



MINISTRY OF DEFENCE (DGQA)

STANDARD QUALITY ASSURANCE PLAN

‘A’ & ‘P’ BRACKETS


Standard Quality Assurance Plan covers the technical requirements for providing Quality Assurance cover to “A” & “P” Bracket.

**STANDARD QAP NO. DGQA/DQA (WP)/ ‘A’ & ‘P’ BRACKETS/17/2019/REV 0
07 MAR 2019**

Total Nos. of Pages: 15


ISSUING AUTHORITY

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

	MINISTRY OF DEFENCE / DGQA DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 011	'A' & 'P' BRACKET STANDARD QAP NO. DGQA/ DQA(WP)/ "A" & "P" BRACKET/17/ 2019/ REV-0	PAGE	01
			REV. NO.	0
			DATE	07 MAR 19

RECORD OF AMENDMENTS


<u>Sl. No.</u>	<u>Date of Amendment</u>	<u>Amendments</u>	<u>Authority</u>	<u>Remarks</u>

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	02
	DIRECTORATE OF QUALITY ASSURANCE (WP)	STANDARD QAP NO. DGQA/DQA(WP)/ "A" & "P" BRACKET/17/2019/ REV-0	REV. NO.	0
	NEW DELHI - 110 011		DATE	07 MAR 19

MINISTRY OF DEFENCE (DGQA)
STANDARD QUALITY ASSURANCE PLAN FOR
'A' & 'P' BRACKETS




STANDARD QAP NO.
DGQA/DQA(WP)/ 'A' & 'P' BRACKETS /17/2019/REV 0
MAR 2019


 (A GEORGE)
 REAR ADMIRAL
 ADGQA(WP)

Promulgated by:-


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

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	03
	DIRECTORATE OF QUALITY ASSURANCE (WP)	STANDARD QAP NO. DGQA/	REV. NO.	0
	NEW DELHI - 110 011	DQA(WP)/ "A" & "P" BRACKET/17/2019/ REV-0	DATE	07 MAR 19

CONDITIONS OF RELEASE


1. This Standard Quality Assurance Plan (SQAP) has been formulated for reference of the Order Placement Agencies, Inspection Authority, Inspection Agencies and the Industry. No alteration is to be made to this SQAP except by the issue of authorised amendment by DQA (WP).
2. It is to be applied, as required, for Quality Assurance during various stages of manufacture of 'A' and 'P' Brackets for *IN* Ships.
3. The website <http://www.dggadefence.gov.in> may also be referred for other QA requirements.
4. The SQAP has been prepared with reference to earlier approved QAPs, QA requirements specified in the latest SOTR of 'A' and 'P' Brackets and decisions made during the Collegiate Meeting held at DQA(WP) with OEM and representatives of the concerned Production Directorate of the *IN*. 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.
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. The specifications and standards laid out in the SQAP are indicative only. The specifications/ parameters and standards given in the Technical Specifications (TSP) / MoM of TNC/ Approved drawings will be final and binding.
7. 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 Standard QAP does not in itself confer immunity from legal obligations.
8. 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

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	04
	DIRECTORATE OF QUALITY ASSURANCE (WP)	STANDARD QAP NO. DGQA/	REV. NO.	0
	NEW DELHI - 110 011	DQA(WP)/ "A" & "P" BRACKET/17/2019/ REV-0	DATE	07 MAR 19

CONTENTS


Sl. No.	Description	Page
1.	Standards Invoked	05
2.	Specific Requirements	06
3.	Abbreviations	07
4.	Scope	08
5.	Item Description	09
6.	Part-I: General Information	10
7.	Part-II: Technical Inspection/Trials	10
APP 'A'	Standard QAP 'A' & 'P' Bracket	11-15

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	05
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 011	STANDARD QAP NO. DGQA/ DQA(WP)/ "A" & "P" BRACKET/17/ 2019/ REV-0	REV. NO.	0
			DATE	07 MAR 19

STANDARDS INVOKED


<u>S. No.</u>	<u>Specification No.</u>	<u>Description</u>
1	GOST 977-88	Material Standard
2	NES 729	NDT, Including Surface Inspection
3	NES 745 Part 2 Issue 1 as applicable to class I castings	Classification, Inspection requirements and acceptable standards
4	NES 736 Part 3	Samples for Mechanical (Destructive) Tests
4	ISO 6892-1:2016	Mechanical Test - Tensile Testing
5	EN ISO 148-1:2016	Mechanical Test - Impact Testing at 0 & -50 °C
6	EN ISO 6506-1:2014	Mechanical Test - Hardness Testing
7	NES 02-706 & 02-770	Welding
8	ASTM E 112-13	Macro Analysis
9	ASTM E 350-2	Spectrometric Chemical analysis

Note: The standards given are indicative only and specification given in TSP / MOM of TNC / approved drawings will be applicable

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	06
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 011	STANDARD QAP NO. DGQA/ DQA(WP)/ "A" & "P" BRACKET/17/ 2019/ REV-0	REV. NO.	0
			DATE	07 MAR 19


SPECIFIC REQUIREMENTS

1. All QA requirements including approval of Drawings and QAP is to be in conformance with the conditions stipulated in Quality Assurance Document **QAD-01** available at DGQA website <http://www.dgqadefence.gov.in> .
2. Testing of Chemical Composition and Mechanical / Physical properties is to be done by NABL accredited lab (including firm's NABL accredited lab).
3. If casting is being poured without integral test bar, then only pouring is to be witnessed by Inspector.
4. Radiography is to be carried out for critical regions marked in the approved drawing.
5. Non-Destructive Testing is to be carried out by ISNT/ ASNT Level II / III qualified technician.
6. The manufacturer has to determine the detailed Heat Treatment to produce casting to meet the requirements of specification. However, the recommended Heat Treatment will be as per Appendix-4 of GOST 977-88.
7. The Welding Procedure Specifications (WPS) and Procedure Qualification Record (PQR) for casting shall be submitted to QAE for review.

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	07
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 011	STANDARD QAP NO. DGQA/ DQA(WP)/ "A" & "P" BRACKET/17/ 2019/ REV-0	REV. NO.	0
			DATE	07 MAR 19


ABBREVIATIONS

VI	Visual Inspection
DI	Dimensional Inspection
LTC	Lab Test Certificate
STC	Supplier Test Certificate
CC	Conformance/Compliance Certificate
CHP	Customer Hold Point
IR	Inspection Report
HT	Heat Treatment
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
PQR	Procedure Qualification Record
WPS	Welding Procedure Specification
WPQ	Welder Performance Qualification
ASNT	American Society of Nondestructive Testing
ISNT	Indian Society of Nondestructive Testing

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	08
	DIRECTORATE OF QUALITY ASSURANCE (WP) NEW DELHI - 110 011	STANDARD QAP NO. DGQA/ DQA(WP)/ "A" & "P" BRACKET/17/ 2019/ REV-0	REV. NO.	0
			DATE	07 MAR 19

SCOPE

1. **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, In-process Stage and Final Stage.
2. The Standard Quality Assurance Plan contains comprehensive list of inspections and / or trials that is to be applicable for quality assurance of the 'A' & 'P' Brackets. 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
3. The following quality assurance activities will be carried out during the Quality Assurance of Equipment:
 - (a) Visual Inspection.
 - (b) Dimensional Inspection.
 - (c) Review of Lab Test Certificates / Supplier Test Certificates / Compliance Certificates/Import documents.
 - (d) Witness of in-house Lab Testing, if applicable.
 - (e) Witness of Non-destructive Testing viz. UT, DPT & MPT.
 - (f) Review of Heat Treatment Charts.
 - (g) Review of Draft documentation and witness / stamping of final documentation, as applicable.
 - (h) Issue of CHP clearance.
 - (j) Issue of Dispatch Clearance or Issue of Form-IV, as applicable.

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	09
	DIRECTORATE OF QUALITY ASSURANCE (WP)	STANDARD QAP NO. DGQA/	REV. NO.	0
	NEW DELHI - 110 011	DQA(WP)/ "A" & "P" BRACKET/17/2019/ REV-0	DATE	07 MAR 19

ITEM DESCRIPTION

'A' & 'P' Bracket.

'A' & 'P' Bracket castings are the major supporting member of ship's transmission system. The output from main drive i.e. engine / turbine is connected to propeller blades by propeller shaft. The propeller shaft passes through 'A' & 'P' Bracket.

'A' Brackets comprise of 03 major parts i.e. 02 Arms & 01 Barrel. In 02-piece 'A' Brackets, the Arms & Barrel made by metal casting process are joined by welding process. However, 'P' Bracket is casted in one piece only.


The material used for casting is Grade 08GDNFL with the following Physical & Chemical Properties as stated in GOST 977-88:

Chemical Composition:- The chemical composition is as below

Proportion by mass of element (%)							
C	S	P	Mn	Si	Ni	V	Cu
0.10 Max	0.035 Max	0.035 Max	0.60-1.00	0.16-0.40	1.15-1.55	0.10 Max	0.80-1.20

Physical Properties: The physical properties achieved by normalizing or normalizing plus tempering are as below (Not less than):

SI	Property	Value	Test Method
(a)	Yield Point	343 MPa	Tensile testing as per ISO 6892-1:2009
(b)	Ultimate Strength	441 MPa	
(c)	Elongation	18%	
(d)	Reduction of area	30%	
(e)	Impact strength KCU at -50°C	491 KJ/m ²	Impact test as per EN ISO 148-1:2016

	MINISTRY OF DEFENCE / DGQA	'A' & 'P' BRACKET	PAGE	10
	DIRECTORATE OF QUALITY ASSURANCE (WP)	STANDARD QAP NO. DGQA/	REV. NO.	0
	NEW DELHI - 110 011	DQA(WP)/ "A" & "P" BRACKET/17/2019/ REV-0	DATE	07 MAR 19

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)

Part - II:

Standard QAP of "A" & "P" Brackets	Appendix "A"
------------------------------------	--------------

STANDARD QUALITY ASSURANCE PLAN FOR 'A' & 'P' BRACKETS

SL. NO	MATERIAL/ COMPONENT/ DRG. NO/ QUALITY ACTIVITY	QTY. AS PER P.O.	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	ACTION BY QAE	REMARKS
1.0.0	<u>DRAWINGS/DOCUMENTS</u>								
1.1.0	Manufacturing Drawings		Check for the availability of approved drawings	100%	PO & SOTR/ TNC Minutes	All approved drawings along are available	List of approved drawings	CHP for R	
			Verification of manufacturing drawings for completeness and sufficiency of data to undertake production and process inspections.	100%		Manufacturing drawings bear complete data; The data is sufficient for production and stage inspections	List of approved drawings	CHP for R	
2.0.0	<u>PATTERNS</u>								
2.1.0	'A' & 'P' Brackets (Patterns)		VI & DI	100%	TSP, SOTR, TNC Minutes, Approved GA drgs., Manufacturing Drawings	Patterns meet the requirement of approved GA drawings and manufacturing drawings	JIR	W	Final approval for manufacture will be given by DQA(WP). Approval of Shipyard will be sought, if required as per PO.
3.0.0	<u>MATERIAL INSPECTION</u>								
3.1.0	'A' & 'P' Brackets (Class 1 Castings)		Material Identification	100%	TSP, SOTR, TNC Minutes, Approved GA drgs., Manufacturing Drawings	--	TC	R	
			Raw material / Ingot Spectrometry Chemical analysis + gas content Analysis	01 sample / heat		Chemical properties meet the laid down specifications	Liquid Metal report	CHP for R	
			Pouring with Integral Test Bars / Blocks / Test Coupons	One sample/ heat/casting		Conformance to specifications	IR	R	

SL. NO	MATERIAL/ COMPONENT/ DRG. NO/ QUALITY ACTIVITY	QTY. AS PER P.O.	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	ACTION BY QAE	REMARKS
			Cleaning of Casting	100%	TSP, SOTR, TNC Minutes, Approved GA drgs., Manufacturing Drawings	Casting should be free from moulding sand scale and burn etc.	IR	W	
			Heat Treatment	100%		The mode of heat treatment established by the manufacturer should confirm the required chemical composition and mechanical / physical properties	Time/Temp Chart	R	
			Integral Test Bar detachment/ Blocks / Test Coupons identification and stamping	100%		Test samples to be properly identified, stamped and sealed for sending to lab for testing.	IR	W	
			Chemical analysis	One sample/ heat/casting		Chemical composition meet laid down specifications	NABL LTC	CHP for R	
			Mechanical and Physical Properties including impact testing	One sample /heat / casting/HT batch		Mechanical properties meet the laid down specifications	NABL LTC	CHP for R	
			Micro Structure	One sample/ heat / casting/ HT batch		Micro structure should confirm to specification	NABL LTC	CHP for R	
			LPT & MPT	100%		Surface/ sub-surface defects within permissible limit	NDE Report	CHP for W	
			UT	100%		Sub-surface defects within permissible limit	NDE Report	CHP for W	

SL. NO	MATERIAL/ COMPONENT/ DRG. NO/ QUALITY ACTIVITY	QTY. AS PER P.O.	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	ACTION BY QAE	REMARKS
			Defect rectification (if any)	100%	TSP, SOTR, TNC Minutes, Approved GA drgs., Manufacturing Drawings	Surface/ sub-surface defects within permissible limit	IR	R	
			Soundness of repaired location	100%		All weld repairs to be subjected to heat treatment & re-inspection including NDT to confirm the quality of repair and compliance to specification	IR	W	
4.0.0	IN-PROCESS INSPECTION								
4.1.0	WPS & PQR		Suitability of WPS and PQR	100%	Approved Drawing & ASME Sec V and Sec IX	Welding procedure should qualify the specified tests	WPS, PQR & WPQ	R	
4.2.0	A' Bracket in Two Pieces		Edge preparation at arm joint	100%	TSP, SOTR, TNC Minutes, Approved GA / Manufacturing Drawings	Edge Preparation as per drawing/ specifications	IR	R	
			LPT (on prepared weld edges)	100%		Surface defects within permissible limit	NDE Report and video of edges	CHP for R	If videography not feasible, LPT to be witnessed
			RT (on prepared weld edges)	100%		Subsurface defects within permissible limit	RT Film / NDE Report	CHP for R	
4.3.0	A' Bracket (Post Welding)		Post Weld Heat Treatment	100%	TSP, SOTR, TNC Minutes, Approved GA / Manufacturing Drawings	Heat Treatment to meet the specified requirements	Time/Temp Chart	R	
			UT (on welded joint)	100%		Sub-surface defects within permissible limit	NDE Report	CHP for R	
			RT (on welded joint)	As applicable		Sub-surface defects within permissible limit	NDE Report	CHP for R	

SL. NO	MATERIAL/ COMPONENT/ DRG. NO/ QUALITY ACTIVITY	QTY. AS PER P.O.	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	ACTION BY QAE	REMARKS
4.4.0	'A' & 'P' Brackets		VI & DI	100%		Compliance to approved drawings	IR	R	
5.0.0	FINAL INSPECTION								
5.1.0	'A' & 'P' Brackets		VI & DI	100%	TSP, SOTR, TNC Minutes, Approved GA / Manufacturing Drawings	Compliance to approved drawings	IR	W	
			LPT & MPT (on machined surface)	100%		Surface/ sub-surface defects within permissible limit	NDE Report	CHP for W	
			UT	100%		Subsurface defects within permissible limit	NDE Report	CHP for W	
			RT (minimum 10% of total area including trailing edges as per approved Shooting Sketch)	100%		Subsurface defects within permissible limit	NDE Report & RT Films	CHP for R	
5.2.0	Weight Measurement		Weight	100%	TSP, SOTR, TNC Minutes, Approved GA / Manufacturing Drawings	SOTR & Approved drawings	Weight Certificate	W	
5.3.0	Painting		Visual Inspection	100%		SOTR & Approved drawings	IR	W	
5.4.0	Preservation, Packing and Marking		Visual Inspection	100%	SOTR, TSP, Approved Drawings or Preservation Scheme/ Procedure	Compliance to specifications	IR	W	
6.0.0	PRE-REQUISITE-ISSUE OF I & T CERTIFICATE-FORM-IV								
6.1.0	Submission of As-built Drawing (If applicable)		Verification	100%	Approved drawings	Concurrence from Drawing Approval authority	As-built drawings	R	
6.2.0	Compliance to SOTR		Verification	100%	SOTR	Manufacturing should meet SOTR requirements	Compliance Matrix	R	

SL. NO	MATERIAL/ COMPONENT/ DRG. NO/ QUALITY ACTIVITY	QTY. AS PER P.O.	CHARACTERISTIC/ TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE CRITERIA	FORMAT OF RECORD	ACTION BY QAE	REMARKS
6.3.0	Guarantee/ Warrantee Certificate		Verification	100%	As per Purchase Order	Should meet the P.O. requirements	Certificate	R	
6.4.0	Submission of FORM 4 (I & T Certificate)		Correctness	100%	SOTR, Purchase Order	SOTR, Purchase Order	FORM-4	P	

NOTE:-

- Item & accessories to be supplied should conform to specifications.
- Material Testing to be done at NABL accredited laboratories.
- NDT procedure and reports are to be approved by ASNT / ISNT Level III qualified technicians based on standards and acceptance criteria specified in SOTR / TSP and performed by ASNT / ISNT Level II / Level III qualified technicians.**
- The QAP does not apply to items not in the scope of supply of the firm.
- Inspection of assemblies / sub-assemblies and other items which have not been included in the SQAP but form an important part of the system will also be undertaken.
- 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 QAP for approval.
- The specifications / parameters for quality requirements given in the Technical Specifications (TSP) / MoM of TNC / Approved drawings will be final and binding and in addition to above requirements.