



MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN **FOR ALTERNATOR**

ALTERNATOR ARE AN INTEGRAL PART OF MODERN WARSHIPS DIESEL GENERATOR. THEY PROVIDE REQUIRED ELECTRICAL POWER FOR SHIP AND WORKING OF VARIOUS EQUIPMENT FITTED ON BOARD SHIPS AND SUBMARINE. ALTERNATOR RATED VOLTAGE IS TO BE 415V, 50HZ, 3ph. POWER DISTRIBUTION ONBOARD SHIPS WOULD BE 415V, 3ph, 50HZ WHICH WILL BE OBTAINED BY EITHER DIRECT POWER GENERATION OR DERIVES FROM HIGHER VOLTAGE GENERATION. THIS SQAP IS FOR ALL ALTERNATOR TO BE USED IN THE INDIAN NAVY.

STANDARD QAP NODGQA/DQA (WP)/ALTERNATOR/25/2022/REV0
18 APR 2022

Total Nos. of Pages: 95

ISSUING AUTHORITY

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MINISTRY OF DEFENCE (DGQA)
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NEAR SN DEPOT, NEW DELHI-110023

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	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	03
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN(REVISION 0) **FOR ALTERNATOR**

**STANDARD QAP NO
DGQA/DQA(WP)/ALTERNATOR/25/2022/REV0
APR 2022**


(S N Alamanda) 18/5/22
Rear Admiral
ADGQA(WP)

Promulgated by:-

**DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
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	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	04
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

CONDITION OF RELEASE

1. This standard QAP has been prepared for use of the Indian Navy and of its contractors to follow the specified Quality Assurance procedure during the execution of the contracts. No alteration is to be made to this Standard QAP except by the issue of authorised amendment by DQA (WP).
2. It is to be applied as required in the Quality Assurance procedures covering manufacture of Alternator (AC Generator) for IN Ships.
3. The website <http://www.dggqadefence.gov.in> may also be referred for other QA requirements.
3. The Standard QAP has been prepared on the basis of decisions made in Collegiate meeting held at DQA (WP) with leading manufacturers of Alternator representatives of professional directorate (DEE) and production directorates (DND and DSP). Any user of this Standard QAP either within DGQA / Indian Navy or in industry may propose an amendment to it with valid justification. Proposals not applicable to particular contract can be sent directly to DQA (WP), New Delhi, and those directly applicable to a particular contract are to be dealt with using contract procedures.
5. DQA (WP) reserves the right to amend or modify the contents of this Standard QAP without consulting or informing any holder of this document.
6. When this Standard QAP is incorporated into contracts, users are responsible for their correct application and for complying with contractual and other statutory requirements. Compliance with Standard QAP does not of itself confer immunity from legal obligations.
7. Enquiries in connection to these requirements may be made from:

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
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	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	05
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

CONTENTS

<u>S.No.</u>	<u>DESCRIPTION</u>	<u>PAGE</u>
1.	Standards Invoked	06
2.	Specific Requirements	07
3.	Abbreviations	08-09
4.	Scope	10
5.	System Description	11
6.	SQAP Part-I: General Information	12
7.	SQAP Part-II : Technical Inspection/Trials	13-25
8.	Annexure-1 : SOP for Testing at Environmental Test Lab CQAE(WE), Bangaluru CQAE(WE) Bangaluru SoP letter no. CQAE(WE)/Lab /1001, dated 06 Jul 2020	26-33
9	Annexure-II : ESS Test (Thermal Cycling, Random Vibration, DQA(N) Policy no. 66301/Policy-07/DQA (N)/QA-07 dated 09 Aug 16 and Burn in/Endurance Policy no. 66301/Policy-10/DQA (N)/QA-10, dt 14 Jun 2013.	34 -46
10	Annexure-III: Compendium of Vendors as per promulgated EE-50-30(Rev-2) issued by IHQ MoD(N)/DEE note no. EE/03/9715/Vendor list, dt 26 Apr 21	47-55
11	Annexure-IV: Conformal Coating of PCBs , DQA(N) Policy No. 580930/DQA(N)/EL dated 17 Feb 14	56-57
12	Annexure-V Preliminary Test, details of enclosure, salt corrosion and mould growth Test of alternator are to be carried out as per EED-Q-0242 (R3) iaw IHQ MoD(N)/DEE policy note no. EE/03/9700 dated 28 Jun 21.	58-58
13	Annexure-VI: Interpretation of policy –Mould Growth test of MSB as per IHQ MoD(N)/DEE policy note no. EE/03/9711 dated 15 Mar 21 and DQA(N) Policy no. 66301/ Policy/DQA(N)/SG, dated 01 Feb 19 and DQA(N) Policy no. DQAN/SG/1001/Type Test, dated 18 Jan 22.	59-76
14	Annexure-VII: Ingress Protection(Dust Protection) IHQ MoD(N)/DEE policy note no. EE/03/5124 dated 01 Mar 21.	77-78
15	Annexure-VIII : Guidelines for Approval of SQAPs/QAPs , DQA(WP) Policy no. 12575/Policy/DGQA/WP-TC, dated 28 Sep 20.	79-82
16	Annexure-IX: SOP for Remote Inspection , DQA(WP) Policy no. 29814/Misc/DGQA/WP-TC, dated 24 Feb 21	83-93
17	Annexure-X: Applicability of Environmental Stress Screening (ESS) Test , DQA(WP) Policy no. 570000/Tech Misc/DGQA/WP-IV, dated 11 Jan 2018.	94-95

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	06
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO DATE	00 APR 2022

STANDARDS INVOKED

Standards as mentioned in the SOTR and approved drawings.

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	07
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

SPECIFIC REQUIREMENTS

1. Testing of physical and chemical properties has to be done by NABL accredited lab. (Including firm's NABL accredited lab)
2. Make of the Items should be as per approved PIL/Bill of Material (BoM) or Naval approved sources
3. In case of bought out items, physical verification / function of item may be undertaken during assembly of the equipment to avoid repetition.
4. Imported items will be accepted against following import documents:-
 - (a) Bill of Lading.
 - (b) Country of Origin.
 - (c) Shipping Bill/ Air way bill.
 - (d) Bill of entry to warehousing.
 - (e) OEM Test Certificate/Quality Assurance Guarantee Certificate.
 - (f) OEM's certificate confirming that spares are tested for fitment on main equipment for which spares are ordered i.e. firm's confirmation certificate.
 - (g) Firm's Guarantee Certificate as per SO. Functional test may be undertaken ,if required, in addition.
5. Ingress protection testing will be as per applicable IP rating.
6. EMI/EMC test and ETT will be done at Government/PSU test centers or NABL accredited labs.
7. If Type Testing, EMI/EMC and ETT have already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will have to be provided for review of Inspection Agency.

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	08
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

ABBREVIATIONS

ASNT	American Society of Non destructive Testing
ATP	Acceptance Test Procedure
AVR	Automatic Voltage Regulator
BDV	Break Down Voltage
CHP	Customer Hold Point-a point beyond which the vendor will not proceed without a written authority from QAO. The process / activity will be inspected by QAO.
COTS	Commercially Off the Shelf
DBOM	Details Bill of Material
DI	Dimensional Inspection
DEE	Directorate of Electrical Engineering
DSP	Directorate of Ship Production
DND	Directorate of Naval Design
DQA(N)	Directorate of QA (Naval)
ETT	Environmental Type Test
ESS	Environmental Stress Screening Test
EED	Electrical Engineering Document
EMI/ EMC	Electromagnetic Interference/ Electromagnetic Compatibility
FATs	Factory Acceptance Trials
HVR	Hand Voltage Regulator
HV Test	High Voltage Test
IR	Inspection Report
IP	Ingress Protection
IR Test	Insulation Resistance Test
LTC	Lab Test Certificate
NABL	National Accreditation Board For Testing And Calibration of Laboratories
NEC	Naval EMI/EMC Center
OCC	Open Circuit Characteristics
OEM	Original Equipment Manufacturer
PO	Purchase Order



MINISTRY OF
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DIRECTORATE OF
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NEW DELHI - 110023

ALTERNATOR

STANDARD QAP NO
DGQA/DQA(WP)/ALTERNATOR/25/2022/REV0

PAGE

09

REV NO

00

DATE

APR
2022

ABBREVIATIONS

PCB/PWB	Printed Circuit Board/Printed Wire Board
P	Perform
R	Review of certificate and records by QAO-a point at which client will review documentation records at an agreed time after completion of activity.
RI	Remote Inspection
STC	Supplier Test Certificate
SOTR	Specification of Technical Requirement
TC	Test Certificate
TSP	Technical Specification
TNC	Technical Negotiation Committee
UT	Ultrasonic Test
VCI	Vapor Corrosion Inhibitor

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	10
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

SCOPE

Scope of Quality Assurance: The scope of Quality Assurance will cover witness and review Of all manufacturing activities during all stages viz. Raw Material, Stage including bought- out items, In-process Stage and Final Stage. The scope also covers the review and witness of Type test of equipment, wherever applicable.

The Standard Quality Assurance Plan contains comprehensive list of inspections and/or trials that is to be applicable for quality assurance of the equipment. In addition, quality assurance of equipment will also be governed by specific conditions laid down in SOTRs and 'Approved Drawings'. The inspections/ trials must be contemporary to latest technology/ techniques available in the industry at the time of placement of orders

The following quality assurance activities will be carried out during the Quality Assurance of Equipment:

- (a) Visual Inspection.
- (b) Dimensional Inspection.
- (c) Review of Lab Test Certificates.
- (d) Witness of in-house Lab Testing, if applicable.
- (e) Witness of Non-destructive Testing viz. UT.
- (f) Review of ETT, EMI/EMC and ESS reports, in addition to pre ETT inspection and post ETT inspection of Unit, as applicable.
- (g) Review of Draft documentation and witness/Stamping of final documentation, as applicable.
- (h) Issue of CHP clearance.
- (j) Weight of the final assembly unit, Painting, Packing, Preservation and Marking.
- (k) Issue of Dispatch Clearance or Issue of Form-IV, as applicable.

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	11
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

SYSTEM DESCRIPTION

1. A synchronous generator (Alternator) is a machine for converting mechanical power from a prime mover to ac electric power at a specific voltage and frequency. A synchronous machine rotates at a constant speed called synchronous speed.
2. Shipboard power is generated using a prime mover and an alternator working together. For this an alternating current generator is used on board. The generator works on the principle that when a magnetic field around a conductor varies, a current is induced in the conductor.
3. A Shipboard distribution system consist of different component for distribution and safe operation of the system. They are :-
 - (i) Ship Generator consisting of prime mover and alternator.
 - (ii) Main Switch board which is a metal enclosure taking power from the diesel generator and supplying it to different machinery.
 - (iii) Bus bar which acts as a carrier and allow transfer of load from one point to another. Circuit breakers which act as a switch and in unsafe condition can be tripped to avoid breakdown and accidents. Fuse as safety device for machinery.
 - (iv) In a power distribution system, the voltage at which the system works is usually 440V.
 - (v) Power is supplied through circuit breakers to large auxiliary machinery at high voltage.
 - (vi) For smaller supply fuse and machinery circuit breakers are used.
 - (vii) Distribution system is three wires and can be neutrally insulated or earthed.
 - (viii) Insulated system is more proffered as compare to earthed system because during an earth Fault essential machinery such as steering gear can be lost.

	MINISTRY OF DEFENCE (DGQA)	ALTERNATOR	PAGE	12
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110023	STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR /25/2022/REV0	REV NO	00
			DATE	APR 2022

STANDARD QUALITY ASSURANCE PLAN

Part – I: **General Information**

1. The following generic information must generally be indicated on each QAP as its identity:

- (a) Equipment Name
- (b) Equipment Technical Details (as applicable)
- (c) Purchase Order Reference
- (d) Sub/Sub-Sub Orders reference (as applicable)
- (e) Name of Main Indenter/ Ordering Authority
- (f) Name of end user
- (g) Name of Firm/Manufacturer
- (h) SOTRs Reference
- (j) Yard No./ Name of Ship where to be fitted (if available)/End User
- (k) References of relevant Drawings
- (l) QAP No. & Date (as indicated by the firm)
- (m) Contractual Delivery Date
- (n) Inspection Authority
- (p) Inspection Agency
- (q) Quantity (as applicable)

(Technical Inspection & Trials in the form of SQAP Part-II)									
MINISTRY OF DEFENCE (DGQA)				ALTERNATOR			PAGE 13		
DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 023				STANDARD QAP NO DGQA/DQA(WP)/ALTERNATOR/25/2022/REV0			REV NO 00		
							DATE APR 22		
SL. NO	MATERIAL/COMPONENT/DRG.NO./QUALITY ACTIVITY	CHARACTERISTIC / TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS	
1	DRAWING & DOCUMENTATION								
1.1.0	Drawings	Verification	100%	PO, SOTR, TNC Minutes and EED-Q-242 (Rev 03), Drgs check of list	Same as reference document	List of Approved Drawings	CHP for R	Availability of manufacturing drawings and DBOM to be checked DQA(WP) promulgated Drg Check of list	
1.1.1	Type Test Report	Verification	One per Type	PO, TSP/ SOTR & TNC Minutes DQA(N) Policy no.DQAN/SG/1001/ Type Test, dated 18 Jan 22	JSS 55555 2012 (R3) ,Amendment-1 Jul 2014 DQA(N) Policy no.DQAN/SG/1001/ Type Test, dated 18 Jan 22	JSS 55555 2012 (R3) ,Amendment-1 Jul 2014	R	For Shipyard Orders: If equipment is not Type Tested OR reports are not held, Type Test shall be undertaken as per SQAP For DPRO/CPRO Orders:- Type test is requirement only if indicated in PO	
2.0.0	INCOMING MATERIAL (INDIGENOUS MATERIAL)								
2.1.0	Steel for fabrication, Plates for Body and End Shield	Dimensions Physical & Chemical Properties Dimensions Elongation Resistivity BDV Thermal endurance /Tempe Index test	1 Sample/Heat/Lot	Approved Drawings/TSP	Material Grade std. as Per Approved drawings	IR IR LTC (NABL Lab)	CHP for R	Sample to be drawn in presence of QA rep	
2.1.1	Copper, Double Enamel coated, class- H Strip for Main Stator and Main Rotor for copper wire	Dimensions Elongation Resistivity BDV Thermal endurance /Tempe Index test	100%	Approved Drawing/TSP/IS 13730/IEC 60317 EED-Q-242 (Rev 03)	Approved Drawing/TSP/IS 13730/IEC 60317		R		
2.1.2	Copper, Double Enamel coated, class- H wire for exciter Stator, Exciter Rotor & PMG Stator	Dimensions Elongation Resistivity BDV Thermal endurance /Tempe Index test	1 Sample/Heat/Lot			LTC (NABL Lab)	CHP for R	Sample to be drawn in presence of QA rep	

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR

Part II

14

SL. NO	MATERIAL/COMPONENT/ DRG./QUALITY ACTIVITY	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
2.1.3	Stamping steel sheets -Main Stator, Main Rotor, Exciter Rotor, F/MG Stator & PMG Rotor	Visual check Thickness Insulating Coating/Thickness of coating Specific total loss before and after aging Magnetization /Magnetic Induction insulating resistance/surface insulation resistance Stacking factor Grade of material)	1 Sample/Heat/Lot	Approved Drawings/TSP/IS 3024, IS 648/649	Material Grade std. as Per Approved drawings, Sample as reference documents	STC/IR	CHP for R	Sample to be drawn in presence of QA rep. and material testing to be done at NABL /Govt Lab.
2.1.4	CRCA/CRCS Stamp Material (Exciter Stator)	Thickness Grade of Material Chemical Composition Hardness Yield Strength Tensile Strength Elongation Ultrasonic Test(NDT)	1 Sample/Heat/Lot	Approved Drawings/TSP/IS 3024, IS 513	Approved Drawings/TSP/IS 3024, IS 513	STC	CHP for R	As per DBOM
2.1.5	Shaft Material	Yield Strength Tensile Strength Elongation Ultrasonic Test(NDT)	1 Sample/Heat/Lot	App Drg/TSP/EN 24 BS970"™ Condition/ ADSEC 1100	Material Grade std. as Per Approved drawings	LTC(NABL Lab report)	CHP for R	Sample to be drawn in presence of QA rep. and material testing to be done at NABL /Govt Lab. UT as per DQA(WP) policy dated 12 Oct 20.
2.1.6	Bearings	Dimensions Life (>30000 Hrs) Capacity with stand sock Resistance Continuity Wattage HV & IR	100%	App Drg/TSP/DEF Std 31.3 Part 1 and BR 3026 App Drg/TSP EE-D-Q-0242(R3)	App Drg/TSP/DEF Std 31.3 Part 1 and BR 3026 App Drg/TSP	STC	R	Make/Model Number for Indigenous & Imported Bearing
2.1.7	Space Heater	Resistance Continuity Wattage HV & IR	100%	App Drg/TSP EE-D-Q-0242(R3)	App Drg/TSP	STC	R	
2.2	INSULATING MATERIAL OR INCOMING MATERIAL							
2.2.1	Class H Insulating Material Slot Liner.	Thickness Electrical Strength Temperature Stability	100%	Approved Drawings/TSP/IS 3024 EE-D-Q-0242(R3)	Material Grade std. as Per Approved drawings	STC	R	
2.2.2	Silicon elastomer coated glass insulating sleeve	Insulation resistance Burning test Voltage withstand strength	100%	App Drg/TSP	Material Grade std. as Per Approved drawings	STC	R	
2.2.3	Synthetic resin bonded glass fiber sheet (for wedge separator	Electrical Strength Thermal stability	100%	App Drg/TSP/IS-10192	App Drg/TSP/IS-10192	STC	R	

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR								Part II	15
S NO	MATERIAL/COMPONENT/ DRG.NO/QA	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS	
2.2.4	Winding RTDs	Resistance Element (Resistance accuracy) HV test/Proof voltg test	100%	App Drg/TSP	App Drg/TSP	STC	R		
2.2.5	BDT/ATD	Resistance Element (Resistance accuracy) HV test/Proof voltg test	100%	App Drg/TSP	App Drg/TSP	STC	R		
2.2.6	Gasket	Hardness	100%	App Drg/IS 11149(Latest)	App Drg/IS 11149(Latest)	STC	R		
2.2.7	Cable glands with IP 67/68 for power cables	Material Dimensions	100%	App Drg/TSP/BS 6121/EN 62444(2013)& NES 514 and DGS/IEED/V/1535/R6	App Drg/TSP/BS 6121/EN 62444(2013)	STC	R		
3.0	IN PROCESS INSPECTION								
3.1.1	Machined Shaft	Dimensions Surface Finish (Visual check)	100%	App Drg/TSP	Material Grade std. as per Approved drawings	STC/IR	R	DP test to be carried out by INST/ANST Level II/III Personnel Chemical composition already covered in 2.1.0	
3.1.2	Machined End Shields	Dimensions Surface Finish (Visual check)							
3.1.3	Fan	Dimensions							
3.1.4	Body (Stator Casing)	Dye penetration test on End faces (ASNT, Level -II Certificates) Test certificates including stress relieving Chemical Composition							
3.1.5	Rotating Rectifier Assembly with surge protection devices	Input & Output Voltage Rotor Balancing & Air Gap							
3.1.6	Main Terminal Box	Dimensions					R CHP for W R		
3.2.0	Wound Stator								
3.2.1	Stator Core	Core Length	100%	App Drg/TSP/NES 629/NES 313/	Material Grade std as per approved Drawing	STC/IR	R		

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR

Part II

16

SL. NO	MATERIAL/COMPONENT/ DRG.NO/QA	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
3.2.2	Before Impregnation	Polarity Resistance Insulation Resistance Before and after HV test HV Test	100%	App Drg/TSP/NES 629/NES 313 NES 511 Design Specification	Material Grade std as per approved Drawing	STC/IR	R	
3.2.3	After Varnish	Resistance Insulation Resistance Before and after HV test HV Test						
3.2.4	Main Rotor(After impregnation)	Dynamic Balancing with fan exciter and RRA Resistance Insulation Resistance Before and after HV test HV Test		App Drgs/TSP/ISO 1940 Gr. 2.5 NES 511 App Drg/TSP/NES 629/NES 313 NES 511	App Drgs/TSP/ISO 1940 Gr. 2.5 App Drg/TSP/NES 629/NES 313	IR STC/IR	R R	
3.2.5	Exciter Stator	Resistance Insulation Resistance Before and after HV test HV Test						
3.2.6	Exciter Rotor	Resistance Insulation Resistance Before and after HV test HV Test		App Drgs/TSP/ISO 1940 Gr. 2.5	App Drgs/TSP/ISO 1940 Gr. 2.6	STC/IR	R	Application for spares only
3.2.7	Test before Assembly	Air Gap by stator ID and Rotor OD method		App Drg/TSP/NES 629/NES 313	App Drg/TSP/NES 629/NES 313	STC/IR	R	
4.0.0	ASSEMBLY							
4.1.0	Alternator Assembly	Gland Plate Assembly Bill of Material Items Panel Coupling (All fabrication items)	100%	App Drg/TSP/NES 629/NES 313	App Drg/TSP/NES 629/NES 313	IR	W	
4.1.1	Visual Inspection	Overall Dimension and weight Mounting Arrangement of components Wiring arrangement, Gasket fixing, and Tally plate details	100%	App Drg/TSP/NES 629/NES 313/Def Std 723	App Drg/TSP/NES 629/NES 313/Def Std 723	IR	W	

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR							Part II	17
SL. NO	MATERIAL/COMPONENT/ DRG.NO/QA	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
4.1.2	MISCELLANEOUS/COTS ITEMS							
4.1.2.1	O' Ring	Physical Dimension Test Reports	100%	App Drg/TSP/IS 9975(Latest)	App Drg/TSP/IS 9975(Latest)	IR STC	R	Miscellaneous/COTS items name should be as per DBOM
4.1.2.2	Verification Grid	Visual Check Test Reports	100%	App Drg/TSP/NES 629/NES 313	App Drg/TSP/NES 629/NES 313	STC/IR	R	
4.1.2.3	Cover for end shield	Visual Check Test Reports						
4.1.2.4	Shroud Assembly for Heat Exchanger	Visual Check Test Reports						
4.1.2.5	Shroud Assembly for Cable Terminal	Visual Check Test Reports						
4.1.2.6	Cable Terminal Assembly	VI and Test Reports	100%	App Drg/TSP	App Drg/TSP	STC/IR	R	
4.1.2.7	Insulated Report							
4.1.2.8	SCM CT							
4.1.2.9	QDC CT							
4.1.2.10	Straight Plug							
4.1.3.1	Clamp							
4.1.3.2	Hand Voltage Regulator(AVR)	VI Test Report	100%	App Drg/TSP/NES 629	App Drg/TSP/NES 629	STC/IR	R	
4.1.3.3	Heat Exchanger (CACW Cooler)	test as per separately approved QAP	100%	App Drg/TSP	Material Grade std. as per Approved drawings	I-Note	R	(i) Approved Heat Load Calculations to be submitted (ii) Note 14 on thermo wells relevant
4.1.3.4	Test After Assembly	Bearing grease Relief Water tightness up to shaft level(before testing) Effectiveness of Endurance IPX4/IPX5	100%	App Drg/TSP/NES 629/EEED-Q-242(R3)	App Drg/TSP/NES 629/EEED-Q-242(R3)	STC/IR	CHP for W (Only for Water Ingress at Vendor Premises)	-IPX4 or IPX5 is a routine test for all equipment as per EED-Q-242(R3). It will be performed on 100% basis. Vendor must have testing facility for Water Ingress & dust be carried out as per foot note no.17.

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR										Part II	19
S. NO	MATERIAL/COMPONE NT/ DRG.NO/Q A	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS			
5.3.0	ROUTINE TEST WITH ALTERNATOR AND EXCITATION PANEL										
5.3.1	Preliminary Checks prior to functional checks on Excitation Panel without AVR	(a) Insulation Resistance (before and after HV test) (b) High Voltage Test (c)Earth Bond Test	100%	EED-Q-242(R3), NES629, NES 511	EED-Q-242(R3), NES629, NES 511	IR	CHP for W				
5.3.2	Test with AVR	(a) Voltage built up (b) Voltage variation on no load through push button (c)Voltage regulation test (with AVR on cold condition with 50% of full load) (d) Under freq roll off test at 47 Hz (e) Verification of set Point (f) Voltage min and Max limit (g) Trip alarm and visual indication for voltage out of limit (h) Trip alarm and visual indication for AVR failure (i) Redundant AVR operation Test (k) Temp. Rise Test (l) Single diode failure operation test (m) Efficiency test by summation of loss method									

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR

Part II

20

SL. NO	MATERIAL/COMPONENT/ DRG.NO/QA	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
5.3.3	Test with Hand Voltage Regulator	Voltage variation +/-5% of Rated Voltage	100%	EED-Q-242(R3), NES629, NES 511	EED-Q-242(R3), NES629, NES 511	IR	CHP for W	Test will be performed in all conditions of load and all frequencies within 5% of the normal
5.4.0	T Type Test (Heat Run Test)	(a) All tests mentioned in Routine Test b) Hot Spot Sensing Test (c) Ripple, Harmonic content, Modulation Test (Alternator Only) (d) Measurement of Characteristics and Const.(Alternator only) (e) Temp rise by OCC & SCC Method (f) 50% Over load test for 30 sec.by SCC (g) 20% Over speed for 15 minutes (h) Vibration test (i) Noise Level (k) Transient Voltage performance Test (l) Power factor for all loads b/w 50% to 100% (m) Effectiveness of enclosure IP (Alternator and Excitation Panel) (n) Bearing grease relief Test (Alternator Only) (p) Single Diode failure Operation Test (q) Steady State SC (r) Protective Devices Test (s) Efficiency test by summation of loss method (Alternator Only)	One Sample each frame size	EED-Q-242(R3), NES629, NES 511 and Approved Test Procedure by Professional Directorate	EED-Q-242(R3), NES629, NES 511 and Approved Test Procedure by Professional Directorate	IR	CHP for W	-IP will be as per approved drawing eg IP54/55. - All routine tests to be carried out before and after IP Test.

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR							Part II	21
SL. NO	MATERIAL/COMPONENT/ DRG.NO/ Q A	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
5.4.1	Environmental Type Test (All Environmental test for both Alternator & Excitation Panel unless recommended otherwise)	(a) Shock/Impact Test (b)Vibration (c) High temp. test (d) Damp Heat test (e) Drip proof test (f) Salt Corrosion (g) Mould growth test (h) Bump test (i) Ship motion test (k) Inclination/Tilt	One Sample each frame size	App Drg/TSP/JSS 55555/EED-Q-242 (R3)	App Drg/TSP/JSS 55555/EED-Q-242 (R3)	LTC (NABL Lab)	CHP for R (CHP only for Shipyard Orders)	Test 24 of JSS 55555 CL 0563 Sec19 Test 28 of JSS 55555 Test 17 of JSS 55555 Test 10 of JSS 55555 Test 11 of JSS 55555 Test 9 of JSS 55555 Test 21 of JSS 55555 Test 5 of JSS 55555 As per GCR
5.5.0	Proving Run The Alternator to run continuously for 06 Hrs as part of proving run. All parameters including noise and vibration need to be recorded every 01 hour. Following parameters to be recorded ever hour in presence of inspecting authority:-	(a) Operating parameters of the entire system of alternator (b) Noise and Vibration levels (c) Indication / alarm / shut down tests (d) Winding Resistance(Hot) (e) Temp Rise (f) Insulation resistance (g) Voltage Range (h) Direction of rotation (j) Voltage Regulation (Steady State and Transient)	100%	App drg / TSP / EED-Q-242 (R3) / NES 629 / NES 511 / EED-Q-071 (Latest Version) and Approved Test Procedure by Professional Directorate	App drg / TSP / EED-Q-242 (R3) / NES 511 / EED-Q-071 (Latest Version) and Approved Test Procedure by Professional Directorate	IR	CHP for W	Voltage Regulation (Steady State & transient) and Frequency Regulation(Steady State & transient) tests will be witnessed during IFAT

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR

Part II

22

SL. NO	MATERIAL/COMPONENT/ DRG./QUALITY ACTIVITY	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
5.6.0	EMI/EMC Test	Conduct of EMI/EMC Test	One Sample each frame size	MIL-STD-461 F/G	MIL-STD-461 F/G	LTC	CHP for R	EMI & EMC reports to be vetted by NEC Mumbai as per foot note no.2 &21
5.7.0	Endurance Run It shall be carried out for 24 hours continuously and the equipment shall be thoroughly inspected soon after. The following parameters recorded every hours are to be provided by the manufacturer:-	(a) Operating parameters of the entire system of alternator (b) Operation of the auto cut-off system (c) Noise and Vibration levels (d) Airborne noise levels (e) Indication / alarm / shut down tests (f) Winding resistance (Cold , Hot) (g) Dry and Damp heat resistance (h) Insulation resistance (i) Voltage Range (k) Operation of protective devices & Vibration alarms the auto cut-off system (l) Voltage Regulation (steady state & transient) (m) Freq Regulation (steady state & transient) (n) Parallel Running /Operation	100%	App drg / TSP / EED-Q-242 (Latest Version) / NES 629 / NES 511 (Latest Version) and Approved Test Procedure	App drg / TSP / EED-Q-242 (Latest Version) / NES 629 / NES 511 (Latest Version) and Approved Test Procedure	IR	CHP for W	On completion of endurance test, trip open test and performance test proving run test is to be undertaken

DRAFT STANDARD QUALITY ASSURANCE PLAN FOR ALTERNATOR								23
Part II								
SL. NO	MATERIAL/COMPONENT/ DRG/ QUALITY ACTIVITY	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	VERIFIED BY QAE	REMARKS
6.0	Pre dispatch inspection on Completed Machine	Dimensional Measurement	100%	App Drg /TSP	App Drg /TSP	IR	CHP for W	Preservation Procedure by Firm
7.0	DOCUMENTATION							
7.1.0	Documents for Operation, Maintenance and Repair	Availability & Verification	100%	PO/JSS0251 Standard	PO/JSS 0251 Standard	-	CHP for R	Approved by NTG Bangalore before Dispatch/Form-IV issued
8	PACKING AND PRESERVATION							
8.01	Weight of the final assembly unit	Visual Inspection	100%	Approved Drawing, SOTR/PO	Approved Drawing, SOTR/PO	IR	CHP for W	(a) VCI poly bags to be used for packing metallic items (b) Industrial Grade Silica Gel to be used for Electronic items (c) ESD proof bags to be used for spare PCBs.
8.02	Painting,	Visual Inspection & DFT	100%	Approved Drawing, SOTR, Paint Plan/DGS 0251	Approved Drawing, SOTR/PO/ DGS 0251	IR		
8.03	Packing	Visual Inspection	100%	Approved Drawing, SOTR/PO/ DGS 0251	Approved Drawing, SOTR/PO/ DGS 0251	IR		
8.04	Preservation and Marking	Visual Inspection	100%	Approved Drawing, SOTR/PO/ DGS 0251	Approved Drawing, SOTR/PO	IR		

NOTE:

1. Type Test as per JSS 55555, EMI/EMC and Environmental test in accordance with EED-Q-242-(R3) is to be carried out after QA agencies, clearance and sealing of equipment. Post ET and EMI/EMC, checks will also be conducted by QA agencies. If Type Testing, EMI/EMC and ETT has already been done in earlier projects on identical units, it will not be done again & the reports of earlier tested units will be provided for review of Inspection Agency. In case of any difficulty/discrepancy in carrying out the above, matter be referred to IHQ MoD (N)/DEE within 10 days of receipt of approved QAP under intimation to HQ DQA(WP).
2. EMI/EMC test and ETT will be done at NABL/Govt Lab. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai. Original Cable which will be used on board is to be used undertake for EMI/EMC testing.
3. ESS test (Thermal Cycling, Random Vibration and Thermal Cycling) as per DQA (N) policy vide letters 66301/Policy07/DQA (N)/QA-07, dated 09 Aug 2016 and Burn in/Endurance as per vide letter 66301/Policy-10/DQA(N)/QA-10 dated 14 Jun 2013.
4. In lieu of confirm coating, Conformal coating/Humi sealing Confirm coating of PCBs, to be done as per DQA(N) policy letter 58093/DQA(N)/EL, dated 17 Feb 14.

5. Equipment & Accessories to be supplied should conform to specifications.
6. Starter cum Control Panel is to be procured /manufactured only from Naval approved vendor as mentioned in IHQ MoD(N)/DEE Compendium of Vendors 2015 No. EE-50-30(REV-2) dated 29 Jun 2015.
7. The term "Prototype Alternator & Excitation Panel" refers to any 01 (One) Alternator & Excitation Panel of a particular design. An Alternator & Excitation Panel or Alternators & Excitation Panels from the One Production Lot of a design may be chose as a prototype Alternator(s) & Excitation Panel(s).
8. Type Testing (Environmental test /EMI/EMC) is to be done only once for any given design, any prototype from the first production lot. No requirement for this testing apply for any subsequent production lot.
9. The Prototype chosen for "Type Tests" may or may not be same as the prototype chosen for "Environmental and EMI/EMC Tests". The choice of two prototype Alternators and Excitation Panel may be made. If necessary, to speed up completion of type approval based on delivery requirements.
10. All bought out items are to be indicated in the QAP..
11. Samples for Lab testing are to be Stamped and Sealed by CQAE rep.
12. NABL accreditation or Government Body certification or statutory for all LTC.
13. M - Load condition to be met as per TSP.
14. FEM analysis/Structural Integrity Analysis can be carried out at NSTL Vishakhapatnam for Bump Test and Shock Test due to fame size and CQAE(WE) Bangalore test set up facilities limitations
15. Cooling water flow balancing to regulate water flow between coolers for alternator and prime mover. Check may be undertaken with integrated DG Set trials as appropriate.
16. Inclination Test of Alternator shall be undertaken post integration with prime mover.
17. Dust Protection (Part of Ingress Protection) is to be undertaken at CQAE(WE) Bangalore and any others NABLs Lab as per IHQ MoD(N)/DEE policy note no. EE/03/5124 dated 01 Mar 21.
18. Preliminary Test, details of enclosure, salt corrosion and mould growth Test of alternator are to be carried out as per EED-Q-0242 (R3) and IHQ MoD(N)/DEE policy note no. EE/03/9700 dated 28 Jun 21.
19. Firm is to submit approved Functional test Procedure (ATP) along with approved drawings as the same is required for ETT

20. Applicability of Environmental Stress Screening (ESS) Test to be complied in accordance with DQA(WP) Policy no. 570000/Tech Misc/DGQA/WP-IV, date 11 Jan 2018.
21. Type Testing of Naval Electrical/Electronic equipment to be complied in accordance with DQA(N) Policy no. DQAN/SG/1001/Type Test, dt 18 Jan 22.
22. As per CQAE(WE) SoP letter no. CQAE(WE)/LAB/1001, dt 06 Jul 2020, Testing at Environmental Test Lab CQAE(WE), Bangalore may be complied.