MINISTRY OF DEFENCE (DGQA)
STANDARD QUALITY ASSURANCE PLAN
FOR PUMPS
(CENTRIFUGAL, SCREW, SUBMERSIBLE AND CANNED)

PUMP MAY BE CONSIDERED AS A DEVICE THAT MOVES FLUIDS (LIQUID OR GASES) OR SLURRIES BY MECHANICAL ACTION. THE COMMONLY USED PUMP TYPES ARE CENTRIFUGAL AND SCREW. THE CENTRIFUGAL PUMPS ARE DYNAMIC PUMPS IN WHICH ENERGY IS CONTINUOUSLY ADDED TO INCREASE THE FLUID VELOCITY WITHIN THE MACHINE TO VALUES IN EXCESS OF THOSE OCCURRING AT THE DISCHARGE SUCH THAT SUBSEQUENT VELOCITY REDUCTION WITHIN OR BEYOND THE PUMP PRODUCES A PRESSURE INCREASE. THE SCREW PUMP MAY BE DEFINED AS A SPECIAL TYPE OF ROTARY POSITIVE DISPLACEMENT PUMP IN WHICH THE FLOW THROUGH PUMPING ELEMENTS IS TRULY AXIAL. THE LIQUID IS CARRIED BETWEEN SCREW THREADS ON ONE OR MORE AND IS DISPLACED AXIALLY AS THE SCREWS ROTATE AND MESH. PUMPS ARE AN IMPORTANT AND INSEPARABLE PART OF MARINE SYSTEMS ONBOARD AND CONTRIBUTE DIRECTLY TO THE SHIP'S OPERATIONAL EFFECTIVENESS AND BATTLE WORTHINESS. THE INDIAN NAVAL SHIPS ARE PRESENTLY FITTED WITH WIDE VARIETIES AND TYPES OF PUMPS WITH VARYING CAPACITIES AND SOURCES OF SUPPLY (INDIGENOUS AS WELL AS IMPORTED).

STANDARD QAP NO. DGQA / DQA(WP) / PUMPS /11/ 2016 / REV 0
DEC 2016
Total Nos. of Pages: -- 78

ISSUING AUTHORITY
DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
'H' BLOCK, NIRMAN BHAWAN PO
NEW DELHI - 110 011

RECORD OF AMENDMENTS

Sl. No.	Date of Amendment	Amendments	Authority	Remarks

रक्षामंत्रालय (गु.आ.म.नि)

MINISTRY OF DEFENCE (DGQA)

पम्प के लिए मानक गुणता आश्वासन प्लान

(सेन्ट्रीफ्यूगल, स्क्रू, सबमर्सिबल एवं कैन्ड पम्प)

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

मानक गुआ प्लान संख्या

DGQA/DQA(WP)/PUMPS/11/2016/REV 0

दिसम्बर 2016

STANDARD QAP NO.

DGQA/DQA(WP)/PUMPS/11/2016/REV 0

DEC 2016

एके दत्ता /(AK Dutta)

रियर एडमिरल, एन एम / Rear Admiral, NM

अपर महानिदेशक(यु.पो.परि.)/ ADGQA(WP)

द्वारा प्राख्यापित/Promulgated by:-

गुणता आश्वासन निदेशालय (यु.पो. परि.)

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)

रक्षा मंत्रालय/ गु.आ.म.नि.

MINISTRY OF DEFENCE (DGQA)

"एच" ब्लॉक निर्माण भवन, नई दिल्ली - 11

'H' BLOCK, NIRMAN BHAWAN PO NEW DELHI - 110 011

Website : dgqadefence@gov.in

E-Mail : dqawp @navy.gov.in

CONDITION OF RELEASE

1. This Standard QAP (SQAP) 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 SQAP except by the issue of authorised amendment by DQA (WP).

2. It is to be applied as required in the Quality Assurance procedures covering manufacturing of Centrifugal, Screw, Submersible and Canned Motor Pumps for IN Ships.

3. The website **htpp://www.dgqadefence.gov.in** may also be referred for other QA requirements.

4. The SQAP has been prepared on the basis of decisions made in the Collegeate meeting held at DQA (WP) with leading manufacturers of Centrifugal, Screw, Submersible and Canned Motor Pumps, representative of Professional Directorates (DME, DEE and DNBCD) , Production Directorates (DND and DSP) and DQA(WP) field Units. Any user of this SQAP 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. The prime movers for pumps and other associated equipment like shock mounts, starters/control panel etc. will be governed by their separate SQAPs which are not in the scope of this SQAP.

5. DQA (WP) reserves the right to amend or modify the contents of this SQAP without consulting or informing any holder of this document.

6. When this SQAP is incorporated into contracts, users are responsible for their correct application and for complying with contractual and other statutory requirements. Compliance with SQAP does not in itself confer immunity from legal obligations.

7. Enquiries in connection to these requirements may be made from:

DIRECTORATE OF QUALITY ASSURANCE (WARSHIP PROJECT)
MINISTRY OF DEFENCE (DGQA)
'H' BLOCK, NIRMAN BHAWAN PO
NEW DELHI - 110 011

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REFERENCE STANDARDS

S. No.	Specification No.	Description
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	Requirment for NAB casting & Ingots
11	NES 1004	Requirements for the design & Testing of equipment to meet environment conditions
12	DME 402	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 (FG 260,FG210)
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-461 D & MIL-STD-461 E	EMI/EMC Requirement for Electronic Equipments 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
31	MIL-STD-740-1	Airborne Borne sound measurement
32	MIL-STD-1474-D	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 equipments
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
55	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

SPECIFIC REQUIREMENTS

1. All raw material testing will be as per applicable specifications. As the testing of material is mandatorily to be checked at NABL lab, there may be no need to witness. However, QAOs can exercise discretion based on the criticality of item.

2. If casting is being poured without integral test bar, then the pouring is to be witnessed by Inspector.

3. All major castings are to be subjected to RT. For Class 1 castings 100% RT is mandatory. For all other castings, the extent of RT /inspection will be as specified in the approved drawing and details provided in DBOM (detailed bill of material) of drawing. The critical regions for RT along with shooting sketches/angles prepared by level III technician need to be submitted along with drawings for approval. Inspection and NDE report by ASNT/ISNT level II or III technician is acceptable. Small components for which RT is not considered essential should be brought out upfront in the drawings submitted for approval.

4. Pump shafts are subjected to Micro and Macro examination to check grain flow / grain size.

5. Non Destructive Testing is to be carried out by ISNT/ ASNT level II or III qualified technician which could be a firm's employee also. The record of test will be NDE report and all NDT tests (except RT) will be done on machined surface and witnessed by QAO rep.

6. Hydraulic pressure test is to be checked @ 1.5 times of working pressure for not less than 30 minutes as per DME 402, unless otherwise specified in the drawing/ SOTR/ TNC minutes.

7. Both over speed and cooling tests are also applicable for pumps as per DME 402 and are type test requirements applicable 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. Tilt test to be carried out as per SOTR/TNC minutes/PO. If SOTR does not specify anything, then procedure for tilt test will be followed as per DME 402.

9. 'Strip Open' and post run test is to be carried on one Pump selected at random by QAO per lot of 07 and in multiples thereafter. The QAO reserves the right to inspect/accept/reject all pumps based on the outcome of random inspection.

10. Make of the Items should be as per approved PIL/Detailed Bill of Material (DBoM) in approved drawings.

11. The items/components are divided in four categories with following acceptance criteria:-

(a) Manufactured Items – These items / components are to be inspected as per the requirements of SQAP.

(b) Bought Out/Sub contracted items – Refers to those items which the firm gets manufactured or buys from a third party against their own specifications and not available in the open market. These items would be accepted on the basis of STC/OEM TC/Separately approved QAP as applicable based on critical nature of component. The final decision for the same rests with DQA (WP).

(c) COTs items – These commercially off the shelf available items can be procured by anyone from open market. COTs items are not to be inspected. These would be accepted on the basis of STC / CC.

(d) Imported items – Will be inspected on the basis of following import documents as per extant DGQA policy :

(i) Bill of Lading
(ii) Country of Origin
(iii) Shipping Bill/ Air way bill
(iv) Bill of entry to warehousing
(v) OEM Test Certificate/Quality Assurance Guarantee Certificate.
(vi) OEM's certificate confirming that spares are tested for fitment on main equipment for which spares are ordered. i.e., PAC firm's confirmation certificate.
(vii) Firm's Guarantee Certificate as per SO.

In case the items are assembled locally with imported components, functional trials of assembly as per approved FATs would be required. The 'Bought out' items in the SQAP are indicative only. The firm is required to categorically define the Bought out/Sub-contracted/COTS items specific to their products in the drawings.

12. Acceptance of items is to be based on approved drawing for assemblies / sub-assemblies and manufacturers' drawing for components prepared by the OEM. The manufacturing drawings against which the item will be inspected are not required to be submitted by the firm. However, reference to the manufacturing drawing details is to be provided in the DBOM which is approved by the customer. Submission of 'As-Built drawings' is mandatory along with approved documents for verification and stamping.

13. Air Borne Noise & Structure Borne Noise testing will be done as per relevant standard for 100% quantity and can be undertaken by Lab approved by NHQ.

14. Balancing of an individual part/component is not required. The balancing is to be checked as an assembly with companion parts viz impeller with shaft for centrifugal pumps and Sub Assy consisting of Power Screw/Rotor, Pump Half coupling, Pump etc. in case of screw pump.

15. Ingress protection testing will be as per applicable IP rating.

16. EMI EMC test and ETT will be done at Government/PSU test centers or NABL accredited labs.

17. 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 along with drawings used during Type Testing for review of Inspection Agency.

18. Prior to starting inspection activity all reports with approved drawings used during type testing etc. with similar pumps, if any, are to be submitted to QAO for verification. Further, prior to call for final inspection, the firm should submit Internal Final inspection report/FAT report, test bed setup and compliance to SOTR along with all supporting documents for verification of QAO.

19. The QA activities will be governed by the SQAP from the date of promulgation and it will supersede all previous QAPs/MQAPs. If firm has PAC status for the particular item/equipment, the spares may be accepted as per OEM specifications.

20. All inspections involving DGQA, only SQAP/DQA(WP) approved QAP will be followed. QAP approved by TPI agency is not valid for DGQA inspection and vice versa. Also, Stores once inspected if not used/ delivered within 60 days of inspection are to be offered again for inspection and cannot be used on the document review basis.

ABBREVATIONS

VI	Visual Inspection
DI	Dimensional Inspection
LTC	Lab Test Certificate
MTC/OEMTC	Manufacturer/OEM Test Certificate
STC	Supplier Test Certificate
CC	Conformance/Compliance Certificate
CHP	Customer Hold Point
IR	Inspection Report
NABL	National Accreditation Board For Testing And Calibration of Laboratories
R	Review
W	Witness
TC	Test Certificate
OEM	Original Equipment Manufacturer
DPT	Dye Penetrant Test
MPT	Magnetic Particle Test
UT	Ultrasonic Test
RT	Radiography test
HT	Heat Treatment
NDE	Non Destructive Examination
SBN	Structure Borne Noise
ABN	Air Borne Noise
FATs	Factory Acceptance Trials
PQR	Procedure Qualification Record
WPS	Welding Procedure Specification
WPQ	Welder Performance Qualification
ETT	Environmental Type Test
EMI	Electro Magnetic Induction
EMC	Electro Magnetic Conduction
ASNT	American Society of Non destructive Testing
ISNT	Indian Society of Non destructive Testing
TPI	Third Party Inspection

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, Sub contracted and COTS items, In-process Stage and Final Stage. The scope also covers the review and witness of Type test of equipment, wherever applicable.

The SQAP 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) Witness of Pouring in absence of integral test bar

(d) Review of Lab Test Certificates/Supplier Test Certificates/Compliance Certificates/Import documents

(e) Witness of in-house Lab Testing, if applicable.

(f) Witness of Non-destructive Testing viz. UT,DPT & MPT

(g) Witness of Eddy Current Test Or review of Eddy Current Test Report, as applicable

(h) Review of RT films and reports.

(j) Review of Heat Treatment Charts

(k) Witness of Endurance Trials & Tilt Test and verification of Shock Test and SBN & ABN reports

(l) Review of ETT , EMI/EMC and ESS reports, in addition to Pre ETT inspection and Post ETT inspection of Unit , as applicable

(m) Review of Draft documentation and witness/Stamping of final documentation, as applicable

(n) Issue of CHP clearance

(p) Issue of Dispatch Clearance or Issue of Form-IV, as applicable

EQUIPMENT DESCRIPTION

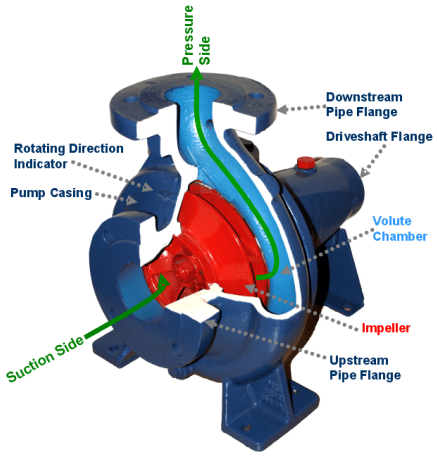
1. Pump may be considered as a Turbomachine which produce a mechanical work input to effect a change in the stagnation state of a fluid. Turbomachine is a device in which energy transfers occurs between a flowing fluid and a rotating element due to dynamical action, and results in a change in pressure and momentum of the fluid. Though the turbine is also a Turbomachine, it is different from a rotodynamic pump in view that a turbine takes liquid energy and gives out mechanical energy, while a rotodynamic pump takes in mechanical energy and gives out liquid energy. A rotodynamic pump adds energy to the liquid while turbine extract energy from liquid. With all the technological development which has occurred since ancient times including transformation from water power to other forms of energy, all the way to nuclear fission, the pump remains probably the second most common machine in use, exceeded in numbers only by electric motors. The pump has evolved over time with important modifications and changes to make it more efficient and user friendly.

2. Commonly used Pumps can be broadly classified in following ways:-

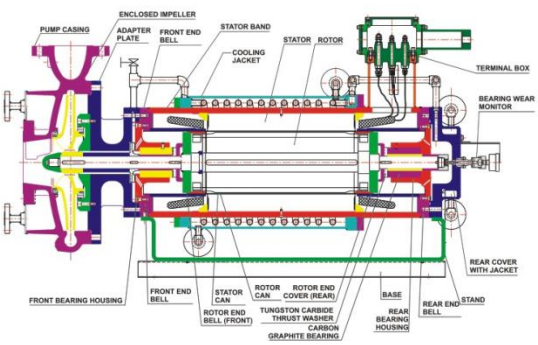
(a) Dynamic viz. Centrifugal, Submersible, Canned
(b) Positive Displacement viz. Rotary (single and multiple screw pumps), Reciprocating etc.

3. Centrifugal Pump - The centrifugal pump consists of three important parts:-

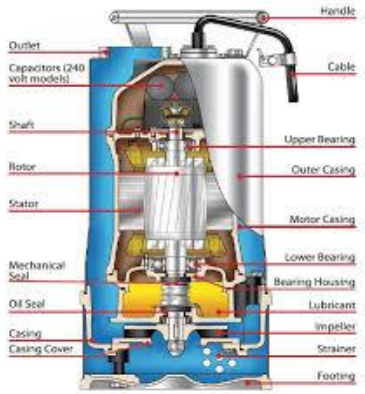
(a) The rotor, usually called impeller
(b) The volute casing, a water tight and airtight chamber
(c) The diffuser



The impeller may be single sided or double sided according to application. As the impeller rotates under power, the fluid is drawn into the blade passage at the impeller eye, the centre of the impeller. The inlet pipe is axial and therefore fluid enters the impeller with very little whirl or tangential component of velocity and flows outward in the direction of the blades. The fluid receives energy from the impeller while flowing through it and discharges with increased pressure and velocity into the casing. To convert the kinetic energy or fluid at the impeller outlet gradually into the pressure energy, diffuser blades mounted on a diffuser ring are used. The stationary blade passage so formed has an increasing cross-sectional area which reduces the flow velocity and hence increases the static pressure of the fluid. Finally, the fluid moves from the diffuser blades into volute casing which is a passage of gradually increasingly cross-section which also serves to reduce the velocity of fluid and convert some of the velocity head into static head. Submersible and canned pumps are types of centrifugal pumps.



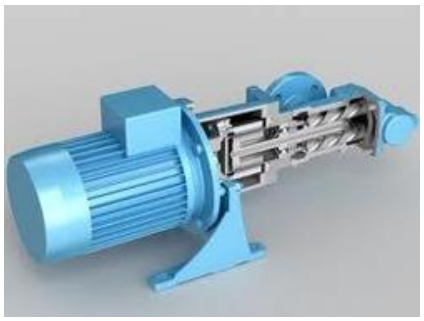
Canned Pump



Submersible Pump

4. Screw Pump – A Screw Pump is one type of positive displacement pump widely used in the marine application. The Positive displacement pumps are those in which energy is periodically added by application of force to one or more movable boundaries of any desired numbers of enclosed fluid containing volume, resulting in direct increase in pressure upto the value required to move the fluid through the valves or ports into the discharge line. In all other rotary pumps, the liquid is forced to travel circumferentially, thus giving screw pump with it's unique axial flow pattern and low internal velocities a number of advantages in many application areas where liquid agitation or churning is objectionable. Screw pumps are self priming and have delivery and flow characteristic which is essentially independent of pressure. Screw pumps are classified into single screw or multiple screw (double screw or triple screw pumps). The major working elements in a Screw pumps are:-

(a) Stator in Elastomer/Steel construction
(b) Rotor in SS or tool steel construction



5. The Stator has a formed (two start helix) cavity while rotor is a single helix screw profile with a built in eccentricity. When rotor rotates in the stator cavity it forms cavities that appear to progress axially carrying liquid without agitation. Twin screw pump is based on the Archimedean principle, two intermediate screws on parallel shafts operate inside a close fitting 8 shaped liner (or housing). Liquid is pumped from both ends of the screw into the pump's centre body where discharge is located. Due to special profiling of the flanks of screw threads, the two spindles form sealed cavity among themselves. These cavities moves axially and continuously from suction end to delivery chamber by rotation of screw. Triple screw pumps have a main screw and two idler screws. The hardened and ground screws run in a reciprocal casing insert (liner). The main screw is driven through flexible coupling by a driver and the idlers are turned hydraulically. Due to special profiling of the flanks of screw threads, the three spindles form sealed cavities among themselves. These cavities moves axially and continuously from suction chamber to delivery chamber by rotation of the screw.

6. <u>Pump Characteristics</u>

One or more of the following quantities must be assured by the manufacturers under the specified conditions and speed of rotation:-

(a) Total head of the pump, $H_{G,}$ at the agreed flow rate $Q_{vG,}$ or flow rate of the pump, $Q_{vG,}$ at the agreed total head H_G

(b) Power input or efficiency of the pump or combined pump-motor unit at the guaranteed $Q_{vG,}H_G$ point.

(c) NPSH required by the pump at the agreed flow rate, Q_{vG}

(d) Other points of the $Q_{v,}H$ curve may be indicated by guarantying the total head at a reduced or increased flow rate, in which case separately agreed increased tolerances will apply.

7. The imperative need for efficient and full utilization of pumps in the ocean going and naval ships for normal and emergency duty on the ship is being felt increasingly. Proper selection and installation of these pumps constitute a vital step towards achieving this very important objective in naval ships. This requires certainty of performance which can be achieved through a systematic and efficient way of QA check which can be understood by the vendors, users, engineers and the technical staff who inspect the pumps.

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 per PO)

STANDARD QUALITY ASSURANCE PLAN

Part – II:

Standard QAP of Centrifugal, Screw, Submersible and Canned Pumps for IN Ships.	Appendix "A", "B" & "C"

Appx- 'A'

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.00	**DRAWINGS/DOCUMENTS/TYPE TESTS**								
1.01	Drawings & Documents		GA drawings and detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approved binding drawings	**CHP** For R	Binding Drawing & Binding Data, duly approved by Design authority, Professional & Inspection Authority (or by Command for MO orders) to be verified.
1.02	Type test / ETT / EMI/EMC reports and Approved drawings		Availability & verification	100%	PO & SOTR / TNC Minutes/ JSS 55555/ *and* Approved drawings used during type test for similar pump	PO & SOTR / TNC Minutes JSS 55555	Type Test / ETT/EMI / EMC reports	**CHP** For R	If not type tested, Equipment to be Type Tested as per Sl. 4.0.0. If type tested, all type test reports along with approved drawing used during Type tests to be submitted to QAO.
2.00	**SECTION I - RAW MATERIAL INSPECTION**								
2.01 (a)	Pump Casing, (Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards	SOTR,	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) Heat Treatment	100%	BS 1400/ NES 747/ DGS 8520/ Ni Al Br DGS348/ Al alloy LM6 BS 1490/ ASTM E272 level 2 (for RT), ASTM A 609 (for UT)	Approved Drawings and relevant Standards	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	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab
			(v) RT (Applicable as per Drg./ spec.)	Critical Regions			NDE Report and film	**CHP** For R	Approved shooting sketches to be provided. Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.01 (b)	Pump casing (Extrusion)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards		IR	W	
			(ii) Physical, Mechanical & Chemical properties	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) UT	100%	AISI 316/ BS 1400 LB2/EN 57/SS341/A STMA276/ SS 431529 to BS 970/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.02	Shaft (Forging/Extrusion)		(i) Material Identification & Stamping	100%			IR	W	
			(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) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab
			(iv) Micro & Macro examination	100%			LTC	R	Test to be done at NABL Lab
			(v) UT	100%			NDE report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.03	Impeller, (Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards/ DGS 8520/ BS 1400/	*SOTR,* Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	
			(iii) Heat Treatment	100%			HT Report	R	HT is not mandatory if not given in material

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
					NES 747/ ASTM E272 level 2 (for RT)/ ASTM A 609 (for UT)				specification and if firm is able to achieve desired physical and mechanical properties
			(iv) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab
			(v) RT (Applicable as per Drg./ spcn)	Critical Regions			NDE Report and film	**CHP** For R	Approved shooting sketches to be provided. Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.04	Stuffing Box/Casing Cover (Casting)		(i) Pouring with integral test bar for casting	100%	SOTR, Approved Drawings and relevant Standards DGS 203/ BS1400/NES 747/	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	
			(iii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iv) RT (Applicable as per Drg./ spec.)	Critical Regions	ASTM E272 level 2 (for RT) ASTM A 609 (for UT)		NDE Report and film	**CHP** For R	Approved shooting sketches to be provided. Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(v) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.05	Lower & Upper Bearing housing/ Bearing Cover (Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards/ DGS 203A/ BS1400/ FG 260/ ASTM E272 level 2 (for RT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	
			(iii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R	Test to be done at NABL Lab
			(iv) RT (Applicable as per Drg./ spec.)	Critical Regions			NDE Report and film	**CHP** For R	Approved shooting sketches to be provided. Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.06	Wearing Ring Wearing Plate (Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards/ DGS 203A/ BS1400/ FG 260/ ASTM E272 level 2 (for RT)/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	
			(iii) Physical, Mechanical, Chemical properties	01 sample / heat / lot			LTC	R	Test to be done at NABL Lab
			(iv) RT (Applicable as per Drg./ spec.)	Critical Regions			NDE Report and film	**CHP** For R	Approved shooting sketches to be provided. Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO
2.07	Gland Plate, Cover Plate, Seal Housing		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and Relevant Standards	SOTR, Approved Drawings and relevant Standards	IR	W	Test to be done at NABL Lab
2.08	Impeller Nut		(ii) Physical, Mechanical, Chemical properties	01 sample/ heat / lot			LTC	R	Approved shooting sketches to be provided.
2.09	Impeller Key ,Coupling Key								

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.10	Companion Flange-Suction		(iii) RT (Applicable as per Drg./ spec- for 2.10 &2.11 in case of casting.)	100%	NES 747/ASTM 276/IS 1670/AISI316/AISI410		NDE Report and film	**CHP** For R	Testing to be done by ISNT/ ASNT level II or III qualified technician. RT reports & films to be submitted to QAO
2.11	Companion Flange-Delivery								
	BOUGHT OUT ITEMS								
2.12	SV Mounts		(i) Prod. Identification	100%	SOTR, Approved Drawings and SQAP (SQAP No. DGQA/ DQA (WP)/ Shock and Vibration Mounts/08/ 2016/Rev 0 dt Mar 16)	SOTR, Approved Drawings and SQAP	IR	W	
			(ii) SQAP Compliance	100%			IR as per SQAP	R	
			(iii) Dispatch clearance	--			I-note/ Form 4/ Dispatch Certificate (as applicable)	R	
2.13	Motor		(i) Prod. Identification	100%	SOTR,TNC Minutes, Approved	EED-Q-071 (R4), SOTR,	IR	W	Motor to be inspected at motor manufacturer's premises as per motor
			(ii) SQAP Compliance	100%			IR as per SQAP	R	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) Dispatch clearance	--	Drawings, , EED-Q-071 (R4) and SQAP (SQAP No. DGQA/ DQA (WP)/Ac Motor/05/ 2016/Rev 0 dated Mar 16)	Approved Drawings and SQAP	I-note/ Form 4/ Dispatch Certificate (as applicable)	R	SQAP by main QAE/ sub -nominated QAE
2.14	Starter /Control Panel		(i) Prod. Identification	100%	SOTR, TNC Minutes , Approved Drawings, EED-Q-071(R4), and SQAP No. DGQA/ DQA(WP)/A c Starter-Control Gear/ 06/ 2016/Rev 0 dated Mar 2016/TNC minutes	EED-Q-071 (R4) SOTR, Approved Drawings and SQAP	IR	W	Starter to be inspected at starter manufacturer's premises as per SQAP for Starter Panel by main QAE/ sub -nominated QAE.100% ESS test to be carried out on PCB modules as per DQA(N) latest guidelines
			(ii) SQAP Compliance	100%			IR as per SQAP	R	
			(iii) Dispatch clearance	--			I-note/ Form 4/ Dispatch Certificate (as applicable)	R	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.15	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			LTC/MTC	R	Test to be done at NABL Lab
			(iii) Visual and Dimensional Examination	100%			IR	R	
2.16	Diffuser, Strainer		(i) Product identification	100%	SOTR/ Approved drawings/ Supplier's catalogue/	SOTR/ Approved drawings/ Supplier's catalogue	STC or OEM TC/MTC	W	
			(ii) Visual and Dimensional Examination				IR	R	
2.17	Flexible Hose		(i) Product identification	100%	SOTR/ Approved drawings/ Supplier's catalogue/ SAE 100 R1/ Hydraulic pressure test @ 1.5x working pressure	SOTR/ Approved drawings/ Supplier's catalogue	OEM TC/MTC	W	
			(ii) Visual and Dimensional Examination				IR	R	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
	COTS ITEMS								
2.18	Gasket		(i) Product identification (ii) Visual and Dimensional Examination	100%	Approved drawing/ SOTR/ Supplier's catalogue/ OEM Spec/NES 360/DEM 405 RM	Approved drawing/ SOTR/ Supplier's catalogue/ OEM Spec	(i) STC *or* CC or MTC (ii) IR	W R	VI/DI acceptance based on approved drawing for assemblies/sub-assemblies and manufacturer drawing for components.
2.19	Mechanical Seal								
2.20	Bearings								
2.21	O Rings								
2.22	Compound Gauge, Pressure gauge								
2.23	Gauge Piping								
2.24	Valves								
2.25	Bellows								
2.26	Hardware Items- Studs, Nut, bolts, Screws, washers, Circlips, lantern, Rivet, Keys Sand Guard, Cap Chain, Plug Assy, Name Plate, Sleeve, flange, Neck Ring, Sealing Ring								

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.00	**SECTION II - IN PROCESS INSPECTION**								
3.01	Pump Casing, (Casting or (Extrusion)		(i) Visual and Dimensional Examination	100%	SOTR, Approved Drawing ASTM E 165/ NES 729	Approved drawing and relevant standard	IR	R	
			(ii) Surface Defects, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
			(iii) Hydraulic Pressure Test	100%		No leakage	IR	**CHP** for W	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 (Forging)		(i) Visual and Dimensional Examination	100%	SOTR, Approved Drawing ASTM E 165/ NES 729/ ISO 1940	Approved drawing and relevant standard	IR	R	
			(ii) Surface Defects, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
			(iii) Static & Dynamic balancing	100%			IR	**CHP** for W	Static & Dynamic balancing to be checked with Impeller
3.03	Impeller, (Casting)		(i) Visual and Dimensional Examination	100%	SOTR, Approved	Approved	IR	R	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(ii) Surface Defects MPT *or* DPT	100%	Drawing ASTME 165/ IS 11723/ ISO 1940/ NES 729	drawing and relevant standard	NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
			(iii) Static & Dynamic balancing	100%			IR	**CHP** for W	Static & Dynamic balancing to be checked with Shaft
3.04	Impeller Nut		(i) Visual and Dimensional Examination (ii) Surface Defects MPT or DPT	100%	SOTR, Approved Drawing ASTME 165/ IS 11723/ NES 729 SOTR, Approved Drawing ASTME 165/ IS 11723/ NES 729	SOTR, Approved Drawing	IR	R	
3.05	Impeller Key, Coupling Key								
3.06	Companion Flange – suction						NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician
3.07	Companion Flange – Delivery								
3.08	Stuffing Box/Casing Cover		(i) Visual and Dimensional Examination	100%		Approved Drawing	IR	R	
			(ii) Surface Defects MPT *or* DPT	100%		Approved drawing and relevant standard	NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
			(iii) Hydraulic Pressure Test	100%	SOTR, Approved Drawing	No leakage	IR	**CHP** for W	Hydraulic pressure test to be checked @ 1.5 times of working pressure for not less than 30 minutes

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
									as per DME 402 unless otherwise specified in the SOTR/Drg/TNC Minutes
3.09	Bearing housing/Cover-Lower & Upper		Visual and Dimensional Examination	100%	SOTR, Approved Drawing FG 260/ NES 729/ ASTM165	Approved Drawing	IR	R	.
			Surface Defects MPT *or* DPT			Approved drawing and relevant standard	NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician
3.10	Gland Plate, Cover Plate, Seal Housing		Visual and Dimensional Examination	100%	SOTR, Approved Drawing/ NES 729/ ASTM165	Approved Drawing	IR	R	
3.11	Wearing Plate/Wearing Ring		(i) Visual and Dimensional Examination	100%		Approved Drawing	IR	R	
			(ii) Surface Defects MPT *or* DPT	100%		Approved drawing and relevant standard	NDE Report	**CHP** for W	Testing to be done by ISNT/ ASNT level II or III qualified technician.

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.00	**SECTION III : PRE-REQUISITE- FINAL INSPECTION**								
	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	
4.02	Overall Dimensional Inspection				Approved Drawings/ Mfg Drawing	Approved Drawings/ Mfg Drawing	IR	R	
4.03	Over Speed test (20% above specified speed)				PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	IR	**CHP** for W	Not applicable for Motor driven pumps
4.04	Start /Stop test						IR	W	
4.05	Cooling Test						IR	W	
4.06	Un interrupted Endurance Test (100 Hrs) Performance test with integral Motor and control panel		Flow(Q) v/s Head(H)		PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	IR	**CHP** for W	Uninterrupted endurance test Readings to be recorded every 02 hrs. Motor related tests may be checked at motor manufacturers' site
			Flow(Q) v/s Efficiency(Effn)						
			Flow(Q) v/s Power(P)						
			Motor Temperature						
			Bearing Temperature						
			Winding Resistance (Cold & Hot)						
			Insulation Resistance						
			Vibration Level						

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			Air Borne Noise Indication/ Alarm/Shut Down test						
4.07	Strip Open Test		Wearing Parts	One Unit	PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes / Approved Drawing, DME Spcn 402	IR	W	
4.08	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 Level Vibration test	One Unit			IR	W	
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	
4.10	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	**CHP** for R	Test to be carried out by NABL approved Lab /Agencies. In case of non -availability of NABL accredited lab, third party / Agency selected for conducting ABN & SBN tests needs to be approved by NHQ
4.11	Air born Noise test (ABN)		Air Borne Noise	One Unit	SOTR /TNC Minutes /BS 3744 & MIL-STD-740-1/Mil Std 1474D	SOTR /TNC Minutes /Approved drawing/relevant standard	LTC	**CHP** for R	
4.12	Tilt test		Head(H) v/s Flow (Q) v/s Power(P)	One Unit	SOTR /TNC Minutes/ App. Test Procedure	SOTR /TNC Minutes/ App. Test Procedure	IR	**CHP** for W	Tilt test to be carried out as per SOTR/ PO/ TNC Minutes. If SOTR does not specifies any

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
									thing then DME 402 will be followed
5.00	**MISCELLANEOUS REQUIREMENTS**								
5.01	Submission of Draft Documents	No of sets	Verification of submission	100%	PO/ SOTR / TNC Minutes /DME 402	PO/ SOTR / TNC Minutes /DME 402	Documentation	**R**	
5.02	SOTR/TNC Compliance		Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	**R**	
5.03	Internal FAT/Final Inspection		Availability & Verification	100%	SOTR/TNC Minutes/Approved drawing	SOTR/TNC Minutes/Approved drawing	Internal FAT/final inspection report	**R**	Internal FAT/ Inspection Report to be submitted along with inspection call
6.00	**SECTION IV : 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- 8 hours/set		Flow(Q) v/s Head(H) Flow(Q) v/s Efficiency(Effn) Flow(Q) v/s Power(P)	100%	PO, SOTR , TNC Minutes/ Approved Drawing,	PO, SOTR , TNC	IR	**CHP** for	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			Motor temperature Bearing Temperature Start Stop test; Noise & Vibration Leak check test(Joint leakage, seal leakage)		DME Spec 402 /Mil std 740-2/BS 3744 & MIL STD-740-1/ Mil Std 1474D/ IS 9137	Minutes/ Approved Drawing, DME Spec 402		W	
6.03	Strip Open test		Wearing Parts	One per lot of seven			IR	W	To be selected at random, one per lot of 07 and in multiples thereafter. QAO reserves the right to inspect/ accept/reject all pumps based on condition
6.04	Post-Trial test For 1 hour		Suction head, Discharge Head, Output, RPM Noise and Vibration test						
6.05	Dimensional Inspection		Overall Dimensional check	100%	Approved Drawings/ Mfg Drawing and SOTR	Approved Drawings SOTR	IR	W	
6.06	Weight		Weight recording	100%	Approved Drawings/ Mfg Drawing and SOTR/ NES 723	Approved Drawings SOTR	Weight certificate	W	
6.07	Tally Plate		Visual check	100%			IR	R	
6.08	Lifting arrangement		Visual check	100%			IR	R	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
7.00	**SECTION V : PRE REQUISITE ISSUE OF FORM -4**								
7.01	OBS Items as per Purchase Order		(i) Product identification	100%	PO,SOTR, Approved Drawings/ PIL / OEM Specification	PO & Approved Drawings/PIL	IR	W	
			(ii) VI/DI				OEM TC, CC , IR	R	
7.02	Submission of As Built Drawings		Verification	100%	Approved Drawings, Concessions & Deviations	Approved drawings & Concurrence from drawing approval authority	As built drawings	**CHP** for W	
7.03	Submission of approved documents for stamping	sets	Verification and stamping	100%	PO,SOTR, Approved Drawings	PO,SOTR, Approved Drawings	Docume ntation	**CHP** for W	
7.04	Liquidation of observation during Final inspection/FATs, if any		Defect rectification	100%	Approved Drawing, SOTR & FAT report	Approved Drawing, SOTR , FAT report & necessary approval	IR	**CHP** for W	

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
7.05	Painting		Visual Inspection & DFT	100%	Approved Drawing, SOTR, Paint Plan/DGS 251	Approved Drawing/ SOTR/ PO	IR	W	
7.06	Preservation & Packing		Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	
7.07	Submission of Form -4 (I&T Certificate)		Correctness	100%	SOTR,PO	SOTR,PO	Form-4	P	

Important Notes:-

(a) Specific conditions and requirements shall be applicable as given in the Preface at page 8 to 10.
(b) Each type of Equipment & accessories to be supplied shall conform to specification acceptable to the TYPE APPROVAL authority.
(c) Motor, SV Mounts & Control Panel to be procured only from Naval approved vendors against separate SQAP.
(d) The Components for Submersible and Canned Motor Pumps /COTS/ 'Bought out' items in the SQAP are indicative only. The firm is required to categorically define the Components for submersible and canned motor pumps/'Bought out'/COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the SQAP 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.

STANDARD QUALITY ASSURANCE PLAN FOR CENTRIFUGAL PUMP

Srl No	**Material /components/ As per SOTR/QA Activity**	**QTY As Per PO**	**Characteristic/ Type Of Check**	**Quantum of Check**	**Reference Documents**	**Acceptance Criteria**	**Format of Record**	**Action by QAE**	**Remarks**

(e) The SQAP does not apply to items not in the scope of supply of the firm.
(f) The column 'Quantity as per P.O' has been left blank which has to be filled by the firm as per P.O while submitting Draft QAP for approval.
(g) 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
(h) Assy more than 40 Kgs weight should be provided with lifting arrangement.
(i) Internal FAT/ Inspection Report to be submitted along with inspection call
(j) Test bed set, internal performance test and compliance SOTR/TNC to be submitted before FATs
(k) Pump for type testing is to be selected by the Naval Inspector from a batch of pumps that have been manufactured in the normal course of production. On completion of testing the equipment manufacturer is to prepare four copies of the test result in accordance with Para 0836 of DME 402.
(l) Stock items inspected by TPI to be offered to QAE for inspection as per approved SQAP

Appx 'B'

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.00	**DRAWING/ DOCUMENTS/ TYPE TEST**								
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	**CHP** For R	Binding Drawing & Binding Data, duly approved by Design authority, Professional & Inspection Authority (or by Command for MO orders) to be verified.
1.02	Type test / ETT/ EMI/EMC reports and Approved drawings		Availability & verification	100%	PO & SOTR/ TNC Minutes/ JSS 55555/ and approved drawings used during type test for similar pump	PO & SOTR / TNC Minutes JSS 55555	Type test /ETT/EMI /EMC reports	**CHP** For R	If not type tested, Equipment to be Type Tested as per Sl. 4.0.0 If type tested all type test reports along with approved drawings used during type test to be submitted to QAO.
2.00	**SECTION I : RAW MATERIAL INSPECTION**								
2.01 (a)	Pump Casing (Casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards/ IS:2062/ Fe 410 W IS 1570/NES 348 ASTM E272 level 2 (for RT), ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification &Stamping	100%			IR	W	
			(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

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iv) Physical Mechanical & Chemical properties	1sample per heat / lot			LTC	R	Test to be done at NABL Lab
			(v) RT (Applicable as per Drg/spcn)	Critical Regions			NDE Report *and film*	**CHP** for R	Approved Shooting sketches to be provided. Testing to be done by approved ASNT/ISNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.01 (b)	Pump casing (Sheet plate fabrication)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/IS 2062/IS 1570/ NES 348	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1 Sample /lot/heat			LTC	R	Test to be done at NABL Lab
2.02	Insert/Liner (casting)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards/ BS 1400 LB2/ LG4C/ IS		IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material Identification & Stamping	100%			IR	W	

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) Heat Treatment	100%	318/ NES 747/ DGS 8520 IS:2062/ /ASTM E272 level 2 (for RT), ASTM A 609 (for UT)		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 /per lot			LTC	R	Test to be done at NABL Lab
			(v) RT (Applicable as per Drg/spcn)	Critical Regions			NDE Report and film	**CHP** for R	Approved Shooting sketches to be provided. Testing to be done by approved ASNT/ISNT level II or III qualified technician RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.03	Stator (for single screw pump)(outer pipe)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/IS 2062/IS 1570/	SOTR, Approved Drawings and relevant	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample/ heat / lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) UT	100%	ASTM A 106 / ASTM A 609 (for UT)	Standards	NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.04	Rotor (for single screw pump)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards ASTM A 276/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample heat / lot			LTC	R	Test to be done at NABL Lab
			(iii) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.05	Drive Shaft		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards AST A 276/IS 1570/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
			(iii) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.06	Coupling Rod (for single screw pump)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards AST A 276/IS 1570/	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) UT	100%	ASTM A 609 (for UT)		NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.06	Screw Shaft (Power Screw)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ ASTM A 276/ EN 41 B (Nitrided)/ EN 41R(Nitrided)/ Alloy steel 40 Cr 7Al 10 Mo 2 IS1570/ 16 Mn Cr 5 ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical Chemical & properties	1sample/ heat / lot			LTC	R	Test to be done at NABL Lab
			(iii) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician.
2.07	Screw Shaft (Idler Screw)		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards EN 41 R (Nitrided)/	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample /heat / lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iii) UT	100%	EN 41 B (Nitrided)/ Alloy steel 40 Cr 7All0mO2 /IS 1570/16 Mn Cr 5/ ASTM A 609 (for UT)		NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.08	PS balancing Bush		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards BS 1400/ LTB 5 IS 318 DGS 8520/ Ni Al Br DGS348/	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample /heat / lot			LTC	R	Test to be done at NABL Lab
2.09	IS Balancing Bush		(i) Material Identification & Stamping	100%			IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.10	Seal Housing		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards FE 410 W IS 1570/ IS228/	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample /heat / lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.11	Coupling Pump Half		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards FE 410 W IS 1570/ IS228	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample / heat / lot			LTC	R	Test to be done at NABL Lab
2.12	Coupling Motor Half		(i) Material Identification & Stamping	100%			IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample heat / lot			LTC	R	Test to be done at NABL Lab
2.13	Suction flange		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards ANSI B/ASTM A 105/ Al alloy LM6 BS 1490	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample /heat / lot			LTC	R	Test to be done at NABL Lab
2.14	Discharge Flange		(i) Material Identification & Stamping	100%			IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.15	Bearing Housing		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant	SOTR, Approved Drawings and relevant	IR	W	
			(ii) Physical	1sample			LTC	R	Test to be done at

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			Mechanical & Chemical properties	/heat / lot	Standards EN 8/ Al alloy LM6 BS 1490	Standards			NABL Lab
2.16	Cover		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards ASTM A 105/ IS 2062 Gr A	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample / heat /lot			LTC	R	Test to be done at NABL Lab
2.17	Gear Box		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards ASTM A 105/ IS 2062 Gr A/ ASTM A 106 Gr B	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample /heat /lot			LTC	R	Test to be done at NABL Lab
2.18	Relief Valve Assembly		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards IS 226/IS 1570/IS 7906/ IS 1367 ASTM A GR WC 8/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	W	Test to be done at NABL Lab (a) OEM TC or MTC to be provided if RV bought as complete assembly. (b) NABL TC of components to be provided if the RV manufactured in-house. (c) STC or CC for COTs components is applicable.
			(ii) Physical Mechanical & Chemical properties	1sample per heat /per lot			OEMTC/ LTC	R	

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.19	Motor stool/ Base Plate		(i) Material Identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards FE 410 W IS 2062/IS 1608	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical Mechanical & Chemical properties	1sample / heat / lot			LTC	R	Test to be done at NABL Lab
	BOUGHT OUT ITEMS								
2.20	SV Mounts		(i) Product identification	100%	SOTR, Approved Drawings and SQAP (SQAP No. DGQA/ DQA(WP)/ Shock and Vibration Mounts/08/ 2016/Rev 0 dt Mar 2016	SOTR, Approved Drawings and SQAP	IR	W	
			(ii) SQAP Compliance				IR as per SQAP	R	
			(iii) Dispatch clearance				I-note/ Form4 Dispatch certificate (as applicable)		
2.21	Motor		(i) Product identification	100%	EED-Q-071 (R4), SOTR, TNC Minutes, Approved Drawings and SQAP (SQAP No. DGQA/ DQA(WP) /Ac Motor/05/201 6/Rev 0 dated Mar 2016	EED-Q-071(R4), SOTR, Approved Drawings and SQAP	IR	W	Motor to be inspected at motor manufacturer's premises as per motor SQAP by main QAE/ sub -nominated QAE
			(ii) SQAP Compliance				IR as per SQAP	R	
			(iii) Dispatch clearance				I-note/ Form4 Dispatch certificate (as applicable)		

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.22	Starter Panel		(i) Product identification	100%	EED-Q-071 (R4), SOTR, TNC Minutes, Approved Drawings and SQAP(SQAP No. DGQA/ DQA(WP)/Ac Starter-Control Gear/06/2016 /Rev 0 dated Mar 2016 /TNC minutes	EED-Q-071(R4) SOTR, Approved Drawings and SQAP	IR	W	Starter to be inspected at starter manufacturer's premises as per SQAP for Starter Panel by main QAE/ sub - nominated QAE. 100% ESS test to be carried out on PCB modules as per DQA(N) latest guidelines
			(ii) SQAP Compliance ESS test				IR as per SQAP	R	
			(iii) Dispatch clearance				I-note/ Form4 Dispatch certificate (as applicable		
2.23	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			LTC/MTC	R	Test to be done at NABL Lab
2.24	Diffuser, strainer		(i) Product identification	100%	SOTR/ Approved drawings/ Supplier's catalogue	SOTR/ Approved drawings/ Supplier's catalogue	STC or OEM TC/ MTC	W	
			(ii) Visual & Dimensional Check				IR	R	
2.25	Flexible Hoses		(i) Product identification	100%	SOTR/ Approved drawings/	SOTR/ Approved drawings/	STC or OEM TC/MTC	W	

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(ii) Visual & Dimensional Check		Supplier's catalogue/ SAE 100 R1/ Hydraulic pressure test @ 1.5 x working pressure	Supplier's catalogue	IR	R	
	COTS ITEMS								
2.26	Bearings		(i) Product identification (ii) Visual & Dimensional Check	100%	Approved drawing/SOTR /Catalogue/ OEM spec	Approved drawing/ SOTR/ Catalogue/ OEM spec	(i) STC *or* CC *or MTC* (ii) IR	W R	VI/DI acceptance based on approved drawing for assemblies/sub-assemblies and manufacturer drawing for components.
2.27	Mechanical seal								
2.28	Valves								
2.29	Bellows								
2.30	Compound gauges and Pressure gauges								
2.31	Gauge Piping								
2.32	O Rings and Gasket								
2.33	Hardware Items-fastener Studs, Nut, bolts, Screws, washers, Circlips, Rivet, Keys Sand Guard, Plug Assy, Name Plate, Sleeve, flange, Neck Ring, Sealing Ring								

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.00	**SECTION II : IN PROCESS INSPECTION**								
3.01	Pump Casing		(i) Visual and Dimensional Examination	100%	SOTR/ Approved Drawing ASTME 165/ ISO 1940/ ASTM E 125 IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	
			(ii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
			(iii) Hydraulic Pressure test (1.5 times of working pressure)	100%		No Leakage	IR	**CHP** for W	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
			(iv) DPT of weld joint (if manu-factured from sheet metal)	100%		Approved Drawings & Relevant Standard	NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.02	Insert		(i) Visual & Dimensional	100%	SOTR/ Approved Drawing ASTME 165/ ASTM E 125/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	
			(ii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.03	Motor stool/Base plate		(i) Visual & Dimensional	100%	SOTR/ Approved Drawing ASTME 165/ ASTM E 125/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	
			(ii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.04	Stator		(i) Visual & Dimensional	100%		Approved Drawings & Relevant Standard	IR	R	
			(ii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.05	Rotor		(i) Visual & Dimensional	100%	SOTR/ Approved Drawing ASTME 165/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	
			(ii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.06	Drive Shaft		(i) Visual & Dimensional	100%		Approved Drawings & Relevant Standard	IR	R	Dimensional check after case hardening
			(ii) Case Depth Hardness	100%			IR	**CHP** for R	Test to be done at NABL Lab
			(iii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.07	Idler Screw		(i) Visual & Dimensional	100%	SOTR/ Approved Drawings & Relevant Standard ASTME 165/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	Dimensional check after case hardening
			(ii) Case Depth Hardness	100%			IR	**CHP** for R	Test to be done at NABL Lab
			(iii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.08	Power Screw		(i) Visual & Dimensional	100%	SOTR/ Approved Drawings & Relevant Standard ASTME 165/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR	R	Dimensional check after case hardening
			(ii) Case Depth Hardness	100%			IR	**CHP** for R	Test to be done at NABL Lab
			(iii) Surface Defect, MPT *or* DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.09	Balancing Bush		(i) Visual & Dimensional (ii) Surface Defect, MPT *or* DPT	100%	SOTR/ Approved Drawings & Relevant Standard ASTME 165/ IS 11723/ NES 729	Approved Drawings & Relevant Standard	IR NDE Report	R **CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.10	Seal Housing								
3.11	Coupling Pump Half								
3.12	Coupling Motor Half								
3.13	Suction Flange								
3.14	Discharge Flange								
3.15	Liner/Insert								
3.16	Bearing Housing								
3.17	Cover								
3.18	Gear Box								

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.19	Relief Valve Assy		(i) Visual & Dimensional	100%	SOTR/ Approved Drawings & Relevant standard	Approved Drawings & Relevant standard	IR	R	
			(ii) Relief valve body Hydraulic pressure test/ Leak test (1.5 times of working pressure	100%				**CHP** for W	
			(iii) Set pressure test for relief valve assembly @ 1.1X operating pressure	100%					
3.20	Sub Assy consisting of Power Screw/Rotor Pump Half coupling, Pump Shaft Key, Shaft Sleeve, Coupling Bolt, Coupling washer		Balancing	100%	SOTR/ Approved Drawings & Relevant standard/ ISO 1940	Approved Drawings & Relevant standard	IR	**CHP** for W	
4.00	**SECTION III : PRE-REQUISITE- FINAL INSPECTION**								
	TYPE TESTING OF PUMP (To be carried out on one unit /prototype)								
4.01	Pump & Motor Assy		Free rotation of Pump & Motor		Rotate freely	Free Rotation	IR	W	
4.02	Overall Dimensional Inspection		Dimensional check		Approved Drawings/ Mfg Drawing	Approved Drawings/ Mfg Drawing	IR	R	

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
4.03	Over Speed test (20% above specified speed)			One Unit	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spcn 402	IR	**CHP** for W	Not applicable for Motor driven pumps
4.04	Start /Stop test								
4.05	Cooling Test								
4.06	Un interrupted Endurance Test (100 Hrs) Performance test with integral Motor and control panel		Flow(Q) v/s Head(H)				IR	**CHP** for W	Un interrupted endurance test. Readings to be recorded every 02 hrs. Motor related tests may be checked at motor manufacturers' site
			Flow(Q) v/s Efficiency(Effn)						
			Flow(Q) v/s Power(P)						
			Motor Temp						
			Bearing Temp						
			Winding Resistance (Cold & Hot)						
			Insulation Resistance						
			Vibration Level						
			Air Borne Noise						
			Indication/ Alarm/ Shut Down test						
4.07	Strip Open Test		Wearing Parts	One Unit	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	IR	W	
4.08	Post-Trial test For 1 hour		Flow(Q) v/s Head(H)				IR	W	
			Flow(Q) v/s Eff(n)						
			Flow(Q) v/s Power(P)						
			Noise Level						
			Vibration test						

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format 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	
4.10	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	**CHP** for R	Test to be carried out by NABL approved Lab /Agencies. In case of non -availability of NABL accredited lab, third party / Agency selected for conducting ABN & SBN tests needs to be approved by NHQ
4.11	Air borne Noise test (ABN)		Air Borne Noise	One Unit	SOTR /TNC Minutes /BS 3744 & MIL-STD-740-1/Mil Std 1474D	SOTR /TNC Minutes /BS 3744 & MIL-STD-740-1/ Mil Std 1474D	LTC	**CHP** for R	
4.12	Tilt test		Head(H) v/s Flow (Q) v/s Power(P)	One Unit	SOTR /TNC Minutes/ App. Test Procedure	SOTR /TNC Minutes/ App. Test Procedure	IR	**CHP** for W	Tilt test to be carried out as per SOTR/ PO/ TNC Minutes. If SOTR does not specifies any thing then DME 402 will be followed
5.00	**MISCELLENEOUS REQUIREMENT**								
5.01	Submission of Draft Documents	No of sets	Verification of submission	100%	PO/ SOTR / TNC Minutes /DME 402	PO/ SOTR / TNC Minutes /DME 402	Documen tation	**R**	
5.02	SOTR/TNC Compliance		Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Complian ce Matrix	**R**	
5.03	Internal FAT/Final Inspection		Availability & Verification	100%	SOTR/TNC Minutes/Appr oved drawing	SOTR/TNC Minutes/Appro ved drawing	Internal FAT/ final inspectio n report	**R**	Internal FAT/ Inspection Report to be submitted alongwith inspection call

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
6.00	**SECTION IV : 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- 8 hours/set		Flow(Q) v/s Head(H) Flow(Q) v/s Efficiency(Effn) Flow(Q) v/s Power(P) Motor temperature Bearing Temperature Noise & Vibration Leak check test(Joint leakage, seal leakage)	100%	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402 /Mil std 740-2/BS 3744 & MIL STD-740-1/ Mil Std 1474D/ IS 9137	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	IR	**CHP** for W	.
6.03	Strip Open test		Wearing Parts	100%	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	IR	W	To be selected at random, one per lot of 07 and in multiples thereafter. QAO reserves the right to inspect/accept/reject all pumps based on condition.
6.04	Post-Trial test For 1 hour		Suction head, Discharge Head, Output, RPM Noise and Vibration test	100%					

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
6.05	Dimensional Inspection		Overall dimensional Check	100%	Approved Drawings/ Mfg Drawing and SOTR	Approved Drawings SOTR	IR	W	
6.06	Weight		Weight recording	100%			Weight certificate	W	
6.07	Tally Plate Check		Visual Check	100%			IR	R	
6.08	Lifting arrangement		Visual Check	100%			IR	R	
7.0	**SECTION- V : PRE REQUISITE ISSUE OF FORM -4**								
7.01	OBS Items as per Purchase Order		(i) Product identification	100%	PO,SOTR, Approved Drawings/ PIL / OEM Specification	PO & Approved Drawings/PIL	IR	W	
			(ii) VI/DI				OEM TC, CC , IR	R	
7.02	Submission of as Built Drawings		Verification	100%	Approved Drawings, Concessions & Deviations	Approved drawings & Concurrence from drawing approval authority	As built drawings	**CHP** for R	
7.03	Submission of approved documents for stamping	sets	Verification and stamping	100%	PO,SOTR, Approved Drawings	PO,SOTR, Approved Drawings	Documen tation	**CHP** for R	
7.04	Liquidation of observation during Final Inspection/FATs, if any		Defect rectification	100%	Approved Drawing, SOTR & FAT report	Approved Drawing, SOTR & FAT report, necessary approvals	IR	**CHP** for R	

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	Material /components/ As per SOTR/QA Activity	QTY As Per PO	Characteristic/ Type Of Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
7.05	Painting		Visual Inspection & DFT	100%	Approved Drawing, SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W	
7.06	Preservation & Packing		Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	
7.07	Submission of Form -4 (I&T Certificate)		Correctness	100%	SOTR,PO	SOTR,PO	Form-4	P	

Important Notes:-

(a) Specific conditions and requirements shall be applicable as given in the Preface at page 8 to 10.
(b) Each type of Equipment & accessories to be supplied shall conform to specification acceptable to the TYPE APPROVAL authority.
(c) Motor, SV Mounts & Control Panel to be procured only from Naval approved vendors against separate SQAP.
(d) The Components for Submersible and Canned Motor Pumps /COTS/ 'Bought out' items in the SQAP are indicative only. The firm is required to categorically define the Components for submersible and canned motor pumps/'Bought out'/COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the SQAP 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.
(e) The SQAP does not apply to items not in the scope of supply of the firm.
(f) The column 'Quantity as per P.O' has been left blank which has to be filled by the firm as per P.O while submitting Draft QAP for approval.
(g) 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
(h) Assy more than 40 Kgs weight should be provided with lifting arrangement.

STANDARD QUALITY ASSURANCE PLAN FOR SCREW PUMP

Srl No	**Material /components/ As per SOTR/QA Activity**	**QTY As Per PO**	**Characteristic/ Type Of Check**	**Quantum of Check**	**Reference Documents**	**Acceptance Criteria**	**Format of Record**	**Action by QAE**	**Remarks**

(i) Internal FAT/ Inspection Report to be submitted along with inspection call

(j) Test bed set, internal performance test and compliance SOTR/TNC to be submitted before FATs

(k) Pump for type testing is to be selected by the Naval Inspector from a batch of pumps that have been manufactured in the normal course of production. On completion of testing the equipment manufacturer is to prepare four copies of the test result in accordance with Para 0836 of DME 402.

(l) Stock items inspected by TPI to be offered to QAE for inspection as per approved SQAP

Appx-'C'

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
1.00	**DRAWINGS/DOCUMENTS/TYPE TESTS**								
1.01	Drawings & Documents		GA drawings and detailed bill of material(DBOM)	100%	PO & SOTR/ TNC Minutes	PO & SOTR/ TNC Minutes	List of approved binding drawings	**CHP** for R	Binding & Binding Data, Duly approved By Design authority, Professional& Inspection. Authority(orby Command for MO orders)be verified
1.02	Type test / ETT / EMI/EMC reports and Approved drawings		Availability & verification	100%	PO & SOTR/ TNC Minutes /JSS 55555/ and Approved drawings used during type test for similar pump	PO & SOTR / TNC Minutes/ JSS 55555	Type test/ ETT/EMI/ EMC reports	**CHP** for R	If not type tested, Equipment to be Type Tested as per Sl. 4.0.0. If type tested, all type test reports along with approved drawing used during Type tests to be submitted to QAO.
2.00	**RAW MATERIAL INSPECTION**								
2.01	Pump Casing, (Upper & Lower)		(i) Pouring with integral test bar	100%	SOTR, Approved Drawings and relevant Standards BS 1400/ NES 747/ DGS 8520/ Ni Al Br DGS348/ Al alloy LM6 BS 1490/	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & Stamping	100%			IR	W	
			(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

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(iv) Physical, Mechanical & Chemical properties	1sample per heat /per lot	ASTM E272 level 2 (for RT)/ ASTM A 609 (for UT)		LTC	R	Test to be done at NABL Lab
			(v) RT (Applicable as per Drg/Spcn)	Critical regions			NDE Report and film	**CHP** for R	Approved Shooting sketches to be provided. Testing to be done by approved ASNT/ ISNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.02	Impeller (casting)		(i) Pouring with integral test bar for casting	100%	SOTR, Approved Drawings and relevant Standards/ DGS 8520/BS 1400/NES 747/ ASTM E272 level 2 (for RT)/ ASTM A 609 (for UT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & Stamping	100%			IR	W	
			(iii) Heat Treatment	100%			HT Report	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,Chemi - cal properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(v) RT (Applicable as per Drg/Spcn)	Critical regions			NDE Report and film	**CHP** for R	Approved Shooting sketches to be provided Testing to be done by approved ASNT/ISNT level II or III qualified technician. RT reports & films to be submitted to QAO
			(vi) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician
2.03	Lower Bearing Bracket/ &Upper Bearing Bracket / Bearing housing		(i) Pouring with integral test bar for casting	100%	SOTR, Approved Drawings and relevant Standards/ DGS 203A/ BS1400/ FG 260/ ASTM E272 level 2 (for RT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & Stamping	100%			IR	W	
			(iii) Heat Treatment	100%			HT report	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 /per lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			(v) RT (Applicable as per Drg/Spcn)	Critical regions			NDE Report and film	**CHP** for R	Approved Shooting sketches to be provided Testing to be done by approved ASNT/ISNT level II or III qualified technician. RT reports & films to be submitted to QAO
2.04	Companion Flanges Suction & Delivery (for Canned Pumps)		(i) Pouring with integral test bar for casting	100%	SOTR, Approved Drawings and relevant Standards/ DGS 203A/ BS1400/ FG 260/ ASTM E272 level 2 (for RT)	SOTR, Approved Drawings and relevant Standards	IR	R	If casting is without integral test bar, pouring to be witnessed by QAO
			(ii) Material identification & Stamping	100%			IR	W	
			(iii) Heat Treatment	100%			HT report	R	HT is not mandatory if not given in material specification and if firm is able to achieve desired physical and mechanical properties
			(v) RT (Applicable as per Drg/Spcn)	Critical regions			NDE Report and film	**CHP** for R	Approved Shooting sketches to be provided Testing to be done by approved ASNT/ISNT level II or III qualified technician. RT reports & films to be submitted to QAO

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.05	Wear Ring/Wear Plate		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ NES 747/ ASTM 276/BS 1400.	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.06	Bearing Cover/ End cover		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.07	Rotor Shaft		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ ASTM A 609 (for UT	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
			Micro/Macro examination	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
			(iii) UT	100%			NDE Report	**CHP** For W	Testing to be done by ISNT/ ASNT level II or III qualified technician

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.08	Zinc Anode		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ BS EN 1179	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.09	Die cast Rotor/ Rotor can		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ EC Gr Al/ Silicon Gr 47 Hastelloy C-276		IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC/STC	R	Test to be done at NABL Lab. If NABL tests not possible, can be accepted on STC, with the warranty of OEM
2.10	Cable Gland		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC/CC	R	Test to be done at NABL Lab
2.11	Discharge outlet		(i) Material identification & Stamping	100%			IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC/CC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.12	Stator		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ Cu class 200	SOTR, Approved Drawings and relevant Standards	IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab (not applicable if firm is using stator laminated pack)
2.13	Stator Casing/ Stator can		(i) Material identification & Stamping	100%	SOTR, Approved Drawings and relevant Standards/ Silicon Gr47/ Hastelloy C 276		IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.14	Stator laminated pack/ Wound stator		(i) Material identification & Stamping	100%			IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC/STC	R	Test to be done at NABL Lab. If NABL tests not possible, can be accepted on STC, with the warranty of OEM
2.15	Holding Plate for Mechanical seal/ Rotor end Plate		(i) Material identification & Stamping	100%			IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.16	Supporting pipes for Can (for Canned Pumps)		(i) Material identification & Stamping	100%			LTC	R	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
2.17	Motor frame/ Stool		(i) Material identification & Stamping	100%			IR	W	
			(ii) Physical, Mechanical, Chemical properties	1sample per heat /per lot			LTC	R	Test to be done at NABL Lab
	BOUGHT OUT ITEMS								
2.18	Starter/Control Panel		(i) Product identification	100%	EED-Q-071(R4), SOTR, Approved Drawings and SQAP No. DGQA/ DQA(WP)/AC Starter-Control gear/ 06/2016/Rev 0 dated Mar 2016 /TNC minutes	EED-Q-071(R4), SOTR, Approved Drawings and SQAP	IR	W	Starter to be inspected at starter manufacturer's premises as per SQAP for Starter Panel by main QAE/ sub -nominated QAE. 100% ESS test to be carried out on PCB modules as per DQA(N) latest guideline
			(ii) SQAP Compliance				IR as per SQAP	R	
			(iii) Dispatch clearance				I-Note/ Form4 Dispatch certificate (as applicable)	R	

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.19	Diffuser, strainer		(i) Product identification	100%	SOTR/ Approved Drawing/ Supplier's catalogue	SOTR/ Approved Drawing/ Supplier's catalogue	STC/OEM TC/MTC	W	
			(ii) Visual & Dimensional Check				IR	R	
2.20	Cable		(i) Product identification	100%	SOTR, Supplier's catalogue	SOTR, Supplier's catalogue	STC / OEMTC	W	
			(ii) Electrical & Mechanical Properties					R	
			(iii) Visual & Dimensional Check				IR	R	
2.21	Copper Wire		Electrical & Mechanical Properties	100%			STC / OEMTC	R	
2.22	Terminal Box		Physical, Mechanical, Chemical properties	1sample per heat /per lot	SOTR, Supplier's catalogue	SOTR, Supplier's catalogue	LTC/STC	R	NABL Lab test report
2.23	Terminal Box Cover								
2.24	Shaft sleeve								
2.25	Thrust collar								
2.26	Fitter- Bearing housing								
2.27	Filter Casing								
	COTS ITEMS								
2.28	Bearings/Bush Bearings		(i) Product identification	100%	Approved drawing/ SOTR/	Approved drawing/ SOTR/	(i) STC or CC or MTC	W	
2.29	Mechanical Seal								
2.30	Valves								
2.31	Compound gauges/ Pressure Gauges								

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
2.32	Gauge Piping		(ii) Visual & Dimensional examination		Catalogue/ OEM Spec	Catalogue/ OEM Spec	(ii) IR	R	
2.33	'O' Rings & Gaskets								
2.34	Oil Seals								
2.35	Handle/Lifting Hook								
2.36	Cable grommet								
2.37	Spacer for Glands								
2.38	Pipe Connecting Ferrules								
2.39	Inst Coupling								
2.40	Hardware Items- fasteners, Studs, Nut, bolts, Screws, washers, lock washer, lock screw, grub screw Circlips, Rivet, Keys, Sand Guard, Plug Assy, Name Plate, Sleeve, flange, Neck Ring, Sealing Ring, Cap Chain, Cable Clamps, Cable Grip		(i) Product identification (ii) Visual & Dimensional examination	100%	Approved drawing/ SOTR/ Catalogue/ OEM Spec	Approved drawing/ SOTR/ Catalogue/ OEM Spec	(i) STC or CC or MTC (ii) IR	W R	
2.41	Oil		Test Certificate	100%	Catalogue/ OEM Spec	Catalogue/ OEM Spec	CC	R	
3.00	**SECTION II - IN PROCESS INSPECTION**								
3.01	Pump Casing, (Upper & Lower)		(i) Visual & Dimensional Examination	100%	SOTR/ Approved drawing	Approved drawing & Relevant	IR	R	
			(ii) Surface defect MPT or DPT				NDE Report	**CHP** for	Testing to be done by approved ASNT/ISNT

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
					ASTME 165/ ISO 1940/ IS 11723/ NES 729	standard		W	level II or III qualified technician
			(iii) Hydraulic Pressure test (1.5 times of the working pressure)			No Leakage	IR	**CHP** for W	
3.02	Impeller		(i) Visual & Dimensional Examination	100%	SOTR/ Approved drawing/ ASTME 165/ ISO 1940/ IS 11723/ NES 729	Approved drawing & Relevant standard	IR	R	
			(ii) Surface defect MPTor DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
			(iii) Static & Dynamic Balancing				IR	**CHP** for W	May be checked with companion parts
3.03	Lower Bearing Bracket/ Bearing housing Upper Bearing Bracket/ Bearing housing		(i) Visual & Dimensional Examination	100%		Approved drawing & Relevant standard	IR	R	
			(ii) Surface defect MPT or DPT	100%			NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.04	Companion Flanges Suction & Delivery		(i) Visual & Dimensional Examination (ii) Surface defect MPT or DPT	100%		Approved drawing & Relevant standard	IR	R	
3.05	Seal Housing						NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.06	Wear Ring/Wear Plate		(i) Visual & Dimensional Examination	100%		Approved drawing Approved drawing & Relevant standard	IR	R	
			(ii) Surface defect MPT or DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.07	Bearing Cover		(i) Visual & Dimensional Examination	100%	SOTR/ Approved drawing/ ASTME 165/ ISO 1940/ IS 11723/ NES 729	Approved drawing & Relevant standard	IR	R	
			(ii) Surface defect MPT or DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
3.08	Rotor Shaft		(i) Visual & Dimensional Examination	100%			IR	R	
			(ii) Surface roughness				LTC	R	Test to be done at NABL Lab
			(iii) Surface defect MPT or DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician
			(v) Static and Dynamic Balancing				IR	**CHP** for W	May be checked with companion parts (rotor and keys)
			(vi) Hardness				LTC	R	Test to be done at NABL Lab

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.09	Zinc Anode		Visual & Dimensional Examination	100%	SOTR/ Approved drawing	Approved drawing & Relevant standard	IR	R	
3.10	Cable Gland		Visual & Dimensional Examination				IR	R	
3.11	Discharge outlet		Visual & Dimensional Examination				IR	R	
3.12	Stator Laminated Pack		Visual & Dimensional examination				IR	R	
3.13	Die Cast Rotor/ Rotor Can		(i) Visual & Dimensional examination	100%	SOTR/ Approved drawing	Approved drawing & Relevant standard	IR	R	
			(ii) Surface defect MPT or DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician(not applicable if Rotor as a complete Unit is used as per para 3.15)
3.14	Stator Casing/Stator Can		(i) Visual & Dimensional Examination	100%	SOTR/ Approved drawing	Approved drawing &	IR	R	
			(ii) Surface defect MPT*or* DPT				NDE Report	**CHP** for W	Testing to be done by approved ASNT/ISNT level II or III qualified technician

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
3.15	Supporting Pipes for Can		(i) Hydrostatic Pressure Test @1.5 times of working pressure	100%	SOTR/ Approved drawing	No Leakage	IR	**CHP** for W	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
3.16	Casing (Assembled Pump)		(ii) Pneumatic pressure test						
3.17	Rotor Complete		(i) Visual & Dimensional Examination	100%		Approved drawing & Relevant standard	OEMTC /MTC/IR	**CHP** for W	Assembly of shaft & DC Rotor
			(ii) Run Out						
			(iii) Dynamic Residual unbalancing / Dynamic Balancing						
			(iv) Calculation of air gap						
3.18	Stator Complete/Wound Stator		(i) Shaping	100%	SOTR/ Approved drawing& Relevant standard	Approved drawing & Relevant standard	OEMTC /MTC/IR	**CHP** for W	
			(ii) Insulation resistance						
			(iii) Line resistance						
			(iv) HV Test						
			(v) Surge test						
			(vi)Varnish coating						
			(vii)Epoxy coating						
3.19	Integral Motor		(i) All applicable tests as per EED-Q-071 R4 (ii) IR before &		SOTR/ Approved drawing/ SQAP for	SOTR/ Approved drawing/ SQAP for	IR	**CHP** for R	Complete Motor to be inspected as per SQAP for Motor by main QAE/ sub -nominated QAE

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			after HV test		Motor/EED Q-071 R4	Motor/EED Q-071 R4			
4.00	**SECTION III : PRE-REQUISITE- FINAL INSPECTION**								
	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	
4.02	Overall Dimensional Inspection				Approved Drawings/ Mfg Drawing	Approved Drawings/ Mfg Drawing	IR	R	
4.03	Start /Stop test				PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	IR	**CHP** for W	
4.04	Cooling Test						IR		
4.05	Locked rotor test						IR		For canned motor pump
4.06	Hydrostatic test and External Pneumatic pressure test						IR		
4.07	Uninterrupted Endurance Test (100 Hrs) Performance test with integral Motor and control panel		Flow(Q) v/s Head(H) Flow(Q) v/s Efficiency(Effn) Flow(Q) v/s Power(P) Heat run/ Temp rise Bearing Temp	One Unit	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	IR	**CHP** for W	Uninterrupted endurance test Readings to be recorded by every 02 hrs.

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			Winding Resistance (Cold & Hot)						
			Insulation Resistance						
			High Voltage Test						
			Indication Alarm/ Shut Down test						
4.08			Calculation for Motor efficiency, torque, power factor & slip at different loads				IR	**CHP** for W	For canned motor pump
4.09			Tilt test						
4.10	Strip Open Test		Wearing Parts	One Unit	PO, SOTR , TNC Minutes / Approved Drawing, DME Spec 402	PO, SOTR , TNC Minutes/ Approved Drawing, DME Spec 402	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)						
4.12	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	

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
5.00	**MISCELLENEOUS REQUIREMENTS**								
5.01	Submission of Draft Documents	No of sets	Verification of submission	100%	PO/ SOTR / TNC Minutes /DME 402	PO/ SOTR / TNC Minutes /DME 402	Documentation	**R**	
5.02	SOTR/TNC Compliance		Compliance	100%	SOTR/TNC Minutes	SOTR/TNC Minutes	Compliance Matrix	**R**	
5.03	Internal FAT/Final Inspection		Availability & Verification	100%	SOTR/TNC Minutes/ Approved drawing	SOTR/TNC Minutes/ Approved drawing	Internal FAT/final inspection report	**R**	Internal FAT/ Inspection Report to be submitted alongwith inspection call
6.00	**SECTION IV : FINAL INSPECTION**								
6.01	Pump & Motor Assy		Free rotation of Pump & Motor	100%	Rotate freely	Free Rotation	IR	W	
			Hydrostatic test and External Pneumatic pressure test						For canned motor pump
6.02	Performance test with Integral motor and Control Panel Duration- 8 hours/set		Flow(Q) v/s Head(H) Flow(Q) v/s Efficiency(Effn) Flow(Q) v/s Power(P) Heat run Temperature rise Bearing Temperature	100%	PO, SOTR , Approved Drawing & DME Spec 402	PO, SOTR, Approved drg and DME Spec 402	IR	**CHP** for W	

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
			High Voltage Test						
			Calculation for Motor efficiency, torque, power factor & slip at different loads				IR	**CHP** for W	For canned motor pump
6.03	Strip Open test		Wearing Parts	100%			IR	W	To be selected at random, one per lot of 07 and in multiples thereafter. QAO reserves the right to inspect/accept/reject all pumps based on
6.04	Post-Trial test For 1 hour		Suction head, Discharge Head, Output, RPM	100%					
6.05	Dimensional Inspection		Overall Dimensional Check	100%	Approved Drawings/ SOTR	Approved Drawings/ SOTR	IR	W	
6.06	Weight		Weight recording	100%			Weight certificate	W	
6.07	Tally Plate Check		Visual Check	100%			IR	R	
6.08	Lifting arrangement		Visual Check	100%			IR	R	
7 .0	**SECTION V : PRE REQUISITE ISSUE OF FORM -4**								
7.01	OBS Items as per Purchase Order		(i) Product identification	100%	PO,SOTR, Approved Drawings/ PIL / OEM Specification	PO & Approved Drawings/PIL	IR	W	
			(ii) VI/DI				OEM TC, CC , IR	R	
7.02	Submission of as Built Drawings		Verification	100%	Approved Drawings, Concessions & Deviations	Approved drawings & Concurrence from drawing	As built drawings	**CHP** for R	

STANDARD QUALITY ASSURANCE PLAN FOR SUBMERSIBLE/CANNED PUMPS

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks
						approval authority			
7.03	Submission of approved documents for stamping	sets	Verification and stamping	100%	PO,SOTR, Approved Drawings	PO,SOTR, Approved Drawings	Documentation	**CHP** for R	
7.04	Liquidation of observation during Final inspection/ FATs, if any		Defect rectification	100%	Approved Drawing, SOTR & FAT document	Approved Drawing, SOTR & FAT document	IR	**CHP** for R	
7.05	Painting		Visual Inspection & DFT	100%	Approved Drawing, SOTR, Paint Plan	Approved Drawing/ SOTR/ PO	IR	W	
7.06	Preservation & Packing		Visual Inspection	100%	Approved Drawing, SOTR, OEM Preservation Plan	Approved Drawing, Approved Preservation Plan	IR	W	
7.07	Submission of Form -4 (I&T Certificate)		Correctness	100%	SOTR,PO	SOTR,PO	Form-4	P	

Important Notes:-

(a) Specific conditions and requirements shall be applicable as given in the Preface at page 8 to 10.
(b) Each type of Equipment & accessories to be supplied shall conform to specification acceptable to the TYPE APPROVAL authority.
(c) Motor, SV Mounts & Control Panel to be procured only from Naval approved vendors against separate SQAP.
(d) The Components for Submersible and Canned Motor Pumps /COTS/ 'Bought out' items in the SQAP are indicative only. The firm is required to categorically define the Components for submersible and canned motor pumps/'Bought out'/COTS items specific to their products in the drawings. Items will be categorized as bought out or COTs in the SQAP on the basis of

Srl No	Material /components/ As per SOTR/QA Activity	Qty. as per P.O.	Characteristic/ Type Check	Quantum of Check	Reference Documents	Acceptance Criteria	Format of Record	Action by QAE	Remarks

approved drawings. Further, only finished products will be accepted as COTs and no raw material for manufacturing will be acceptable as a COTS item.

(e) The SQAP does not apply to items not in the scope of supply of the firm.

(f) The column 'Quantity as per P.O' has been left blank which has to be filled by the firm as per P.O while submitting Draft QAP for approval.

(g) 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

(h) Assy more than 40 Kgs weight should be provided with lifting arrangement.

(i) Internal FAT/ Inspection Report to be submitted along with inspection call

(j) Test bed set, internal performance test and compliance SOTR/TNC to be submitted before FATs

(k) Pump for type testing is to be selected by the Naval Inspector from a batch of pumps that have been manufactured in the normal course of production. On completion of testing the equipment manufacturer is to prepare four copies of the test result in accordance with Para 0836 of DME 402.

(l) Stock items inspected by TPI to be offered to QAE for inspection as per approved SQAP

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