

संदर्भ: : CC/QA&I/2021/Letter/352**दिनांक:** 27.Jul.2021**M/s Bharat Heavy Electricals Limited**
Piplani, Raison Road, BHEL,
Bhopal-462022**Kind Attn.: Sh. M K Sharma Addl G.M.-QTR****SUB:** Amendment in stage inspection by POWERGRID for M/s BHEL, Bhopal make EHV Power Transformers /Shunt Reactors as per QIN system.

Dear Sir,

This is in reference to our earlier letter dtd. 30.07.2020, wherein M/s BHEL, Bhopal came under Grade B vendor based on equipment performance data for Factory (successful FAT) for last 01 year and for site operational performance for last 05 years.

In line with the requirement of approved guidelines for implementation of QIN system, site as well as test bed failures of Transformers/Reactors of all manufacturers have been reviewed again in respect of data up to 30.06.2021. Accordingly, category of M/s BHEL, Bhopal shall be **Grade-C**. M/s BHEL, Bhopal is hereby advised to make all possible efforts to improve in their quality system and quality of the products for coming under the category Grade-A vendor

Further, it may be noted that stage inspections/ process checks now have to be carried out as per the requirement of Annex-A. You are requested to kindly ensure to comply the same with immediate effect.

Further, M/s BHEL, Bhopal shall carry out all stage inspections as per MQP, wherein there is no POWERGRID witnessing and keep records for the same for POWERGRID review during final testing. M/s BHEL, Bhopal shall be fully responsible for satisfactory performance of their product as well as sub vendor products. If, at any point of time, any critical observation is noticed, we reserve the right to change the grade immediately based on the criticality, on case to case basis.

Thanking You,

PRADEEP
SAXENA
Digitally signed by PRADEEP SAXENA
DN: c=IN, o=Power Grid Corporation
of India Limited, ou=Quality
Assurance and Inspection,
postalCode=122001, st=HARYANA,
cn=PRADEEP SAXENA**(Pradeep Saxena)**
DGM (QA&I)**CC: DGM IO Bhopal**

Annexure -A for Grade-C

Item	Existing MQP requirement for stage inspection (CIP)	Stage inspection requirement for Grade-C vendor
PICC/ CTC	CIP in Level-IV for 01 sample of each size for three Job of each rating per contract & for rest units are in CIP level II	CIP in Level-IV for 01 sample of each size for 01 Job of each contract for each sub vendor. Balance record review
Insulation material (PCB & raw material of moulding components)	CIP in Level-IV on first lot of insulation item for each package	CIP in Level-IV on first lot of insulation item for each package
Prime CRGO	CIP in Level-IV for each Job	CIP in Level-IV for each Job
CRGO Lamination	CIP in Level-IV for each Job	CIP in Level-IV for each Job
OIP Bushing	Imported bushings - CIP in Level-IV for complete set of bushing of 01 Job of each contract. Balance record review. Indigenous bushing - CIP in Level-IV for all bushing including spare bushings in case of indigenous	CIP in Level-IV for complete set of bushing of 01 Job of each contract in case of both indigeneous and imported . Balance record review.
RIP Bushing	CIP in Level-IV for 02 nos bushing for Job of each type for each contract (For Trench-China, Xian XD-China, ABB Sweden and MASSA-Russia). Balance record review. For balance manufacturer's-As per their approved MQP(1. Electrical accessories,2. Nanjing,3. Yash, 4. ABB Micafil 5. Passoni Villa)	CIP in Level-IV for 02 nos bushing for Job of each type for each contract. Balance record review. (Except for Yash High Voltage & MIM, Bhiwadi-inspection as per applicable MQP).
OLTC	CIP in Level-IV - for one unit of each type & size of each contract. Record review on surveillance basis for rest of the units	CIP in Level-IV - for one unit of each type & size of each contract. Record review on surveillance basis for rest of the units
Tank	CIP in Level-IV for one Transformer /Reactor for each contract. Balance level-II	CIP in Level-IV for one Transformer /Reactor for each contract. Balance level-II
Radiators & pipe asmbly.	CIP level- IV for one Job for each contract. Balance record review on surveillance basis)	CIP level- IV for one Job for each contract. Balance record review on surveillance basis)
Core Building	CIP in Level-IV for Each Job	CIP in Level-IV for Each Job
Winding	CIP on one transformer of each contract & record review on balance units on surveillance basis.	CIP in Level IV for one unit per package. For balance recored review. (Visual and dimensional checks as per Mfr's Plant standard before Coil stablization)
CCA	CIP in Level-IV for one Job for each contract. Balance level-II	CIP in Level-IV for all Jobs of each rating of each contract
Oil Parameter before start of FAT	CIP Level-IV for One Transformer & balance CIP in Level – II	CIP in Level-IV for one Job for each contract. Balance level-II
Servicing and Tanking*	CIP Level-II for all units	CIP in Level II for each Job. (To check visual inspection of CCA after VPD and internal cleanliness of Tank before tanking)
Internal Inspection before dispatch	CIP in Level-IV for each Job (Additional requirement communicated to all OEMs for carrying out joint internal inspection of all units before final dispatch)	CIP in Level-IV for all Jobs of each rating of each contract

*Process should not be delayed on account of inspection



केन्द्रीय कार्यालय : "सौदामिनी", प्लॉट नं.: 2, सेक्टर-29, गुरुग्राम-122001, (हरियाणा), दूरभाष 0124-2571700-719

Corporate Office : "Saudamini", Plot No. 2, Sector-29, Gurugram-122001, (Haryana) Tel. : 0124-2571700-719

पंजीकृत कार्यालय : बी-9, कुतुब इंस्टीट्यूशनल एरिया, कटवारिया सराय, नई दिल्ली – 110 016 दूरभाष : 011-26560112, 26560121, 26564812, 26564892, सीआईएन : L40101DL1989GOI038121

Registered Office : B-9, Qutab Institutional Area, Katwaria Sarai, New Delhi-110 016. Tel : 011-26560112, 26560121, 26564812, 26564892, CIN : L40101DL1989GOI038121

Website : www.powergridindia.com

विनिर्माण गुणवत्ता योजना अनुमोदन / MQP APPROVAL

संदर्भ: CC/QA&I/2020/Letter/03

दिनांक: 01.01.2021

निर्माता का नाम Name of Manufacturer	BHEL Bhopal	
निर्माता का पता Address of Manufacturer	Piplani, Raison Road, BHEL Bhopal-462022	
निर्माता कोड Manufacturer Code	3000000057	
संपर्क का नाम Contact Name	टेली/ मोबाइल Tele/Mobile	ईमेल आईडी Email id
सत्येन्द्र कुमार सिंह Satyendra Kr. Singh	9770003861	satyendrasingh@bhel.in
मद का नाम & गुणवत्ता योजना सं. Item Name & MQP no.	TXB 112 R01- For Transformer up to 765kV Class & SRB 112 R01 For Reactor up to 765kV Class	
पिछले अनुमोदन का संदर्भ Previous approval letter ref. No. & date	C/QA&I/MQP/BHEL/PXmer_SR/01 dtd 28.10.2020	
संचार संदर्भ विवरण Communication reference details	28.12.2020	
वैधता अवधि Validity Period up to	31.12.2021	

This MQP shall be read in conjunction with the contract specific technical specification / approved drawing/ data Sheets/ GTP/ test procedures, relevant IEC/IS standards and project specific type tests. Manufacturer shall ensure that the above documents are available at the works so that proper inspection is carried out without delay. Please note that further approval shall be considered based upon performance, quality, and supplies during this approval period. Manufacturer shall ensure that request for renewal of above approval should come at least 1 month before expiry of this approval letter. All other clauses mentioned in above mentioned approval letters remain unchanged.

While on the subject, we wish to clarify that process inspection/ audit shall continue for above item in adherence to this MQP at your works. In case of serious and repeated observations of process/process parameter violation and if any problem is encountered with regards to the quality, we reserve the right to increase our involvement by way of additional quantum of inspection and / or additional Customer Inspection Points (CIP) at any stage or withdraw this MQP.

Special Remarks:

Note 1: Letter regarding- Non-Indulgence in Fraudulent / Unethical Practices attached.

**PRADEEP
SAXENA**

 Digitally signed by PRADEEP SAXENA
 DN: c=IN, o=Power Grid Corporation
 of India Limited, ou=Quality
 Assurance and Inspection,
 postalCode=122001, st=HARYANA,
 cn=PRADEEP SAXENA

प्रदीप सक्सेना



उप महाप्रबंधक (गु° आ° एवं नि°)

प्रति: सम्बंधित निरीक्षण कार्यालय

Enclosure: As above





STANDARD MANUFACTURING QUALITY PLAN
FOR
EHV TRANSFORMERS UP TO 765 KV
(STANDARD MQP no. CC/QA&I/SMQP/01 Rev 00)

<div>Manufacturer Name & Address</div> <div> BHEL-BHOPAL</div>		<div>Manufacturing Quality Plan for EHV Transformers up to 765 kV</div> <div></div>												
		Customer		Vendor Code		Item Description			MQP No.		Rev	Date of issue		Validity of MQP
		POWERGRID Corporation of India Ltd.		3000000057		EHV Transformers up to 765 kV			TXB 112		01	31.12.2020		31.12.2021
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
							1	2	3	4	5	6		

NOTES AND CODES USED IN THIS MQP													
Code 1: Indicates place 'where testing is planned' to be performed i.e. inspection location A. At equipment manufacturer's works B. At component manufacturer's works C. At authorised distributors place D. At independent Lab E. At Turn Key contractors location F. Not Specified							Code 2: Indicates 'who has to perform' the tests i.e. Testing agency J. The equipment manufacturer K. The component manufacturer L. The Third party M. The turnkey contractor						
Code 3: Indicates 'who shall witness the tests' i.e. witnessing agency P. Component manufacturer itself Q. Component manufacturer and equipment manufacturer R. Component manufacturer, equipment manufacturer and contractor S. equipment manufacturer itself T. equipment manufacturer and contractor U. equipment manufacturer and contractor and POWERGRID V. Third party itself							Code 4: Indicates 'review of test reports/certificates' W. By the equipment manufacturer X. By contractor during product/process inspection Y. By POWERGRID during product/process inspection Z. By contractor and/or POWERGRID during product/process inspection						
Code 5: Whether 'specific approval of sub vendor make is envisaged' E. Envisaged N. Not Envisaged							Code 6: Whether 'test records required to be submitted' after final inspection for issuance of CIP/MICC Y. Yes N. No						





<div>Manufacturer Name & Address</div> <div></div> <div>BHEL-BHOPAL</div>		Manufacturing Quality Plan for EHV Transformers up to 765 kV													
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		POWERGRID Corporation of India Ltd.			3000000057		EHV Transformers up to 765 kV			TXB 112		01	31.12.2020		31.12.2021
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks		
							1	2	3	4	5	6			

General Notes:

- The MQP should be read in conjunction with POWERGRID specification and shall deem to include additional tests required as per the contract
- POWERGRID specification shall include provisions of the 'Letter of Award', PBD/ specific agreements, POWERGRID approved drawings/technical data sheet/BOM/test schedule/test procedure applicable to the specific contract.
- In case of contradiction between the manufacturer's plant standard and this MQP and POWERGRID specification following preference shall be followed:
 - POWERGRID Specification
 - This Manufacturing Quality Plan
 - Manufacturer's plant standards
- It is the responsibility of the manufacturer to ensure that this document is readily available at their works, as well as the works of their sub vendor in order to avoid any delay at the time of inspection.
- The manufacturer shall ensure that their as well as their sub vendor's control, metering and testing instruments are duly calibrated and should have calibration certificates traceable to Indian/International standards. Calibration records should be available during inspection by POWERGRID. Key testing instruments will be calibrated by an agency having full membership & MRA of ILAC/APLAC.
- In case of any tests being carried out at third party Lab. such lab / facility should be an agency having full membership & MRA of ILAC/APLAC accredited / accepted by POWERGRID.
- The manufacturer shall maintain the proper correlation of test certificates from raw material stage to finished product stage and the records should be available during inspection by POWERGRID.
- Manufacturer shall show the approval of POWERGRID Engineering for all contract specific type tests, including specific type tests if any as per the POWERGRID specification at the time of final inspection.
- All packing cases should be marked with POWERGRID LOA Details, Name of project, item description and CIP/ MICC number (by which the material has been cleared for dispatch).
- One copy of test report, CIP & MICC shall also be sent along with the consignment.
- Inspection of Spare items ordered by POWERGRID shall also be governed by the provisions of this MQP. Items if not governed under this MQP shall be offered for inspection as per POWERGRID specification/ relevant Indian/ International standards.
- The manufacturer shall assign their quality systems and that of their sub-vendors to the requirements of latest ISO 9001 quality standards in a time bound manner.
- In case of the change in name of the sub vendor manufacturer shall submit request to update the same along with supporting documents.
- Wherever Indian/International standard are referred their latest amendment shall be included. The same shall be applicable in case of manufacturer specification also so long as these changes are made with the approval of the competent authority of manufacturer.
- Raw material/ bought out items envisaged shall be procured from POWERGRID approved source only
- All outsourced services shall be from approved sources only.
- Surveillance checks shall be carried out by POWERGRID as and when deemed necessary no inspection call to be given for surveillance check.
- Manufacturer to get clearance/approval from POWERGRID Engineering for Type test on first Transformer of each rating against each contract including Bushing, Buchholz relay, OLTC, Cooler control cabinet, cooling fan motor assembly, PRD, MOLG, Air cell, OTI & WTI & Terminal connector as applicable in the TS of contract in question.



[Handwritten signatures]

<div>Manufacturer Name & Address</div> <div></div> <div>BHEL-BHOPAL</div>		<div>Manufacturing Quality Plan for EHV Transformers up to 765 kV</div> <div></div>											
		Customer		Vendor Code	Item Description			MQP No.	Rev	Date of issue	Validity of MQP		
		POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV			TXB 112	01	31.12.2020	31.12.2021		
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks
							1	2	3	4	5	6	

19. POWERGRID may review the effective implementation of the processes during the product- inspection/ process-inspection. In case any violation in process or process parameters are observed, the reason along with corrective & preventive Measurements shall be conveyed to POWERGRID within 2 weeks.

20. This MQP is standard MQP for Transformers up to 765 kV manufactured by BHEL.

21. No inspection call shall be raised unless and until GTP/Drawings/ Design Reviews /Type test reports approved by POWERGRID Engineering

22. The following abbreviations are used in this MQP:



EM : Equipment Manufacturer
CM : Component manufacturer
TC : Test Certificate
TS : Technical Specification
Vendor : BHEL
Tech : Technical
Spec : Specification
Drg : Drawings
Appvd : Approved
Tol : Tolerance
Min : Minimum
Max : Maximum




POWERGRID: Power Grid Corporation of India Ltd.




23. M/S BHEL shall ensure that all tests mentioned in the technical specification of subject contract in question need to be carried out strictly, without fail.




24. MQP shall be read in conjunction with QIN and all stage inspection (except tank inspection) shall be done as per annex of transformer manufacturer QIN grade.






Manufacturer Name & Address		Manufacturing Quality Plan for EHV Transformers up to 765 kV											
 BHEL-BHOPAL		Customer			Vendor Code	Item Description	MQP No.	Rev	Date of issue	Validity of MQP			
		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV	TXB 112	01	31.12.2020	31.12.2021			
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks
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A	RAW MATERIAL												
1.1	PAPER INSULATED COPPER CONDUCTOR (PICC)												
1.1.1	Check of a) Surface finish of conductor b) Finish of PICC	Visual	One Sample for each size for each Transformer	BHEL Tech Data Sheet BHEL Drg IEC 60317	No visible defects	CMTC	B	K	P/U	W		Y	For On shore(Indigenous): CIP for 01 sample of each size for three transformers of each rating per contract & for rest units are in CIP level II For Offshore(Imported): CIP for one sample of each size for one Transformer for contract. Balance Record review on surveillance basis
1.1.2	Check of a) Dimension of bare copper b) Corner radius c) Number of layers of paper covering d) Arrangement of layers e) Increase in dimension due to paper covering	Measurement			Bare copper in mm (Width/Thickness) Tol Up to 3.15 ±0.03 >3.15 to 6.30 ±0.05 >6.30 to 12.50 ±0.07 12.50 to 16.00 ±0.10 16.00 to 25.00 ±0.13 Corner Radius Thickness Tol 1- 0.5 X Size ±25% 1.00 - 1.60 0.50±25% 1.60 - 2.24 0.65±25% 2.24 - 3.55 0.80±25% 3.55 - 5.6 1.0±25% Min No. of Paper layers As per Manufacturer Spec. Paper covering in mm Paper covering Tol % 0.25 to 0.5 -10.0 + 0 0.50 to 1.3 - 7.5 + 0 Above 1.30 - 5.0 + 0	CMTC	B	K	P/U	W/Z		Y	
1.1.3	Resistivity at 20 °C	Measurement			For soft/annealed conductor Max: 0.017241 Ωmm ² /m For work hardened conductor Max: 0.01777 Ωmm ² /m	CMTC	B	K	P/U	W/Z		Y	

Manufacturer Name & Address		Manufacturing Quality Plan for EHV Transformers up to 765 kV											
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		POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV		TXB 112	01	31.12.2020	31.12.2021			
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.1.4	Elongation (for annealed conductor)	Measurement	each Transformer		Thickness Up to 2.5 mm Tol 30% Min 2.5 to 5.6 mm 32% Min		B	K	P/U	W/Z		Y	
1.1.5	Proof Stress for work hardened conductor (if applicable)	Measurement			As per BHEL Design Review documents		B	K	P/U	W/Z		Y	
1.1.6	Insulation test for bunched conductor	Measurement			Maximum Charging current 1A at 250V AC / 500V DC for 1 minute.		B	K	P/U	W/Z		Y	
1.2	CONTINUOUSLY TRANSPOSED COPPER CONDUCTOR (CTC)										E		
1.2.1	Check surface finish conductor	Visual	One Sample for each size for each Transformer	BHEL Tech Data Sheet BHEL Drg IEC 60317	No visible defects	CMTC	B	K	P/U	W/Z		Y	For On shore(Indigenous): CIP for 01 sample of each size for three transformers of each rating per supplier per contract & for rest units are in CIP level II  For Offshore(Imported): CIP for one sample of each size for one Transformer for contract. Balance Record review on surveillance basis
1.2.2	Check of Dimension Width and thickness, Corner Radius of bare copper Check of the number of conductors	Measurement			Bare copper in mm (Width/Thickness) Tol Up to 3.15 ±0.03 >3.15 to 6.30 ±0.05 >6.30 to 12.50 ±0.07 12.50 to 16.00 ±0.10 Corner Radius Thickness Tol 1- 0.5 X Size ±25% 1.00 - 1.60 0.50±25% 1.60 - 2.24 0.65±25% 2.24 - 3.55 0.80±25% 3.55 - 5.6 1.0±25%		B	K	P/U	W/Z		Y	
1.2.3	Increase in bare dimension due to enamel and due to paper covering. Verification of axial width, radial depth and arrangement of paper covering	Measurement			BHEL TDS/ IEC 60317/ Design review docs		B	K	P/U	W/Z		Y	

Manufacturer Name & Address <div> BHEL-BHOPAL</div>		Manufacturing Quality Plan for EHV Transformers up to 765 kV												
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		POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV		TXB 112	01	31.12.2020		31.12.2021			
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
							1	2	3	4	5	6		
1.2.4	Resistivity at 20 °C	Measurement	One Sample for each size for each Transformer	BHEL Tech Data Sheet BHEL Drg IEC 60317 IS13730-27	Soft/annealed conductor Max: 0.017241 Ω mm ² /m Work hardened conductor Max: 0.01777 Ω mm ² /m	CMTC	B	K	P/U	W/Z		Y		
1.2.5	Elongation (for annealed conductor)	Measurement			Thickness Tol Up to 2.5 mm 30% Min 2.5 to 5.6 mm 32% Min	CMTC	B	K	P/U	W/Z		Y		
1.2.6	Proof Stress for work hardened conductor (if applicable)	Measurement			As per BHEL Design Review documents	CMTC	B	K	P/U	W/Z		Y		
1.2.7	Check for adherence of enamel coating & breakdown voltage test on enamelled conductor at room temp.	Measurement			Should pass inline with IEC 60317	CMTC	B	K	P/U	W/Z		Y		
1.2.8	Insulation test between strands of CTC (if applicable)	Measurement			Maximum Charging current 1A at 250V AC / 500V DC for 1 minute.	CMTC	B	K	P/U	W/Z		Y		
1.3	KRAFT INSULATING PAPER (FOR COVERING OF PICC & CTC)										E		<div>Record review on surveillance basis</div> <div></div>	
1.3.1	Checks of paper healthiness	Visual	One sample for each size per lot	BHEL Tech Data Sheet BHEL Drg IEC 60554	No surface defects.	CMTC	B	K	P	W		N		
1.3.2	Thickness	Measurement			Thickness tolerance: Within specified value $\pm 10\%$	CMTC	B	K	P	W		N		
1.3.3	Apparent Density	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.4	Tensile index in Nm/g a) Machine Direction b) Cross Machine direction	Measurement			IEC 60554-3-1	CMTC	B	K	P	W		N		
1.3.5	Electrical Strength in air	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.6	Ash content	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.7	Conductivity of aqueous extract	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.8	PH of aqueous extract	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.9	Heat Stability	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.10	Air Permeability	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		
1.3.11	Moisture content	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N		



Manufacturer Name & Address <div> BHEL-BHOPAL</div>		Manufacturing Quality Plan for EHV Transformers up to 765 kV													
		Customer			Vendor Code	Item Description	MQP No.	Rev	Date of issue	Validity of MQP					
		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV	TXB 112	01	31.12.2020	31.12.2021					
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks		
							1	2	3	4	5	6			
1.3.12	Tear Index	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N			
1.3.13	Water absorption (Capillary rise)	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N			
1.3.14	Elongation at break	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N			
1.3.15	substance (grammage)	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N			
1.3.16	Degree of Polymerization	Measurement			IEC 554-3-1	CMTC	B	K	P	W		N			
1.4 A	PRECOMPRESSED PRESSBOARD- Note: BHEL shall ensure that samples of Pressboard are duly sealed annually (randomly on different sizes) by POWERGRID-RIO at the premises of transformer manufacturers/ Insulation cutter's/ PCB manufacturer & tested at third party lab.										E				
1.4.A1	Check for healthiness	Visual	One sample of each size per lot	BHEL Drg BHEL Spec. IEC 60641 IEC 60763	No visible defect	CMTC	A/B	J/K	S/P	W/Z		N	CIP on first lot of insulation item for each Transformer package on pressboards for review of: Mfr's TCs, Yearly TPL sample test reports and to verify traceability. Balance record review on surveillance basis. 		
1.4.A2	Check for thickness	Measurement			Within Tolerance	CMTC	B	K	P	W/Z		N			
1.4.A3	Density	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A4	Oil absorption	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A5	Moisture Content	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A6	Shrinkage in air	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A7	Tensile strength a) Machine Direction b) Cross Direction	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A8	Elongation a) Machine Direction b) Cross Direction	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A9	Compressibility in air a) Compressibility b) Reversible compressibility	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A10	Dielectric strength (Air & Oil)	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			
1.4.A11	Ash content	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N			



Manufacturer Name & Address <div></div> BHEL-BHOPAL			Manufacturing Quality Plan for EHV Transformers up to 765 kV													
			Customer POWERGRID Corporation of India Ltd.			Vendor Code 3000000057	Item Description EHV Transformers up to 765 kV	MQP No. TXB 112	Rev 01	Date of issue 31.12.2020	Validity of MQP 31.12.2021					
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks			
							1	2	3	4	5	6				
1.4.A12	PH value	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N				
1.4.A13	Conductivity of aqueous extract	Measurement			IEC 60641	CMTC	B	K	P	W/Z		N				
1.4 B	LAMINATED PRECOMPRESSED PRESSBOARD-											E				
1.4.B1	Design, Dimensional and Visual Checks	Measurements / Visual	One Sample Per Lot	As per Transformer/Reactor manf. component Drg. drawing	As per Transformer/Reactor manf. component Drg. drawing	CMTC/EMTC	B	K	P	W/Z		N	Record review on surveillance basis.			
1.4.B2	Thickness (mm)	Measurement	-do-	5.1	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B3	Flexural Strength-(MPa) MD & CMD	Mechanical	-do-	6.1	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B4	Compressibility (%) C & Crev	Mechanical	-do-	7.1	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B5	Electric strength (KV/mm)	Electrical	-do-	8	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B6	Internal Ply Strength (%)	Dried, tested at 23°C	Mechanical	-do-	9	As per IEC 60763-3-1	CMTC	B	K	P	W/Z			N		
		Dried tested at 120°C retention	Mechanical	-do-	9	As per IEC 60763-3-1	CMTC	B	K	P	W/Z			N		
		Oil Impregnated, tested at 23°C	Mechanical	-do-	9	As per IEC 60763-3-1	CMTC	B	K	P	W/Z			N		
		Aged for 1 week at 120°C in oil, Tested at 23°C, retention	Mechanical	-do-	9	As per IEC 60763-3-1	CMTC	B	K	P	W/Z			N		
1.4.B7	Apparent density (gr/cm³)	Physical	-do-	10	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B8	Moisture content (%)	Physical	-do-	11	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				
1.4.B9	Shrinkage (%) (MD/CMD/Thickness)	Mechanical	-do-	12	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N				



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			Customer		Vendor Code	Item Description		MQP No.	Rev	Date of issue		Validity of MQP			
			POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV		TXB 112	01	31.12.2020		31.12.2021			
SI No.	Components and Operations		Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
								1	2	3	4	5	6		
1.4.B10	Oil absorption (%)		Physical	-do-	13	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N	Record review on surveillance basis	
1.4.B11	Ash Content (%)		Physical	-do-	14	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N		
1.4.B12	Contamination of Dielectric liquids	Neutralization Valve (MgKOH/g)	Physical	-do-	15	As per IEC 60763-3-1	B	K	P	W/Z		N			
		Sludge Content (Mg/l)	Physical	-do-	15	As per IEC 60763-3-1	B	K	P	W/Z		N			
		Dissipation factor	Physical	-do-	15	As per IEC 60763-3-1	B	K	P	W/Z		N			
1.4.B13	Conductivity of aqueous extract (mS/m)		Physical	-do-	16	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N		
1.4.B14	PH of aqueous extract		Physical	-do-	17	As per IEC 60763-3-1	CMTC	B	K	P	W/Z		N		
1.5	MOULDED INSULATION COMPONENTS (raw material) Note: - BHEL shall ensure that samples made from Wet Material(raw material) of moulding components duly sealed annually by POWERGRID-RIO at the premises of transformer manufacturers/ Insulation cutter's/ PCB manufacturer & tested at third party lab.											E			
1.5.1	Check for healthiness		Visual	One sample per lot	BHEL Drg BHEL Spec. IEC 60641	No visible defect	CMTC	B	K	P	W/Z		N	CIP on first lot of moulding component for each Transformer package for review of: Mfr's TCs of raw material, yearly TPL sample test reports and to verify traceability Balance record review on surveillance basis	
1.5.2	Check for thickness		Measurement			Within Tolerance	CMTC	B	K	P	W/Z		N		
1.5.3	Apparent Density		Measurement			BHEL Drg BHEL Spec. IEC 60641	CMTC	B	K	P	W/Z		N		
1.5.4	Shrinkage: Machine direction and Cross machine direction		Measurement				CMTC	B	K	P	W/Z		N		
1.5.5	Shrinkage thickness		Measurement				CMTC	B	K	P	W/Z		N		
1.5.6	Moisture Content		Measurement				CMTC	B	K	P	W/Z		N		
1.5.7	Conductivity aqueous extract		Measurement				CMTC	B	K	P	W/Z		N		
1.5.8	PH value of aqueous extract		Measurement				CMTC	B	K	P	W/Z		N		
1.5.9	Oil absorption		Measurement				CMTC	B	K	P	W/Z		N		




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		POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV	TXB 112	01	31.12.2020	31.12.2021				
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.5.10	Dielectric strength in oil at 90±2°C	Measurement				CMTC	B	K	P	W/Z		N	
1.6	UNIMPREGNATED DENSIFIED LAMINATED WOOD- Note: BHEL shall ensure that samples of densified laminated wood are duly sealed annually (randomly on different sizes) by POWERGRID-RIO at the premises of transformer manufacturers/ DL wood cutter's/DL wood manufacturer & tested at third party lab.										E		
1.6.1	Check thick, width & length	Measurement	One sample of each size per lot	BHEL Spec IEC 61061	Dimension within Tolerance	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.6.2	Flatness	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.3	Flexural strength perpendicular to the laminations	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.4	Apparent modulus of elasticity in flexure perpendicular to the laminations	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.5	Compressibility perpendicular to the laminations C C rev	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.6	Impact strength	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.7	Shearing strength test for glue line bond	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.8	Electric strength perpendicular to the laminations	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.9	Breakdown voltage, parallel to the laminations	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.10	Apparent density	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.11	Moisture content	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.12	Shrinkage after drying Direction A Direction B Thickness	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	
1.6.13	Oil absorption	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N	













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							1	2	3	4	5	6			
1.6.14	Contamination of liquid dielectrics	Measurement			IEC 61061	CMTC	A/B	J/K	S/P	W		N			
1.7	CRGO STEEL (Parent material)											E			
1.7.1	Check prime CRGO coil for Manufacturer's identification slip/ unique numbering of prime CRGO coil	Visual	100% of coils	POWERGRID CRGO checklist for inspection of prime CRGO / BHEL Drg/ POWERGRID Spec IS 3024 IS649	POWERGRID Check for inspection of prime CRGO, BHEL Drawing POWERGRID Spec.	EMTC	B	K	S/U	W/Z		Y	CIP as per latest CRGO check list		
1.7.2	Check for coil width & thickness from name plate	Measurement	10% of coils		CMTC/ EMTC	B	K	S/U	W/Z		Y				
1.7.3	Specific Core Loss	Measurement	One sample per job		As per GTP/ Specific grade	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.7.4	Stacking Factor	Measurement			IS 3024	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.7.5	Surface Insulation Resistivity	Measurement			Avg Value Min:10 Ω-cm ² Individual Value: Min 5 Ω-cm ²	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.7.6	Minimum polarisation in Tesla at field strength of 800 A/m	Measurement			Min: 1.75 for CGO Min: 1.85 for HPGO	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.7.7	Accelerated ageing test	Measurement			Max 4% increase in Specific Total Losses	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.7.8	Ductility/ Bend test	Measurement			Completion of one 160 ° bend without fracture	CMTC/ EMTC	D/B	L/K	V/S/ U	W/Z		Y			
1.8	CRGO LAMINATION FOR CORE										E				
1.8.1	Traceability Record of parent coil	Visual	One sample of each type per item	POWERGRID CRGO checklist for inspection of prime CRGO/ BHEL Drg	POWERGRID Check List for inspection of prime CRGO	CMTC/ EMTC	A	J	S	W/Z		N	CIP as per latest CRGO check list		
1.8.2	Slitting dimension	Measurement			BHEL lamination Drgs.	CMTC/ EMTC	A	J	S	W/Z		N			
1.8.3	Length dimension	Measurement			BHEL lamination Drgs.	CMTC/ EMTC	A	J	S	W/Z		N			
1.8.4	Burr check	Measurement			20 micron (Max)	CMTC/ EMTC	A	J	S	W/Z		N			

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		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV		TXB 112	01	31.12.2020		31.12.2021		
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
							1	2	3	4	5	6		
1.8.5	Bow Check	Measurement			L,250 mm H≤2 mm L≥250 mm H≤3 mm	CMTC/ EMTC	A	J	S	W/Z		N		
1.9	NITRILE GASKET/ NITRILE RUBBER SHEET FOR TRANSFORMER										E			
1.9.1	Visual Check	Visual	One Sample per lot per size	BHEL Drg BHEL Spec. POWERGRID Spec ISO 7619-1 ISO 815 ISO3865 IS11149	Free from cracks & pinholes	CMTC	B	K	P	W/Z		N	Record review on surveillance basis	
1.9.2	Dimension check	Measurement			Dimension within tol.	CMTC	B	K	P	W/Z		N		
1.9.3	Shore Hardness Check	Measurement			75 (±5) IRHD	CMTC	B	K	P	W/Z		N		
1.9.4	Tensile Strength	Measurement			Min: 120kg/cm2	CMTC	B	K	P	W/Z		N		
1.9.5	Elongation at break	Measurement			Min: 250%	CMTC	B	K	P	W/Z		N		
1.9.6	Compression Set	Measurement			Max: (35% 70+-1deg cent)	CMTC	B	K	P	W/Z		N		
1.9.7	Accelerated ageing in air at 100 ± 2°C for 72 hrs.	Measurement			Change in Hardness: (+-15) IRHD Tensile Strength change:20% Max Elongation change: (Max 10% & -25%)	CMTC	B	K	P	W/Z		N		
1.9.8	Accelerated ageing in oil at 100 ± 2°C for 72 hrs.	Measurement			Change in Hardness:±8 IRHD Tensile Strength change: 35% Max Volume change: +20 / -8%	CMTC	B	K	P	W/Z		N		
1.10	RESIN COATED GLASS TAPE (if applicable)										E			
1.10.1	Visual Check	Visual	One Sample per lot per size	BHEL Drg BHEL Spec.	Free from visible defects	CMTC	A/B	J/K	S/P	W		N	<div> Record review on surveillance basis</div>	
1.10.2	Dimension check (thick & width)	Measurement			BHEL Spec./ BHEL Drgs	CMTC	A/B	J/K	S/P	W		N		
1.10.3	Shelf life	Visual			To be used within shelf life period. Not to use after expiry	CMTC	B	K	P	W		N		
1.10.4	Elongation	Measurement			Max:4 %	CMTC	B	K	P	W		N		
1.10.5	Tensile Strength	Measurement			Max: 800 Mpa	CMTC	B	K	P	W		N		



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							1	2	3	4	5	6	
1.10.6	Resin Content	Measurement			27± 2%	CMTC	B	K	P	W		N	
1.11	EPDM GASKET FOR MARSHALLING BOX										E		
1.11.1	Visual check	Visual	One sample of each size per lot	BHEL Spec BHEL Drgs	Free from cracks & pinholes	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.11.2	Dimension check (thickness and width)	Measurement			BHEL Spec/ BHEL Drg	CMTC	A/B	J/K	S/P	W		N	
1.11.3	Tensile Strength	Measurement		ISO 1798 IS 11149	IS 11149/ CM Spec	CMTC	B	K	P	W/Z		N	
1.11.4	Elongation at break	Measurement			IS 11149/ CM Spec	CMTC	B	K	P	W/Z		N	
1.11.5	Shore Hardness Check	Measurement		DIN 53 505	IS 11149/ CM Spec	CMTC	B	K	P	W/Z		N	
1.11.6	Compression test (in air)	Measurement		DIN ISO 815	IS 11149/ CM Spec	CMTC	B	K	P	W/Z		N	
1.12	RESIN IMPREGNATED BUSHINGS (Including spare bushing)										E		
1.12.1	Visual Check	Visual	100%		No visible damage	CMTC	B	K	P/U	W/Z		Y	CIP as per Bushing manufacturer's Approved MQP 
1.12.2	Dimension check	Measurement	100%		As per approved drawing	CMTC	B	K	P/U	W/Z		Y	
1.12.3	Routine tests: a) Measurement of tan δ & capacitance at room temp b) Measurement of PD test c) Full wave Lightning impulse withstand (if applicable) d) Dry PF Voltage withstand e) Test tap insulation test f) Tightness test	Measurement	100%	POWERGRID spec, approved drg, approved GTP , Approved MQP of Bushings, IEC 60137,	POWERGRID spec, approved drg, approved GTP , Approved MQP of Bushings, IEC 60137	CMTC	B	K	P/U	W/Z		Y	

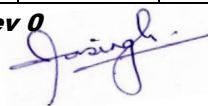
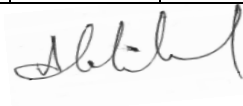
Manufacturer Name & Address		Manufacturing Quality Plan for EHV Transformers up to 765 kV												
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1.12.4	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.13	OIP CONDENSER BUSHING (Including spare bushing)										E			
1.13.1	Test on oil before carrying out routine tests on Bushing: a) BDV b) Water content c) Tan Delta at 90 °C d) IFT at 27°C	Measurement	50% of lot for bushings of each rating	POWERGRID Tech Spec/ IEC 60137/ POWERGRID Approved MQP for condenser bushing	a) BDV: Min 70 kV b) Water content: Max 10 ppm c) Tan Delta 90°C Max:0.005 d) IFT at 27°C: Min 40 mN/m	CMTC	B/D	K/L	P/V	W/Z		Y	For On shore supply: CIP as per bushing MQP For Off shore : Record review (Oil test) at bushing manufacturer's works or 3 rd party Lab	
1.13.2	Check of fitting of all accessories and type	Visual				CMTC	B/D	K/L	P/V	W/Z		Y		For On shore supply: CIP for all bushing including spare. For Off shore: CIP for 1 complete set of bushing for 1 Transformer of each rating per contract Balance record review on surveillance basis.
1.13.3	Routine test: (as applicable) a) Measurement of tan δ & capacitance at room temp. b) Partial discharge test c) Dry PF Voltage test d) Lightning impulse withstand e) Test tap insulation test f) Pressure test for leakage of internal filling as specified.	Measurement	100%		BHEL Spec. BHEL Drgs. IEC 60137 POWERGRID approved Drg POWERGRID Tech spec POWERGRID Approved MQP for condenser bushing	CMTC	B	K	P/U	W/Z		Y		
1.13.4	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.14	PORCELAIN BUSHING										E			
1.14.1	Visual check	Visual	100%	IS 8603 IS2099 IS3347 IEC 60137	No surface defect	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis	
1.14.2	Dimension check	Measurement			Dimension within tolerance	CMTC	A/B	J/K	S/P	W		N		
1.14.3	All routine test	Measurement			IS2099/ IS3347/ IEC 60137	CMTC	B	K	P	W		N		



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							1	2	3	4	5	6	
1.14.4	TYPE TEST (if applicable)	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained											
1.15	CURRENT TRANSFORMER										E		
1.15.1	Visual check of healthiness	Visual	100%	IS 2705, IEC 60044-1, POWERGRID approved GTP, R&D plate, BHEL Spec, BHEL Drgs	No surface defects	CMTc	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.15.2	Check for dimension (ID/OD, thickness)	Measurement			Dimension within tolerance	CMTc	A/B	J/K	S/P	W		N	
1.15.3	Routine test a) Accuracy Ratio b) Dry PF withstand test on secondary c) Over voltage inter turn test d) Verification of terminal mark e) Polarity f) Knee point voltage g) Exciting current for PS class h) Secondary winding resistance for PS class	Measurement			IS 2705, IEC 60044-1, POWERGRID approved GTP, R&D plate, BHEL Spec, BHEL Drgs	CMTc	B	K	P	W/Z		N	
1.16	BUCHHOLZ RELAY										E		
1.16.1	Visual inspection of model and type	Visual	100%	BHEL Spec BHEL Drgs IS :3637-1966 (Reaffirmed 2007)	No surface defects	CMTc	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.16.2	Check of Dimension	Measurement	100%		Dim within tolerance	CMTc	A/B	J/K	S/P	W		N	
1.16.3	Routine test: a) Porosity & element test b) High voltage c) Insulation resistance d) Gas volume test e) Loss of oil & surge test/ float operation test	Measurement	100%		BHEL Spec BHEL Drgs IS :3637-1966 (Reaffirmed 2007)	CMTc	B	K	P	W/Z		N	
1.16.4	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained											
1.17	TERMINAL CONNECTOR (if applicable)										E		









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							1	2	3	4	5	6	
1.17.1	Visual check of healthiness	Visual	100%	BHEL Drgs BHEL Spec POWERGRID Spec IS 5561	No surface defects	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.17.2	Check for dimension	Measurement	100%		Dimension within tolerance	CMTC	A/B	J/K	S/P	W		N	
1.17.3	Routine test: a) Tensile test b) Resistance test c) Galvanising test (if required)	Measurement	One sample per lot per size		BHEL Drgs BHEL Spec POWERGRID Spec IS 5561	CMTC	B	K	P	W/Z		Y	
1.17.4	TYPE TEST (if applicable)	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained											
1.18	MARSHALLING BOX/ Cooler Control Cabinet										E		
1.18.1	Design, Dimensional and Visual Checks (Workmanship, Clearances, ferruling, labelling, accessories, Earthing Terminals, Mounting/Lifting Details, 20% spare TBs etc.)	Visual	100%	BHEL Drgs BHEL Spec POWERGRID Spec POWERGRID approved Drg	BHEL Drgs BHEL Spec POWERGRID Spec POWERGRID approved Drg	CMTC	B	K	Q/U	W/Z		Y	CIP for all Transformer at the time of final testing of Transformer 
1.18.2	Dimension (including thickness of sheet)	Measurement				CMTC	B	K	Q/U	W/Z		Y	
1.18.3	Check of: a) Surface cleaning by 7 tank process b) Paint thickness c) Paint adhesion test d) Verification of paint shade	Measurement				CMTC	B	K	Q/U	W/Z		Y	
1.18.4	Routine test: a) HV test at 2 kV for 1 min between live terminal/earth b) IR at 500 V for 60 sec c) Verification of wiring and its routing	Measurement				CMTC	B	K	Q/U	W/Z		Y	
1.18.5	All Functional test done at Max, minimum and rated operating Voltage, Electrical Control operations, Alarms, Interlocks and sequential operations.	Measurement				CMTC/EMTC	A/B	J/K	Q/U	W/Z		Y	



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		POWERGRID Corporation of India Ltd.		3000000057	EHV Transformers up to 765 kV	TXB 112	01	31.12.2020	31.12.2021				
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks
							1	2	3	4	5	6	
1.18.6	BOM Check for Make and type & rating of Instruments/Components.	Visual		POWERGRID Specs/ Drawing	BHEL Drgs BHEL Spec POWERGRID Spec POWERGRID approved Drg	CMTC/ EMTC	A/B	J/K	Q/U	W/Z		Y	
1.18.7	Check for Paint shade, Thickness and Adhesion	Mechanical		POWERGRID Specs/ Drawing	REACTOR OEM Drgs REACTOR OEM Spec POWERGRID Spec POWERGRID approved Drg	CMTC/ EMTC	A/B	J/K	Q/U	W/Z		Y	
1.18.8	Check for Sealing Gasket (EPDM Rubber for Outdoor/ Neoprene Rubber for indoor).	Visual		POWERGRID Specs/ Drawing	BHEL Drgs BHEL Spec POWERGRID Spec POWERGRID approved Drg	CMTC/ EMTC	A/B	J/K	Q/U	W/Z		Y	
1.18.7	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained											
1.19	SECONDARY TERMINAL BOARD										N		
1.19.1	Visual check of healthiness	Visual		BHEL Drgs BHEL Spec POWERGRID Spec	No surface defects	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.19.2	Check for dimension	Measurement			Dimension within tolerance	CMTC	A/B	J/K	S/P	W		N	
1.19.3	Voltage withstand test a) Between terminals b) Between terminals & holes	Measurement	One sample per lot per size		4 kV for 1 min	CMTC	B	K	P	W		N	
1.19.4	Oil pressure test	Measurement			No leakage at 1.5 kg/cm ² for 1 hr with hot transformer oil at 90°C	CMTC	B	K	P	W		N	
1.20	AIR CELL										E		
1.20.1	Check of surface finish of complete air cell	Visual	100%	BHEL Drgs BHEL Spec POWERGRID Spec IS 3400	No surface defects	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis
1.20.2	Check of dimension	Measurement			Dimension within tolerance	CMTC	A/B	J/K	S/P	W		N	
1.20.3	Routine tests: a) 10 times inflation & deflation at test 10 Kpa	Measurement			No leak No opening of joints	CMTC	B	K	P	W/Z		N	









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		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV	TXB 112	01	31.12.2020	31.12.2021				
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	b) Pressure test at 10 Kpa for 24 hrs.													
1.20.4	Type tests on basic fabric a) Oil side coating compound b) Air side inner/outer coating c) Rubber coating inner/outer d) Coated fabric	Measurement	One sample per lot of raw material		Tensile strength & elongation at break: ISO 1421 Tear resistance: ISO 4674-1 Coating adhesion: ISO 2411 Gas permeability: ISO 7229	CMTC	B	K	P	W/Z		N		
1.20.5	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.21	ROLLER ASSEMBLY										E			
1.21.1	Visual, & paint check	Visual	One sample per lot	BHEL Drg IS 5517 IS 2004 IS 28 IS2026	BHEL Drg IS 5517 IS 2004 IS 28 IS2026	CMTC	A/B	K	Q	W		N	Record review on surveillance basis	
1.21.2	Dimensional check	Measurement				CMTC	A/B	K	Q	W		N		
1.21.3	Mechanical properties and chemical composition of raw material used for shaft and roller forging.	Measurement	One sample/ melt of heat treatment batch			CMTC	B	K	Q	W		N		
1.22	OIL & WINDING TEMPERATURE INDICATOR (LOCAL & REMOTE)										E			
1.22.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Spec POWERGRID Spec/ IEC 60751-2	No visible damage	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis	
1.22.2	Dimensional check	Measurement			Within tol as per drawing.	CMTC	A/B	J/K	S/P	W		N		
1.22.3	Calibration check & verify accuracy	Measurement			Accuracy should be ±3 °C or better	CMTC	B	K	P	W/Z		N		
1.22.4	HV test at 2 kV for 1 min between terminals/earth	Measurement			Should withstand	CMTC	B	K	P	W/Z		N		

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		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV		TXB 112	01	31.12.2020		31.12.2021		
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
							1	2	3	4	5	6		
1.22.5	Switch operation check	Measurement			Switch operation should be ± 2.5 °C of switch setting	CMTC	B	K	P	W/Z		N		
1.22.6	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.23	RTD TYPE REMOTE AND WINDING TEMPERATURE INDICATOR										E			
1.23.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Spec POWERGRID Spec/ IEC 60751-2	No visible damage	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis	
1.23.2	Dimensional check	Measurement			Dimension within tolerance	CMTC	A/B	J/K	S/P	W		N		
1.23.3	a) Calibration check b) HV test (2kV for one min) c) IR at 500 V for 60 sec d) Sensor Resistance	Measurement			BHEL Drg BHEL Spec POWERGRID Spec	CMTC	B	K	P	W		N		
1.24	PRESSURE RELIEF VALVE										E			
1.24.1	Dimensional check	Measurement	100%	BHEL Drg BHEL Spec POWERGRID Spec/ IEC 60529	Within tolerance as per drg	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis	
1.24.2	Air pressure test	Measurement			Operate at Specified pressure ± 0.07 kg/cm ²	CMTC	B	K	P	W		N		
1.24.3	Liquid pressure (Operating pressure test)	Measurement				CMTC	B	K	P	W		N		
1.24.4	Leakage test at 75% operating pressure	Measurement			No leak for 24 Hrs	CMTC	B	K	P	W		N		
1.24.5	Switch contact operation test	Measurement			Status to be checked after operation	CMTC	B	K	P	W		N		
1.24.6	Dielectric test between each terminals & body of PRV	Measurement			Withstand 2 kV for 1 minute	CMTC	B	K	P	W		N		
1.24.7	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.25	MAGNETIC OIL LEVEL GAUGE										E			
1.25.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Spec POWERGRID Spec	No visible defect	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis	
1.25.2	Dimension check	Measurement			Within tolerance as per drg	CMTC	A/B	J/K	S/P	W		N		
1.25.3	Calibration check by empty & full	Measurement			Check for High & Low contact	CMTC	B	K	P	W		N		
1.25.4	HV test between terminals and body	Measurement			Should withstand 2 kV for 1 min.	CMTC	B	K	P	W		N		

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POWERGRID Corporation of India Ltd.		3000000057		EHV Transformers up to 765 kV		TXB 112		01		31.12.2020		31.12.2021			
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1.25.5	Leak test with air for 30 Minutes	Measurement			No leak/deformation at 5.6 Kg/cm ²	CMTC	B	K	P	W		N			
1.25.6	Switch operation test	Measurement			Drive flexible and point in normal condition	CMTC	B	K	P	W		N			
1.25.7	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained													
1.26	GAS COLLECTING DEVICE										E				
1.26.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Spec POWERGRID Spe	No visible defect	CMTC	B	K	P	W		N	Record review on surveillance basis		
1.26.2	Dimension check	Measurement			Within tolerance as per drg	CMTC	B	K	P	W		N			
1.26.3	Pressure test / leak test	Measurement			No leak at 0.75 kg/cm ² for 30 min	CMTC	B	K	P	W		N			
1.27	GATE AND GLOBE VALVE										E				
1.27.1	Check of healthiness	Visual	1 sample of 1 size per lot	BHEL Drg BHEL Spec POWERGRID Spec/ IS 778	No visible defect	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis		
1.27.2	Dimension check	Measurement			Within tolerance as per drg	CMTC	A/B	J/K	S/P	W		N			
1.27.3	Check for raw material for valve body, gate wedge, spindle & Gland	Visual			POWERGRID Specification, BHEL Drg, BHEL Spec.	CMTC	B	K	P	W		N			
1.27.4	a) Body test at 1.5 Mpa (2 min) b) Seat test at 1.0 Mpa (2 min) c) Seepage test at 2 kg/cm ² for 12 hrs.	Measurement	100% (1sample /lot for seepage test)		There should be no leaks	CMTC	B	K	P	W		N			
1.28	BUTTERFLY VALVE										E				
1.28.1	Dimensional check	Measurement	One sample per lot	BHEL Spec BHEL Drg BHEL Stds/ IS 778	Within tolerance	CMTC	B	K	P	W		N	Record review on surveillance basis		
1.28.2	Visual inspection	Visual	100%		No visible defects	CMTC	B	K	P	W		N			
1.28.3	Pressure test through body and spindle	Measurement			No leak at 5 kg/cm ² for 10 min	CMTC	B	K	P	W		N			

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1.28.4	Pressure test diaphragm	Measurement			Max 6 drops/min at 1.5 kg/cm ²	CMTC	B	K	P	W		N					
1.28.5	Oil seepage Test (oil 100 ±5°C pressure of 2 Kg/cm ² for 24 hrs) – Type test	Measurement	One sample per lot		No leak in body & spindle Max 6 drops/min through disc	CMTC	B	K	P	W		N					
1.28.6	Material composition (Disc & Housing)	Measurement			BHEL Drawing	CMTC	B	K	P	W		N					
1.29	SILICAGEL BREATHER										E						
1.29.1	Dimension, Type and model check	Measurement	100%	BHEL Drg BHEL Spec POWERGRID Spec	Within tolerance, Type and model as per drg	CMTC	A/B	J/K	S/P	W		N	Record review on surveillance basis				
1.29.2	Check of healthiness & colour of Silica gel	Visual			No visible defect. Gel colour is blue/Orange	CMTC	A/B	J/K	S/P	W		N					
1.29.3	Pressure test by blanking oil cup end	Measurement			No leak at 0.35 kg/cm ² (for 30 Min)	CMTC	B	K	P	W		N					
1.30	RADIATOR										E						
1.30.1	Visual check of raw material (CRC steel) finish	Visual	100%	POWERGRID spec, POWERGRID approved Drg, BHEL Spec BHEL Drg IS 513	No surface defect	CMTC	B	K	P	W		N	CIP for 1 unit of each contract. Balance record review on surveillance basis				
1.30.2	Chemical composition of raw material (CRC steel)	Measurement	1 sample/lot		POWERGRID spec. POWERGRID approved Drg, BHEL Spec BHEL Drg IS 513	CMTC	B	K	P	W/Z		N					
1.30.3	Mechanical properties of raw material (CRC steel)	Measurement	100%			CMTC	B	K	P	W/Z		N					
1.30.4	DP test on lifting lug welds	Visual				CMTC	B	K	P	W/Z		N					
1.30.5	Leakage test at 2 kg/cm ² for 1 Hr	Visual															
1.30.6	Surface cleaning of header support & bracing details by short blasting	Visual				CMTC	B	K	P	W/Z		N					

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1.30.7	Visual check of paint shade, paint film thickness & outside film adhesion test.	Visual				CMTC	B	K	P	W/Z		N	
1.30.8	Dimensional check after final welding flange centre & overall	Measurement			Dimension within Tolerance	CMTC	B	K	P	W/Z		N	Record review on surveillance basis
1.31	DRUMS FOR INSULATING OIL (if applicable)										N		
1.31.1	Visual check of inside cleanliness & outside coat a) Dimension check (thickness, height & diameter) b) Leakage test on drum c) Drop test d) Hydraulic test	Visual and Measurement	IS178 3 Part 1	BHEL Spec BHEL Drg BHEL Stds IS1783 Part 1	BHEL Spec BHEL Drg BHEL Stds IS1783 Part 1	CMTC	B	K	P	W/Z		N	Record review at time of final testing
1.32	INSULATING OIL FOR FILLING AT SITE Note: All tests to be conducted as per POWERGRID applicable TS of subject contract, Oil should be virgin high grade inhibited, conforming to IEC 60296 and POWERGRID specified parameters.										E		
1.32.1	Appearance	Visual	IS 6855 IEC 60296	POWERGRID Tech Spec of the contract/IEC 60296	Clear & transparent	CMTC	B	K	U	W/Z		Y	 CIP for all units at Oil manufacturer's works
1.32.2	Viscosity at 100°C	Measurement			Max: 3 mm ² /s	CMTC	B	K	U	W/Z		Y	
1.32.3	Viscosity at 40°C	Measurement			Max: 12 mm ² /s	CMTC	B	K	U	W/Z		Y	
1.32.4	Viscosity at -30°C	Measurement			Max: 1800 mm ² /s	CMTC	B	K	U	W/Z		Y	
1.32.5	Pour point °C	Measurement			Max: -40 °C	CMTC	B	K	U	W/Z		Y	
1.32.6	Water content a) For Bulk supply b) For delivery in drums	Measurement			a) Max: 30 mg/kg b) Max 40 mg/kg	CMTC	B	K	U	W/Z		Y	
1.32.7	Electric strength (Break down voltage)	Measurement			Min 50 kV rms (New Unfiltered) Min 70 kV rms (After filtration)	CMTC	B	K	U	W/Z		Y	
1.32.8	Density at 20 °C	Measurement			Max. 0.895 kg/m ³	CMTC	B	K	U	W/Z		Y	
1.32.9	Dielectric dissipation factor (Tan Delta) at 90 °C	Measurement			Max: 0.005	CMTC	B	K	U	W/Z		Y	



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1.32.10	Resistivity at 90 °C	Measurement			Min: 150 X 10 ¹² ohm-cm	CMTC	B	K	U	W/Z		Y	
1.32.11	Negative impulse at 25 °C	Measurement			Withstand Min 145 kVp	CMTC	B	K	U	W/Z		Y	
1.32.12	Carbon type composition % of Aromatic, Paraffinic and naphthalene	Measurement			Aromatic 4 to 12% Paraffinic <50% Balance shall be Naphthalene	CMTC	B	K	U	W/Z		Y	
1.32.13	Acidity	Measurement			Max 0.01 mg KOH/g	CMTC	B	K	U	W/Z		Y	
1.32.14	Interfacial tension at 27 °C	Measurement			(Min) 0.04 N/m	CMTC	B	K	U	W/Z		Y	
1.32.15	Total Sulphur content	Measurement			Max: 0.15%	CMTC	B	K	U	W/Z		Y	
1.32.16	Corrosive Sulphur (IEC 62535)	Measurement			Non-corrosive on copper & paper	CMTC	B	K	U	W/Z		Y	
1.32.17	Corrosive Sulphur (ASTM D 1275B)	Measurement			Non-corrosive	CMTC	B	K	U	W/Z		Y	
1.32.18	Presence of oxidation inhibitor	Measurement			Min: 0.08% to Max: 0.4% (No other additive)	CMTC	B	K	U	W/Z		Y	
1.32.19	2 Furfural content	Measurement			Max 25 Microgram/ Litre	CMTC	B	K	U	W/Z		Y	
1.32.20	Oxidation stability a) Total acidity b) Total sludge by mass c) Tan delta at 90 °C	Measurement			a) Max 0.30 mg KOH/g b) Max 0.05% c) Max 0.05	CMTC	B	K	U	W/Z		Y	
1.32.21	Oxidation stability (rotating bomb test)	Measurement			Min 220 minutes	CMTC	B	K	U	W/Z		Y	
1.32.22	Flash Point °C	Measurement			135°C (Min)	CMTC	B	K	U	W/Z		Y	
1.32.23	PCA content	Measurement			Max 3%	CMTC	B	K	U	W/Z		Y	
1.32.24	PCB content	Measurement			Not detectable (less than 2 mg/kg)	CMTC	B	K	U	W/Z		Y	
1.32.25	Check of oil prior to dispatch: a) Proper sealing of oil drum b) Visual check for leakage c) Damage of drums	Visual	100%	POWERGRID TS of subject contract	a) Proper sealing of Drums b) No leak from filled drums c) No damage to drums	CMTC	B	K	U	W/Z		Y	
1.32.26	Checking of Oil Quantity	Measurement	100%	POWERGRID contract/ Approved GTP/ Appvd Drgs		CMTC	B	K	U	W/Z		Y	


CIP for all units at Oil manufacturer's works





CIP for all units at Oil manufacturer's works



Signature




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							1	2	3	4	5	6		
1.33	Intentionally left Blank													
1.34	STEEL FOR TANK COVER, CONSERVATOR, TURRETS & ACCESSORIES (RAW MATERIAL)										E			
1.34.1	Check for finish	Visual	One sample per lot	BHEL Spec BHEL Drg BHEL Stds BS4360 IS 2062	BHEL Spec BHEL Drg BHEL Stds BS4360 IS 2062	MTC	B	K	Q	W		N	Record review on surveillance basis	
1.34.2	Check of dimension	Measurement				MTC	B	K	Q	W		N		
1.34.3	Chemical composition	Measurement				MTC	B	K	Q	W		N		
1.34.4	Mechanical properties	Measurement				MTC	B	K	Q	W		N		
1.35.5	Ultrasonic Test on bottom Plate of bottom tank (16 mm & above)	Measurement	100%				B/D	K/L	Q/V	W / Z		Y	Inspection report will be submitted for review	
1.35	RAW MATERIAL FOR MILD STEEL TUBE, CARBON STEEL PIPES (ELECTRIC RESISTANCE WELDED) FOR PIPES SUB ASSEMBLY & LIFTING BOLLARD													
1.35.1	Check for finish	Visual	One sample per lot	BHEL Spec BHEL Drg EN10216-12004/ IS 3589	No visual defects	CMTC	B	K	P	W		N	Record review on surveillance basis	
1.35.2	Check of dimension	Measurement			Dimension within tolerance	CMTC	B	K	P	W		N		
1.35.3	Chemical composition	Measurement			BHEL Spec/ BHEL Drg EN10216-12004 /IS 3589	CMTC	B	K	P	W		N		
1.35.4	Mechanical properties	Measurement				CMTC	B	K	P	W		N		
1.35.5	Welding procedure Spec (WPS) & welder qualification (for all fabricated items)	Visual	For all jobs	ASME Sec IX & POWERGRID Approved WPS	ASME Sec IX & POWERGRID Approved WPS	EMTC	B	K	Q	W/Z		N	Review of POWERGRID approval during POWERGRID inspection	
1.35.6	Visual check for Welding Electrode (for all steel fabricated items)	Visual	One sample per lot	Do	Do	CMTC/EMTC	B	K	Q	W / Z		N	Record review on first unit of each contract & rest on surveillance basis	
1.36	FABRICATION OF TANK, TANK COVER, TURRET, CONSERVATOR & ACCESSORIES										E			
1.36.1	Check for fit up for butt welds on tank walls, base & cover	Visual	100%	BHEL Drg BHEL Stds	BHEL Drg	EMTC	B	K	Q	W/Z		N	Record review on surveillance basis	
1.36.2	DP Test on load bearing welds (lifting lugs/ bollards. DP test on jacking pads)	Visual	Each tank	BHEL Spec BHEL Drg BHEL MQP for fabrication	No defect as per test report	EMTC	B	K	Q/U	W/Z		N	CIP Level IV for one Transformer of each rating of each sub vendor per contract. Balance CIP Level II	



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1.36.3	Radiography Test on Butt weld in bottom plate of bottom tank after fit up (if any)	Measurement	100%		BHEL Spec BHEL Drg BHEL MQP for fabrication	EMTC	B	K	Q	W/Z		N	Inspection report will be submitted for review	
1.36.4	Visual Check of welding joint	Visual	100%			EMTC	B	K	Q	W/Z		N	Record review on surveillance basis	
1.36.5	Dimensional check after final welding including rim flatness, position of guides & earth connection, projection and matching of tank with cover	Measurement	100%			EMTC	B	K	Q	W/Z		N		
1.36.6	Back chip DP test on butt welds after fit up	Visual	Each tank			EMTC	B	K	Q	W/Z		N		
1.36.7	D.P. Test on all wet weld joints after complete welding including accessories (to be done by level II certified person)	Visual	Each tank			EMTC	B	K	Q	W/Z		N		
1.36.8	Air leakage test on assembled tank with turrets and on conservator separately	Measurement	100%		BHEL Spec BHEL Drg BHEL Stds CBIP standard	EMTC	B	K	Q	W/Z		N	CIP Level IV for one Transformer of each rating of each sub vendor per contract. For Balance Jobs CIP Level II	
1.36.9	Pressure test & Vacuum Test on Tank only with deflection Measurement	Measurement	Each tank			EMTC	B	K	P/U	W/Z		Y		
1.36.10	Dimension of roller mounting pad with std. Fixture of roller by turning by 90°	Measurement	100%		BHEL Spec BHEL Drg BHEL MQP for fabrication	EMTC	B	K	Q	W/Z		N	Record review on surveillance basis	
1.36.10	Surface cleaning by shot blasting (for all items)	Visual	100%			EMTC	B	K	P	W/Z		N		
1.36.13	Check of a) Paint shade b) Paint film thickness (inside & outside) c) Film adhesion test	Visual	100%		BHEL Drg BHEL Stds BHEL MQP for fabrication BHEL painting specification POWERGRID painting specification		EMTC	B	K	P	W/Z		Y	CIP Level II



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							1	2	3	4	5	6	
1.36.14	PIPEWORK INCLUDING RADIATOR HEADER ASSEMBLY												
1.36.15	Dimension check	Measurement	100%	BHEL Spec BHEL Drg BHEL MQP for fabrication	EMTC	B	K	Q	W/Z		N	Record review on surveillance basis	
1.36.16	Matching of accessories (dummy), conservator and pipework header with respect to tank	Visual, Dimensional	100%		EMTC	B	K	Q	W/Z		N		
1.36.17	Air pressure test on pipework & header Assembly	Measurement	100%		EMTC	B	K	U/Q	W/Z		N	CIP for one transformer of each rating per contract for each sub vendor. (for Air pressure test)	
1.36.18	Surface cleaning by Shot blasting	Visual	100%	BHEL Drg BHEL Stds BHEL MQP for fabrication BHEL painting specification POWERGRID painting specification	EMTC	B	K	Q	W/Z		N	Record review on surveillance basis	
1.36.19	Check of Paint shade Paint film thickness (inside & outside) Film adhesion test	Measurement	100%		EMTC	B	K	Q	W/Z		N		
1.36.20	Visual check inside the pipe with BAROSCOPE/Magnetic Stick (below and including 50NB)	Measurement	100%	BHEL Spec BHEL Drg	There shall not be any foreign particle inside pipe/ it should be defect free	EMTC	B	K	Q	W/Z		N	Test report will be submitted for review during final tank clearance
1.37	FIBRE OPTIC SENSOR										E		
1.37.1	Visual check, check of range & dimension	Visual	100%	POWERGRID tech spec.	As per manufacturer's certificate	CMTC	B	K	P	W/Z		N	Record review on surveillance basis
1.37.2	Negative full wave LI test (Type test)	Measurement	One sample	Preparation: ASTM D 2413 Test:: ASTM D 3426	500 kVp for gap of 25 mm without breakdown or flashover	CMTC	B	K	P	W/Z		N	
1.37.3	Impulse creep test (Type test)	Measurement		ASTM D 149	360 kVp for gap of 25 mm without breakdown or flashover	CMTC	B	K	P	W/Z		N	

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1.37.4	PD Measurement AC withstand test (Type test)	Measurement		ASTM D 2413	Less than 10 pc at electric field strength of 4.7 kV/ mm 70 kV on 15 mm gap 140 kV on 30 mm gap	CMTC	B	K	P	W/Z		N		
1.38	ONLINE DISSOLVED GAS & MOISTURE MONITOR										E			
1.38.1	Check healthiness & Dimension	Visual/ Measurement	100%	POWERGRID tech spec of the subject contract/ IEC 60599	No damages as per drawing	CMTC	B	K	P	W/Z		N	CIP in level II	
1.38.2	Visual Checks (Verification of Make and Model)	Visual	100%		Make and Model as per GTP	CMTC	B	K	P	W/Z		N		
1.38.3	BOM Checks & Review of Manufacturer TC	Visual	100%		Manufacturer BOM / POWERGRID TS	CMTC	B	K	P	W/Z		N		
1.39	ONLINE INSULATING OIL DRYING SYSTEM										E			
1.39.1	Visual and dimension check	Measurement	100%	POWERGRID tech spec of the subject contract	No damage & dimension within limits	CMTC	B	K	P	W/Z		N	CIP in level II	
1.39.2	All other test as latest POWERGRID FAT checklist	Measurement			POWERGRID TS	CMTC	B	K	P	W/Z		N		
1.40	FLOW SENSITIVE VALVE										E			
1.40.1	Check for healthiness	Visual	One sample per lot	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec	CMTC	B	K	P	W		N	Record review on surveillance basis	
1.40.2	Dimension check	Measurement				CMTC	B	K	P	W		N		
1.40.3	Operating system test	Measurement				CMTC	B	K	P	W		N		
1.40.4	Setting of secondary valve	Measurement				CMTC	B	K	P	W		N		
1.40.5	Tightness check	Measurement			100%	As per Specification	CMTC	B	K	P	W			N
1.40.6	Insulation test	Measurement				As per Specification	CMTC	B	K	P	W			N
1.41	OIL CIRCULATING PUMP										E			
1.41.1	Check of healthiness	Visual	100%	BHEL	BHEL Drg	CMTC	B	K	P	W/Z		N	Record review on	




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1.41.2	Dimensional Check	Measurement	100%	Drg BHEL Stds POWERGRID Spec IS 9137	BHEL Stds IS 9137	CMTC	B	K	P	W/Z		N	surveillance basis	
1.41.3	Oil pressure test on pump at 4 kg/cm² for 30 minutes	Measurement			No leakage	CMTC	B	K	P	W/Z		N		
1.41.4	Dielectric test between terminals & earth	Measurement			Shall withstand 2 kV for 1 min	CMTC	B	K	P	W/Z		N		
1.41.5	Check for No load running (RPM, Input power & current)	Measurement			BHEL Drg BHEL Stds IS 9137	CMTC	B	K	P	W/Z		N		
1.41.6	Locked rotor test	Measurement				CMTC	B	K	P	W/Z		N		
1.41.7	Performance test Discharge at different heads & power consumption	Measurement				CMTC	B	K	P	W/Z		N		
1.41.8	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.42	COOLING FAN & MOTOR ASSEMBLY										E			
1.42.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Stds POWERGRID Spec. IS 2312	BHEL Drg BHEL Stds POWERGRID Spec. IS 2312	CMTC	B	K	P	W/Z		N	Record review on surveillance basis	
1.42.2	Dimensional check	Measurement				CMTC	B	K	P	W/Z		N		
1.42.3	Routine and acceptance test	Measurement				CMTC	B	K	P	W/Z		N		
	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.43	OIL FLOW INDICATOR										E			
1.43.1	Check of healthiness	Visual	100%	BHEL Drg BHEL Stds POWERGRID Spec	BHEL Drg BHEL Stds POWERGRID Spec.	CMTC	B	K	P	W		N	 Record review on surveillance basis	
1.43.2	Dimensional check	Measurement				CMTC	B	K	P	W		N		
1.43.3	Full Flow Check	Measurement				CMTC	B	K	P	W		N		
1.43.4	Alarm & Trip operation check	Measurement				CMTC	B	K	P	W		N		
1.43.5	Dielectric Test between terminals and earth	Measurement			Shall withstand 2 kV for 1 min	CMTC	B	K	P	W		N		
1.43.6	Leak test at 7 kg/cm² for 2 min	Measurement			No leak	CMTC	B	K	P	W		N		




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1.44	Digital RTCC Panel including AVR										E		
1.44.1	Surface cleaning before painting by 7 tank process (if called for in subject contract)	Visual	100%	BHEL Drg BHEL Stds POWERGRID Spec POWERGRID paint procedure		CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		Y	Record review on surveillance basis
1.44.2	Dimension check (including sheet thickness)	Measurement				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		Y	CIP for first unit of each contract & rest record review on surveillance basis
1.44.3	Check of paint shade, paint film thickness & paint adhesion	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.4	Checking for wiring routing, connections & assembly	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.5	Check for make & type of instruments / component	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.6	2 kV ac for one minute insulation test between all live terminal & earth	Measurement	100%	BHEL Drg BHEL Stds POWERGRID Spec/ std FAT Checklist	CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N		
1.44.7	Measurement of insulation resistance by 500 Volt megger	Measurement				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.8	Functional Check remote/local, auto/manual & electrical operation as per scheme at Min, rated and max operating voltage	Measurement				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.9	Check of auxiliary and PT supply voltage range	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.10	Check CT range	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.11	Check for LED indications	Visual				CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		N	
1.44.12	Check on digital RTCC Relay/ automatic voltage regulating relay (AVR) If applicable												
1.44.13	Digital RTCC Relay: 1. Check of Binary i/p & o/p signal along with HMI display nomenclature 2. Check of availability of spare binary i/p & o/p terminals	Measurement	100%	BHEL Drg BHEL Stds POWERGRID Spec	BHEL Drg BHEL Stds POWERGRID Spec	CMTC/ EMTC	A/B	J/K	S/Q/U	W/Z		Y	CIP for first unit of each contract & rest record review on surveillance



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							1	2	3	4	5	6		
1.44.14	Voltage and current Measurement	Measurement										basis		
1.44.15	Check of panel switches	Visual				CMTC/EMTC	A/B	J/K	S/Q/U	W/Z			Y	
1.44.16	Check for function of communication interface	Measurement				CMTC/EMTC	A/B	J/K	S/Q/U	W/Z			Y	
1.44.17	Test of complete function including tap ,position indicator & raise and lower command	Measurement				CMTC/EMTC	A/B	J/K	S/Q/U	W/Z			Y	
1.44.18	TYPE TEST (if applicable)	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												
1.45	ON LOAD TAP CHANGER									E				
1.45.1	Pressure leak test of diverter switch compartment	Measurement	Each OLTC	BHEL Drg BHEL Stds POWERGRID Spec IS 8468 IEC 60214	No leak at 10 psi for 1 hour	CMTC	B	K	Q	W/Z		Y	Record review on surveillance basis	
1.45.2	Mechanical operation test of diverter switch (Endurance test)	Measurement			No defect after 5000 operations	CMTC	B	K	Q/U	W/Z		Y	CIP on one unit of each rating of transformer of each contract. Record review of balance on surveillance basis	
1.45.3	Sequence test	Measurement			Switching time within limits	CMTC	B	K	Q/U	W/Z		Y		
1.45.4	Mechanical test of tap selector with motor drive	Measurement			500 satisfactory operations between extreme taps	CMTC	B	K	Q/U	W/Z		Y		
1.45.5	Operation test of complete OLTC including functional check of driving mechanism	Measurement			Satisfactory operation	CMTC	B	K	Q/U	W/Z		Y		
1.45.6	HV test on auxiliary circuit 2 kV for 1 min	Measurement			Should withstand	CMTC	B	K	Q/U	W/Z		Y		
1.45.7	Physical & Dimension check as per drawing including verification of fibre glass bar used in diverter switch	Measurement		Conform to component Drawing			CMTC	B	K	Q/U	W/Z		Y	
1.45.8	Visual check of paint shade & thickness and adhesion on motor drive panel	Visual		BHEL Drg BHEL Stds POWERGRID Spec POWERGRID paint procedure			CMTC	B	K	Q/U	W/Z		Y	
1.45.9	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted. Approval of POWERGRID Engineering to be obtained												




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							1	2	3	4	5	6	
1.46	Cables										E		
	All cables used for connecting Transformer fitting and Turret CTs to Marshalling Box should be procured from POWERGRID approved Source					CMTC	B	K	Q	W/Z		N	Record Review by POWERGRID on surveillance basis
B	IN PROCESS INSPECTION												
2.1	WINDING												
2.1.1	Measurement of conductor size	Measurement	Each winding of Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		N	CIP on one transformer of each contract & record review on balance units on surveillance basis. 
2.1.2	Check Inside diameter and radial width of coil	Measurement				EMTC	A	J	S	W/Z		N	
2.1.3	Check Brazing of conductor	Measurement				EMTC	A	J	S	W/Z		N	
2.1.4	Check of end insulation arrangement	Visual				EMTC	A	J	S	W/Z		N	
2.1.5	Check assembly of composite coil	Visual				EMTC	A	J	S	W/Z		N	
2.1.6	Check pressure for Coil (clamping force)	Measurement				EMTC	A	J	S	W/Z		N	
2.1.7	Drying of coils	Measurement				EMTC	A	J	S	W/Z		N	
2.1.8	Check arrangement of Fibre Optic Sensor (FOS) (if applicable)	Visual				EMTC	A	J	S	W/Z		N	
2.1.9	Testing of winding: Continuity/buzzer test	Visual				EMTC	A	J	S	W/Z		N	
2.1.10	Check of the no of turns/ discs	Visual				EMTC	A	J	S	W/Z		N	
2.1.11	Check of terminal marking & length	Visual				EMTC	A	J	S	W/Z		N	



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2.1.12	Brazing procedure & Brazer qualification	Verify	All brazers	ASME Sec IX POWERGRID approved procedure/ BHEL Approved Procedure		EMTC	A	J	S	W/Z		N	Review of POWERGRID Brazer approval Checked yearly by BHEL	
2.2	CORE BUILDING & FRAME ASSEMBLY													
2.2.1	CRGO sheet selection during core building for testing of a) Specific core loss b) Stacking factor c) Surface insulation resistivity d) Magnetic polarisation e) Ductility / Bend test f) Ageing g) Lamination thickness	Measurement	As per POWERGRID approved CRGO check list			EMTC	A/D	J/L	U/V	W/Z		Y	CIP as per latest CRGO check list	
2.2.2	Check of frame assembly	Visual	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		N	Record review on surveillance basis 	
2.2.3	Check window width and window height and diagonal of frame	Measurement				EMTC	A	J	S	W/Z		N		
2.2.4	Check arrangement of insulation	Visual				EMTC	A	J	S	W/Z		N		
2.2.5	Check height of core stack	Measurement				EMTC	A	J	S	W/Z		N		
2.2.6	Check assembly of tensile bolt (torque check)	Visual				EMTC	A	J	S	W/Z		N		
2.2.7	Check banding of polyester tape	Visual				EMTC	A	J	S	W/Z		N		
2.2.8	Check of core inclination	Measurement				EMTC	A	J	S	W/Z		N		
2.2.9	Check of waviness of core yoke	Measurement				EMTC	A	J	S	W/Z		N		
2.2.10	Check of Overall Dimension of core (without Top Yoke)	Measurement				EMTC	A	J	S	W/Z		N		
2.2.11	Core assembly dielectric and earthing continuity test Isolation test between CC-Cl, CC-Yoke Bolt, Cl-Yoke Bolt by 2kV AC	Measurement				EMTC	A	J	S	W/Z		N		


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2.3	CORE & COIL ASSEMBLY												
2.3.1	Check of level of bottom yoke (bearing beam)	Visual	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		Y	Record review on surveillance basis
2.3.2	Check assembly of the magnetic shields (if applicable)	Visual				EMTC	A	J	S	W/Z		Y	
2.3.3	Check strip barrier assy. on all limbs	Visual				EMTC	A	J	S	W/Z		Y	
2.3.4	Check position of lead take out of HV					EMTC	A	J	S	W/Z		Y	
2.3.5	Check clamping of upper yoke	Visual				EMTC	A	J	S	W/Z		Y	
2.3.6	Check torque/ pressure of tensile bolt	Visual				EMTC	A	J	S	W/Z		Y	
2.3.7	Check insulation resistance between cooling duct by 500 V megger	Measurement				EMTC	A	J	S	W/Z		Y	CIP in Level-IV on all unit of Transformer package
2.3.8	Measurement of Voltage ratio	Measurement				EMTC	A	J	S	W/Z		Y	
2.3.9	Check Isolation test between core and frame at 2 kV AC for 60 s.	Measurement				EMTC	A	J	S/U	W/Z		Y	
2.3.10	Measurement of mag. Current, Resistance, Magnetic balance polarity and vector group	Measurement				EMTC	A	J	S/U	W/Z		Y	
2.3.11	Final inspection of core & coil assy. a) Check for completeness b) Check cleanliness c) Check clearances of live parts d) Check absence of sharp edges e) Check placement of lead support assembly	Visual				EMTC	A	J	S/U	W/Z		Y	




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2.3.12	Dummy insulation block insertion with active part for detecting moisture content in solid insulation (As per applicable TS)	Verify		POWER GRID SPEC.	Moisture content should be less than 0.5%		A/D	L/J	V/S/ U	W/Z		Y	(Sample to be sent after VPD for testing to be done at third party/ in-house lab) CAT B CIP may be issued at the risk & cost of BHEL		
2.4	DRYING OF ACTIVE PART (VPD) VPD Validation - Verification of vacuum leak rate once in year duly witnessed by POWERGRID														
2.4.1	Check of temp of Evaporator	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		N	Graph of Vacuum Vs Time and Temperature Vs time to be submitted for review		
2.4.2	Check temp of Main heating	Measurement				EMTC	A	J	S	W/Z		N			
2.4.3	Check temp of Sprayed Kerosene	Measurement				EMTC	A	J	S	W/Z		N			
2.4.4	Check Vacuum Pressure (mbar) of VPD	Measurement				EMTC	A	J	S	W/Z		N			
2.4.5	Check Vacuum Pressure (mbar) of Fine vacuum	Measurement				EMTC	A	J	S	W/Z		N			
2.4.6	Check Water Extraction (g / Hr / Ton of Insulation) / Process Termination parameters	Measurement				EMTC	A	J	S	W/Z		N	Record review on surveillance basis		
2.4.7	Check Total process time (Hr)	Measurement				EMTC	A	J	S	W/Z		N			
2.4.8	Check Oil characteristics before impregnation a) Electric strength b) Water content c) Tan delta at 90°C d) Resistivity at 90°C(For Information) e) IFT at room temperature	Measurement			Oil characteristics before impregnation a) Min 70 kV b) Max 5 ppm c) Max 0.003 d) (For Information) e) Min 40 m N/m	EMTC	A	J	S	W/Z		N	Note:- Oil to be used for impregnation, testing & for final filling at site should be of same type/grade meeting POWERGRID spec.		



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2.5	SERVICING AND TANKING												
2.5.1	Check of cleanliness & insulation arrangement of tank	Visual	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		N	CIP Level-II for all units
2.5.2	Final inspection of the active part prior to tanking	Visual				EMTC	A	J	S	W/Z		N	
2.5.3	Check compression of active part prior to tanking	Measurement				EMTC	A	J	S	W/Z		N	
2.5.4	Check tightness, completeness of insulation material and lead assembly	Visual				EMTC	A	J	S	W/Z		N	
2.5.5	Clearance (Inside) of the leads with Tank Wall/Shunt	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	BHEL Spec BHEL Drg BHEL Stds BHEL Check list	EMTC	A	J	S	W/Z		N	Record review on surveillance basis
2.5.6	Check of Isolation test between core, frame and tank by 2 kV AC for 60 s.	Measurement				EMTC	A	J	S	W/Z		N	
2.5.7	Check exposure time of active part	Measurement				EMTC	A	J	S	W/Z		N	
2.5.8	Check vacuum, oil filling and hot-oil circulation	Measurement				EMTC	A	J	S	W/Z		N	
2.5.9	Leakage test by Dry air/Nitrogen after completion of tanking (box up)	Visual				EMTC	A	J	S	W/Z		N	
2.6	TEST OF OIL PRIOR TO FINAL TESTING												
2.6.1	BDV Check	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds	Min: 70 kV	EMTC	A	J	S	W/Z		N	 CIP L-IV for One Transformer & balance CIP in Level – II
2.6.2	Check for moisture content	Measurement			Max: 5 ppm	EMTC	A	J	S	W/Z		N	
2.6.3	Check Tan Delta	Measurement			Max: 0.005	EMTC	A	J	S	W/Z		N	
2.6.4	Check Resistivity (For Information)	Measurement			(For Information)	EMTC	A	J	S	W/Z		N	
2.6.5	Check Interfacial Tension (IFT)	Measurement			Min: 40 m N/m	EMTC	A	J	S	W/Z		N	
2.6.6	Particle Content (Only for 400 kV and above class)	Measurement			≤1000 particles/100 ml size ≥5 microns	EMTC	A	J	S	W/Z		N	



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		POWERGRID Corporation of India Ltd.			3000000057		EHV Transformers up to 765 kV			TXB 112		01	31.12.2020		31.12.2021	
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks			
							1	2	3	4	5	6				

2.7	SETTLING TIME												
2.7.1	Before start of high voltage test	Visual	Each Transformer	BHEL Spec BHEL Stds	BHEL Spec BHEL Stds	EMTC	A	J	S	W/Z		N	Record review at time of final testing

C	FINAL INSPECTION AND TESTING												
3.1	ROUTINE TESTS (All routine tests mentioned in applicable TS of subject contract in question need to be carried out. Transformer shall be offered for routine testing only after complete HOC, settling and at normal head pressure as per design.												
3.1.1	Check of Calibration of a) High voltage test equipment b) Loss Measurement c) L Impulse & S Impulse d) Partial discharge	Validity of calibration	Once a year		Calibration procedure	EMTC	A	J	U	W/Z		Y	Witness by POWERGRID
3.1.2	Dimension check as assembled for testing	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026/ POWERGRID Standard Test Procedure (Latest Revision)	As per approved drawing	EMTC	A	J	U	W/Z		Y	Customer inspection point (CIP) 
3.1.3	Measurement of Winding resistance	Measurement			BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026	EMTC	A	J	U	W/Z		Y	
3.1.4	Measurement of voltage Ratio at all taps	Measurement				EMTC	A	J	U	W/Z		Y	
3.1.5	Measurement of vector group & Polarity	Measurement				EMTC	A	J	U	W/Z		Y	
3.1.6	Magnetic balance test at low voltage (for 3 phase transformers)	Measurement				EMTC	A	J	U	W/Z		Y	
3.1.7	Measurement of IR & PI value	Measurement			(PI value) (HV+IV+N)/LV+E ≥ 1.5 LV/(HV+IV+N+E) ≥ 1.5 (HV+IV+N)/LV ≥ 2.0 IR value for all above combination shall be greater than 1 G ohm at 60 seconds.	EMTC	A	J	U	W/Z		Y	

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		POWERGRID Corporation of India Ltd.			3000000057	EHV Transformers up to 765 kV			TXB 112	01	31.12.2020	31.12.2021		
SI No.	Components and Operations	Type of check	Quantum of check	Reference document	Acceptance norms	Form of record	Applicable Codes						Remarks	
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3.1.8	Measurement of insulation power factor and capacitance between winding & earth	Measurement			As per applicable TS	EMTC	A	J	U	W/Z		Y		
3.1.9	Measurement of insulation power factor at variable frequency and capacitance of bushing	Measurement			As per applicable TS	EMTC	A	J	U	W/Z		Y		
3.1.10	No load loss & current Measurement at 90, 100, 110 % excitation	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026/ POWERGRID Standard Test Procedure (Latest Revision)	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026	EMTC	A	J	U	W/Z		Y	Customer inspection point (CIP) 	
3.1.11	Measurement of Short circuit impedance & load loss Measurement at normal & extreme taps	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.12	Chopped wave lightning impulse test for the line terminals (LIC)	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.13	Measurement of the transfer surge on LV due to Lightning Impulse on HV and IV (as applicable)	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.14	Switching impulse test	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.15	Measurement of the transfer surge on LV due to Switching Impulse on HV and IV (as applicable)	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.16	Separate source voltage withstand test	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.17	Induced voltage tests with PD Measurement	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.18	Short duration heat run test (not applicable on unit on which Temperature rise performed)	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.19	Repeat No load loss & current Measurement at 100% excitation	Measurement				EMTC	A	J	U	W/Z		Y		



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3.1.20	Over excitation test (as applicable)	Measurement				EMTC	A	J	U	W/Z		Y			
3.1.21	DGA test before & after dielectric test	Measurement				EMTC	A	J	U	W/Z		Y			
3.1.22	Test on OLTC- (Ten complete cycle before LV test) and other tests such as One complete operating cycle at 85 % of auxiliary supply voltage ,one complete operating cycle with Transformer energised at rated voltage and frequency at no load .Ten tap change operation with + / - 2 steps of principal tap with as far as possible the rated current of Transformer with one winding short circuited etc. as per IS 2026	Measurement				EMTC	A	J	U	W/Z		Y		Customer inspection point (CIP)	
3.1.23	Measurement of No load current and short circuit impedance at 230/415 Volt ac (for Single/Three phase Transformer)	Measurement	Each Transformer	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026	BHEL Spec/ Drg / Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026	EMTC	A	J	U	W/Z		Y	Customer inspection point (CIP)		
3.1.24	Isolation test of core, frame and tank by 2 kV megger	Measurement			With 2 kV megger the acceptable value $\geq 1 \text{ G}\Omega$	EMTC	A	J	U	W/Z		Y			
3.1.25	Frequency Response Test (SFRA) after completion of tests for Max, Min and Normal tap. Soft copy to be submitted to POWERGRID for reference	Measurement			Each transformer	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026/ POWER GRID Standard Test Procedure (Latest	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec POWERGRID Appvd Data Sheet Appvd GTP IEC 60076 IS 2026	EMTC	A	J	U	W/Z			
3.1.26	HV withstand test on auxiliary equipment wiring after assembly & function test on control cabinet	Measurement					EMTC	A	J	U	W/Z			Y	

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3.1.27	Oil leakage test on Transformer as assembled for Electrical routine test	Visual	Each Transformer	Revision)		EMTC	A	J	U	W/Z		Y	CIP (pls. see point no.1.36.8 of this MQP) CIP (pls. see point no.1.18 & 1.44) of this MQP) Record review by POWERGRID	
3.1.28	Tank Vacuum & Pressure Test (At tank supplier premises during tank manufacturing)	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.23	Marshalling Box, Common Marshalling Box & RTCC checks and digital RTCC if applicable.	Measurement				EMTC	A	J	U	W/Z		Y		
3.1.30	DP Test on jacking pads	Measurement				EMTC	A	J	S	W/Z		Y		
3.2	TYPE TEST	All type test as required as per Tech Spec of the subject contract in question need to be conducted												



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D	PACKING AND DESPATCH													
4.1	Dew point Measurement of dry air before filling in Transformer	Measurement	On sample basis	BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec	Better than -60 deg C (Before filling)	EMTC	A	J	S	W/Z		N	Record review on surveillance basis	
4.2	Pre-shipment check-Dry Air / oil tightness, proper blanking of all openings, mounting of nitrogen gas cylinder & regularization of pressure	Visual	Each Transformer		BHEL Spec BHEL Drg BHEL Stds POWERGRID Spec	EMTC	A	J	S	W/Z		N		
4.3	Dew point Measurement of nitrogen/ Dry air after 24 hrs. of filling in Transformer	Measurement			(Dew point value after 24 hrs) -38 at 20 degree -35 at 30 degree -30 at 40 degree	EMTC	A	J	S/U	W/Z		Y	CIP on all units	
4.4	Internal inspection of unit before dispatch for any dust, foreign metal elements, etc.	Visual			No foreign elements, metal parts should be present	EMTC	A	J	S/U	W/Z		Y		New Battery in impact recorder to be installed before despatch
4.5	Installation and checking of Electronic impact Recorder and GPS system on hydraulic trailer	Visual			BHEL Spec	EMTC	A	J	S/U	W/Z		Y		
4.6	Measurement of Paint DFT	Measurement			No Surface defect POWERGRID Spec	EMTC	A	J	S/U	W/Z		N		
4.7	Verification of completeness of accessories and fittings Check for soundness of packing	Visual	BHEL Shipping List	BHEL Shipping List	EMTC	A	J	S	W/Z		N	Record review on surveillance basis		
4.8	Verification of CIP/MICC reference no on packing case	Verify	CIP/MICC	CIP/MICC issued by POWERGRID	EMTC	A	J	S	W/Z		N	Review of documents by POWERGRID		

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