



MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN
FOR PUMPS
(CENTRIFUGAL, SCREW, SUBMERSIBLE,
GEAR AND CANNED MOTOR PUMP)


PUMP MAY BE CONSIDERED AS A DEVICE THAT MOVES FLUIDS
(LIQUID OR GASES) OR SLURRIES BY MECHANICAL ACTION

STANDARD QAP NO. DGQA/DQA(WP)/PUMPS/11/2025/REV-2
DATED 19 Mar 25

Nos. of Pages: 56


ISSUING AUTHORITY

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
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RECORD OF AMENDMENTS

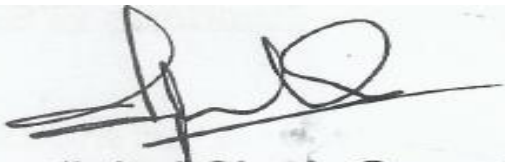
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MINISTRY OF DEFENCE (DGQA)


STANDARD QUALITY ASSURANCE PLAN (SQAP) **FOR PUMPS** **(CENTRIFUGAL, SCREW, SUBMERSIBLE, GEAR AND** **CANNED MOTOR PUMP)**

SQAP NO.
DGQA/DQA (WP)/PUMPS/11/2025/REV-2


 (Iqbal Singh Grewal)
 Rear Admiral
 ADGQA(WP)
 19 Mar 25

Promulgated by


DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
 MINISTRY OF DEFENCE (DGQA)
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CONDITIONS OF RELEASE


1. This Standard Quality Assurance Plan (SQAP) has been formulated for reference of the Order Placement Agencies, Inspection Authority, Inspection Agencies and the Industry. No alteration is allowed to this SQAP except by the issue of authorised amendment by DQA (WP).
2. It is to be applied, as required, for Quality Assurance during various stages of manufacture of Pumps for *IN* Ships.
3. The QAD R02 available at website <http://www.dgqadefence.gov.in> may also be referred for other Quality Assurance related inputs.
4. The SQAP has been prepared on the basis of decisions made during the collegiate meeting held at DQA(WP) with leading manufacturers of Pumps and representatives of Professional Directorates and Production Directorates of the *IN*. Any user of this SQAP within DGQA/ *IN* 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. The specifications and standards laid out in the SQAP are indicative only. The specifications/ parameters and standards given in the Statement of Technical Requirement (SOTR) / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding.
6. DQA(WP) reserves the right to amend or modify the contents of this SQAP without consulting or informing any holder of this document.
7. In case the SQAP is incorporated into contracts, users are responsible for their correct application while complying with contractual and other statutory requirements. Compliance with SQAP does not of itself confer immunity from legal obligations.
8. The SQAP will be applicable only for orders wherein DQA(WP) is the Inspection Authority.
9. Enquiries in connection to these requirements may be made from:

Directorate of Quality Assurance (Warship Project)
Ministry of Defence (DGQA)
6TH Floor, 'B' Block, Defence Office Complex
Africa Avenue, PO - Sarojini Nagar
New Delhi - 110 023

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STANDARDS INVOKED

<u>S. No.</u>	<u>Specification No.</u>	<u>Description</u>
1	NES 327	Pumps and Eductors
2	NES 360	Valves
3	NES 501	General Requirements for the design of electro technical equipment
4	NES 632	Requirements for AC and DC Motors
5	NES 636	Requirements for AC and DC Starting Control Gear
6	NES 719	Sea Water System for HM Surface Ships
7	NES 723	Tally/diagram plates
8	NES 729	Requirements for Non-destructive Testing
9	NES 745	Classification, Inspection requirements and Acceptance Standard for casting
10	NES 747	Requirement for NAB casting & Ingots
11	NES 1004	Requirements for the design & Testing of equipment to meet environment conditions
12	DME 402/ 465	Centrifugal Pumps
13	DME 405 (R1)	Instrumentation Specification
14	DME 423	Standard Ranges of Pumps
15	DME 424	Electrical Indicator Specification
16	DME 450	Design & Installation of Naval Engineering equipment
17	DME 451	Maintainability
18	DME 452	Documentation Specification
19	IS 210	Grey Iron casting
20	IS 733	Wrought Aluminium Alloy & Aluminium alloy bars
21	IS 1030	Carbon Steel for general purpose
22	IS 1670	Determination of basic load
23	IS 1570 (Part 2)	Schedules for wrought steels (Carbon Steels- Un alloyed Steel)
24	IS 1570 (Part 4)	Schedules for wrought steels (Alloy Steel)
25	IS 2062	Steel for General Structural Purpose
26	IS 11723	Mechanical Vibration, balance quality (superseded by ISO 1940)
27	MIL-STD-167	Mechanical Vibrations of Shipboard Equipment
28	MIL-STD-461E/F	EMI/EMC Requirement for Electronic Equipment Static Conversion Equipment
29	MIL-STD-740B	Airborne and Structure Borne Noise measurements and acceptance criteria of shipboard Equipment
30	MIL-STD-740-2	Structure Borne vibratory acceleration

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31	MIL-STD-740-1	Airborne Borne sound measurement
32	MIL-STD-1474-E	Noise limits
33	DGS 203	Gland housing
34	DGS 251	Painting
35	DGS 252	Electrical system-design Manufacturing & testing
36	DGS/EED/VI/1535/R6	Cable Glands
37	DGS 8520	NAB casting
38	DGS 348	Impingement test on NAB casting
39	DGS 203A	Stainless Steel
40	BS 970	Specification for Steel
41	BS 1400	Copper alloy ingots and copper alloy and high conductivity copper castings
42	BS 1490	Aluminum & aluminum ingots for casting
43	BS 2871: Part 2	Copper & Copper Alloy Tubes
44	SES 18	Electronic Equipment
45	SES 19	Static Conversion Equipment
46	ASTM A-276	SS Bars
47	ASTM A-609	Standard practice for Ultrasonic Examination (Steel)
48	ASTM E 165	Non-Destructive Testing
49	ASTM E272 Level 2	Radiographic Testing
50	ASTM E 446 and 1320	Specification for Radiography test
51	IP66	Specification for Ingress Protection.
52	JSS 55555	Environmental test methods for electrical & electronic equipment
53	EED-Q-071(R4)	Specification for AC Motors and Starters/Control Gears
54	BR 3021	Requirement for High Impact Shock Test, Shipboard Equipment and System
055	AISI 316/316 L	Stainless steel
56	ISO 1940	Mechanical vibration balance quality requirement for rotor in a constant state.
57	SAE 100R	Hydraulic pressure hoses

Note: - The Standards given are indicative only. The specifications / parameters given in the SOTR / Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding


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ABBREVIATIONS

ABN	Air Borne Noise
ASNT	American Society of Non-destructive Testing
ATP	Acceptance Test Plan
CHP	Customer Hold Point
CoC	Certificate of Conformance
COTS	Commercially Off The Shelf
CPRO	Controller of Procurement
DBOM	Detailed Bill of Material
DI	Dimensional Inspection
DME	Directorate of Marine Engineering
DOI	Directorate of Indigenisation
DPRO	Directorate of Procurement
DPT	Dye Penetrant Test
DQA(WP)	Directorate of Quality Assurance (Warship Project)
DQA(N)	Directorate of Quality Assurance (Naval)
EED	Electrical Engineering Document
EMC	Electro Magnetic Conduction
ECT	Eddy Current Testing
EMI	Electro Magnetic Induction
ESS	Environment Stress Screening
ET/ ETT	Environmental Testing/ Environmental Type Testing
FATs	Factory Acceptance Trials
GA	General Arrangement
HT	Heat Treatment
IFATs	Integrated Factory Acceptance Trials
IR	Inspection Report
ISNT	Indian Society of Non-destructive Testing
LTC	Lab Test Certificate
MPT	Magnetic Particle Test
MTC	Material Test Certificate
NABL	National Accreditation Board for Testing and Calibration Laboratories
NDT	Non-destructive Testing
NDE	Non-destructive Examination
OEM	Original Equipment Manufacturer
P	Perform
PIL	Parts Identification List
PO	Purchase Order
PQR	Procedure Qualification Record
PSU	Public Sector Undertaking
QA	Quality Assurance
QAD	Quality Assurance Document
QAE	Quality Assurance Establishment
QAP	Quality Assurance Plan
R	Review
RT	Radiographic Testing
SBN	Structure Borne Noise


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SOTR	Statement of Technical Requirement
SQAP	Standard Quality Assurance Plan
STC	Supplier Test Certificate
TAC	Type Approval Certificate
TC	Test Certificate
TNC	Technical Negotiation Committee
TSP	Technical Specifications
TT	Type Test
TTR	Type Test Report
UT	Ultrasonic Testing
V	Verification
VI	Visual Inspection
W	Witness
WPQ	Welder Performance Qualification
WPS	Welding Procedure Specification

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SPECIFIC REQUIREMENTS

1. Testing of physical and chemical properties has to be done by NABL accredited laboratory only (including firm's NABL accredited laboratory).
2. **Manufacturer's Own Scrap**. Castings are to be poured from ingots/ scrap generated in the foundry (i.e., risers, runners, defective castings, machining chips/ swarf etc). The composition of the scarp in terms of complete range of both alloying elements & impurity elements should be well established. Own scrap proposed to be used is to be segregated and should be identifiable to the inspection agency. No other scrap, including scrap procured from market shall be permitted.
3. **Use of Virgin Metals**. The ingots for non-ferrous castings (NAB only) are to be poured from virgin metals, where specified in the SOTR/ TSP/ applicable standard. The virgin metals shall be identified and Mill TC of the same shall be submitted by the firm for verification by the inspection agency.
4. **Testing of Ingots (applicable for NAB only)**. All ingots are to be stamped/ embossed/ labelled by the manufacturer with unique cast/ heat number. Each batch/ lot of ingot is to be accompanied with results of melt control analysis. Randomly selected samples from ingots shall be forwarded to NABL lab for analysis. Testing of Ingots will be governed by the latest policies of DQA(WP).
5. All castings are to be subjected to RT and/ or UT, as applicable, to qualify the same in accordance with the approved class of casting, unless otherwise specified in P.O. & SOTR/ TSP. The extent of RT will be as per the approved drawing/SOTR/TSP. Repairs on castings, if necessary, are to be undertaken only post inspection of the casting defects and clearance of the QA Agency.
6. All forgings are to undergo UT for soundness and integrity checks.
7. Both over speed and cooling tests are type test requirements and applicable for pumps as per DME 402/ 465 for the Prototype (on one unit only). Pumps driven by steam turbine, gas turbine or diesel engine are to be subjected to run at various speed upto 20% above the specified speed required for maximum specified duty or 5% above the approved over-speed emergency trip speed, whichever is greater. As motor driven pumps are driven by motor whose rpm is related to incoming supply frequency which is generally fixed and cannot be varied, over speed test is exempted for motor driven pumps. However, firms must guarantee pumps performance in case pump over speeding occurs for any reasons.
8. RT shooting sketch indicating critical test zones and test zones are to be submitted prior to testing.

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9. NDT.

(a) **NDT Certification:** All NDT procedures are to be performed and / or sentenced by NDT personnel who have acquired the desired minimum qualification (Level II /III) through Central Certification Programs conducted by Certification Bodies like ISNT, ASNT and BINDT. The certification of these personnel should be in-date and verifiable through the websites of the Certification Bodies. **Certification of personnel through Employer Based Programs is not to be treated at par with Central Certification Programs.**


(b) Radiography (RT) and Ultrasonic Testing (UT).

- (i) RT and UT procedures/technique sheets are to be approved by ISNT Level-III or ASNT Level-III or PCN Level-III other equivalent Level-III NDT personnel, certified through Central Certification Programs.
- (ii) RT and UT are to be performed by ISNT Level-II/III or ASNT Level II/III or PCN Level-II/III or other equivalent Level-II/III NDT personnel, certified through Central Certification Programs.
- (iii) Interpretation/sentencing of RT and UT reports are to be done by ISNT Level – III or ASNT Level-III or PCN Level-III or other equivalent Level-iii NDT personnel, certified through Central programs.

(c) Magnetic Particle Testing (MPT) and Dye Penetrant Testing (DPT).

- (i) MPT and DPT procedures/technique sheets are to be approved by ISNT Level-III or ASNT Level-III or other equivalent Level-III NDT personnel, certified through central certification programs.
- (ii) MPT and DPT are to be performed by ISNT level-II/III or ASNT Level-II/III or ASNT (SNT-TC-1A) Level-II/III or PCN Level-II/III or other equivalent level-II/ III certified NDT personnel.
- (iii) Interpretation/ sentencing of MPT and DPT reports are to be carried out by ISNT Level-III or ASNT Level-III or PCN Level-III or other equivalent Level-III NDT personnel, certified through Central Certification Programs, only if there is any ambiguity/ difference of opinion between QA Agency and the supplier

10. Make of the Items should be as per approved PIL/ Detailed Bill of Material (DBOM) or /N approved sources.

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11. The outsourced components in the SQAP are indicative only. OEM is to categorize the outsourced components, specific to their product, in the QAP as per the approved DBOM / Drawings and in accordance with Chapter-5 of QAD-02.

12. Imported items will be accepted against following import documents as per directives in vogue. Additionally, functional tests of imported items may be undertaken as per guidelines, if deemed necessary. Presently, the documents to be scrutinised *iro* imported items as follows: -

- (a) Copy of one among Bill of Lading/ Shipping Bill/ Airway Bill.
- (b) Invoice by OEM/ Country of Origin certificate of equipment with packing list.
- (c) Bill of Entry for Warehousing.
- (d) The certificate of Conformity (CoC) indicating governing specifications and values to which the items are tested along with OEM Test Certificates/ Test Reports/ Catalogue/ Data Sheet.
- (e) Guarantee/ Warrantee certificate from the supplier/ OEM as per supply order.
- (f) Non-inclusion of Malicious Code Certificate in case of active electronic components.


In case the items are assembled locally with imported components, functional trials of assembly as per approved FATs would be required.

13. ESS test shall be conducted for electrically operated pumps as per DQA(N) policy vide letters DQAN/SG/1001/ESS dated 30 May 22.

14. MTC is to be issued by the original manufacturer of the item. Certificate of Conformity (CoC) may be issued by the equipment manufacturer or integrator who has sourced the item for use in the equipment. CoC/ MTC must indicate governing specifications and values to which the item has been tested.

15. All Type Tests, pressure tests, torque tests and other tests mentioned under the scope of Final Inspection shall be undertaken as per approved ATP. Firms will have to submit draft ATP, duly covering the test procedures, test pressure, duration etc for the approval of IHQMoD(N) DME/ Command Headquarters, on as applicable basis.

16. TT and ET will be done at Government/PSU test centers or NABL accredited labs. EMI/EMC Acceptance Test Plan is to be duly vetted by NEC Mumbai. Policy on conduct of Type Test has been promulgated vide DQA(WP) letter 12575/POLICY/DGQA/WP-TC dated 17 Mar 21. Post completion of type tests, TAC with Unique Type Approval Number will be issued iaw policy promulgated vide DQA(WP) letter 12575/POLICY/DGQA/WP-TC dated 11 Oct 21.

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17. TT and ET already conducted in earlier projects on identical units will not be repeated & the test reports be provided for review of Inspection Agency.

18. Bought-out items will be subjected to normal QA inspections as per SQAP/ QAP as applicable.

19. Items/ components classified as Bought-out/ COTS is indicative only. In this regard, the approved GA drawing and DBOM shall be final & binding.

20. Packing material should not contain environmentally hazardous material prohibited by law/ regulation.

21. Post promulgation of this SQAP, separate QAP approval for Pumps is not required. The manufacturer shall be required to submit confirmation to concerned QA Agency and/ or OPA, towards acceptance of SQAP either in totality or with some design specific inclusions and/or exclusions w.r.t. SQAP, if any. The SQAP along with proposed inclusions/ exclusions approved by DQA(WP) shall be deemed as the approved QAP for the particular PO.

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SCOPE

Scope of Quality Assurance. The scope of QA includes witness / review at all stages of manufacturing viz., raw material stage, in-process stage and final stage. The scope also covers witness / review of Type Testing, wherever applicable.

The SQAP contains comprehensive list of inspections and/or trials that are applicable for QA of the equipment. In addition, QA of the equipment will also be governed by specific conditions laid down in SOTRs and 'Approved Drawings'. The inspections/ tests / trials must be contemporary to latest technology/ techniques available in the industry at the time of placement of purchase order.

The following QA activities will be carried out for the Pumps: -

- (a) Visual Inspection.
- (b) Dimensional Inspection.
- (c) Witness of pouring in absence of integral test bar.
- (d) Review of Lab Test Certificates.
- (e) Witness of in-house Lab Testing, if applicable.
- (f) Witness of Non-destructive Testing viz. UT, DPT, MPT& ECT.
- (g) Review of RT films and reports.
- (h) Review of Heat Treatment Charts.
- (j) Review of Shock Test and SBN & ABN reports for qualification of Type Test, as applicable.
- (k) Review of ETT, EMI/EMC and ESS reports
- (l) Hydraulic/ Pneumatic pressure testing.
- (m) Issue of CHP clearance.
- (n) Review of Draft documentation and witness/ stamping of final documentation, as applicable.
- (p) Issue of Dispatch Clearance or Issue of Form-IV/ I-Note, as applicable.

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SYSTEM DESCRIPTION

1. Pump may be considered as a Turbomachine which produce a mechanical work input to effect a change in the stagnation state of a fluid. Turbomachine is a device in which energy transfers occurs between a flowing fluid and a rotating element due to dynamical action, and results in a change in pressure and momentum of the fluid. The various categories of Pumps conventionally used onboard */N* ships and submarines are briefly introduced below.


2. **Centrifugal Pump.** A centrifugal pump is a rotating machine in which flow and pressure are generated dynamically. The inlet is not walled off from the outlet as is the case with positive displacement pumps, whether they are reciprocating or rotary in configuration. Rather, a centrifugal pump delivers useful energy to the fluid or “pumpage” largely through velocity changes that occur as this fluid flows through the impeller and the associated fixed passageways of the pump; that is, it is a “rotodynamic” pump. All impeller pumps are rotodynamic, including those with radial-flow, mixed-flow, and axial-flow impellers: the term “centrifugal pump” tends to encompass all rotodynamic pumps.

3. **Screw Pump.** Screw pumps are a special type of rotary positive displacement pump in which the flow through the pumping elements is truly axial. The liquid is carried between screw threads on one or more rotors and is displaced axially as the screws rotate and mesh. In all other rotary pumps, the liquid is forced to travel circumferentially, thus giving the screw pump with its unique axial flow pattern and low internal velocities a number of advantages in many applications where liquid agitation or churning is objectionable.

4. **Submersible Pump.** A Submersible Pump is type of Centrifugal Pump where hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between the pump and fluid surface.

5. **Gear pump.** Gear Pump is a positive displacement pump. it moves a fluid by repeatedly enclosing a fixed volume using interlocking gears and transferring it mechanically using a cyclic pumping action. It delivers a smooth pulse-free flow proportional to the rotational speed of its gears.

6. **Canned Motor Pump.** Canned Motor Pump combines the well-understood hydraulics of centrifugal pumps with equally well proven three-phase induction motor. The hydraulic section is directly connected to the drive motor.

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STANDARD QUALITY ASSURANCE PLAN

Part – I. General Information

The following generic information must generally be provided on each QAP as its identity:


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- (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

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Part - II.

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SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
1.00	DRAWINGS/DOCUMENTS/TYPE TESTS							
1.01	Drawings & Documents along with DBOM	GA drawings and detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approve binding drawings	R	Binding Drawing& Binding Data, duly approved by Design authority, Professional& Inspection Authority (or by Command for MO orders) to be verified. SOTR/ TNC documents are to submitted by the firm
1.02	Type test report	Verification	One per Type	PO, TSP/ SOTR & TNC Minutes	Equipment is Type Tested and reports are held	Type Test reports	CHP For R	For Shipyard/ DoI/ DME Orders: Type test shall be undertaken as per SOTR,subjected to equipment is not Type tested/equipment has undergone changes/ Type test reports are not held, For DPRO/CPRO Orders: Type Test shall be applicable, only if indicated in PO
1.03	Manufacturing Drawings	Verification of manufacturing drawings with reference to the approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	MfgDrgs. bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	R	The manufacturing or detailed drawings will remain with the firm, to be produced to the QA team during the visit for inspection. On completion of inspection the inspector will stamp and sign the component drawing for future reference iaw QAD-R03

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.00	SECTION I - RAW MATERIAL INSPECTION							
2.01 (a)	<u>Casting</u> (i) Pump Casing, (ii) Impeller (s), (iii) Lower & Upper Bearing housing & Bearing Cover, (v) Stuffing Box/Casing Cover (vi) Wearing Ring / Wearing Plate (vii) Companion Flanges (Suction & Delivery)	(i) Pouring with integral test bar	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	R/W	<u>Review.</u> If casting is done with integral test bar, review of documents by QA rep. <u>Witness.</u> If casting is undertaken without integral test bar, pouring may be witnessed by QA rep through virtual mode (live steaming) or submission of videography with time stamp by firm to QA Rep
		(ii) Material Identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		(iii) Heat Treatment	100%			HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties
		(iv) Physical, Mech & Chemical properties	01 sample/ heat / lot			NABL TC	R	
		(v) NDT (RT/UT/ECT)	As per Drg. / spec			NDE Report and film	R – RT W – UT/ ECT	
2.01 (b)	<u>Extrusion</u> Pump casing	(i) Material Identification & Stamping	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W	Samples to be drawn by QAE Rep
		(ii) Physical, Mech & Chemical properties	01 sample/ heat / lot/ Size			NABL TC	R	
		(iii) NDT (RT/UT/ECT)	UT/ECT- 100% RT- As per applicable standard			NDE Report and film	R – RT W – UT/ ECT	
2.02	<u>Forging/Extrusion</u> Shaft	(i) Material Identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		(ii) Heat Treatment				HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties.

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks		
		(iii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot/size			NAB TC	R			
		(iv) Micro & Macro examination (Applicable as per Drg. / Specs.)								
		(v) NDT (RT/UT/ECT)	UT/ECT-100% RT-As per applicable standard			NDE report & film	R – RT W – UT/ECT			
2.03	Gland Plate, Cover Plate, Seal Housing	(i) Material Identification & Stamping	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W	Samples to be drawn by QAE Rep and Test to be done at NABL Lab		
2.04	Impeller Nut	(ii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot/Size			NABL TC	R			
	<u>BOUGHT OUT ITEMS</u>									
2.05	SV Mounts	Inspection as per latest SQAP for SV Mounts/TNC/ TSP Minutes				I-note/ Form IV/ Dispatch certificate	CHP for R			
2.06	Motor	Inspection as per latest SQAP for Motors/TNC/ TSP Minute								
2.07	Starter/Control Panel	Inspection as per latest SQAP for Starter/Control Panel/TNC/ TSP Minutes								
2.08	Bellows	Inspection as per latest SQAP for Bellows /TNC/ TSP Minutes								
2.09	Coupling	(i) Product Identification & Visual Examination	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards/catalogue	Compliance to Specification	IR	W			
		(ii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R		Test to be done at NABL Lab	
		(iii) Dimensional Examination	100%			IR	R			
2.10	Diffuser, Strainer	(i) Product identification& Visual Examination	100%					STC or OEM TC/ MTC	W	
		(ii) Dimensional Examination						IR	R	
2.11	Flexible Hose	(i) Product identification& Visual Examination	100%	Approved GA Drg/DBOM/ Supplier's	OEM TC/MTC			W		


SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
		(ii) Dimensional Examination		catalogue/ SAE 100 R1		IR	R	
		(iii) Hydraulic pressure test		Hydraulic pressure test @ 1.5x working pressure		IR	R	
	COTS ITEMS							
2..12	As indicated in DBOM	(i) Visual & Product identification	100%	Approed drawing/ SOTR/ Catalogue/ OEM Spec	Compliance to Specification	IR/STC/ CoC	W	
3.00	<u>SECTION II - IN PROCESS INSPECTION</u>							
3.01	Pump Casing	(i) VI & DI	100%	SOTR, Mfg Drgs iaw Appd GA Drgs / DBOM and relevant standards	Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) Surface Defects, MPT or DPT	100%			NDE Report	W	
		(iii) Hydraulic Pressure Test	100%		No leakage	IR	R	Hydraulic pressure test to be checked @ 1.5 times of working pressure for not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
3.02	Shaft	(i) VI & trueness	100%		Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) DI						
		(iii) Surface Defects, MPT or DPT	100%			NDE Report	W	
3.03	Impeller, (Casting)	(i) VI & DI	100%	SOTR, Mfg Drgs iaw Appd GA Drgs / DBOM and relevant standards/ DME Specs 402	Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) Surface Defects, MPT or DPT	100%			NDE Report	W	
		(iii) Dynamic balancing (as per ISO-1940 Grade-1.0)	100%			IR	W	Dynamic balancing to be checked with Shaft
3.04	Impeller Nut	(i) VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
3.05	Companion Flange – Suction& Delivery	(ii) Surface Defects, MPT <i>or</i> DPT				NDE Report	W	
3.06	Stuffing Box/Casing Cover	(i) VI & DI	100%			IR	R	W- Witness for VI R- Review for DI
		(ii) Surface Defects, MPT <i>or</i> DPT	100%			IR &NDE Report	W	
		(iii) Hydraulic Pressure Test	100%		No leakage	IR	R	Hydraulic pressure test to be checked @ 1.5 times of working pressure for not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
3.07	Lower & Upper Bearing housing and Bearing Cover	(i) VI & DI	100%		Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) Surface Defects MPT <i>or</i> DPT				IR & NDE Report	W	
3.08	Gland Plate, Cover Plate, Seal Housing	VI & DI	100%		Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
3.09	Wearing Plate/Wearing Ring	(i) VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI
		(ii) Surface Defects MPT <i>or</i> DPT	100%		IR & NDE Report	W		

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.00	<u>SECTION III : PRE-REQUISITE- FINAL INSPECTION</u>							
	<u>TYPE TESTING OF PUMP (To be carried out on one unit /prototype)</u>							
4.01	Pump & Motor Assy	Free Rotation of Pump & Motor	One Unit	Rotate freely	Free Rotation	IR	W	
		Hydro Test of Pump Assy		1.5 Times of working Press. for 30 Min	No leakage	IR	W	
4.02	Overall Dimensional Inspection	DI		Approved GA Drgs	Approved GA Drgs	IR	W	
4.03	Start /Stop test			PO, SOTR, TNC Min / Approved GA Drawing, DME Spec 402/465 & approved ATP	Compliance to Specifications		CHP for W	
4.04	Cooling Test, if applicable							
4.05	Performance test with integral Motor and control panel	Flow(Q) v/s Head						
		Flow V/s Efficiency V/s NPSH						
		Flow V/s Power(P)						
		Motor Temperature						
	Bearing Temperature							
	Vibration Level							
	Indication/ Alarm/Shut Down test							
4.06	Endurance Test (100 Hrs) (Rated Capacity)	Measurement of Flow & Head along with all type of checks indicated in approved ATP	One Unit			IR	W	
4.07	Structure Borne Noise	Structure Borne Noise emitted by EUT	One Unit	SOTR /TNC Minutes /MIL-STD-740-2 / ATP	Compliance to Specifications	LTC	CHP for R	Approval of NHQ required to perform SBN/ ABN test by Non-NABL Third Party/ Agency
4.08	Air born Noise test (ABN)	Air Borne Noise	One Unit	SOTR /TNC Minutes / MIL-Std-740-1/Mil Std 1474E/ ATP	Compliance to Specifications	LTC	CHP for R	Final ABN and SBN reports to be approved by NHQ...
4.09	Tilt test	Head(H) v/s Flow (Q) v/s Power(P)	One Unit	SOTR/TNCMin / ATP	Compliance to Specification	IR	CHP for W	Tilt test to be carried out as per SOTR/ PO/TNC Minutes. If SOTR does not address then DME 402 will be followed.

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.10	Environmental Shock & Vibrations	Shock & Vibrations Analysis	One Unit	SOTR/NSS-II/ BR 3021 /MIL-Std-167	Compliance to Specification	NSTL Report	CHP for R	
4.10	Strip Open Test	Wearing Parts	One Unit	SOTR/ TNC Min/Appd GA Drgs/DME Specs 402 or 465/ ATP	Compliance to Specification	IR	W	
4.11	Post-Trial test For 1 hour	Flow(Q) v/s Head(H)						
		Flow(Q) v/s Eff(n)						
		Flow(Q) v/s Power(P) along with all type checks as per approved ATP						
5.00	SECTION IV : MISCELLANEOUS REQUIREMENTS							
5.01	SOTR/TNC Compliance	Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	R	
5.02	Internal Final Inspection Report	Verification	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Internal inspection report	R	
6.00	SECTION V : FINAL INSPECTION							
6.01	Pump & Motor Assy	Free rotation of Pump & Motor	100%	Rotate freely	Free Rotation	IR	W	
		Hydro Test of Pump Assy		1.5 Times of working Pressure for 30 Min	No leakage	IR	W	
6.02	Performance test with Integral motor and Control Panel (Duration of Performance Test is to be as per approved FAT protocol)	Flow(Q) v/s Head	100%	PO, SOTR, TNC Min / Approved GA Drawing, DME Spec 402/465 & approved IFAT	Compliance to Specifications	IR	CHP for W	Min 02 Hrs Performance Trial to be conducted including Mechanical / Proving run.
		Flow V/s Efficiency V/s NPSH						
		Flow V/s Power						
		Motor temperature						
		Bearing Temperature						
		Start Stop test						
		Noise & Vibration						
		Leak check test (Joint leakage, seal leakage)						

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
6.03	Dimensional Inspection	Overall Dimensional check	100%	Approved GA Drgs and SOTR	Approved GA Drgs and SOTR	IR	W	
6.04	Weight	Weight recording	100%	Approved Drgs/ Mfg Drawing and relevant standard	Approved Drgs /SOTR	Weight certificate	W	Witnessing through remote mode also acceptable
6.05	Tally Plate	Visual check	100%			IR	W	
6.06	Lifting arrangement	Visual check	100%			IR	W	
7.00	<u>SECTION VI: PRE REQUISITE ISSUE OF FORM -4/ I-Note</u>							
7.01	OBS Items as per Purchase Order	(i) Product identification& VI	100%	PO,SOTR, Approved GA Drawings/ PIL / OEM Specification	PO & Approved GA Drawings/PIL	IR	W	
		(ii) DI				OEM TC, CoC , IR	R	
7.02	Liquidation of observation during Final inspection/FATs, if any	Defect rectification	100%	Approved GA Drawing, SOTR &FAT report	Approved GA Drawing, SOTR , FAT report & necessary approval	IR	CHP for R	
7.03	Submission of As Built Drawings	Verification	100%	Approved GA Drawings, Concessions & Deviations	Approved GA drawings & Concurrence from drawing approval authority	As built drawings	CHP for R	
7.04	Painting	Visual Inspection & DFT	100%	Approved Drg/ SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W & RMI	Witnessing through remote mode also acceptable
7.05	Preservation & Packing	Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	Witnessing through remote mode also acceptable Packing Procedure is to be mentioned by firm which shall be cleared by QAE rep
7.06	Submission of Form -4 (I&T Certificate)	Correctness	100%	SOTR, PO	SOTR, PO	Form-4	P	

	MINISTRY OF DEFENCE / DGQA	APPENDIX 'B' SCREW PUMP	PAGES	08
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI – 110 023	STANDARD QAP NO. DGQA/DQA(WP)/ PUMPS /11/2025/ REV-02 PART-II (Technical Inspection/Trials in form of SQAP Part-II (Refers to Page No. 15))	REV. NO.	01
			DATE	19 Mar 25

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
1.00	<u>DRAWING/ DOCUMENTS/ TYPE TEST</u>							
1.01	Drawings & Documents	GA Drawing and detailed bill of material (DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approved binding drawings	R	Binding Drawing & Data, duly approved by Design authority, Professional & Inspection Authority (or by Command for MO orders) to be verified. SOTR/ TNC documents are to be submitted by the firm
1.02	Type test report	Verification	One per Type	PO, TSP/ SOTR & TNC Minutes	Equipment is Type Tested and reports are held	Type Test reports	CHP for R	<u>For Shipyard/ DoI/ DME Orders:</u> Type test shall be undertaken as per SOTR, subjected to equipment is not Type tested/equipment has undergone changes/ Type test reports are not held, <u>For DPRO/CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO
1.03	Manufacturing Drawings	Verification of manufacturing drawings with reference to the approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drgs along with DBOM	Mfg Drgs. bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	R	The manufacturing or detailed drawings will remain with the firm, to be produced to the QA team during the visit for inspection. On completion of inspection the inspector will stamp and sign the component drawing for future reference iaw QAD -R03

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.00	SECTION I :RAW MATERIAL INSPECTION							
2.01 (a)	Casting (a) Pump Casing (b) Insert/Liner (c) Bearing Housing (d) Relief Valve Body (e) Balancing Bush (f) Companion Flanges (g) End Covers	(i) Pouring with integral test bar	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Stds	Compliance to Specification	IR	R/W	Review. If casting is done with integral test bar, review of documents by QA rep. Witness. If casting is undertaken without integral test bar, pouring may be witnessed by QA rep through virtual mode (live steaming) or submission of videography with time stamp by firm to QA Rep
		(ii) Material Identification &Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		(iii) Heat Treatment	100%			HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties
		(iv) Physical, Mechanical & Chemical properties	1sample per heat / lot			NABL TC	R	
		(v) NDT (UT/RT/ ECT) Applicable as per Drg / Specn	UT/ECT- 100% RT- As per applicable standard			NDE Report and film	R – RT W –UT/ ECT	
2.01 (b)	Pump casing (seamless/sheet plate fabrication)	Material Identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		Physical, Mechanical & Chemical properties	One Sample /lot/heat/size			NABL LTC	R	
2.02	(a) Bonded Stator (for single screw pump) (b) Rotor (for single screw pump) (c) Drive Shaft (for single screw pump) (d) Coupling Rod (for single screw pump) (e) Screw Shaft	Material Identification & Stamping	100%	SOTR,Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W	Samples to be drawn by QAE Rep
		Physical Mechanical & Chemical properties	One sample/ heat / lot/size			NABL LTC	R	

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
	(Power Screw) (f) Screw Shaft (Idler Screw) (g) Motor Stool/Base Plate/Mounting Bracket (h) Locking Plate (j) Pump Pedestal (k) Seal Housing (l) Gear Box (m) Cover							
	<u>BOUGHT OUT ITEMS</u>							
2.03	S & V Mounts	Inspection as per latest SQAP for S&V Mounts/TNC/ TSP Minutes				I-note/ Form4/ Dispatch certificate	CHP for R	
2.04	Motor	Inspection as per latest SQAP for Motor /TNC/ TSP Minutes						
2.05	Starter/Control Panel	Inspection as per latest SQAP for Starter/ Control Panel/TNC/ TSP Minutes						
2.06	Bellows	Inspection as per latest SQAP for Bellows/TNC/ TSP Minutes						
2.07	Driving/Driven Gear	Chemical composition & Mechanical properties	100%	SOTR, Mfg Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	STC	R	W – VI R – DI
		VI & DI				IR	W/R	
		Case depth Hardness				STC	R	
		DPT/MPT				NDE Report	W	
2.08	Coupling	Chemical composition & Mechanical properties				STC	R	W – VI R – DI
		VI & DI				IR	W/R	
		DPT/MPT				NDE report	W	
		Balancing				IR	R	
2.09	Tube/Flexible Hoses	Product identification	100%	SOTR, Mfg Drgs iaw Appd GA Drawings / DBOM and relevant Stds / Supplier's catalogue, SAE 100R1	Compliance to Specification	STC or CoC /shelf life cert.	W	
		Visual & Dimensional Check				IR	W/R	W – VI R – DI


SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks	
		Hydraulic Pressure Test		Hydraulic Pressure test @ 1.5 times of working pressure for 10 Min		IR	R		
	<u>COTS ITEMS</u>								
2.10	As indicated in DBOM	Visual & Product identification	100%	Approved drawing/ SOTR/ Catalogue/ OEM Spec	Compliance to Specification	STC/ CoC	W		
3.00	<u>SECTION II: IN PROCESS INSPECTION</u>								
3.01	Pump Casing	Visual Examination	100%	SOTR, Mfg. Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W		
		Dimensional Examination	100%		Compliance to Specification	NDE Report	R		
		Surface Defect, MPT <i>or</i> DPT on machined surface					W		
		Hydraulic Pressure test (1.5 times of working pressure)	100%		No Leakage	IR	W	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes	
		RT of weld joint (in case of Fabrication)	100%		Compliance to Specification	NDE Report and Film	R		
3.02	Insert/Liner	Visual Examination	100%		Compliance to Specification	IR	W		
		Dimensional Examination					R		
		Surface Defect, MPT <i>or</i> DPT on outer machined surface				NDE report	W		
3.03	Motor stool/Base Plate/ Mounting Bracket	Visual Examination	100%				IR	W	
		Dimensional Examination						R	
		Surface Defect, MPT <i>or</i> DPT on weld joints					NDE Report	W	

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
3.04	Bonded Stator	Visual Examination	100%	SOTR, Mfg. Drawings iaw Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W	
		Dimensional Examination					R	
3.05	Rotor	Visual Examination	100%			IR	W	
		Dimensional Examination					R	
		Surface Defect, MPT or DPT on machined surfaces	100%			NDE Report	W	
3.06	Drive Shaft, Idler Screw & Power Screw	Visual Examination	100%			IR	W	Dimensional check after case hardening
		Dimensional Examination					R	
		Case Depth Hardness	One sample/ heat / lot/size			NABL TC	R	
		Surface Defect, MPT or DPT on machined surfaces	100%			NDE Report	W	
3.07	Balancing Bush	(i) Visual Examination	100%			IR	W/ R	W – VI R – DI
3.08	Seal Housing	(ii) Dimensional Examination						
3.09	Coupling Rod	(iii) Surface Defect, MPT or DPT on machined surfaces				NDE Report	W	
3.10	Companion Flanges							
3.11	Bearing Housing							
3.12	Gear Box							
	Cover/ End Cover							
3.13	Relief Valve Assy	(i) Visual & Dimensional	100%			IR	R	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
		(ii) Relief valve body	100%				W	
		Hydraulic pressure test/Leak test @ 1.5 times of working pressure						
		(iii) Set pressure test for relief valve assembly @ 1.1 times of operating pressure	100%				W	
3.14	Sub Assy consisting of Power Screw/ Rotor &	Balancing	100%	SOTR, Mfg. Drawings iaw	Compliance to Specification	IR	R	Applicable for Twin and Triple Screw Pump only

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
	Half coupling			Approved GA Drawings / DBOM and relevant Standards				
4.00	<u>SECTION III : PRE-REQUISITE- FINAL INSPECTION</u>							
	TYPE TESTING OF PUMP (To be carried out on one unit/prototype)							
4.01	Pump & Motor Assy	Free rotation of Pump & Motor	One Unit	Rotate freely	Free Rotation	IR	W	Applicable only other than single screw pump
4.02	Overall Dimensional Inspection	DI		Approved GA Drawings	Approved Drawings	IR	R	
4.03	Start /Stop test					IR	CHP for W	Performance will be recorded for 6 different flow conditions/ Approved ATP
4.05	Performance Test with integral Motor and Control Pane	Diff. Pressure v/s Flow(Q)						
		Diff. Pressure v/s Efficiency						
		Diff. Pressure v/s Power(P)						
		Motor Temp						
		Bearing Temp						
		Leak check test (Joint leakage, seal leakage)						
4.06	Uninterrupted Endurance Test with integral Motor and Control Panel (100 Hrs or as per ATP)	Measurement of Flow &Diff. Pressure Along with all type of checks as per approved ATP				IR	W	Readings to be recorded by every 02 hrs.
4.08	Structure Borne Noise	Structure Borne Noise emitted by Unit	One Unit	SOTR /TNC Minutes /MIL-STD-740-2/ ATP	Compliance to Specification	LTC	CHP for R	Approval of NHQ required to perform SBN/ ABN test by Non-NABL Third Party/ Agency
4.09	Air born Noise test (ABN)	Air Borne Noise	One Unit	SOTR /TNC Minutes /MIL-STD-740-1/Mil Std 1474E/ ATP	Compliance to Specification	LTC	CHP for R	Final ABN and SBN reports to be approved by NHQ.
4.10	Tilt test	Diff Pressure (H) v/s Flow (Q) v/s Power(P)	One Unit	SOTR /TNC Minutes/ App. Test Procedure	Compliance to Specification	IR	W	Tilt test to be carriedout as per SOTR/ PO/ TNC Minutes otherwise DME 402 will be followed

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.11	Environmental Shock & Vibrations	Shock & Vibrations Analysis	One Unit	SOTR/NSS-II/ BR 3021 /MIL-Std-167	Compliance to Specification	NSTL Report	CHP for R	
4.12	Strip Open Test	Wearing Parts	One Unit	PO, SOTR, TNC Minutes/ Approved GA Drawing	PO, SOTR, TNC Minutes/ Approved Drawing	IR	W	
4.13	Post Strip Open test Trial for 1 hour	Diff. Pressure v/s Flow(Q)						
		Diff. Pressure v/s Efficiency						
		Diff. Pressure v/s Power(P)						
		Noise Level						
		Vibration test						
5.00	SECTION IV : MISCELLANEOUS REQUIREMENT							
5.01	SOTR/TNC Compliance	Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Comp. Matrix	R	
5.02	Internal Final Inspection Report	Verification	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Internal inspection report	R	
6.00	SECTION V : FINAL INSPECTION							
6.01	Pump & Motor Assy	Free rotation of Pump & Motor	100%	Rotate freely	Free Rotation	IR	W	
6.02	Performance test with Integral motor and Control Panel (Duration as per SOTR/ IFATs)	Diff. Pressure v/s Flow(Q)	100%	PO, SOTR, TNC Minutes/ Approved Drawing and approved FATs	PO, SOTR, TNC Minutes/ Approved Drawing and approved IFATs	IR	CHP for W	Min 02 Hrs Performance Trial to be conducted including Mechanical / Proving run.
		Diff. Pressure v/s Efficiency						
		Diff. Pressure v/s Power(P)						
		Motor temperature						
		Bearing Temperature						
		Leak check test (Joint leakage, seal leakage)						
		Noise and Vibration test						
6.03	Overall Dimensional Inspect.	DI	100%	Approved Drawings/ Mfg Drawing and SOTR	Approved Drawings SOTR	IR	W	Witnessing through remote mode also acceptable
6.04	Weight	Weight recording	100%			Weight certificate		
6.05	Tally Plate Check		100%			IR		
6.06	Lifting arrangement		100%			IR		

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
7.0	SECTION VI : PRE REQUISITE ISSUE OF FORM -IV/ I-NOTE							
7.01	OBS Items as per Purchase Order	(i) Product identification& VI	100%	PO, SOTR, Approved Drawings/ PIL/ OEM Specn.	PO & Approved Drawings/PIL	IR	W	
		(ii) DI					R	
7.02	Liquidation of observation during FATs, if any	Defect rectification	100%	Approved Drawing, SOTR & FAT document	Approved Drawing, SOTR & FAT document, necessary approvals	IR	CHJP for R	
7.03	Submission of as Built Drawings	Verification	100%	Approved Drawings, Concessions & Deviations	Approved drawings & Concurrence from drawing approval authority	As built drawings	CHP for R	
7.04	Paint	Visual Inspection & DFT	100%	Approved Drg/ SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W & RMI	Witnessing through remote mode also acceptable
7.05	Preservation & Packing	Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	Witnessing through remote mode also acceptable Packing Procedure is to be mentioned by firm which shall be cleared by QAE rep
7.06	Submission of Form -4 (I&T Certificate)	Correctness	100%	SOTR, PO	SOTR, PO	Form-4	P	

	MINISTRY OF DEFENCE / DGQA	APPENDIX 'C' SUBMERSIBLE PUMP	PAGES	11
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI – 110 023	STANDARD QAP NO. DGQA/DQA(WP)/ PUMPS /11/2025/ REV-02 PART-II (Technical Inspection/Trials in form of SQAP Part-II (Refers to Page No. 15))	REV. NO.	01
			DATE	19 Mar 25

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
1.00	DRAWINGS/DOCUMENTS/TYPE TESTS							
1.01	Drawings & Documents	GA drawings and of detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes/ATP	PO & SOTR/ TNC Minutes/ATP	List of approved binding drawings	R	Binding Documents duly approved by Design Authority, Professional & Inspection Authority or by Command for MO orders, be verified. SOTR/ TNC documents are to submitted by the firm
1.02	Type test report	Verification	One per Type	PO & SOTR/ TNC Minutes/ATP	Equipment is Type Tested and reports are held	Type Test reports	CHP for R	For Shipyard/ DoI/ DME Orders: Type test shall be undertaken as per SOTR, subjected to equipment is not Type tested/equipment has undergone changes/ Type test reports are not held, For DPRO/CPRO Orders: Type Test shall be applicable, only if indicated in PO
1.03	Manufacturing Drawings	Verification of manufacturing drawings with reference to the approved GA drawings& DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	Manufacturing drawings bear complete data, the data is sufficient for production and stage inspections	List of approved drawings	R	The manufacturing or detailed drawings will remain with the firm, to be produced to the QA team during the visit for inspection. On completion of inspection the inspector will stamp and sign the component drawing for future reference iaw QAD -R03

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks		
2.00	RAW MATERIAL INSPECTION									
2.01	(a) Impeller (b) Lower Bearing Bracket &Upper Bearing Bracket (c) Discharge Outlet (d) Holding Plate for Mechanical Seal	(i) Pouring with integral test bar	100%	SOTR, TSP/ TNC Minutes Approved Drawings and relevant Standards	Compliance to specification	IR	R/W	Review. If casting is done with integral test bar, review of documents by QA rep. Witness. If casting is undertaken without integral test bar, pouring may be witnessed by QA rep through virtual mode (live steaming) or submission of videography with time stamp by firm to QA Rep		
		(ii) Material identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep		
		(iii) Heat Treatment	100%			HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties		
		(iii) Physical, Mech, Chemical properties	01 sample/ heat/ lot			NABL TC	R			
		(iii) NDT (UT/RT/ECT)	UT/ECT- 100% RT- As per applicable standard			NDE Report and film	R – RT W –UT/ ECT			
2.02	Shaft (Forging/Extrusion)	(i) Material Identification & Stamping	100%	SOTR, TSP/ TNC Minutes Approved Drawings and relevant Standards	Compliance to specification	IR	W	Samples to be drawn by QAE Rep		
		(ii) Heat Treatment				HT reports	R	HT is not mandatory if not given in material specification and firm is able to achieve desired physical and mechanical properties.		
		(iii) Physical, Mechanical Chemical properties	01 sample /heat/lot			NABL TC	R			
		(iv) Micro & Macro examination (Applicable as per Drg/ Specn)				NABL TC	R			
		(v) NDT (RT/UT/ECT) (Applicable as per Drg. / Specs.)	UT/ECT- 100% RT- As per			NDE report	R – RT W –UT/ ECT			

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
			applicable standard					
2.03	(a) Outer Casing (b) Wear Ring/Wear Plate (c) Stator Casing (d) Bearing Cover (e)Zinc Anode	(i) Material identification & Stamping	100%	SOTR, TSP/ TNC Minutes Approved Drawings and relevant Standards	Compliance to specification	IR	W/R	Witness for 2.03 (a) to (c) Review for -2.03 (d) & (e) Samples to be drawn by QAE Rep
		(ii) Physical, Mechanical, Chemical properties	01sample/ heat/lot			NABL TC	R	
2.04	Rotor and Stator Stamping	(i) Material identification	100%	SOTR, TSP/ TNC Minutes Approved Drawings and relevant Standards	Compliance to specification	IR	W	Not applicable if firm is using stator laminated pack
		(ii) Physical, Electro-Magnetic, Chemical properties	01 sample /heat/lot			NABL TC	R	
	<u>BOUGHT OUT ITEMS</u>							
2.05	Starter/Control Panel	Inspection as per latest SQAP for Starter/Control Panel/TNC/TSP				I-note/ Form4/ Dispatch certificate	CHP for R	
2.06	Diffuser, strainer	(i) Product identification	100%	Approved drawing/ SOTR/ Catalogue/ OEM Spec	Approved drg/ SOTR/ Catalogue/ OEM Spec	STC	W	
		(ii) Visual & Dimensional Check				IR	W/R	W- Witness for VI R- Review for DI
2.07	Cable (LFH/FRLS)	(i) Product identification	100%	Approved drawing /SOTR, Supplier's catalogue	Approved drg /SOTR/ Supplier's catalogue	STC	W	
		(ii) Elect & Mech Properties				STC	R	
		(iii) Visual & Dimensional Check				IR	W/R	W- Witness for VI R- Review for DI
2.08	Copper Wire	Electl & Mech Properties	100%			STC	R	

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
	COTS ITEMS							
2.09	As indicated in DBOM	Visual & Product identification	100%	Approved drgs/ OTR/ Catalogue/ OEM Spec	Compliance to Specification	STC/ CoC	W	
3.00	SECTION II - IN PROCESS INSPECTION							
3.01	Outer Casing	(i) VI & DI	100%	SOTR, TSP/ TNC Minutes Approved Drgs and relevant Standards	Compliance to Approved Drg. / Specs.	IR	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT (Surface defect)				NDE Report	W	
		(iii) Hydraulic Pressure test (1.5 times of the working pressure)			No Leakage	IR	W	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
3.02	Impeller	(i) VI & DI	100%		Compliance to Approved Drg. / Specs.	IR	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT (Surface defect)				NDE Report	W	
		(iii) Dynamic Balancing as per ISO 21940, Grade -1.0				IR	W	
3.03	Lower Bearing Bracket Upper Bearing Bracket	(i) VI & DI	100%			IR and NDE Report	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT	100%				W	
3.04	Seal Housing	(i) VI & DI	100%			IR and NDE Report	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT	100%				W	
3.05	Wear Ring/Wear Plate	(i) VI & DI	100%			IR and NDE Report	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT					W	
3.06	Bearing Cover	(i) VI & DI	100%			IR and NDE Report	W/R	W- Witness for VI R- Review for DI
		(ii) MPT or DPT (Surface defect)					W	

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks		
3.07	Rotor Shaft	(i) VI & DI	100%	SOTR, TSP/ TNC Minutes Approved Drawings and relevant Standards	Compliance to Approved Drg. / Specs	IR and NDE Report	W/R	W- Witness for VI R- Review for DI		
		(ii) MPT or DPT (Surface defect)	100%				W			
3.08	Zinc Anode	VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI		
3.09	Discharge outlet	VI & DI								
3.10	Stator Laminated Pack	VI & DI	100%			NDE Report	W/R	W- Witness for VI R- Review for DI		
3.11	Stator Casing	(i) VI & DI							100%	(ii) MPT or DPT (Surface defect)
3.12	Rotor Complete	(i) VI & DI	100%			(ii) Run Out				
		(iii) Dynamic Residual unbalancing/ Dynamic Balancing as per ISO 21940, Grade -1.0								
3.13	Stator Complete	(i) Insulation resistance	100%			(iii) Line resistance				
		(iv) HV Test								
		(v) Surge test								
		(vi) Varnish coating								
		(vii) Epoxy coating								
3.14	Integral Motor (Type test and Routine Test as per Encl -1)	All applicable tests as per EED- Q-071 (R4 or latest revision)	One Unit per type for Type Testing and 100% for Routine test			IR	W/R	W or R as per EED- Q-071 R4 or latest		


SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.00	<u>SECTION III : PRE-REQUISITE- FINAL INSPECTION</u>							
	<u>TYPE TESTING OF PUMP (To be carried out on one unit /prototype)</u>							
4.01	Pump & Motor Assy	Free rotation of Pump & Motor	One Unit	Rotate freely	Free Rotation	IR	W	
4.02	Overall Dimensional Inspection	DI		Approved Drawings/ Mfg Drawing	Approved Drawings/ Mfg Drawing	IR	W	
4.03	Dry Run/No load test Duration – Minimum 5 Minutes or as agreed between IHQ MOD(N) and Supplier	Current, Voltage, Power, RPM and Mechanical Seal Wear		PO, SOTR, TNC Minutes/ Approved Drawing& relevant standards and Approved ATP	PO, SOTR, TNC Minutes/ Approved Drawing& relevant standards and Approved ATP	IR	W	
4.04	Start /Stop test							
4.05	Performance test with integral Motor and control panel	Flow(Q) v/s Head(H)	One Unit	PO, SOTR, TNC Minutes/ Approved Drawing& relevant standards and Approved ATP	PO, SOTR, TNC Minutes/ Approved Drawing& relevant standards and Approved ATP	IR	CHP for W	
		Flow(Q) v/s Efficiency						
		Flow(Q) v/s Power(P)						
		Heat run/ Temp rise						
		Winding Resistance (Cold & Hot)						
		High Voltage Test						
		Indication/Alarm/Shut Down test						
		Inclined test						
		Vibration Test						
4.06	Uninterrupted Endurance Test with integral Motor and Control Panel (100 Hrs or as per ATP)	Measurement of Flow & Head along with all type of checks as per approved ATP				IR	W	Readings to be recorded by every 02 hrs.
4.07	Strip Open Test	Wearing Parts	One Unit			IR	W	
4.08	Post-Trial test For 1 hour	Flow(Q) v/s Head(H)						
		Flow(Q) v/s Efficiency (Effn)						
		Flow(Q) v/s Power(P)						
		Noise						
		Vibration						

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.09	Environmental Shock & Vibrations	Shock & Vibrations Analysis	One Unit	SOTR/NSS-II/ BR 3021 /MIL-Std-167	SOTR/NSS-II/ BR 3021 /MIL-Std-167	NSTL Report	CHP for R	
5.00	SECTION IV: MISCELLANEOUS REQUIREMENT							
5.01	SOTR/TNC Compliance	Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	R	
5.02	Internal Final Inspection Report	Verification	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Internal inspection report	R	
6.00	SECTION V : FINAL INSPECTION							
6.01	Pump & Motor Assy	Free rotation of Pump & Motor	100%	Rotate freely	Free Rotation	IR	W	
6.02	Performance test with Integral motor and Control Panel Duration- As per reference documents	Flow(Q) v/s Head(H)	100%	PO, SOTR, Approved Drawing, Approved ATP/FAT	PO, SOTR, Approved Drawing, Approved ATP /FAT	IR	CHP for W	
		Flow(Q) v/s Efficiency						
		Flow(Q) v/s Power(P)						
		Heat run/ Temperature rise						
		High Voltage Test						
6.03	Overall Dimensional Inspection	Dimensional Check	100%	PO, SOTR, Approved Drawing, Approved ATP/FAT	PO, SOTR, Approved Drawing, Approved ATP/FAT	IR	W	Witnessing through remote mode also acceptable
6.04	Weight	Weight recording	100%			Weight certificate		
6.05	Tally Plate Check		100%			IR		
6.06	Lifting arrangement		100%			IR		
7.00	SECTION VI : PRE REQUISITE ISSUE OF FORM -IV/ I-Note							
7.01	OBS Items as per Purchase Order	(i) Product identification& VI	100%	PO, SOTR, Approved Drgs/ PIL/ OEM Specn	PO & Approved Drawings/PIL	IR	W	
		(ii) DI					R	
7.02	Liquidation of observation during FATs, if any	Defect rectification	100%	Approved Drawing, SOTR & FAT document	Approved Drawing, SOTR & FAT document, necessary approvals	IR	CHP for R	

SI No	Material/ Component Quality Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
7.03	Submission of as Built Drawings	Verification	100%	Approved Drawings, Concessions & Deviations	Approved drawings & Concurrence from drawing approval authority	As built drawings	CHP for R	
7.04	Painting	Visual Inspection & DFT	100%	Approved Drg/ SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W & RMI	Witnessing through remote mode also acceptable
7.05	Preservation & Packing	Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	Witnessing through remote mode also acceptable Packing Procedure is to be mentioned by firm which shall be cleared by QAE rep
7.06	Submission of Form -4 (I&T Certificate)	Correctness	100%	SOTR, PO	SOTR, PO	Form-4	P	

TESTS REQUIRED ON SUBMERSIBLE PUMP INTEGRAL MOTOR

SER	TEST	TYPE TEST	ROUTINE TEST
1.	Insulation Resistance (Ambient and Hot)	Yes	--
2.	Winding Resistance (Hot and Cold)	Yes	Yes
3.	Earth bonding	Yes	--
4.	Load Test at 100%, 75% and 50%	Yes	--
5.	Direction of Rotation	Yes	Yes
6.	Over Speed at 115% for 15 minutes	Yes	Yes
7.	Temperature Rise	Yes	--
8.	Reduce Voltage	Yes	--
9.	Withstand Voltage	Yes	--
10.	Starting Current at Full Load/No Load at Normal/Reduced Voltage	Yes	No load test
11.	Phase Balance at Full Load and No Load	Yes	Phase Balance at No Load
12.	Load test at 110% for 15 sec	Yes	--
13.	Starting current and run up time	Yes	--
14.	Efficiency & PF	Yes	--
15.	Starting torque	Yes	--
16.	Pull out torque	Yes	--
17.	Protection under stall condition	Yes	--
18.	IP as applicable	Yes	--

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	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI – 110 023	STANDARD QAP NO. DGQA/DQA(WP)/ PUMPS /11/2025/ REV-02 PART-II (Technical Inspection/Trials in form of SQAP Part-II (Refers to Page No. 15))	REV. NO.	01
			DATE	19 Mar 25

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
1.0	<u>DRAWING/ DOCUMENTS/ TYPE TEST</u>							
1.01	Drawings & Documents along with DBOM	GA drawings and detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approve binding drawings	R	Binding Drawing& Binding Data, duly approved by Design authority, Professional& Inspection Authority (or by Command for MO orders) to be verified. SOTR/ TNC documents are to submitted by the firm
1.02	Type test report	Verification	One per Type	PO, TSP/ SOTR & TNC Minutes	Equipment is Type Tested and reports are held	Type Test reports	CHP For R	<u>For Shipyard/ DoI/ DME</u> <u>Orders:</u> Type test shall be undertaken as per SOTR,subjected to equipment is not Type tested/equipment has undergone changes/ Type test reports are not held, <u>For DPRO/CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO
1.03	Manufacturing Drawings	Verification of manufacturing drawings with reference to the approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	Mfg Drgs. bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	R	The manufacturing or detailed drawings will remain with the firm, to be produced to the QA team during the visit for inspection. On completion of inspection the inspector will stamp and sign the component drawing for future reference iaw QAD- R03

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.0	RAW MATERIAL INSPECTION							
2.01	(a) Housing (b) Housing Bush (c) Bearing Bush	(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards	Compliance to Specification	IR	R/W	Review. If casting is done with integral test bar, review of documents by QA rep. Witness. If casting is undertaken without integral test bar, pouring may be witnessed by QA rep through virtual mode (live steaming) or submission of videography with time stamp by firm to QA Rep
		(ii) Material Identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		(iii)Heat Treatment	100%			HT reports	R	HT is not mandatory, if desired mechanical properties are achieved without same
		(iv) Chemical Composition and Mechanical properties	01 sample per heat / lot			NABL TC	R	
		(v) RT	Critical Regions			NDE Report & film	CHP for R	
2.02	(a) Gears (b) Shaft (c) Connector (d) Connector Nut (e) Front and Back Cover	(i) Material Identification & Stamping	100%	SOTR, Approved Drawings, TNC Minute and relevant Standards	Compliance to specification	IR	W	Samples to be drawn by QAE Rep
		(ii) Physical Mechanical & Chemical properties	01 sample/ heat/ lot			NABL TC	R	
	BOUGHT OUT ITEMS							
2.03	S & V Mounts	Inspection as per latest SQAP for S&V Mounts/TNC/TSP				I-note/ Form4/	CHP for R	
2.04	Motor	Inspection as per latest SQAP for Motor /TNC/TSP						


Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.05	Starter/Control Panel	Inspection as per latest SQAP for Starter/ Control Panel/ TNC/TSP				Dispatch certificate		
2.06	Bellows	Inspection as per latest SQAP for Bellows/TNC/TSP						
2.07	Coupling	(i) Product Identification	100%	SOTR, Approved Drawings and relevant Standards	SOTR, Approved Drawings and relevant Standards	IR	W	
		(ii) Physical, Mechanical, Chemical properties	01 sample/ heat/ lot			NABL TC	R	
		(iii) VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI
	<u>COTS ITEMS</u>							
2.08	As indicated in approved DBOM	Product identification	100%	SOTR/ Approved drawings/ Supplier's catalogue	Compliance to Specification	STC/ CoC/ OEM TC	W	
3.0	<u>SECTION II - IN PROCESS INSPECTION</u>							
3.01	Housing	VI & DI	100%	SOTR/ Approved Drawing, TNC minutes, approved ATP and relevant Standards	Approved Drawaings	IR	W/R	W- Witness for VI R- Review for DI
		MPT/DPT (Surface Defect)	100%		Compliance to specification / Approved Drgs	NDE Report	W	
		Hydraulic Pressure test (1.5 times of working pressure)	100%		No Leakage	IR	R	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
3.02	Housing Bush	VI & DI	100%		Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI
		DPT	100%		Compliance to specn/ AppdDrgs	NDE Report	W	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
3.03	Gears	VI & DI	100%	SOTR/ Approved Drawing, TNC minutes, approved ATP and relevant Standards	Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI
		(i) Surface Hardness (ii) Micro& Macro Structure (iii) Surface Hardness on Teeth, (iv) Core Hardness, (v) Gear Profile	100%		Compliance to specn/ Appd Drgs	NABL TC	R	
		MPT or DPT	100%			NDE Report	W	
3.04	Shaft	VI & DI	100%	SOTR Approved Drawing, TNC minutes, approved ATP and relevant Standards	Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI
		(i) Surface Hardness (ii) Core Hardness (iii) Case Depth	100%		Compliance to specn/ AppdDrgs	NABL TC	R	
		MPT or DPT	100%		Compliance to specn/ Appd Drgs	NDE Report	W	
		UT	100%					
3.05	Front Cover/Back Cover/Cover	VI & DI	100%		Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI
		DPT	100%		Compliance to specn/ Appd Drgs	NDE Report	W	
3.06	Bearing Bush	VI & DI	100%		Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI
		MPT or DPT (Surface Defect)	100%		Compliance to specn/ Apprd Drgs	NDE Report	W	
3.07	Connector and Connector Nut	VI & DI	100%		Approved Drawings	IR	W/R	W- Witness for VI R- Review for DI

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
3.08	Final Pump Assembly	Hydraulic Pressure test (1.5 times of working pressure)	100%	SOTR/ Approved Drawing/ TNC minutes/ approved ATP and relevant Standards	No Leakage	IR	W	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/ Drg/ TNC Minutes
4.0	<u>SECTION III : PRE-REQUISITE : FINAL INSPECTION</u> <u>TYPE TESTING OF PUMP (To be carried out on one unit /prototype)</u>							
4.01	Pump Assy	Free rotation of Pump	One Unit	SOTR/ Approved Drawing, TNC minutes, approved ATP and relevant Standards	Free Rotation	IR	W	
		Overall Dimensional Inspection			Appd Drg.	IR	R	
4.02	Start /Stop test							
4.03	Performance test with integral Motor and control panel	Flow (Q) v/s Differential Pressure				IR	W	Performance will be recorded for six different flow conditions/ Approved ATP
		Flow(Q) v/s Speed (N)						
		Vibration Level						
		Air Borne Noise						
		Indication/ Alarm/Shut Down test						
4.04	Uninterrupted Endurance Test with integral Motor and Control Panel (100 Hrs or as per ATP)	Flow (Q) v/s Differential Pressure Along with all checks as per /ATP				IR	W	Readings to be recorded by every 02 hrs.
4.05	Structure Borne Noise	Structure Borne Noise emitted by Unit		SOTR /TNC Minutes /MIL-STD-740-2		LTC	CHP for R	Approval of NHQ required to perform SBN/ ABN test by Non-NABL Third Party/ Agency
4.06	Air born Noise test (ABN)	Air Borne Noise		SOTR /TNC Minutes /BS 3744 & MIL-STD-740-1/Mil Std 111474D	Compliance to specification	LTC	CHP for R	Final ABN and SBN reports to be approved by NHQ

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.07	Tilt test	Flow (Q) v/s Differential Pressure		SOTR/ Appr Drawing/ TNC mins/ approved ATP and relevant Standards	compliance to specification	IR	CHP for W	
		Flow (Q) v/s Speed(N)						
4.08	Shock Test	Shock & Vibrations Analysis		SOTR/NSS-II/ BR 3021 /MIL-Std-167	Compliance to specification	NSTL Report	CHP for R	
4.09	Strip Open Test	Wearing Parts		SOTR/ Apprd Drg/ TNC mins/ approved ATP and relevant Std	No wear	IR	W	
4.10	Post-Trial test For 1 hour	Flow(Q) v/s Differential Pressure			Compliance to specification	IR	W	Reading every 30 Minutes
		Flow(Q) v/s Speed (N)						
5.00	SECTION IV: MISCELLANEOUS REQUIREMENTS							
5.01	SOTR/TNC Compliance	Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	R	
5.02	Internal Final Inspection Report	Verification	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Internal IR	R	
6.00	SECTION V : FINAL INSPECTION							
6.01	Final Pump Assembly	Free rotation of Pump	100%	Rotate freely	Free Rotation	IR	W	
6.02	Performance test	Flow (Q) v/s Differential Pressure	100%	SOTR/ Apprd Drg/ TNC mins/ approved ATP and relevant Std	Compliance to specification	IR	W	Min 02 Hrs Performance Trial to be conducted including Mechanical / Proving run.
		Flow(Q) v/s Speed (N)						
		Noise & Vibration						
		Bearing Temp						
6.03	Overall Dimensional Inspection	DI	100%		Approved Drawings	IR	W	
6.04	Weight	Weight recording		SOTR/ Approved Drawing, TNC	Approved Drawings/ SOTR	Weight certificate	W	Witnessing through remote mode also acceptable
6.05	Tally Plate Check	VI	100%			IR	W	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
6.06	Lifting arrangement	VI	100%	minutes, approved ATP		IR	W	
7.0	<u>SECTION VI : PRE REQUISITE ISSUE OF FORM – IV/ I-NOTE</u>							
7.01	OBS Items as per Purchase Order	(i) Product identification and VI	100%	PO, SOTR, Approved Drawings/ PIL / OEM Specification	Compliance to specification	IR	W	
		(ii) DI					R	
7.02	Liquidation of observation during FATs, if any	Defect rectification	100%	Approved Drawing, SOTR & FAT document	AppdDrg, SOTR & FAT document	IR	CHP for R	
7.03	Submission of as Built Drawings	Verification	100%	Approved Drawings, Concession & Deviations	Appd drg. or Concurrence from drgs approval authority	As built drawings	CHP for R	
7.04	Paint	Visual Inspection & DFT	100%	Approved Drg/ SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	R & RMI	Witnessing through remote mode also acceptable
7.05	Preservation & Packing	Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	Witnessing through remote mode also acceptable Packing Procedure is to be mentioned by firm which shall be cleared by QAE rep
7.06	Submission of Form -IV (I&T Certificate)	Correctness	100%	SOTR, PO	SOTR, PO	Form-IV	P	

	MINISTRY OF DEFENCE / DGQA	APPENDIX 'E' CANNED MOTOR PUMP	PAGES	11
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI – 110 023	STANDARD QAP NO. DGQA/DQA(WP)/ PUMPS /11/2025/ REV-02 PART-II (Technical Inspection/Trials in form of SQAP Part-II (Refers to Page No. 15))	REV. NO.	01
			DATE	19 Mar 25

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
1.00	DRAWINGS/DOCUMENTS/TYPE TESTS							
1.01	Drawings & Documents	Verification of GA drawings and detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approved binding drawings	R	Binding & Binding Data, duly approved By Design authority, Professional & Inspection Authority or by Command for MO orders, be verified. SOTR/ TNC documents are to submitted by the firm
1.02	Type test report	Verification	One per Type	PO, TSP/ SOTR & TNC Minutes	Equipment is Type Tested and reports are held	Type Test reports	CHP for R	<u>For Shipyard/ DoI/ DME Orders:</u> Type test shall be undertaken as per SOTR subjected to equipment is not Type tested/ equipment has undergone changes/ Type test reports are not held, <u>For DPRO/CPRO Orders:</u> Type Test shall be applicable, only if indicated in PO
1.03	Manufacturing Drawings	Verification of manufacturing drawings with reference to the approved GA drawings and DBOM for completeness and sufficiency of data to undertake production and process inspections.	100%	SOTR, GA Drawings along with DBOM	Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	R	The manufacturing or detailed drawings will remain with the firm, to be produced to the QA team during the visit for inspection. On completion of inspection the inspector will stamp and sign the component drawing for future reference i.a.w QAD -02

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.00	RAW MATERIAL INSPECTION							
2.01	(a) Pump Casing (b) Impeller (c) Front Bearing Housing (d) Rear Bearing Housing (e) Wear Ring (f) Rear Cover (g) Companion Flanges (Suction and Delivery) (h) Terminal Box (j) Terminal Cover (k) Dome Nut (in case of casting)	(i) Pouring with integral test bar	100%	SOTR, Mfg Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	R/W	Review. If casting is done with integral test bar, review of documents by QA rep. Witness. If casting is undertaken without integral test bar, pouring may be witnessed by QA rep through virtual mode (live steaming) or submission of videography with time stamp by firm to QA Rep
		(ii) Material identification & Stamping	100%			IR	W	Samples to be drawn by QAE Rep
		(iii) Heat Treatment	100%			HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties
		(iv) Mechanical & Chemical properties	01 sample per heat /per lot			NABL TC	R	
		(v) NDT(RT/UT/ECT)	100%			NDE Report & Film	R – RT W –UT/ ECT	
2.02	Shaft (Forging/Extrusion)	(i) Material Identification & Stamping	100%	SOTR, Mfg. Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W	Samples to be drawn by QAE Rep
		(ii) Heat Treatment				HT reports	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties.
		(iii) Mechanical, Chemical properties	01 sample/ heat / lot			NABL TC	R	
		(iv) Micro & Macro examination				NABL TC	R	
		(v) NDT(UT/ECT)	100%			NDE report & Film	R – RT W –UT/ ECT	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
2.03	Components made from plate, Pipe & Bar Material as indicated in DBOM	(i) Material identification & Stamping	100%	SOTR, Mfg Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	R	
		(ii) Mechanical, Chemical properties	01 sample per heat/ lot			NABL TC	R	
	<u>BOUGHT OUT ITEMS</u>							
2.04	S & V Mounts	Inspection as per latest SQAP for S&V Mounts				I-note/ Form4/ Dispatch certificate	CHP for R	
2.05	Starter/Control Panel	Inspection as per latest SQAP for Starter/ Control Panel						
2.06	Bellows	Inspection as per latest SQAP for Bellows						
	<u>COTS ITEMS</u>							
2.07	As indicated in DBOM	(i) Visual & Product identification	100%	Approved drawing/ SOTR/ Catalogue/ OEM Spec	Compliance to Specification	STC/ CoC	W	
3.00	<u>SECTION II - IN PROCESS INSPECTION</u>							
3.01	Pump Casing	(i) VI & DI	100%	SOTR, Mfg Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) MPT <i>or</i> DPT				NDE Report	W	
		(iii) Hydraulic Pressure test (1.5 times of the working pressure for 30 min)			No Leakage	IR	R	
3.02	Impeller	(i) VI & DI	100%		Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) MPT <i>or</i> DPT				NDE Report	W	
		(iii) Dynamic Balancing as per ISO 21940, Grade-1.0				IR	W	
3.03	Front & Rear Bearing Housing	(i) VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI
		(ii) MPT <i>or</i> DPT	100%			NDE Report	W	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks		
3.04	Wear Ring	(i) VI & DI	100%			IR	W/R	W- Witness for VI R- Review for DI		
		(ii) MPT <i>or</i> DPT				NDE Report	W			
3.05	Rear Cover	(i) VI & DI	100%	SOTR, Mfg Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W/R			
		(ii) MPT or DPT				NDE Report	W			
3.06	Rotor Shaft	(i) VI & DI	100%			IR	W/R			
		(ii) Surface roughness				NABL TC	R			
		(iii) MPT <i>or</i> DPT				NDE Report	W			
3.07	Rotor Liner and Stator Liner	(i) VI & DI	100%			IR	W/R			
		(ii) MPT or DPT on weld Joint				NDE Report	R			
3.08	Stator Laminated Pack	DI	100%			SOTR, Mfg Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification		IR	R
3.09	Stator Casing	(i) VI and DI							IR	W/R
		(ii) MPT <i>or</i> DPT							NDE Report	W
		(iii) Hydrostatic Test @1.5 times of working pressure	No Leakage			IR	R	Hydraulic pressure test duration not less than 30 minutes as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes		
3.10	Rotor Complete	(i) VI & DI	100%			SOTR, Mfg. Drawings i.a.w Approved GA Drawings / DBOM and relevant Standards	Compliance to Specification	IR	W/R	W- Witness for VI R- Review for DI
		(ii) Run Out		R						
		(iii) Dynamic Residual unbalancing/ Dynamic Balancing as per ISO 21940, Grade-1.0								
		(iv) Calculation of air gap								
3.11	Stator Complete	(i) Shaping	100%				IR	R		
		(ii) Insulation resistance								
		(iii) Line resistance								
		(iv) HV Test								
		(v) Surge test								

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks	
3.12	Integral Motor	All applicable tests as per EED-Q-071 R4	100%	TNC/SOTR/ Latest SQAP	Compliance to Specification	IR	CHP for R	Complete Motor to be inspected as per SQAP for Motor by main QAE/ sub-nominated QAE	
4.00	<u>SECTION III : PRE-REQUISITE : FINAL INSPECTION</u> <u>TYPE TESTING OF PUMP (To be carried out on one unit /prototype)</u>								
4.01	Pump Assy	Overall Dimensional Inspection	One Unit	Approved GA Drawings	Approved GA Drawings	IR	W		
		Hydrostatic Test & Helium Leak Test		PO, SOTR, TNC Minutes/ Approved GA Drawing, DME Spec 402/ 461 and ATP	PO, SOTR, TNC Minutes/ Approved GA Drawing, DME Spec 402/461 and ATP				
		Locked Rotor Test							
		Start /Stop test							
4.02	Performance test with integral Motor and control panel	Flow(Q) v/s Head(H)	One Unit				IR	W	Performance will be recorded for 06 different flow conditions/ Approved ATP
		Flow(Q) v/s Efficiency							
		Flow(Q) v/s Power(P)							
		Heat run/ Temp rise							
		Bearing Temp							
		Winding Resistance (Cold & Hot)							
		Insulation Resistance							
		High Voltage Test							
		Indication/ Alarm/Shut Down test							
		Motor efficiency, torque, power factor & slip							
4.03	Endurance Test (100 Hrs) (Rated Capacity)	Measurement of Flow & Head along with all type of checks as per ATP	One Unit					IR	W
4.04	Structure Borne Noise (SBN)	Structure Borne Noise emitted by Unit	One Unit	SOTR /TNC Minutes /MIL-STD-740-2	SOTR /TNC Minutes /MIL-STD-740-2	LTC	R	Approval of NHQ required to perform SBN/ ABN test by Non-NABL Third Party/ Agency	
4.05	Air born Noise test (ABN)	Air Borne Noise	One Unit	SOTR /TNC Minutes /BS 3744 & MIL-STD-740-1/Mil Std 1474E	SOTR /TNC Minutes /Approved drawing/relevant standard	LTC	R	Final ABN and SBN reports to be approved by NHQ	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
4.06	Tilt test	Head(H) v/s Flow (Q) v/s Power(P) V/s	One Unit	SOTR /TNC Minutes/ App. Test Procedure	SOTR /TNC Minutes/ App. Test Procedure	IR	W	Tilt test to be carried out as per SOTR/ PO/ TNC Minutes. If SOTR does not specifies anything then DME 402 will be followed
4.07	Environmental Shock & Vibrations	Shock & Vibrations Analysis	One Unit	SOTR/NSS-II/ BR 3021 /MIL-Std-167	SOTR/NSS-II/ BR 3021 /MIL-Std-167	NSTL Report	R	
4.08	Strip Open Test	Wearing Parts	One Unit	PO, SOTR, TNC Minutes/ Approved GA Drawing, DME Spec 402/ 461 and ATP	PO, SOTR, TNC Minutes/ Approved GA Drawing, DME Spec 402/ 461 and ATP	IR	W	Reading every 30 Minutes
4.09	Post-Trial test For 1 hour	Flow(Q) v/s Head(H)						
		Flow(Q) v/s Eff(n)						
		Flow(Q) v/s Power(P)						
		Noise Test						
		Vibration Test						
5.00	SECTION IV : MISCELLANEOUS REQUIREMENTS							
5.01	SOTR/TNC Compliance	Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	R	
5.02	Internal Final Inspection Report	Verification	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Internal inspection report	R	
6.00	SECTION V : FINAL INSPECTION							
6.01	Pump Assy	Hydrostatic Test and Helium Leak test	100%	PO, SOTR, Approved Drawing &DME Spec 402/ 461 and Approved IFAT document	PO, SOTR, Approved Drg and DME Spec 402/461 and Approved IFAT document	IR	CHP for W	Min 02 Hrs Performance Trial to be conducted including Mechanical / Proving run.
6.02	Performance test with Integral motor and Control Panel (Duration as per approved FATs)	Flow(Q) v/s Head(H)	100%					
		Flow(Q) v/s Efficiency(Effn)						
		Flow(Q) v/s Power(P)						
		Heat run						
		Temperature rise						
		Insulation resistance						
		Winding Resistance						
		High Voltage Test						
		Noise and Vibration						
6.03	Overall Dimensional Inspection	Dimensional Check	100%	Approved Drawings/	Approved Drawings/	IR	W	

Srl No	Material /components/ As per SOTR/QA Activity	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Type of Record	Action by QAE	Remarks
6.04	Weight	Weight recording	100%	SOTR	SOTR	Weight certificate	W	Witnessing through virtual mode also acceptable
6.05	Tally Plate Check	Visual	100%			IR	W	
6.06	Lifting arrangement	Visual	100%			IR	W	
7.0	<u>SECTION VI : PRE REQUISITE ISSUE OF FORM - 4</u>							
7.01	OBS Items as per Purchase Order	(i) Product identification& VI	100%	PO, SOTR, Approved Drawings/ PIL/ OEM Specification	PO & Approved Drawings/PIL	IR	W	
		(ii) DI					R	
7.02	Liquidation of observation during FATs, if any	Defect rectification	100%	Approved Drawing, SOTR & FAT document	Approved Drawing, SOTR & FAT document	IR	CHP for R	
7.03	Submission of as Built Drawings	Verification	100%	Approved Drawings, Concessions & Deviations	Apprd drg. or Concurrence from drgs approval authority	As built drawings	CHP for R	
7.04	Painting	Visual Inspection & DFT	100%	Approved Drg/ SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W / RMI	Witnessing through remote mode also acceptable
7.05	Preservation & Packing	Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	Witnessing through remote mode also acceptable Packing Procedure is to be mentioned by firm which shall be cleared by QAE rep
7.06	Submission of Form -4 (I&T Certificate)	Correctness	100%	SOTR, PO	SOTR, PO	Form-4	P	

Important Notes:-

- (a) Each type of Equipment & accessories to be supplied shall conform to specification acceptable to the TYPE APPROVAL authority.
- (b) Visual and Dimensional inspection (VI/DI) to be checked as per Approved drawings for assembly and sub-assembly and as per manufacturer drawings for components.
- (c) HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties.
- (d) All castings will be subjected to RT. Class of casting and extent of RT requirement (shooting sketches) along with critical region to be indicated by the firm in the approved drawing. RT report along with film to be submitted by firm to QAO for review.
- (e) Motor SV Mounts & Control Panel to be procured only from Naval approved vendors.
- (f) EMI/EMC and ETT tests to be done at NABL approved Lab.
- (g) Material Testing to be done at NABL approved Lab.
- (h) **All NDT to be performed in accordance with DQA(WP) policy letter no. 12575/POLICY/DGQA/WP-TC dated 25 Mar 22 and time to time amendments therein.** Acceptance criteria for NDT is as per specification laid in approved Drgs/ DBOM or specified by OPA. MPT or DPT to be undertaken on machined surface.
- (j) The firm is required to categorically define the 'Bought out'/COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the QAP on the basis of approved drawings. Further, only finished products will be accepted as COTs and no raw material for manufacturing will be acceptable as a COTS item. Each bought out and COTs item should have Make, Model, Type, specification and grade details in approved DBOM.
- (k) The SQAP does not apply to items not in the scope of supply of the Purchase Order.
- (l) WPS / WPQ certificates to be submitted by the firm for all welding related work. Validity of firm for performing WPS/WPQ to be ascertained if firm not undertaken similar welding so far.
- (m) Assy more than 40 Kgs weight should be provided with lifting arrangement.
- (n) ATP duly approved along with Performance Indicator data sheet to be submitted prior FATs.
- (p) Test bed set, internal performance test and compliance SOTR/ TNC to be submitted before FATs.
- (q) Witnessing of inspections can be done in remote mode, wherever, feasible. The modalities of remote inspection are to be worked out jointly by the firm and QAO rep.
- (r) SOP for Remote Inspection wrt Weight measurement, Painting, Preservation and Packing issued vide DQA(WP) letter 29814/MISC/DGQA/WP-TC dated 24 Feb 21 as amended from time to time is to be followed, wherever feasible.
- (s) **Inspection through Virtual/ Hybrid mode to be conducted, wherever feasible, in accordance with DGQA, SoP No. DGQA/STD/005-23 dated 20 Oct 2023.**
- (t) In order to optimise the Inspection time / requirement viz a viz the Delivery schedule, without compromising on the quality aspect, sampling plan for inspection for non-critical component may be resorted to. The scope and extent of sampling / full inspection to be discussed and finalised during FCM based on PO quantity, Capability/ Capacity & vendor rating of the Firm.

