

**KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE**

**TECHNICAL SPECIFICATION
FOR
LT SWITCHGEAR**

**SPECIFICATION No. PE-TS-519-506-E002
ISSUE NO. 00
REV NO. 00**



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**

	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)	PE-TS-519-506-E002
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		Rev. No. 00
		02 September 2026

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PROJECT INFORMATION

SL.NO	DESCRIPTION	DETAILS
1	METEOROLOGICAL DATA	
1.1	MAXIMUM MEAN TEMPERATURE	38.6°C
1.2	MINIMUM MEAN TEMPERATURE	9.1°C
1.3	MAXIMUM RELATIVE HUMIDITY	82
1.4	MINIMUM RELATIVE HUMIDITY	23
1.5	AVERAGE ANNUAL RAINFALL	1126 mm to 1210 mm
1.6	SEISMIC ZONE (AS PER IS 1893)	II and IV
1.7	HEIGHT ABOVE MSL	402M
2	ELECTRICAL DATA	
2.1	AMBIENT TEMPERATURE FOR DESIGN OF ELECTRICAL EQUIPMENT	50 Deg C
2.2	RATED FREQUENCY	50Hz
2.3	FREQUENCY VARIATION	+3 / -5%
2.4	AC VOLTAGE	415V, 230V, 230V (UPS), 110V
2.5	AC VOLTAGE VARIATION	+/- 10% for 415V
2.6	DC VOLTAGE	220V, 48V, 24V
2.7	DC VOLTAGE VARIATION	+10% to -15% for 220V/48V
2.8	FAULT LEVEL (KA/SEC)	i) 50KA for 1 sec for 415V system
		ii) 40KA for 1 sec for 220V DC
		iii) 20KA for 1 sec for 48V DC

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SCOPE			
SCOPE OF THIS PACKAGE COVERS THE FOLLOWING:			
SL.NO	PARAMETERS	REQUIREMENT	REMARKS
1	SUPPLY INCLUDING DESIGN, ENGINEERING, MANUFACTURING OF	YES	
a)	MAIN SUPPLY	YES	
b)	COMMISSIONING SPARES	YES	
2	PAINTING	YES	
3	INSPECTION & TESTING	YES	
4	PACKING	YES	
5	TRANSPORTATION & DELIVERY TO SITE	YES	
6	ERECTION & COMMISSIONING	YES	COMMISSIONING of Numerical Relay, Energy Meters, 24V PDB, Ethernet Switch, IMCC, Y-Link, Wireless Temp. Monitoring System & HMI only
7	SUPERVISION OF ERECTION & COMMISSIONING	NO	
8	MANDATORY SPARES	YES	
9	O & M SERVICE	NO	
10	O & M SPARES	NO	

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GENERAL TECHNICAL REQUIREMENT

1.0	It is not the intent to specify herein all the details of design and manufacturing. Bidder shall ensure that the offered equipment confirms in all respects to high standards of design, engineering and workmanship.
2.0	Bidder shall also ensure that the offered equipment shall comply with all applicable statutory and regulatory requirements.
3.0	In the event of any conflict between the requirements of two clauses of this specification, documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply.
4.0	Drawing/document submission shall be through web based Document Management System(DMS) of BHEL. Bidder would be provided access to the DMS for drawing/document submission. Bidder to ensure internet connectivity of min speed of 2Mbps at their end.
5.0	Drawings/ documents submitted by bidder at any stage shall be complete in all respects. Any incomplete drawing submitted shall be treated as non- submission with delays attributable to bidder. For any clarification/ discussion required to complete the drawings, the bidder shall depute his personnel to BHEL / Customer's Office as per the requirement for across the table submission/ finalizations of drawings.
6.0	Latest codes and standards shall be complied with.
7.0	Successful Bidder shall submit attached Quality Plan on compliance route for BHEL/ End customer's approval during contract stage.
8.0	Inspection / testing shall be witnessed as per the quality plan apart from review of various test certificates/ Inspection records etc. There shall be no techno-commercial implication to BHEL on account of Quality plan approval.
9.0	Successful bidder shall furnish their sub-vendor list as annexure to quality plan which shall be subject to BHEL / Customer approval without any techno-commercial implication to BHEL.
10.0	In case, the bidder is sourcing the item/any component from outside India, the third party inspection shall be arranged by bidder at their cost and shall be deemed to be considered by the bidder in their offer.
11.0	Nameplates shall be manufactured from stainless steel or aluminium with a matte or satin finish, and engraved with black lettering or Anodized Aluminium name plates of black background with laser engraving of a minimum 6 mm height or as per equipment standard whichever is higher.
12.0	Equipment must be safe, reliable and easy to maintain at all operating condition.
13.0	SWITCHBOARDS
13.1	All switchboards shall be of double front, draw out, complete closed-door operation, metal enclosed, indoor, floor-mounted, free-standing type of bolted design. Entire bus bar system shall be insulated with PVC sleeves (UL 224). Cable terminations located in cable alley shall be designed to meet the Form IVb Type 7 (as per IEC 61439) for safety purpose. All switchboards shall be divided into distinct vertical sections (panels), each comprising of the following compartments:
a)	BUSBAR COMPARTMENT - A completely enclosed bus bar compartment shall be provided for the horizontal and vertical bus bars. Bolted covers shall be provided for access to horizontal and vertical busbars and all joints for repair and maintenance, which shall be feasible without disturbing any feeder compartment. Auxiliary and power bus bars shall be in separate compartments. All moving and fixed contacts of each draw-out modules must be of rating more than 150%+ of MCCB/MPCB mounted inside the module. Each phase of vertical busbars shall be separated by phase barrier and same shall be sleeved (UL-224). Two separate sets of vertical busbars shall be provided in each panel of double front MCCs / DBs. Interleaving arrangement for busbars shall be adopted for switchboards with a rating of more than 1600A.
b)	SWITCHGEAR / FEEDER COMPARTMENT - All equipment associated with an incomer or outgoing feeder shall be housed in a separate compartment of the vertical section. Two-tier breaker arrangement in a vertical section shall be offered for outgoing breaker feeders of rating up to 1600A. Fixed part of vertical busbar and moving part of draw-out modules for power connection shall be of Silver/Tinned plated Copper only. No live parts shall be accessible with equipment drawn out. The Module compartment door shall have external padlocking facility with MCC frame/fixed structure. The MCC module will have a hole with a grommet on side plate of the module truck for taking Profibus DP connector with 2 nos. armoured profibus DP cables from Cable alley to IMC's profibus DP port for making daisy chain connection of IMCs. Alternatively, good quality Secondary Isolating Contacts (SICs) can be offered for Profibus DP communication port connection & isolation between moving & fixed parts of MCC. A separate compartment shall be provided for relays and other control devices associated with a circuit breaker. For breaker controlled motor feeders, an aux. relay shall be provided for taking Local push button station (EPB) "normally open (NO)" contact input from field and provide potential free output to DDCMIS to avoid probable mixing of switchgear control voltage with DDCMIS 24V DC voltage. This aux. relay shall have 2NO+2NC contacts.

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13.2	Wherever two breaker compartments are provided in the same vertical section, form 4B separation and separate vertical busbar chamber shall be provided. For Incomer panel suitable interlock shall be provided to prevent opening of rear cover, in case incoming supply is ON/Line is live and for Bus-coupler panel suitable interlock shall be provided to prevent opening of rear cover, in case either of the bus-section is in charged condition.
13.3	For modules of size more than 300 mm, symmetric guides not less than 4 nos shall be provided for smooth removal or insertion of module. All identical module chassis of same size shall be fully interchangeable without having to carry out any modifications.
13.4	Suitable interlock to be provided between incomer and bus coupler for non-breaker boards including DCDBs for prevention of opening of Incomer when the bus coupler is open and vice-versa.
13.5	All 415V air circuit breaker switchgear panels shall be of single-front type. All 415V Circuit breaker modules and other MCC modules shall be fully draw out type (Except module in ACDB, DCDB & Solenoid Valve DBs). All draw-out modules & Circuit Breaker modules shall be provided with "Closed door operation" feature wherein movement of the module from "Isolated" position to "Test" position and to "Service" position & vice-versa and power ON / OFF operation of the module shall be possible only with the module door closed condition. All phases/neutral and control contact shall be intact while in service position. Degree of protection of the panel shall be maintained in "Service", "Test" and "Isolated" positions. Module door shall open only when module is in "Isolated" position and "Power off" condition. Interlock shall be provided to prevent the change of module state from "Isolated" to "Test" position and to "Service" position or vice-versa, if Main Switch/MCCB/MPCB of the module is kept in ON condition. All the modules shall be of standard width only and no half width, quarter width etc sized modules shall be acceptable. It shall be possible to pad lock the module door irrespective of state of module i.e. "Service", "Test" or "Isolated". Module Operated Automatic safety shutter shall be provided to cover all the live power terminals, in case the module is taken out from the panel. Two (2) nos of Dummy modules of each size to fill in module being taken out for maintenance purpose shall be provided in each switchgear room, in case module door is part of module. These Dummy Modules shall be fitted in switchboard as vacant modules having no cut out on back side and cable alley side. In case door is hinged to the panel, 2 nos of blanking plates of each size need to be provided. Minimum 10mm of gap shall be ensured between busbar and moving power contact tips while module is in "Test" position to ensure user safety (Refer Annexure-3 for calculating number and type of dummy modules to be supplied).
13.6	Interlock mechanism shall be provided with the voltage monitoring such that, it should not be possible to open the rear door of incomer and bus coupler modules when the incoming power source is in live condition. In case of any bypass/overriding of this interlock, appropriate hooter at local and alarm to DCS shall be provided.
13.7	Circuit-breaker cubicles shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage, to cover the stationary isolated contacts when the breaker is withdrawn.
13.8	The compartment door of fixed type modules shall be interlocked to prevent opening while the MCCB/MPCB is in "ON" condition.
13.9	The Bidder shall provide adopter panel/ dummy panel required to meet various configuration / arrangement of busbars.
13.10	Cable alley door should be hinged at minimum 3 position. Panel space heater and plug & socket (As per Module PNL SP HTR mentioned in Module wise BOM) to be provided in cable alley of each vertical.
13.11	All power and control cable inside the modules shall be neatly dressed.
13.12	Control and communication cables inside the modules shall be separate and should be terminated at separate terminal blocks.
13.13	Power contactors/ Isolators should be securely mounted inside panel to prevent its vibration during operation.
13.14	All components mounted in switchboard shall be accessible and shall not obstruct access to wiring, terminals or components. Maintenance and inspection shall be possible in any individual unit without affecting other units.
13.15	Negative Bus of DCDB between two bus section should be shorted with suitable rating busbar link to avoid double voltage formation.
13.16	Each cubicle shall be provided with suitable base channels for direct bolting to the foundation at site. All necessary galvanized bolts, nuts, washers etc. shall be supplied by the Bidder for installation of Cubicle at site.
13.17	Wireless temperature monitoring system to be provided and same shall be integrated to DDCMIS/ separate HMI. Temperature sensors shall be installed in all relevant joints, contact joints etc. as per the standard OEM Practice, however Position of such sensors shall be decided at the time of detailed engineering. This shall be provided as indicated in the Board wise BOM. Bidder to consider complete monitoring system with transmitter, receiver and its connection upto Unitised HMI for LT Switchgear.
13.18	Width of Dummy panels may vary from 300mm to 600mm which shall be informed during detailed engineering.
13.19	Contactors shall be of 250% of motor FLC for fan and compressor application and 200% of motor FLC for other application.
13.20	Bottom most operable handle should be at least 300mm above FFL. Shrouding of at least 3mm thickness to be provided below the hanging portion of vertical busbars.

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14.0	PROTOTYPE PANELS
	In order to establish the compliance with the requirements of this technical specification, prototype panels shall be made and offered for the BHEL / End Customer inspection and approval before the start of bulk manufacturing of panels for this project. The exact configuration of such prototype panels (with respect to Type & Number of Modules) shall be finalized during detailed engineering. The switchgear shall be modified complying the observation marked during Prototype inspection (if any) without any price implication.
15.0	INTELLIGENT MOTOR CONTROLLER (IMC)
15.1	Profibus DP based IMC is envisaged which is to be interfaced to the fieldbus based DDCMIS on Profibus DP protocol. The complete monitoring and control along with detailed diagnostics of IMC shall be provided by the bidder. For interface with DDCMIS, IMC modules in a Profibus DP segment shall be connected to Y link with single cable in daisy chain fashion using PG/PG connectors. All the Profibus DP cables (the looping cables from the Y-links to the IMC modules) are in the scope of bidder. The Profibus cables shall be neatly dressed & connected on MCC Modules in MCC/SWGR rooms. The total no. of IMC modules in one Profibus DP segment and their response time shall be governed by Process requirement and other relevant clauses. The same shall be finalized during detailed engineering and submitted to the Employer for prior approval before implementation. Necessary support along with required software and hardware accessories shall be provided by the bidder to BHEL while integration of IMCs with DDCMIS. The connection/looping/ interface of IMC with DDCMIS shall be as per Compliance Drawings_ Annexure-2 (Typical IMC Network Architecture). IMC shall be suitable for both 110 V AC, 50 Hz & 220 V DC auxilliary power supply (For basic and expansion module (if applicable) both). For 110V AC, aux. power supply shall be tapped from 415/110 V Control transformer module/bus.
15.2	All requisite hardware & software for seamless integration and interface of Profibus DP based IMC modules with fieldbus based DDCMIS system, even if not explicitly indicated in the Technical Specifications are to be supplied and engineered.
15.3	The IMC shall be able to perform its functions without fail inside MCC modules which are kept in non-AC normal ventilated Switchgear rooms of the power plant.
15.4	Electronic modules of IMCs and other associated electronic modules shall be G3 / GX compliant with Conformal protective coating in line with ISA S71.1/ Class 3C3 (3C4) in line with IEC 60721-3-3 for protection against air pollution and harsh environments. The conformal coating version shall be a standard product from the manufacturer's factory. The hardware that is being conformal coated locally shall not be acceptable.
15.5	Intelligent Motor Controller (IMC) shall provide protection, metering, control, monitoring and historical logging for 1 ϕ and 3 ϕ AC induction motors using integral current transformers (CTs) or external CTs and line-line voltages (415V). The IMC should conform to IEC-60947-4-1 and 60947-8 for overload protections.
15.6	All active electronic components / modules like OLMs / Y-links etc. required for the interface of Profibus based IMCs with DDCMIS system to be installed in the CER / MCC /RIO room, shall be powered by redundant 24V DC feeders. Redundant feeder shall be provided by BHEL at 24V PDB located at different SWITCHGEAR ROOM. Further powering from 24V PDD to Y-Link shall be done by bidder.
15.7	The loss / power supply failure of any IMC shall not disrupt the network including the last IMC module in the segment. To meet this functional requirement any additional component / power supply shall be provided by the bidder.
15.8	Voltage measurement input of IMC shall be capable of taking 415V directly from line & no voltage transformer (VT) should be required. IMC shall also have provisions for receiving hardwired contacts of Local Push Button operated.
15.9	The IMC shall be pre-programmed with basic software based on all type of feeders in bidder's scope. The fine tuning/ limit values shall be done at the time of commissioning of the PMCC/ MCC panels.
15.10	The IMC shall have following protection functions, control functions and other operation & diagnostic features but not limited to these:

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	a) PROTECTION FUNCTIONS i) Overload (I^2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running	b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter	c) The IMC will have standard function control blocks for various functions: i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset	d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local / remote)- a) For DK2/DK2-H/DN1/HTR module: i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) Local Push Button Operated b) For DK21/DK21-H module: In addition to the above for DK2/DK2-H module, following measurement data shall also be provided. x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy
15.11	Bidder shall provide complete list of data items available for cyclic and acyclic data communication on Profibus DP for DDCMIS interface and diagnostics.			
15.12	Configuration / programming: i) IMC shall be programmable from IMC's HMI, PC (laptop) and DDCMIS. ii) IMC shall be configurable to operate as an overload relay iii) Digital outputs shall be potential free and independent, each output shall be connectable to different field voltages iv) All licensed software required for configuration / programming / parameterization / fault diagnostics of IMCs along with software licenses shall be supplied as a part of the package. v) All interface files like DTM & GSD files shall be provided for interfacing IMCs with DDCMIS.			
15.13	User Interface: i) Local HMI shall be provided with each IMC. The HMI shall be mounted on front of the MCC module for easy access to the operator to view measurement parameters & fault/trip status. ii) HMI shall have the capability of uploading / downloading parameters to IMC. iii) The address & other communication parameters shall be configurable from HMI. iv) HMI shall be internally powered by IMC and no additional power supply shall be required. Simple cables with RJ45 connectors or RS232 connector or USB cable shall be sufficient for connection to IMC. IMC shall have dedicated port for connection to IMC's HMI/PC(laptop). v) HMI shall have the simple text display in English. vi) HMI shall have operate / reset buttons. vii) HMI shall display the operating data, status, faults, counters & warnings information.			
15.14	The total no. of IMC modules in one Profibus DP segment and their response time shall be governed by Process requirement. The same shall be finalized during detailed engineering and submitted to the customer for prior approval before implementation.			
15.15	Profibus cable shall be routed in a separate pre-fitted closed PVC tray inside MCC panels. The tray shall be located in such way that interference due to 220V DC/110V AC/240V AC available in Switchgear/MCC panels can be minimized on Profibus cables.			
15.16	Bidder to ensure training of Customer's representatives by IMC OEM regarding Familiarisation of IMCC and its Interface with DCS. Further, IMC OEM shall also give training at End Customer's site regarding Operation & Maintenance of IMCC and its interface with DCS.			
15.17	Bidder to provide one no. of each type of IMC module along with Y-Link to BHEL on returnable basis & coordinate with BHEL for conducting FAT for IMC as per customer satisfaction.			
15.18	Y link along with OLM modules shall be installed in separate cabinet(s) in MCC room (Non-AC) for main plant at different floors & buildings identified for placement of Switchgear. For other areas where RIO rooms are envisaged, Y-link along with OLM modules shall be installed either in DDCMIS cabinets or in separate cabinets, located in RIO room. Profibus cable alongwith hardware and Y-link hardware for establishing communication of IMC with Y-link shall be in bidder's scope.			

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15.19	In case Y links are installed in MCC room, then redundant Fiber optic links using OLMs (Optical Link Modules) in redundant bus configuration shall be provided.
16.0	NUMERICAL RELAY
	The circuit breaker will normally be controlled from remote control panels (DDCMIS) through closing and shunt trip coils. All the protective relays associated with the Circuit breaker modules shall be of Numerical communicable type for Protection, Control, Metering and Status monitoring. All the numerical relays shall have communications on three ports, local front port communication to laptop and dual ports on IEC 61850 to communicate with the DCS through LAN. The auxiliary contacts of the MCCB shall be fed to the digital inputs available in the numerical relays of Incomer / bus coupler / motor circuit breaker feeders or 61850 Compatible IO Modules, for integration into the numerical relay network/ DCS.
16.1	PROVEN TRACK RECORD FOR NUMERICAL RELAYS & NETWORKING
	a) Bidder/ Sub Vendor should have manufactured, supplied and successfully configured at least one hundred (100) numbers of Numerical Relays with IEC 61850 used for application in Feeder Protections/Transformer Protections/Motor protections. These relays should have been in successful operation for at least two (2) years. And b) Bidder/ Sub Vendor should have manufactured/ integrated and successfully done Site Acceptance Test (SAT) for a network on IEC 61850 with at least one hundred (100) numbers of Communicable Numerical Relays.
16.2	SWITCHGEAR NUMERICAL RELAY NETWORKING
	The typical configuration of such a proposed system is as per the enclosed Compliance Drawings Annexure-1 (Typical Switchgear Relay Network Architecture) . The numerical relay network shall include relays on all LV switchgears being supplied under this package. Each ring network shall consist of switchgear level Ethernet switches connected through Fibre Optic cable and subsequently connected to Network Level Ethernet Switches (L3 Level) placed in main plant control equipment room (CER). Port requirement in Network Level ethernet switch (L3 Level) for DDCMIS interface shall be furnished by BHEL/Customer during detail engineering.
16.3	SYSTEM PERFORMANCE REQUIREMENTS
a)	Latency: The system shall be so designed and implemented as to provide data transfer speeds prescribed by IEC 61850-5.
b)	Reliability: All components shall be designed and configured to make the system highly reliable. Failure of any component shall be immediately announced and wherever possible, the system shall be made self-healing.
c)	Diagnostic tools: The system shall have necessary diagnostic tools to continuously monitor the system performance and provide feedback to the operator / engineer. Necessary software tools to track changes in the system shall be provided.
16.4	GENERAL REQUIREMENTS
a)	Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity for the intended application.
b)	All numerical relays shall be capable of satisfactory continuous operation between 80-120% of the rated voltage.
c)	Threshold voltage for binary inputs shall be suitably selected to ensure avoidance of mal operation due to stray voltages and preferably shall be more than 70% of the rated control supply voltage.
d)	All IEDs shall have freely programmable optically isolated binary inputs (BI) and potential free binary output (BO) contacts, the quantity of which shall be adequate to realize the associated interlocks / feedbacks. At least 2 binary inputs (BI) & 2 binary outputs (BO) shall be kept as Spares for End Customer's future use. The required no of IO's can be achieved through external I/O device of same make complying the requirement.
e)	Failure of a control supply and de-energization of a relay shall not initiate any circuit breaker/ vacuum contactor operation.
f)	Disturbance Record waveforms, event records & alarms shall be stored in Non-volatile memory and failure of control supply shall not result in deletion of any of these data.
g)	The Bidder shall be responsible for providing adequate and co-ordinated scheme of protection in his equipment. The protective devices shall be selectively co-ordinated and range and settings so selected to have a good down stream discrimination as well as quickest possible circuit isolation in case of fault.
h)	All the numerical relays shall have communications on three ports, one local front port communication to laptop and two rear port on IEC 61850 to communicate with the DDCMIS through LAN.
i)	All Numerical relays shall have features for electrical measurements including voltage, current, power (active & reactive), frequency, power-factor and energy parameters. All numerical relays shall have provision of both current (CT) and voltage (VT) inputs. Relays shall be suitable for both residually connected neutral CT input as well as CBCT input. All CT terminals on the relays shall be of fixed type suitable for connection of ring-type lugs to avoid any hazard due to loose connection leading to CT open-circuit. In no circumstances Plug In type connectors shall be used for CT / VT connections. Relays shall be suitable for CT secondary current of 1A.

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	DAET (LT Incomer)	5CT	3-Ph, 1 REF, 1 Spare
	DAE (Buscoupler, Tie)	4CT	3-Ph, 1 Spare
	DM (ACB Controlled Motor)	4CT	3Ph, 1 Spare
	DG (INCOMER)	7CT	3Ph, 3 Differential, 1 Spare
j)	Relays used in incomers, ties and bus couplers shall have provision of two sets of voltage inputs (3 Nos for bus voltage & 1 No. for line voltage) for the purpose of synchronization.		
k)	All numerical relays shall have key pad / keys to allow relay setting from relay front. Pre-programmed or programmable key for Master trip (86) reset shall be provided on the relay front.		
l)	Relays shall have suitable output contact for circuit breaker failure protection (CBFP). Relays shall have self diagnostic feature with continuous self check for power failure, program routines, memory and main CPU failures and a separate output contact for indication of any failure.		
m)	Relays shall have at least two sets or groups of two different sets of adaptable settings. Relays shall have multiple IEC / ANSI / user-programmable characteristics. Design of the relay must be immune to any kind of electromagnetic interference. All cards/ hardware of numerical relays shall be suitable for operation in Harsh environmental conditions with respect to high temperature, humidity & dust. Relays of each type / model shall be supplied with same Firmware / Software version for the complete package.		
n)	Bidder to prepare & submit Relay Network Scheme and Mimic document for Relay Network architecture for helping DDCMIS Bidder (i.e. BHEL) to create the dynamic/static mimic in DDCMIS for Network monitoring.		
o)	The IP address for the Numerical Relays & SNTP address shall be furnished by customer during detailed engineering. The required .ICD / .CID files of the Numerical relays configured with unique IP address, SNTP address & unique logic device name under LV Switchgears for integration with DDCMIS shall be provided by Bidder along with necessary engineering support as and when required during detailed engineering.		
p)	The integration of Switchgear Relay Network with Switchgear DDCMIS (supplied by customer) shall be finalized in consultation with the Switchgear DDCMIS Bidder i.e. BHEL EDN Bangalore and the same shall be tested as a part of Major Design Feature testing with a prototype system of the offered Switchgear relay Network system, at the works of the DDCMIS Bidder i.e. EDN Bangalore or any other place approved by customer.		
q)	During the Factory Acceptance Test (FAT) of the DDCMIS, Relay & Ethernet Switch Bidder will arrange a prototype ring with at least three ethernet switches at switchgear level (L2) with one numerical relay of each type and L3 Switches network, at the works of the DDCMIS Bidder along with the relay configuration engineer and necessary engineering support. Exact test setup shall be finalized during detailed engineering.		
r)	Numerical relays are to be configured with two datasets. One dataset for Analog data & the other dataset for Binary data. Analog dataset shall be assigned for two no's of un buffered Report Control Block and Binary dataset shall be assigned for two no's of Buffered Report Control Block.		
s)	Numerical relay configuration for all relays being supplied under the package shall be carried out in line with the approved schematics and shall be submitted for approval. Setting calculations and relay settings configured in relay software for all relays shall be submitted for approval. Approved relay configuration / settings files shall be loaded in all the relays prior to dispatch to site.		
t)	Relay shall be immune to capacitance effect due to long length of connected control cables. Any external hardware, if required for avoiding mal operation of the relay due to cable capacitance shall be included as a standard feature.		
16.5	PROTECTION & CONTROL FEATURES		
a)	Control of breakers shall be carried out from DDCMIS through hardwired control commands in the form of 24V DC signal. All close and trip commands from DDCMIS shall be hardwired through separate coupling relays to BI of numerical relays in form of 220 V DC signal.		
b)	Trip circuit supervision shall be provided for all feeders to monitor the circuit breaker / contactor trip circuit both in pre-trip and post-trip conditions.		
c)	Schematics requiring auxiliary relays / timers for protection function shall be a part of numerical relay. The number of auxiliary relay and timer functions shall be as required for the application. Timer functions shall be configurable for on & off delays as per requirement.		
d)	The numerical relay shall be able to provide supervisory functions such as trip circuit monitoring, circuit breaker status monitoring, VT and CT supervision.		
e)	The numerical processor shall be capable of measuring and storing values of a wide range of quantities, all events, faults and disturbance recordings with a time stamping using the internal real time clock. Battery backup for real time clock in the event of power supply failure shall be provided.		
f)	At least 200 time tagged events / records shall be stored with time stamping. Details of at least 5 previous faults including the type of protection operated, operating time, all currents & voltages and time of fault.		
g)	Diagnostics Automatic testing, power on diagnostics with continuous monitoring to ensure high degree of reliability shall be provided. The results of the self reset functions shall be stored in battery back memory. Test features such as examination of input quantities, status of digital inputs and relay outputs shall be available on the user interface.		
h)	20 Signals (both Analog & Digital) from each relay shall be communicated to DDCMIS on IEC 61850 protocol. Bidder to furnish mapping details of each relay for all signals. Mapping document (IO list) shall be furnished by customer during detail engineering.		
i)	Sequence of events shall have 1ms resolution at device level.		

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j)	Measurement accuracy shall be 2 % for rated RMS Current and voltage.
k)	It shall be possible to carryout open / close operation of breakers from a laptop by interfacing from the relay front port during initial commissioning.
l)	All motor feeders(>30KW) shall have 4-20 mA analog output (current signal) for use in control logics in DDCMIS or for information in DDCMIS.
m)	GOOSE Controls shall be configured in the Numerical Relays for following functions. The response time of GOOSE interlocks shall be 10 ms. (GOOSE Performance Class P1, Message Type 1A) - (a) Inter tripping (b) Reverse Blocking including Hard wiring (c) Earthing Interlocks
16.6	INPUT / OUTPUT INTERFACE, FILTERS AND OPTICAL ISOLATION
	Relay shall be immune to capacitance effect due to long length of connected control cables. Any external hardware, if required for avoiding mal operation of the relay due to cable capacitance shall be included as a standard feature. All I/Os shall have optical isolation. Analog inputs shall be protected against switching surges, harmonics etc. No separate earth bus shall be required for the relays. It shall be possible to connect the relay earth to the common earth bus in the switchgear panel which shall be connected to the plant earth mat.
17.0	ETHERNET SWITCHES AND ETHERNET SWITCH BOX
17.1	Ethernet switches shall be 'substation hardened', 19" rack mounted and shall comply with IEC-61850 for communications and environment requirements. The Ethernet switches shall be of Layer 2 & managed type with four (4) Nos of Fibre Optic ports fully populated with SFP modules and Sixteen(16) / Eight(8) Copper ports to achieve the LAN configuration indicated in the drawing. These switches shall be mounted inside the switchgear panels and shall be suitable for accepting dual redundant power supplies. The FO ports shall be Single mode 1000Mbps ports. Copper ports shall be 10/100Mbps ports. The switch shall support RSTP/MSTP. The Ethernet Switch shall have feature of MAC binding per port and IEEE 801.1X radius Authentication for Port Security. Switch shall have feature to monitor the Port status over Modbus/SNMP Protocol & Port Configuration through Web Interface. Power supply arrangement for all the ethernet switches shall be in Bidder's scope.
17.2	Necessary software for configuration and real-time network monitoring shall be provided along with the Ethernet switches. Stabilized network ring architecture should be established in all aspects considering network redundancy as per project requirement. Suitable software for Network monitoring shall be integrated with the HMI (Switchgear EWS) to provide complete network status.
17.3	Cat5e/Cat6 Ethernet cable / FO cable shall be used for connecting the Numerical Relays to Ethernet switches in all Switchgears. If FO cable are used then numerical relays & Ethernet switches shall also have suitable FO ports. Further, additional FO patch cords of maximum length (quantity – 10% of total quantity of IEDs) shall be supplied to facilitate maintenance. Optical Fibre Cable termination equipment such as LIU, patch cord, etc. for the seamless network shall be provided by bidder. Minimum FO ports quantity on Ethernet switch shall be as per clause 17.1 above.
17.4	The Fibre Optic cable shall be armoured, Single-mode, graded index OMI (ISO/IEC 11801) of Diameter 125µm core / cladding with max attenuation of 1.52 dB/km at 1310nm wavelength & 1.0 dB/km at 1550nm wavelength. The cable should be suitable for operation at 1310/1550nm. The outer Sheath / Jacket of the FO Cable shall be Fire retardant.
17.5	The numerical relays & Ethernet switches being installed at switchboard shall be suitable for auxiliary power supply 220V DC with tolerance of 80% to 120 % of rated voltage & shall be finalized during detailed engineering. Ethernet switches shall have provision to receive dual redundant power supplies.
17.6	IEC 61850 Ethernet switches in Switchgear panels – Sufficient quantity of Ethernet switches as per requirement for all boards under bidder's scope. At least 2 ports per switch shall be kept as spare ports.
17.7	All the ethernet switch (at L2 & L3 level) shall be rack mounted. The racks shall be supplied by Bidder.
17.8	Ethernet Switch Box shall consist of the following: (a) Two nos. Ethernet switches (layer-3) at network level for Ring formation and taking data from Numerical relay network (IEC-61850) and providing to DDCMIS(IEC-61850). (b) At least 2 Nos (1 working + 1 standby) ventilation fans with monitoring. (c) Arrangement for receiving and distributing auxiliary power supply to various equipment/ circuits along with monitoring devices for incoming power supply. (d) 1 LED light +1 Power Socket with Switch. (e) Any other equipment/ device necessary for completeness of the system.
17.9	The Network level Ethernet Switches shall be provided to network the various switchgears at different locations through LAN system. They shall also provide gateway between Numerical relays, HMI (Switchgear EWS) and DDCMIS.
18.0	PROTECTION CO-ORDINATION
	Each motor/heater feeder shall consist of MPCB/MCCB (with S/C release only), Power contactor & intelligent motor controller (IMC) to ensure Type-2 Co-ordination.
19.0	HMI (SWITCHGEAR ENGINEERING WORK STATION) AND LAPTOP

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19.1	All the HMI PCs being offered in the system shall be industrial grade PC and as per the latest available configurations as on the date of bid opening. The minimum storage capacity shall be 1 TB, minimum RAM shall be 16GB and processor shall be I7/ equivalent or higher. Screen size shall be minimum 24 inches. Operating system of the HMI shall be 64-bit Windows Professional/ Enterprise version and necessary application software such as relays configuration & setting software, Disturbance record analysis software, Relays IEC 61850 configuration software, Ethernet Switches configuration software, Anti-virus software, etc shall be installed in the HMI. All HMI shall be provided with other required accessories like Keyboard, mouse etc.
19.2	Switchgear Engineering Work Station will be provided with Laser printer & connected to the relay network through Network level switches for online configuration/setting change of relays & ethernet switches. Automatic downloading and saving of the disturbance records & event files from relays through automatic DR download software tools provided by the relay vendors shall also happen in this HMI.
19.3	Licensed software for automatic downloading & saving of Disturbance records and Event records from Numerical relay to Switchgear Engineering works stations (EWS) shall also be provided & installed in HMI (Switchgear EWS).
19.4	Laptops shall have same hardware configuration and software as for HMI PC except screen size which shall be 14 inches.
19.5	Laptops shall be supplied complete with following accessories: • carrying case, • 240VAC adaptor, • Communication cord with port converter (if required) for relay communication.
19.6	HMI console (furniture i.e. Table with drawer & chair) shall be provided for each HMI. The console shall have space for keeping an additional PC.
20.0	SYSTEM SOFTWARE REQUIREMENTS
	The bidder shall provide all licensed software packages required by the system for meeting the intent, functional and parametric and performance requirements of the specification. All licenses (except anti-virus which shall be valid for 3 years from the date of takeover by the end customer) shall be valid for the continuous service life of the plant.
21.0	SYSTEM SECURITY
21.1	Security features shall be provided for Identification and authentication control at each level for safeguarding against unauthorized access. The bidder shall provide software locks / passwords to the Employer's engineers at site for all operating and application software at all levels.
21.2	Security Audit for Switchgear Relay Network shall be done as defined in Security Policies/Procedures and Security Audits mentioned below by BHEL. Suitable actions based on the findings of the security audit shall be carried out by the relay/ Ethernet switch/ LT switchgear Bidder.
21.3	STANDARDS AND COMPLIANCE
	The system shall comply with the latest versions of the following Standards and Specifications as a minimum: 1. IEEE 1686-2013: IEEE Standard for Intelligent Electronic Devices Cyber Security Capabilities. 2. IEC-62443-4-2: Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components. 3. IEC TS 62351-6: Power systems management and associated information exchange - Data and communications security - Part 6: Security for IEC 61850.
22.0	SECURITY POLICIES/PROCEDURES AND SECURITY AUDITS
22.1	In order to enforce network security in the Switchgear Relay network integrated to the Switchgear DDCMIS, security policies and procedures are to be followed by the bidder. For checking compliance to the above security policies & procedures, periodic security audit by a certified auditor (as per CERT-IN panel or CERT of country of origin of DDCMIS Bidder (BHEL)) will be arranged during ATST, at the time of trial operation and every year during AMS period. However only during ATST, the security audit for Switchgear Relay network integrated to the Switchgear DDCMIS shall be done on prototype ring during Station LAN FAT. At the time of trial operation and every year during AMS period, the security audit for Switchgear Relay network shall be carried out on the actual installation at site. This shall include vulnerability assessment of the workstations/ servers and penetration testing of the Station LAN through the firewall from a node outside the network. It may be noted that following policies/procedures are only the operation guidelines and advisory steps to ensure maximum data security.

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	The following security policies shall be followed. Details of the same shall be provided during detailed engg. 1. Information Security Policy a) Information Security Team Policy b) Firewall Policy c) Information Identification and Classification Policy d) Security Policy Review Policy e) Information Labelling and Handling Policy f) System Planning and Acceptance Policy g) Capacity Management Policy h) Media Handling Policy i) Information Security Awareness Policy j) Third Party Access Policy k) Change Control Policy l) Anti Virus Policy m) System Access Policy n) Monitoring Policy o) Incident Handling Policy p) Information Backup and Restoration Policy q) Network Access Policy r) User Access Management Policy All the above is in the scope of BHEL and included in the specification for system clarity only. However, based on the findings of the security audit, any material (i.e. cards/ modules/ peripherals/ cables/ components etc.) required for the above which is part of supply of vendor will be part of AMC. The security policies/procedures envisages formation of an Information Security team which shall comprise of Bidder's personnel deputed at site during tenure of the contract. All the responsibilities of information security team have to be discharged by Bidder's team during tenure of the contract.
23.0	TIME SYNCHRONIZATION
	RTC of Numerical relays, Ethernet Switches, HMI, etc shall be time synchronized with plant clock of upstream system on SNTP or IRIG-B (to be decided during detailed engineering).
	One Digital display of time shall be provided in the Network level Ethernet switch box.
24.0	CABLE TERMINATION
24.1	Cable termination compartment and arrangement for power cables shall be suitable for heavy duty, 1.1 kV grade, stranded Aluminium conductor, XLPE insulated, armored and PVC sheathed cables. All necessary cable terminating accessories such as Lugs, Glands, supporting clamps and brackets, hardware etc. for cables shall be provided by the Bidder to suit the final cable sizes.
24.2	Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating. Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands & heavy duty lugs of BHEL approved make for external power & control cable connection and termination at Bidder supplied equipment's end shall be in the scope of Bidder. Further grounding bolts for connection to earth flat shall be in the scope of Bidder.
24.3	It shall be preferred to follow a standardization of Terminal Numbers across all LV Modules for ease of Interconnection and maintenance as per Compliance Drawings_Annexure-4 (Scheme).
24.4	Terminal Points of Supply:
a)	Cable/Busduct termination compartment of PCC/PMCC/MCC/ACDB/DCDB
b)	Termination at multi-way terminal board for control cables.
c)	Scope and terminal points for interface between Numerical Relays and DDCMIS shall be as per Compliance Drawings_Annexure-1 (Typical Switchgear Relay Network Architecture). All necessary hardware and software required to ensure the successful installation, testing, and commissioning of the Bidder's supplied system will be the responsibility of the bidder. The bidder is required to provide the necessary support to establish seamless communication on IEC 61850 between the DDCMIS and network level (L3) ethernet switch as and when required.
d)	Scope and terminal points for interface between IMC and DDCMIS shall be as per Compliance Drawings_Annexure-2 (Typical IMC Network Architecture). All necessary hardware and software required to ensure the successful installation, testing, and commissioning of the Bidder's supplied system will be the responsibility of the Bidder. The Bidder is required to provide the necessary support to establish seamless communication between the DDCMIS and the Y-Link as and when required.
25.0	DERATING OF EQUIPMENTS

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	The Bidder shall ensure that the equipment offered will carry the required load current at site ambient conditions specified and perform the operating duties without exceeding the permissible temperature as per Indian Standards / Specification. Continuous current rating at 50°C ambient in no case shall be less than 90% of the normal rating specified. The Bidder shall indicate clearly the derating factors if any employed for each component and furnish the basis for arriving at these derating factors duly considering the specified current ratings and ambient temperature of 50°C.
26.0	RELAY TEST EQUIPMENT
26.1	The required relay test equipment shall comprise the following: (a) One 3 phase (4 Voltage and 6 current sources) dynamic portable relay test system for allowing dynamic and steady state testing. (b) Any other auxiliary items required for comprehensive protection testing all types of the protection relays supplied under this contract.
26.2	It shall have the capability to replay the Disturbance / Fault records acquired by the numerical relays in IEEE / COMTRADE format or EMTTP simulations, to facilitate dynamic testing of all the numerical relays supplied under this contract. The required software for steady state/dynamic testing of all the numerical protection relays along with a laptop dedicated for the testing shall also be supplied. The relay test set shall be suitable for IEC 61850 compliance testing with required no. of RJ45, FO and USB Ports. The test set shall have min 8 nos. (GI) binary inputs and 4 nos. (GI) binary outputs. The associated software for automated relay testing and IEC61850 GOOSE/GSSE Configuration shall also be supplied.
27.0	SPARE MODULE REQUIREMENT
	a) Spares (MCCB Modules less than 100A and MPCB Modules): All Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped MCCB/ MPCB modules of each rating as spares which shall be uniformly distributed over different vertical sections. b) Spares (MCCB modules—100A and higher—Starter/DAE-OG/DM Modules): In addition, all Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB/ DAE-OG/DM modules or at least one module (whichever is higher) of each rating range of the selection table, equipped for the rating of the largest auxiliary fed from that range. However, the same is already considered in the Board wise BOM (Annexure-A.1 part of technical data Part-A).
28.0	TRAINING
	The Bidder shall arrange for training on system design, engineering, operation and maintenance of Numerical relays & Numerical relay Network system at the principal's facility and at site as follows:
28.1	Training at principals works (Relay Manufacturer) in the following areas:
a)	Basics of Feeder, Transformer and Motor Protection for IEC 61850 Numerical relay and detail discussion on functions available in the relays.
b)	Relay configurations and hands on practice of preparation of logic & settings, .CID files through relay software tools and relay GOOSE Logics.
c)	Interfacing / communication of relay with software: uploading / downloading of logic.
d)	Secondary injection testing of provided function blocks and guidelines for relay settings. DR downloading and analysis for Fault diagnostics.
e)	Common problems faced and trouble shooting.
	The Scope shall include providing training in the areas stated above for five (5) Nos. Executives from Engineering, Site Erection and O&M for a duration of five (5) days. The cost of training including boarding & lodging and local transportation shall be in the Bidder's scope.
28.2	Training Workshop at Site:
a)	Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O&M of Numerical Relays and Numerical Relay Network and trouble shooting.
b)	The scope shall include Two No's of Numerical Relay and Numerical Relay Network workshops and Training for a batch of 20 Engineers at Project Site. One such Workshop shall be organized before the commissioning of First LV Switchboard and the Second workshop shall be conducted before Unit Commissioning. Customer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.
29.0	RESPONSIBILITY OF THE ASSOCIATE/COLLABORATOR (APPLICABLE IF LT SWITCHGEAR IS SUPPLIED THROUGH PRE QUALIFICATION REQUIREMENT: ROUTE-2):
	The Associate/Collaborator (as applicable) for sourcing of LT Air Circuit Breaker shall be fully responsible and accountable for the item supplied and its compliance to the specification requirements. The Associate/Collaborator (with respect to his manufactured and supplied LT Air Circuit Breaker) shall: i) Participate in the Inspection of the LT Switchgears at Switchgear Bidder's Works, if required by End Customer. ii) Participate in Technical Co-ordination Meetings (TCMs) from time to time during detailed engineering, if required. iii) Participate in Site Testing and Commissioning of LT Switchgears, if required. iv) Participate/address/resolve the issues raised during Contract Execution Period.

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30.0	Painting shade on exterior shall be RAL 9002 for complete panel except RAL 5012 for extreme ends and RAL 9002 for Mounting Plate & Trolley. Paint finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However, in case electrostatic process of painting is offered, minimum paint thickness of 50 microns shall be acceptable for finish coat.
31.0	Four (4) Nos. lifting lugs shall be provided for each shipping section, two (2) nos. on either end of the section. For each shipping section, the bus conductor shall be supported at minimum two positions.
32.0	All hardwares used for the panel manufacturing shall be zinc passivated with the Salt Spray life of minimum 120hrs.
33.0	ENGINEERING
33.1	Complete engineering including the following: (a) Development of Module Type-wise Schemes with hardwired & soft logics. (b) Configuration of Feeder IED including Protection and Control logics (c) Relay Network Design based on reliability & speed (d) Configuration and application development of Switchgear relay network as required for real time monitoring & data acquisition (e) Preparation & Submission of mimic document for Relay Network architecture for helping DDCMIS Bidder to create the dynamic/static mimic in DDCMIS for Network monitoring (f) Preparation of I/O lists for each module type for integration with DDCMIS on IEC-61850 protocol (g) The integration of Switchgear Relay Network with Switchgear DDCMIS shall be finalized during detail engineering. (h) The required. ICD / .CID files of the Numerical relays under LV Switchgears for the integration with the DDCMIS shall be provided by the Numerical relay vendor along with necessary engineering support as and when required during detail engineering. (i) During the Factory Acceptance Test (FAT) of the DDCMIS, Relay & Ethernet Switch Bidder will arrange a prototype ring with at least three ethernet switches (L2) with one numerical relay of each type and L3 Switches network, at the works of the DDCMIS Bidder along with the necessary engineering support. Exact test setup shall be finalized during detailed engineering.
33.2	Numerical relay configuration for all relays being supplied under the package shall be carried out in line with the approved schematics and shall be submitted for end customer's approval. Setting calculations and relay settings configured in relay software for all relays shall be submitted for end customer's approval. Approved relay configuration / settings files shall be loaded in all the relays prior to dispatch to site. Relay setting calculation for breaker fed motor feeder is in bidder's scope.
34.0	ENERGY ACCOUNTING AND AUDIT METERING
34.1	Energy meters used for accounting and audit, included in specific feeders as per Annexure-A.2 Modulewise BOM shall be suitable for measurement, recording and display of cumulative active energy with date and time. Voltage supply measurement shall be taken from individual board BUS VT Module for outgoing feeders & LINE VT Modules for Incomer Feeders.
34.2	Energy meters shall be electronic digital integrated type with built in test facilities. Alternatively, it may have test block to facilitate testing of meter without disturbing C.T or V.T secondary connections. The necessary transducers shall also be supplied along with meter / energy meter. The transducers shall be mounted in the switchgear panel itself.
34.3	The energy meters may also have the facility to measure, record and display one or more of the following parameters depending upon the energy accounting and audit requirement. All parameters excluding instantaneous electrical parameters shall also be stored in memory. a) Apparent power b) Phase wise kilowatt at peak kVA c) Phase wise kVA (reactive) at peak kVA d) Phase wise voltage at peak kVA e) Power down time f) Average power factor g) Line currents h) Phase voltages i) Date and time j) Tamper events
34.4	The energy accounting and audit meter shall have storage capacity for at least 35 days in a non-volatile memory. Energy accounting and audit meters shall have facility to download the parameters through meter reading instruments as well as remote transmission of data over communication network.
34.5	All energy Meters shall be connected in Daisy chain loop in a switchboard and shall be connected to Ethernet switch (switchboard level) with necessary MODBUS to TCP/IP converter. From board level Ethernet Switch upto Network level Ethernet Switch (placed in CER/CCR room) connectivity to be established by bidder. From Network level switch, communication up to IEMS (BHEL supplied system) shall be done by BHEL. Necessary converters, LIUs & any other hardware ((if required) shall be in bidders scope for interfacing with IEMS system.

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TECHNICAL DATA PART - A				
SL.NO	DESCRIPTION	UOM	DETAIL	
1.0	DESIGN CODES & STANDARDS			
1.1	Low-Voltage Switchgear and Controlgear Assemblies General Rules		IEC: 61439	
1.2	Colours for ready-mixed paints and enamels.		IS: 5	
1.3	PVC insulated cables for working voltages up to and including 1100V		IS: 694	
1.4	AC static wathhour meters		IS: 13010	
1.5	Electrical Indicating instruments		IS: 1248	
1.6	Air-Break Switches, air break disconnectors, air break disconnector and fuse combination units for voltages not exceeding 1000V AC or 1200 V DC.		IS/IEC: 60947	
1.7	Danger Notice Plates		IS: 2551	
1.8	Hot dip galvanising		IS: 2629	
1.9	Current Transformers		IS: 2705	
1.10	Code of practice for earthing		IS: 3043	
1.11	Instrument transformers		IS: 16227	
1.12	Wrought Aluminium and Aluminium alloys for electrical purposes		IS: 5082	
1.13	Code of practice of phosphating of iron and steel		IS: 6005	
1.14	Static Relays		IS: 8686	
1.15	Specification of control transformers for switchgear and Control gear for voltage not exceeding 1000V AC		IS - 12021	
1.16	Electrical Relays		IEC: 60255	
1.17	Communication networks and systems in substations		IEC: 61850	
1.18	Guide for uniform system of marking and identification of conductors and apparatus terminals		IS: 11353	
1.19	Cold Rolled Low Carbon Steel Sheets and Strips		IS :513	
1.20	Cable glands		BS:6121	
1.21	Compression lugs and Connectors		DIN 46239	
1.22	A.C. Electricity Meters		IS : 722	
1.23	Voltage transformers		IS: 3156	
1.24	Code of practice for climate proofing of electrical equipment.		IS: 3202	
1.25	Electrical relays for power system protection		IS: 3231	
1.26	Low Voltage Switchgear & Control gear assemblies		IS: 8623 / IEC:61439-1/2	
1.27	Code of practice for selection, installation and maintenance of switchgear and control gear.		IS: 10118 (4 parts)	
1.28	Specification for dry type transformers.		IS: 11171	
1.29	HRC Catridge Fuses		IS: 13703 / IEC: 60269	
2.0	DESIGN /SYSTEM PARAMETERS			
2.1	Max. System Voltage for continuous operations Max. System Frequency for continuous operations		415 Volt (+/- 10%) 50Hz (+3/- 5%), Combined (10% absolute sum)	
2.2	One minute power frequency withstand voltage			
a)	Main circuit	KV	2.5 rms.	
b)	Aux. Circuit	KV	2.0 rms.	
2.3	Internal arc classification		Shall be as per Annexure-A enclosed	
2.4	Draw out type modules		Complete Closed Door Operation	
2.5	Cable alley compartment		Form-IVB-Type 7 as per IEC-61439	
2.6	Busbars & connections			
2.6.1	Fault level			
a)	ACB		50 KA r.m.s for 1 sec.	
b)	MCCB		50 KA r.m.s for MCCB clearing time	
2.6.2	Dynamic Rating for ACB & MCCB	KA	105 ka (peak)	
2.6.3	Temperature rise above ambient temperature (50 Deg C)			
a)	Busbar (when carrying 90% of the rated current)			
i.	Silver plated joints	Deg C	55	
ii.	Non-silver plated joints	Deg C	40	
b)	Accessible parts/external enclosures	Deg C	20	
c)	Manual operating means			
i	For Metallic	Deg C	10	
ii	For Insulating material	Deg C	15	
2.6.4	PVC sleeving for horizontal busbar		Insulated (UL224) CE/UL (CERTIFIED)	
2.6.5	Colour coding for conductor & terminals		Applicable as per IS 11353	
2.6.6	Busbar clearances in air (minimum)			
a)	Phase-phase	mm	25mm (Insulation Sleeves / Barriers shall be provided for clearance less than 25 mm)	
b)	Phase-earth	mm	25mm (Insulation Sleeves / Barriers shall be provided for clearance less than 25 mm)	
c)	Incomer Rear Door and Busbar	mm	400mm	
2.7	Secondary wiring		FRLS Copper Wire	
2.7.1	Colour code of wires			
a)	CT Circuit		R,Y,B,Black	
b)	Space Heater Circuit		Black	
c)	PT Circuit		R,Y,B	
d)	AC Control Circuit		Black	
e)	DC Control Circuit		Grey	
f)	Door Earthing		Green	
2.7.2	Sizes of wires (minimum)			
a)	CT leads	Sqmm	2.5, 650V, FRLS, 1C	
b)	Other wires	Sqmm	1.5	
2.8	Auxiliary buses provision			
a)	AC control bus	V	110V AC (With Neutral solidly earthed)	
b)	DC control bus	V	220V DC	
c)	AC space heater bus	V	240V AC (with Neutral solidly earthed)	

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TECHNICAL DATA PART - A				
d)	Controls, indications & alarms			To be provided
2.9	Switchgear main assemblies			
2.9.1	Air circuit breakers			
a)	Rated Voltage, Frequency, No of Poles			415 Volts, 50 Hz, 3 (three) Poles
b)	Symmetrical (rms) interrupting capacity at rated voltage	KA		50kA
c)	Momentary making current	KA		105kA (peak)
d)	Short Circuit Breaking Current - AC Component			50 KA/(RMS) for 1 Sec
e)	Short Circuit Breaking Current - DC Component			As per IS/IEC 60947
f)	Operating mechanism			Air break spring charged stored energy type
g)	Auxiliary voltage			
i	Spring charging motor	V		220 DC
ii	Closing coil	V		220 DC
iii	Shunt trip coil	V		220 DC
h)	Operating duty			O-3 min-CO-3 min-CO
i)	Auxiliary contacts			Minimum 10 NO + 10 NC (4NO+4NC for DDCMIS interface and 6NO+6NC Auxiliary Contact- directly operated from breaker operated Mechanism)
j)	Anti-pumping feature			Both Mechanical & Electrical
2.9.2	Moulded case circuit breakers (MCCB) & Motor protection circuit breakers (MPCB)			
a)	Type			Thermal Magnetic based with in built front adjustable releases
b)	For Motors Below 30kW			MPCB to be provided
c)	For Motors From 30kW and below 90kW			MCCB to be provided
d)	Rated voltage	V		415V AC
e)	Rated Insulation level	V		690V AC
f)	Rated short circuit breaking capacity	KA		50kA
g)	Rated making capacity	KA		105kA
h)	Utilization category			A of IS / IEC 60947
i)	Type of releases required			
i	Overload			Refer Modulewise BoM (Annexure-A.2)
ii	Under voltage			No
iii	Short circuit			Yes
iv	Shunt trip			No
j)	Auxiliary contacts			
	Numbers (Minimum)			1 NO + 1 NC
2.10	Switchgear components			
2.10.1	Intelligent motor controller (IMC/IMCC)			
a)	Aux. supply voltage & frequency			Suitable for both 110 V AC, 50 Hz & 220 V DC (For basic and expansion module (if applicable) both)
b)	Degree of protection			IP20 for IMC and IP54 for HMI
c)	Current sensing module			For motors & heaters both below 90 KW
d)	Voltage sensing module			For motors & heaters both from 30 KW & below 90 KW
e)	Resetting			Manual on panel facia
f)	Digital input & output			6 Digital Inputs & 3 programmable potential free Digital Outputs (inbuilt with basic module or with add-on expansion modules)
g)	Binary input interrogation voltage			110V AC, 50 Hz
h)	Binary output			Rated for 6A, 110V AC
i)	Protocol			Profibus DP
j)	Profibus connector			One PG/PG port connector for each IMC, fast-connect type
k)	Over Load protection			As per IEC 60947-4-1 & 60947-8
l)	LED indications on IMC			Required for: i) Controller healthy ii) Controller fault iii) Controller power supply healthy
2.10.2	Power Contactors			Air break electro magnetic type
a)	Coil voltage (nominal)	V		(i) 110V AC (-15% to +10%) (Drop out voltage-less than 70%, Guaranteed Drop out at 20% of rated voltage) (ii) 220V DC (-15% to +10%)
b)	No. of poles for contactor			Three
c)	Utilization category			
i)	AC Reversible motor			AC4 of IS/IEC 60947
ii)	AC Non-reversible motor			AC3 of IS/IEC 60947
iii)	DC contactor			DC3
iv)	Aux contact			1 NO + 1 NC (Minimum)
2.10.3	Auxiliary Contactors			
a)	Coil voltage (nominal)	V		110 AC / 230AC / 220 DC
b)	No. of poles for contactor			Three
c)	Permissible supply voltage variation w.r.t. Nominal coil voltage	%		85 – 110
d)	Aux Relay contact			2 NO + 2 NC (Minimum)
2.10.4	High rupturing capacity (HRC) fuses			
a)	Voltage Class	V		650V
b)	Rupturing Capacity			
i)	AC	KA		80kA rms for AC Circuit
ii)	DC	KA		20kA for DC Circuit
2.10.5	Instruments, meters & transducers			
a)	Indicating instruments			
i)	Accuracy class			1 (except for energy meters, where accuracy class shall be 0.5s)
ii)	One min. power frequency withstand test voltage	kV		2.0 (RMS)
b)	Current Transducers			
i	Input	A		0-1A
ii	Output	mA		4 - 20mA
iii	Number of outputs	Nos.		2nos. (decoupled)

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iv	Minimum Overcurrent reach for motor current ammeters		6 x CT sec. current of 1A for a minimum period of 30seconds
v	Accuracy Class		1.0
c)	Voltage Transducers		
i	Input		(i) 500V / 50 Hz (for AC) (ii) 250V (for DC)
ii	Output	mA	4-20mA
iii	Number of outputs	Nos.	2nos. (decoupled)
iv	Accuracy Class		1.0
2.10.6	Relays		
a)	Type		Numerical Relay
b)	Coil rating		
i)	Current coil	A	1
ii)	Coil Voltage	V	220V DC
c)	Aux. Voltage	V	220V DC with variation of 80% to 120%
d)	One minute power frequency withstand voltage (rms)	kV	2kV
e)	Measurement Accuracy for rated RMS Current and voltage	%	2
f)	Power frequency withstand test voltage	kV	2.5kV for 1 seconds
2.10.7	Current transformers		
a)	Type		Cast Resin Bar Primary / Nylon Casing (Insulation Class E or Better)
b)	Voltage class and frequency		650V, 50 Hz
c)	Secondary rating	A	1A
d)	Accuracy class (metering) & Burden		Class 1.0, 5VA (Minimum)/ Class 0.2, 5VA (Minimum)/ Class 0.5S, 5VA (Minimum) (As required) (Refer Annexure-A.2 _Modulewise BOM for details)
e)	Accuracy class (protection) & Burden		5P20, 5VA or better, PS Class for REF
f)	Instrument security factor for metering CT		5
g)	Short time withstand capability (RMS)		
i	Associated with circuit breaker protected feeders	KA	50 KA (RMS) for 1 Sec
ii	Associated with MCCB protected feeders	KA	Prospective current of 50 KA (RMS) for the MCCB clearing time
h)	Dynamic withstand capability (peak)		
i	Associated with circuit breaker protected feeders	KA	105kA (peak)
ii	Associated with MCCB protected feeders	KA	Prospective current of 105kA (peak) as Limited by MCCB
2.10.8	Voltage transformers		
a)	Type		Cast Resin, Insulation class Class E or better
b)	System earthing		EFFECTIVE
c)	Voltage Ratio		
i	Line PT		415V/110V
ii	Bus PT		415V/3V/110V/3 V
d)	Accuracy class		Cl. 0.5 / Cl. 0.2 (Refer Annexure-A.2 _Modulewise BOM for details)
e)	Method of Construction		V-V
f)	Rated Voltage factor		1.1 continuous, 1.5 for 30 sec.
g)	One minute power frequency withstand voltage (rms)	KV	2.5kV
2.10.9	Control transformers (for contactor operation)		
a)	Type		Dry / Cast Resin, Insulation Class B or better
b)	Voltage Ratio		415V/110 V with taps +/- 5% in steps of 2.5%
c)	One minute power frequency withstand voltage (rms)	KV	2.5kV
d)	Rating		1.5 X Adequate for application (VA)
2.10.10	Miniature circuit breaker		
a)	Rated Voltage		415V/240V/110V AC/220V DC
b)	Current breaking Capacity	KA	10kA
c)	Characteristic Curve		C or above
2.10.11	Control and selector switch		
a)	Application		As per Annexure-A.2 _Modulewise BOM
b)	Type		
i)	Control switch		Pistol Grip & Spring return
ii)	Selector switch		Stay Put
2.10.13	Indication Lamp		LED type (Refer Annexure-A.2 _Modulewise BOM for details)
2.10.14	Panel Space heaters		
a)	Voltage	V	240V AC
b)	Thermostat required		Yes
2.10.15	General purpose timers		
a)	Type		Electronic
b)	No. of contacts		As per requirements
2.10.16	Terminal block		
a)	Rating		
i	voltage grade	V	650V
ii	current	A	10A
b)	Material of construction		6.6 polyamide as per UL 94
c)	Type		Screw less, push in technology (IEC 60947-7-1 and UL certified)
d)	Spare TB		20%
e)	CT Terminals		(i) With shorting and disconnecting facility (ii) Stud type terminals (iii) Suitable for ring type lugs
2.11	DC MCCB Box		
a)	Construction/ DOP		(i) Metal Enclosed Fixed Type CRCA: 2mm structure & 1.6mm enclosure Or (ii) Poly Carbonate (a) Halogen Free, flame Retardant (UL-94,V0) (b) Thickness: 4mm (iii) UL224 sleeved Busbars (iv) DOP -Indoor IP52 Outdoor -IP54
b)	Incomer		63A DP MCCB
c)	Busbars		100 A fully insulated (PVC sleeved, UL224) busbars
d)	Outgoing		8 nos. 16A outgoing DP MCCB feeders

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e)	Other Components			1 no. Auxiliary Contactor for supply monitoring & 1 no. Led Indicating lamp (Blue color)
f)	Paint Shade			RAL 9002
2.12	AC MCCB Box			
a)	Construction/ DOP			(i) Metal Enclosed Fixed Type CRCA: 2mm structure & 1.6mm enclosure Or (ii) Poly Carbonate (a) Halogen Free, flame Retardant (UL-94,V0) (b) Thickness: 4mm (iii) UL224 sleeved Busbars (iv) DOP -Indoor IP52 Outdoor -IP54
b)	Incomer			63A TPN MCCB
c)	Busbars			100 A, 3-phase, 4-wire, fully insulated (PVC sleeved,UL224) busbars
d)	Outgoing			9 nos. 16 A DP MCCB and 3 nos. 16 A TPN MCCB
e)	Other Components			3 nos. Led Indicating lamps (R,Y,B) for incoming supply monitoring
f)	Paint Shade			RAL 9002
2.13	24V DC PDB			
a)	Construction & technical Details			(i) Input Voltage- 24 V DC nominal(Range 20-30V DC) (ii) Rated Input Current- 20A (iii) Output Voltage- 24 V DC nominal (iv) No. of Outgoing Feeders- 16/32/64 Ways, as required (v) Outgoing Protection- Individual fuse & rated MCB for each feeder (vi) Typical Outgoing Feeder Rating-1 A, 2 A as required (vii) Polarity- Separate +24 V DC and 0 V DC distribution (viii) Terminal Blocks-Feed-through, touch-safe, DIN-rail mounted (ix) Protection-Short-circuit and overload protection for individual outputs (x) Surge Protection-DC surge protection device (xi) Enclosure-Wall-mounted(Complete with Fixing arrangement) (xii) Enclosure Material-CRCA steel, powder coated (xiii) Mounting-DIN rail (xiv) Cable Entry-Bottom/top entry with suitable cable glands and lugs. (xv) Earthing-Dedicated protective earth (PE) terminal/bar (xvi) Busbar-Copper busbar, adequately rated for maximum continuous current (xvii) Identification-Ferrules, wire markers, feeder labels and circuit identification (xviii) Heat Dissipation-Natural ventilation (xix) Testing-Continuity, insulation resistance, polarity, functional and protection tests (xx) Standards-IEC 61439-1/-2 where applicable
b)	Input Supply & Incomer			24V DC- 15A for 16/32 Ways and 32A for 64 Ways (Incomer shall be redundant)
c)	DOP			Indoor- IP52
d)	Cable Glands and Lugs			Double compression Ni-plated Brass Glands and Copper Lugs for Incoming and Outgoing cables
e)	Other Components			LED indication for incoming supply
f)	Paint Shade			RAL 9002/Manufacturer standard
3.0	CONSTRUCTION FEATURES			
3.1	General			
3.1.1	Operational fronts			Both Single & Double Front (Refer Annexure-A.1 Boardwise BOM for details)
3.1.2	Type of Module operation			PCC/PMCC/MCC - Drawout type ACDB/DCDB/SOLENOID VALVE DB's - Fixed Type
3.1.3	Enclosure			
a)	Material			Sheet steel
b)	Type			CRCA
c)	Sheet metal thickness (minimum)			
i	Non-load bearing - covers, doors, partition etc.	mm		1.6
ii	Load bearing - structures & frame etc.	mm		2
iii	Gland plates			3mm for CRCA/HR, 4mm for Non-Magnetic –Single Core Cable Entry
3.1.4	Glands			Double compression, Heavy duty nickel chrome plated brass machine finished. Thickness of plating not less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality.
3.1.5	Lugs/ ferrules			Heavy duty solderless crimping type (copper lugs/ ferrules for copper cables, aluminium lugs/ ferrules for aluminium cables and Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections) as per the DIN 46239
3.1.6	Degree of protection of switchboards with modules in service and all doors closed			
a)	Without louvers (<1600 A)			IP-52
b)	With louvers (= > 1600 A)			IP-42 (Gasketing arrangement shall be as per type tested design for IP 5X)
c)	Outdoor panels with stainless steel enclosure (Applicable for TRF AREA OUTDOOR SWGR U# 3, U#4, and SWITCHYARD OIL FILTRATION OUTDOOR SWITCHGEAR as specified in Annexure-A.2_ Modulewise BOM.)			IP 55 (mounted on 500mm pedestal). Other construction details (except sheet steel) shall be as per SI. No. 3.1.3, 3.1.4, & 3.1.5 above. Outdoor Panel shall be with stainless steel enclosure.
3.1.7	Facility for functional testing of withdrawable			
a)	Incomer & Bus Coupler units			Yes
b)	Outgoing contactor starters			Yes
3.1.8	Gasket			Steel Reinforced EPDM /PU Foam / Neoprene gaskets

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3.1.9	Panel Height	mm	2450 (max.)	
3.2	Busbars & connections			
3.2.1	Busbar material			
a)	Horizontal & Jumper connection		High Conductivity Aluminium Alloy/Copper	
b)	Vertical		Copper	
c)	Earth BusBar			
i.	For all switchboards except ACBD and DCDB		GS (65 mm X 8 mm)	
ii.	For ACDB and DCDB		GS (50 mm x 6 mm)	
iii.	Electronic earthing for IMC		Separate Copper Earth bus (25mm x 3mm)	
d)	Hardware for busbars		High Tensile steels (Bolts/Nuts/Spring Washer)	
e)	Type of cover for busbar compartment		Bolted Type	
f)	Additional Requirement		(i) Separate compartments for Auxiliary and Power Busbars (ii) Two separate sets of vertical busbars in each panel of double front MCC / DB (iii) Interleaving arrangement for busbar for switchboards of rating >1600 Amps	
3.3	Cabling and terminations			
a)	Cable entry		Bottom	
b)	Incoming connections from transformer/DG for PCC/PMCC 1600A and above		Busduct	
c)	Incoming connections from transformer for PCC/PMCC below 1600A		Cable	
4.0	INSPECTION/ TESTING			
4.1	The following type test certificates of LT Switchgear and MCC panels with 10 years validity from 14.11.2024 (i.e. from 15.11.2014 to 14.11.2024) shall be submitted.			
a)	Circuit breaker of each rating i) Test sequence 1 ii) Combined test sequence (With Circuit breakers mounted inside the Switchgear panel)			
b)	Complete design verification of Switchgear/MCC Panels as per IEC 61439 Part- 1, Annexure-D			
c)	Internal arc test for Personnel and Assembly Protection as per IEC/TR 61641.Refer annexure-A for details			
d)	MCC modules of any three ratings, as selected by the Employer, for class - II protection Co-ordination as per IS 13947-4-1 / IEC 60947-4-1.			
4.2	For the following equipment the bidder shall submit the reports of all the type tests			
a)	NUMERICAL RELAYS			
b)	MCCB			
c)	Intelligent Motor Controller (IMC) for Electromagnetic Compatibility (EMC) & other requirements as per applicable standards.			
4.3	Type test reports conducted within last 10 years from 14.11.2024 for the following tests on the model of the Numerical relays & Ethernet switches being offered shall be submitted for customer's review. Type Tests of Ethernet Switches shall have been conducted at NABL accredited Lab.			
4.4	TEST ITEMS		Standard	
a)	Dimensions of structure and visual inspection		IEC 60297-3-101	
b)	Functional requirements:		Relevant IEC 60255-100 series	
	– Steady-state simulation			
	– Dynamic simulation			
c)	Product safety requirements (including the dielectric tests and thermal short time rating)		IEC 60255-27	
d)	EMC requirements:		IEC 60255-26	
	– Emission			
	– Immunity			
e)	Energizing quantities:		N/A	
	– Burden			
	– Change of auxiliary energizing quantity		IEC 60255-11	
f)	Contact performance		N/A	
g)	Communication requirements		Relevant IEC protocol standards	
h)	Climatic environmental requirements:		IEC 60068-2-14,	
	– Cold		IEC 60068-2-1,	
	– Dry heat		IEC 60068-2-2,	
	– Change of temperature		IEC 60068-2-78,	
	– Damp heat		IEC 60068-2-30,	
			IEC 60255-27	
i)	Mechanical requirements: – Shock		IEC 60255-21-1, IEC 60255-21-2, IEC 60255-21-3	
	– Vibration			
	– Bump			
	– Seismic			
j)	Enclosure protection		IEC 60529, IEC 60255-27	
4.5	In absence of type tests reports or in case reports are not found to be meeting the specification/standards requirements, bidder shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the customer for approval.			
4.6	The tests shall be carried out as per Quality Plan.			

TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
Annexure-A
Internal Arc (IAC) Testing

S. No.	Test Location	Clarification
a)	Outgoing side of Incomer breaker	As these switchgear locations are not protected with current-limiting devices, IAC testing with 50 kA for 0.5sec will be required to be conducted. The breaker must remain in the ON position during the period.
b)	Main Busbar/Horizontal busbar	
c)	Cable alley	As per IEC TR 61641: 1.0 If the connected module of the cable alley is protected with a current limiting device, arc can be initiated by keeping current limiting device in circuit. 2.0 Accordingly, the testing shall be carried out as specified in clause no. 8.5 and 8.6 of the IEC TR 61641. Since MCCB is used in the modules, test shall be conducted at the outgoing of 400 Amp module with MCCB in service.
d)	Incoming side of smallest module	As per IEC TR 61641, if a part of the circuit meets the requirement of arc ignition protected zone, arc need not to be initiated there. Dielectric and IP tests, as mentioned in IEC TR 61641, will required to be conducted at that part. If the bidder confirms that all of their modules comply with the requirements of IEC TR 61641 of the arc ignition protected zone, the incoming side of the modules can be declared as an arc ignition protected zone. In this case, to fully meet the specification for the incoming side of the smallest module, IAC test shall be conducted at the topmost portion of the vertical bus bar which is completely uninsulated and does not meet with the arc ignition protected zone requirement. Else, IAC test shall be conducted at the incoming side of the smallest module.

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				Rev. No. 00		
				Date : 02.09.2026		
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM						
Type of Connection : SANDWICH BUSDUCT						
DOUBLE FRONT D/O TYPE						
FLOOR MOUNTED						
Name of the Board (EMERGENCY MCC) →				3DG	4DG	
RATING	UNIT	MODULE TYPE		QTY.	QTY.	
3000	A	DG(I/C)		2	2	
3000	A	DAE(B/C)		1	1	
3000	A	DAE(TIE)		2	2	
630	A	DAE(O/G)		0	0	
800	A	DAE(O/G)		0	0	
1000	A	DAE(O/G)		2	2	
1250	A	DAE(O/G)		0	0	
16	A	E3-TP (O/G)		24	24	
32	A	E3-TP (O/G)		5	5	
63	A	E3-TP (O/G)		12	12	
100	A	E3-TP (O/G)		4	4	
125	A	E3-TP (O/G)		0	0	
160	A	E3-TP (O/G)		0	0	
250	A	E3-TP (O/G)		8	8	
400	A	E3-TP (O/G)		2	2	
0.0 – 5.5	KW	DK2E		10	10	

5.6 – 7.0	KW	DK2E	0	0
7.1 – 13.0	KW	DK2E	14	14
13.1 – 24.0	KW	DK2E	3	3
24.1 – 29.9	KW	DK2E	0	0
30.0 – 37.0	KW	DK21E	6	6
37.1 – 55.0	KW	DK21E	2	2
55.1 – 80.0	KW	DK21E	0	0
80.1 – 89.9	KW	DK21E	0	0
0.0 – 5.5	KW	DK2E-H	12	12
5.6 – 7.0	KW	DK2E-H	0	0
7.1 – 13.0	KW	DK2E-H	3	3
13.1 – 24.0	KW	DK2E-H	4	4
24.1 – 29.9	KW	DK2E-H	0	0
30.0 – 37.0	KW	DK21E-H	2	2
37.1 – 55.0	KW	DK21E-H	0	0
55.1 – 80.0	KW	DK21E-H	0	0
80.1 – 89.9	KW	DK21E-H	0	0
90 – 200.0	KW	DM / PM	8	8
Up to 32A		E1	3	3
		G2 (BUS PT)	2	2
		CS (Control Supply)	2	2
		WTS1 (Wireless Temp. Sensor Module 1)	45	45
		WTS2 (Wireless Temp. Sensor Module 2)	75	75
		Dummy Panel	2	2
		Y-link	7	7
		Ethernet Switch	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.



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EPC PACKAGE

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TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DA	0DB	3DA	3DB	4DA	4DB
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
4000	A	DAET(I/C)	2	2	2	2	2	2
4000	A	DAET(B/C)	1	1	1	1	1	1
3000	A	DAET(I/C)	0	0	0	0	0	0
3000	A	DAET(B/C)	0	0	0	0	0	0
630	A	DAE(O/G)	5	5	3	3	3	3
800	A	DAE(O/G)	3	3	0	0	0	0
1000	A	DAE(O/G)	5	5	2	0	2	0
1250	A	DAE(O/G)	0	0	0	0	0	0
1600	A	DAE(O/G)	2	2	0	0	0	0
2500	A	DAE(TIE)	0	0	0	0	0	0
3000	A	DAE(TIE)	1	1	0	3	0	3
16	A	E3 (O/G)	0	0	22	9	22	9
32	A	E3 (O/G)	4	4	0	5	0	5
63	A	E3 (O/G)	5	5	7	5	7	5
125	A	E3 (O/G)	5	5	8	4	8	4
160	A	E3 (O/G)	3	3	0	0	0	0
200	A	E3 (O/G)	5	5	6	10	6	10
250	A	E3 (O/G)	3	3	2	2	2	2
400	A	E3 (O/G)	6	6	4	2	4	2
0.0 – 5.5	KW	DK2 / PK2 / AK2	0	0	33	0	33	0



TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE

PE-TS-519-506-E002

Issue No: 00

Rev. No. 00

Date : 02.09.2026

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DA	0DB	3DA	3DB	4DA	4DB
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	24	7	24	7
13.1 – 24.0	KW	DK2 / PK2 / AK2	0	0	10	6	10	6
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	2	2	5	0	5	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	2	2	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
0.0 – 5.5	KW	DK2E-H	0	0	6	16	6	16
5.6 – 7.0	KW	DK2E-H	0	0	0	0	0	0
7.1 – 13.0	KW	DK2E-H	0	0	4	6	4	6
13.1 – 24.0	KW	DK2E-H	0	0	0	6	0	6
24.1 – 29.9	KW	DK2E-H	0	0	0	0	0	0
30.0 – 37.0	KW	DK21E-H	0	0	0	0	0	0
37.1 – 55.0	KW	DK21E-H	0	0	0	2	0	2
55.1 – 80.0	KW	DK21E-H	0	0	0	0	0	0
80.1 – 89.9	KW	DK21E-H	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	4	4	6	8	6	8
Up to 32A		E1	6	6	7	10	7	10
Up to 16A		EA3	0	0	6	4	6	4

बी एच ई एल BHEL	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE						PE-TS-519-506-E002		
							Issue No: 00		
							Rev. No. 00		
							Date : 02.09.2026		
TECHNICAL DATA PART - A									
ANNEXURE-A.1									
BOARDWISE BOM									
Type of Connection : TOP/SIDE BUSDUCT ENTRY									
DOUBLE FRONT D/O TYPE									
FLOOR MOUNTED									
Name of the Board (PMCC) →			0DA	0DB	3DA	3DB	4DA	4DB	
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
32	A	EA3	0	0	7	3	7	3	
63	A	EA3	0	0	0	0	0	0	
125	A	EA3	0	0	0	0	0	0	
32	A	ET3	0	0	6	6	6	6	
400	A	ES3	4	4	2	2	2	2	
		G1 (BUS PT)	2	2	2	2	2	2	
		CS (Control Supply)	2	2	2	2	2	2	
		WTS1 (Wireless Temp. Sensor Module 1)	36	36	27	54	27	54	
		WTS2 (Wireless Temp. Sensor Module 2)	150	150	90	90	90	90	
		Dummy Panel	2	2	2	2	2	2	
		Y-link	1	1	12	7	12	7	
		Ethernet Switch	2	2	1	2	1	2	

Note: The quantity mentioned above includes the requirement for engineering contractual spares.



TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II
(2X800MW)
EPC PACKAGE

PE-TS-519-506-E002

Issue No: 00

Rev. No. 00

Date : 02.09.2026

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			ODE	ODF
RATING	UNIT	MODULE TYPE	QTY.	QTY.
4000	A	DAET(I/C)	0	0
4000	A	DAET(B/C)	0	0
3000	A	DAET(I/C)	0	0
3000	A	DAET(B/C)	0	0
2500	A	DAET(I/C)	0	0
2500	A	DAET(B/C)	0	0
1600	A	DAET(I/C)	2	2
1600	A	DAET(B/C)	1	1
1000	A	DAET(I/C)	0	0
1000	A	DAET(B/C)	0	0
630	A	DAE(O/G)	0	0
800	A	DAE(O/G)	0	0
1000	A	DAE(O/G)	0	0
1600	A	DAE(O/G)	0	0
16	A	E3 (O/G)	11	18
32	A	E3 (O/G)	0	11
63	A	E3 (O/G)	9	6
100	A	E3 (O/G) ₂₇	0	0

बी एच ई एल BHEL	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE			PE-TS-519-506-E002
				Issue No: 00
				Rev. No. 00
				Date : 02.09.2026
TECHNICAL DATA PART - A				
ANNEXURE-A.1				
BOARDWISE BOM				
Type of Connection : TOP/SIDE BUSDUCT ENTRY				
DOUBLE FRONT D/O TYPE				
FLOOR MOUNTED				
Name of the Board (PMCC) →			ODE	ODF
RATING	UNIT	MODULE TYPE	QTY.	QTY.
125	A	E3 (O/G)	3	6
160	A	E3 (O/G)	0	0
200	A	E3 (O/G)	0	0
250	A	E3 (O/G)	0	2
400	A	E3 (O/G)	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	20	15
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	4	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	3	2
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	4
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0
90 – 200.0	KW	DM / PM	4	0
Up to 32A		E1	16	8
32	A	EA3	3	3
63	A	EA3 28	3	2

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE			PE-TS-519-506-E002		
				Issue No: 00		
				Rev. No. 00		
				Date : 02.09.2026		
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM						
Type of Connection : TOP/SIDE BUSDUCT ENTRY						
DOUBLE FRONT D/O TYPE						
FLOOR MOUNTED						
Name of the Board (PMCC) →			0DE	0DF		
RATING	UNIT	MODULE TYPE	QTY.	QTY.		
125	A	EA3	2	3		
32	A	ET3	4	4		
125	A	ES3	2	2		
		G1 (BUS PT)	2	2		
		CS (Control Supply)	2	2		
		Dummy Panel	2	2		
		Y-link	5	4		
		Ethernet Switch	1	1		

Note: The quantity mentioned above includes the requirement for engineering contractual spares.



TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE

PE-TS-519-506-E002

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Rev. No. 00

Date : 02.09.2026

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (IDCT PMCC) →			3DQ	3DR	3DT	3DU	4DQ	4DR	4DT	4DU
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
4000	A	DAET(I/C)	0	0	0	0	0	0	0	0
4000	A	DAET(B/C)	0	0	0	0	0	0	0	0
3000	A	DAET(I/C)	2	2	2	2	2	2	2	2
3000	A	DAET(B/C)	0	0	0	0	0	0	0	0
2500	A	DAET(I/C)	0	0	0	0	0	0	0	0
2500	A	DAET(B/C)	0	0	0	0	0	0	0	0
1600	A	DAET(I/C)	0	0	0	0	0	0	0	0
1600	A	DAET(B/C)	0	0	0	0	0	0	0	0
1000	A	DAET(I/C)	0	0	0	0	0	0	0	0
1000	A	DAET(B/C)	0	0	0	0	0	0	0	0
630	A	DAE(O/G)	0	0	0	0	0	0	0	0
800	A	DAE(O/G)	0	0	0	0	0	0	0	0
1000	A	DAE(O/G)	2	0	0	1	2	0	0	0
1600	A	DAE(O/G)	0	0	0	0	0	0	0	0
16	A	E3 (O/G)	3	6	3	0	3	4	3	0
32	A	E3 (O/G)	0	0	0	0	0	0	0	0
63	A	E3 (O/G)	0	14	5	3	0	11	5	3
100	A	E3 (O/G)	0	0	0	0	0	0	0	0
125	A	E3 (O/G)	0	0	2	2	0	0	0	0
160	A	E3 (O/G)	0	0	0	0	0	0	0	0
200	A	E3 (O/G)	0	0	0	0	0	0	2	2

250	A	E3 (O/G)	0	0	0	0	0	0	0	0
400	A	E3 (O/G)	0	0	0	0	0	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	0	0	9	0	0	0	9	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	10	11	10	10	10	11	10	10
Up to 32A		E1	0	7	4	0	0	7	4	0
32	A	EA3	0	0	0	0	0	0	0	0
63	A	EA3	0	0	0	0	0	0	0	0
125	A	EA3	0	0	0	0	0	0	0	0
32	A	ET3	4	4	4	4	4	4	4	4
125	A	ES3	2	2	2	2	2	2	2	2
		G1 (BUS PT)	1	1	1	1	1	1	1	1
		CS (Control Supply)	1	1	1	1	1	1	1	1
		Dummy Panel	2	2	2	2	2	2	2	2
		Y-link	0	0	2	0	0	0	2	0
		Ethernet Switch	1	1	1	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.



**TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE**

PE-TS-519-506-E002

Issue No: 00

Rev. No. 00

Date : 02.09.2026

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (ESP PMCC) →			3DC	3DD	3DE	3DF	3DH	3DJ	4DC	4DD	4DE	4DF	4DH	4DJ
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
3000	A	DAET(I/C)	1	1	1	1	1	1	1	1	1	1	1	1
3000	A	DAE(TIE)	1	1	1	1	1	1	1	1	1	1	1	1
630	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
800	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
1000	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
1600	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
32	A	E3 (O/G)	5	5	5	5	5	5	5	5	5	5	5	5
400	A	E3 (O/G)	5	5	5	5	5	5	5	5	5	5	5	5
400	A	E2 (O/G)	24	24	24	24	24	24	24	24	24	24	24	24
6	A	ALI	6	6	6	6	6	6	6	6	6	6	6	6
6	A	WLT (3D)	6	6	6	6	6	6	6	6	6	6	6	6
6	A	ARECA	2	2	2	2	2	2	2	2	2	2	2	2
6	A	MM	2	2	2	2	2	2	2	2	2	2	2	2
0.37	KW	RM1	26	26	26	26	26	26	26	26	26	26	26	26
0.37	KW	RM2	25	25	25	25	25	25	25	25	25	25	25	25
17	KW	HH (HOPPER HEATER)	24	24	24	24	24	24	24	24	24	24	24	24
40	KW	HI	4	4	4	4	4	4	4	4	4	4	4	4
10	KW	HS	4	4	4	4	4	4	4	4	4	4	4	4
2X1.1	KW	DDM	8	8	8	8	8	8	8	8	8	8	8	8
Up to 32A		E1	2	2	2	2	2	2	2	2	2	2	2	2

250	A	ES3	1	1	1	1	1	1	1	1	1	1	1	1
32	A	ET3	6	6	6	6	6	6	6	6	6	6	6	6
		G1 (BUS PT)	1	1	1	1	1	1	1	1	1	1	1	1
		CS (Control Supply)	1	1	1	1	1	1	1	1	1	1	1	1
		Dummy Panel	2	2	2	2	2	2	2	2	2	2	2	2
		Y-link	6	6	6	6	6	6	6	6	6	6	6	6
		Ethernet Switch	1	1	1	1	1	1	1	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.



TECHNICAL SPECIFICATION
LT SWITCHGEAR
KODERMA THERMAL POWER STATION PHASE-II (2X800MW)
EPC PACKAGE

PE-TS-519-506-E002

Issue No: 00

Rev. No. 00

Date : 02.09.2026

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (ESP Standby PMCC) →			3DK	3DL	4DK	4DL
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.
4000	A	DAET(I/C)	1	1	1	1
4000	A	DAE(B/C)	0	0	0	0
630	A	DAE(O/G)	0	0	0	0
800	A	DAE(O/G)	0	0	0	0
1000	A	DAE(O/G)	0	0	0	0
3000	A	DAE(TIE)	1	1	1	1
4000	A	DAE(TIE)	1	1	1	1
16	A	E3 (O/G)	0	0	0	0
32	A	E3 (O/G)	0	0	0	0
63	A	E3 (O/G)	0	0	0	0
125	A	E3 (O/G)	5	7	5	7
160	A	E3 (O/G)	0	0	0	0
250	A	E3 (O/G)	3	3	3	3
400	A	E3 (O/G)	3	2	3	2
0.0 – 5.5	KW	DK2 / PK2 / AK2	0	0	0	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	3	3	3	3
13.1 – 24.0	KW	DK2 / PK2 / AK2	3	0	3	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE				PE-TS-519-506-E002	
					Issue No: 00	
					Rev. No. 00	
					Date : 02.09.2026	
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM						
Type of Connection : TOP/SIDE BUSDUCT ENTRY						
DOUBLE FRONT D/O TYPE						
FLOOR MOUNTED						
Name of the Board (ESP Standby PMCC) —→			3DK	3DL	4DK	4DL
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0
Up to 32A		E1	0	7	0	7
		G1 (BUS PT)	1	1	1	1
		CS (Control Supply)	1	1	1	1
		Dummy Panel	2	2	2	2
		Y-link	1	1	1	1
		Ethernet Switch	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

(बी एच ई एल) BHEL	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE	PE-TS-519-506-E002	
		Issue No: 00	
		Rev. No. 00	
		Date : 02.09.2026	
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM			
Type of Connection : TOP/SIDE BUSDUCT ENTRY			
DOUBLE FRONT D/O TYPE			
FLOOR MOUNTED			
Name of the Board (SWITCHYARD PMCC) —————→		SWITCHYARD MAIN SWBD	
RATING	UNIT	MODULE TYPE	QTY.
1600	A	DAE(I/C)	2
1600	A	DAE(B/C)	1
16	A	E3 (O/G)	4
32	A	E3 (O/G)	4
63	A	E3 (O/G)	23
125	A	E3 (O/G)	9
160	A	E3 (O/G)	0
250	A	E3 (O/G)	6
400	A	E3 (O/G)	2
0.0 – 5.5	KW	DK2 / PK2 / AK2	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0

55.1 – 80.0	KW	DK21 / PK21 / AK21	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0
90 – 200.0	KW	DM / PM	0
Up to 32A		E1	19
250	A	ES3	2
		G1 (BUS PT)	2
		CS (Control Supply)	2
		Dummy Panel	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

बी एच ई एल BHEL	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE				PE-TS-519-506-E002	
					Issue No: 00	
					Rev. No. 00	
					Date : 02.09.2026	
TECHNICAL DATA PART - A						
ANNEXURE-A.1						
BOARDWISE BOM						
Type of Connection : CABLE ENTRY						
DOUBLE FRONT D/O TYPE						
FLOOR MOUNTED						
Name of the Board (MCC) →			3TB	4TB	3HC	4HC
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.
250	A	E3 (I/C)	0	0	0	0
250	A	CC (I/C)	0	0	0	0
250	A	E3 (B/C)	0	0	0	0
400	A	E3 (I/C)	2	2	0	0
400	A	CC (I/C)	0	0	2	2
400	A	E3 (B/C)	1	1	0	0
16	A	E3 (O/G)	8	8	34	34
32	A	E3 (O/G)	3	3	4	4
63	A	E3 (O/G)	5	5	11	11
100	A	E3 (O/G)	0	0	0	0
125	A	E3 (O/G)	3	3	0	0
160	A	E3 (O/G)	0	0	0	0
250	A	E3 (O/G)	0	0	0	0
400	A	E3 (O/G)	0	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	38	38	0	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	4	4	6	6
13.1 – 24.0	KW	DK2 / PK2 / AK2	12	12	0	0

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE				PE-TS-519-506-E002	
					Issue No: 00	
					Rev. No. 00	
					Date : 02.09.2026	
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM						
Type of Connection : CABLE ENTRY						
DOUBLE FRONT D/O TYPE						
FLOOR MOUNTED						
Name of the Board (MCC) →			3TB	4TB	3HC	4HC
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	3	3	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0
Up to 32A		E1	32	32	4	4
Up to 16A		EA3	0	0	0	0
32	A	EA3	0	0	0	0
63	A	EA3	8	8	0	0
200	A	EA3	0	0	0	0
32	A	ET3	0	0	0	0
		VM (BUS PT)	2	2	1	1
		CS (Control Supply)	2	2	2	2
		Dummy Panel	2	2	2	2
		Y-link	9	9	1	1
		Ethernet Switch	1	1	1	1
		Alarm module				

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE					PE-TS-519-506-E002	
						Issue No: 00	
						Rev. No. 00	
						Date : 02.09.2026	
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM							
Type of Connection : CABLE ENTRY							
DOUBLE FRONT D/O TYPE							
FLOOR MOUNTED							
Name of the Board (MCC) —————>			0SA	0SB	0QA	0QB	0SC
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.
400	A	E3 (I/C)	0	0	0	0	0
400	A	E3 (B/C)	0	0	0	0	0
630	A	DAE(I/C)	0	0	2	2	0
630	A	DAE(B/C)	0	0	1	1	0
800	A	DAE(I/C)	2	2	0	0	0
800	A	DAE(B/C)	1	1	0	0	0
1000	A	DAE(I/C)	0	0	0	0	2
1000	A	DAE(B/C)	0	0	0	0	1
630	A	DAE(O/G)	0	0	0	0	0
16	A	E3 (O/G)	27	22	38	38	47
32	A	E3 (O/G)	0	0	14	14	23
63	A	E3 (O/G)	6	6	7	7	11
125	A	E3 (O/G)	0	0	4	4	0
160	A	E3 (O/G)	0	0	0	0	3
250	A	E3 (O/G)	0	0	0	0	2
400	A	E3 (O/G)	0	0	0	0	0

बी एच ई एल 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE					PE-TS-519-506-E002	
						Issue No: 00	
						Rev. No. 00	
						Date : 02.09.2026	
TECHNICAL DATA PART - A							
ANNEXURE-A.1							
BOARDWISE BOM							
Type of Connection : CABLE ENTRY							
DOUBLE FRONT D/O TYPE							
FLOOR MOUNTED							
Name of the Board (MCC) →			0SA	0SB	0QA	0QB	0SC
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.
0.0 – 5.5	KW	DK2 / PK2 / AK2	30	24	17	21	22
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	0	0	4
13.1 – 24.0	KW	DK2 / PK2 / AK2	7	7	6	6	4
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	6	6	0	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0	0
Up to 32A		E1	24	23	24	24	24
125		EA3	0	0	0	0	0
		VM (BUS PT)	2	2	2	2	2
		CS (Control Supply)	2	2	2	2	2
		Dummy Panel	2	2	2	2	2
		Y-link	6	5	3	4	4
		Ethernet Switch	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002		
			Issue No: 00		
			Rev. No. 00		
			Date : 02.09.2026		
TECHNICAL DATA PART - A					
ANNEXURE-A.1					
BOARDWISE BOM					
Type of Connection : CABLE ENTRY					
DOUBLE FRONT D/O TYPE					
FLOOR MOUNTED					
Name of the Board (MCC) →			3TA	4TA	0TA
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.
1600	A	DAE(I/C)	0	0	2
1600	A	DAE(B/C)	0	0	1
1000	A	DAE(I/C)	0	0	0
1000	A	DAE(B/C)	0	0	0
630	A	DAE(I/C)	2	2	0
630	A	DAE(B/C)	1	1	0
16	A	E3 (O/G)	4	4	4
32	A	E3 (O/G)	0	0	15
63	A	E3 (O/G)	4	4	10
125	A	E3 (O/G)	0	0	5
160	A	E3 (O/G)	0	0	0
250	A	E3 (O/G)	0	0	4
400	A	E3 (O/G)	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	10	10	11
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	5
13.1 – 24.0	KW	DK2 / PK2 / AK2	9	9	6

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002		
			Issue No: 00		
			Rev. No. 00		
			Date : 02.09.2026		
TECHNICAL DATA PART - A					
ANNEXURE-A.1					
BOARDWISE BOM					
Type of Connection : CABLE ENTRY					
DOUBLE FRONT D/O TYPE					
FLOOR MOUNTED					
Name of the Board (MCC) —————→			3TA	4TA	0TA
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	6	6	16
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	4
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0
90 – 200.0	KW	DM / PM	0	0	0
Up to 32A		E1	8	8	10
32	A	EA3	0	0	0
32	A	ET3	0	0	0
		VM (BUS PT)	2	2	2
		CS (Control Supply)	2	2	2
		Dummy Panel	2	2	2
		Y-link	4	4	6
		Ethernet Switch	1	1	1
		Alarm module			

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

(बी एच ई एल) 	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE		PE-TS-519-506-E002	
			Issue No: 00	
			Rev. No. 00	
			Date : 02.09.2026	
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM				
Type of Connection : CABLE ENTRY				
DOUBLE FRONT D/O TYPE				
FLOOR MOUNTED				
Name of the Board (MCC) —————→			SOOT BLOWER-UNIT 3	SOOT BLOWER-UNIT 4
RATING	UNIT	MODULE TYPE	QTY.	QTY.
63	A	CC (I/C)	2	2
0.0 – 5.5	KW	WB	221	221
0.0 – 5.5	KW	LR	75	75
0.0 – 5.5	KW	AH	6	6
		JAMMING RELAY MODULE	2	2
		VM (BUS PT)	1	1
		CS (Control Supply)	2	2
		Dummy Panel	4	4
		Y-link	0	0
		Ethernet Switch	0	0

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE										PE-TS-519-506-E002		
											Issue No: 00		
											Rev. No. 00		
											Date : 02.09.2026		

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT FIXED TYPE

FLOOR MOUNTED

Name of the Board (ACDB) →			3HA	3KA	4HA	4KA	3HB	3QA	4HB	4QA	0WB	TRF AREA OUTDOOR SWGR U# 3	TRF AREA OUTDOOR SWGR U# 4
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
630	A	DAE(I/C)	0	0	0	0	2	2	2	2	0	0	0
630	A	DAE(B/C)	0	0	0	0	1	1	1	1	0	0	0
400	A	E3 (I/C)	0	0	0	0	0	0	0	0	0	1	1
400	A	E3 (B/C)	0	0	0	0	0	0	0	0	0	0	0
250	A	CC (I/C)	2	2	2	2	0	0	0	0	0	0	0
250	A	E3 (I/C)	0	0	0	0	0	0	0	0	2	0	0
250	A	E3 (B/C)	0	0	0	0	0	0	0	0	1	0	0
16	A	E3 (O/G)	148	338	148	338	12	39	12	39	48	0	0
32	A	E3 (O/G)	15	3	15	3	30	4	30	4	5	0	0
63	A	E3 (O/G)	14	5	14	5	23	26	23	26	8	0	0
125	A	E3 (O/G)	0	0	0	0	0	0	0	0	3	0	0
160	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	0	0
250	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	0	0
400	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	2	2
Up to 32A	A	E1	4	3	4	3	27	33	27	33	3	0	0
125A	A	E1	0	0	0	0	0	0	0	0	0	0	0
Up to 16A	A	EA3-H	0	0	0	0	0	8	0	8	0	0	0
250	A	ES3	0	0	0	0	0	0	0	0	2	0	0
		VM (BUS PT)	1	1	1	1	2	2	2	2	2	1	1
		CS (Control Supply)	0	0	0	0	0	0	0	0	0	0	0
		Dummy Panel	2	2	2	2	2	2	2	2	2	0	0

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)			PE-TS-519-506-E002		
				Issue No: 00		
				Rev. No. 00		
				Date : 02.09.2026		
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM						
Type of Connection : CABLE ENTRY						
DOUBLE FRONT FIXED TYPE						
FLOOR MOUNTED						
Name of the Board (DCDB) —————>			3FA	4FA	0FA	
RATING	UNIT	MODULE TYPE	QTY.	QTY.		
125	A	DB	0	0	2	
125	A	DC	0	0	2	
125	A	CH	0	0	2	
125	A	HD	0	0	1	
1600	A	DB	2	2	0	
1600	A	DC	2	2	0	
1600	A	CH	2	2	0	
1600	A	HD	1	1	0	
125	A	Discharge Feeder				
UP TO 32A	A	MCCB TYPE (X)	108	108	30	
63	A	MCCB TYPE (X)	20	20	10	
100	A	MCCB TYPE (X)	4	4	0	
125	A	MCCB TYPE (X)	3	3	2	
250	A	MCCB TYPE (X)	3	3	0	
400	A	MCCB TYPE (X)	3	3	0	
600	A	MCCB TYPE (X)	3	3	0	
		S (BUS PT)	2	2	2	
		CS (Control Supply)	0	0	0	
		Dummy Panel	2	2	2	

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE		PE-TS-519-506-E002
			Issue No: 00
			Rev. No. 00
			Date : 02.09.2026
<u>TECHNICAL DATA PART - A</u> <u>ANNEXURE-A.1</u> <u>BOARDWISE BOM</u>			
Type of Connection : CABLE ENTRY			
DOUBLE FRONT FIXED TYPE			
FLOOR MOUNTED			
Name of the Board (SWITCHYARD DCDB)————→			220V SWYD DCDB
RATING	UNIT	MODULE TYPE	QTY.
125	A	DB	2
125	A	DC	2
125	A	CH	2
125	A	HD	1
125	A	Discharge Feeder	2
UP TO 32A	A	MCCB TYPE (X)	68
63	A	MCCB TYPE (X)	4
100	A	MCCB TYPE (X)	0
125	A	MCCB TYPE (X)	0
250	A	MCCB TYPE (X)	0
400	A	MCCB TYPE (X)	0
600	A	MCCB TYPE (X)	0
		S (BUS PT)	2
		CS (Control Supply)	0
		Dummy Panel	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

बी एच ई एल BHEL	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW) EPC PACKAGE			PE-TS-519-506-E002
				Issue No: 00
				Rev. No. 00
				Date : 02.09.2026
TECHNICAL DATA PART - A ANNEXURE-A.1 BOARDWISE BOM				
Type of Connection : CABLE ENTRY				
DOUBLE FRONT FIXED TYPE				
FLOOR MOUNTED				
Name of the Board →			SWITCHYARD EPDB	SWITCHYARD OIL FILTRATION OUTDOOR SWITCHGEAR
RATING	UNIT	MODULE TYPE	QTY.	QTY.
630	A	DAE(I/C)	0	0
630	A	DAE(B/C)	0	0
400	A	E3 (I/C)	0	1
400	A	E3 (B/C)	0	0
250	A	CC (I/C)	2	0
250	A	E3 (B/C)	0	0
16	A	E3 (O/G)	0	0
32	A	E3 (O/G)	0	0
63	A	E3 (O/G)	0	0
125	A	E3 (O/G)	3	0
160	A	E3 (O/G)	2	0
250	A	E3 (O/G)	0	0
400	A	E3 (O/G)	0	2
Up to 32A		E1	0	0
		VM (BUS PT)	1	1
		CS (Control Supply)	0	0
		Dummy Panel	2	0

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

		TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002 Issue No: 00 Rev. No. 00 DATE: 02.09.2026	
TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
S. No.	Module Type	Item Description	Qty.	Remarks	
1	DAET (I/C)	PMCC INCOMER BREAKER OF RATING 1000A & ABOVE			
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1		
		CONTROL MCB SP 6A	8		
		415V MPCB	2		
		NEUTRAL LINK	2		
		INDICATING LAMP	5		
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, CL-PS, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
		POWER TERMINALS	As required		
		220 V DC DP MCB 10A	2		
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1		
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2		
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STAND BY EARTH FAULT PROTECTION (51NS) • RESTRICTED EARTH FAULT PROTECTION (64R) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL with I/L • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THRESHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 5 NOs. (3-Ph for current protection, 1 for REF and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1		
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1		
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5S, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
2	DAE (I/C)	MCC INCOMER BREAKER OF RATING 630A & ABOVE			
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1		
		CONTROL MCB SP 6A	4		
		415V MPCB	2		
		NEUTRAL LINK	2		
		INDICATING LAMP	5		
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
		POWER TERMINALS	As required		
		220 V DC DP MCB 10A	4		
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1		
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1		
		LIMIT SWITCH	2		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2		

		TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002 Issue No: 00 Rev. No. 00 DATE: 02.09.2026	
TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STAND BY EARTH FAULT PROTECTION (51NS) • RESTRICTED EARTH FAULT PROTECTION (64R) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL with I/L • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 4 NOS. (3-Ph for current protection, and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOS. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1		
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1		
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5S, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
3	DAET/DAE (B/C)	PMCC/ MCC BUSCOUPLER BREAKER OF RATING 630A & ABOVE			
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1		
		CONTROL MCB SP 6A	10		
		NEUTRAL LINK	1		
		INDICATING LAMP	2		
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
		POWER TERMINALS	As required		
		220 V DC DP MCB 10A	2		
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1		
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1		
		LIMIT SWITCH	2		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2		
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 4 NOS. (3-Ph for current protection and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOS.	1		
4	DG (I/C)	EMERGENCY BOARD INCOMER BREAKER FROM DG OF RATING 630A & ABOVE			
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1		
		CONTROL MCB SP 6A	8		
		415V MPCB	2		
		NEUTRAL LINK	2		
		INDICATING LAMP	5		
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5s, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, CL-PS, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		

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	TECHNICAL DATA PART - A			
	ANNEXURE-A.2			
	MODULE WISE BOM			
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 6A	4	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • DIFFERENTIAL PROTECTION (87) (HIGH IMPEDANCE) • REVERSE POWER PROTECTION • DG NEUTRAL DISPLACEMENT (59) • DG MONITORING • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (96) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THRESHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 7 NOs. (3 Ph FOR CURRENT PROTECTION, 3 Ph for DIFFERENTIAL PROTECTION, 1 SPARE). SECONDARY CURRENT: 1A • PT INPUT 4 NOs.	1	For DIFFERENTIAL PROTECTION (87) (HIGH IMPEDANCE), separate Numerical Relay to be provided in addition to Numerical Relay for other protection as defined here.
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1	
5	DAE(O/G) / DAE-TIE	OUTGOING/ TIE BREAKER FEEDER OF RATING 630A & ABOVE		
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	4	
		NEUTRAL LINK	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 10A	2	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) (Applicable for DAE-TIE only) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (96) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THRESHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 4 NOs. (3-Ph for current protection and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1	
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1	

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5S, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
6	DM/PM/AM	BREAKER CONTROLLED MOTOR FEEDER RATED 90KW & ABOVE (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1		
		CONTROL MCB	5		
		NEUTRAL LINK	1		
		INDICATING LAMP	3		
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5S, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1		
		DIGITAL AMMETER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
		POWER TERMINALS	As required		
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF BREAKER MOTOR FDR, 10A, 240V AC	1		
		220 V DC DP MCB 6A	4		
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1		
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1		
		LIMIT SWITCH	2		
		AUXILIARY CONTACTOR 2NO+2NC WITH ADD-ON BLOCK 1NO+1NC, COIL VOLTAGE:- 220V DC	1		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STALLING/ LOCKED ROTOR PROTECTION (50L/R) • THERMAL OVERLOAD PROTECTION (49) • NEGATIVE PHASE SEQUENCE PROTECTION (46) • BUS NO VOLT • REPETATIVE START PROTECTION (66) • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • CIRCUIT BREAKER FAILURE (50BF) • PHASE REVERSAL PROTECTION (46R) • MOTOR START MONITORING & RESTART INHIBIT FEATURE • VT FUSE-FAIL PROTECTION (60) • CURRENT UNBALANCE PROTECTION • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANSFORMER SUPERVISION • VOLTAGE TRANSFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF, H, 27U) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THRESHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 4 NOS. (3-Ph for current protection, and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOS. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1		
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1		
7	G1	BUS PT MODULE FOR PCC/ PMCC			
		TRIPLE POLE MCCB	1		
		4 POLE MCB	1		
		NEUTRAL LINK	2		
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 50 VA CL-0.5, INSL CL-E OR BETTER	3		
		CONTROL TERMINALS (FIXED)	As required		
8	G2	BUS PT MODULE FOR EMERGENCY MCC			
		TRIPLE POLE MCCB	1		
		4 POLE MCB	1		
		NEUTRAL LINK	2		
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 50 VA CL-0.5, INSL CL-E OR BETTER	3		
		CONTROL TERMINALS (FIXED)	As required		
9	VM	BUS PT MODULE FOR MCC/ ACDB			
		MCCB WITH 1NO+1NC AUX. CONTACT	3		
		CONTROL DP MCB	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 415 V AC	1		
		AC VOLTMETER (0-500V)	1		
		VOLTMETER SELECTOR SWITCH	1		
		VOLTAGE TRANSDUCER (AC), 4-20 mA, DUAL O/P	1		
		CONTROL TERMINALS (FIXED)	As required		
10	CS	EACH CONTROL SUPPLY MODULE			
		MCCB	2		
		CONTROL MCB	4		
		NEUTRAL LINK	6		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC (AS AC MONITORING RELAY)	4		
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/110V, INS. CL-B OR BETTER	2		
		2 POLE, 2 POSI., SELECTOR SWITCH FOR CONTROL TRF., 110V AC	2		
		CONTROL TERMINALS (FIXED)	As required		
11	DB	220V/ 48V DC INCOMER OF DCDB FROM BATTERY			
		DC AMMETER WITH SHUNT AND CENTER ZERO	1		
		CONTROL TERMINALS (FIXED)	As required		
12	DC	220V/ 48V DC BUS COUPLER (NORMALLY CLOSED)			
		250V DC ISOLATING SWITCH WITH 2NO+2NC AUXILIARY CONTACTS	1		
		CONTROL TERMINALS (FIXED)	As required		
13	CH	220V/ 48V DC INCOMER OF DCDB FROM CHARGER			
		MCCB -A TP, 1C/O AUX. CONTACT & EXTENDED ROTARY HANDLE	1		
		CONTROL TERMINALS (FIXED)	As required		
14	HD	220V/ 48V DC BUS COUPLER (NORMALLY OPEN)			
		TP, 250V DC ISOLATING SWITCH WITH 2NO+2NC AUXILIARY CONTACTS	1		
		LINK/ ISOLATION (FOR SWITCHYARD)	1		
		CONTROL TERMINALS (FIXED)	As required		
NOTE: MODULE TYPE HD SHALL HAVE KEY INTERLOCK WITH MODULE TYPE DC ON BOTH SECTION IN SUCH A WAY THAT WHEN SWITCH 'HD' IS IN OPEN CONDITION THE KEY SHALL BE TRAPPED. ON CLOSING MODULE 'HD' THE KEY SHALL BE RELEASED. MODULE TYPE DC CAN ONLY BE OPENED ON INSERTING THE ABOVE KEY IN ANY ONE OF THE SECTION.					
15	S	220V/ 48V DCDB BUS MODULE FOR METERING & PROTECTION			
		250V DC MCCB	1		
		UNDERVOLTAGE RELAY (INSTANTANEOUS WITH SETTING OF 80% OF 220VDC. THE RESETTING OF RELAY SHOULD NOT BE MORE THAN 1.05)	1		
		OVERVOLTAGE RELAY (INSTANTANEOUS WHICH SHALL OPERATE AT 110% OF 220V DC. THE RESETTING SHOULD NOT BE LESS THAN .95)	1		
		EARTHFAULT RELAY (CAEM21 OR EQV.)	1		
		INDICATING LAMP	3		
		CONTROL MCB	2		
		NEUTRAL LINK	1		
		DC VOLTMETER (0-300V)	1		
		VOLTMETER SELECTOR SWITCH	1		
		VOLTAGE TRANSDUCER (DC), 4-20mA, DUAL O/P	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 220/48 V DC	2		
		PUSH BUTTON - SPRING RETURN WITH 1NO+1NC AUX. CONTACT	2		
		CONTROL TERMINALS (FIXED)	As required		
16	MCCB TYPE (X)	220V/ 48V DC OUTGOING FEEDER			
		250V DC DP MCCB	1		
		POWER TERMINALS	As required		
17	CC (I/C)	MCC/ ACDB INCOMER WITH CONTACTOR (FOR ONE OUT OF TWO LOGIC) OF RATING UP TO 400A			
		TP MCCB ADJ. O/L, S/C & E/F RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		CONTROL MCB 6A, 10KA	7		
		INDICATING LAMP	3		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		CONTROL TERMINALS (DRAWOUT)	As required		
18	E3 (I/C)	MCC/ ACDB INCOMER OF RATING UP TO 400A			
		TP MCCB ADJ. O/L & S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		NEUTRAL CT	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		MECHANICAL INTERLOCK	As required		
19	E3 (B/C)	MCC/ ACDB BUSCOUPLER OF RATING UP TO 400A			
		TP MCCB ADJ. O/L & S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		NEUTRAL CT	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		POWER TERMINALS	As required		
		MECHANICAL INTERLOCK	As required		
20(A)	E3 (O/G)	TPN AC OUTGOING MCCB OPERATED FEEDER FOR RATING UP TO 400A			
		TP MCCB ADJ. S/C & O/L RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
20(B)	E3-TP (O/G)	TP AC OUTGOING MCCB OPERATED FEEDER FOR RATING UP TO 400A (FOR 3PHASE, 3WIRE SYSTEM)			
		TP MCCB ADJ. S/C & O/L RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
21	E2	2 PHASE AC OUTGOING MCCB OPERATED FEEDER			
		DP MCCB ADJ. S/C & O/L RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
22	E1	SINGLE PHASE AC OUTGOING MCCB OPERATED FEEDER			
		DP MCCB ADJ. S/C & O/L RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
23	ES3	TPN AC OUTGOING FOR SOLAR, MCCB OPERATED FEEDER FOR RATING UP TO 400A			
		FP MCCB ADJ. S/C & O/L RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-0.5S, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (DRAWOUT)	As required		
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 25 VA CL-0.5, INSL CL-E OR BETTER	3		
		CONTROL 4P MCB 6A, 10KA	2		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		Multifunction 3 Phase digital Energy meter with RS485 Port (0.5S Acc. Class)	1		
24	DK2/PK2/AK2 OR DK2-H/PK2-H/AK2-H	UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		Applicable only for DK2-H/PK2-H/AK2-H Scheme.
25	DK21/PK21/ AK21 OR DK21-H/PK21-H/ AK21-H	UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	2		
		NEUTRAL LINK-16A	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		CURRENT TRANSFORMER , 5VA, CL-1, INSL CL-E OR BETTER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		Applicable only for DK21-H/PK21-H/ AK21-H Scheme.
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1		
26	DK2E/PK2E/AK2E OR DK2E-H/PK2E-H/AK2E-H	UNIDIRECTIONAL MOTOR FEEDER (REACCELERATION) BELOW 30KW (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status	1		

		TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002 Issue No: 00 Rev. No. 00 DATE: 02.09.2026	
TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.			
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		Applicable only for DK2E-H/PK2E-H/AK2E-H Scheme.
		POWER OFF DELAY TIMER	1		
27	DK21E/PK21E/ AK21E OR DK21E-H/PK21E-H/ AK21E-H	UNIDIRECTIONAL MOTOR FEEDER (REACCELERATION) RATED 30KW & BELOW 90KW (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	2		
		NEUTRAL LINK-16A	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CURRENT TRANSFORMER , 5VA, CL-1, INSL CL-E OR BETTER	1		
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		Applicable only for DDK21E-H/PK21E-H/ AK21E-H Scheme.
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1		
		POWER OFF DELAY TIMER	1		
28	K2	UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM LCP)			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
29	K21	UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM LCP)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	2		
		NEUTRAL LINK-16A	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1		
30	K3	UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM LPBS)			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
31	K31	UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM LPBS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy e) LED INDICATIONS i) Contoller healthy ii) Contoller fault iii) Contoller power supply healthy.			
		CONTROL MCB 6A, 10KA	2		
		NEUTRAL LINK-16A	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1		
32	DN1/PN1/AN1	BIDIRECTIONAL MOTOR FEEDER (CONTROLLED FROM DDCMIS/PLC/ATRS)			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2		
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Contoller healthy ii) Contoller fault iii) Contoller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	3		
		INDICATING LAMP	4		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	3		
33	EA3 OR EA3-H	3 PHASE MCCB CONTACTOR CONTROLLED FEEDER (CONTROLLED FROM DDCMIS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	Applicable only for EA3-H Scheme.	
34	EA1	1 PHASE MCCB CONTACTOR CONTROLLED FEEDER (CONTROLLED FROM DDCMIS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		
35	SHS	240V AC SPACE HEATER SUPPLY MODULE			
		CONTROL MCB	4		
		NEUTRAL LINK	4		
		POWER CONTACTOR(AC) COIL VOLTAGE 240V AC	1		
		4 POLE, 2 POSI., SELECTOR SWITCH	1		
		CONTROL TERMINALS (FIXED)	As required		
36	PNL SP HTR	PANEL SPACE HEATER AND PLUGS & SOCKETS (IN CABLE ALLEY OF EACH VERTICAL)			
		DP MCB	1		
		NEUTRAL LINK	1		
		SWITCH	1		
		THERMOSTAT 30-110 DEG C	1		
		SPACE HEATER 60W, 240V AC	1		
		3 PIN INDUSTRIAL SOCKET & PLUG	1		
		DOOR SWITCH	1		
		LED LAMP	1		
		CONTROL TERMINALS (FIXED)	As required		
37	RM1	RAPPING MOTOR FEEDER WITH IMC			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		2 POLE, 2 POSI., SELECTOR SWITCH (AUTO/ MANUAL), 110V AC	1		
		PUSH BUTTON	2		
		CONTROL TERMINALS (DRAWOUT)	As required		
38	RM2	RAPPING MOTOR FEEDER WITH OLR			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		OVERLOAD RELAY BUILT IN SPPR FEATURE 1NO+1NC	1		
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	1		
		RESET CORD ACTUATOR	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		2 POLE, 2 POSI., SELECTOR SWITCH (AUTO/ MANUAL), 110V AC	1		
		PUSH BUTTON	2		
		CONTROL TERMINALS (DRAWOUT)	As required		
39	DDM	DUST DENSITY MONITOR FEEDER			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2		

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TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: a) PROTECTION FUNCTIONS i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running b) CONTROL FUNCTIONS i) Close / Trip Command ii) Reversing starter c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset d) OPERATING AND DIAGNOSTICS DATA The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence e) LED INDICATIONS i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	2		
		CONTROL MCB 6A, 10KA	2		
		NEUTRAL LINK-16A	2		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	5		
		ROTARY ON/OFF SWITCH	1		
		CONTROL TERMINALS (DRAWOUT)	As required		
40	HH	HOPPER HEATER FEEDER			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	2		
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3		
		AC AMMETER	1		
		AMMETER SELECTOR SWITCH	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (DRAWOUT)	As required		
41	HS	SHAFT INSULATOR HEATER FEEDER			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		INDICATING LAMP	2		
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3		
		AC AMMETER	1		
		AMMETER SELECTOR SWITCH	1		
		ROTARY ON/OFF SWITCH	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (DRAWOUT)	As required		
42	HI	SUPPORT INSULATOR HEATER FEEDER			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		INDICATING LAMP	2		
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3		
		AC AMMETER	1		
		AMMETER SELECTOR SWITCH	1		
		ROTARY ON/OFF SWITCH	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (DRAWOUT)	As required		
43	ALI(H)	ASH LEVEL INDICATOR (HIGH) FEEDER			

		TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002 Issue No: 00 Rev. No. 00 DATE: 02.09.2026	
TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	10		
		INDICATING LAMP	11		
		TIMER WITH 2C/O	10		
		PUSH BUTTON WITH 1NC	1		
		DOUBLE POLE ON/OFF SWITCH, 32 A, 110 V AC	1		
		CONTROL TERMINALS (FIXED)	As required		
44	ALI(L)	ASH LEVEL INDICATOR (LOW) FEEDER			
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	10		
		INDICATING LAMP	11		
		TIMER WITH 2C/O	10		
		PUSH BUTTON WITH 1NC	1		
		DOUBLE POLE ON/OFF SWITCH, 32 A, 110 V AC	1		
		CONTROL TERMINALS (FIXED)	As required		
45	ARECA	ARECA MARSHALING MODULE FEEDER			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/24V, INS. CL-B OR BETTER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
46	WLT	WAVE LEVEL TRANSMITTER FEEDER			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/24V, INS. CL-B OR BETTER	1		
		RECTIFIER	1		
		CT SHORTING TERMINAL - STUD TYPE	As required		
		CONTROL TERMINALS (FIXED)	As required		
47	MM	MARSHALING MODULE FOR SSPB OF RAPPING MOTOR AND HOPPER HEATER FEEDBACK			
		CONTROL TERMINALS (FIXED)	As required		
48	WB	WALL BLOWER FEEDER			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	3		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2		
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC	2		
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	2		
		RESET CORD ACTUATOR	2		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		Note: Further for details of Wall Blower feeder refer SBMCC Drawing.			
49	LR	LR BLOWER FEEDER			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	3		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2		
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC	2		
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	2		
		RESET CORD ACTUATOR	2		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		Note: Further for details of LR Blower feeder refer SBMCC Drawing (Annexure- 5).			
50	AH	AH BLOWER FEEDER			
		TP MPCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MPCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2		
		OVERLOAD RELAY,BUILT IN SPFR FEATURE 1NO+1NC	1		
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	1		
		RESET CORD ACTUATOR	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		Note: Further for details of AH Blower feeder refer SBMCC Drawing (Annexure- 5).			
51	JAMMING RELAY MODULE	JAMMING RELAY FOR SOOT BLOWER MCC			
		CURRENT TRANSFORMER, CLASS-5P20, -- VA	1		
		CT DISCONNECTING TERMINAL S	4		

		TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE-II (2X800MW)		PE-TS-519-506-E002 Issue No: 00 Rev. No. 00 DATE: 02.09.2026	
TECHNICAL DATA PART - A					
ANNEXURE-A.2					
MODULE WISE BOM					
		MCB DP 6A, C CURVE, 10kA BC	1		
		ELECTRONIC TYPE JAMMING RELAY OCR	1		
		CONTROL TERMINAL SUITABLE UPTO 2.5 Sq.mm WIRE	As required		
52	WTS1	WIRELESS TEMPERATURE SENSOR (WTS1) MODULE (IN ONE ACB/PCC PANEL WITH SINGLE ACB)			
		TEMPERATURE SENSORS	1		Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required		
		RECEIVER	As required		
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required		
53	WTS2	WIRELESS TEMPERATURE SENSOR (WTS2) MODULE (IN ONE ACB/PCC PANEL WITH DOUBLE ACB)			
		TEMPERATURE SENSORS	1		Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required		
		RECEIVER	As required		
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required		
54	WTS3	WIRELESS TEMPERATURE SENSOR (WTS3) MODULE (IN ONE MCC PANEL)			
		TEMPERATURE SENSORS	1		Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required		
		RECEIVER	As required		
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required		
55	ALARM MODULE	ALARM MODULE -			
		CONTROL MCB 6A - 1	1		
		9 WINDOWS ALARM ANNUNCIATION -1	1		
		ELECTRONIC HOOTER (96SQMM) - 1	1		
		TEST/ACCEPT/RESET PB WITH 1 NO CONTACT - TOTAL 3	3		
		TERMINALS (FIXED) - AS REQUIRED	As required		Quantity shall be finalised during detailed engineering
56	ET3	3 PHASE MCCB CONTACTOR CONTROLLED FEEDER WITHOUT IMC (CONTROLLED FROM DDCMIS)			
		TP MCCB ADJ. S/C RELEASE	1		
		EXTENDED ROTARY HANDLE	1		
		AUXILIARY CONTACT FOR MCCB 1C/O	1		
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1		
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1		
		CONTROL MCB 6A, 10KA	1		
		NEUTRAL LINK-16A	1		
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2		
		INDICATING LAMP	3		
		CONTROL TERMINALS (DRAWOUT)	As required		
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2		

Technical Data - Part - B

CLAUSE NO.	SUPPLIER SPECIFIC INFORMATION (To be filled by Supplier)
1.00.00	LT Switchgears SWITCHGEAR & MCC a) General i) Manufacturer's Name ii) Type designation iii) Country of origin b) Rated voltage c) Symmetrical short circuit withstand current at rated voltage of switchgear /MCC cubicle. d) Peak short circuit withstand current e) Rated current at ambient f) Degree of protection as per IS:13947 i) Breaker / MCC cubicles ii) Busbar chamber g) Cubicle sheet metal details i) Cold rolled / hot rolled ii) Thickness, structural & load bearing members iii) Thickness, front & rear iv) Thickness, Sides & top v) Thickness of gland plates h) Painting shade & Thickness as per IS :5 i) External surfaces(front & rear) ii) Extreme end covers i) Minimum Clearance in air for Busbars i) Between phases ii) Between phase & earth j) Standard height, width & depth of typical panel i) Circuit breaker panel ii) MCC panels (S.F./D.F.)

CLAUSE NO.	DATA REQUIREMENTS
	iii) Circuit breaker panel with Bus trunking /Bus Duct Termination iv) ACDB/DCDB v) AC/DC Fuse boards k) Width of cable alley l) Shrouding arrangement in cable alley provided or not YES/NO m) Earth busbar size & material n) Approx. Weight of one panel With circuit breaker o) Recommended dynamic loading for foundation design p) Approx. weight of one MCC panel q) Form of Internal Separation as per IEC-61439-2
2.00.00	POWER BUSBARS & INSULATORS
	a) Material & applicable standards b) Bare/painted / epoxy insulated/sleeved c) Continuous current rating at an ambient temp. of 50°C d) Temperature rise over design ambient temperature for continuous current rating deg. C e) Material of the support insulators f) One second current rating (kA)
3.00.00	CONTROL SUPPLY TRANSFORMER
	a) Make b) Type c) Material & class of insulation d) Voltage rating & taps e) Continuous rating (VA)
4.00.00	CIRCUIT BREAKER
	a) Manufacturer's name and country of manufacturer b) Manufacture's type and designation c) Rated Voltage d) Rated operating duty

CLAUSE NO.	DATA REQUIREMENTS
	e) Design ambient temperature f) Rated current at design ambient temperature g) Derating factor for site operating conditions inside panel h) Continuous current at ambient temp. i) Rated symmetrical breaking current j) Rated peak making current k) Rated short time rating (for 1 sec.) l) Rated peak momentary rating m) Number of openings, the circuit breaker is capable of performing without inspection, replacement of contacts or other parts at 100% rated breaking current n) No. of breaker auxiliary contacts provided on fixed portion of breaker & their rating o) Trip free and anti pumping features have been provided (Furnish description) YES/NO p) Power operating mechanism q) Spring charging motor details i) Type ii) Rating Watts iii) Rated voltage iv) Class of insulation v) Time for fully charging the closing spring r) Emergency Manual charging facility provided YES/NO s) Limits of voltage for satisfactory operation of the following devices as percentage of normal voltage i) Motor ii) Closing coil iii) Tripping coil t) Manual operating mechanism u) i) Type of Releases provided ii) Available range of following parameters for each type of release offered

CLAUSE NO.	DATA REQUIREMENTS
	v) i) Maximum Tripping Time ii) Maximum Closing time w) i) Closing coil VA ii) Tripping coil VA x) Telescopic trolley i) Make ii) Type designation iii) Dimensions
5.00.00	AIR BREAK SWITCHES (The following details shall be furnished for each type & rating) a) Make b) Type c) Applicable standards d) Rated current at design ambient temperature (Amps) e) Design ambient temperature Deg C f) Rated breaking current (kA) g) Maximum through fault current withstand kA h) Door interlock as specified has been provided ? YES/NO i) No. of auxiliary contacts and its rating
6.00.00	CONTROL/SELECTOR SWITCH a) Make b) Type Designation c) Voltage grade
7.00.00	CONTACTOR (The following details shall be furnished for each type and rating) a) Make b) Type & applicable standards c) Rated voltage of main and auxiliary contacts

CLAUSE NO.	DATA REQUIREMENTS
	d) Rated voltage of coils e) Limits of operation i) Supply voltage variation +/-% ii) Supply frequency variation for closing (+/-)% iii) Drop out voltage % f) Rated (thermal) current A g) Rated duty h) Rated utilisation category as per IS:13947 i) Rated breaking capacity kA j) Rated making capacity - kA k) Coil VA burden
8.00.00	AUXILIARY CONTACTOR
	a) Make b) Type c) Catalogue attached as Annexure No.
9.00.00	FUSES
	a) Make b) Type c) Category
10.00.00	CURRENT TRANSFORMERS
	(The following details shall be provided for each type & rating) a) Make b) Applicable standards c) Ratio d) VA Rating e) Accuracy class f) Class & type of insulation
11.00.00	VOLTAGE TRANSFORMERS

CLAUSE NO.	DATA REQUIREMENTS
	v) Monitoring Functions w) Control functions x) Detailed Technical Catalogue for offered Relays enclosed y) Spares and Repairs a) State availability of spares in country and spares holding in country of origin b) Maximum repair turnaround time c) Define the proposed repair strategy d) Recommended spares list z) List of reference sites in operation for more than 1 year
13.00.00	THERMAL OVERLOAD RELAY & SINGLE PHASING PREVENTER (The following details shall be furnished for each type & rating) a) Make & type designation b) Catalogue
14.00.00	VOLTMETER a) Make b) Type c) Catalogue
15.00.00	AMMETER a) Make b) Type c) Catalogue
16.00.00	PUSH BUTTONS a) Make b) Type designation c) Catalogue
17.00.00	INDICATING LAMPS a) Make b) Type

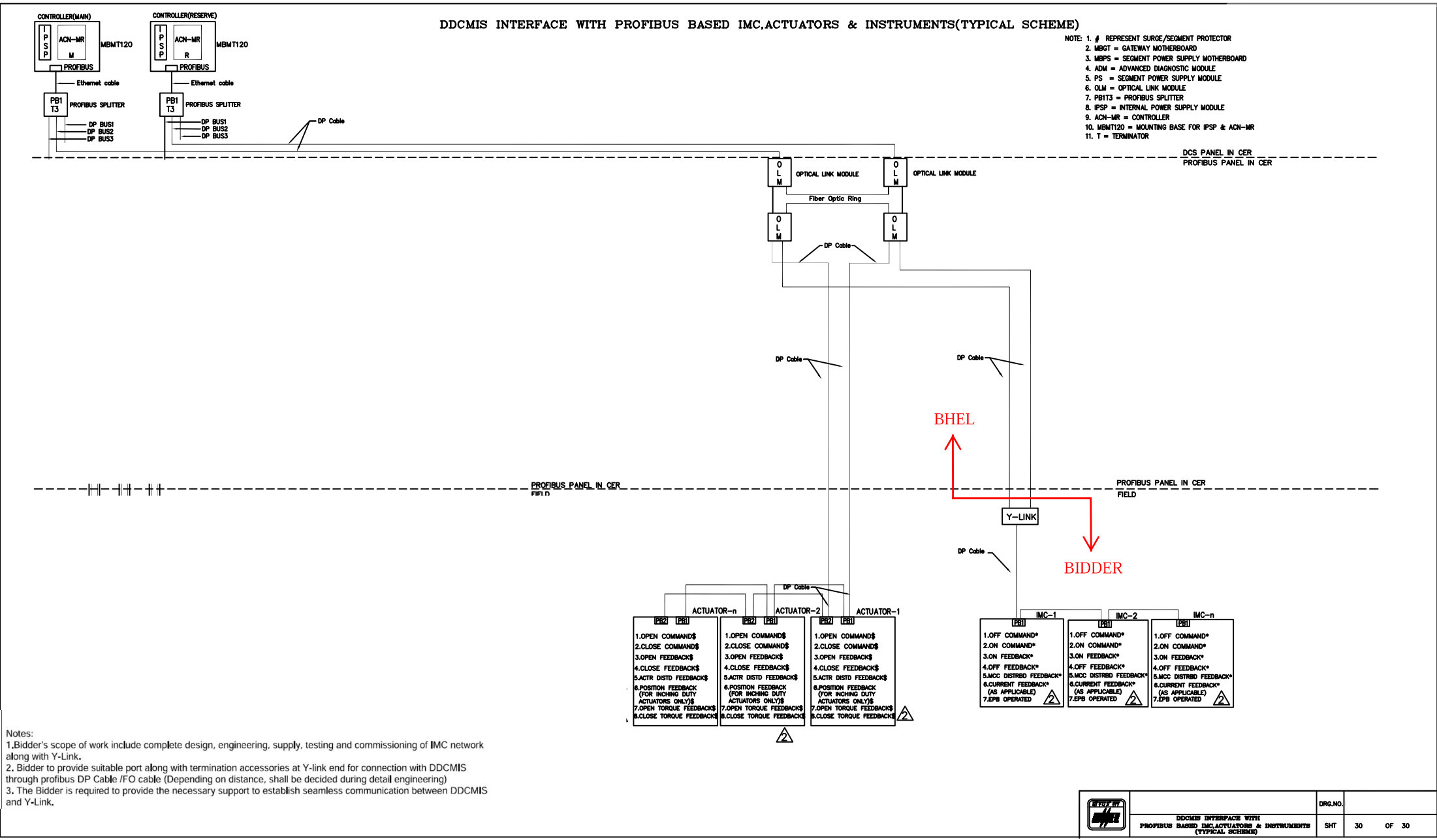
CLAUSE NO.	DATA REQUIREMENTS
	c) Catalogue

CLAUSE NO.	DATA REQUIREMENTS
21.00.00	MCCB a) Rated voltage b) Rated insulation level c) Rated ultimate &Service S.C.breaking capacity d) Rated making capacity e) Utilization category 22.00.00 Ethernet switches (For Networking of Numerical Relays) a) Compliance to IEC 61850 b) No of Ports c) Power supply to Ethernet Switches

	TECHNICAL SPECIFICATION LT SWITCHGEAR KODERMA THERMAL POWER STATION PHASE- II (2X800MW)	PE-TS-519-506-E002
		Issue No: 00
		Rev. No. 00
		02 September 2026

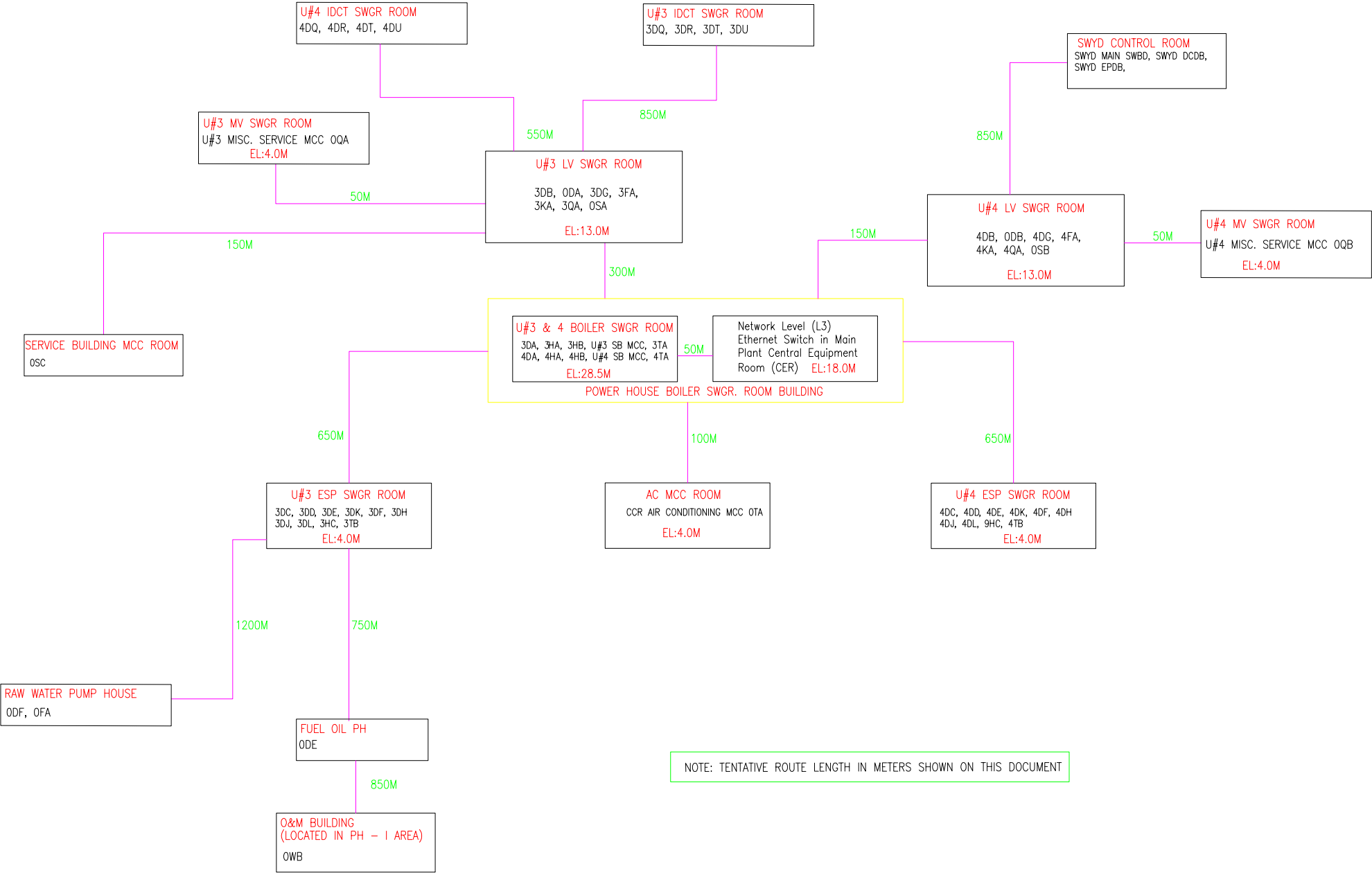
List of Compliance Drawings:

SL.NO	DESCRIPTION	REMARKS
1	Typical Switchgear Relay Network Architecture	Annexure-1
2	Typical IMC Network Architecture	Annexure-2
3	Tentative Switchboard location	Annexure-3
4	Tentative LV Switchgear Schemes	Annexure-4
5	Soot Blower MCC Scheme	Annexure-5



Notes:
1.Bidder's scope of work include complete design, engineering, supply, testing and commissioning of IMC network along with Y-Link.
2. Bidder to provide suitable port along with termination accessories at Y-link end for connection with DDCMIS through profibus DP Cable /FO cable (Depending on distance, shall be decided during detail engineering)
3. The Bidder is required to provide the necessary support to establish seamless communication between DDCMIS and Y-Link.

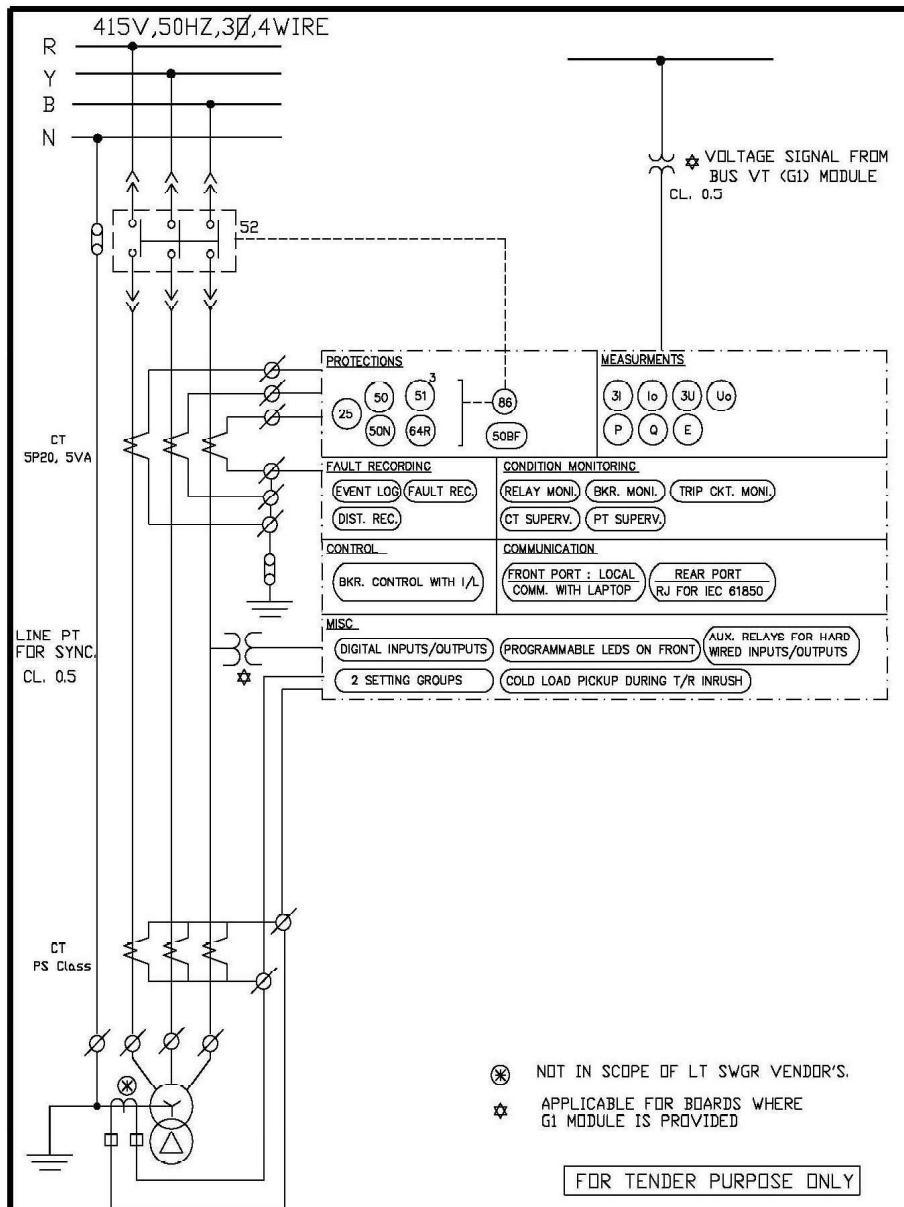
	DDCMIS INTERFACE WITH PROFIBUS BASED IMC,ACTUATORS & INSTRUMENTS (TYPICAL SCHEME)	DRG.NO.	
		SHT	30 OF 30



CLAUSE NO.	TECHNICAL REQUIREMENT																																																	
LEGEND DESCRIPTION 52 CIRCUIT BREAKER 42 CONTACTOR 5A SURGE ARRESTOR CURRENT TRANSFORMER CORE BALANCE CURRENT TRANSFORMER VOLTAGE TRANSFORMER 50 TRIPLE POLE IDMTL/DMT O/C PROTECTION 51 TRIPLE POLE INSTANTANEOUS O/C PROTECTION 50N IDMTL/DMT SENSITIVE/F PROTECTION 51N INSTANTANEOUS E/F PROTECTION 49 THREE PHASE THERMAL O/L PROT.N.WTH O/L ALARM & RESTART INHIBITE FUNCTION 4L/R STALLING/LOCKED ROTOR PROTECTION 4B THREE PHASE NEGATIVE PHASE SEQUENCE PROTECTION 36 NUMBER OF START LIMITATION /REPEATITIVE START PROTECTION 2 THE DELAY PROTECTION 50 FUSE FAILURE PROTECTION 57M 3 PHASE MOTOR DIFFERENTIAL PROTECTION 1 MCB 1B MPCB	LEGEND DESCRIPTION 64R RESTRICTED EARTH FAULT PROTECTION 51G STAND BY EARTH FAULT PROTECTION 87T 3 PHASE UNDER VOLTAGE TRANSFORMER DIFFERENTIAL PROTECTION 27M 3 PHASE UNDER VOLTAGE TRANSFORMER FOR MOTOR TRIPPING 27L 3 PHASE BUS UNDER VOLTAGE 27N NO VOLT PROTECTION FOR BUS 60BF CIRCUIT BREAKER FAILURE PROTECTION 8B LOCKOUT FUNCTION 3I 3 PHASE CURRENT MEASUREMENT IN NEUTRAL CURRENT MEASUREMENT 3U 3 PHASE VOLTAGE MEASUREMENT Uo RESIDUAL VOLTAGE MEASUREMENT P ACTIVE POWER MEASUREMENT Q REACTIVE POWER MEASUREMENT E ENERGY MEASUREMENT PF POWER FACTOR MEASUREMENT Hz FREQUENCY MEASUREMENT HM HOUR RUN METER 1 MCCB																																																	
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="5" style="text-align: center;">CLEARED BY</td> <td colspan="2" style="text-align: center;">PROJECT</td> </tr> <tr> <td style="width: 10%;">C</td> <td style="width: 10%;">E</td> <td style="width: 10%;">H</td> <td style="width: 10%;">C&I</td> <td style="width: 10%;">ES</td> <td colspan="2" style="text-align: center; vertical-align: middle;">STANDARD</td> </tr> <tr> <td colspan="5"></td> <td colspan="2" style="text-align: center;">TITLE</td> </tr> <tr> <td colspan="5"></td> <td colspan="2" style="text-align: center;">LEGEND DETAIL</td> </tr> <tr> <td>DRN</td> <td>DGN</td> <td>CHKD</td> <td>APPD</td> <td>DATE</td> <td>SCALE</td> <td>DRAWING No.</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>18/05/18</td> <td></td> <td>0000-206-PDE-A-003</td> </tr> <tr> <td colspan="6"></td> <td>REV. A</td> </tr> </table>		CLEARED BY					PROJECT		C	E	H	C&I	ES	STANDARD							TITLE							LEGEND DETAIL		DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.					18/05/18		0000-206-PDE-A-003							REV. A
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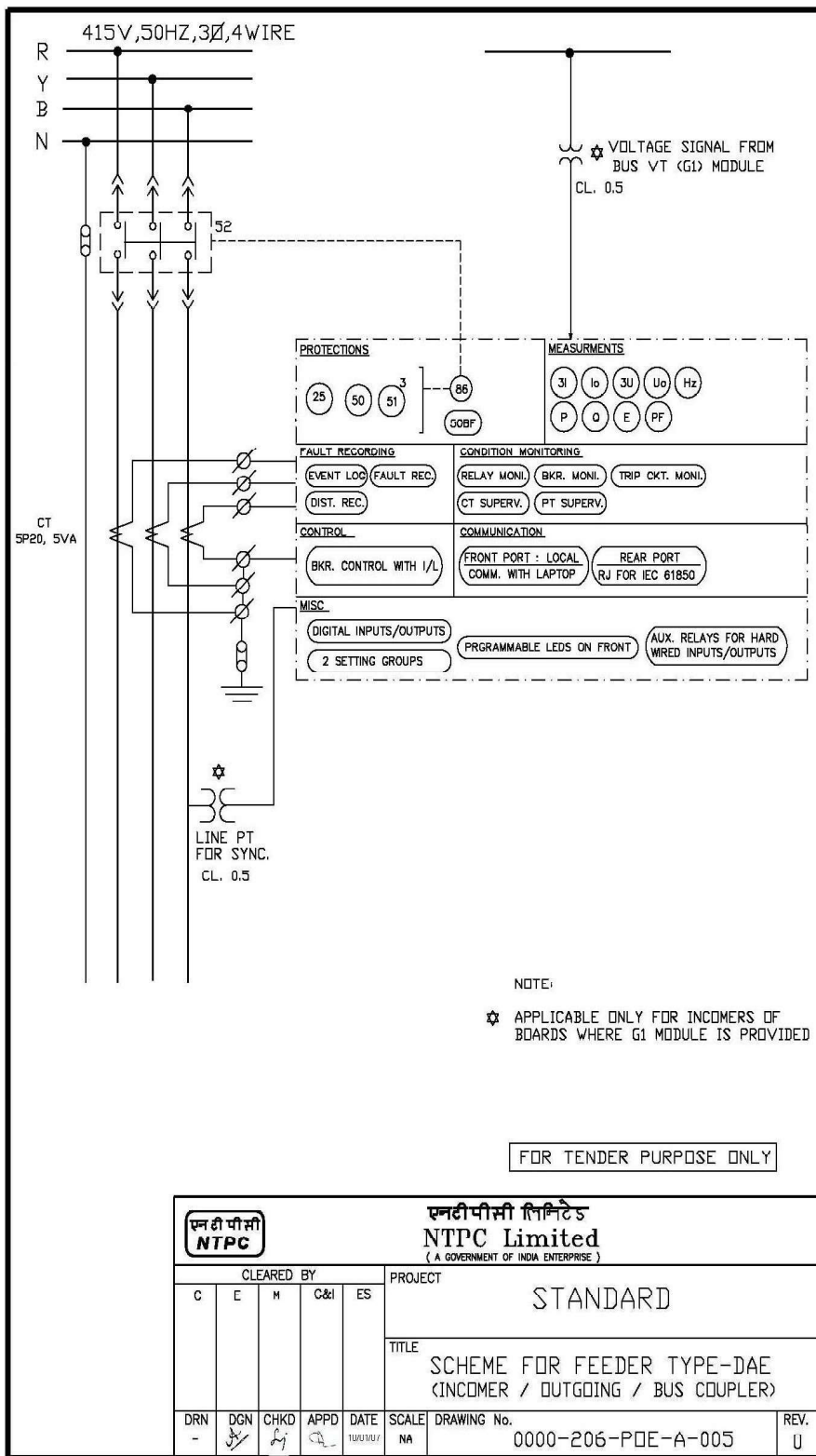
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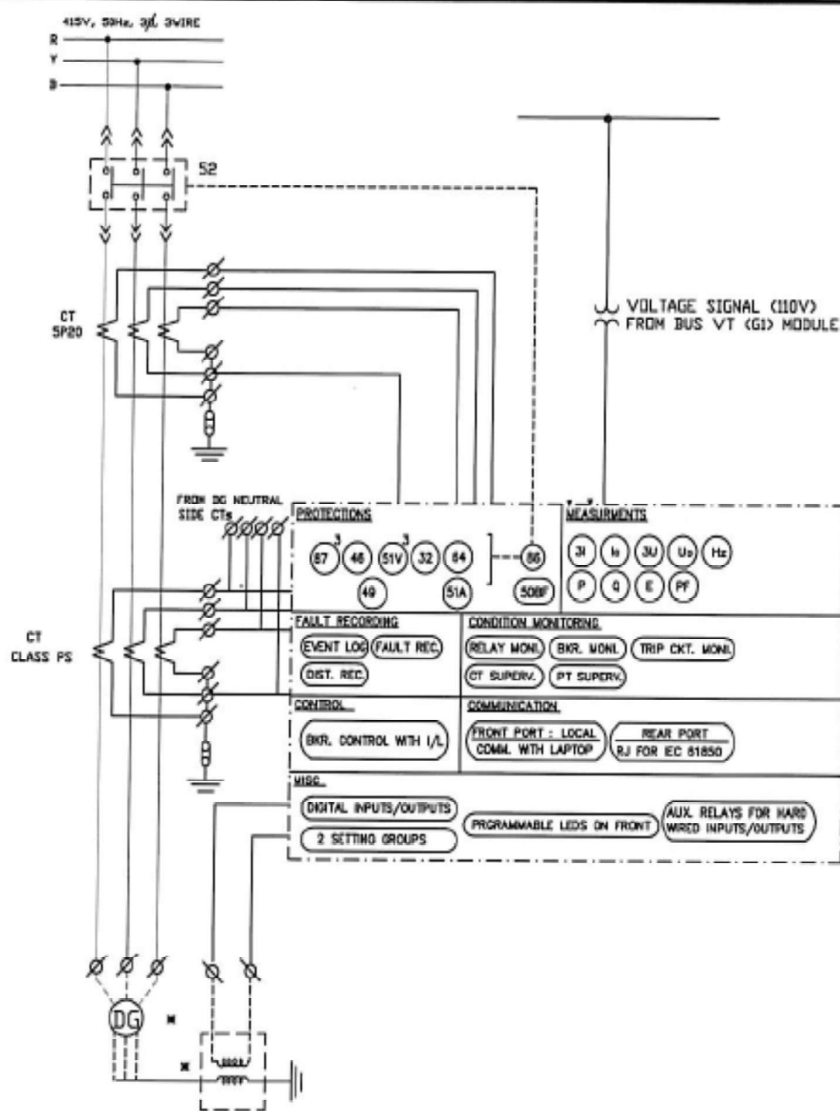
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TITLE					SCHEME FOR FEEDER TYPE-DAET (INCOMER FROM TRANSFORMER)				
DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.			REV.
-				10/01/2017	NA	0000-206-POE-A-004			0

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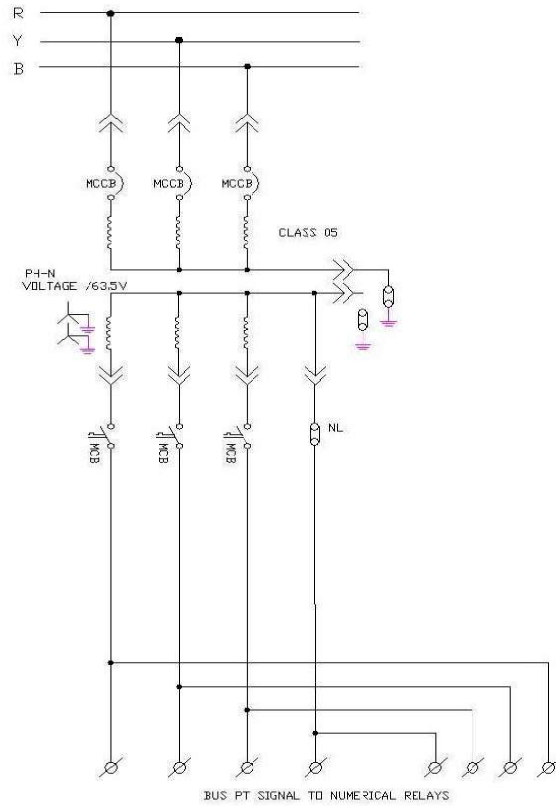
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TITLE SCHEME FOR FEEDER TYPE-DG (INCORNER FROM DG)		DRAWING No. 0000-206-PDE-A-006	
DRN -	DGN <i>raj</i>	GHKD <i>W</i>	APPD <i>W</i>
DATE 27/4/17	SCALE NA	REV. 0	DRAWING No. 0000-206-PDE-A-006

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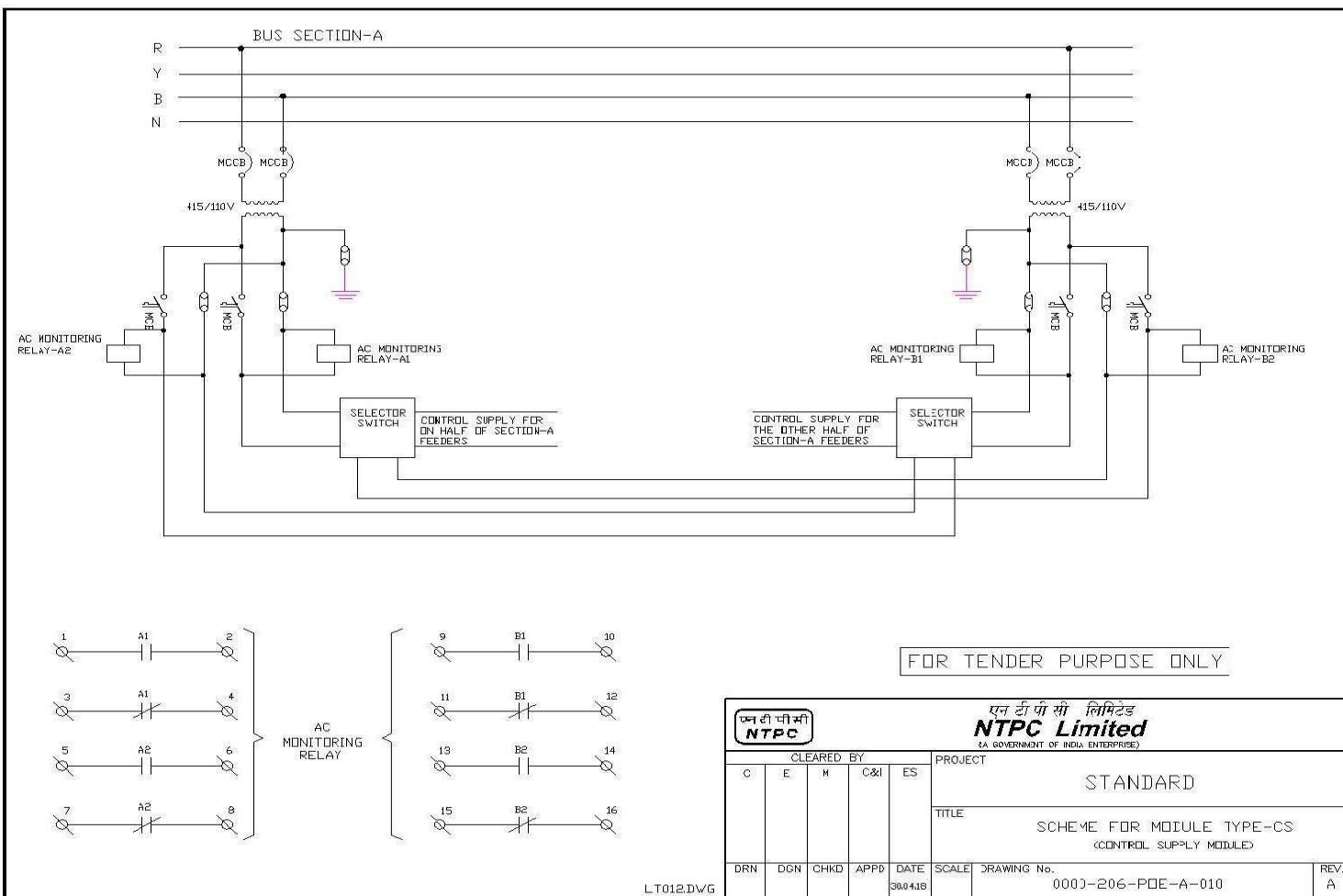
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TITLE	SCHEME FOR MODLLE TYPE-G1 (BUS PT)																	
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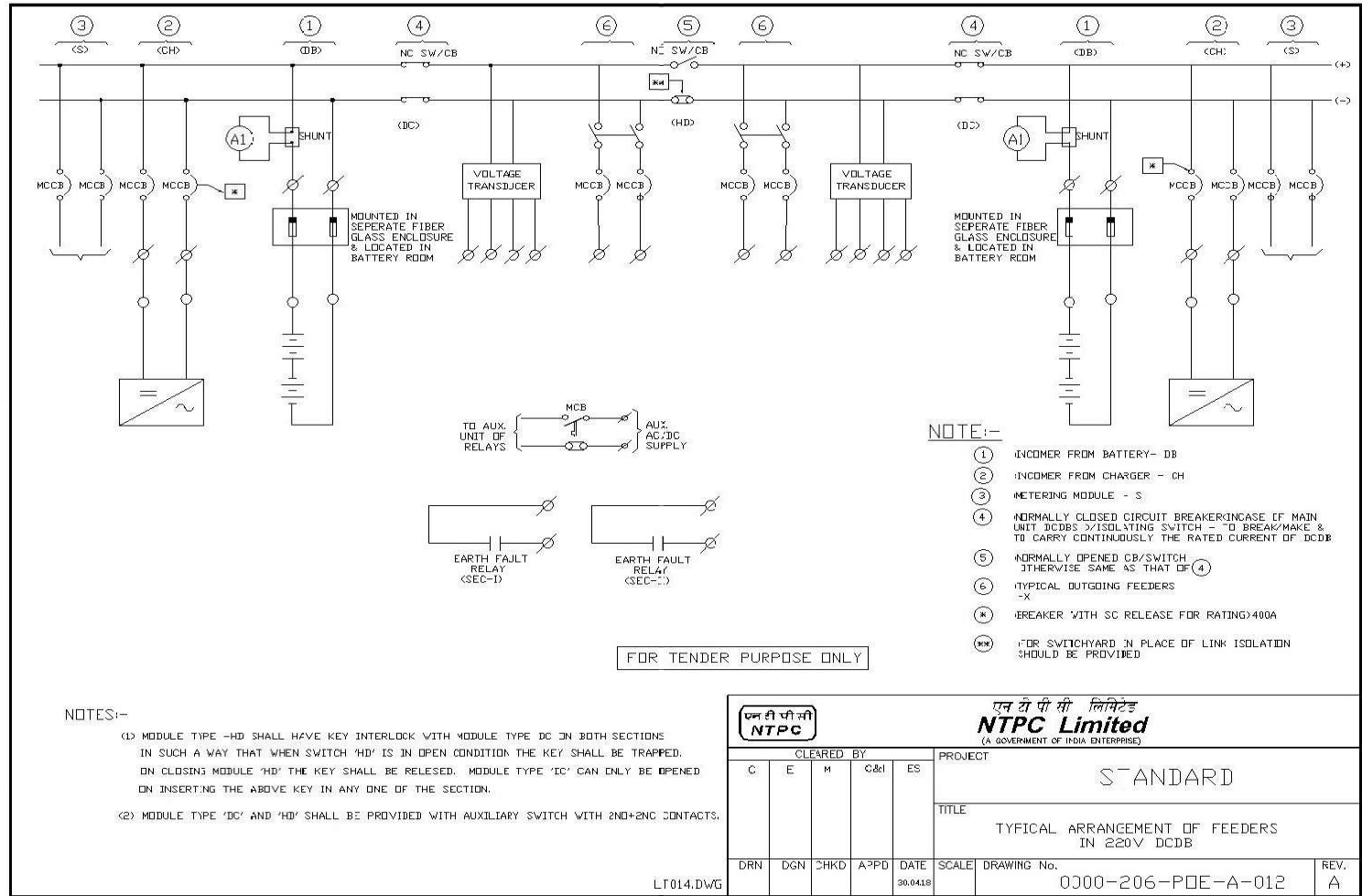
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C I N C&I ES	STANDARD
TITLE	Scheme for Module Type-IN1 (REVERSIBLE MOTOR)
DRN DGN CHKD APPD DATE 25.06.19	SCALE DRAWING No. 0000-206-PDE-A-019
	REV. A

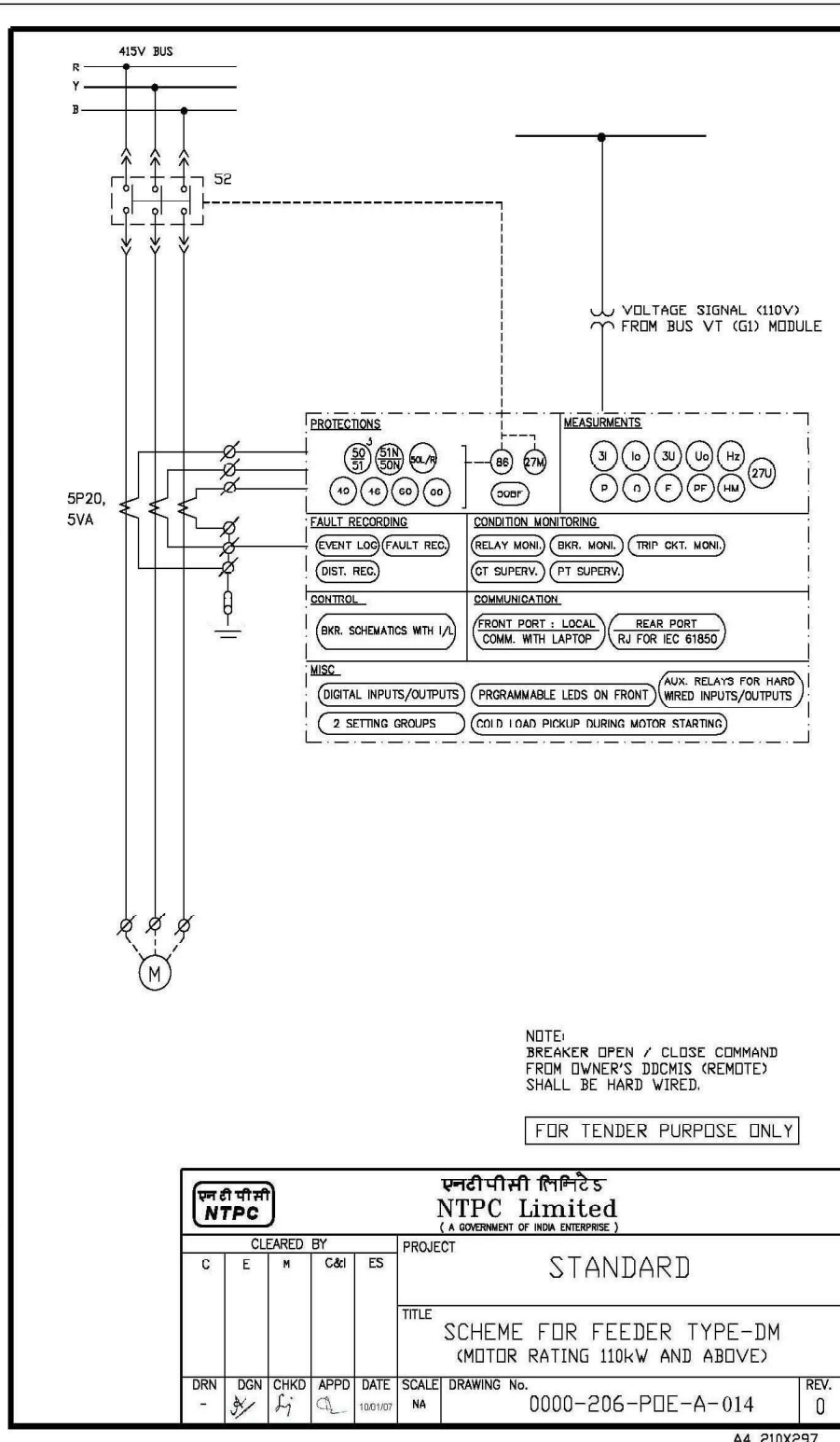
NOTES:-

- MOTOR SHALL BE CONTROLLED FROM DCS/PIC THROUGH MC ON PROFIBUS PROTOCOL COMMUNICATION.
- EPB WIRING FROM FELD TO MC INPUT AND CONTACTOR CONTROL HARDWIRED CKT TO BE DONE.

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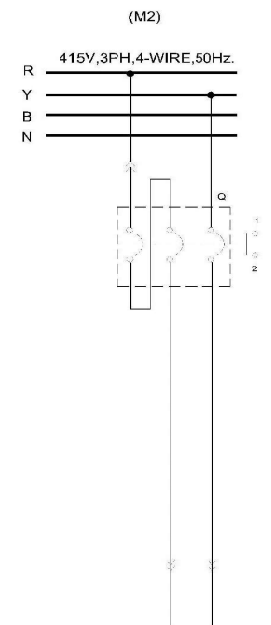
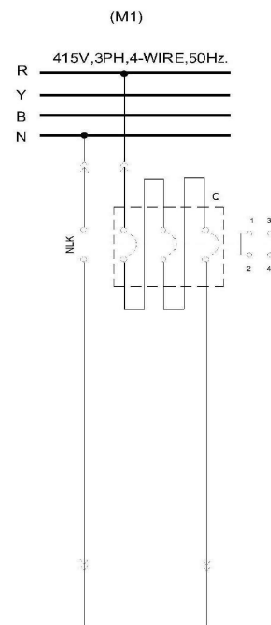
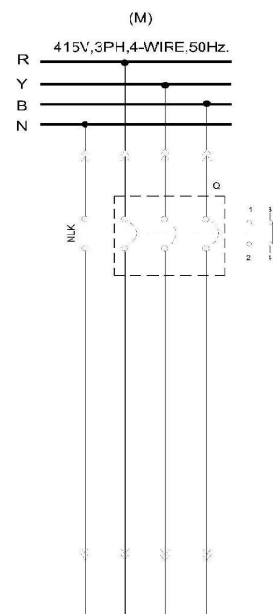


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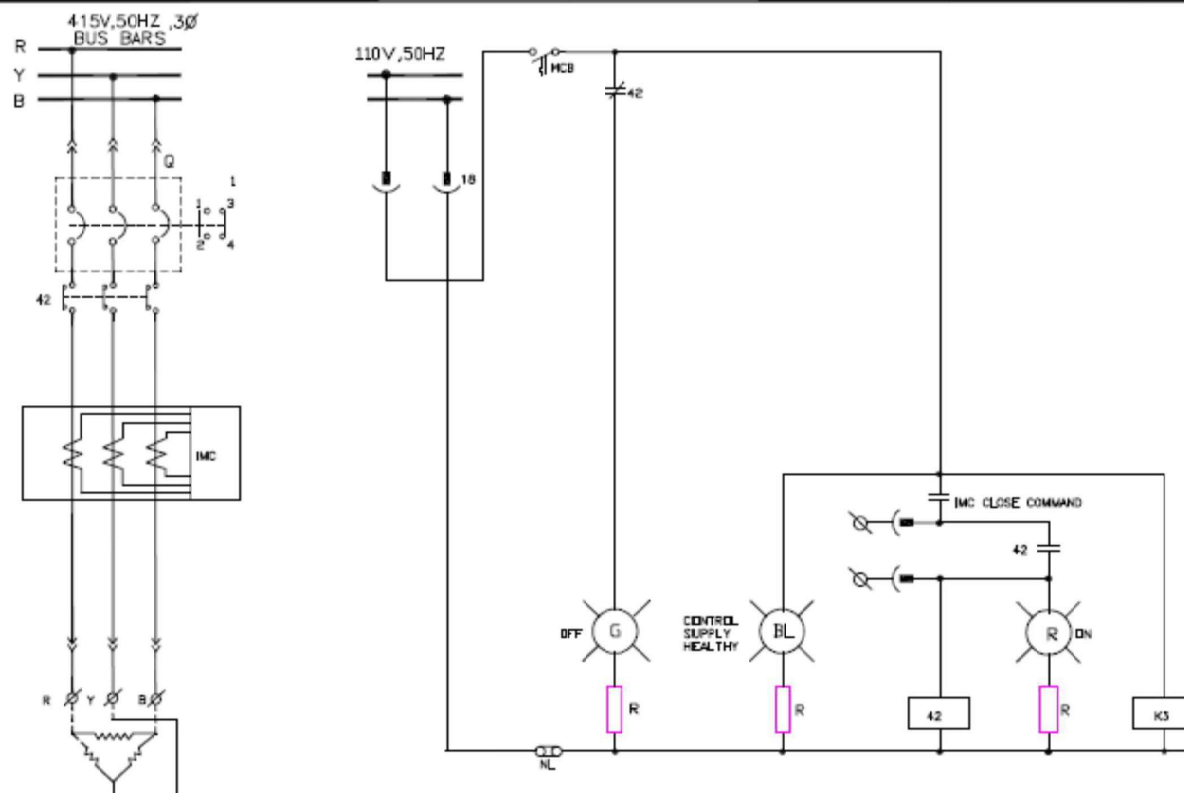
FOR TENDER PURPOSE ONLY

				एन टी पी सी लिमिटेड NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)			
CLEARED BY				PROJECT			
C	E	M	C&I	STANDARD			
TITLE				TYPICAL SCHEMATIC FOR MM1/M2			
DRN	DGV	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				18.05.18		000C-206-POE-A-018	A

LT016.DWG

A3 420X287

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LEGEND

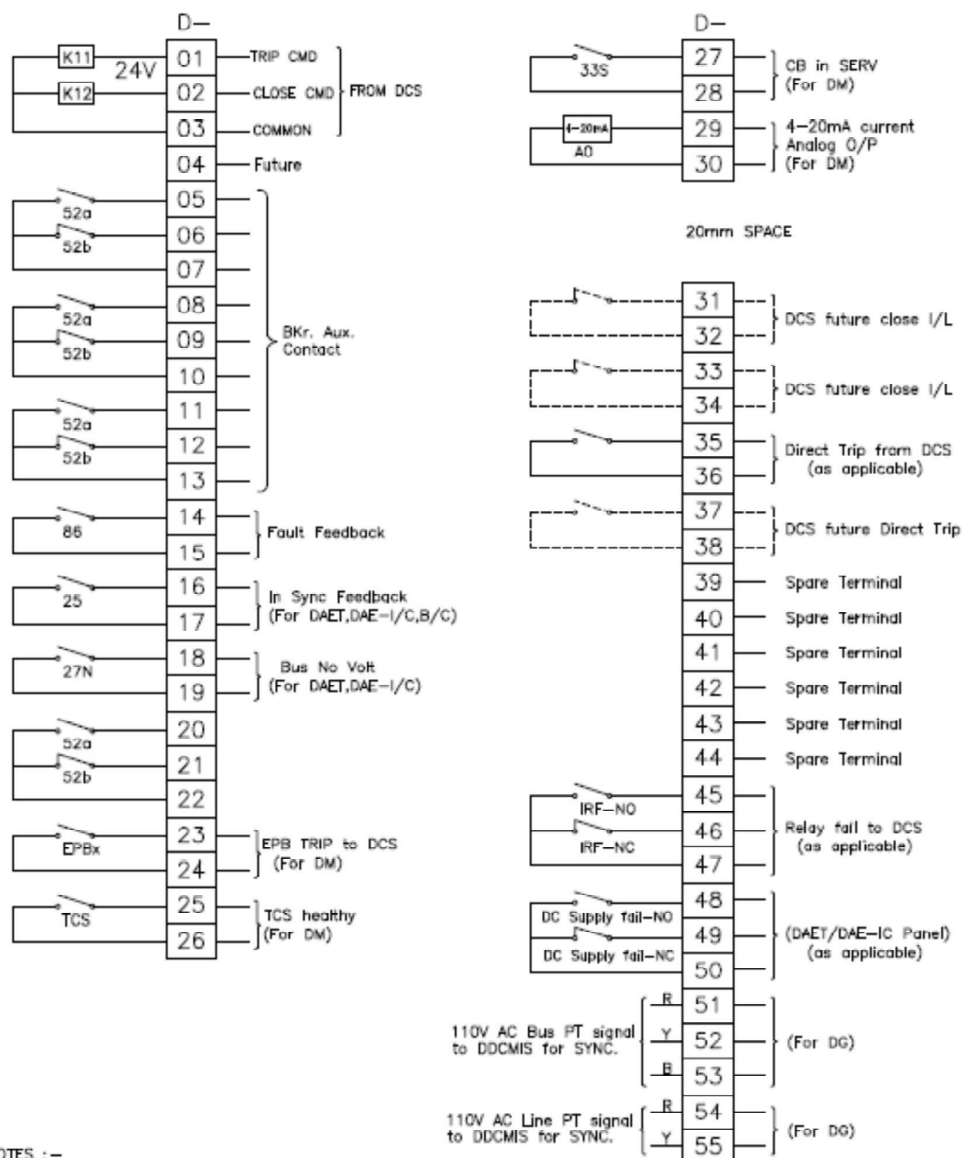
-  POWER DRAW OUT CONTACT
 CONTROL DRAW OUT CONTACT
 FIXED TERMINAL ON MCC

NOTES:-

1. HEATER SHALL BE CONTROLLED FROM DCS/PLC THROUGH MC ON PROFIBUS PROTOCOL COMMUNICATION.

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(CLEARED) BY					PROJECT				
C	E	M	C&I	ES	STANDARD				
					TITLE				
					SCHEME FOR MODULE TYPE-HTR (CONTRACTOR CONTROLLED HEATER)				
DRN	OGN	CHKD	APPD	DATE 25.06.19	SCALE	DRAWING No.			REV A
						0000-206-PDE-A-021			

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NOTES :-

1. 52a & 52b shown above are breaker aux. contacts when breaker is in Service position.
2. If any signal (except 52a & 52b signals, future & Spare terminals marked) is not applicable for a module type, associated terminals/terminal nos. may be absent in the panel.
3. If any new signal not covered in this list is required to be wired to DCS during detail engg, new terminal nos as per above philosophy shall be assigned.

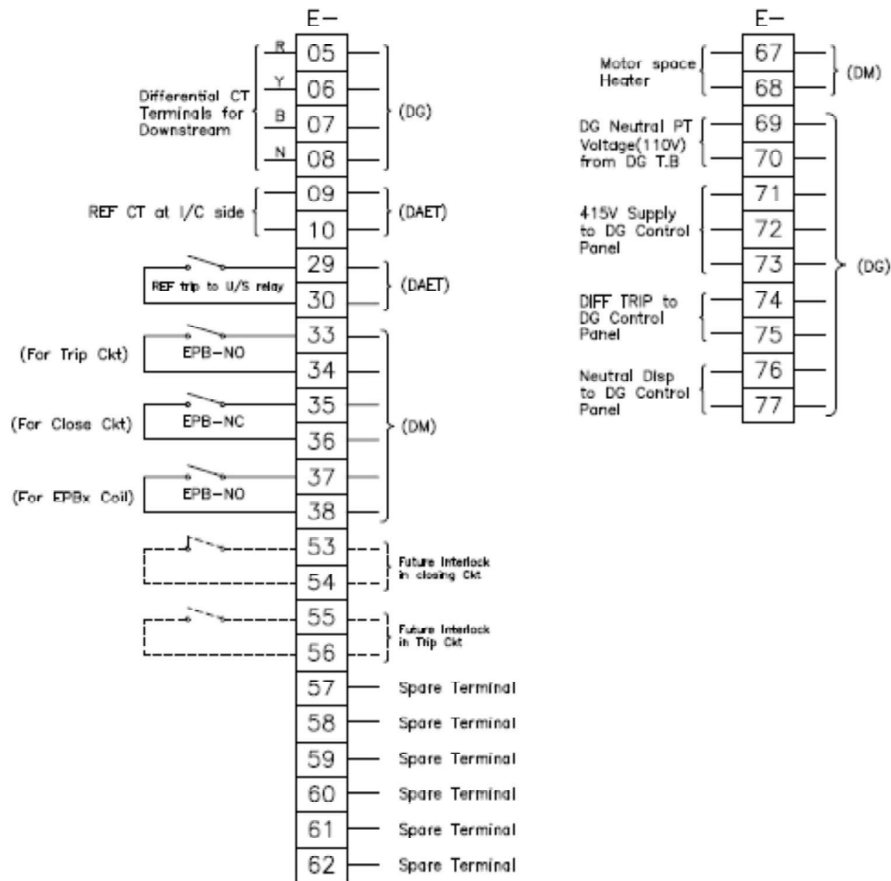
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NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

CLEARED BY					PROJECT	
C	E	M	CM	ES	STANDARD	
					TITLE	
					STANDARD "D" TERMINALS (FOR CABLING BETWEEN SWGR & DCS) FOR LT SWGR	
DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.
-				20.06.19	NA	0000-206-POE-A-022
						REV. A

A4 210X297

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NOTES :-

- 52a & 52b shown above are breaker aux. contacts when breaker is in Service position.
- If any signal (except 52a & 52b signals, future & Spare terminals marked) is not applicable for a module type, associated terminals/terminal nos. may be absent in the panel.
- If any new signal not covered in this list is required to be wired to any other external equipment during detail engg, new terminal nos as per above philosophy shall be assigned.

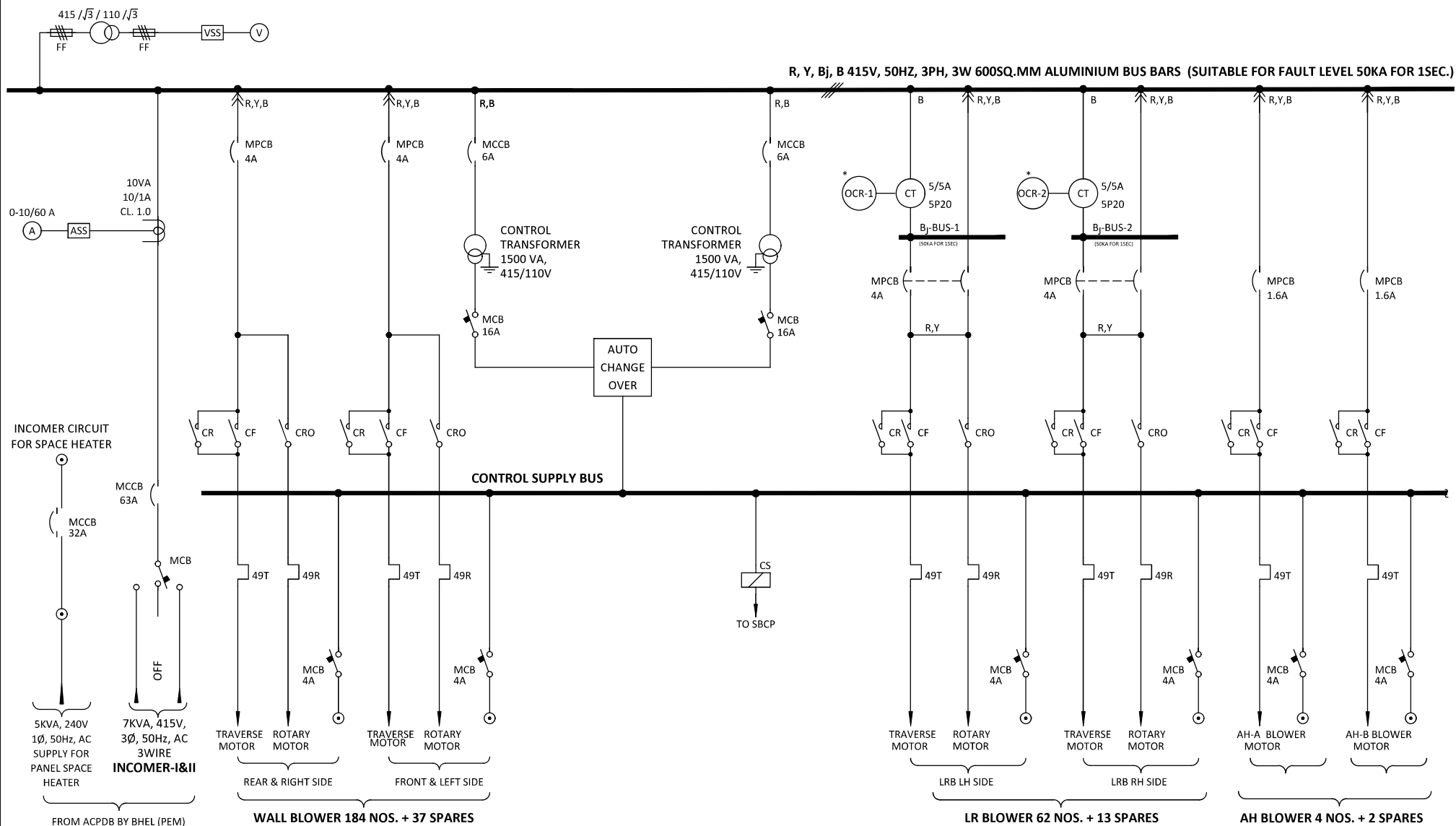
FOR TENDER PURPOSE ONLY

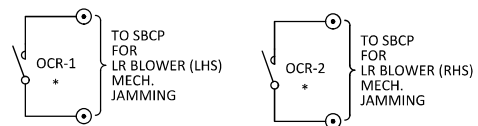
		एनटीपीसी लिमिटेड NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)	
PROJECT		STANDARD	
TITLE STANDARD 'E' TERMINALS (FOR CABLING BETWEEN SWGR TO MOTOR, SWGR TO TRF & INTERBOARD CABLING) FOR LT SWGR			
DRN	DGN	CHKD	APPRD
-			20.06.18
SCALE	DRAWING No.		REV.
NA	0000-206-POE-A-023		A

A4 210X287

LEGEND	
49R	THERMAL OVER LOAD RELAY ROTARY
49T	THERMAL OVER LOAD RELAY TRAVERSE
74	AUX. CONTACTORS
A	AMMETER
CF	CONTACTOR FOR FORWARD
CR	CONTACTOR FOR REVERSE
CRO	CONTACTOR FOR ROTARY
CS	CONTROL SUPPLY HEALTHY
CT	CURRENT TRANSFORMER
FF	FUSE
LSTE	WALL BLOWER HOME POSITION LIMIT SWITCH
LSTR	WALL BLOWER ROTARY LIMIT SWITCH
LSTS	WALL BLOWER FORWARD END POSITION LIMIT SWITCH
LS1	LRB/AHB FORWARD END POSITION LIMIT SWITCH
LS2	LRB/AHB HOME POSITION LIMIT SWITCH
MCB	MINIATURE CIRCUIT BREAKER
MCCB	MOULDED CASE CIRCUIT BREAKER
MPCB	MOTOR PROTECTION CIRCUIT BREAKER
SBC	SOOTBLOWER CONTROLS SYSTEM
V	VOLTMETER

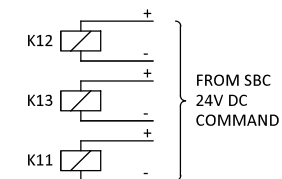
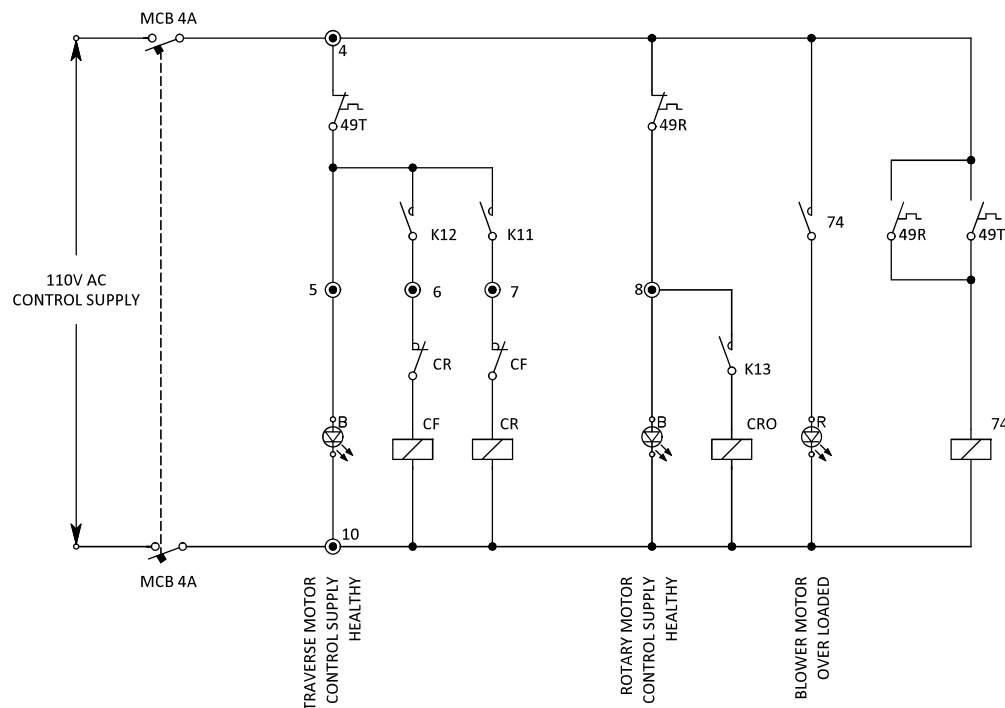
LEGEND	
	SB CP TERMINALS
	SB MCC TERMINALS
	LOCAL TERMINALS
	POWER / AUX. CONTACTOR
	"NO" CONTACT OF CONTACTOR
	"NC" CONTACT OF CONTACTOR
	OFF DELAY TIMER
	"NO" CONTACT OF TIMER
	INDICATING LAMP (A-AMBER) (B-BLUE)
	MPCB/MCCB
	MCB
	SWITCH
	DRAWOUT TYPE TERMINALS
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER





*NON-COMMUNICABLE NUMERICAL RELAY TO BE PROVIDED FOR OVER CURRENT SENSING FOR LR BLOWERS (OCR 1 & 2).

DESCRIPTION	INCOMER FOR SPACE HEATER	INCOMER-I	INCOMER-II	WALL BLOWERS		LR BLOWERS		AH BLOWER
FEEDER NO. DETAILS	1	1	1	184 + 37 SPARES		62 + 13 SPARES		4 NOS. + 2 SPARE
DRIVE DETAILS	-	-	-	TRAVERSE	ROTARY	TRAVERSE	ROTARY	
MOTOR CAPACITY IN KW	5 KVA	7 KVA	7 KVA	0.56	0.09	0.56	0.736	0.18
FULL LOAD CURRENT IN AMPS	-	-	-	1.36	0.64	1.45	1.8	0.66
O/L RELAY RANGE IN AMPS	-	-	-	0.9-1.5	0.45-0.75	0.9-1.5	1.0-2.0	0.45-0.75
MCCB/MPCB RATING IN AMPS	32A	63 A	63 A	4		4		1.6
POWER CONTACTOR	-	-	-	16	16	16	16	16
CABLE SIZE	3CX6SQ.MM(AL) PC	3CX10SQ.MM(AL) PC	3CX10SQ.MM(AL) PC	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)



LIMIT SWITCH CONTACT DEVELOPMENT				
CONTACT	POSITION	HOME	INTER MEDIATE	FORWARD END
LSTS	1-2	-	-	X
	3-4	X	X	-
LSTE	9-10	-	X	X
	7-8	X	-	-
LSTR	5-6	-	-	MAKES AFTER 1 Rev.
X CONTACT CLOSED, - CONTACT OPEN				

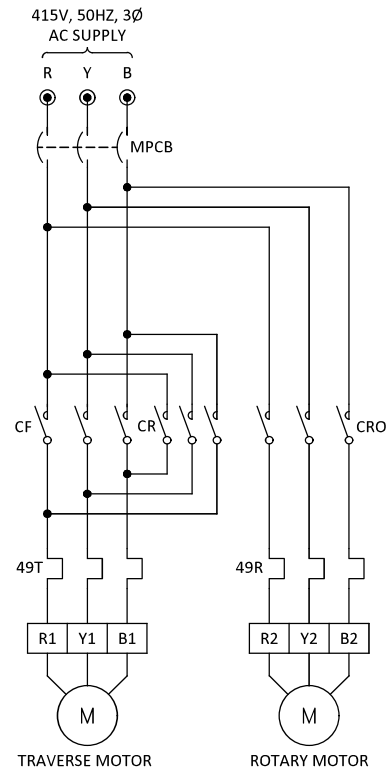
ALL LIMIT SWITCHES ARE WIRED TO DCS.

WRITE UP ON OPERATION OF WALL BLOWERS

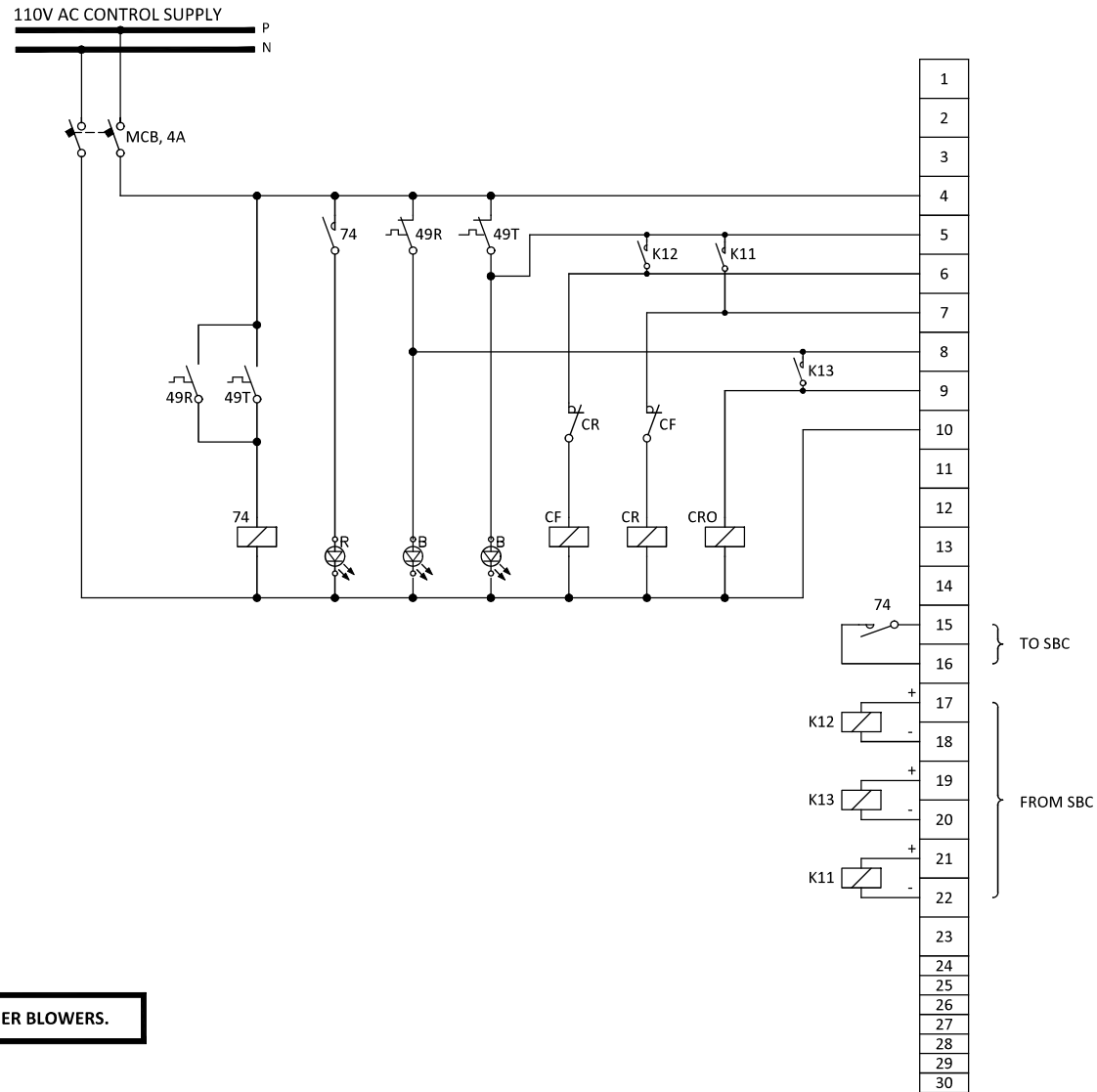
There are 3 limit switches and two motors, one for traverse motion and the other for rotary motion. At a time only one motion will take place. When an impulse is given for the blower start, the forward Motion starts. When the blower reaches its full forward position, it actuates the limit switch LSTS. This gives an impulse to trip traverse motor and to start the rotary motor through SBC. When the blower completes its rotary motion, it actuates limit switch LSTR. This gives an impulse for the Blower to retract from SBC by energising the reverse contactor in the starter. Limit switch LSTR and LSTS resets. As soon as the blower leaves the forward end position resetting of LSTS, SBC trips the rotary motor. When it reaches Its initial position, it actuates limit switch LSTE and the blower is stopped.

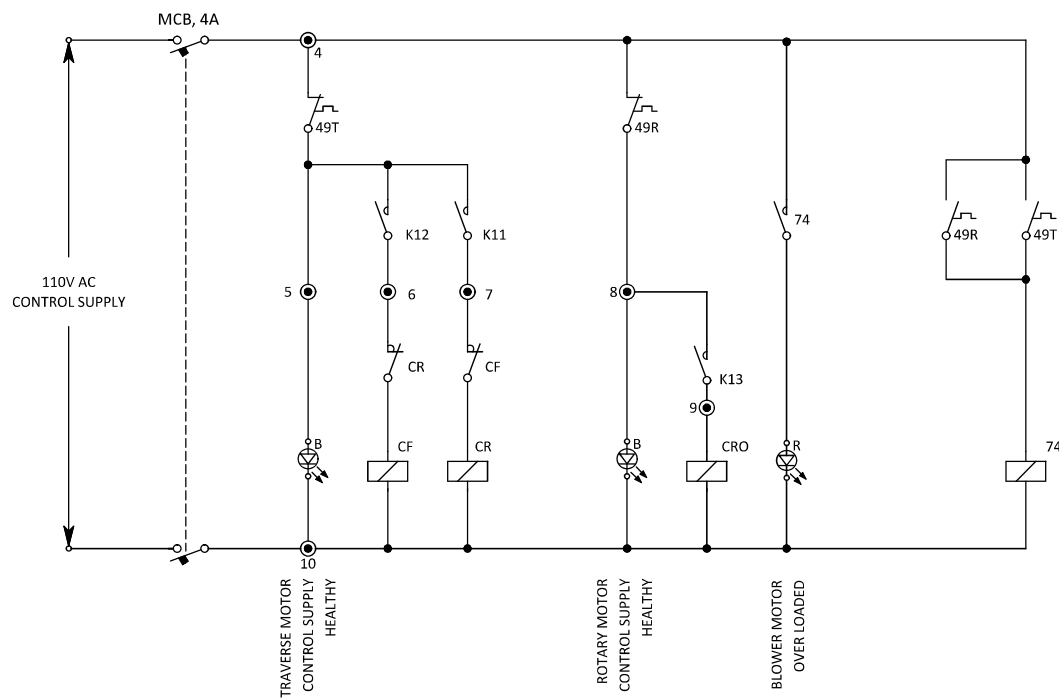
NOTE

K11, K12, & K13 ARE ENERGISED BY 24V DC COMMANDS FROM SBC.
K12 - ADVANCE COMMAND
K13 - ROTATE COMMAND
K11 - RETRACT COMMAND



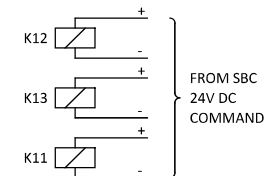
WIRING SHOWN FOR BLOWER-1 & SIMILAR FOR OTHER BLOWERS.





WRITE UP ON OPERATION OF LONG RETRACTABLE BLOWER.

The long retractable blower has dual electric motor drives. One motor moves the lance into and out of the boiler. The other rotates it always in the same direction. Rotation is continuous from the moment the lance starts to extend until retraction is completed. At the end of travel into boiler the two jets always return over a different path than that taken while the lance was extending. To start the LR blower, First the rotary motor is given command forward and starts rotating. Then the traverse motor starts is given start command. The limit switch LS-2 (contact 4,5) closes as soon as the blower starts moving. At the end of the forward Motion limit switch LS-1 opens (contacts 1,2). This will be used for resetting forward command and to issue retract command. When the blower reaches the home position. The limit switch LS-2 (contact 4,5) opens and the blower stops.



LIMIT SWITCH CONTACT DEVELOPMENT

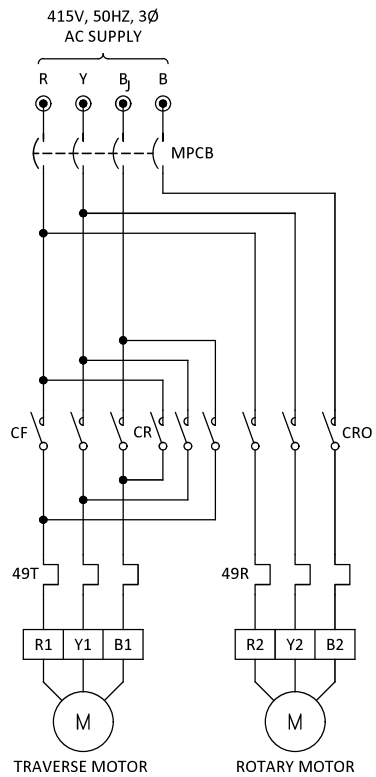
CONTACT	POSITION	HOME	INTER MEDIATE	FORWARD END
LS-1	1-2	X	X	-
LS-2	4-5	-	X	X
	4-6	X	-	-

X CONTACT CLOSED, - CONTACT OPEN

ALL LIMIT SWITCHES ARE DIRECTLY WIRED TO DCS.

NOTE

K11, K12, & K13 ARE ENERGISED BY 24V DC COMMANDS FROM SBC.
 K12 - ADVANCE COMMAND
 K13 - ROTATE COMMAND
 K11 - RETRACT COMMAND



WIRING SHOWN FOR BLOWER-1 & SIMILAR FOR OTHER BLOWERS.

