	240V AC, 60 Watts, Mounting Arrangement, Earthing Provision & Protective Cover	SRISAI/VELCO/GIRISH/SMV/C&S/CANDS	01
23	TH	THERMOSTAT	240V AC, Range 30-60 Degree Contigrade	RITTAL	01
24	SKT	SOCKET WITH SWITCH	15A/5A 5 Pin Socket With Switch	ANCHOR/HAVELLS/COL	01
25	TBP:1 TO 10	TERMINAL BLOCKS	stud type trerminals, 6 sq mm, CAT M4	ELEMEX/CONNECTWELL/PHOENIX/WAGO/WEID MULLER	1set
26	TBFP:1 TO 5	TERMINAL BLOCKS	Distribution terminals, Sutable for 2.5 TO 6 sq MM,RED		1set
27	TBFN:1 TO 5	TERMINAL BLOCKS	Distribution terminals, Sutable for 2.5 TO 6 sq MM,BLACK		1set
28	TBICT: 1 TO 30, TB1FB:1 TO 60, TB1RT:1 TO 80 TBISP:1 TO 30	CONTROL TERMINAL BLOCKS	Screw type terminals , 6 sq MM, CST6		1set

DRG. NO. EP-3-GA-003-02

INVENTORY NO. 19820/9/2021/SBD-CPBG

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (PBV) FOR PUNATSANGCHHU-II(6X170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 06

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-02 | REV. 03

FORM 66-301 A4

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198209/2021/SBD-CPBG

SCHEMATIC DIAGRAM FOR
PV ELECTRICAL CONTROL PANEL (PVECP)

PROJECT :- PUNATSANGCHHU-II HEP (6X170MW)-BHUTAN

RATING :- 6 X 170 MW (V. FRANCIS)

DRG.NO. :- 3-21702-188-02 REV 00

HYDRO PROJECT ENGG. DIVISION.

BHARAT HEAVY ELECTRICALS LIMITED.

BHOPAL 462 021

REFERENCE DRAWINGS:

1. 12000018805 – DIAGRAM OF CONTROL GEAR FOR PENSTOCK VALVE (BFV)
2. 32170118801 – WIRING DIAGRAM FOR PENSTOCK VALVE HYDRULIC CONTROL PAENL (PVHCP)
3. 32304018803 – WIRING DIAGRAM OF PENSTOCK VALVE JUNCTION BOX (PVJB)

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

ADDITIONAL INFORMATION

STATUS OF DRAWING: U

DISTRIBUTION OF PRINTS
HPE–1
CUSTOMER–7

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

PROJECT	PUNATSANGCHHU-II HEP(6x170MW)-BHUTAN
CUSTOMER	PHPA-II BHUTAN
CONSULTANT	WAPCOS LIMITED, GURGAON CENTRAL ELECTRICITY AUTHORITY, NEW DELHI
CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD. BHOPAL

ISSUED BY DEPT HPE | DEPT. CODE 415 | UNTOL.DIMS. GR. | ANGLE | SCALE: NTS | WEIGHT (KG): — | REF. TO ASSY. DRG.: 3 21702 18801 | CARD CODE: 0.00

TITLE: COVERING SHEET

DRAWING NO.: 3 21702 18802 | REV.: 00

SHT. No. 01 | NO. OF SHT. 25

127

SHT NO.	TITLE	CARD CODE
1	COVERING SHEET	0.00
2	INDEX SHEET	0.10
3	SYMBOL & LEGENDS	0.20
4	COMPONENTS & DEVICE LIST	0.30
5	SYSTEM (240 VAC), FIELD POWER (24 VDC)	1.10
6	CUBICLE HEATER & ILLUMINATION CIRCUIT	1.20
7	FUNCTIONAL GROUP-PV	2.01
8	BYPASS VALVE OPEN	3.01
9	BYPASS VALVE CLOSE	3.02
10	PENSTOCK VALVE OPEN	3.11
11	PENSTOCK VALVE CLOSE	3.12
12	PENSTOCK VALVE LOGIC	3.50
13	EMERGENCY CLOSING	3.70
14	MULTIPLIER RELAYS - 1	4.01
15	MULTIPLIER RELAYS - 2	4.02
16	MULTIPLIER RELAYS - 3	4.03
17	STATUS INDICATION-1	5.01
18	STATUS INDICATION-2	5.02
19	STATUS INDICATION-3	5.03
20	STATUS INDICATION-4	5.04

SHT NO.	TITLE	CARD CODE
21	REMOTE CONTACTS-1	7.01
22	REMOTE CONTACTS-2	7.02
23	LIST OF TERMINALS (TBP, TBFP-TBFN, TB1CT, TB1FB)	8.01
24	LIST OF TERMINALS (TB1FB, TB1RT)	8.02
25	LIST OF TERMINALS (TBR1T, TB1SP)	8.03

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INVENTORY NO. N.A

SIGN.& DATE

REF.DRG.NO.

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 0.10

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE
INDEX SHEET

PROJECT
PUNATSANGCHHU-II HEP
(6x170MW)-BHUTAN

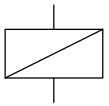
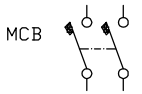
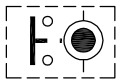
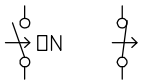
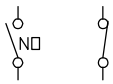
DRAWING NO. 3 21702 18802

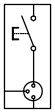
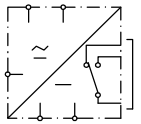
REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 02 NO. OF SHT. 25

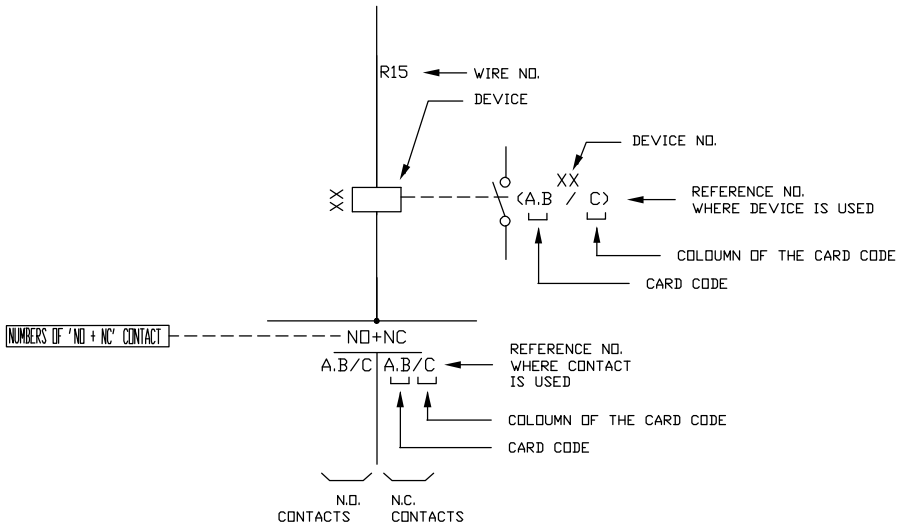
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETERMENTAL TO THE INTEREST OF THE COMPANY

SYMBOL	DESCRIPTION
	SOLENOID OPERATED DEVICE
	MINIATURE CIRCUIT BREAKER
	SELECTOR SWITCH STAYPUT TYPE
	CONTACTOR/ AUX. RELAY COIL
	ON DELAY TIMER
	ILLUMINATED PUSH BUTTON
	SIGNAL LAMP
	ON DELAY TIMER CONTACTS
	NORMALLY OPEN/ NORMALLY CLOSED CONTACTS
	TB FOR EXTERNAL CONNECTION
	LINK

SYMBOL	DESCRIPTION
	HEATER
	3 PIN SOCKET
	SWITCHED MODE POWER SUPPLY UNIT
	DOOR SWITCH

LEGEND	DESCRIPTION
PVECP	PENSTOCK VALVE ELECTRICAL CONTROL PANEL
PVHCP	PENSTOCK VALVE HYDRAULIC CONTROL PANEL
PVOPU	PV OIL PRESSURE UNIT
PVJB	PV JUNCTION BOX
RTU-BFV	RTU PANEL IN BF VALVE HOUSE

DEVICE & SHEET REFERENCE:



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 0.20

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: SYMBOL & LEGENDS

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802 | REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP) | SHT. No. 03 | NO. OF SHT. 25

SL. NO.	DEVICE NO.	DESCRIPTION	TECHNICAL SPECIFICATION	QTY.	MAKE
1	FPS1 , FPS2	AC-DC CONVERTOR (SMPS)	Input : 240 VAC, Output: 24 VDC, Current rating:5A	2	PHOENIX CONTACT / POWERTECH / ABB
2	DSS	DIODE ORING MODULE	2 Input: 24 VDC, FOR REDUNDANCY OF FPS1 & FPS2	1	PHOENIX CONTACT / POWERTECH / ABB / NANOTECH
3	80PV, 4PVFGO, FGPVCX, BVOP, PVOP, PVOCMD, PVCP, PVCCMD, PVOOC, PVCREC, 86PV-1, 63W4-T6X, 33-53X-1, 33-53X-2, 33-58aX, 33-58bX, 63W-4X, 33-79X, 33-78X, 71DG-18X, 33-SP1X, 33-88PVX, 88RDX	AUXILIARY CONTACTOR	Coil Voltage 240V AC, Auxiliary Contacts 4NO + 2NC (with freewheeling diode)	23	SIEMENS / ABB / L&T / SCHNEIDER
4	PRX, 86PV, 33-52X-1, 33-52X-2, 33-56X, 33-56AX, 33-57X, 33-57AX, SP1, SP2	AUXILIARY CONTACTOR	Coil Voltage 240V AC, Auxiliary Contacts 4NO + 4NC (with freewheeling diode)	10	SIEMENS / ABB / L&T / SCHNEIDER
5	FGPVOX, BPMIVCF, 63PV-1X, PDVCFPH, 33-52X-4, 33-SP2X, 33-SP3X, 33-SP4X, 33-SP5X	AUXILIARY CONTACTOR	Coil Voltage 240V AC, Auxiliary Contacts 6NO + 2NC (with free wheeling diode)	9	SIEMENS / ABB / L&T / SCHNEIDER
6	80DCPV	AUXILIARY CONTACTOR	Coil Voltage 24V DC, Auxiliary Contacts 4NO + 2NC	1	SIEMENS / ABB / L&T / SCHNEIDER
7	T1, T2, T3, T4, T5	TIME DELAY RELAY	240V AC, ON DELAY,0-60 SEC, 2NO + 2NC CONTACT	5	SIEMENS / L&T
8	T6	TIME DELAY RELAY	240V AC, ON DELAY,0-10 HRS , 2NO + 2NC CONTACT	1	SIEMENS / L&T
9	PL01, PL03, PL05, PLS1	ILLUMINATED PUSH BUTTON	1 NO+1NC Contact, Colour Red, LED Type, Lamp Voltage 240V AC	4	SIEMENS / L&T / SCHNEIDER
10	PL02, PL04, PL06, PLS2	ILLUMINATED PUSH BUTTON	1 NO+1NC Contact, Colour Green, LED Type,Lamp Voltage 240V AC	4	SIEMENS / L&T / SCHNEIDER
11	PB-7E	PUSH BUTTON	1 NO+1NC Contact, Colour Red, 240V AC (With Protective Cover)	1	SIEMENS / L&T / SCHNEIDER
12	SL06, SL08, SL09, SL11, SL13, SL15, SLS1	SIGNAL LAMP	Colour Red, LED Type,Lamp Voltage 240V AC	7	SIEMENS / L&T / SCHNEIDER
13	SL05, SL10, SL12, SL17, SL18, SLS2	SIGNAL LAMP	Colour Green, LED Type,Lamp Voltage 220V AC	6	SIEMENS / L&T / SCHNEIDER
14	SL01, SL02, SL03,SL04, SL07, SL14, SL16,SL19, SLS3	SIGNAL LAMP	Colour Amber LED Type,Lamp Voltage 220V AC	9	SIEMENS / L&T / SCHNEIDER
15	SS1	SELECTOR SWITCH	2 Positions (Local/Remote), 6 Poles (For each positions), Make Before Break & Staypit Type, Voltage 240 VAC,	1	KAYCEE / SAIZER / C&S / L&T / EE / SIEMENS
16	Q1, Q2	MCB	240 VAC, 5 A , 2 Poles	2	SIEMENS / ABB / L&T / SCHNEIDER
17	Q3	MCB	240 VAC, 10 A , 2 Poles	1	SIEMENS / ABB / L&T / SCHNEIDER
18	QS1, QS2	MCB	240 VAC, 10 A , 1 Pole	2	SIEMENS / ABB / L&T / SCHNEIDER
19	LK1	LINK	16 A AC with base	1	ABB / SIEMENS / L&T / SCHNEIDER / C&S
20	DS	DOOR SWITCH	240V AC, 1 Amp.	1	KAYCEE/SIEMENS/VAISHNO/OMRON/TECHNIC/SURAJ/SULOCHNA
21	H1	PANEL ILLUMINATION LAMP	240V AC, 11 Watt CFL	1	PHILIPS / BAJAJ / HAVELLS / CGL /WIPRO
22	HT	SPACE HEATER	240V AC, 60 Watts, With Mounting Arrangement, Earthing Provision & Protective Cover	1	SRISAI/VELCO/GIRISH/SMV/C&S/CANDS
23	TH	THERMOSTAT	240V AC, Range 30-60 Degree Centigrade	1	RITTAL
24	SKT	SOCKET WITH SWITCH	15A/5A 5 Pin Socket with Switch	1	ANCHOR / HAVELLS / CGL
25	TBP:1 TO 10	TERMINAL BLOCKS	Stud type terminals , 6 Sq mm, CAT M4	1 Set	ELEMEX / CONNECTWELL / PHOENIX / WAGO / WEID MULLER
26	TBFP:1 TO 5	TERMINAL BLOCKS	Distribution terminals , Suitable for 2.5 to 6 sq mm, Red	1 Set	
27	TBFN: 1 TO 5	TERMINAL BLOCKS	Distribution terminals , Suitable for 2.5 to 6 sq mm, Black	1 Set	
28	TB1CT: 1 TO 30 , TB1FB: 1 TO 60, TB1RT: 1 TO 60, TB1SP: 1 TO 30	CONTROL TERMINAL BLOCKS	Screw type terminals , 6 Sq mm , CST 6	1 Set	

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REF.DRG.NO.

INVENTORY NO. N.A

SIGN & DATE

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 0.30

ISSUED BY BOPT HPE, BOPT. 415, BOPT. CODE

TITLE: COMPONENTS & DEVICE LIST

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

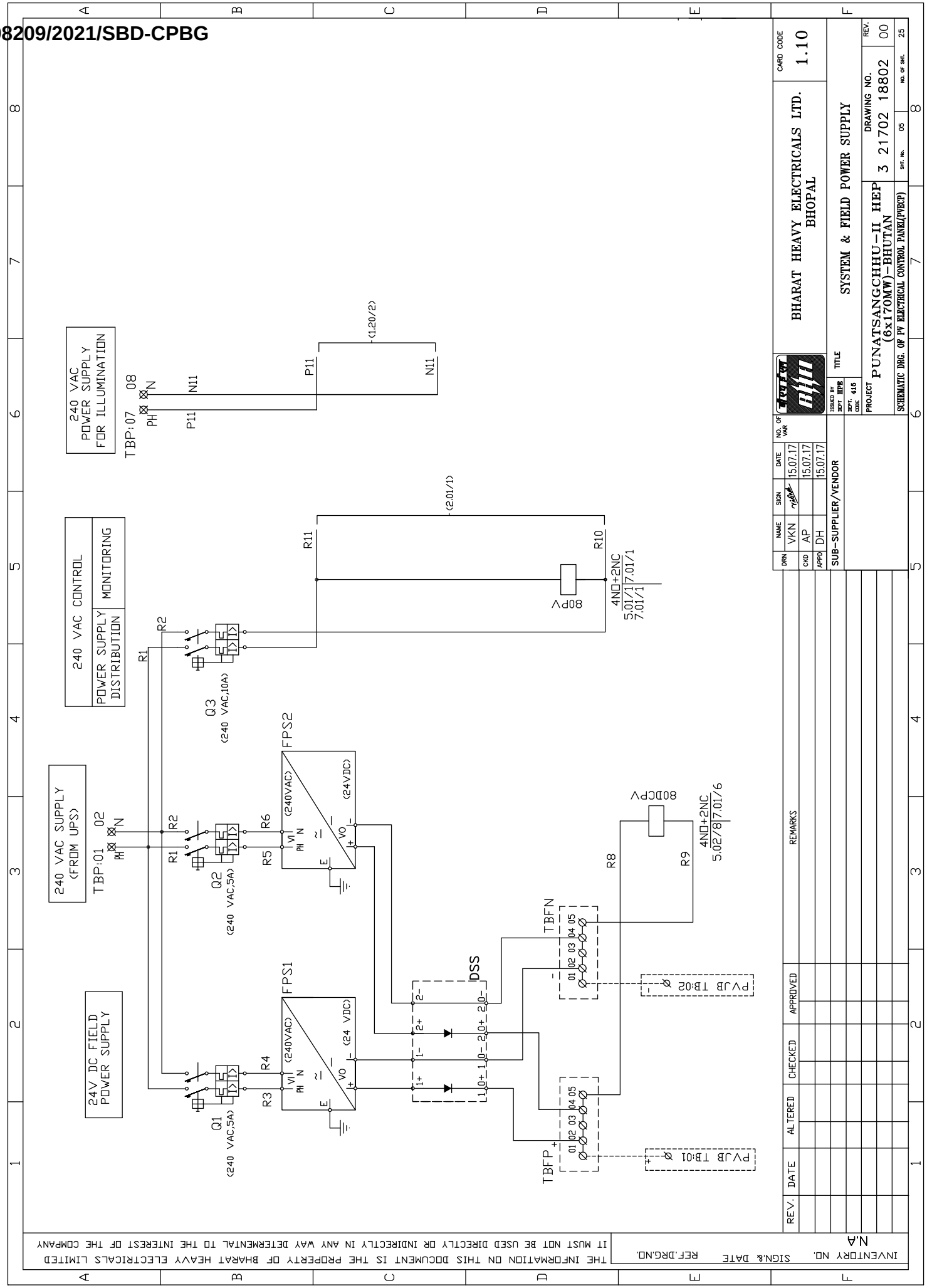
DRAWING NO. 3 21702 18802

REV. 00

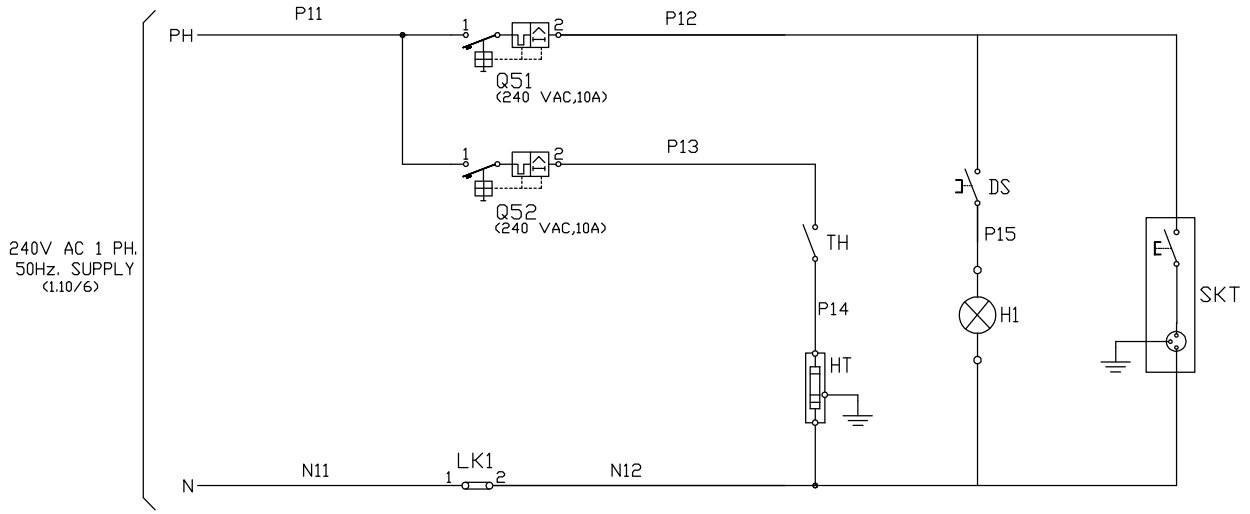
SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. NO. 04 NO. OF SHT. 25

198209/2021/SBD-CPBG



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REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A
SIGN.& DATE
REF.DRG.NO.

	NAME	SIGN	DATE
DRN	VKN		15.07.17
CKD	AP		15.07.17
APPD	DH		15.07.17

NO. OF VAR

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 1.20

ISSUED BY DEPT HPE
DEPT. CODE 415

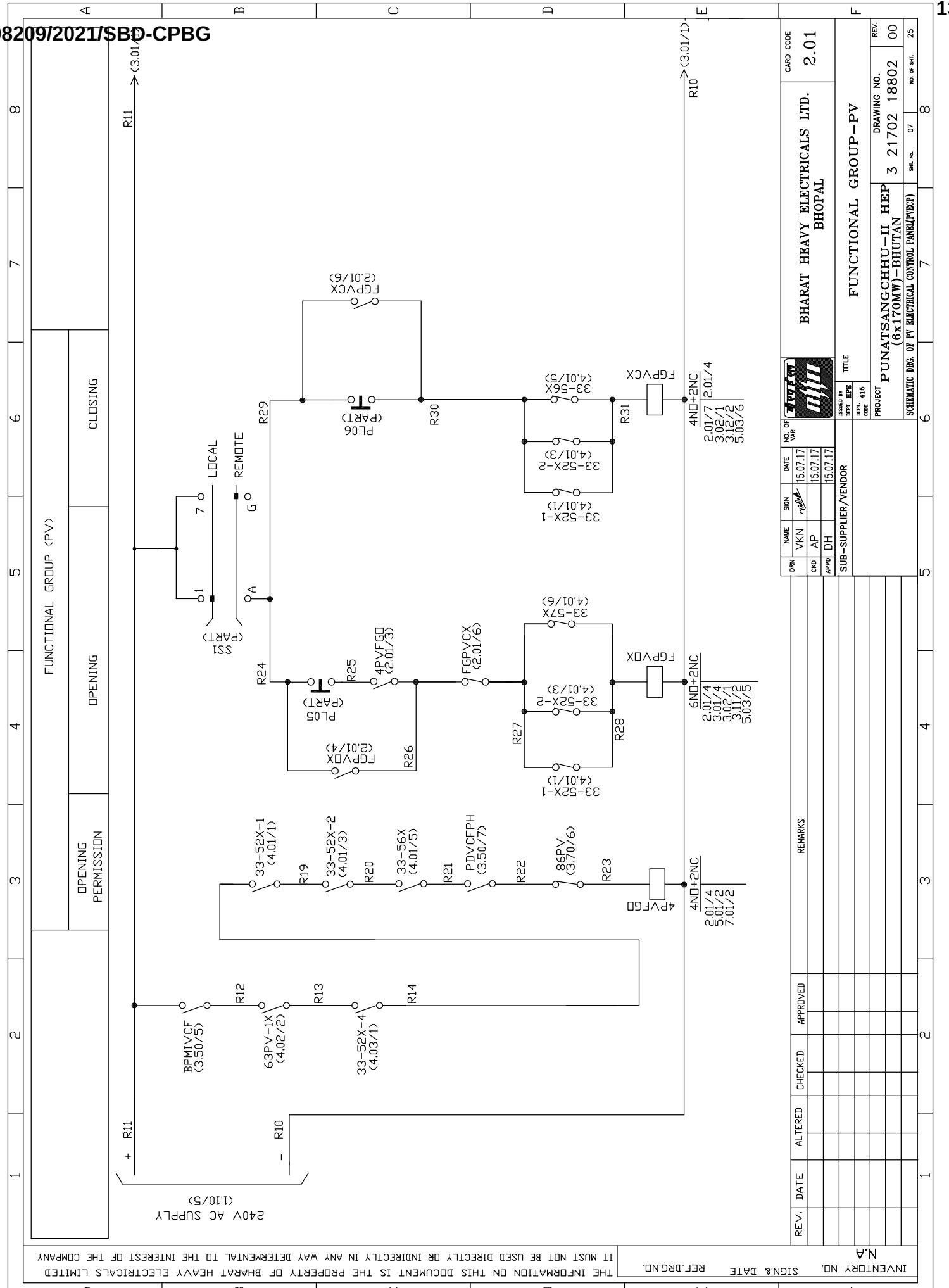
TITLE: CUBICLE HEATER & ILLUMINATION CIRCUIT

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21702 18802 REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 06 NO. OF SHT. 25



DRN	NAME	SIGN	DATE	NO. OF VAR
CKD	VKN		15.07.17	
APPD	AP		15.07.17	
	DH		15.07.17	

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT. HPB
DEPT. CODE 415

TITLE

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

FUNCTIONAL GROUP–PV

PROJECT PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21702 18802

CARD CODE 2.01

REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 07 NO. OF SHT. 25

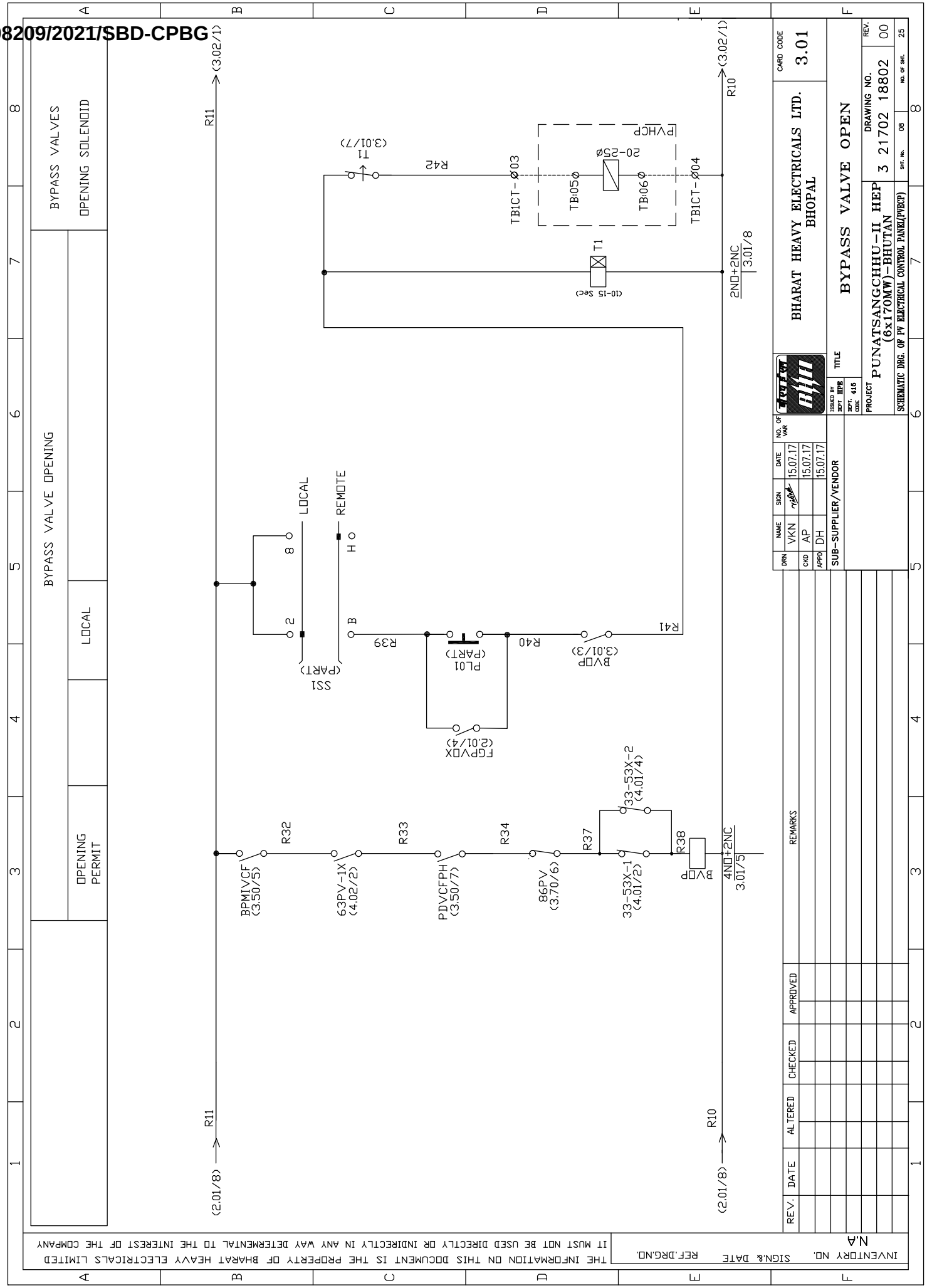
REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A

SIGN& DATE

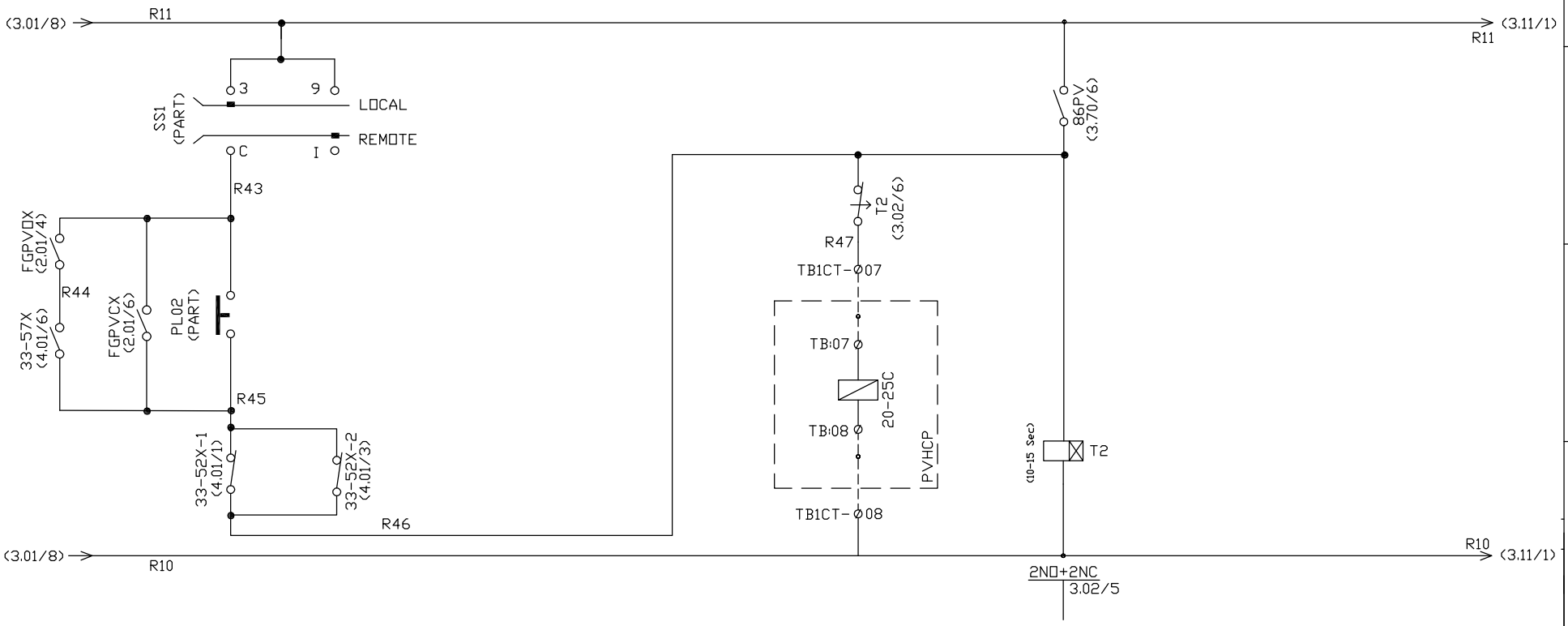
REF.DRG.NO.

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BYPASS VALVES
OPENING SOLENOID
BYPASS VALVE OPENING
OPENING PERMIT
LOCAL
(2.01/8)
R11
(3.02/1)
R10
BPMIVCF (3.50/5)
R32
63PV-1X (4.02/2)
R33
PDVCFPH (3.50/7)
R34
86PV (3.70/6)
R37
33-53X-1 (4.01/2)
33-53X-2 (4.01/4)
R38
BVDP
4ND+2NC 3.01/5
2ND+2NC 3.01/8
T1 (10-15 Sec)
TB1CT-Ø03
TB1CT-Ø04
TB1Ø5
TB1Ø6
20-25Ø
PVHCP
R42
T1 (3.01/7)
BVDP (3.01/3)
R41
R40
PL01 (PART)
FGPVDX (2.01/4)
R39
SS1 (PART)
LOCAL
REMOTE
2
8
B
H
BHARAT HEAVY ELECTRICALS LTD. BHOPAL
CARD CODE 3.01
BYPASS VALVE OPEN
PROJECT PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN
DRAWING NO. 3 21702 18802
REV. 00
SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)
SHT. No. 08
NO. OF SHT. 25
DRN VKN 15.07.17
CKD AP 15.07.17
APPD DH 15.07.17
SUB-SUPPLIER/VENDOR
ISSUED BY DEPT. HPB
DEPT. CODE 415
TITLE
REMARKS
REV. DATE ALTERED CHECKED APPROVED
INVENTORY NO. N.A
SIGN& DATE
REF.DRG.NO.
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BYPASS VALVE CLOSING			BYPASS VALVE CLOSING SOLENOID	TIMER		
	LOCAL					



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A
SIGN.& DATE
REF.DRG.NO.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.02

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: BYPASS VALVE CLOSE

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

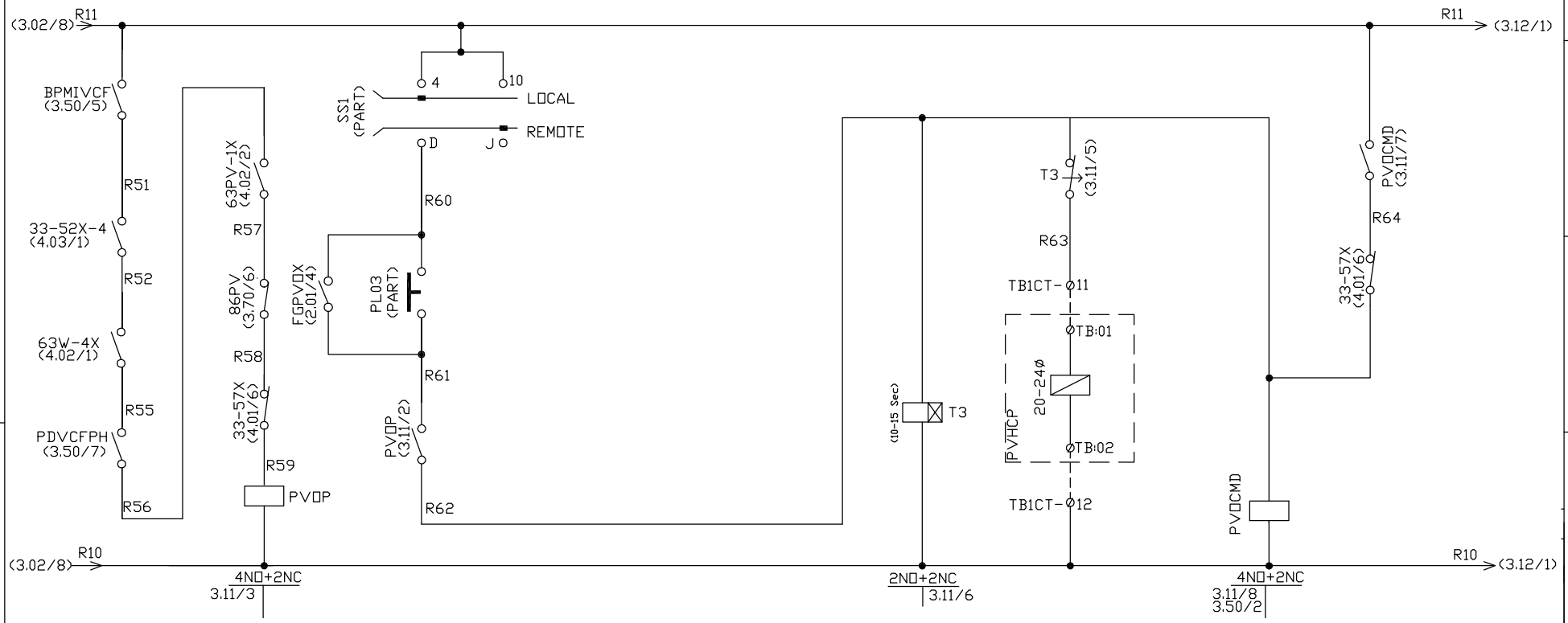
DRAWING NO. 3 21702 18802

REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 09 NO. OF SHT. 25

PV OPENING				PV OPENING SOLENOID	PV OPENING COMMAND RELAY	
PERMIT RELAY	LOCAL					



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE: 3.11

ISSUED BY DEPT: HPE
DEPT. CODE: 415

TITLE: PENSTOCK VALVE OPEN

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO.: 3 21702 18802

REV.: 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

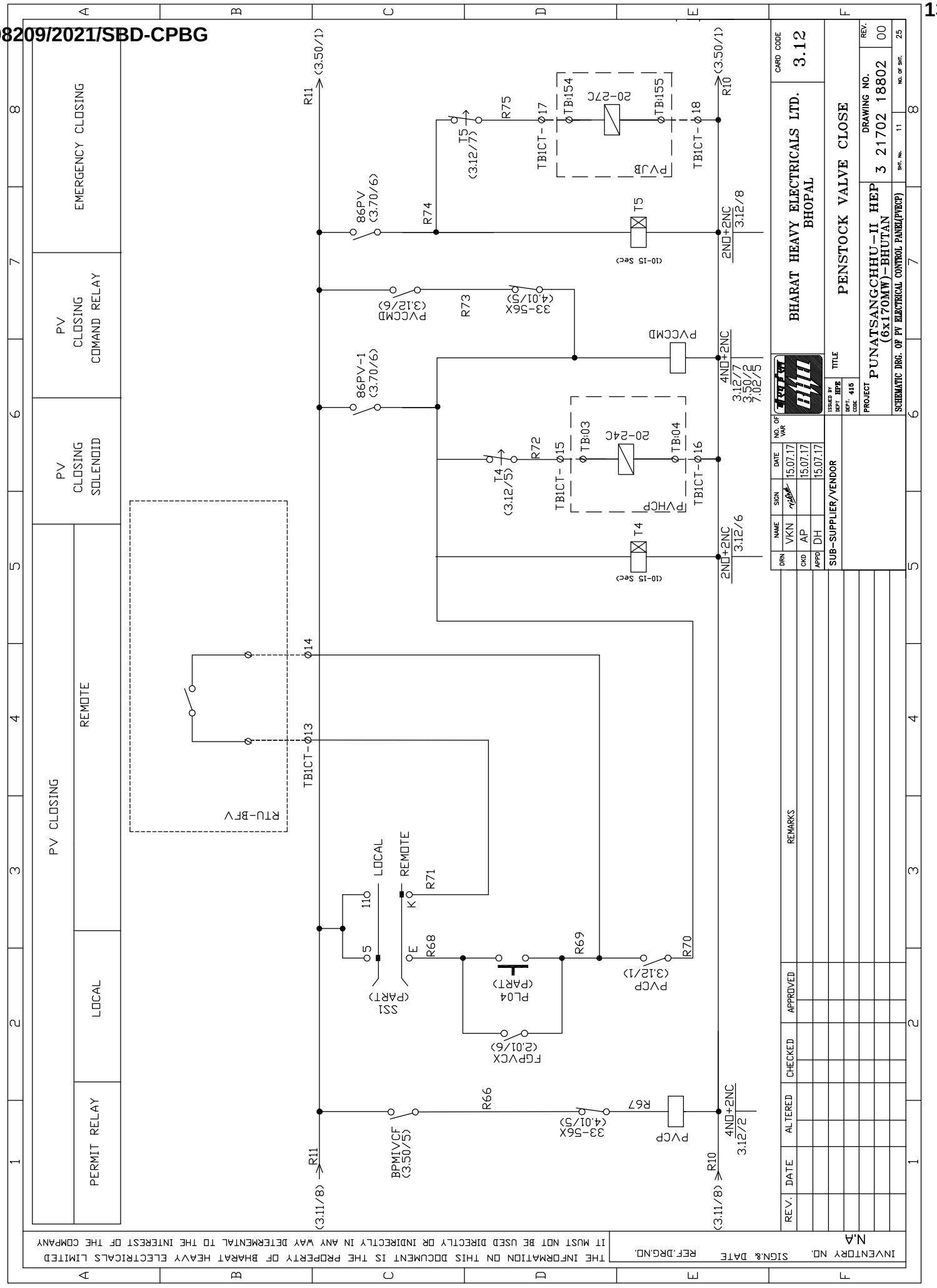
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INVENTORY NO. N.A

SIGN.& DATE

REF.DRG.NO.

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REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT. HPB
DEPT. CODE 415

TITLE

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.12

PENSTOCK VALVE CLOSE

PROJECT PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21702 18802

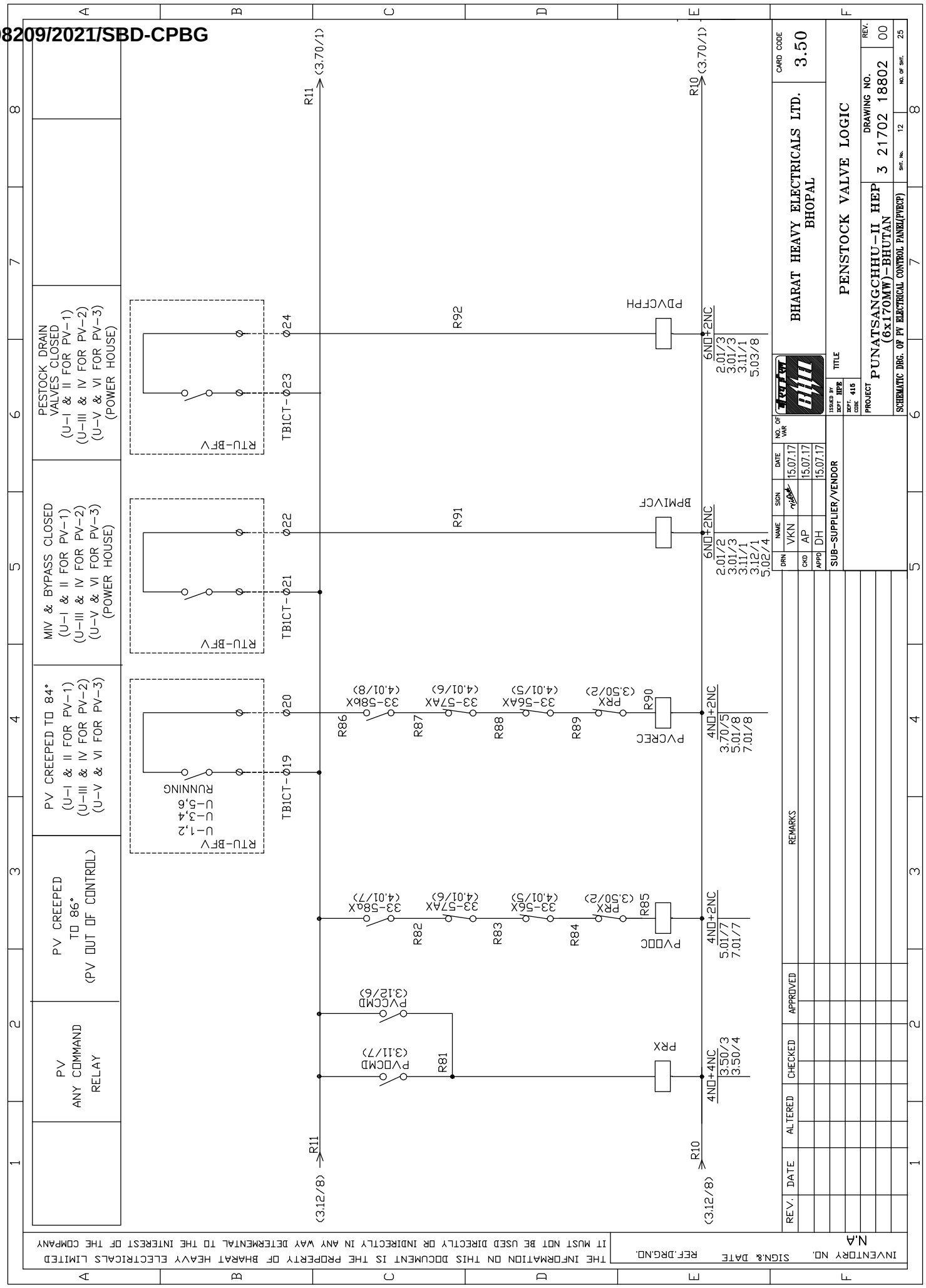
REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

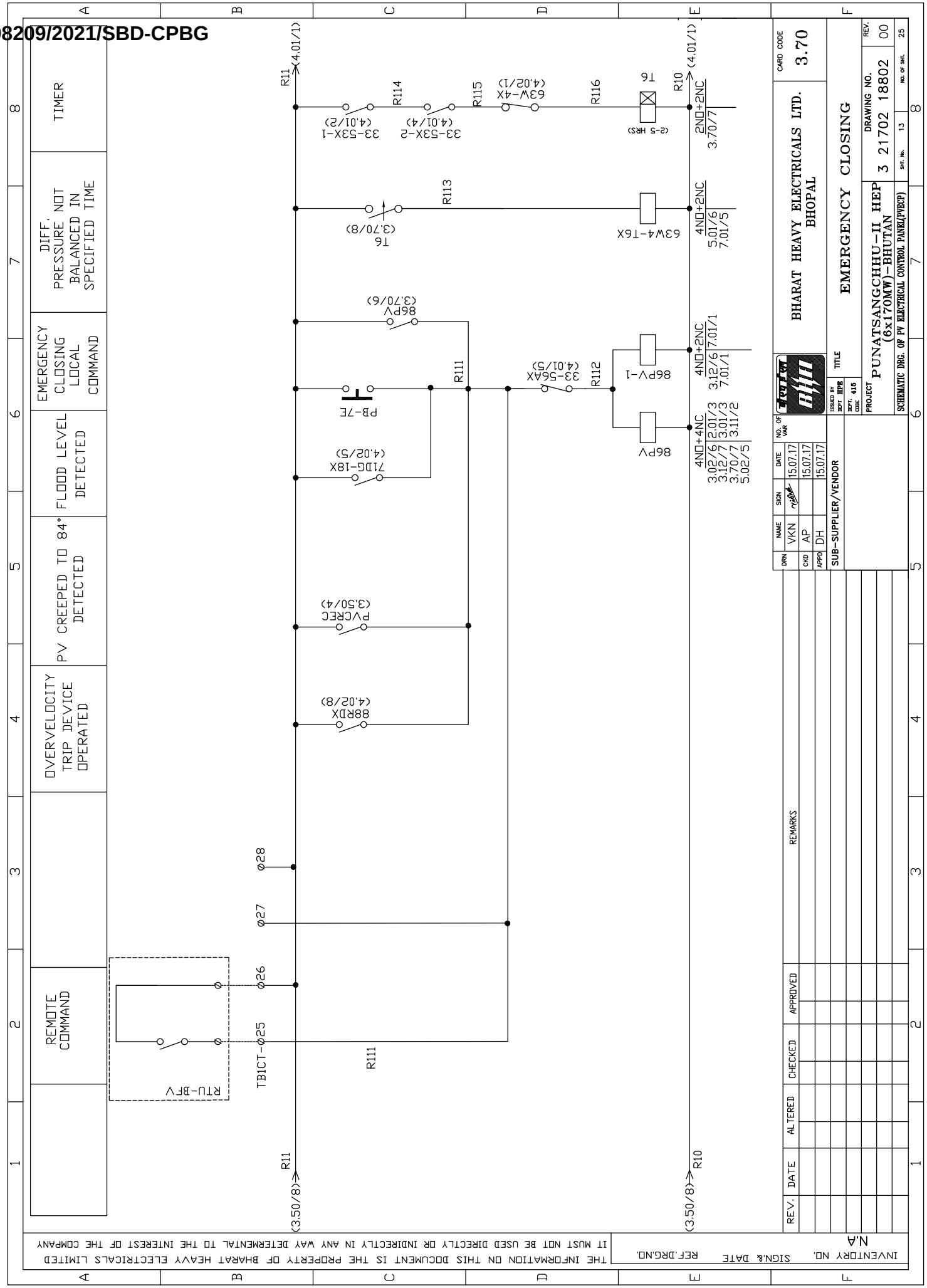
SHT. No. 11 NO. OF SHT. 25

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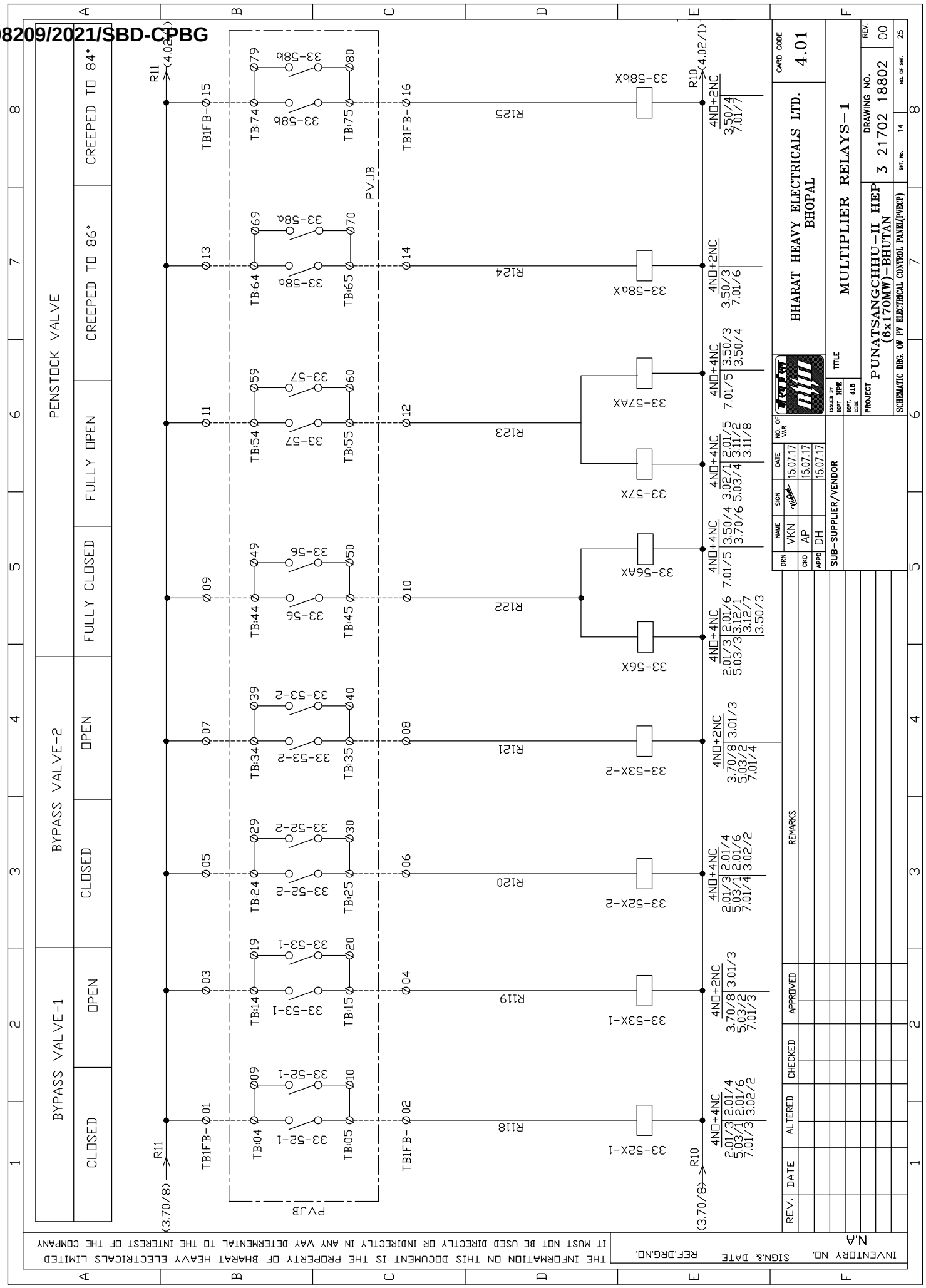
SIGN.& DATE REF.DRG.NO. INVENTORY NO. N.A


PV ANY COMMAND RELAY
PV CREEPED TO 86° (PV OUT OF CONTROL)
PV CREEPED TO 84° (U-I & II FOR PV-1) (U-III & IV FOR PV-2) (U-V & VI FOR PV-3)
MIV & BYPASS CLOSED (U-I & II FOR PV-1) (U-III & IV FOR PV-2) (U-V & VI FOR PV-3) (POWER HOUSE)
PESTOCK DRAIN VALVES CLOSED (U-I & II FOR PV-1) (U-III & IV FOR PV-2) (U-V & VI FOR PV-3) (POWER HOUSE)
R11 (3.70/1)
R10 (3.70/1)
PRX
PVDCMD (3.11/7)
PVCCMD (3.12/6)
R81
4NO+4NC 3.50/3 3.50/4
PVDDC
PVCREC
PRX (3.50/2)
33-56X (4.01/5)
33-57AX (4.01/6)
33-58BX (4.01/7)
33-58AX (4.01/8)
R82
R83
R84
R85
R86
R87
R88
R89
R90
4NO+2NC 5.01/7 7.01/7
4NO+2NC 3.70/5 5.01/8 7.01/8
RTU-BFV
TB1CT-Φ19
TB1CT-Φ20
TB1CT-Φ21
TB1CT-Φ22
TB1CT-Φ23
TB1CT-Φ24
R91
R92
BPMIVCF
PDVCFPH
6NO+2NC 2.01/2 3.01/3 3.11/1 3.12/4 5.02/4
6NO+2NC 2.01/3 3.01/3 3.11/1 5.03/8
(3.12/8)
R11
R10
REV. DATE ALTERED CHECKED APPROVED REMARKS
DRN NAME VKN SIGN DATE 15.07.17
CKD AP 15.07.17
APPD DH 15.07.17
NO. OF VAR
SUB-SUPPLIER/VENDOR
ISSUED BY DEPT. HPB DEPT. CODE 415
TITLE
PENSTOCK VALVE LOGIC
PROJECT PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN
DRAWING NO. 3 21702 18802
REV. 00
SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)
SHT. No. 12 NO. OF SHT. 25
CARD CODE 3.50
BHARAT HEAVY ELECTRICALS LTD. BHOPAL
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INVENTORY NO. N.A
SIGN.& DATE
REF.DRG.NO.

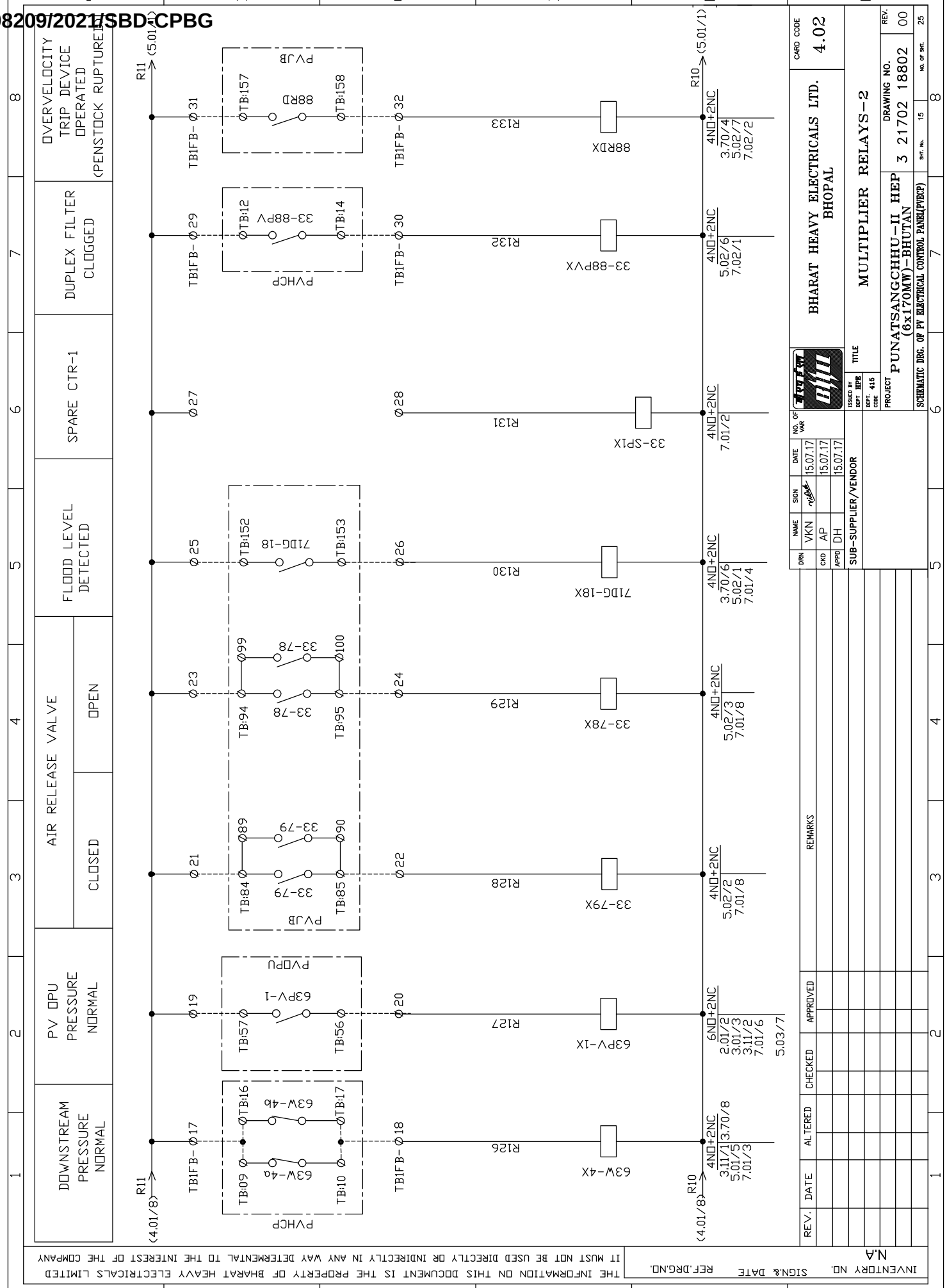
198209/2021/SBD-CPBG



198209/2021/SBD-CPBG

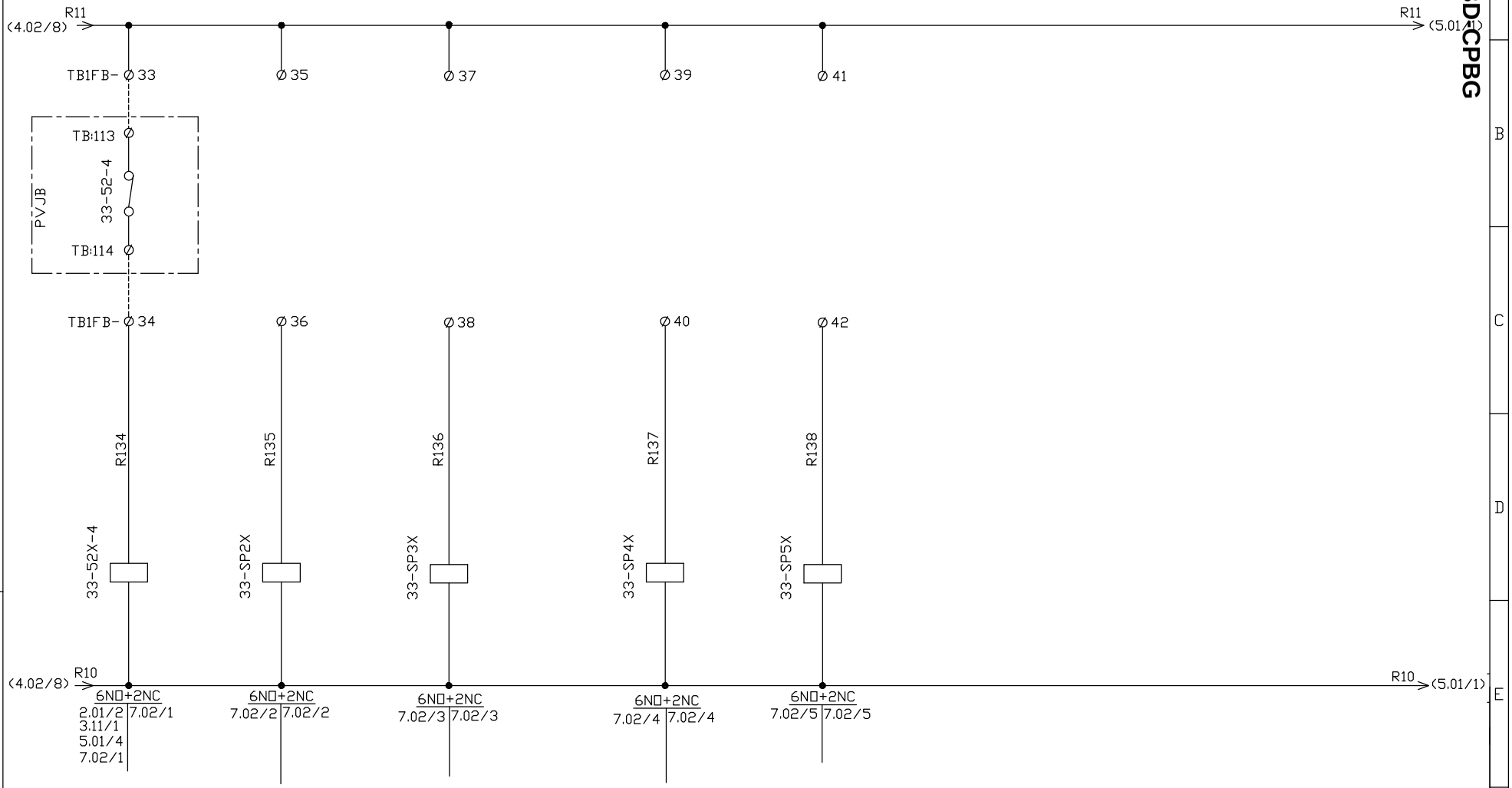


198209/2021/SBD-CPBG



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PV LOCKING PIN DISENGAGED (IN CLOSED POSITION)	SPARE CTR-2	SPARE CTR-3	SPARE CTR-4	SPARE CTR-5	



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A SIGN.& DATE REF.DRG.NO.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 4.03

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: MULTIPLIER RELAYS-3

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

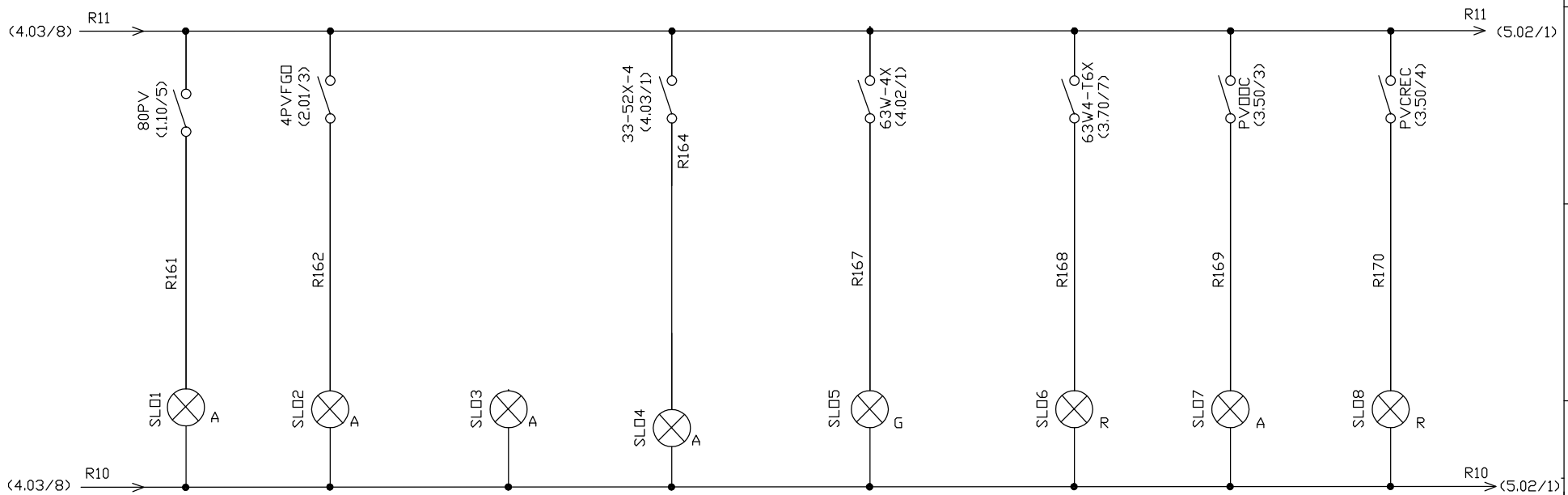
DRAWING NO. 3 21702 18802 REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 16 NO. OF SHT. 25

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AC CONTROL SUPPLY OK	FUNCTIONAL GROUP PRESTART CHECK OK	SPARE	PV LOCKING PIN DISENGAGED	DOWNSTREAM PRESSURE NORMAL	DIFF. PRESSURE NOT BALANCED IN SPECIFIED TIME	PV CREEPED TO 86° (PV OUT OF CONTROL)	PV CREEPED TO 84° (EMERGENCY CLOSING)



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A SIGN.& DATE REF.DRG.NO.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.01

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: STATUS INDICATION-1

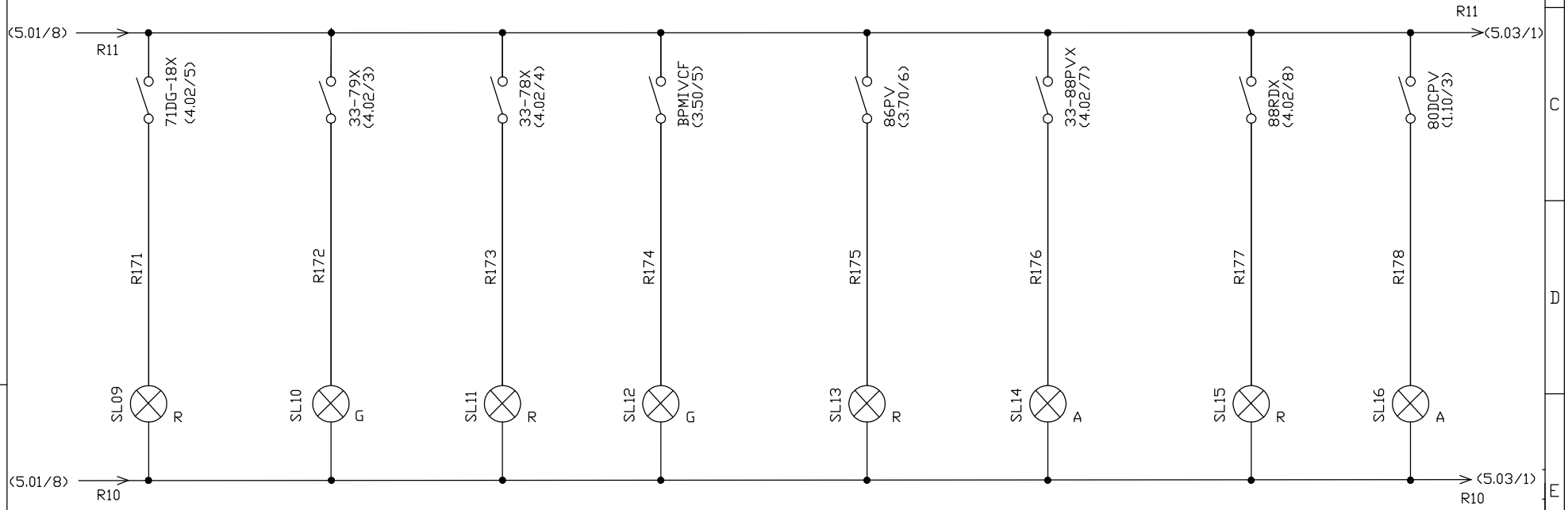
PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802 REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 17 NO. OF SHT. 25

FLOOD LEVEL SWITCH OPERATED	AIR RELEASE VALVE CLOSED	AIR RELEASE VALVE OPEN	MIV & BYPASS CLOSED (U-I & II FOR PV-1) (U-III & IV FOR PV-2) (U-V & VI FOR PV-3) (POWER HOUSE)	PV EMERGENCY CLOSING OPERATED	DUPLEX FILTER CLOGGED	OVERVELOCITY TRIP DEVICE OPERATED	24 VDC FIELD SUPPLY OK



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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.02

ISSUED BY DEPT HPE | DEPT. CODE 415

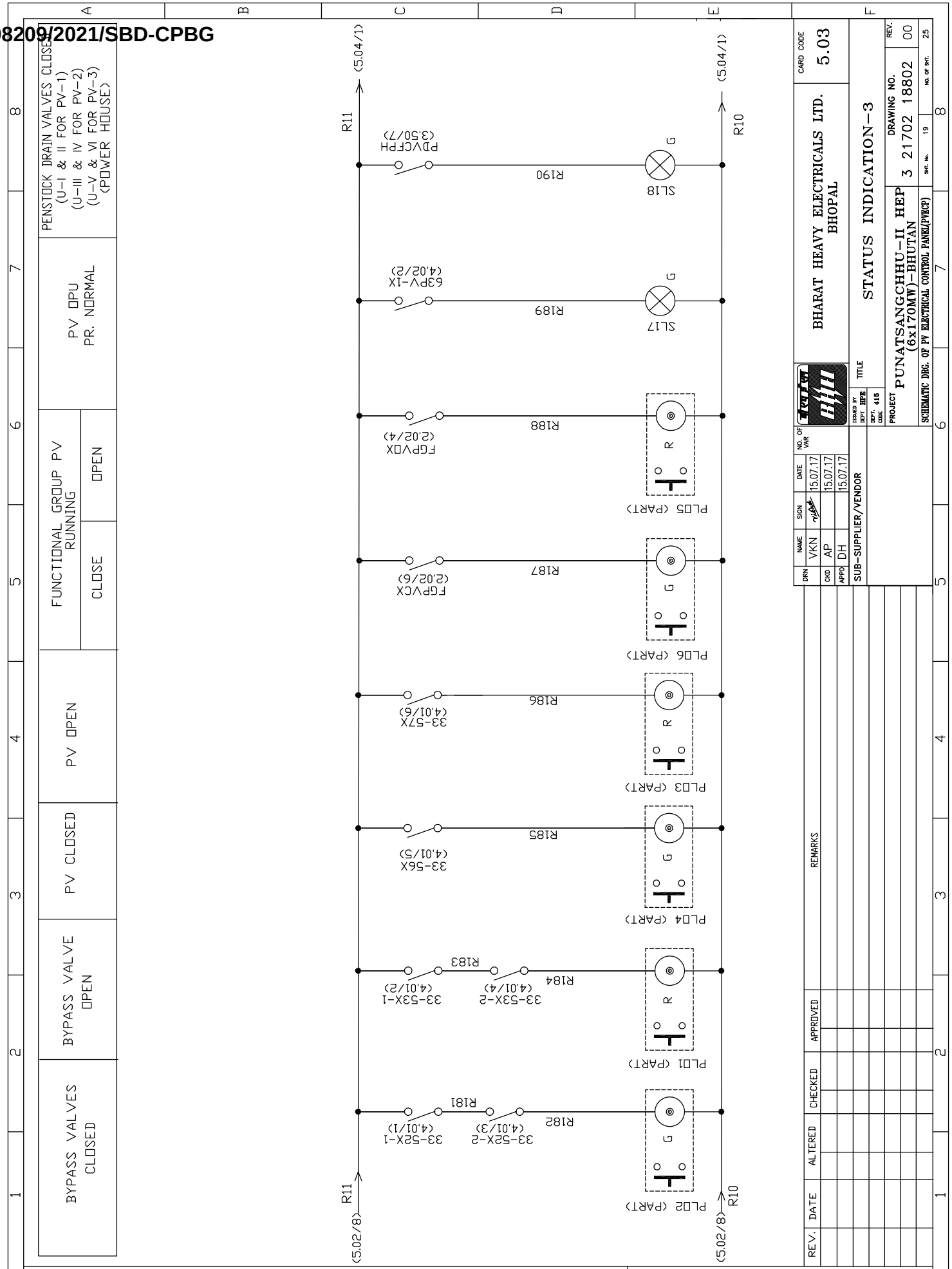
TITLE: STATUS INDICATION-2

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802 | REV. 00

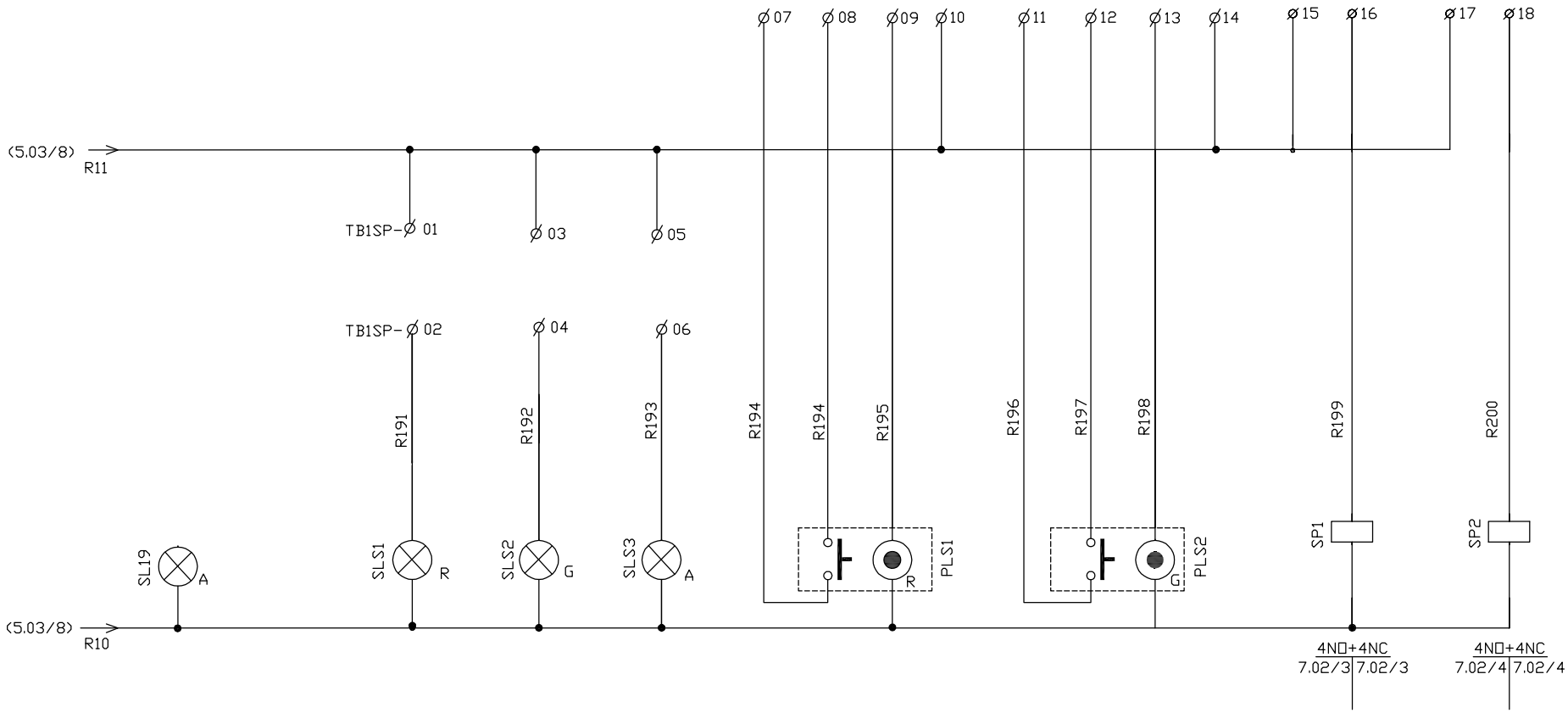
SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 18 | NO. OF SHT. 25


PENSTOCK DRAIN VALVES CLOSED
(U-I & II FOR PV-1)
(U-III & IV FOR PV-2)
(U-V & VI FOR PV-3)
(POWER HOUSE)
PV OPU
PR. NORMAL
FUNCTIONAL GROUP PV RUNNING
CLOSE
OPEN
PV OPEN
PV CLOSED
BYPASS VALVE OPEN
BYPASS VALVES CLOSED
R11
(5.04/1)
R10
(5.04/1)
PDVCFPH
(3,50/7)
R190
SL18
63PV-1X
(4,02/2)
R189
SL17
FGPVDX
(2,02/4)
R188
PLD5 (PART)
FGPVCX
(2,02/6)
R187
PLD6 (PART)
33-57X
(4,01/6)
R186
PLD3 (PART)
33-56X
(4,01/5)
R185
PLD4 (PART)
33-53X-1
(4,01/2)
33-53X-2
(4,01/4)
R184
R183
PLD1 (PART)
33-52X-1
(4,01/1)
33-52X-2
(4,01/3)
R182
R181
PLD2 (PART)
R11
(5.02/8)
R10
(5.02/8)
REMARKS
APPROVED
CHECKED
ALTERED
DATE
REV.
DRN
CKD
APPD
NAME
SIGN
DATE
NO. OF VAR
VKN
AP
DH
15.07.17
15.07.17
15.07.17
SUB-SUPPLIER/VENDOR
ISSUED BY DEPT. HPB
DEPT. CODE 415
TITLE
BHARAT HEAVY ELECTRICALS LTD.
BHOPAL
STATUS INDICATION-3
PROJECT
PUNATSANGCHHU-II HEP
(6x170MW)-BHUTAN
SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)
CARD CODE
5.03
DRAWING NO.
3 21702 18802
REV.
00
SHT. No.
19
NO. OF SHT.
25
INVENTORY NO.
N.A
SIGN.& DATE
REF.DRG.NO.
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SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A

SIGN.& DATE REF.DRG.NO.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.04

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: STATUS INDICATION-4

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

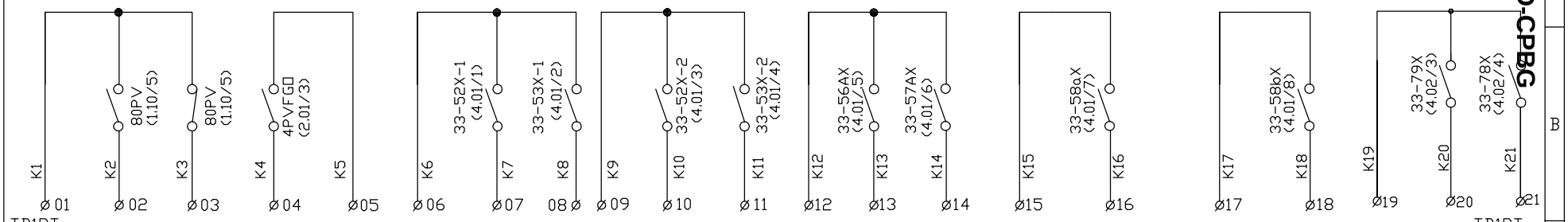
DRAWING NO. 3 21702 18802 REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

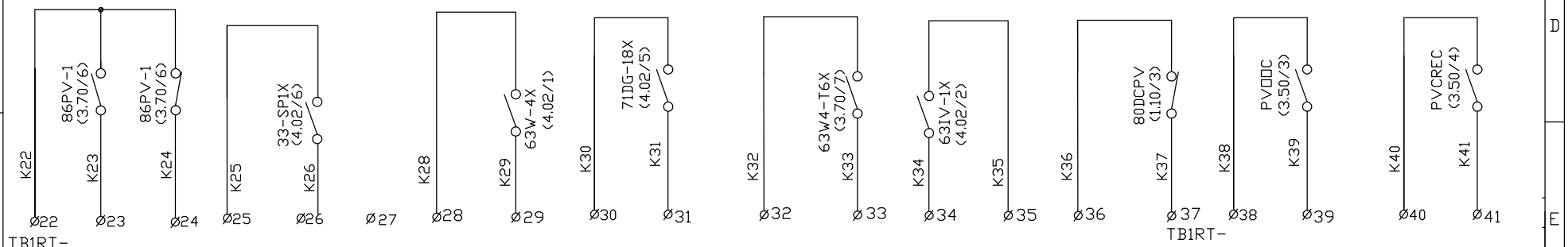
SHT. No. 20 NO. OF SHT. 25

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240 VAC SUPPLY		FUNCTIONAL GROUP PRE-START CHECK-OK	BYPASS VALVE-1		BYPASS VALVE-2		PENSTOCK VALVE		PENSTOCK VALVE	PENSTOCK VALVE	AIR RELEASE VALVE	
OK	FAIL		CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN	CREEPED TO 86'	CREEPED TO 84'	CLOSED	OPEN



EMERGENCY CLOSING RELAY	SPARE CTR-1	DOWNSTREAM PRESSURE NORMAL	FLOOD LEVEL DETECTED	DIFF. PRESSURE NOT BALANCED IN SPECIFIED TIME	PV OPU PRESSURE NORMAL	24 VDC FIELD SUPPLY FAIL	PV CREEPED TO 86° (PV OUT OF CONTROL)	PV CREEPED TO 84' (EMERGENCY CLOSING)



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 7.01

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: REMOTE CONTACTS-1

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

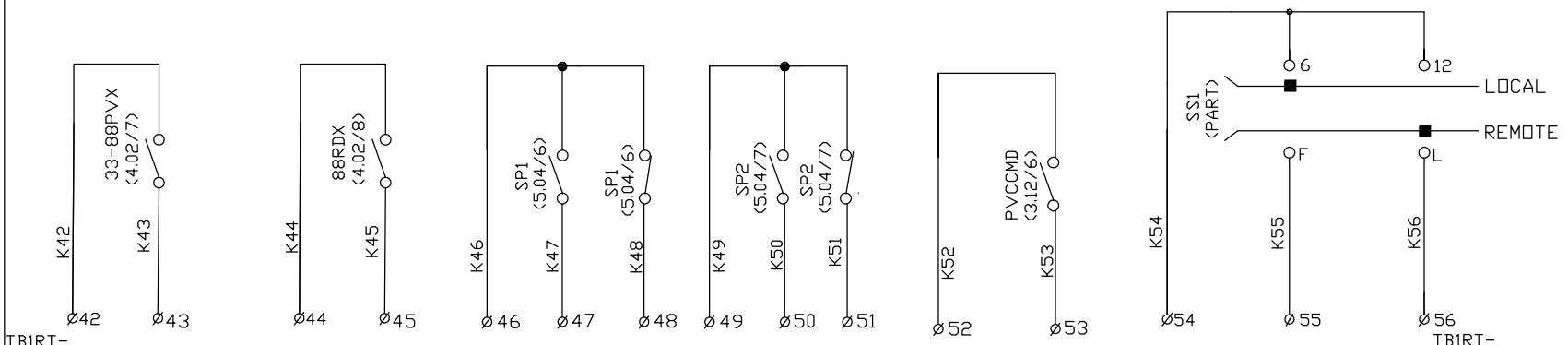
DRAWING NO. 3 21702 18802 | REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

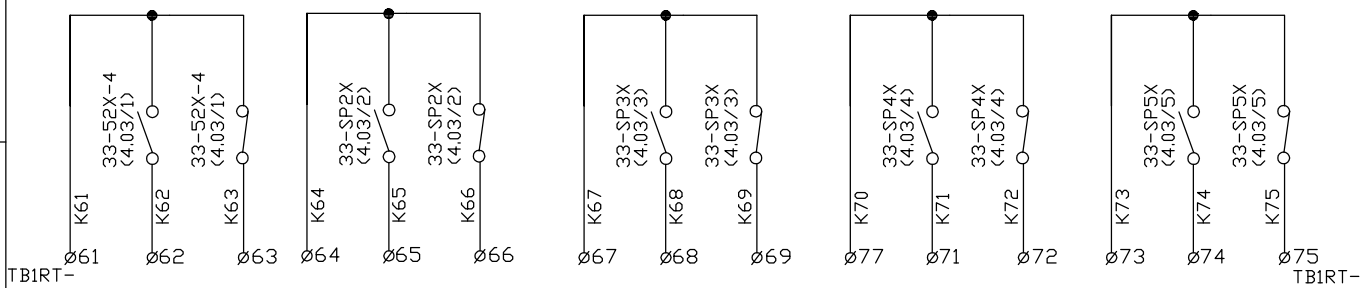
SHT. No. 21 | NO. OF SHT. 25

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DUPLEX FILTER CLOGGED	OVERVELOCITY TRIP DEVICE OPERATED	SPARE-1	SPARE-2	TRIP CMD TO (U-I & II FOR PV-1) (U-III & IV FOR PV-2) (U-V & VI FOR PV-3)	CONTROL SELECTION	
					LOCAL	REMOTE



PENSTOCK VALVE LOCKING PIN		SPARE CTR-2	SPARE CTR-3	SPARE CTR-4	SPARE CTR-5	
DISENGAGED	ENGAGED					



REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

INVENTORY NO. N.A

SIGN.& DATE

REF.DRG.NO.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 7.02

ISSUED BY DEPT HPE

DEPT. CODE 415

TITLE: REMOTE CONTACTS-2

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802

REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 22 NO. OF SHT. 25

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TBP

(1.10)	01	+	240 VAC SUPPLY (FROM UPS)
	02	–	
	03		
	04		
	05		
	06		
(1.10)	07	PH	240 VAC SUPPLY (FROM STATION AC)
	08	N	
	09		
	10		

TBFP

(1.10)	01	+	Ø TB:01 (TO PVJB) 24 VDC SUPPLY FOR LIMIT SWITCH
	02		
	03		
	04		
	05		

TBFN

(1.10)	01	–	Ø TB:02 (TO PVJB) 0 VDC SUPPLY TO MIVJB
	02		
	03		
	04		
	05		

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1CT

	01		
	02		
(3.01)	03	Ø TB:05	(TO PVHCP) BYPASS VALVE OPEN SOLENOID
	04	Ø TB:06	
	05		
	06		
(3.02)	07	Ø TB:07	(TO PVHCP) BYPASS VALVE CLOSE SOLENOID
	08	Ø TB:08	
	09		
	10		
(3.11)	11	Ø TB:01	(TO PVHCP) PV OPEN SOLENOID
	12	Ø TB:02	
(3.12)	13		PV-1 / PV-2 / PV-3 (FROM RTU–BFV) PV CLOSE COMMAND
	14		
	15	Ø TB:03	(TO PVHCP) PV CLOSE SOLENOID
	16	Ø TB:04	
	17	Ø TB:154	(TO PVJB) PV EMERGENCY CLOSE SOLENOID
	18	Ø TB:155	
(3.50)	19		(FROM RTU–BFV) U# I, II RUNNING FOR PV–1 U# III, IV RUNNING FOR PV–2 U# V, VI RUNNING FOR PV–3
	20		
	21		(FROM RTU–BFV) U# I, II BPV & MIV CLOSED FOR PV–1 U# III, IV BPV & MIV CLOSED FOR PV–2 U# V, VI BPV & MIV CLOSED FOR PV–3
	22		
	23		(FROM RTU–BFV) U# I, II PENSTOCK DR VLVS CLOSED FOR PV–1 U# III, IV PENSTOCK DR VLVS CLOSED FOR PV–2 U# V, VI PENSTOCK DR VLVS CLOSED FOR PV–3
	24		
(3.70)	25		(FROM RTU–BFV) EMERGENCY CLOSING COMMAND
	26		
	27		
	28		
	29		
	30		

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1FB

(4.01)	01	Ø TB:04	(FROM PVJB) BYPASS VALVE–1 CLOSE FEEDBACK
	02	Ø TB:05	
	03	Ø TB:14	(FROM PVJB) BYPASS VALVE–1 OPEN FEEDBACK
	04	Ø TB:15	
	05	Ø TB:24	(FROM PVJB) BYPASS VALVE–2 CLOSE FEEDBACK
	06	Ø TB:25	
	07	Ø TB:34	(FROM PVJB) BYPASS VALVE–2 OPEN FEEDBACK
	08	Ø TB:35	
	09	Ø TB:44	(FROM PVJB) PV FULL CLOSE FEEDBACK
	10	Ø TB:45	
	11	Ø TB:54	(FROM PVJB) PV FULL OPEN FEEDBACK
	12	Ø TB:55	
	13	Ø TB:64	(FROM PVJB) PV CREEPED TO 86° FEEDBACK
	14	Ø TB:65	
	15	Ø TB:74	(FROM PVJB) PV CREEPED TO 84° FEEDBACK
	16	Ø TB:75	
	17	Ø TB:09	(FROM PVHCP) DOWNSTREAM PRESSURE NORMAL
	18	Ø TB:10	
	19	Ø TB:57	(FROM PVOPU) PV OPU PRESSURE NORMAL
	20	Ø TB:56	
	21	Ø TB:84	(FROM PVJB) AIR RELEASE VALVE CLOSED FDBK
	22	Ø TB:85	
	23	Ø TB:94	(FROM PVJB) AIR RELEASE VALVE OPEN FDBK
	24	Ø TB:95	
(4.02)	25	Ø TB:152	(FROM PVJB) FLOOD LEVEL DETECTED
	26	Ø TB:153	
	27		
	28		
	29	Ø TB:12	(FROM PVHCP) DUPLEX FILTER CLOGGED
	30	Ø TB:14	

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB–SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 8.01

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: LIST OF TERMINALS (TBP, TBFP–TBFN , TB1CT, TB1FB)

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21702 18802 | REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 23 | NO. OF SHT. 25

198209/2021/SBD-CPBG

198209/2021/SBD-CPBG

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

TB1FB

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS
(4.02)	31 — Ø TB:157 (FROM PVJB) OVER VELOCITY TRIP DEVICE OPERATED
	32 — Ø TB:158
(4.03)	33 — Ø TB:113 (FROM PVJB) PV LOCKING PIN DISENGAGED(IN CLOSED POSN)
	34 — Ø TB:114
	35 — 60 SPARES

TB1RT

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS
(7.01/1)	01 — 240 VAC SUPPLY OK
	02 — 240 VAC SUPPLY FAILED
(7.01/2)	03 — 04 — FUNCTIONAL GROUP PRESTART CHECK OK
(7.01/3)	05 — 06 — (PV-1 PV-2 PV-3) (TO RTU-BFV) BYPASS VALVE-1 CLOSED
	07 — BYPASS VALVE-1 OPEN
(7.01/4)	08 — 09 — (PV-1 PV-2 PV-3) (TO RTU-BFV) BYPASS VALVE-2 CLOSED
	10 — BYPASS VALVE-2 OPEN
(7.01/5)	11 — 12 — (PV-1 PV-2 PV-3) (TO RTU-BFV) PENSTOCK VALVE CLOSED
	13 — PENSTOCK VALVE OPEN
(7.01/6)	14 — 15 — PENSTOCK VALVE CREEPED TO 86'
	16 —
(7.01/7)	17 — PENSTOCK VALVE CREEPED TO 84'
	18 —
(7.01/8)	19 — AIR RELEASE VALVE CLOSED
	20 — AIR RELEASE VALVE OPEN
	21 —
(7.01/1)	22 — EMERGENCY CLOSING OPERATED
	23 — EMERGENCY CLOSING NOT OPERATED
	24 —
(7.01/2)	25 — SPARE
	26 —
	27 —
(7.01/3)	28 — DOWNSTREAM PRESSURE NORMAL
	29 —

TB1RT

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS
(7.01/4)	30 — FLOOD LEVEL DETECTED
	31 —
(7.01/5)	32 — DIFF. PRESSURE NOT BALANCED IN SPECIFIED TIME
	33 —
(7.01/6)	34 — (PV-1 PV-2 PV-3) (TO RTU-BFV) PV OPU PRESSURE NORMAL
	35 —
(7.01/6)	36 — 24 DC FIELD SUPPLY FAILED
	37 —
(7.01/7)	38 — PENSTOCK VALVE CREEPED TO 86' (PV OUT OF CONTROL)
	39 —
(7.01/8)	40 — PENSTOCK VALVE CREEPED TO 84' (EMERGENCY OPERATED)
	41 —
(7.02/1)	42 — DUPLEX FILTER CLOGGED
	43 —
(7.02/2)	44 — (PV-1 PV-2 PV-3) (TO RTU-BFV) OVER VELOCITY DEVICE OPERATED
	45 —
(7.02/3)	46 — 47 — SPARE-1
	48 —
(7.02/4)	49 — 50 — SPARE-2
	51 —
(7.02/5)	52 — TRIP COMMAND TO (U-I, II & III FOR PV-1) (U-IV, V & VI FOR PV-2)
	53 —
(7.02/6)	54 — CONTROL SELECTION IN LOCAL
	55 —
	56 — CONTROL SELECTION IN REMOTE
	57 — 60

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT HPE | DEPT. CODE 415

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 8.02

TITLE: LIST OF TERMINALS (TB1FB, TB1RT)

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802 | REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP) | SHT. No. 24 | NO. OF SHT. 25

150

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INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1RT

(7.02/1)	61	PENSTOCK VALVE LOCKING PIN
	62	DISENGAGED
	63	ENGAGED
(7.02/2)	64	SPARE CTR-2
	65	
	66	
(7.02/3)	67	SPARE CTR-3
	68	
	69	
(7.02/4)	70	SPARE CTR-4
	71	
	72	
(7.02/5)	73	SPARE CTR-5
	74	
	75	
	76	
	77	
	78	
	79	
	80	

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1SP

(5.04)	01	SPARES (LAMPS)
	02	
	03	
	04	
	05	
	06	
	07	
	08	
	09	
	10	
	11	
	12	
	13	
	14	
	15	SPARES
	16	
	17	
	18	
	19	SPARES
	20	
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

REV.	DATE	ALTERED	CHECKED	APPROVED	REMARKS

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN		15.07.17	
CKD	AP		15.07.17	
APPD	DH		15.07.17	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 8.03

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: LIST OF TERMINALS (TB1RT, TB1SP)

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21702 18802 REV. 00

SCHEMATIC DRG. OF PV ELECTRICAL CONTROL PANEL(PVECP)

SHT. No. 25 NO. OF SHT. 25

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

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GENERAL ARRANGEMENT DRG. OF ELECTRICAL CONTROL PANEL FOR PUNATSANGCHHU HEP-II(MIV),BHUTAN

(REF SCHEMETIC NO.32130518802 REV02)

DRG. NO. EP-3-GA-003-01

PROJECT	6x170MW PUNATSANGCHHU-II HEP BHUTAN
CUSTOMER	PHPA-II, BHUTAN
CONSULTANT	WAPCOS LIMITED, GURGAON
	CENTRAL ELECTRICITY AUTHORITY, NEW DELHI
CONTRACTOR	M/S BHARAT HEAVY ELECTRICALS LIMITED BHOPAL
MDL	32130518801

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
07				
06				
05				
04				
03	31.12.18	AS BUILT		
02	19.09.18	CUSTOMER REQUIREMENT		
01	14.03.18	CUSTOMER REQUIREMENT		

	NAME	SIGN.	DATE
DESIGNED	SANTA		27.12.17
DRAWN			
CHECKED	JJM		27.12.17
APPROVED	JJM		27.12.17

CAD DIR : FILE NO.:

BHARAT HEAVY ELECTRICALS LIMITED
ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (MIV) FOR PUNATSANGCHHU-II(6x170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 01

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-01 | REV. 03

FORM 66-301 A4

19820/9/2021/SBD-CPBG

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8

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GENERAL NOTES FOR LT SWITCH BOARD:-

1. ALL DIMENSIONS ARE **IN MM.**
2. THE PANELS SHALL BE DUST & VERMIN PROOF, FREE STANDING, FLOOR MOUNTED AND COMPARTMENTALIZED.
3. THE PANEL SHALL BE SUITABLE FOR **3Ø, 4W, 415V AC, 50HZ SUPPLY.**
4. THE PANEL SHALL BE FABRICATED WITH
   - A. SIDE SHEET, FRONT/REAR DOOR/ REMOVABLE TOP & BOTTOM SHEET **- 2.0 CRCA.**
   - B. FEEDER PARTITION **- 2.0 CRCA.**
   - C. EQUIPMENT MOUNTING PLATE
   - D. INNER SIDE SHEET **- 2.0 MM. G.I.**
   - E. UNDRILLED REMOVABLE GLAND PLATE **- 3.0 MM. CRCA.**
   - F. BASE FRAME **- 3.0 MM. CRCA.**
   - G. LOAD BEARING MEMBER **- 2.5 MM. CRCA.**
   - H. BASE FRAME **- ISMC 75x40x6MM.**
5. NEOPRENE GASKET SHALL BE PROVIDED INSIDE THE DOORS TO MAKE THE PANEL DUST AND VERMIN PROOF.
6. THE PANEL SHALL BE PAINTED WITH **ELECTROSTATIC POWDER COATING PAINT** AFTER 10 TANK PROCESS.
7. BUS BAR SHALL BE OF **ELECTROLYTIC GRADE ALUMINIUM** SUPPORTED ON NON HYGROSCOPIC, NON CARBONISING, CORROSION RESISTANCE, SMC INSULATORS.
8. BUS BAR SHALL BE INSULATED **HEAT SHRINKABLE COLOURED PVC SLEEVES** RED, YELLOW, BLUE AND BLACK FOR IDENTIFICATION.
9. **EARTH BUS** SHALL BE PROVIDED THROUGHOUT THE PANEL LENGTH.
10. CONTROL WIRING SHALL BE CARRIED OUT WITH 1100V GRADE PVC INSULATED **FRLS COPPER FLEXIBLE WIRE** AND FOLLOWING COLOUR STANDARD.
    - A. AC VOLTAGE CIRCUIT **- 1.5 SQ MM RED, YELLOW, BLUE, BLACK**
    - B. CURRENT CIRCUIT **- 2.5 SQ MM RED, YELLOW, BLUE, BLACK**
    - C. AC CONTROL CKT. **- 1.5 SQ MM RED, BLACK**
    - D. DC CIRCUIT **- 2.5 SQ MM GREY**
    - E. INTER PANEL **- 1.0 SQ MM BLACK**
    - F. GROUNDING **- 2.5 SQ MM YELLOW - GREEN BICOLOUR**
11. THE MINIMUM CLEARANCE IN MAIN BUSBARS SHALL BE AS FOLLOWS:
    - A. BETWEEN PHASE TO PHASE **- 32 MM**
    - B. BETWEEN PHASE TO NEUTRAL **- 26 MM**
    - C. BETWEEN PHASE TO EARTH **- 26 MM**
    - D. BETWEEN NEUTRAL TO EARTH **- 26 MM**
12. BLACK ANODISED ALUMINIUM COMPUTERISED PRINTED NAME PLATE SHALL BE PROVIDED ON EACH FEEDER AND PANEL.
13. PANEL **DOOR LOCK** SHALL BE PROVIDED ON EACH DOOR.
14. **CABLE ENTRY** AS PER G.A. DRAWING.
15. **TPN/TP** MEANS TP SWITCHGEAR WITH REMOVABLE TYPE NEUTRAL LINK.
16. ALL kA RATTING MENTION IN B.O.M. ARE AT **415V AC.**
17. PAINT SHADE :– **EXTERNAL COLOUR - SEMI GLOSSY PASTEL GREEN (RAL-6019)**
    INTERNAL COLOUR - GLOSSY WHITE (RAL-9003)
18. DEGREE OF PROTECTION :– **IP 52 (INDOOR TYPE)**
19. EARTH BUS SHALL BE 25x6 SQ MM TINNED COPPER.
20. PANEL SHALL BE POWDER COATED WITH THICKNESS OF THE COATING OF THICKNESS IS GREATER THAN 95 MICRON
21 WEIGHT : Approx. weight of panel is 300Kg.

DRG. NO. EP-3-GA-003-01

INVENTORY NO.

REV. NO.	DATE	DESCRIPTION	BY	APPD.
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03	31.12.18	AS BUILT		
02	19.09.18	CUSTOMER REQUIREMENT		
01	14.03.18	CUSTOMER REQUIREMENT		

	NAME	SIGN.	DATE
DESIGNED	SANTA		27.12.17
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27.12.17

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ELECTROPORCELAIN DIVISION, BANGALORE

TITLE : GENERAL ARRANGEMENT DRG. OF ECP (MIV) FOR PUNATSANGCHHU–II(6X170MW), BHUTAN

NO. OF SHEETS 06 | SHEET. NO. 02

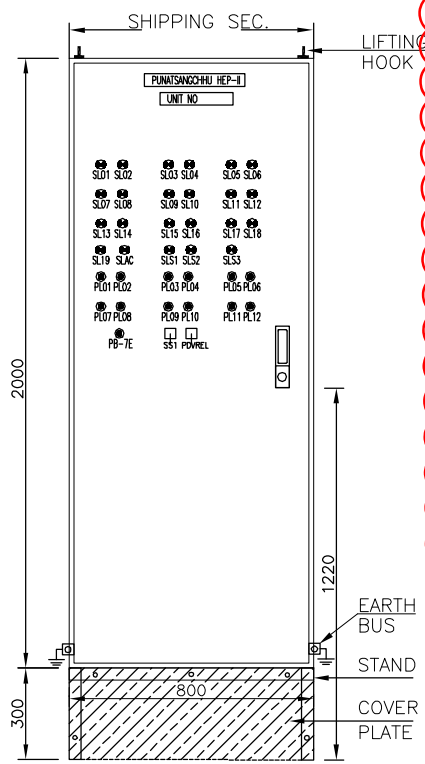
SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-01 | REV. 03

FORM 66–301 A4

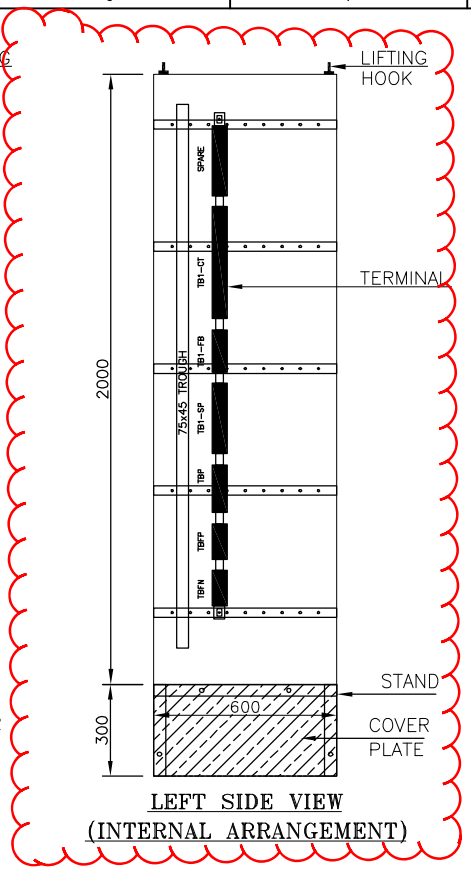
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM.

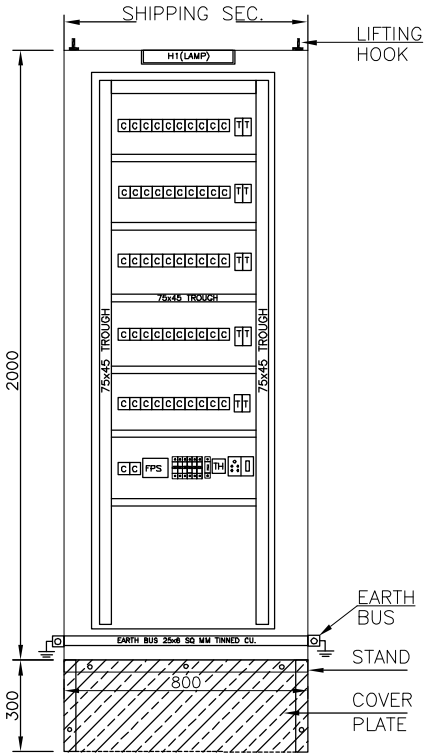
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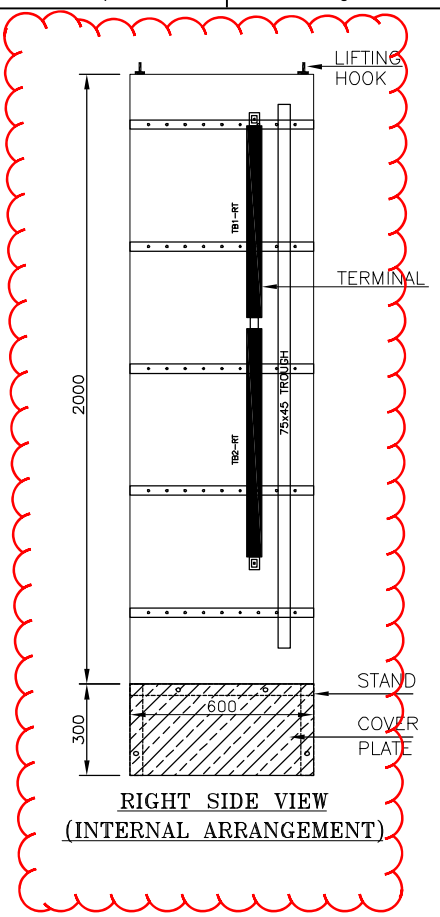
FRONT VIEW



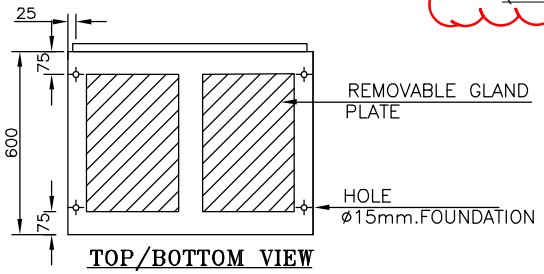
LEFT SIDE VIEW
(INTERNAL ARRANGEMENT)



FRONT VIEW
(INTERNAL ARRANGEMENT)



RIGHT SIDE VIEW
(INTERNAL ARRANGEMENT)



TOP/BOTTOM VIEW

LEGENDS:-

- C — AUX. CONTACTOR
- — DP MCB
- — SP MCB
- — NEUTRAL LINK
- T — TIMER

Revised TB arrangement

BUS BAR SIZE

EARTH : 1x25x06 Sq. mm./Eq. CU.

PANEL QTY-06 NOS

CABLE ENTRY-TOP/BOTTOM

PANEL HEIGHT	2300 mm
PANEL DEPTH	600 mm
PANEL LENGTH	800 mm

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NO. OF SHEETS 06
SHEET. NO. 03

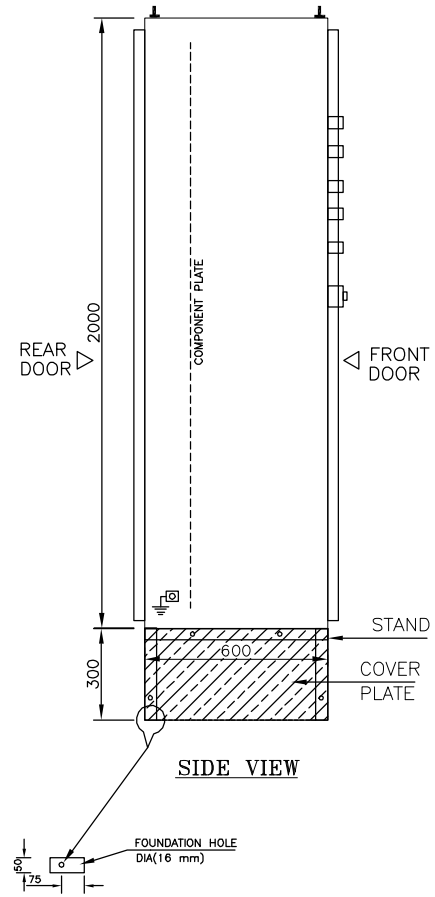
SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-01 | REV. 03

FORM 66-301 A4

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PANEL QTY-06 NOS

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NO. OF SHEETS 06 | SHEET. NO. 04

SCALE | JOB NO. CPB003 | DRG. NO. EP-3-GA-003-01 | REV. 03

FORM 66-301 A4

FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM.

1	2	3	4	5	6	7	8

LEGENDS:–	DESCRIPTION
PL01	BYPASS VALVE OPEN–'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL02	BYPASS VALVE CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL03	SERVICE SEAL DISENGAGED –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL04	SERVICE SEAL ENGAGED –'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL05	MIV OPEN –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL06	MIV CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL07	PENSTOCK DRAIN VALVE OPEN –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL08	PENSTOCK DRAIN VALVE CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL09	FUNCTIONAL GROUP MIV OPEN –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL10	FUNCTIONAL GROUP MIV CLOSED–'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL11	SPARE –'R' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
PL12	SPARE –'G' ILLUMINATED TYPE PUSH BUTTON WITH 1NO+1NC CONTACT.220V DC
SL01	DC CONTROL SUPPLY OK –'A' INDICATION LAMP LED TYPE 220V DC
SL02	GV FULLY CLOSED –'R' INDICATION LAMP LED TYPE 220V DC
SL03	FUNCTIONAL GROUP PRESTART CHECK OK –'A' INDICATION LAMP LED TYPE 220V DC
SL04	DOWNSTREAM PRESSURE EQUALIZED –'A' INDICATION LAMP LED TYPE 220V DC
SL05	MIV LOCKING PIN DISENGAGED –'G' INDICATION LAMP LED TYPE 220V DC
SL06	MIV LOCKING PIN ENGAGED –'R' INDICATION LAMP LED TYPE 220V DC
SL07	MAINTENANCE SEAL LOCKING PIN DISENGAGED –'G' INDICATION LAMP LED TYPE 220V DC
SL08	MAINTENANCE SEAL LOCKING PIN ENGAGED –'R' INDICATION LAMP LED TYPE 220V DC
SL09	DIFF. PR. NOT EQUAL –'R' INDICATION LAMP LED TYPE 220V DC
SL10	FLOOD LEVEL SWITCH OPERATED –'R' INDICATION LAMP LED TYPE 220V DC
SL11	AIR RELEASE VALVE CLOSED –'G' INDICATION LAMP LED TYPE 220V DC
SL12	AIR RELEASE VALVE OPEN –'R' INDICATION LAMP LED TYPE 220V DC
SL13	MAINTENANCE SEAL ENGAGED –'G' INDICATION LAMP LED TYPE 220V DC
SL14	MAINTENANCE SEAL DISENGAGED –'R' INDICATION LAMP LED TYPE 220V DC
SL15	BYPASS VALVE LOCKING PIN DISENGAGED –'G' INDICATION LAMP LED TYPE 220V DC
SL16	BYPASS VALVE LOCKING PIN ENGAGED –'R' INDICATION LAMP LED TYPE 220V DC
SL17	MIV OPU PRESSURE NORMAL –'A' INDICATION LAMP LED TYPE 220V DC
SL18	MIV SEAL OPU PRESSURE NORMAL –'A' INDICATION LAMP LED TYPE 220V DC
SL19	MAINTENANCE TURBINE SHAFT SEAL DEFLATED –'A' INDICATION LAMP LED TYPE 220V DC
SL20	AC SUPPLY HEALTHY –'A' INDICATION LAMP LED TYPE 240V AC
SLS1	SPARE –'R' INDICATION LAMP LED TYPE 220V DC
SLS2	SPARE –'G' INDICATION LAMP LED TYPE 220V DC
SLS3	SPARE –'A' INDICATION LAMP LED TYPE 220V DC
PB–7E	EMERGENCY CLOSING LOCAL COMMAND 'R' PUSH BUTTON WITH 1NO CONTACT,220V DC(WITH COVER)
SS1	2POSITIONS,10POLE LOCAL/REMOTE
PDVREL	2POSITIONS (ENABLE/DISABLE) SELECTOR

PANEL QTY–06 NOS

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NO. OF SHEETS 06 | SHEET. NO. 05

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FORM 66–301 A4

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BILL OF MATERIAL

SL. NO.	DEVICE NO.	DESCRIPTION	TECHNICAL SPECIFICATION	MAKE	QUANTITY
1	FPS	DC-DC CONVERTOR	220 VDC TO 24 VDC Convertor, 5A	PHOENIX CONTACT/POWERTECH/ABB/SIEMENS/SCHNEIDER	01
2	80IV,4PMIVO,,BVOP,SSOP,SSCP,MIVOP,MIVCP,PDWOP ,PDVRELX,63MIV-T10X,33-47X-1, 33-47AX-1, 33-48X-1,33-48AX-1,33-47X-2,33-79X,33-78 X,33-96X,33-52-1X,33-52A-1X,33-25X,33-25A X,63MW-1X,71DGX,33-52-3AX,33-52A-3AX,33-52-3BX,33-52A-3BX,PVCFX,BPVCFX	AUXILIARY CONTACTOR	COIL VOLTAGE 220V DC,AUXILIARY CONTACTS 4NO+2NC	SIEMENS/ABB/L&T/SCHNEIDER	30
2	86IV,86IV-1,33-52-2X,SPI,SP2	AUXILIARY CONTACTOR	COIL VOLTAGE 220V DC,AUXILIARY CONTACTS 4NO+4NC	SIEMENS/ABB/L&T/SCHNEIDER	5
4	FGMIVOX, FGMIVCX,33-45X-1,33-46X-1,33-45X-2,33-46X -2,33-49X,33-49AX,33-50X,33-48X-2,33-97X, 63MIV-2X,63IV-1X,63IV-1AX,63IVS-1X,TSSDFLTX,S P3,SP4	AUXILIARY CONTACTOR	COIL VOLTAGE 220V DC AUXILIARY CONTACTS 6NO+2NC	SIEMENS/ABB/L&T/SCHNEIDER	18
5	T1,T2,T3,T4,T5,T6,T7,T8,T9	TIME DELAY RELAY	220V DC ,ON DELAY,0-60 SEC,2NO+2NC CONTACT	SIEMENS/ L&T	9
6	T10	TIME DELAY RELAY	220V DC, ON DELAY, 0-60 MIN, 2NO+2NC CONTACT	SIEMENS/ L&T	1
7	PL01,PL03,PL05,PL07,PL09,PL11	ILLUMINATED PUSH BUTTON	1 NO CONTACT, COLOUR RED, LED TYPE, LAMP VOLTAGE 220V DC	SIEMENS/L&T/SCHNEIDER	6
8	PL02,PL04,PL06,PL08,PL10,PL12	ILLUMINATED PUSH BUTTON	1 NO CONTACT, COLOUR GREEN, LED TYPE, LAMP VOLTAGE 220V DC	SIEMENS/L&T/SCHNEIDER	6
9	PB-7E	PUSH BUTTON	1 NO CONTACT, COLOUR RED, 220V DC, (with protctive cover)	SIEMENS/L&T/SCHNEIDER	1
10	SL02,SL06,SL08,SL09,SL10,SL12,SL14,SL16,SLS1	SIGNAL LAMP	COLOUR RED, LED TYPE, LAMP VOLTAGE 220V DC	SIEMENS/L&T/SCHNEIDER	9
11	SL05,SL07,SL11,SL13,SL15,SLS2	SIGNAL LAMP	COLOUR GREEN, LED TYPE, LAMP VOLTAGE 220V DC	SIEMENS/L&T/SCHNEIDER	6
12	SL01,SL03,SL04,SLS3,SL17,SL18,SL19	SIGNAL LAMP	COLOUR AMBER, LED TYPE, LAMP VOLTAGE 220V DC	SIEMENS/L&T/SCHNEIDER	7
13	SSI	SELECTOR SWITCH	2 Positions (Local/Remote), 10 Poles (For each Positions), Make Before Break & Staypul Type, Voltage 220 VDC, Current 6 ADC	KAYCEE/SAIZER/C&S/L&T/EE/SIEMENS	1
14	PDVREL	SELECTOR SWITCH	2 Positions (enable/Disable).key operated,single pole	KAYCEE/SAIZER/C&S/L&T/EE/SIEMENS	1
15	Q1	MCB	220 VDC 5 A, 2 Poles	SIEMENS/ABB/L&T/SCHNEIDER	1
16	Q2	MCB	220 VDC 10 A, 2 Poles	SIEMENS/ABB/L&T/SCHNEIDER	1
17	Q51,Q52	MCB	240 VAC 10 A, 1 Pole	SIEMENS/ABB/L&T/SCHNEIDER	2
18	LKI	LINK	16A AC With base	SIEMENS/ABB/L&T/SCHNEIDER/C&S/EQUIVALENT	1
19	DS	DOOR SWITCH	240V AC,1 Amp.	KAYCEE/SIEMENS/VAISHNO/OMRON/TECHNIC/SURAJ /SULOCHNA	1
20	H1	PANEL ILLUMINATION LAMP	240 V AC, 11 Watt CFL	PHILIPS/BAJAJ/HAVELLS/CGL/WIPRO	1
21	HT	SPACE HEATER	240V AC, 60 Watts, with Mounting Arrangement, Earthing Provision & Protective Cover	SRISAI/VELCO/GIRISH/SMV/C&S/CANDS	1
22	TH	THERMOSTAT	240V AC, Range 30-60 Degree Contigrade	RITTAL/ANCO/TEMPTROL/AUTOMATIC INSTRUMENT/APT/GIRISH	1
23	SKT	SOCKET WITH SWITCH	15A/5A 5 Pin Socket With Switch	ANCHOR/HAVELLS/COL	1
24	TBP:1 TO 10	TERMINAL BLOCKS	stud type trerminals, 6 sq mm	ELEMEX/CONNECTWELL/PHOENIX/WAGO/WEID MULLER	1set
25	TBP:1 TO 5	TERMINAL BLOCKS	Distribution terminals, Sutable for 2.5 TO 6 sq MM,RED		1set
26	TBFP:1 TO 5	TERMINAL BLOCKS	Distribution terminals, Sutable for 2.5 TO 6 sq MM,BLACK		1set
27	TBICT: 1 TO 36, TB1FB:1 TO 60, TB1RT:1 TO 90 TBISP:1 TO 30	CONTROL TERMINAL BLOCKS	Screw type terminals , 6 sq MM, CST6		1set
28	SLAC	SIGNAL LAMP	Colour Amber LED type, Lamp Voltage 240 AC	SIEMENS/L&T/SCHNEIDER	1

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FORM 66-301 A4

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

SCHEMATIC DIAGRAM FOR
MIV ELECTRICAL CONTROL PANEL (MIVECP)

PROJECT :- PUNATSANGCHHU-II HEP (6X170 MW)-BHUTAN

RATING :- 6 X 170 MW (V. FRANCIS)

DRG.NO. :- 3-21305-188-02 REV ~~00~~ ~~01~~ ~~02~~ 03

HYDRO PROJECT ENGG. DIVISION.
BHARAT HEAVY ELECTRICALS LIMITED.
BHOPAL 462 021

REFERENCE DRAWINGS:
1. 12000018804 – DIAGRAM OF CONTROL GEAR FOR MIV
2. 32304018802 – WIRING DIAGRAM OF MIV JUNCTION BOX (MIVJB)
3. 32130118801 – WIRING DIAGRAM FOR MIV HYDRAULIC CONTROL PANEL (MIVHCP)

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN–sd–
02	21.09.17	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN –sd–
01	24.10.16	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

ADDITIONAL INFORMATION

STATUS OF DRAWING: U

DISTRIBUTION OF PRINTS
HPE–1
CUSTOMER–5

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	–sd–	01.03.16	
CKD	AP	–sd–	01.03.16	
APPD	DH	–sd–	01.03.16	

SUB-SUPPLIER/VENDOR

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

CUSTOMER: PHPA-II BHUTAN

CONSULTANT: WAPCOS LIMITED, GURGAON; CENTRAL ELECTRICITY AUTHORITY, NEW DELHI

CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD. BHOPAL

ISSUED BY DEPT HPE	UNTOL.DIMS. GR.	ANGLE	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	CARD CODE
DEPT. CODE 415	—		NTS	—	32130518801	0.00

TITLE: COVERING SHEET

DRAWING NO. 3 21305 18802 REV. 03

SHT. No. 01 NO. OF SHT. 30

SHT NO.	TITLE	CARD CODE
1	COVERING SHEET	0.00
2	INDEX SHEET	0.10
3	SYMBOL & LEGENDS	0.20
4	COMPONENTS & DEVICE LIST	0.30
5	SYSTEM (220 VDC), FIELD POWER (24 VDC), 240 VAC SUPPLY	1.10
6	CUBICLE HEATER & ILLUMINATION CIRCUIT	1.20
7	FUNCTIONAL GROUP-MIV OPEN / CLOSE	2.01
8	BYPASS VALVE OPEN	3.01
9	BYPASS VALVE CLOSE	3.02
10	SERVICE SEAL OPEN (DISENGAGE)	3.11
11	SERVICE SEAL CLOSE (ENGAGE)	3.12
12	MAIN INLET VALVE OPEN	3.21
13	MAIN INLET VALVE CLOSE	3.22
14	PENSTOCK DRAIN VALVE OPEN	3.31
15	PENSTOCK DRAIN VALVE CLOSE	3.32
16	EMERGENCY CLOSING	3.70
17	MULTIPLIER RELAYS - 1	4.01
18	MULTIPLIER RELAYS - 2	4.02
19	MULTIPLIER RELAYS - 3	4.03
20	MULTIPLIER RELAYS - 4	4.04
21	STATUS INDICATION-1	5.01
22	STATUS INDICATION-2	5.02
23	STATUS INDICATION-3	5.03
24	STATUS INDICATION-4	5.04
25	STATUS INDICATION-5	5.05

SHT NO.	TITLE	CARD CODE
26	REMOTE CONTACTS-1	7.01
27	REMOTE CONTACTS-2	7.02
28	LIST OF TERMINALS (TBP, TBFP-TBFN , TB1CT)	8.01
29	LIST OF TERMINALS (TB1FB, TB1SP)	8.02
30	LIST OF TERMINALS (TB1RT)	8.03

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 0.10

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: INDEX SHEET

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 02 | NO. OF SHT. 30

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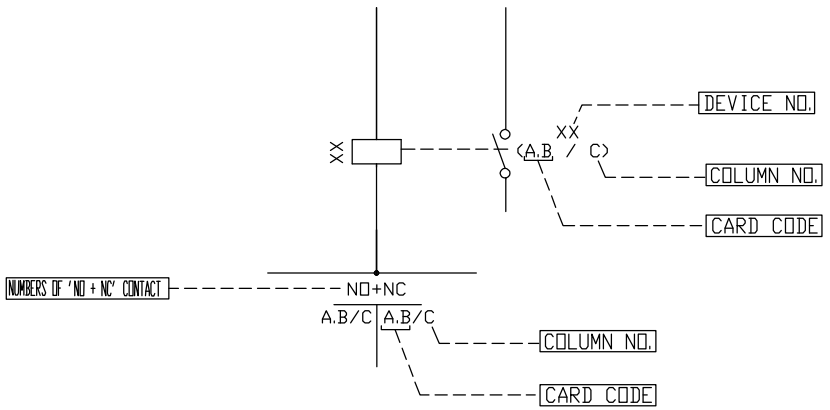
INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

SYMBOL	DESCRIPTION
	SOLENOID OPERATED DEVICE
MCB	MINIATURE CIRCUIT BREAKER
	SELECTOR SWITCH STAYPUT TYPE
	CONTACTOR/ AUX. RELAY COIL
	ON DELAY TIMER
PL	ILLUMINATED PUSH BUTTON
	SIGNAL LAMP
ON ON	ON DELAY TIMER CONTACTS
NO NC	NORMALLY OPEN/ NORMALLY CLOSED CONTACTS
	'TB ' FOR INTERNAL / EXTERNAL CONNECTION (TERMINAL BLOCK)
	KEY OPERATED ELECTRICAL SWITCH

SYMBOL	DESCRIPTION
	HEATER
	3 PIN SOCKET
	SWITCHED MODE POWER SUPPLY UNIT
	DOOR SWITCH
	LINK

LEGEND	DESCRIPTION
MIVECP	MIV ELECTRICAL CONTROL PANEL
MIVHCP	MIV HYDRAULIC CONTROL PANEL
MIVOPU	MIV OIL PRESSURE UNIT
MIVJB	MIV JUNCTION BOX
MIVSOPU	MIV SEAL OIL PRESSURE UNIT
ASEQP	AUTO SEQUENCER PANEL
CACB	COMMON AUXILIARY CONTROL BOARD
RTU-TURFL	RTU AT TURBINE FLOOR

DEVICE & SHEET REFERENCE:



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 0.20

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: SYMBOL & LEGENDS

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 03 | NO. OF SHT. 30

198209/2021/SBD-CPBG

SL. NO.	DEVICE NO.	DESCRIPTION	TECHNICAL SPECIFICATION	QTY.	MAKE
1	FPS	DC-DC CONVERTOR	220 VDC TO 24 VDC Convertor , 5A	1	PHOENIX CONTACT / POWERTECH / ABB / SIEMENS / SCHNEIDER
2	80IV, 4PMIVO, BVOP, SSOP, SSCP, MIVOP, MIVCP, PDVOP, PDVRELX, 63WIV-T10X, 33-47X-1, 33-47-AX-1,33-48X-1, 33-48AX-1, 33-47X-2, 33-79X, 33-78X, 33-96X, 33-52-1X,33-52A-1X, 33-25X, 33-25AX, 63WIV-1X, 71DGX, 33-52-3AX, 33-52A-3AX, 33-52-3BX, 33-52A-3BX, PVCFX, BPVCFX	AUXILIARY CONTACTOR	Coil Voltage 220V DC, Auxiliary Contacts 4NO + 2NC (with free wheeling diode)	30	SIEMENS / ABB / L&T / SCHNEIDER
3	86IV, 86IV-1, 33-52-2X, SP1, SP2	AUXILIARY CONTACTOR	Coil Voltage 220V DC, Auxiliary Contacts 4NO + 4NC (with free wheeling diode)	5	SIEMENS / ABB / L&T / SCHNEIDER
4	FGMIVOX, FGMIVCX, 33-45X-1, 33-46X-1, 33-45X-2, 33-46X-2, 33-49X, 33-49AX, 33-50X, 33-48X-2, 33-97X, 63WIV-2X, 63IV-1X, 63IV-1AX, 63IVS-1X, TSSDFLTX, SP3, SP4	AUXILIARY CONTACTOR	Coil Voltage 220V DC, Auxiliary Contacts 6NO + 2NC (with free wheeling diode)	18	SIEMENS / ABB / L&T / SCHNEIDER
5	T1, T2, T3, T4, T5, T6, T7, T8, T9	TIME DELAY RELAY	220V DC, ON DELAY,0-60 SEC, 2NO+2NC CONTACT	9	SIEMENS / L&T
6	T10	TIME DELAY RELAY	220V DC, ON DELAY,0-60 MIN, 2NO+2NC CONTACT	1	SIEMENS / L&T
7	PL01, PL03, PL05, PL07, PL09, PL11	ILLUMINATED PUSH BUTTON	1 NO Contact, Colour Red, LED Type, Lamp Voltage 220V DC	6	SIEMENS / L&T / SCHNEIDER
8	PL02, PL04, PL06, PL08,PL10, PL12	ILLUMINATED PUSH BUTTON	1 NO Contact, Colour Green, LED Type,Lamp Voltage 220V DC	6	SIEMENS / L&T / SCHNEIDER
9	PB-7E	PUSH BUTTON	1 NO Contact, Colour Red, 220V DC , (With Protective Cover)	1	SIEMENS / L&T / SCHNEIDER
10	SL02, SL06, SL08, SL09, SL10, SL12, SL14, SL16, SLS1	SIGNAL LAMP	Colour Red, LED Type,Lamp Voltage 220V DC	9	SIEMENS / L&T / SCHNEIDER
11	SL05, SL07, SL11, SL13, SL15, SLS2	SIGNAL LAMP	Colour Green, LED Type,Lamp Voltage 220V DC	6	SIEMENS / L&T / SCHNEIDER
12	SL01, SL03, SL04, SLS3, SL17, SL18, SL19	SIGNAL LAMP	Colour Amber LED Type,Lamp Voltage 220V DC	7	SIEMENS / L&T / SCHNEIDER
13	SS1	SELECTOR SWITCH	2 Positions (Local/Remote), 10 Poles (For each positions), Make Before Break & Stayput Type, Voltage 220 VDC, Current 6 ADC	1	KAYCEE / SAIZER / C&S / L&T / EE / SIEMENS
14	PDVREL	SELECTOR SWITCH	2 Position (Enable / Disable), Key operated , Single pole	1	KAYCEE / SAIZER / C&S / L&T / EE / SIEMENS
15	Q1	MCB	220 VDC, 5 A , 2 Poles	1	SIEMENS / ABB / L&T / SCHNEIDER
16	Q2	MCB	220 VDC, 10 A , 2 Poles	1	SIEMENS / ABB / L&T / SCHNEIDER
17	Q51, Q52	MCB	240 VAC, 10 A , 1 Pole	2	SIEMENS / ABB / L&T / SCHNEIDER
18	LK1	LINK	16 AC with base	1	SIEMENS / ABB / L&T / SCHNEIDER/ C&S/ EQUIVALENT
19	DS	DOOR SWITCH	240V AC, 1 Amp.	1	KAYCEE/SIEMENS/VAISHNO/OMRON/TECHNIC/SURAJ/SULOCHNA
20	H1	PANEL ILLUMINATION LAMP	240V AC, 11 Watt CFL	1	PHILIPS / BAJAJ / HAVELLS / CGL
21	HT	SPACE HEATER	240V AC, 60 Watts, With Mounting Arrangement, Earthing Provision & Protective Cover	1	SRISAI/VELCO/GIRISH/SMV/C&S/CAN DS
22	TH	THERMOSTAT	240V AC, Range 30-60 Degree Centigrade	1	RITTAL/ANCO/TEMPTROL/AUTOMATIC INSTRUMENT/APT/GIRISH
23	SKT	SOCKET WITH SWITCH	15A/5A 5 Pin Socket with Switch	1	ANCHOR / HAVELLS / CGL
24	TBP:1 TO 10	TERMINAL BLOCKS	Stud type terminals , 6 Sq mm	1 Set	ELEMEX / CONNECTWELL / PHOENIX / WAGO / WEID MULLER
25	TBFP:1 TO 5	TERMINAL BLOCKS	Distribution terminals , Suitable for 2.5 to 6 sq mm, Red	1 Set	
26	TBFN: 1 TO 5	TERMINAL BLOCKS	Distribution terminals , Suitable for 2.5 to 6 sq mm, Black	1 Set	
27	TB1CT: 1 TO 60 , TB1FB: 1 TO 60, TB1RT: 1 TO 90, TB1SP: 1 TO 30	CONTROL TERMINAL BLOCKS	Screw type terminals , 6 Sq mm , CST 6	1 Set	
28	SLAC	SIGNAL LAMP	Colour Amber LED Type,Lamp Voltage 240V AC	1	SIEMENS / L&T / SCHNEIDER

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INVENTORY NO. N.A | SIGN & DATE | REF.DRG.NO.

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV.	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN-sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

	NAME	SIGN	DATE
DRN	VKN	-sd-	01.03.16
CKD	AP	-sd-	01.03.16
APPD	DH	-sd-	01.03.16

NO. OF VAR

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 0.30

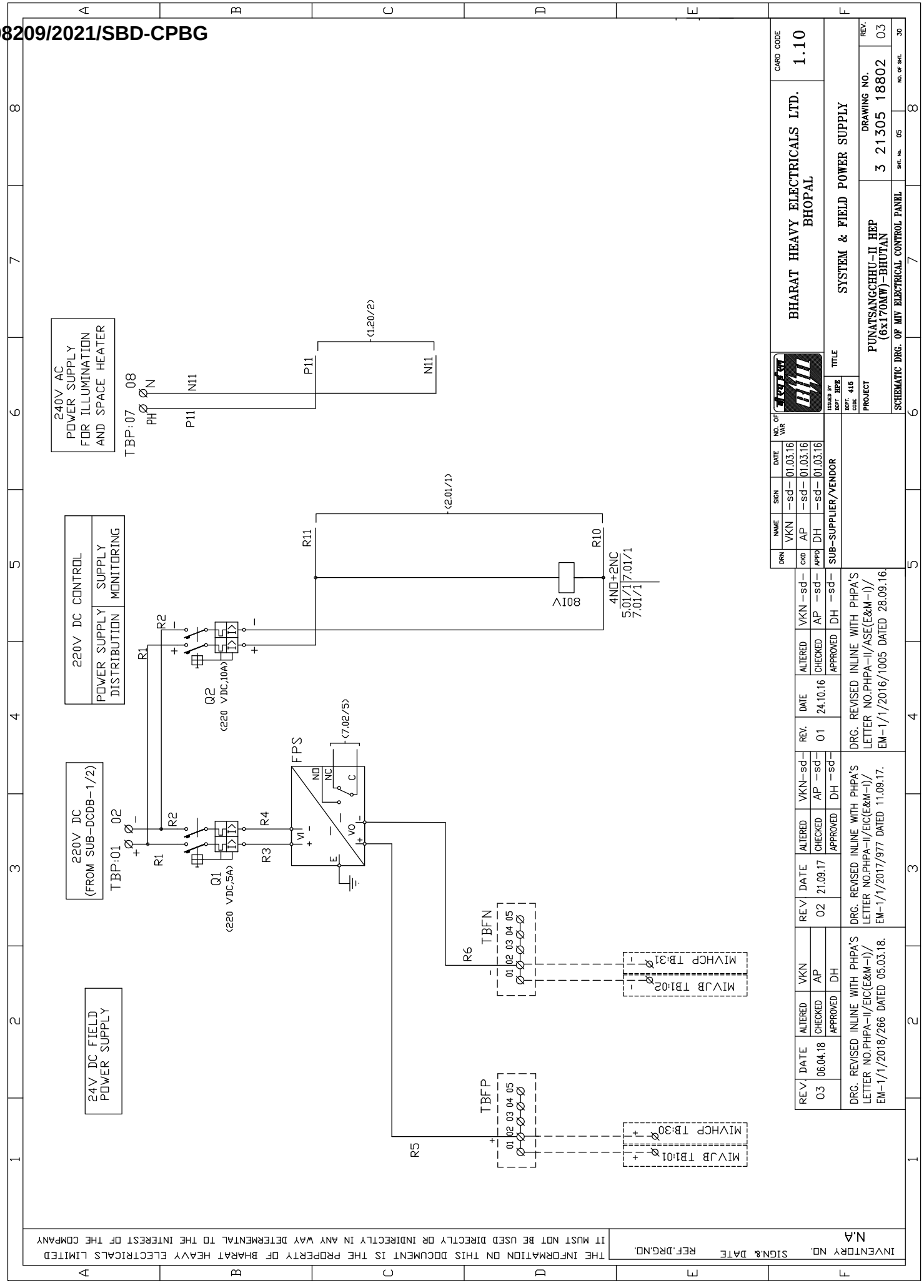
ISSUED BY DEPT. HPR | DEPT. CODE 415

TITLE: COMPONENTS & DEVICE LIST

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 04 | NO. OF SHT. 30



REV.	DATE	ALTERED	VKN
		CHECKED	AP
03	06.04.18	APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV.	DATE	ALTERED	VKN-sd-
		CHECKED	AP -sd-
02	21.09.17	APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN-sd-
		CHECKED	AP -sd-
01	24.10.16	APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE
CKD	VKN	-sd-	01.03.16
APPD	AP	-sd-	01.03.16
	DH	-sd-	01.03.16

NO. OF VAR

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT: BPB
DEPT: 415
CODE:

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

TITLE
SYSTEM & FIELD POWER SUPPLY

PROJECT
PUNATSANGCHHU-II HEP
(6x170MW)-BHUTAN

CARD CODE 1.10

DRAWING NO.
3 21305 18802

REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

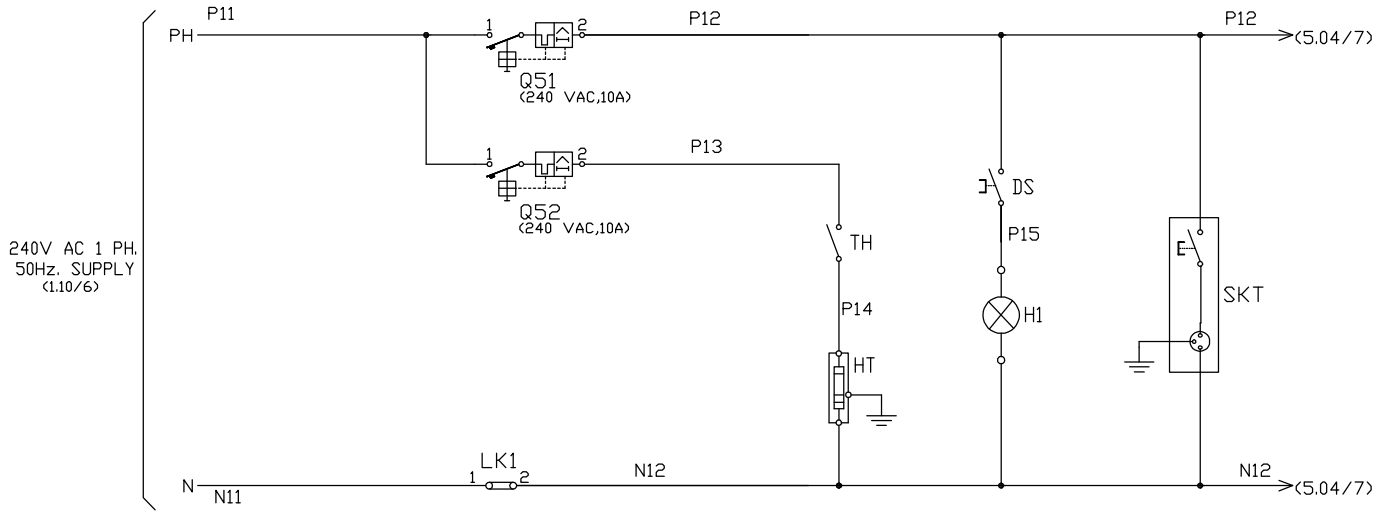
SHT. No. 05 NO. OF SHT. 30

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REV.	DATE	ALTERED	VKN
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		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

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REV.	DATE	ALTERED	VKN -sd-
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		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 1.20

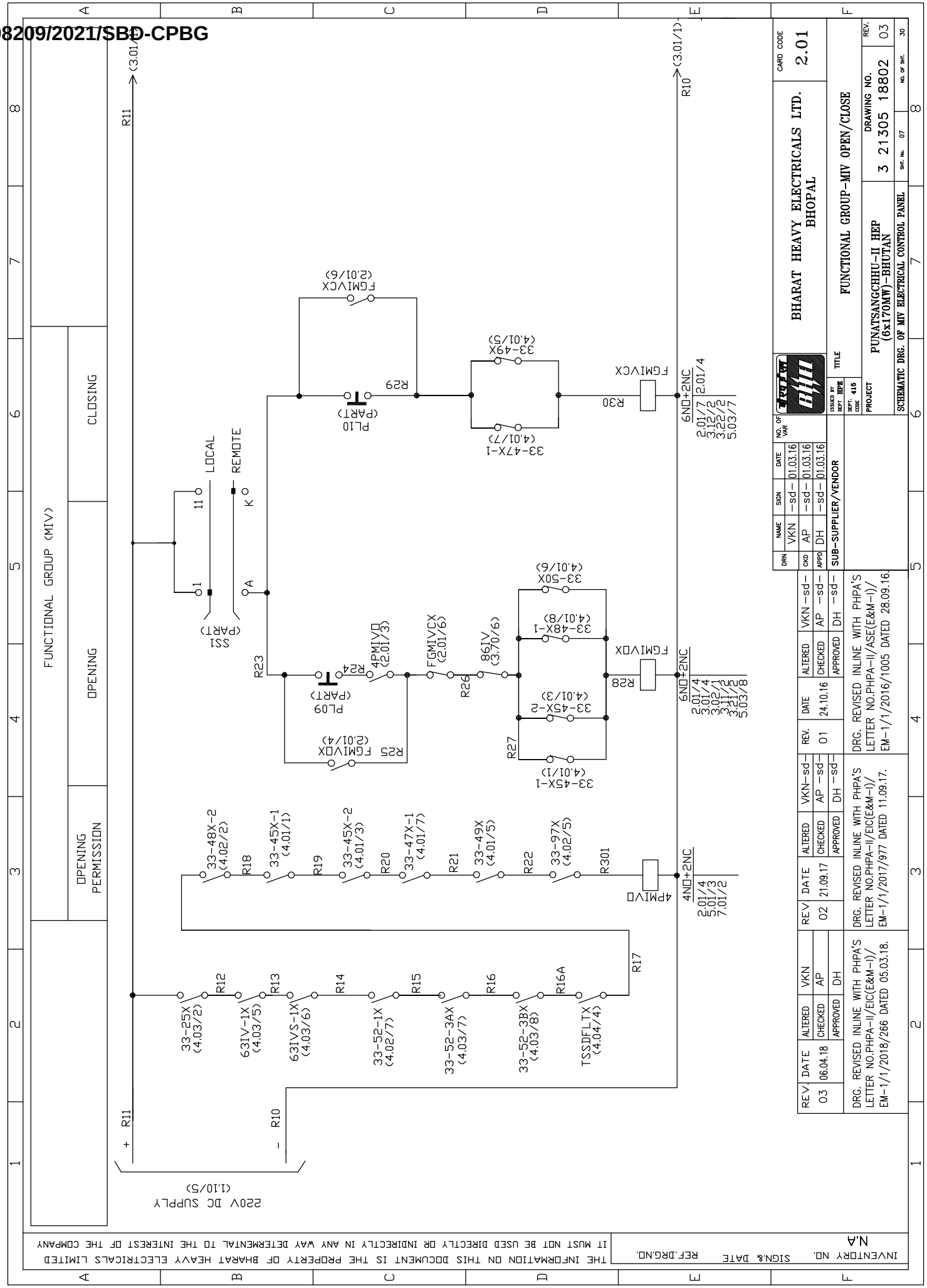
ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: CUBICLE HEATER & ILLUMINATION CIRCUIT

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 06 | NO. OF SHT. 30



REV.	DATE	ALTERED	VKN
		CHECKED	AP
03	06.04.18	APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
		CHECKED	AP -sd-
02	21.09.17	APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN-sd-
		CHECKED	AP -sd-
01	24.10.16	APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

	NAME	SIGN	DATE
DRN	VKN	-sd-	01.03.16
CKD	AP	-sd-	01.03.16
APPD	DH	-sd-	01.03.16

NO. OF VAR

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT. HPB
DEPT. 415
CODE

TITLE

FUNCTIONAL GROUP-MIV OPEN/CLOSE

PROJECT

PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 2.01

DRAWING NO. 3 21305 18802

REV. 03

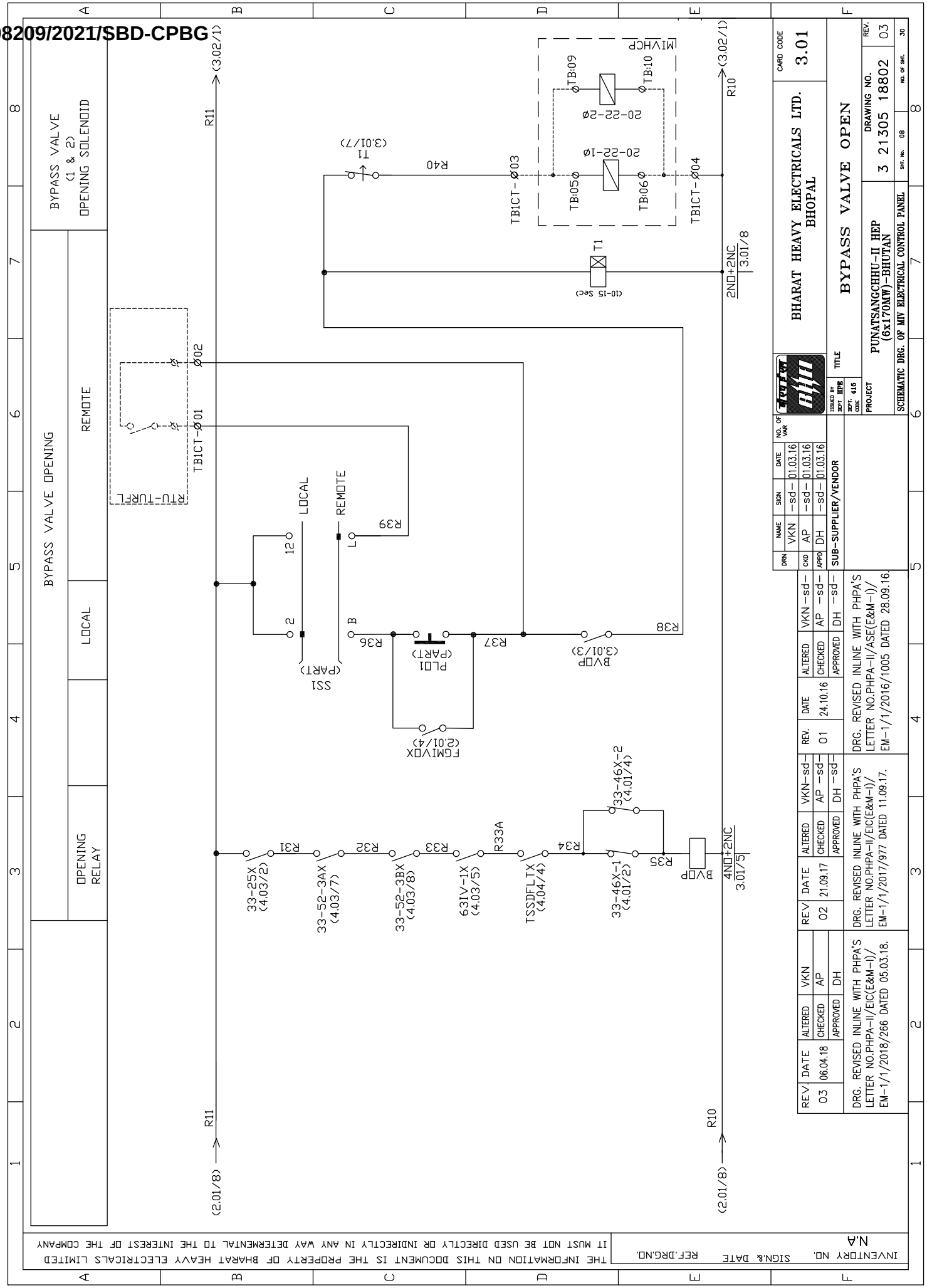
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NO. OF SHT. 30

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

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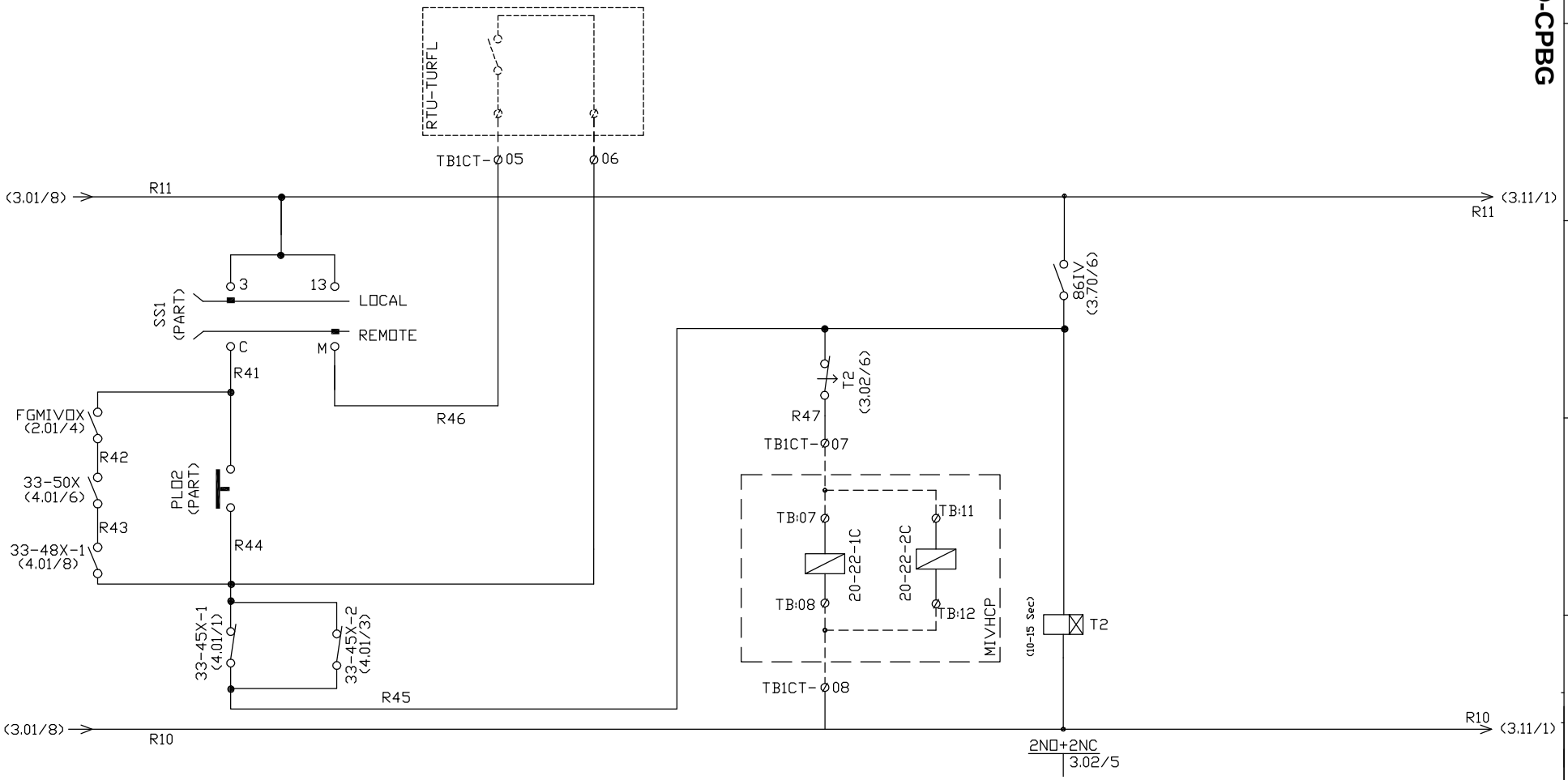
INVENTORY NO. N.A | SIGN & DATE | REF.DRG.NO.


BYPASS VALVE OPENING
OPENING RELAY
LOCAL
REMOTE
BYPASS VALVE (1 & 2) OPENING SOLENOID
(3.02/1)
R11
R10
(2.01/8)
TB1CT-Ø01
TB1CT-Ø02
TB1CT-Ø03
TB1CT-Ø04
RTU-TURFL
T1
(3.01/7)
R40
(10-15 Sec)
2ND+2NC
3.01/8
4ND+2NC
3.01/5
20-22-1Ø
20-22-2Ø
TB:05
TB:06
TB:09
TB:10
MIVHCP
SS1
(PART)
LOCAL
REMOTE
12
2
L
B
R39
R36
R37
R38
PL01
(PART)
BVDP
(3.01/3)
FGMIVDX
(2.01/4)
33-25X
(4.03/2)
33-52-3AX
(4.03/7)
33-52-3BX
(4.03/8)
63IV-1X
(4.03/5)
TSSDFLTX
(4.04/4)
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(4.01/2)
33-46X-2
(4.01/4)
R31
R32
R33
R33A
R34
R35
BVDP
DRN
CKD
APPD
NAME
VKN
AP
DH
SIGN
-sd-
DATE
01.03.16
NO. OF VAR
SUB-SUPPLIER/VENDOR
ISSUED BY
DEPT. HPB
DEPT. CODE 415
TITLE
BHARAT HEAVY ELECTRICALS LTD.
BHOPAL
CARD CODE
3.01
PROJECT
PUNATSANGCHHU-II HEP
(6x170MW)-BHUTAN
BYPASS VALVE OPEN
DRAWING NO.
3 21305 18802
REV.
03
SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL
SHT. No. 08
NO. OF SHT. 30
REV.
DATE
ALTERED
CHECKED
APPROVED
03
06.04.18
VKN
AP
DH
02
21.09.17
VKN-sd-
AP -sd-
DH -sd-
01
24.10.16
VKN -sd-
AP -sd-
DH -sd-
DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.
DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.
DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.
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INVENTORY NO.
N.A
SIGN.& DATE
REF.DRG.NO.

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INVENTORY NO. SIGN.& DATE REF.DRG.NO.
N.A

BYPASS VALVE CLOSING			BYPASS VALVE CLOSING SOLENOID	TIMER		
	LOCAL	REMOTE				



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
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DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.02

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE
BYPASS VALVE CLOSE

PROJECT
PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

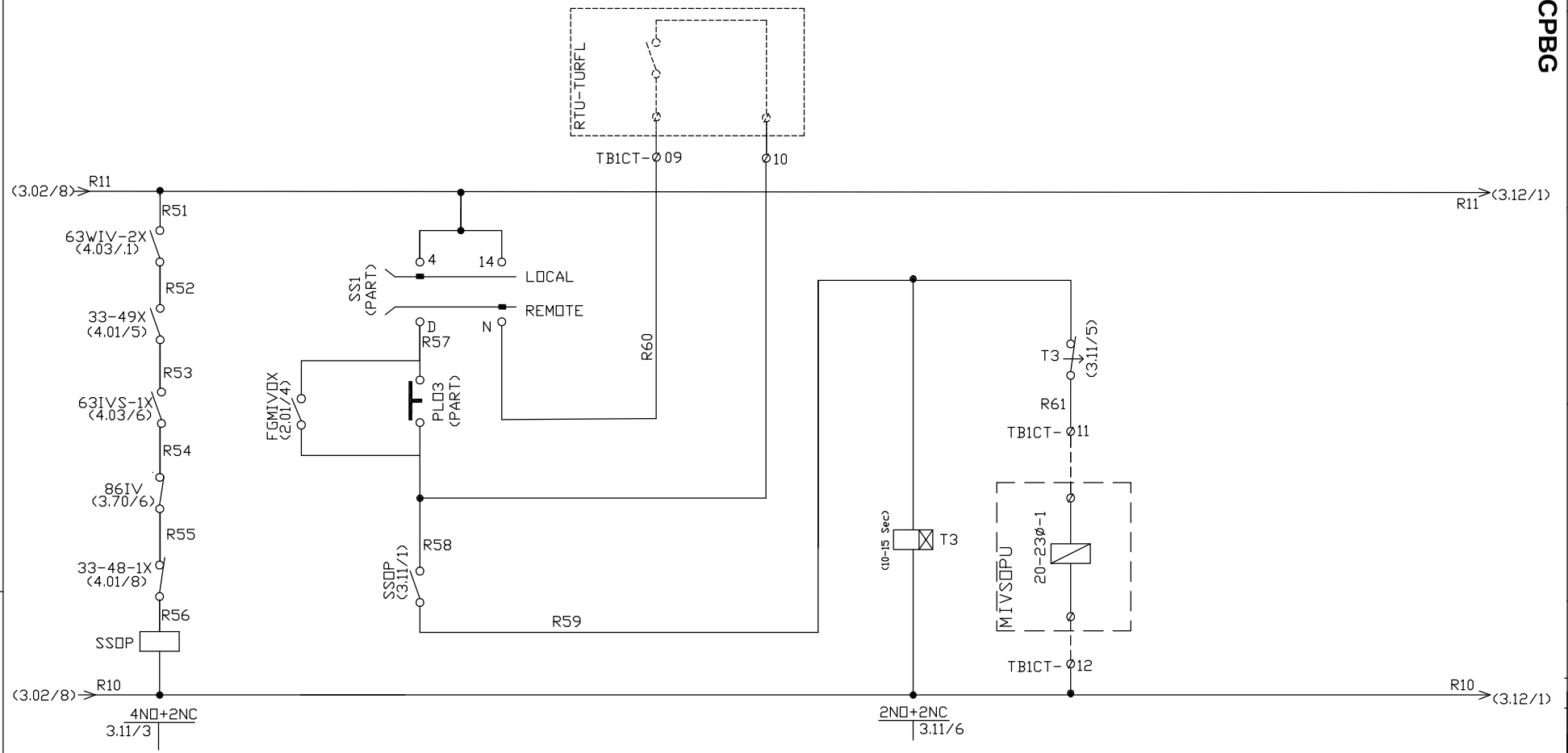
DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

SHT. No. 09 NO. OF SHT. 30

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
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SERVICE SEAL OPENING RELAY	SERVICE SEAL DISENGAGE			SERVICE SEAL DISENGAGE SOLENOID		
		LOCAL	REMOTE			



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.11

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: SERVICE SEAL OPEN(DISENGAGE)

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

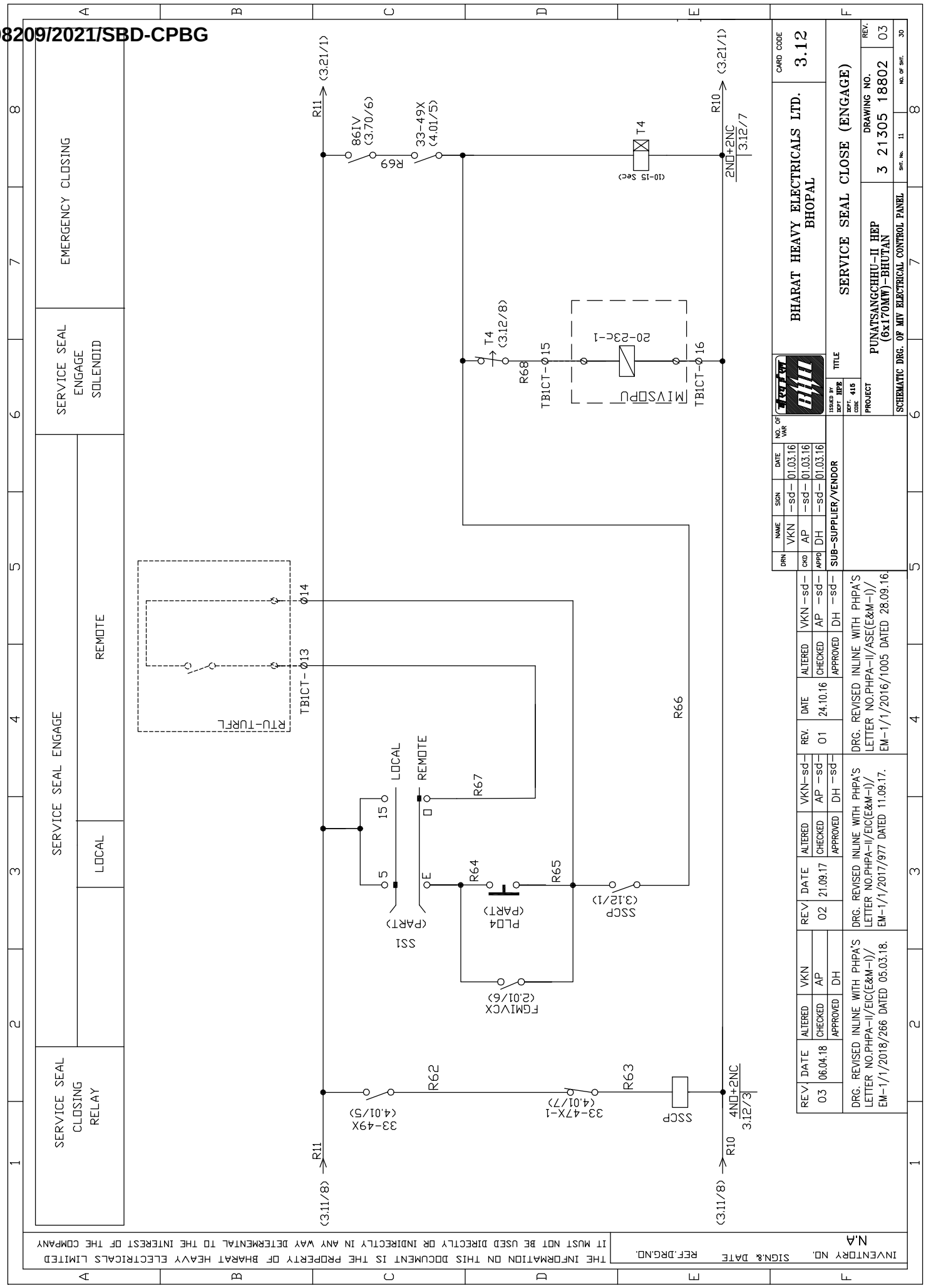
DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

SHT. No. 10 NO. OF SHT. 30

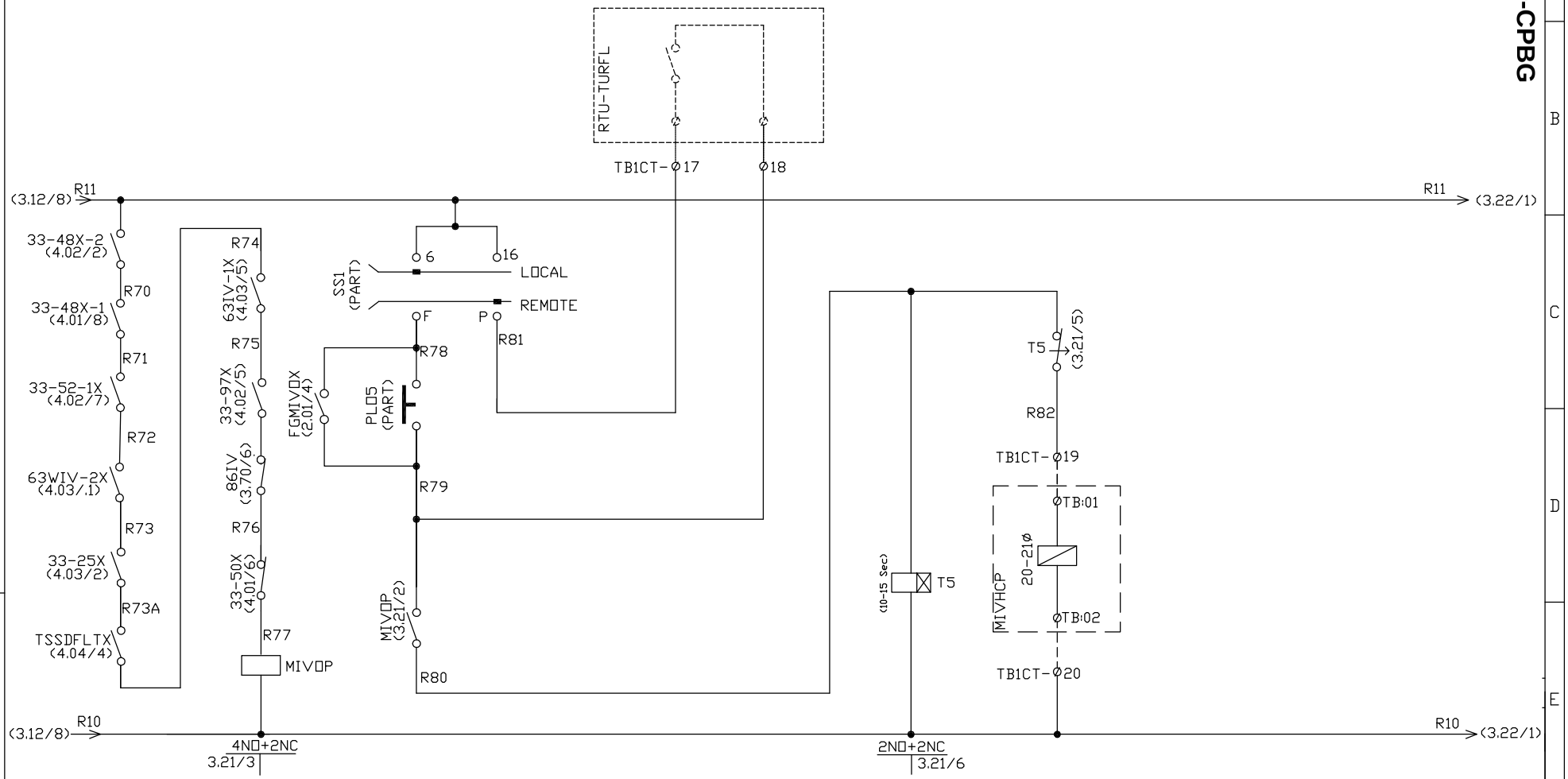
INVENTORY NO. N.A SIGN.& DATE REF.DRG.NO.

198209/2021/SBD-CPBG



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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETERMENTAL TO THE INTEREST OF THE COMPANY

MIV OPENING RELAY	MIV OPENING			MIV OPENING SOLENOID		
		LOCAL	REMOTE			



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.21

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: MAIN INLET VALVE OPEN

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

SHT. No. 12 NO. OF SHT. 30

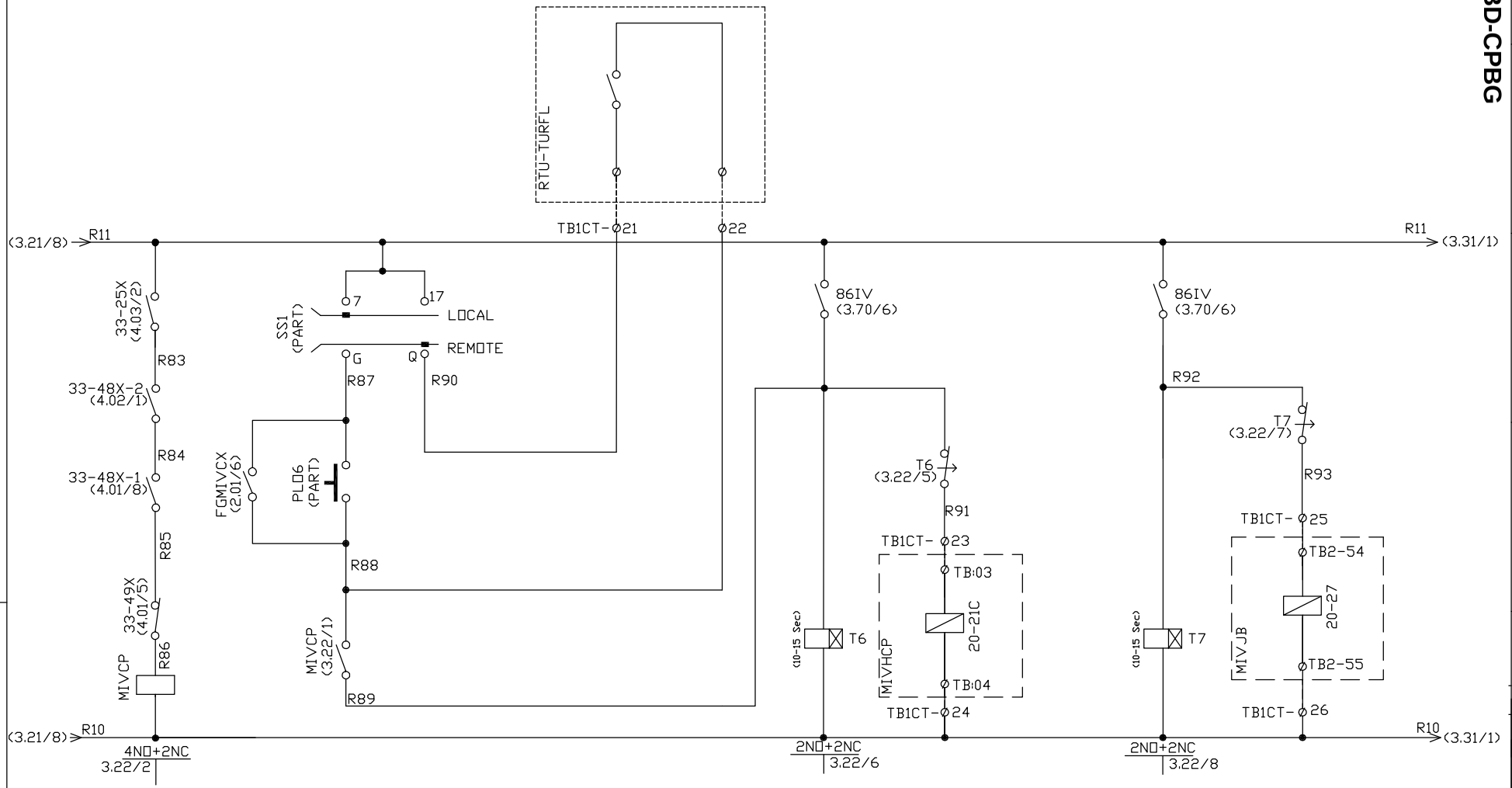
INVENTORY NO. N.A

SIGN.& DATE REF.DRG.NO.

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

MIV CLOSING RELAY	MIV CLOSING			MIV CLOSING SOLENOID	EMERGENCY CLOSING
		LOCAL	REMOTE		



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 3.22

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: MAIN INLET VALVE CLOSE

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

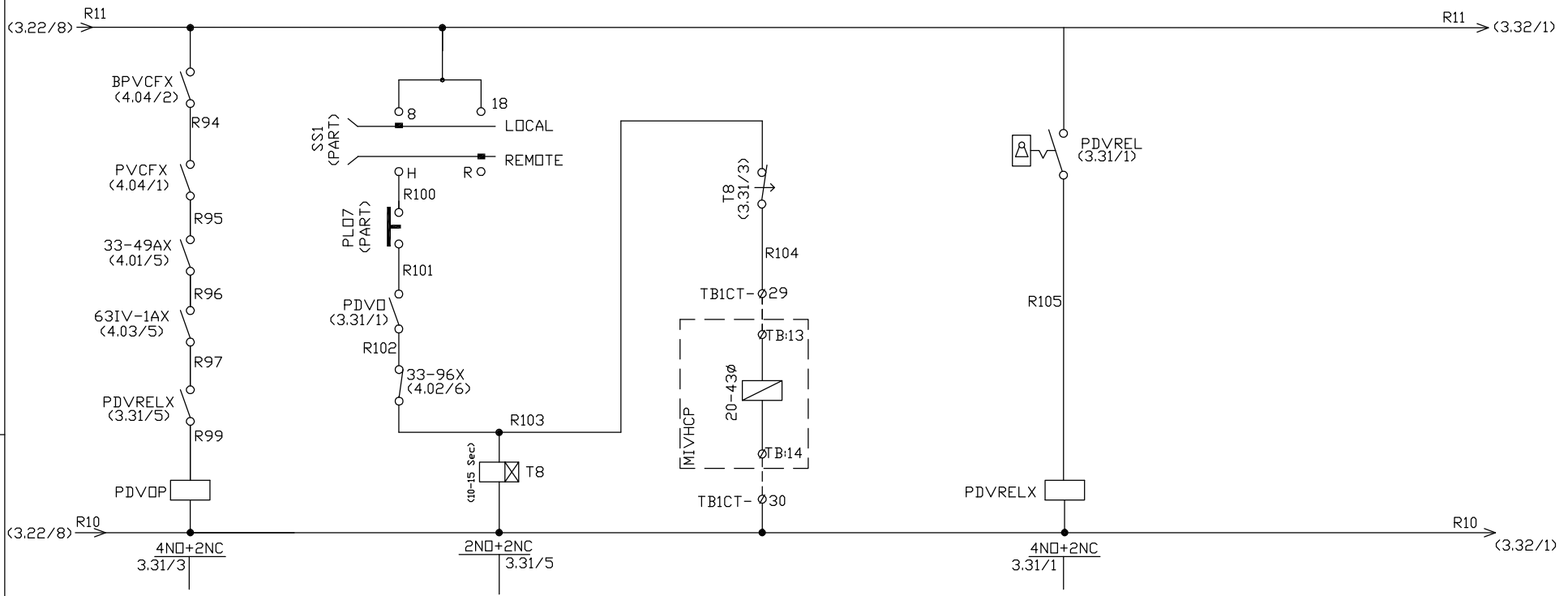
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 13 | NO. OF SHT. 30

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

PENSTOCK DRAIN VALVE OPNING RELAY	PENSTOCK DRAIN VALVE OPEN / LOCAL	PENSTOCK DRAIN VALVE OPENING SOLENOID		PENSTOCK DRAIN VALVE OPENING ENABLE	



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 3.31

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: PENSTOCK DRAIN VALVE OPEN

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

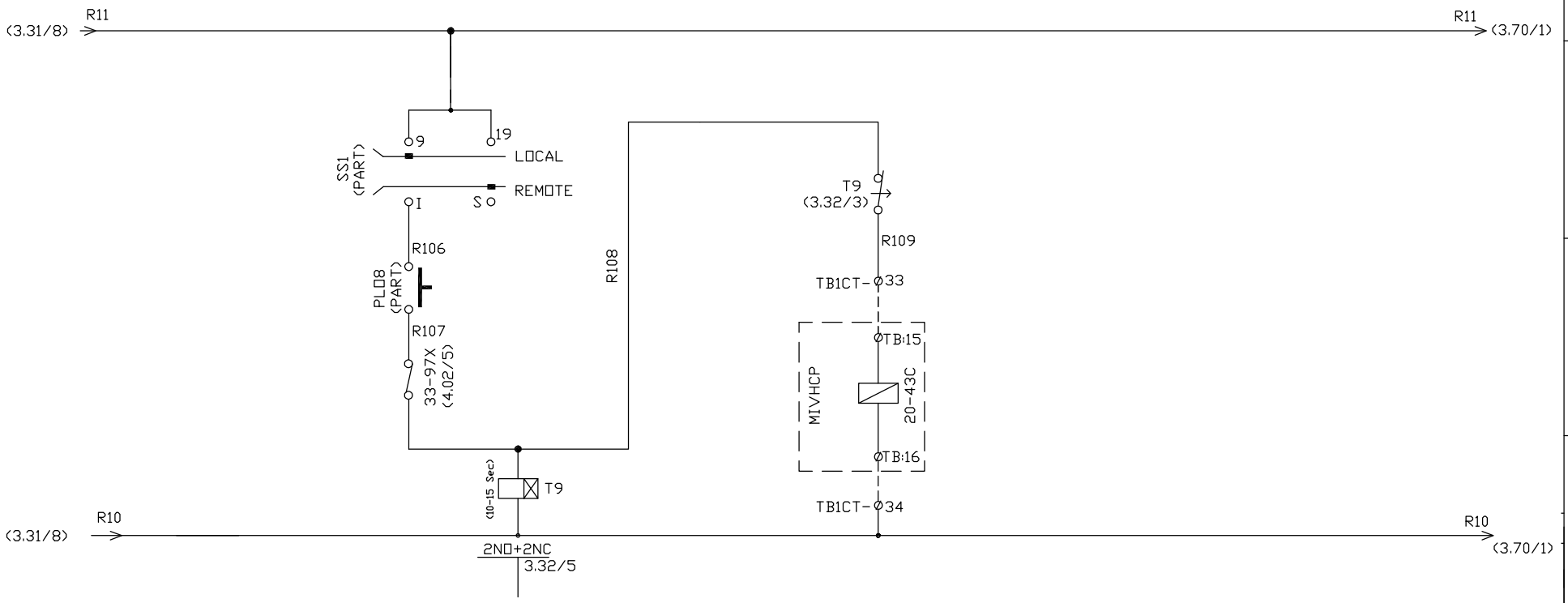
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 14 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

	PENSTOCK DRAIN VALVE CLOSING LOCAL		PENSTOCK DRAIN VALVE CLOSING SOLENOID



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 3.32

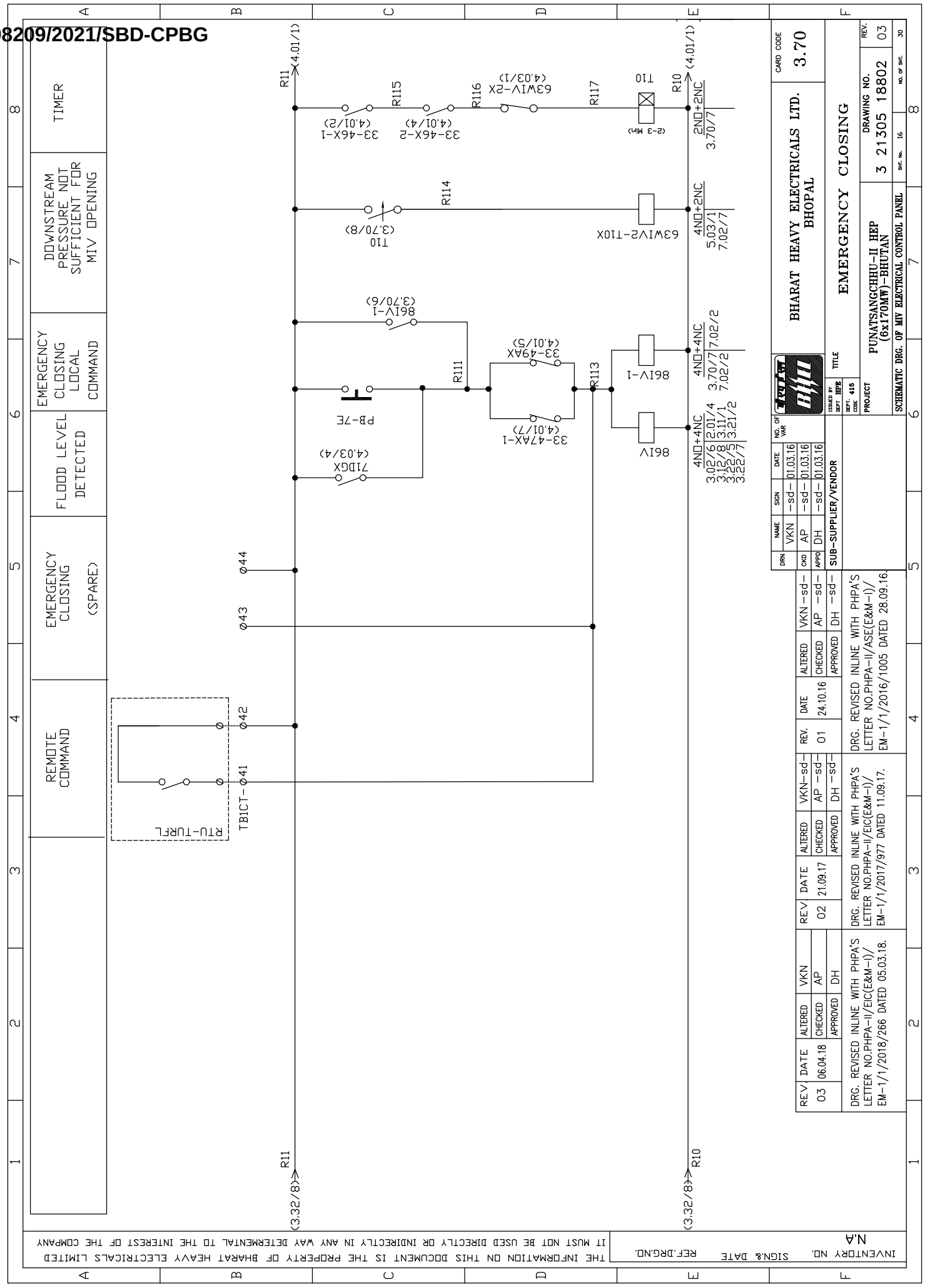
ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: PENSTOCK DRAIN VALVE CLOSE

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 REV. 03

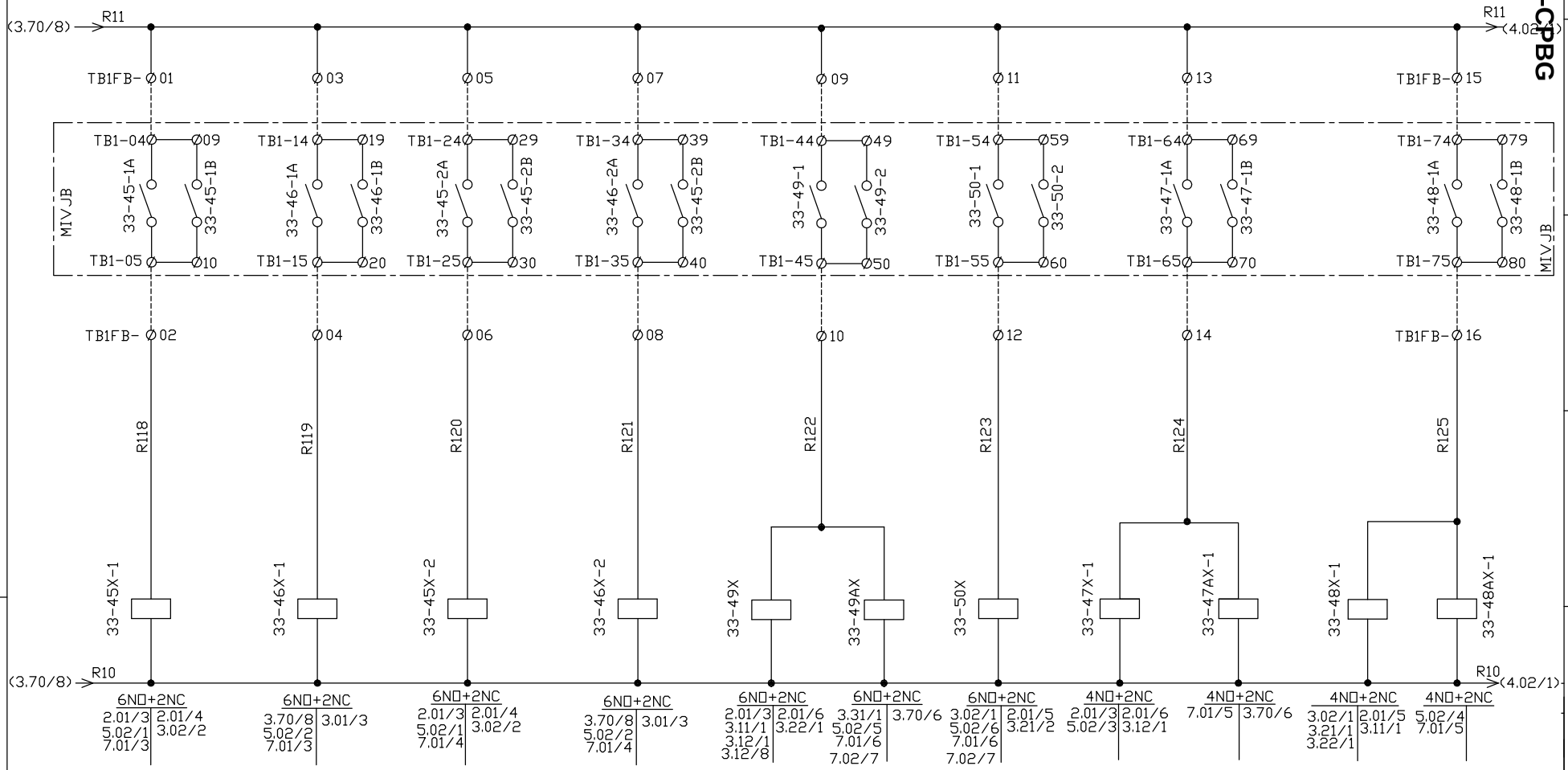
SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 15 | NO. OF SHT. 30


TIMER
DOWNSTREAM PRESSURE NOT SUFFICIENT FOR MIV OPENING
EMERGENCY CLOSING LOCAL COMMAND
FLOOD LEVEL DETECTED
EMERGENCY CLOSING (SPARE)
REMOTE COMMAND
R11
R10
R111
R113
R114
R115
R116
R117
T10
PB-7E
71DGX
86IV-1
86IV
33-46X-1
33-46X-2
63WIV-2X
33-49AX
33-47AX-1
63WIV2-T10X
TBICT-Ø41
RTU-TURFL
Ø42
Ø43
Ø44
BHARAT HEAVY ELECTRICALS LTD.
BHOPAL
EMERGENCY CLOSING
PUNATSANGCHHU-II HEP
(6x170MW)-BHUTAN
DRAWING NO. 3 21305 18802
CARD CODE 3.70
SUB-SUPPLIER/VENDOR
THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY
INVENTORY NO. N.A
SIGN& DATE
REF.DRG.NO.

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

BYPASS VALVE-1		BYPASS VALVE-2		MAIN INLET VALVE		SERVICE SEAL	
CLOSED	OPEN	CLOSED	OPEN	FULLY CLOSED	FULLY OPEN	ENGAGED	DISENGAGED



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 4.01

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: MULTIPLIER RELAYS-1

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

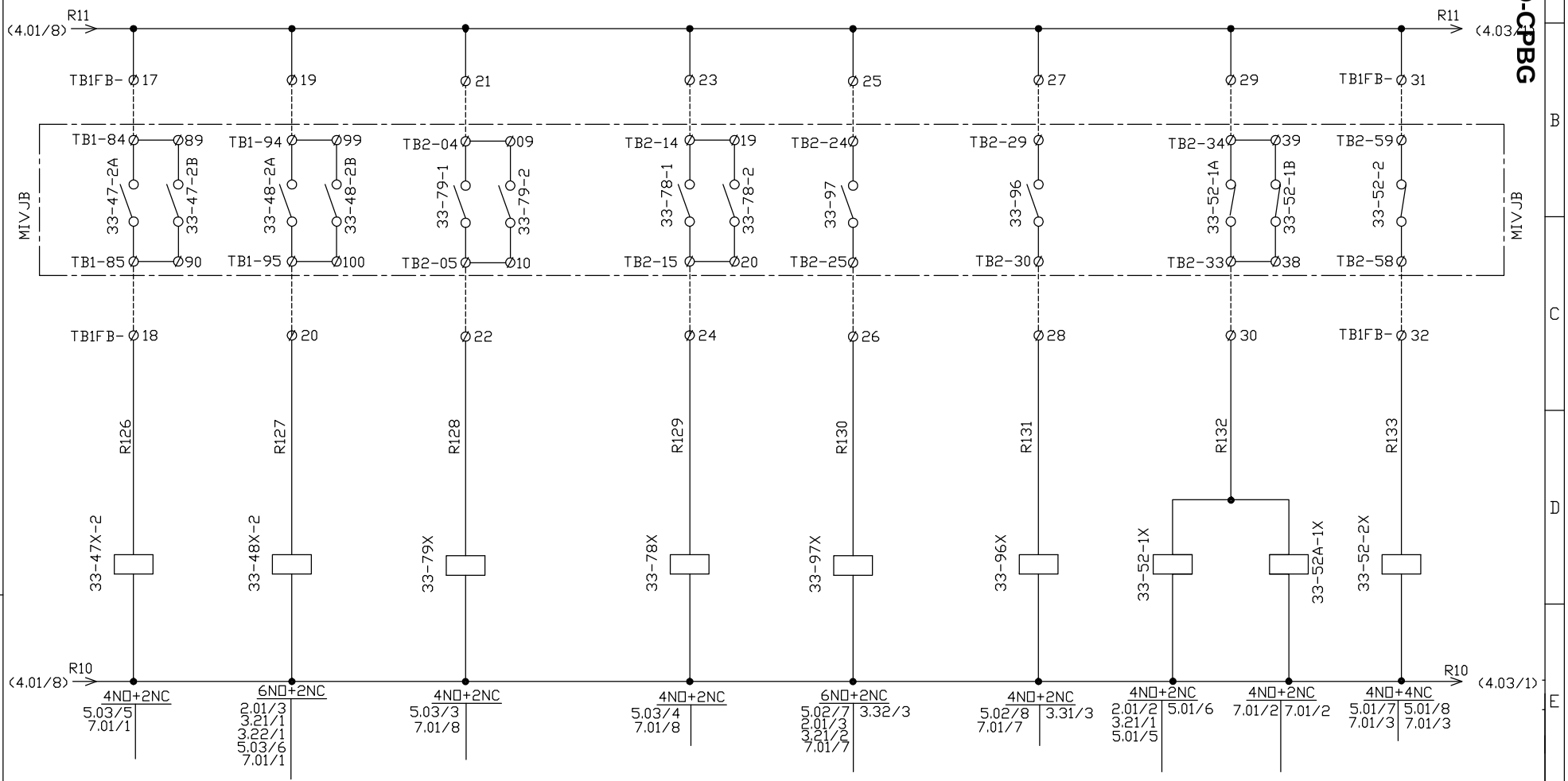
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 17 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

MAINTENANCE SEAL		AIR RELEASE VALVE		PENSTOCK DRAIN VALVE		MIV LOCKING PIN DISENGAGED	MAINTENANCE SEAL LOCKING PIN DISENGAGED
ENGAGED	DISENGAGED	CLOSED	OPEN	CLOSED	OPEN		



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 4.02

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: MULTIPLIER RELAYS-2

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

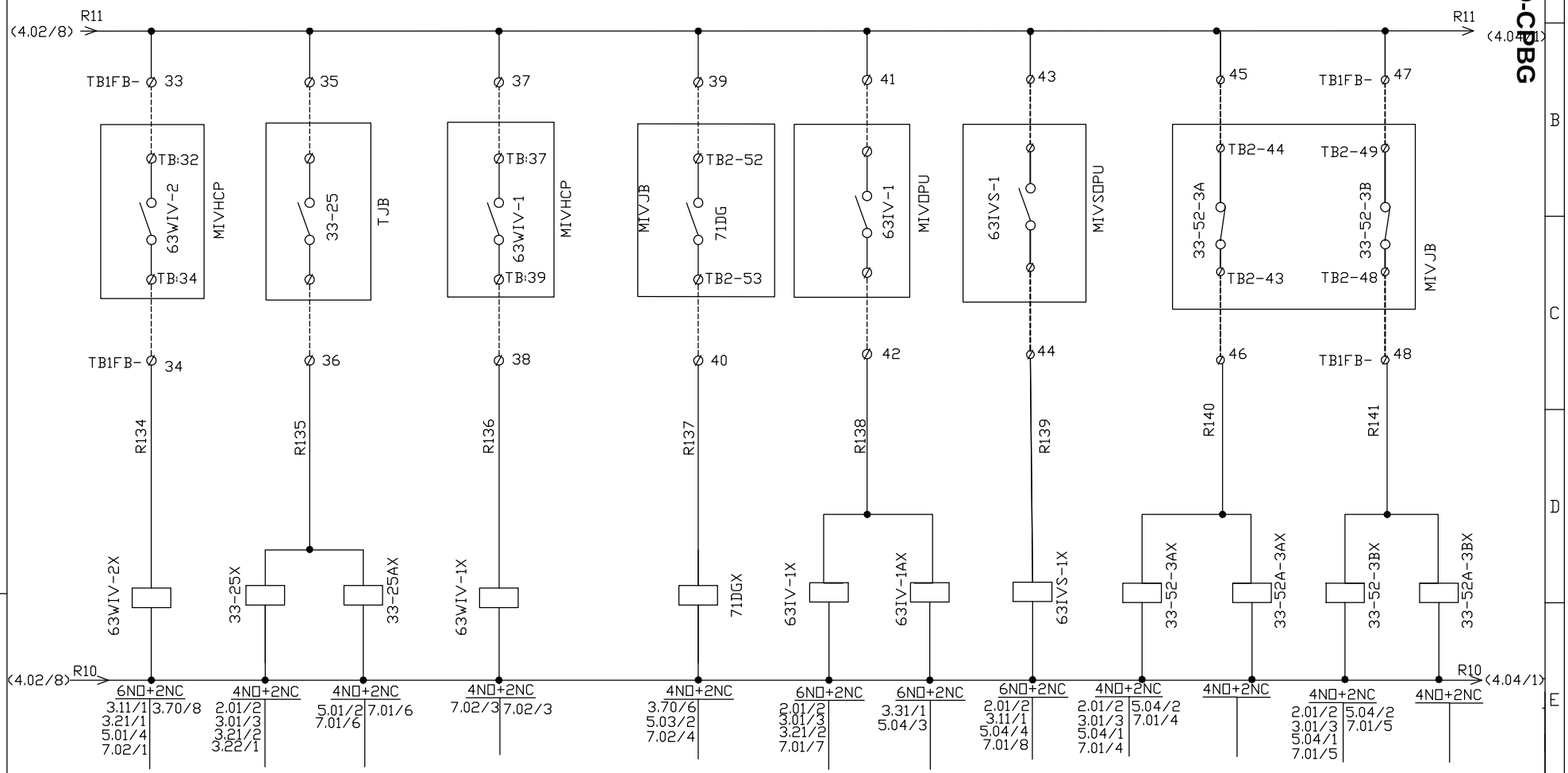
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 18 | NO. OF SHT. 30

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

DOWNSTREAM PRESSURE SUFFICIENT FOR MIV OPENING	GUIDE VANE FULLY CLOSED	UPSTREAM PRESSURE NORMAL	FLOOD LEVEL DETECTED	MIV OPU PRESSURE NORMAL	MIV SEAL OPU PRESSURE NORMAL	BYPASS VALVE-1 LOCKING PIN DISENGAGED	BYPASS VALVE-2 LOCKING PIN DISENGAGED



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 4.03

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: MULTIPLIER RELAYS-3

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

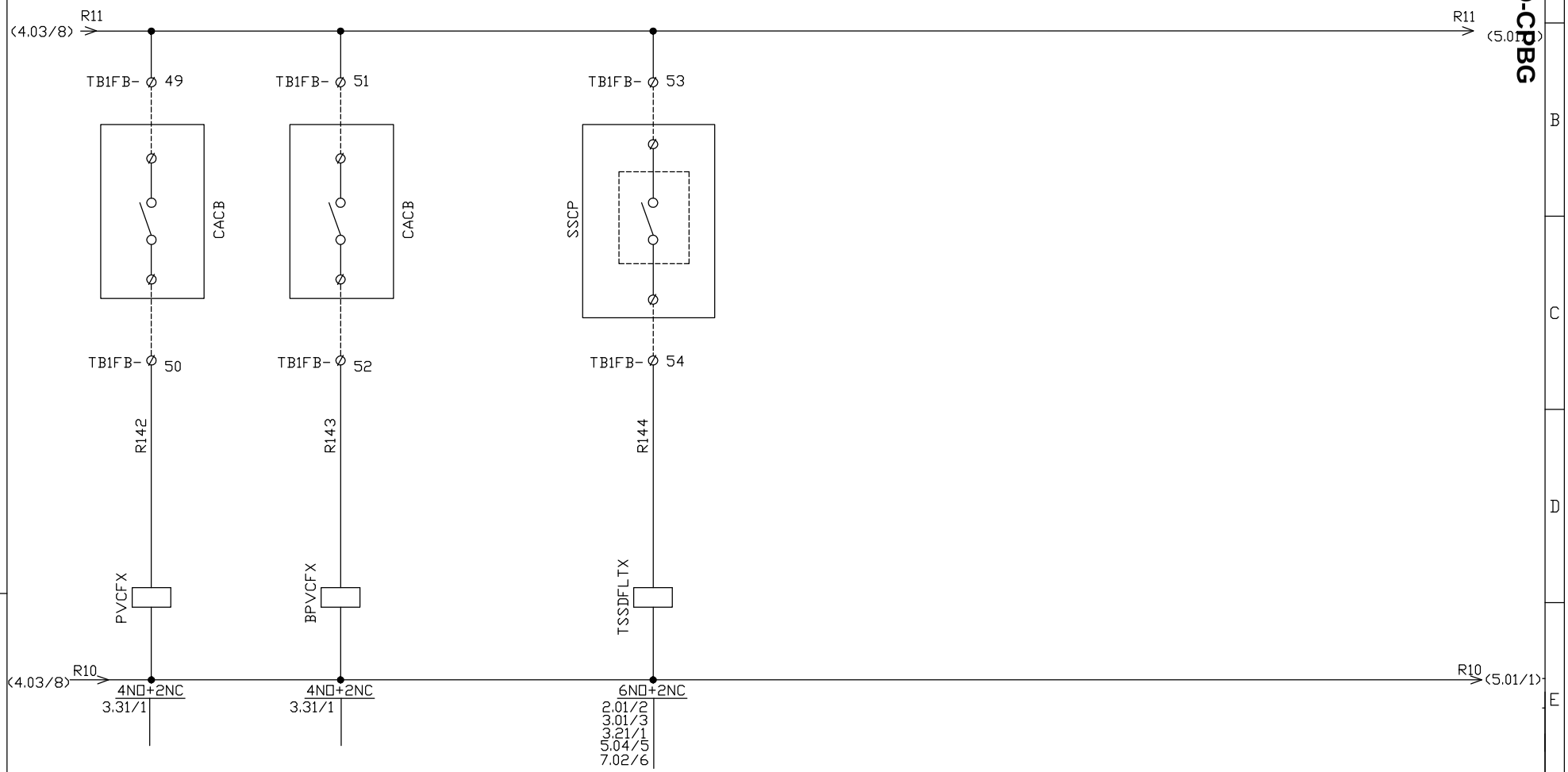
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 19 | NO. OF SHT. 30

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

PENSTOCK VALVE (BFV) CLOSED	BYPASS VALVES OF PENSTOCK VALVE (BFV)CLOSED	MAINTENANCE TURBINE SHAFT SEAL DEFLATED
PV-1 FOR MIV # 1 & 2 PV-2 FOR MIV # 3 & 4 PV-3 FOR MIV # 5 & 6	PV-1 FOR MIV # 1 & 2 PV-2 FOR MIV # 3 & 4 PV-3 FOR MIV # 5 & 6	



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 4.04

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: MULTIPLIER RELAYS-4

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

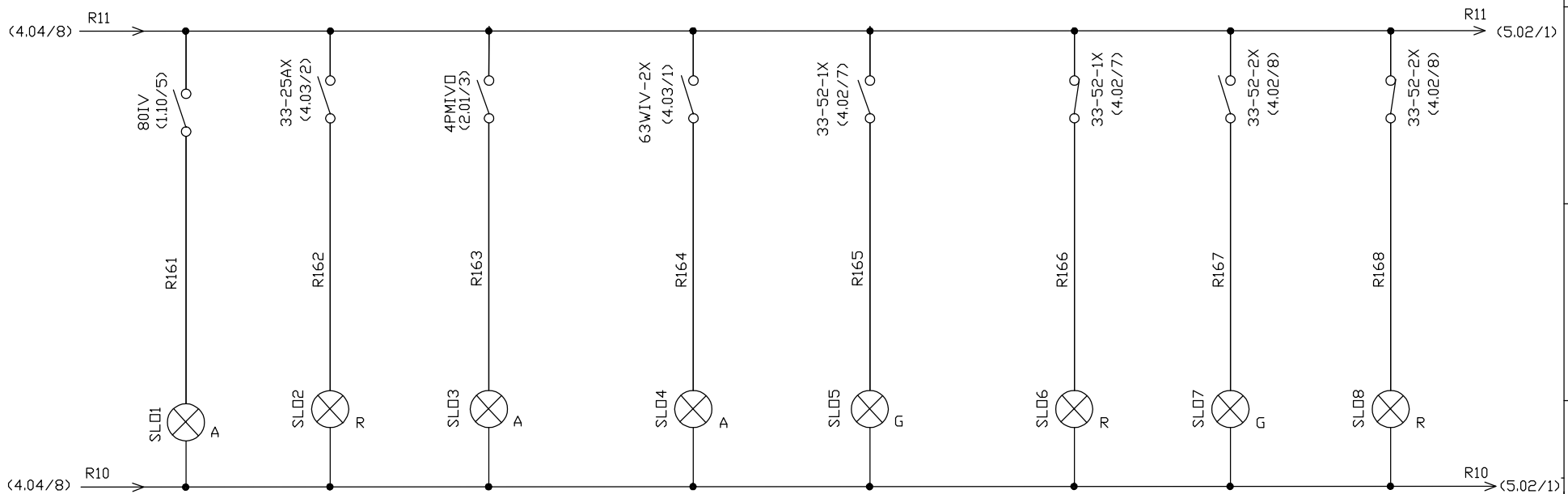
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 20 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

DC CONTROL SUPPLY OK	GV FULLY CLOSED	FUNCTIONAL GROUP PRESTART CHECK OK	DOWNSTREAM PRESSURE SUFFICIENT FOR MIV OPENING	MIV LOCKING PIN DISENGAGED	MIV LOCKING PIN ENGAGED	MAINTENANCE LOCKING PIN DISENGAGED	MAINTENANCE LOCKING PIN ENGAGED



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.01

ISSUED BY DEPT HPB | DEPT. CODE 415

TITLE: STATUS INDICATION-1

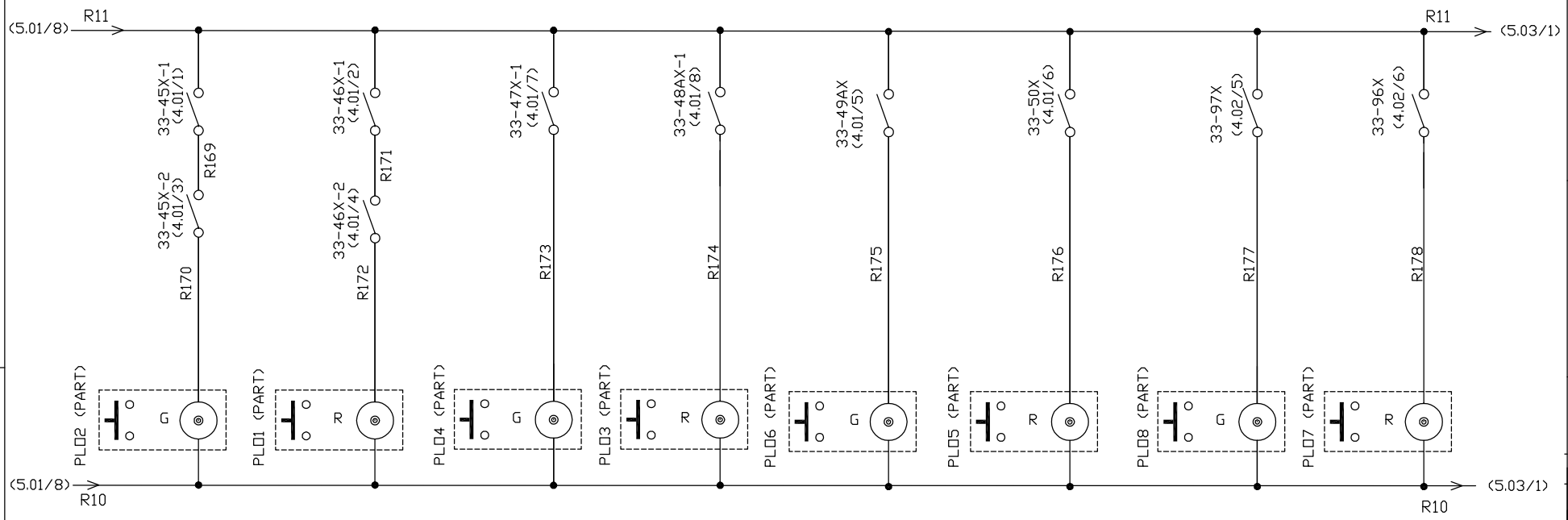
PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 21 | NO. OF SHT. 30

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETERMENTAL TO THE INTEREST OF THE COMPANY

BYPASS VALVES CLOSED	BYPASS VALVE OPEN	SERVICE SEAL ENGAGED	SERVICE SEAL DISENGAGED	MIV CLOSED	MIV OPEN	PENSTOCK DRAIN VALVE CLOSED	PENSTOCK DRAIN VALVE OPEN



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.02

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: STATUS INDICATION-2

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

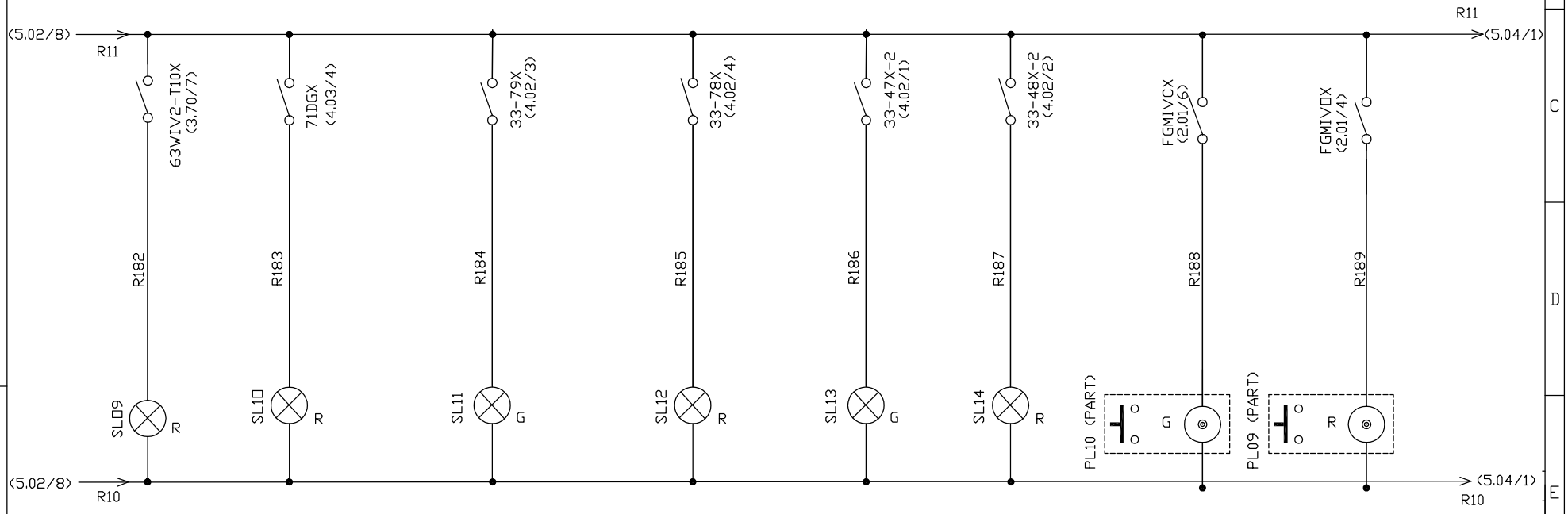
SHT. No. 22 NO. OF SHT. 30

INVENTORY NO. N.A SIGN.& DATE REF.DRG.NO.

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INVENTORY NO. SIGN.& DATE REF.DRG.NO.
N.A

DOWNSTREAM PRESSURE NOT SUFFICIENT FOR MIV OPENING	FLOOD LEVEL SWITCH OPERATED	AIR RELEASE VALVE CLOSED	AIR RELEASE VALVE OPEN	MAINTENANCE SEAL ENGAGED	MAINTENANCE SEAL DISENGAGED	FUNCTIONAL GROUP MIV	
						CLOSE	OPEN



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.03

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: STATUS INDICATION-3

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

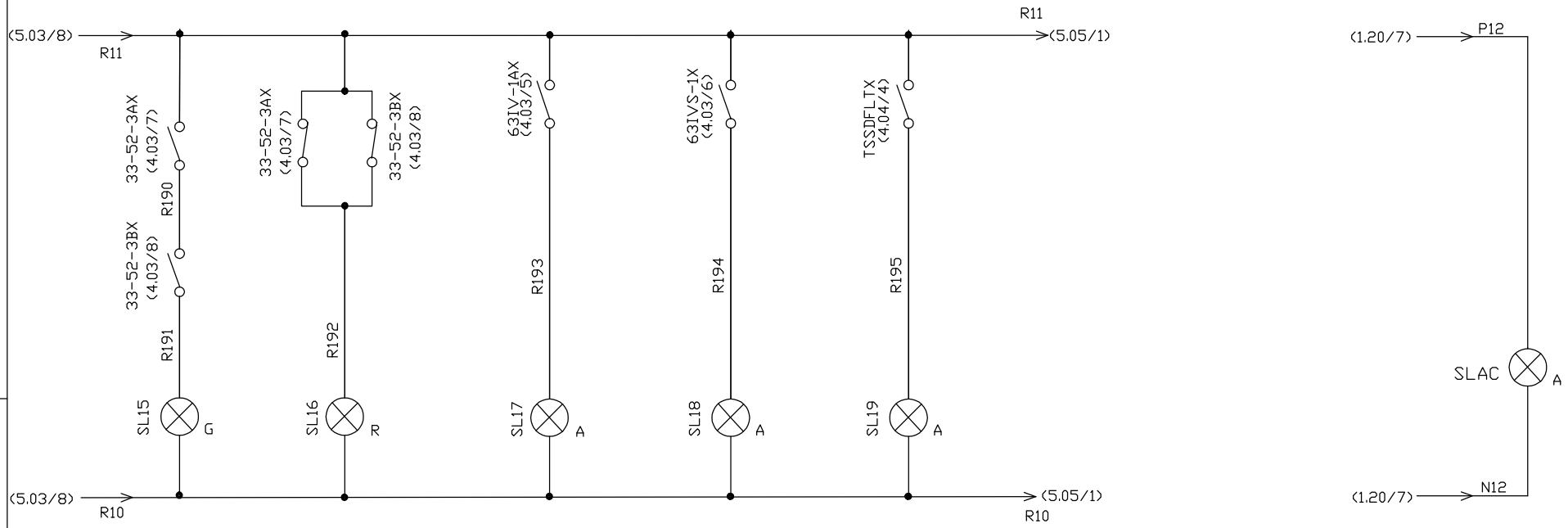
DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

SHT. No. 23 NO. OF SHT. 30

198209/2021/SBD-CPBG

BYPASS VALVE LOCKING PIN DISENGAGED	BYPASS VALVE LOCKING PIN ENGAGED	MIV OPU PRESSURE NORMAL	MIV SEAL OPU PRESSURE NORMAL	MAINTENANCE TURBINE SHAFT SEAL DEFLATED		AC SUPPLY HEALTHY



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INVENTORY NO. SIGN.& DATE REF.DRG.NO.
N.A

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 5.04

ISSUED BY DEPT HPE
DEPT. CODE 415

TITLE: STATUS INDICATION-4

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 REV. 03

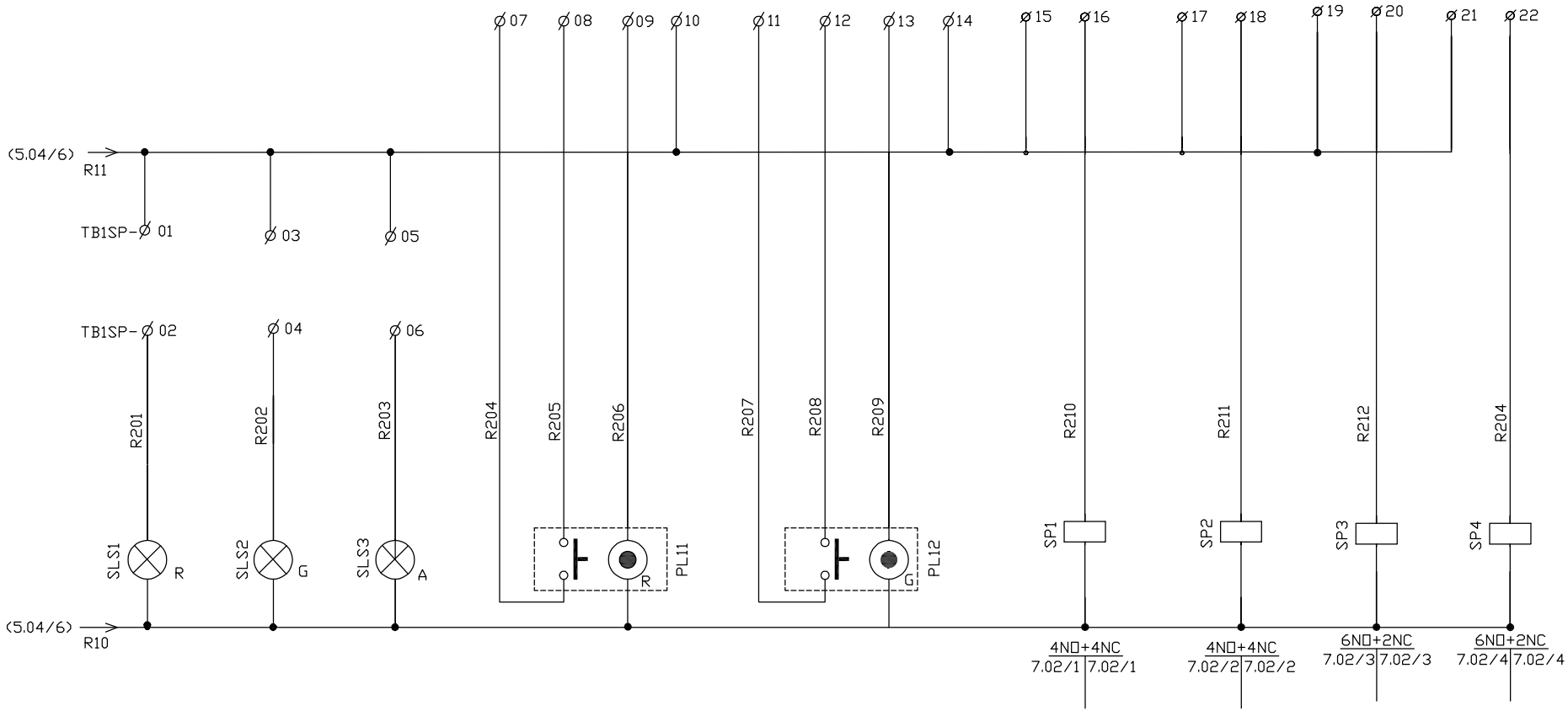
SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL

SHT. No. 24 NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 5.05

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: STATUS INDICATION-5

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

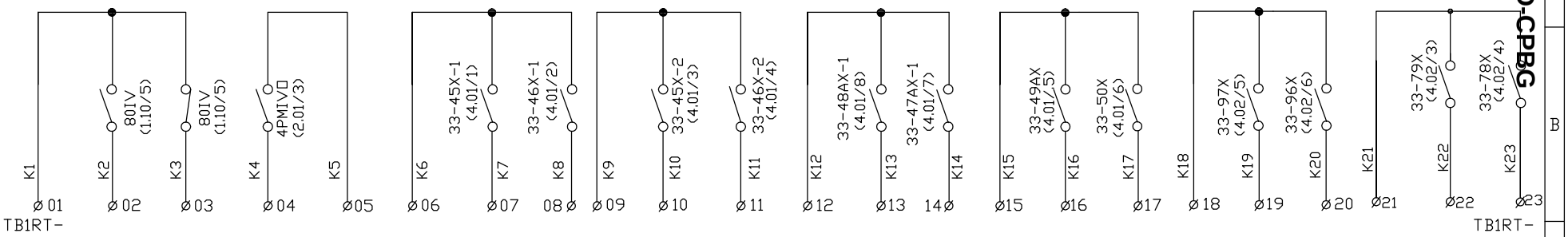
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 25 | NO. OF SHT. 30

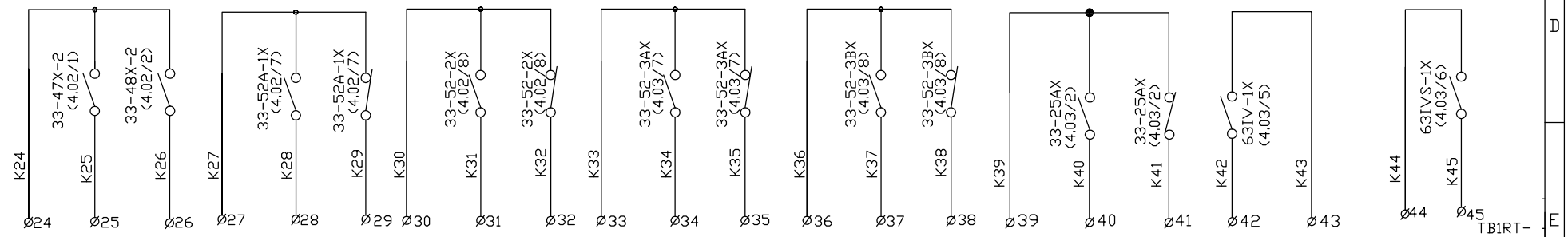
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

220 DC SUPPLY		FUNCTIONAL GROUP PRE-START CHECK-OK	BYPASS VALVE-1		BYPASS VALVE-2		SERVICE SEAL		MIV		PENSTOCK DRAIN VALVE		AIR RELEASE VALVE	
OK	FAIL		CLOSED	OPEN	CLOSED	OPEN	DISENGAGED	ENGAGED	CLOSED	OPEN	CLOSED	OPEN	CLOSED	OPEN



MAINTENACE SEAL		MIV LOCKING PIN		MAINTENACE SEAL LOCKING PIN		BYPASS VALVE-1 LOCKING PIN		BYPASS VALVE-2 LOCKING PIN		GV		MIV OPU PRESSURE NORMAL	MIV SEAL OPU PRESSURE NORMAL
ENGAGED	DISENGAGED	DISENGAGED	ENGAGED	DISENGAGED	ENGAGED	DISENGAGED	ENGAGED	DISENGAGED	ENGAGED	CLOSED	NOT CLOSED		



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 7.01

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: REMOTE CONTACTS-1

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

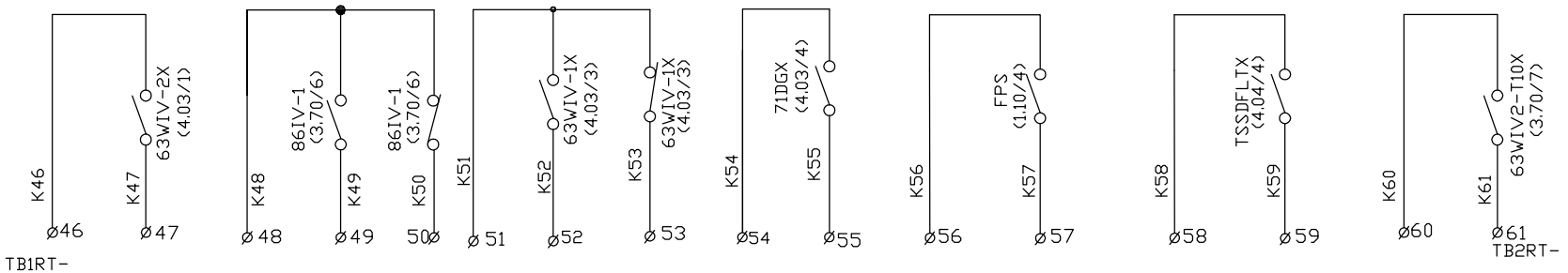
DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 26 | NO. OF SHT. 30

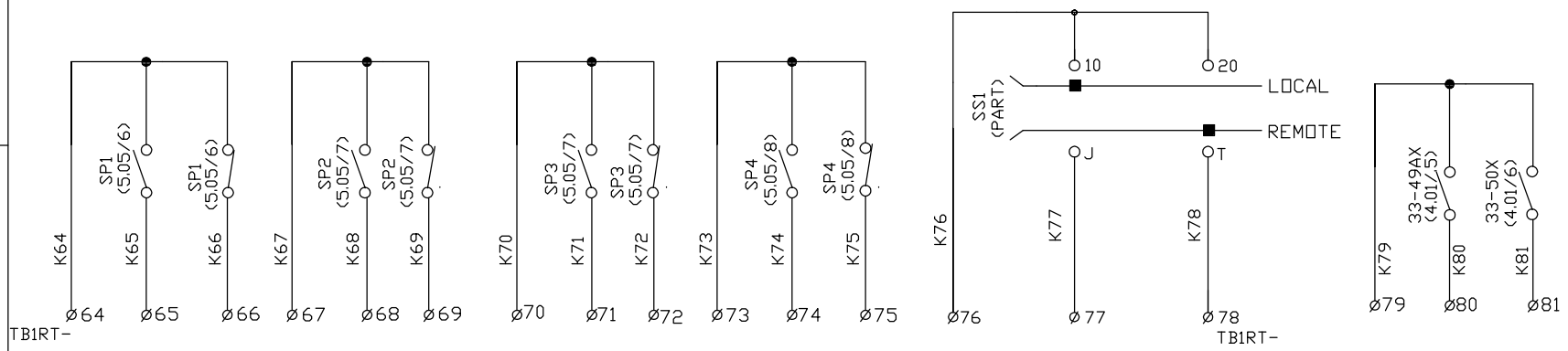
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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

DOWNSTREAM PRESSURE SUFFICIENT FOR MIV OPENING	EMERGENCY CLOSING RELAY	UPSTREAM PRESSURE		FLOOD LEVEL DETECTED	24 VDC FIELD SUPPLY HEALTHY	MAINTENANCE TURBINE SHAFT SEAL DEFLATED	DOWNSTREAM PRESSURE NOT SUFFICIENT FOR MIV OPENING	
		NORMAL	NOT NORMAL					



SPARE-1	SPARE-2	SPARE-3	SPARE-4	CONTROL SELECTION		MIV	
				LOCAL	REMOTE	CLOSED	OPEN



REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN-sd-
02	21.09.17	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/EIC(E&M-I)/ EM-1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN -sd-
01	24.10.16	CHECKED	AP -sd-
		APPROVED	DH -sd-

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA-II/ASE(E&M-I)/ EM-1/1/2016/1005 DATED 28.09.16.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN	-sd-	01.03.16	
CKD	AP	-sd-	01.03.16	
APPD	DH	-sd-	01.03.16	

SUB-SUPPLIER/VENDOR

ISSUED BY DEPT HPE | DEPT. CODE 415

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 7.02

TITLE: REMOTE CONTACTS-2

PROJECT: PUNATSANGCHHU-II HEP (6x170MW)-BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 27 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TBP

(1.10)	01	+	220 VDC SUPPLY (FROM SUB-DCDB-1/2)
	02	–	
	03		
	04		
	05		
	06		
(1.10)	07	PH	240 VAC SUPPLY (FROM STATION AC)
	08	N	
	09		
	10		

TBFP

(1.10)	01	+ Ø TB1:01	(TO MIVJB) 24 VDC SUPPLY FOR LIMIT SWITCH
	02	+ Ø TB:30	(TO MIVHCP) 24 VDC SUPPLY FOR PR. SWITCH
	03		
	04		
	05		

TBFN

(1.10)	01	– Ø TB1:02	(TO MIVJB) 0 VDC SUPPLY TO MIVJB
	02	– Ø TB:31	(TO MIVHCP) 0 VDC SUPPLY FOR PR. SWITCH
	03		
	04		
	05		

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1CT

(3.01)	01	Ø	(FROM RTU–TURFL) BYPASS VALVE OPEN CMD
	02	Ø	
	03	Ø TB:05	(TO MIVHCP) BYPASS VALVE OPEN SOLENOID
	04	Ø TB:06	
(3.02)	05	Ø	(FROM RTU–TURFL) BYPASS VALVE CLOSE CMD
	06	Ø	
	07	Ø TB:07	(TO MIVHCP) BYPASS VALVE CLOSE SOLENOID
	08	Ø TB:08	
(3.11)	09	Ø	(FROM RTU–TURFL) SERVICE SEAL DISENGAGE CMD
	10	Ø	
	11	Ø TB:05	(TO MIVSOPU) SERVICE SEAL DISENGAGE SOLENOID
	12	Ø TB:06	
(3.12)	13	Ø	(FROM RTU–TURFL) SERVICE SEAL ENGAGE CMD
	14	Ø	
	15	Ø TB:07	(TO MIVSOPU) SERVICE SEAL ENGAGE SOLENOID
	16	Ø TB:08	
(3.21)	17	Ø	(FROM RTU–TURFL) MIV OPEN CMD
	18	Ø	
	19	Ø TB:01	(TO MIVHCP) MIV OPEN SOLENOID
	20	Ø TB:02	
(3.22)	21	Ø	(FROM RTU–TURFL) MIV CLOSE CMD
	22	Ø	
	23	Ø TB:03	(TO MIVHCP) MIV CLOSE SOLENOID
	24	Ø TB:04	
	25	Ø TB2–54	(TO MIVJB) MIV EMERGENCY CLOSE SOLENOID
	26	Ø TB2–55	
	27		
	28		
(3.31)	29	Ø TB:13	(TO MIVHCP) PENSTOCK DRN VLV OPN SOLENOID
	30	Ø TB:14	

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1CT

	31		
	32		
(3.32)	33	Ø TB:15	(TO MIVHCP) PENSTOCK DRN VLV CLS SOLENOID
	34	Ø TB:16	
	35		
	36		
	37		
	38		
	39		
	40		
(3.70)	41	Ø	(FROM RTU–TURFL) EMERGENCY CLOSING COMMAND
	42	Ø	
(3.70)	43		SPARE
	44		EMERGENCY CLOSING COMMAND
	45		
	46		
	47		
	48		
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REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2018/266 DATED 05.03.18.

REV.	DATE	ALTERED	VKN –sd–
02	21.09.17	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN –sd–
01	24.10.16	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/ASE(E&M–I)/ EM–1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	–sd–	01.03.16	
CKD	AP	–sd–	01.03.16	
APPD	DH	–sd–	01.03.16	

SUB–SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 8.01

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: LIST OF TERMINALS (TBP, TBFP–TBFN , TB1CT)

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 28 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1FB

(4.01)	01	Ø TB1–04	(FROM MIVJB) BYPASS VALVE–1 CLOSE FEEDBACK	
	02	Ø TB1–05		
	03	Ø TB1–14	(FROM MIVJB) BYPASS VALVE–1 OPEN FEEDBACK	
	04	Ø TB1–15		
	05	Ø TB1–24	(FROM MIVJB) BYPASS VALVE–2 CLOSE FEEDBACK	
	06	Ø TB1–25		
	07	Ø TB1–34	(FROM MIVJB) BYPASS VALVE–2 OPEN FEEDBACK	
	08	Ø TB1–35		
	09	Ø TB1–44	(FROM MIVJB) MIV FULL CLOSE FEEDBACK	
	10	Ø TB1–45		
	11	Ø TB1–54	(FROM MIVJB) MIV FULL OPEN FEEDBACK	
	12	Ø TB1–55		
	13	Ø TB1–64	(FROM MIVJB) SERVICE SEAL ENGAGE FEEDBACK	
	14	Ø TB1–65		
	15	Ø TB1–74	(FROM MIVJB) SERVICE SEAL DISENGAGE FEEDBACK	
	16	Ø TB1–75		
(4.02)	17	Ø TB1–84	(FROM MIVJB) MAINTENANCE SEAL ENGAGE FDBK	
	18	Ø TB1–85		
	19	Ø TB1–94	(FROM MIVJB) MAINTENANCE SEAL DISENGAGE FDBK	
	20	Ø TB1–95		
	21	Ø TB2–04	(FROM MIVJB) AIR RELEASE VALVE CLOSE FDBK	
	22	Ø TB2–05		
	23	Ø TB2–14	(FROM MIVJB) AIR RELEASE VALVE OPEN FDBK	
	24	Ø TB2–15		
	25	Ø TB2–24	(FROM MIVJB) PENSTOCK DRN VLV CLOSE FDBK	
	26	Ø TB2–25		
	27	Ø TB2–29	(FROM MIVJB) PENSTOCK DRN VLV OPEN FDBK	
	28	Ø TB2–30		
	29	Ø TB2–34	(FROM MIVJB) MIV LOCKING PIN DISENGAGED FDBK	
	30	Ø TB2–33		

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1FB

(4.02)	31	Ø TB2–59	(FROM MIVJB) MAINTENANCE SEAL LOCKIN PIN DISENGAGED FDBK	
	32	Ø TB2–58		
	33	Ø TB:32	(FROM MIVHCP) DOWNSTREAM PR. EQUALIZED	
	34	Ø TB:34		
	35	Ø	(FROM TJB) GUIDE VANE FULLY CLOSED FDBK	
	36	Ø		
	37	Ø TB:37	(FROM MIVHCP) UPSTREAM WATER PR. NORMAL	
	38	Ø TB:39		
	39	Ø TB2–52	(FROM MIVJB) FLOOD LEVEL DETECTED	
(4.03)	40	Ø TB2–53		
	41	Ø	(FROM MIVOPU) MIV OPU PRESSURE NORMAL	
	42	Ø		
	43	Ø	(FROM MIVSOPU) MIV SEAL OPU PRESSURE NORMAL	
	44	Ø		
	45	Ø TB2–44	(FROM MIVJB) BYPASS VALVE–1 LOCKING PIN DISENGAGED	
	46	Ø TB2–43		
	47	Ø TB2–49	(FROM MIVJB) BYPASS VALVE–2 LOCKING PIN DISENGAGED	
	48	Ø TB2–48		
(4.04)	49	Ø	(FROM CACB) PENSTOCK VALVE CLOSED	
	50	Ø		
	51	Ø	(FROM CACB) BYPASS VALVES OF PENSTOCK VALVE CLOSED	
	52	Ø		
	53	Ø	(FROM SSCP) MAINTENANCE TURBINE SHAFT SEAL DEFLATED	
	54	Ø		
	55		SPARES	
	56			
	57			
	58			
	59			
	60			

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1SP

(5.04)	01	SPARES (LAMPS)	
	02		
	03		
	04		
	05		
	06		
	07		
	08		
	09		
	10		
	11		
	12		
	13		
	14		
	15	SPARES	
	16		
	17		
	18		
	19		
	20		
	21		
	22		
	23	SPARES	
	24		
	25		
	26		
	27		
	28		
	29		
	30		

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2018/266 DATED 05.03.18.

REV	DATE	ALTERED	VKN–sd–
02	21.09.17	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN –sd–
01	24.10.16	CHECKED	AP –sd–
		APPROVED	DH –sd–

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/ASE(E&M–I)/ EM–1/1/2016/1005 DATED 28.09.16.

	NAME	SIGN	DATE	NO. OF VAR
DRN	VKN	–sd–	01.03.16	
CKD	AP	–sd–	01.03.16	
APPD	DH	–sd–	01.03.16	

SUB–SUPPLIER/VENDOR

ISSUED BY DEPT HPE
DEPT. CODE 415

BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

CARD CODE 8.02

TITLE: TERMINAL DETAILS (TB1FB , TB1SP)

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21305 18802 REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 29 | NO. OF SHT. 30

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INVENTORY NO. N.A | SIGN.& DATE | REF.DRG.NO.

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1RT

(7.01/1)	01		
	02		220 VDC SUPPLY OK
	03		220 VDC SUPPLY FAILED
(7.01/2)	04		
	05		FUNCTIONAL GROUP PRESTART CHECK OK
	06	Ø	(TO RTU–TURFL)
(7.01/3)	07	Ø	BYPASS VALVE–1 CLOSED
	08	Ø	BYPASS VALVE–1 OPEN
	09	Ø	(TO RTU–TURFL)
(7.01/4)	10	Ø	BYPASS VALVE–2 CLOSED
	11	Ø	BYPASS VALVE–2 OPEN
	12	Ø	(TO RTU–TURFL)
(7.01/5)	13	Ø	SERVICE SEAL DISENGAGED
	14	Ø	SERVICE SEAL ENGAGED
	15	Ø	(TO RTU–TURFL)
(7.01/6	16	Ø	MIV CLOSED
	17	Ø	MIV OPEN
	18	Ø	(TO RTU–TURFL)
(7.01/7	19	Ø	PENSTOCK DRAIN VALVE CLOSED
	20	Ø	PENSTOCK DRAIN VALVE OPEN
	21	Ø	(TO RTU–TURFL)
(7.01/8)	22	Ø	AIR RELEASE VALVE CLOSED
	23	Ø	AIR RELEASE VALVE OPEN
	24	Ø	(TO RTU–TURFL)
(7.01/1)	25	Ø	MAINTENANCE SEAL ENGAGED
	26	Ø	MAINTENANCE SEAL DISENGAGED
	27	Ø	(TO RTU–TURFL)
(7.01/2)	28	Ø	MIV LOCKING PIN DISENGAGED
	29	Ø	MIV LOCKING PIN ENGAGED

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1RT

(7.01/3)	30		MAINT. SEAL LOCKING PIN DISENGAGED
	31		MAINT. SEAL LOCKING PIN ENGAGED
	32		
	33	Ø	(TO RTU–TURFL)
(7.01/4)	34	Ø	BYPASS VALVE–1 LOCKING PIN DISENGAGED
	35	Ø	BYPASS VALVE–1 LOCKING PIN ENGAGED
	36	Ø	(TO RTU–TURFL)
(7.01/5)	37	Ø	BYPASS VALVE–2 LOCKING PIN DISENGAGED
	38	Ø	BYPASS VALVE–2 LOCKING PIN ENGAGED
	39	Ø	(TO RTU–TURFL)
(7.01/6)	40	Ø	GUIDE VANE FULLY CLOSED
	41		GUIDE VANE NOT FULLY CLOSED
	42	Ø	(TO RTU–TURFL)
(7.01/7)	43	Ø	MIV OPU PRESSURE NORMAL
	44	Ø	(TO RTU–TURFL)
(7.01/8)	45	Ø	MIV SEAL OPU PRESSURE NORMAL
	46	Ø	(TO RTU–TURFL)
(7.02/1)	47	Ø	DOWNSTREAM PRESSURE SUFFICIENT FOR MIV OPENING
	48		
(7.02/2)	49		EMERGENCY CLOSING OPERATED
	50		EMERGENCY CLOSING NOT OPERATED
	51		
(7.02/3)	52		UPSTREAM PRESSURE NORMAL
	53		UPSTREAM PRESSURE NOT NORMAL
	54	Ø	(TO RTU–TURFL)
(7.02/4)	55	Ø	FLOOD LEVEL DETECTED
	56	Ø	(TO RTU–TURFL)
(7.02/5)	57	Ø	24 DC FIELD SUPPLY HEALTHY
	58		
(7.02/6)	59		MAINTENANCE TURBINE SHAFT SEAL DEFLATED

INTERNAL (SHT. REF.)	EXTERNAL PARTICULARS

TB1RT

(7.02/7)	60		DOWNSTREAM PRESSURE NOT SUFFICIENT FOR MIV OPENING
	61		
	62		
	63		
	64		
(7.02/1)	65		SPARE CONTACTOR–1
	66		
	67		
(7.02/2	68		SPARE CONTACTOR–2
	69		
	70		
(7.02/3)	71		SPARE CONTACTOR–3
	72		
	73		
(7.02/4)	74		SPARE CONTACTOR–4
	75		
	76	Ø	(TO RTU–TURFL)
(7.02/5)	77		CONTROL SELECTION IN LOCAL
	78	Ø	CONTROL SELECTION IN REMOTE
	79	Ø	(TO RTU–TURFL)
(7.01/6)	80	Ø	MIV CLOSED
	81	Ø	MIV OPEN
	82		
	83		
	84		
	85		
	86		SPARES
	87		
	88		
	89		
	90		

REV.	DATE	ALTERED	VKN
03	06.04.18	CHECKED	AP
		APPROVED	DH

DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2018/266 DATED 05.03.18.

REV.	DATE	ALTERED	VKN–sd–
02	21.09.17	CHECKED	AP –sd–
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DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/EIC(E&M–I)/ EM–1/1/2017/977 DATED 11.09.17.

REV.	DATE	ALTERED	VKN –sd–
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DRG. REVISED INLINE WITH PHPA'S LETTER NO.PHPA–II/ASE(E&M–I)/ EM–1/1/2016/1005 DATED 28.09.16.

DRN	NAME	SIGN	DATE	NO. OF VAR
	VKN	–sd–	01.03.16	
CKD	AP	–sd–	01.03.16	
APPD	DH	–sd–	01.03.16	

SUB–SUPPLIER/VENDOR

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

CARD CODE 8.03

ISSUED BY DEPT HPE | DEPT. CODE 415

TITLE: LIST OF TERMINALS (TB1RT)

PROJECT: PUNATSANGCHHU–II HEP (6x170MW)–BHUTAN

DRAWING NO. 3 21305 18802 | REV. 03

SCHEMATIC DRG. OF MIV ELECTRICAL CONTROL PANEL | SHT. No. 30 | NO. OF SHT. 30

TENDER DOCUMENT
PART – A
VOLUME - II

1.	INSTRUCTION TO BIDDER
2.	EARNEST MONEY DEPOSIT (EMD):
3.	SECURITY DEPOSIT (SD) :
4.	NON DISCLOSURE AGREEMENT
5.	CONFIDENTIALITY
6.	STATUTORY REQUIREMENTS
7.	MANPOWER
8.	PERIOD OF CONTRACT
9.	FAILURE TO COMPLY WITH CONTRACT
10.	SUB-CONTRACTING
11.	LAWS GOVERNING THE CONTRACT
12.	LEGAL JURISDICTION:
13.	DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR:
14.	ARBITRATION & CONCILIATION:
15.	COMPENSATION:
16.	PENALTY/ LD FOR DELAYED DELIVERY
17.	CONCILIATION CLAUSE – Annexure IA
18.	MAKE IN INDIA CLAUSE
19.	FORMATS

1.	**INSTRUCTION TO BIDDER**
1.1.	Tender is a two part bid system. The tender documents consist of Part - A and Part - B as detailed below: a. Part 'A': **Techno-commercial Bid** duly sealed and signed to be uploaded at the web-portal (https://eprocurebhel.co.in) on or before the due date. b. Part 'B': **Price Bid** to be quoted in prescribed format available on web portal (https://eprocurebhel.co.in) on or before the due date.
1.2.	Envelope 1: Techno-Commercial Offer a. Documents to be uploaded in Envelope 1: i. Earnest Money Deposit (EMD) either in the form of DD or UTR Number (if paid through EFT) at the space provided. ii. Duly completed tender documents volume 1 sign and Sealed. iii. Each and every page of tender documents should be sealed signed. iv. Documents satisfying PQR/Eligibility Criteria as per relevant clause of NIT. v. Any other documents as per Tender requirements. vi. Duly completed tender documents volume II sign and Sealed. vii. Each and every page of tender documents should be sealed & signed by the tenderer viii. Any other documents as per Tender requirements. b. The tenderer shall not indicate the price or rate in this Envelope. Envelope 2: Part 'B': Online Price-Bid. i. TO be submitted online.
1.3.	The tenderer shall expressly accept all the terms and conditions of the Tender. The tender which does not comply with the BHEL's Terms & Conditions may be rejected as Non-responsive/non-conforming and non-acceptable.
1.4.	The techno-commercial offer will be opened on the due date. The tenders meeting our techno-commercial requirements will be considered for online initial sealed bid auction at a later date for which eligible vendors will be intimated in due course.
1.5.	The tender forms duly filled in all respects shall be signed on each page by the tenderer. Any alteration, erasing will render the tender invalid. Corrections, over writing, cutting(s) etc. are not permitted. All entries in the tender document should be in one ink. All the columns in the tender form should be filled without leaving any column blank in any page of the tender. In case any of the relevant columns are left blank, the tender can be rejected. However, alteration neatly carried out and duly attested over with the full signature of the tenderer is permitted.
1.6.	The tenderer should submit the tender documents intact without detaching any page or pages
1.7.	Before making the offer, the bidders are advised to carefully go through the terms and conditions, which form part of the Agreement.
1.8.	Tender documents consisting of Part 'A' Volume I & II duly sealed and signed and Part 'B' shall be uploaded duly on or before the said Date and Time. Part 'A' Volume I & II of tender form i.e. PQR and Techno-commercial Bid will be opened on specified Tender Due Date and Time. Bidders who qualify the PQR & Techno-commercial Bid will be intimated to participate in R.A.
1.9.	BHEL reserves the right to assess the capacity and capability of the parties for pre-qualification. The company also reserves the right to accept or reject any or all the tenders or any part thereof at any stage of process without assigning any reason whatsoever. The company has no obligation to accept the lowest tender. Offer of the Tenderer if prima-facie found not comparable with the quantum of work envisaged and the bid is a desperate effort to be L1, then the offer is liable to be rejected. BHEL's decision in this regard shall be final and binding.
1.10.	**PRICE BID** - The tenderers are required to submit their quotation for all the items listed in the Price Bid format given along with the tender documents. The price should be quoted for each activity after careful study of the actual job requirement so that, in case the contract is awarded, contractor should not express any difficulties in execution of the contract.

1.11.	Contractor to ensure payment of Minimum Wages payable as per statutory provisions of the Appropriate Govt.
1.12.	**VALIDITY OF RATES:** The rates quoted should be valid for 90 days initially from the date of opening of the Techno-Commercial bid. (Part-A)
1.13.	The rates shall include the payments on account of Employee contribution to PF, PF Admin. Charges, EDLI, Employer contribution to ESI, Gratuity, Bonus as per statutory requirement, applicable taxes, as per the directives issued by BHEL from time to time.
1.14.	BHEL reserves the right to reject any bid, which is technically unacceptable and unworkable. Further BHEL also reserves the right to reject any or all tenders without assigning any reasons thereof.
1.15.	BHEL reserves the right to cancel the contract at the initial stage or during the contract period without assigning any reason to the tenderer.
1.16.	Wherever prescribed formats are specified for the tenderers use, he shall use the same for making his Claims.
1.17.	Tender document should be complete in all respects.
1.18.	Successful tenderers shall enter into an Agreement on a non-judicial stamp paper of Rs.100/- as a token of having accepted the rates, terms and conditions of the contract as per the Proforma given by BHEL.
1.19.	The Offers should be in full conformity with the terms and conditions of this tender. No contradictions are acceptable. Incorrect and incomplete tenders are liable for rejection.
1.20.	Tenders not submitted in the prescribed forms are liable for rejection.
1.21.	BHEL reserves the right to accept or reject any tender in part or full at their discretion without assigning any reason.
1.22.	If a tenderer deliberately gives wrong information in his tender or creates conditions favorable for the acceptance of his tender, then BHEL reserves the right to reject such tender at any stage.
1.23.	If the tenderer indulges in any unethical practice for securing the contract, the offer of such tenderer shall be rejected.
1.24.	Any written communication required to be sent to the contractor in writing shall be sent at the address mentioned on the tender form or to any other address subsequently intimated by contractor in writing to BHEL SBD for the contract purposes.
1.25.	Benefit for MSME / NSIC bidders not available in this contract.
1.26.	**Evaluation of Bids**
1.27.	**Techno-Commercial Bid & PQR**: The techno-commercial bid & PQR will be evaluated based on the eligibility criteria and on acceptance of NIT terms and conditions of BHEL. Only qualified bids will be eligible for price-bid opening
1.28.	**Evaluation of Price-Bids:** i. Evaluation of the L-1 offer shall be computed on overall lowest cost to BHEL basis (Grand Total Price for all the items indicated in Price Bid minus tax credit, if, any) ~~ii.~~ In the event of two or more tenderers becoming L1, the said tenderers would be called for negotiation and will be instructed to submit fresh price bid offers. Further, in the event of two or more tenderers becoming L1, the selection of the tenderer for the purpose of awarding contract will be on the basis of LOTTERY to be held in presence of representatives of L1 tenderer
2.	**EARNEST MONEY DEPOSIT (EMD):**
2.1.	Earnest Money Deposit (EMD) is to be paid by tenderers for securing fulfilment of any obligations in terms of the NIT. Earnest Money Deposit as indicated in the NIT (Ref. General Information) is to be submitted along with tender documents Part – A.
2.2.	**Modes of deposit** The EMD may be accepted only in the following forms: (i) Cash deposit as permissible under the extant Income Tax Act (before tender opening) (ii) Electronic Fund Transfer credited in BHEL account (before tender opening) (iii) Banker's cheque/ Pay order/ Demand draft, in favor of BHEL (along with offer) In case total EMD amount is more than Rs. 20 Lakh, the amount in excess of Rs. 20 lakh may be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months.
2.3.	**Forfeiture of EMD**

	EMD by the Tenderer will be forfeited as per NIT conditions, if: i) After opening the tender and within the offer validity period, the tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL. ii) The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/ Contract EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors" and forfeited/ released based on the action as determined under these guidelines.
2.4.	EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of award of work.
2.5.	EMD shall not carry any interest.
2.6.	EMD of successful tenderer will be retained as part of Security Deposit.
3.	**SECURITY DEPOSIT (SD) :**
3.1.	Security Deposit means the security provided by the Contractor towards fulfilment of any obligations in terms of the provisions of the contract.
3.2.	The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.
3.3.	**Modes of deposit**: The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in the following forms: i. Cash (as permissible under the extant Income Tax Act) ii. Local cheque of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favor of BHEL iii. Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL iv. Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) v. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL) (Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)
3.4.	**Collection of Security:** At least 50% of the required Security Deposit, including the EMD should be collected before start of the work. Balance of the Security Deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected. If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor. The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of the authority competent to award the work.
3.5.	Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract.
3.6.	The Security Deposit shall not carry any interest.
4.	**NON DISCLOSURE AGREEMENT**. The contractor shall sign a Non-Disclosure Agreement (NDA) as per BHEL format (Copy enclosed as per Format 20.3) in compliance to Information Security Management System.
5.	**CONFIDENTIALITY**: The contractor and his representatives shall, at all times, undertake to maintain and ensure complete confidentiality and integrity of all data, information, software, drawings & documents, etc. belonging to BHEL and also of the systems, procedures, reports, input documents, results and any other company documents discussed

	and/or finalized during the course of execution of the order/contract.
6.	**STATUTORY REQUIREMENTS:**
6.1.	While quoting the rate, the tenderers are advised to take note of minimum wages payable to workmen.
6.2.	The tenderer will be required to comply with all the statutory provisions such as Minimum Wages prevailing at the time of payment or arrears thereof Bonus, PF, EDLI, ESI, Applicable Tax, declared Holidays, leave, etc. The contractor shall submit the documentary evidence of payment on account of submission of statutory payments made to the concerned agencies before clearance of bill of next month.
6.3.	The Contractor shall comply with the provisions of the Factories Act 1948, Contract Labour (Regulation and Abolition) Act 1970, ESI Act, Employees Provident Fund and Miscellaneous Act 1952, Minimum Wages Act 1948, Payment of Gratuity Act 1972, Industrial Disputes Act, 1947, Employers Liability Act 1938, Inter State Migrants Workmen (Regulation of employment and conditions of Service) Act 1979,Employees Compensation Act (…), Maternity Benefit Act 1961, and or any other Laws and Rules that may be applicable from time to time to the workers engaged by him. The contractor, when required by the Company shall produce the registers and records for verification and comply with other directions issued by the company for compliance of the statutory provisions.
6.4.	The contractor shall fully indemnify the loss if any caused to BHEL due to any default or non-observance of any of the laws, or any omission or commission or inability on the part of the contractor or his representative.
6.5.	The contractor shall, keep and produce for inspection at all times, forms, registers and other records required to be maintained under various statutes in order to enable scrutiny by the Company whenever required.
6.6.	The contractor shall produce to the Company, the documentary proof of payment of the said statutory dues. Non-observance of the provisions will be construed as default by the Tenderer in making such payment, and payment of his bill will be deferred.
6.7.	The Income tax as applicable will be deducted from the bill of the contractor.
6.8.	Each contractor will be required to maintain the daily attendance of his labors in the prescribed Performa for accounting payment of minimum wages, deduction towards ESI & PF Contributions, payment of Bonus, leave etc.
6.9.	The contractor will have to follow the provisions of Payment of Bonus Act 1965 and Rules 1975, and is liable to pay Bonus to his workers
6.10.	The contractor will have to extend paid National Holidays and Festival Holidays to their workmen as per the provisions of the relevant Act and the Rules thereof. However, if due to exigencies of work the contractor engages his workmen on National Holidays or Festival Holidays contractor shall pay additional wages as prescribed under the provisions of the Act.
6.11.	**COMPLAINCE WITH BOCW ACT: NA**
7.	**Manpower:**
7.1.	The Contractor shall provide the minimum manpower required for executing the contracted work as per the scope of work. The contractor shall not engage a person who is less than 18 years of age and more than 58 years of age.
7.2.	The contractor shall be responsible for safety of his laborers while they are engaged for work connected with the Contract. The Contractor shall be responsible for the appropriate usage of the said safety appliances. In the event of violation of applicable safety, health & environment related norms, a penalty of Rs.500/- per occasion shall be imposed on the contractor.
7.3.	The contractor, as the employer of his workmen, shall manage them. In the event of any dispute arising between the contractor and his employees, the contractor alone is solely responsible for resolving the dispute between them and BHEL will in no way be responsible for settling the dispute either statutory or otherwise.
7.4.	The contractor shall be responsible for safety of his laborers while they are engaged for work connected with the Contract. The Contractor shall be responsible for the appropriate usage of the said safety appliances. In the event of violation of applicable safety, health & environment related norms, a penalty of Rs.500/- per occasion shall be imposed on the contractor.
7.5.	The contractor will be solely responsible for executing the agreed work and the employees of BHEL will only oversee the proper execution of work. The contractor or his representatives shall be available in the factory to control and supervise his workers and take down instructions from the designated officials of BHEL. **The cost of deployment of Supervisor has**

	to be borne by the Contractor.
7.6.	The contractor shall have full control over his employees including w.r.t determining service conditions, discharge, dismiss, or otherwise terminate their services at any time. However, the contractor shall not engage any person who has completed 58 years of age. The contractor shall be solely responsible for any claim arising out of employment or termination of employment of his employees and for statutory payments.
7.7.	The contractor shall employ only such personnel who are medically fit. The company has right to direct the contractor to remove from the premises such of his personnel who may be physically, hygienically, clinically or medically unfit.
7.8.	The contractor shall employ only such personnel who have not been found unfit for employment in Organizations such as Central/State/Public Undertakings by the Police authorities. For this purpose, contractor is required to submit the police verification report before engaging the contract labor. Persons against whom criminal cases are pending or under investigation and persons found guilty of offences involving moral turpitude shall not be engaged for executing work.
7.9.	The Contractor shall comply with all the operational rules and regulations, including safety and security rules framed by the company from time to time wherein the Contractor or his workmen happen to be operating/ working. In the event of any of the workmen of the contractor violating any of the said rules and regulations, the Contractor would be required to remove forthwith such workmen from the company's premises.
8.	**PERIOD OF CONTRACT**
8.1.	Duration of contract is as mentioned in the General Information of NIT
8.2.	The contract shall be, initially, for the period as mentioned in NIT – General Information from the date of award of contract.
8.3.	The parties are at liberty to terminate the Agreement by giving three calendar months' notice in writing and the loss if any caused to the other party due to termination of contract shall be compensated by the party terminating it.
9.	**FAILURE TO COMPLY WITH CONTRACT**
9.1.	Notwithstanding anything contained in any other clause, BHEL reserves the right to terminate the contract due to any failure on the part of the Tenderer in discharging his obligations under the contract or in the event of his becoming insolvent or going into liquidation. The decision of the BHEL about the failure on the part of the Tenderer shall be final and binding on the tenderer.
9.2.	In case of any damage to the existing building, structures, materials, tools, furniture and fixtures, machines etc., caused from contractor's end, the cost of its repairs or replacement will be recovered from the contractor. If there is any work stoppage in any area of the Plant due to the fault of the tenderer, the tenderer is liable to compensate the same.
9.3.	In the event of any failure on the part of the tenderer, BHEL shall have the right without prejudice to any other right or remedies, to get the work done through any other agency and the Tenderer shall be liable to compensate BHEL for any losses on this account. The additional cost, loss, if any incurred by BHEL will be recovered from the bills, security deposits, other dues as well as directly from the Tenderer.
10.	**SUB-CONTRACTING**
10.1.	The contractor shall not sub-contract or transfer or assign the contract in full or any part thereof to any other person or firm or company without the previous express written approval of BHEL.
11.	**LAWS GOVERNING THE CONTRACT**
11.1.	The contract will be governed by the Laws of India for the time being in force and as amended or made from time to time.
11.2.	All disputes shall be settled in accordance with the Laws of India for the time being in force and as amended from time to time.
11.3.	All disputes arising out of or in relation to this contract or Agreement shall be settled by mutual discussions and in the event of failure such disputes shall be referred to the Arbitrator.
12.	**LEGAL JURISDICTION:**
12.1.	In respect of all matters arising out of or pertaining to the contract, the cause of action thereof shall be deemed to have arisen only at Bengaluru, where BHEL – SBD is situated. All legal proceedings pertaining to the above matters or dispute shall be instituted only in courts having territorial jurisdiction over the place where BHEL-SBD is situated and no other court shall have the jurisdiction.
13.	**DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR:**
13.1.	The duties and responsibilities and obligation of the contractor including statutory responsibilities mentioned in this

	document are indicative and not exhaustive. Contractors are required to confirm with the concerned authorities for proper and complete compliance.
13.2.	The contractor will abide by the provisions of Child Labor (Prohibition & Regulation) Rules 1988. He should issue appropriate Appointment Letter to his Workmen.
13.3.	The following documents / forms under Contract Labor (Regulation & Abolition) Act 1970 and relevant rules therein shall be maintained by the contractor: (i) A notice showing the wage period and the place and time of disbursement of wages to be displayed at the place of work and a copy sent by the contractor to the HR Department (Rule 75). (ii) A register of workman From XIII (Rule 75) (iii) Employment card From XIV (Rule 76) (iv) Service Certificate From XV (Rule 77) (v) Muster Roll, Wage Register, Deductions Register, overtime Register, leave register etc. (vi) Half yearly return to be sent (In duplicate) by the contractor to the licensing officer. From – XXIV (Rule 82 (I) with a copy to HRM Department regularly. (vii) All statutory registers and records shall be preserved in original for a period of Ten years and should be made available even after the contract is over for verification.
13.4.	The contractor shall comply with the provisions of Contract Labor (R & A) Act including provisions relating to welfare and Health facilities as provided under the Contract Labor (R& A) Act 1970 and relevant rules.
13.5.	All the registered contractors shall submit the returns required under contract Labor (Regulation & Abolition) Act 1970 and forward a copy to HR Department of BHEL-EPD
13.6.	SBD– Bengaluru is a Notified Area under the provisions for ESI Act 1948. The contractor shall comply with the provision of ESI Act, and will be responsible for any liability arising during the tenure of the work contract under the Act, The contractor should ensure ESI coverage and facilities to his workers (i.e. ESI code no. and ESI card etc.) as per ESI Scheme from ESI authorities including Medical Benefit etc, The contractor shall arrange for filing of family declaration forms in respect of their contract labors and deposit the same in ESI office for issue of Identity card by ESI authorities. The contractor may deduct required ESI contribution from the wages of their employees as per law and deposit the same (Employees share) along with his contribution to the ESI authorities.
13.7.	Workmen insured under ESI Act only shall be deployed in contract work.
13.8.	The contractor shall submit bi-annual return in Form 6 along with monthly Challans to the appropriate authority under the provisions of Employee's State Insurance Act 1948, and send an intimation to HR Department of BHEL-EPD.
13.9.	Not with standing anything contrary to this, in the event of accident the contractor shall be required to submit injury report to the concerned authorities with a copy of the same to the designated BHEL Executive immediately and ensure the compliance of the ESI Act and rules made therein.
13.10.	The contractor shall submit the following returns to the appropriate authority under the provisions of Employee's Provident Fund and Misc. Provisions Act 1952, Employees' Pension Scheme 1995 under intimation to HR Dept. (i) Monthly return in Form 12 A along with form 5 & 10 (addition and deletion) and monthly Challan. (ii) Annual Return in Form 6A along with Form 3A.
13.11.	The Contractor shall maintain the following records as required under the Employees Provident Fund and Miscellaneous Provisions Act 1952, Employee's Pension Scheme 1995 ▪ Declaration of Nomination, Form No.2 Para 33 and 61 (1). ▪ Pass Book. ▪ Cash Book. ▪ Attendance. ▪ Wage Register.
13.12.	The contractor shall regularly pay the amount of contribution (employer's contribution as well as the employee's contribution) as per the Employee's Provident Fund and Miscellaneous Provisions Act 1952, Employees' Pension Scheme 1995 and Employee's State Insurance Act 1948. (i) The contractor may recover from his workmen, the employee's contribution in accordance with the provision of the said act and the Scheme but shall not recover the employer's contribution or the other charges from his employees in any manner. (ii) The contractor shall submit along with monthly bills to BHEL, statement showing the recoveries of

	contributions in respect of employees employed by or through him along with the proof of Deposit of such contribution with the Concerned Authority and shall also furnish to BHEL such information, in the capacity of principal Employer, as required to furnish under the provisions of the schemes under the Employees P.F. and Misc. Provisions Act 1952 and ESI Act, 1948 to the authorities under the said acts. (iii) The Contractor shall arrange for his own P.F. and ESI Code No. from the PF and ESI authorities respectively. The contractor will be reimbursed by BHEL the expenditure incurred by the contractor towards payment of the Employers Contribution and PF Administrative charges.
13.13.	Any failure to comply with the statutory requirements on the part of contractor shall disqualify such contractor from all contracts awarded to him and his name shall be black listed for further tenders / contracts. In addition, the contractor's security deposit shall be forfeited apart from consequential legal action against him.
13.14.	The contractor shall maintain Form D as per Rule 5 of the Payment of Bonus Act, 1965. The contractor is further liable to pay bonus to his employees in accordance with the payment of Bonus Act 1965 and to keep all the records in Form C as per the said Act.
13.15.	In case the contractor employs women, he will discharge his obligation under law in respect of such women workers such as prohibition of engaging them during night hours, prohibition of employing them more than 9 hours per day, provision of crèche facility, grant of maternity leave as per rules etc.
13.16.	The Wage period for the Workmen of Contractors shall be Calendar Month and the contractor shall be responsible for making payment of wages within 7 days of the closure of the wage month. The disbursement shall be preponed to the 6th day, if the 7th day happens to be a holiday. Similarly, in case of Overtime wages, the contractor shall make the OT payment to his workmen along with the salary within 7 days of the closure of the wage month The Contractor would be required to open an Account for Electronic Fund Transfer (EFT) of his Bills/Claims from BHEL as well as EFT of wages/OT/other payments of his workmen from his Account to the Accounts of his workmen so that risks associated with cash transactions can be avoided.
13.17.	The Contractor shall be required to issue monthly Wage /OT Slips to their workmen. Further, the Contractors claims are to be accompanied by a Certificate from BHEL Official certifying that "the Wage /OT Slips for the previous month/current month have been issued by the contractor to all their workmen". Further, the contractor would be required to issue Annual PF Statement from the PF Authorities for all his workmen engaged in BHEL Malleswaram Complex before submitting Claim for refund of Security Deposit for the respective years.
13.18.	In case contractor fails to make payment of wages to his employees or remittance of contribution to the concerned authorities, the Security deposit / other dues payable under the contract can be utilized by BHEL to discharge the liability of the contractor.
13.19.	The workmen of the contractors shall wear uniform while attending duty in BHEL campus which must be different in color from the color of uniform of regular employees. The Contractor/his authorized representative shall ensure wearing of the Uniform and Safety Shoe by his workmen in the BHEL premises. The name of the contractor for which the worker is working should be made available on the uniform. The cost of the uniform and Safety Shoe will be borne by contractor. ***The contractor should ensure and provide masks and gloves to the workmen engaged by him in view of the pandemic COVID-19, till such time it exists. The cost of the same will be borne by contractor.***
13.20.	The liability for compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.
13.21.	**NATIONAL & FESTIVAL HOLIDAYS** (as declared by BHEL): The contractor will give paid National Holidays and Festival Holidays to the workers as per Section 5 of National and Festival Holidays Act. However, if due to the exigency of work if any of his workmen is required to work on National Holiday or Festival Holiday, the contractor has to pay wages as per Section 5, sub section 2 and 3 of the said Act.
13.22.	Besides the three national holidays 15th February, 26th January and 2nd October, if Govt. declares any other day as a national holiday same will be treated as paid holiday for the purpose of this contract. Accordingly, the contractor shall be required to provide paid holiday to its workers for the same. If any of the contract workmen works on such additional declared national holiday, he will be entitled to additional wage for the said day.
13.23.	**GENERAL ELECTIONS:** If the general elections are held for State Assembly / Parliament and Government declares a public holiday for exercising the franchise, the contractor shall give their workmen half day leave in "First" shift only. The contractor's workmen working in "Second" and "Night" shifts will be required to exercise their franchise during their own time.
13.24.	The Contractor shall maintain the following Documents, Registers, Forms as required under the FACTORIES Act 1948 and

	Rules 1969. (I) Leave Book Form No. 15 (Rule 121) (II) Nomination Form No. 25 (Rule 127
13.25.	The contractor will extend leave with wage to his workers who have worked for a period of 240 days or more during a calendar year. To facilitate the proper execution of the Factories Act, these leaves shall be allowed during the same calendar year, at the rate of one day for every 20 working days. A worker commencing service on a day other than the 1st day of the January shall be entitled to leave with wages at the above rate (one day for every 20 days of work) only if he has worked for 2/3 of total no. of days in the remaining year. The contractor will pay the un-availed portion of leave in cash every Six month from the start of the contract.
13.26.	Contractor has to ensure that all his workmen are granted one day weekly off after every 48 hrs. of working. The workmen working for more than 48 hours in any week shall be paid wages twice the ordinary rate of wage in accordance with the provisions of Section 59 of the Factories Act, 1948 read with the Karnataka Factories Rules.
13.27.	The contractor shall follow safety rules and regulations as per provisions of Factories Act 1948, and Rules at his own expense and arrange for the safety provisions as appended to these conditions or rules framed by the government from time to time.
13.28.	Refund of Security Deposit: Security Deposit of contractor will be refunded only after the expiry of the contract period and based on the certification of successful completion of the contract by the concerned Officials and submission of an Indemnity Bond from the contractor, that in case of Claims from any of the statutory authorities, the same would be indemnified by the Contractor. In case of completion of the contract before payment of bonus to the workers, Security Deposit, as deemed appropriate, will be withheld by BHEL. The same would be released to the Contractor after submission of proof of bonus payment to his workmen.
13.29.	The Contractor shall be required to deposit Tax as applicable, if same is applicable as per rules in force from time to time. The amount so spent can be claimed from BHEL after submitting the proof of the same. The contractor has to obtain GST registration wherever required. The Contractor must quote the Service Account Code (SAC) number at the time of raising invoice.
13.30.	Contractor shall inform his PAN to BHEL. Income tax as applicable will be deducted at source by BHEL from the bill of contractor.
13.31.	All the Registers and Records, forms, Notices maintained under the relevant Acts and Rules should be produced on demand before the Inspector or any other authority under the Act, failing which the contract may be terminated without any notice.
13.32.	Contractor shall be required to submit a list of his workers to be deployed for the works contract giving details regarding Name of contract worker, Fathers Name, permanent and Present Address, Date of Birth, Qualification, Caste-SC/ST/OBC, ESI No, PF No. and the family details.
13.33.	The contractor shall abide by all the labor legislations and other laws including the provisions of Contract Labor (Regulation & Abolition) Act, 1970, the Factories Act, 1948, the Payment of Wages Act, 1936, the Minimum Wages Act, 1948, ESI Act, Employee Provident Fund Act and other relevant Acts applicable to his workmen under this Contract.
13.34.	BHEL shall be indemnified against all losses, Claims, prosecutions etc. under any law.
13.35.	The contractor shall promptly furnish all information and document required by BHEL authorities for the purpose of complying with the responsibilities of Occupier of the factory and shall render all the necessary assistance for the same.
13.36.	The contractor will maintain proper discipline of his workmen and will ensure that his workers do not cause any loss or theft or damage to any company's property. The contractor will also be responsible for the good conduct of his workmen.
13.37.	The contractor shall ensure and maintain uninterrupted progress of the work in accordance with instructions given to him on behalf of BHEL from time to time.
13.38.	In case the contractor makes default in commencing the work within the time specified by BHEL without any reasonable cause, disputes any of the terms and conditions of the contract or refuses to execute the contract or any part thereof at any stage, the contract shall, without prejudice to any other right or remedies available to BHEL, be liable to be cancelled / terminated in part or in whole. In the event of such cancellation / termination of contract, the contractor shall be liable; to compensate BHEL for all losses incurred by BHEL including the loss suffered on account of having the work executed through any other contractor or department as may be convenient to BHEL, in accordance with the exigencies of the work. In case only a part of the contract is cancelled, the remaining portion of contract may be allowed be executed by the contractor.

13.39.	The Contractor, shall, without fail, give up-to-date information in writing of the attendance of the workers engaged by him. The Contractor will also submit the required documents and certificates as prescribed from time to time for the clearance and the payment of the Bill.
13.40.	Whenever any sum of money is found to be recoverable from or payable by the contractor, the same will be deducted from any sum that may due or which at any time there after becomes due to the contractor under this contract or under any other contract or from his security deposit. In case the recoveries are not complete even after such deduction, the contractor shall pay the same or the balance thereof from the security deposit. The contractor shall immediately thereafter pay such further sums as may be required to replenish the shortage caused by such recoveries in the amount of security deposit.
13.41.	During the currency of contract, if the contractor is awarded any other work contract in BHEL, the contractor will have to inform the designated BHEL official before accepting the other work.
13.42.	In case of failure on the part of the contractor to execute the work awarded to him within the stipulated time, the sum equivalent to the EMD as per BHEL Works Policy shall be forfeited as per the Undertaking provided by tenderers, after a week's notice issued by the awarding officer and BHEL may in its discretion award the contract to any other party.
13.43.	In case of any extra work executed by the contractor, the contractor will be paid on pro-rata basis
13.44.	All the Terms and Conditions as mentioned in Work Order will also form a part of the Agreement.
13.45.	BHEL shall have the right to deduct any sum from the bill of the contractor for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract, Non- payment of wages or of deduction made from his or their wages which are not justified by the terms of the contract or non-observance of the said contract Labor regulations.
13.46.	The contractor shall be responsible for observance of local laws, employment of personnel, payment of taxes etc. As far as possible, workers shall be engaged from the local areas in which the work is being executed.
13.47.	The contractor shall be wholly responsible for the behavior of the workmen at the work place and outside, in the BHEL premises.
13.48.	The contractor shall be responsible for safe custody of BHEL's property like materials, tools etc., entrusted to him and if necessary arrange insurance at his own expense.
13.49.	The contractor shall be responsible to make good and rectify at his own expense any defect, which may develop or may be noticed within the period of the contract.
13.50.	BHEL shall be entitled to recover any payment made on behalf of the contractor under any law or otherwise.
13.51.	BHEL Officer In-charge shall have the right to stop the work at any stage or at any time by giving the contractor seven days' notice in writing.
13.52.	**CARTEL FORMATION:** The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.
14.	**ARBITRATION & CONCILIATION:**
14.1.	Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL Solar Business Division.
14.2.	The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties
14.3.	Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration

	proceedings under this clause. The seat of arbitration shall be Bengaluru.
14.4.	The cost of arbitration shall be borne as per the award of the Arbitrator.
14.5.	Subject to the arbitration in terms of 11.3, the Courts at Bengaluru shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.
14.6.	Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.
15.	**COMPENSATION:**
15.1.	"BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below. a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below. b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works / during working at BHEL Units/ Offices/ townships and premises/ Project Sites. c) Compensation in respect of each of the victims: (i) In the event of death or permanent disability resulting from Loss of both limbs: ₹10,00,000/- (Rupees Ten Lakhs) (ii) In the event of other permanent disability:₹7,00,000/- (Rupees Seven Lakhs) d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the provison to Section 2 (I) of the Employee's Compensation Act, 1923."
16	**PENALTY/ LD FOR DELAYED DELIVERY:**
16.1	**Delivery period for LD calculation** Delivery Time per Board containing (double front & single front both considered as single vertical): - Upto (<=) 18 verticals = 21 days Above (>) 18 verticals = 28 days From the date of handing over of Enclosure/ raw material in BHEL scope, whichever is later. Delivery delay due to BHEL material unavailability/other vendor material un-availability or delay in execution shall be on BHEL part and contractor under this contract shall not be liable for the same. Payment does not dissolve contractor from the responsibility of attending the defects upon subsequent inspections at SBD shop floor attributable to contractor. Any delay pertaining to same shall also add up in delivery time for LD calculation if not attended within 03 days of intimation for defect attributable to vendor. However, contractor completion time shall be judged based on completion as per his scope of supply and work.
16.2	**Minimum vertical to be delivered at shop floor as per Delivery period and availability** 50 verticals (any rating) per month which should include minimum 6 breaker verticals if applicable.

16.3	**Liquidated Damage formula** 0.5 % per week up to 10% for full board value. Both material & labour will be considered for calculation of LD. No addition/deletion list will be considered for LD purpose.
17	**CONCILIATION CLAUSE – Annexure IA**
18	**MAKE IN INDIA CLAUSE**
	I. For this procurement, Public Procurement (Preference to MAKE IN INDIA) Order 2017 Dated 15.06.2017, 28.05.2018, 29.05.2019, 04.06.2020 and subsequent orders issued by the respective Nodal Ministry shall be applicable. Even if issued after issue of this NIT but before finalization of contract WO against this NIT. ii. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement same shall be applicable .
19	**FORMATS**
19.1	Agreement Format between BHEL & Contractor
19.2	Third Party Non-Disclosure Agreement (NDA) format
19.3	EFT Format

AGREEMENT BETWEEN CONTRACTOR AND BHEL- EPD

This Agreement made on this _____ day of _____ Two Thousand and Nine between M/s / Shri _____ aged about _____ years S/O of Shri _____, residing at _____, hereinafter called the **"Contractor"** (which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors and permitted assigns) of the First part.

AND

BHARAT HEAVY ELECTRICALS LIMITED, SOLAR BUSINESS DIVISION , Prof. CNR Circle, P.B.1245, IISc Post, Malleswaram, BENGALURU-560012, a Company incorporated under the Companies Act 1956 and having its registered office at BHEL House, Siri Fort New Delhi - 110049, **hereinafter called " BHEL-SBD"** (which expression shall unless repugnant to the context or meaning thereof be deemed to mean and include its successors and permitted assigns) of the second part.

Whereas

1. BHEL, SBDis desirous of entrusting to the said contractor to engage and carryout the contract job of …… more specifically mentioned in the Annexure (hereinafter called the Contract work) to this Agreement.

2. The Contractor who is a specialized agency in the type of contract work in different establishments has agreed to undertake the said contract work on job contract basis.

NOW THEREFORE IT IS AGREED BETWEEN THE PARTIES:

The Terms and conditions of this agreement are as stipulated in:

(i) Notice Inviting Tender
(ii) Scope of Work
(iii) Proforma for Offering Techno-Commercial Bid
(iv) Special Terms & Conditions of the Contract
(v) General Terms and Conditions
(vi) Duties and Responsibilities of Contractor
(vii) Price Bid Format
(viii) Declaration By Contractor
(ix) Any minutes of the meeting & written understanding between BHEL & Contractor
(x) Work Orders and Work Instructions issued to the Contractor
(xi) Agreement between Contractor and BHEL-EPD

Shall form part and parcel of this agreement.

IN WITNESS WHEREOF THE PARTIES HERETO through their authorized Representatives have signed these presents on the day, month and year mentioned above.

For and on behalf of M/s----------

[Authorized signatory]
Name & Designation

Witness : 1

Signature :

Designation :

Address :
For and on behalf of
Bharat Heavy Electricals Limited
Solar Business Division ,
Bengaluru 560012.

[Authorized signatory]
Name & Designation

Witness : 2

Signature :

Designation :

Address :

THIRD PARTY NON-DISCLOSURE AGREEMENT

I, _____on behalf of the _____ (Name of Company),

acknowledge that the information received or generated, directly or indirectly, while working with BHEL on contract is confidential and that the nature of the business of the BHEL is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL. Without restricting the generality of the foregoing,
it is agreed that we will not disclose such information consisting but not necessarily limited to:

•Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.

•Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL all documents and property of BHEL, including but not necessarily limited to: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL's business, or in any way obtained
by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL, and are reasonable given the nature of the business carried on by the BHEL. I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Dated at……., this……..day of ……20 .

Name

Company

Signature

ANNEXURE IA:

MODEL CONCILIATION CLAUSE FOR CONDUCT OF CONCILIATION UNDER THE BHEL CONCILIATION SCHEME, 2018.

BRIEF PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:
   The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter- claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings. If BHEL is to initiate Conciliation, then, the invitation to Conciliate shall be extended to the concerned Stakeholder in Format 7 hereto. Where the stakeholder is to initiate the Conciliation, the notice for initiation of Conciliation shall be sent in Format-8 hereto.

2. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
3. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL. The appointment of Conciliator(s) shall be completed and communicated by the concerned Department/Group of BHEL Unit/Division/Region/Business Group to the other party and the Conciliator(s) within 30 days from the date of acceptance of the invitation to conciliate by the concerned party in the **Format-9**. The details of the Claim, and counter-claim, if any, shall be intimated to the Conciliator(s) simultaneously in **Format-5**.
4. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
5. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the
   proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.
6. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within 15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.

7. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.

8. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
9. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
10. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.
11. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
12. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.
13. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.
14. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
15. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
16. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
17. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
18. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.

19. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.

20. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.

21. The proceedings of Conciliation under this Scheme may be terminated as follows:

a. On the date of signing of the Settlement agreement by the Parties; or,

b. By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,

c. By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,

d. By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,

e. On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

22. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	Particulars	Amount
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator) In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator) In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on the,Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation	As per entitlement of equivalent officer (pay scale wise) in BHEL

	Others	As per the extant entitlement of whole time Functional Directors in BHEL. Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region / Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

23. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.
24. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.
25. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.
26. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.
27. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 4 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.
28. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement, except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.
29. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
    - **a.** Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
    - **b.** admissions made by the other party in the course of the Conciliator proceedings;
    - **c.** proposals made by the Conciliator;
    - **d.** The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.

30. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
31. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
32. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.
33. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

Format 5 to BHEL Conciliation Scheme, 2018

STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE IEC BY BOTH THE PARTIES

1. Chronology of the Disputes
2. Brief of the Contract/MoU/Agreement/LOI/LOA
3. Brief history of the Disputes:
4. Issues:
5. Details of Clam(s)/Counter Claim(s):

Sl. No.	Description of claim(s)/Counter Claim	Amount (in INR)Or currency applicable in the contract	Relevant contract clause

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– *The Statement of Claims/Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/Counter Claims. The statement of Claims/Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.*

FORMAT-7

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY BHEL FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Subject: NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY BHEL

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which arise out of the above- referred Contract/MoU/Agreement/LOI/LOA are reproduced hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring disputes to conciliation.

In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU /Agreement / LOI / LOA, we hereby seek your consent to refer the matter to Conciliation by Independent Experts Committee to be appointed by BHEL. You are invited to provide your consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which you might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA.

Please note that upon receipt of your consent in writing within 30 days of the date of receipt of this letter by you, BHEL shall appoint suitable person(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you Yours faithfully
Representative of BHEL

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT-8 FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY A STAKEHOLDER FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,
BHEL (Head of the Unit/Division/Region/Business Group)

Subject: NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY A STAKEHOLDER

Ref: Contract No/MoU/Agreement/LOI/LOA & date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which have arisen out of the above- referred Contract/MoU/Agreement/LOI/LOA are enumerated hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring inter-se disputes of the Parties to conciliation.

We wish to refer the above-said disputes to Conciliation as per the said Clause of the captioned Contract/MoU/Agreement/LOI/ LOA. In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU /Agreement / LOI / LOA, we hereby invite BHEL to provide its consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which it might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA and to appoint suitable person(s) as Conciliator(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of the Stakeholder

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT-9

FORMAT FOR INTIMATION TO THE STAKEHOLDER ABOUT APPOINTMENT OF CONCILIATOR/IEC

To,

M/s. (Stakeholder's name)

Subject: INTIMATION BY BHEL TO THE STAKEHOLDER AND CONCILIATOR(S) ABOUT APPOINTMENT OF CONCILIATOR/IEC

Ref: Contract No/MoU/Agreement/LOI/LOA& date_____.

Sir,

This is with reference to letter dated ---------- regarding reference of the disputes arising in connection with the subject Contract No /MoU/Agreement/LOI/LOA to conciliation and appointment of Conciliator(s).

In pursuance of the said letter, the said disputes are assigned to conciliation and the following persons are nominated as Conciliator(s) for conciliating and assisting the Parties to amicably resolve the disputes in terms of the Arbitration & Conciliation Act, 1996 and the Procedure ---- to the subject Contract ..../MoU/Agreement/LOI/LOA, if possible. Name and contact

details of Conciliator(s)

a) .....
b) .....
c) .....

You are requested to submit the Statement of Claims or Counter-Claims (strike off whichever is inapplicable) before the Conciliator(s) in Format 5 (enclosed herewith) as per the time limit as prescribed by the Conciliator(s).

Yours faithfully,

Representative of BHEL

CC: To Conciliator(s)… for Kind Information please. Encl: As above

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

Format for E-payment

To:

AGM (Finance)
BHEL-EPD/ Bengaluru
Opp. Indian Institute of Science
Prof. CNR Rao Circle
Bengaluru – 560093

Subject: ***E-payments vide RTGS/ NEFT.***

I/ We request and authorize you to effect E-payment vide any two modes to my/ our bank account as per the details given below:

Vendor Name	:	
Title/ Name of Account in the bank	:	
Account Type (Saving/ Current)	:	
Bank Account Number	:	
Name and address of bank	:	
Bank/ Branch contact person name	:	
Bank. Branch phone numbers with STD code	:	
Bank Branch MICR code	:	
Bank Branch RTGS IFSC code	:	
Bank Branch NEFT IFSC code	:	
Your E-mail address	:	
Name of the Authorized Signatory	:	
Contact person Name	:	

I/ We confirm that information provided above is correct & any consequences due to any mistake in above will be borne by us.

Thanking you,

For

(Authorized Signatory)

We confirm that we are enabled for receiving RTGS/ NEFT credits and we further confirm that he account number of (please mention here the name of account holder) _____, the signature of the Authorized Signatory and MICR and IFSC codes of our branch mentioned above are correct.

Bank's Verification
(Manager's/ Officer's signature under bank stamp)

Note: Please attach cancelled original cheque leaf.