

MONITORING INSTRUCTION FOR INSPECTION		Issue No 01 Rev. No 01
		Date of Issue 12/11/2018
CENTERING BAND (120mm FSAPDS MK-II)		HAPP/QA/SC/H/008
Rev no	Amendment	Date
01	Type testing procedure included (ARDE 1/1/10 – Tech dated 4.10.18)	12/11/2018

HAPP DRAWING NO. : C OCB 120 2 401 REV 0 OR
(ARDE 2120 DET NO.6 SHT 2 / ARDE DRG.1006 13 21 01 03 003 00 TA)

REFERENCE DOCUMENT : QAP NO – DRDO –ARDE-DOA-TOT-239-2017 ,
ISS 01, CONTROL COPY 01,FEB-2018

END USE : 120 mm FSAPDS MKII

1.0 TESTING OF RAW MATERIAL PARAMETERS:

INSPECTION CHECKS TO BE CARRIED OUT ON RAW MATERIAL AT FIRM'S PREMISES BY HAPP OR ARDE REPRESENTATIVE FOR RECOMMENDING ACCEPTANCE OF BASIC RAW MATERIAL.

S.NO	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	RAW MATERIAL	THE MATERIAL SHALL BE NYLON 66 GP MOULDING GRADE NATURAL TO SPEC DEF STAN 93-8 / MARANYL NYLON 'A' 100 MANUFACTURED BY ICI LTD OR ZYTEL101 OF DUPONT.	TEST CERTIFICATE INDICATING BATCH NO. & QTY. FROM ORIGINAL MANUFACTURER TO BE SUBMITTED BY FIRM.
2	MELTING POINT	255 °C TO 265° C AS PER ASTM D-789	3 NOS / BATCH
3	MOISTURE CONTENT	0.25 % MAX.	3 NOS / BATCH
4	SPECIFIC GRAVITY	1.13 TO 1.15 AS PER ASTM D-792 OR D-1505	3 NOS / BATCH

- 2.0 RAW MATERIAL WILL BE SEALED BY HAPP OR ARDE REPRESENTATIVE AND THE RELEASE OF RAW MATERIAL WILL BE DONE ONLY AFTER WRITTEN APPROVAL FROM HAPP OR PHYSICAL RELEASE BY HAPP OR ARDE REPRESENTATIVE AFTER SATISFACTORY RESULTS OF THE TEST SPECIMENS.
- 3.0 TEST SPECIMENS OF DIMENSIONS AS PER SPECIFICATION ASTM D 638(TYPE IV), SHALL BE INJECTION MOULDED FROM EACH BATCH OF RAW MATERIALS AT FIRM'S PREMISES IN PRESENCE OF HAPP OR ARDE REPRESENTATIVE AND PLACED IN SMALL, DRY AIR TIGHT CONTAINER SUCH AS DESSICATOR (WITHOUT DESICCANT) IMMEDIATELY AFTER MOULDING.
- 4.0 THE TEST SPECIMENS SO SELECTED BY HAPP OR ARDE REPRESENTATIVE WILL BE FORWARDED TO CQA(ME), PUNE OR CIPET,CHENNAI IN AN AIR TIGHT BAG OR CONTAINER (WITHOUT DESICCANT) WITH MINIMUM EXPOSURE TO OPEN ATMOSPHERE FOR TESTING THE FOLLOWING PARAMETERS. THE SPECIMEN SHALL BE CONDITIONED AT A TEMP. OF $23 \pm 3^{\circ}\text{C}$ FOR 72 Hrs (MIN). PRIOR TO THE FOLLOWING TESTS.

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SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	TENSILE STRENGTH AT YIELD (min)	76 MPa AS PER ASTM D-638	6 NOS / BATCH
2	ELONGATION AT BREAK (min)	40 % AS PER ASTM D-638	6 NOS / BATCH
3	IMPACT STRENGTH (IZOD) (min)	53 J/m AS PER ASTM D-256	6 NOS / BATCH
4	ROCKWELL HARDNESS (R SCALE) (min)	R 120 AS PER ASTM D-785	6 NOS / BATCH * TO BE PERFORMED AT FIRM'S PREMISES

5.0 TESTING OF MOULDED BLANKS.

FOLLOWING INSPECTION CHECK WILL BE CARRIED OUT ON MOULDING BLANKS MANUFACTURED FROM THE APPROVED RAW MATERIAL AT FIRM'S PREMISES IN PRESENCE OF HAPP OR ARDE REPRESENTATIVE FOR RECOMMENDING ACCEPTANCE OF MOULDED BLANKS FOR FURTHER MACHINING. (SAMPLES TO BE KEPT IN THE CONTROLLED ATMOSPHERE AT 23 ± 3°C AND 55 ± 5% RH FOR 72 Hrs.MIN.)

SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	MOISTURE CONTENT	2.5 TO 3.0% BY WEIGHT BY WEIGHT METHOD	1 BLANK / BATCH
2	TESTING FOR VOIDS AND INCLUSIONS	NO VOIDS, INCLUSION PERMITTED WHEN CHECKED USING LIGHT SOURCE	100 %
3	INTERNAL STRESSES	OD AFTER ANNEALING AND MOISTURE CONDITIONING SHALL NOT DIFFER BY MORE THAN 0.3%	1% OF QTY OFFERED

6.0 THREE NUMBERS OF BLANKS TAKEN FROM THE BATCH AND MACHINED TO THICKNESS 1.5 TO 2.00mm AND A STRIP TO BE CUT ALONG THE AXIS TO RENDER THE TENSILE SPECIMEN HAVING SHAPES SIMILAR TO ASTM D-638 TYPE IV AS SHOWN IN ANNEXURE-I (THESE SPECIMENS TO BE CONDITIONED FOR 72 HRS AT 23 ± 3°C.AND RELATIVE HUMIDITY 55± 5% BEFORE TESTING THE TENSILE STRENGTH PROPERTIES.) AND SPECIMEN MACHINING PARAMETERS ARE GIVEN AS FOLLOWS.

- A) CRITICAL RAKE ANGLE : 30°
- B) SPEED : 50 m/min
- C) DEPTH OF CUT : 0.15 mm
- D) COOLANT : SOLUBLE OIL TYPE

7.0 THE TEST SPECIMEN TO BE TESTED AS PER THE TEST PARAMETERS IN THE PRESENCE OF HAPP OR ARDE REPRESENTATIVE AT FIRM'S PREMISES.

SL.NO	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1.	TENSILE STRENGTH AT YIELD (min)	55 MPa AS PER ASTM D-638	3 NOS/BATCH
2.	ELONGATION AT BREAK (min)	50% AS PER ASTM D-638	3 NOS/BATCH

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8.0 AFTER SATISFACTORY TEST RESULTS, FIRM WILL PRODUCE 5 NOS OF ADVANCE SAMPLES (CENTERING BAND) AS PER HAPP DRAWING C OCB 120 2 401 REV 0

9.0 THE MACHINING OPERATIONS HAS TO BE CARRIED OUT IN AIR CONDITION ROOM IN A CONTROLLED ATMOSPHERE WITH RH $55 \pm 5\%$ AND DRY BULB TEMPERATURE OF $23 \pm 3^\circ\text{C}$ DIMENSIONS ARE TO BE CHECKED, AFTER THE CENTERING BANDS KEPT IN THE CONTROLLED ATMOSPHERE AT $23 \pm 3^\circ\text{C}$ AND $55 \pm 5\%$ RH FOR 72 Hrs.MIN

10.0 THE 5 NOS OF ADVANCE SAMPLES HAS TO BE FORWARDED TO HAPP BY FIRM OR HANDED OVER TO HAPP OR ARDE INSPECTOR BY FIRM FOR APPROVAL TO START BULK PRODUCTION.

11.0 THE FIRM WILL BE GIVEN APPROVAL TO PRODUCE THE BULK QUANTITY AFTER VERIFICATION OF THE ADVANCE SAMPLE FOR DIMENSIONS AND FITMENT TRIAL AT HAPP.

IMPORTANT NOTES:

1. FIRM TO OFFER THE LOTS OF COMPLETELY MACHINED BANDS FOR INSPECTION AND TESTING.
2. INSPECTION CALL LETTER SHALL BE CLEARLY INDICATING, QTY., LOT NO. AND RAW MATERIAL BATCH USED/ BALANCE AVAILABLE.
3. INSPECTION CALL LETTER SHALL BE ACCOMPANIED WITH TEST REPORTS AND CERTIFICATES FOR ALL THE INSPECTION/ TESTS CARRIED OUT BY FIRM DURING RAW MATERIAL, MOULDED STAGE AND FINAL MACHINED STAGE (INCLUDING CERTIFICATE FOR CARRYING OUT 100% DIMENSIONAL INSPECTION & WARRANTY CERTIFICATES)

12.0 INSPECTION CHECK TO BE CARRIED OUT ON RECEIPT AT FACTORY.

SL. NO	CHARACTERITICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	WORKMANSHIP (VISUAL)	MAJOR: THE MATERIAL SHALL BE FREE FROM CRACKS, BLOW HOLES, SCALES, LAMINATION AND INCLUSIONS MINOR: THE MATERIAL SHALL BE FREE FROM SHARP EDGES SURFACE ROUGHNESS SHALL NOT EXCEED 1.6 MICRONS.	100% AQL 0.25 FOR MAJOR AND 1.5 FOR MINOR / IL II AS PER DEF 131 A
2	MARKING	AS PER DRAWING	AS PER DEF 131 A
3	PACKING	MACHINED BANDS ARE TO BE DELIVERED IN HERMETICALLY SEALED POLY BAGS / CONTAINERS WHICH IN TURN PUT IN A CORRUGATED CARTON BOX TO ACCOMMODATE 10 NOS. PER BAG SO AS TO PROVIDE AN EFFECTIVE PROTECTION FOR SEALED TUBE & BANDS FROM PHYSICAL DAMAGE, DIRT OR MOISTURE DURING TRANSIT. EACH BOX SHOULD HAVE PROPER PACKING SLIP WITH IDENTIFICATION FOR BATCH/LOT NO. AND QUANTITY	EACH CONSIGNMENT
4	DIMENSIONS	AS PER DRAWING, QAP CLAUSE 6.2.2	AQL 0.25 FOR MAJOR / IL – II AS PER DEF 131 A
5	FITMENT TRIALS	SHOULD SATISFACTORILY PASS FITMENT TRIAL	10 SAMPLES/ LOT
6	VERIFICATION OF INSPECTION DOCUMENTS	1. FIRM'S RAW MATERIAL TEST CERTIFICATE WITH BATCH NO. AND QUANTITY. 2. FIRM'S DIMENSIONAL INSPECTION REPORT. 3. PACKING SLIP INDICATING LOT/ BATCH NO. AND QUANTITY DETAILS. 4. INSPECTION NOTE/ ACCEPTANCE DOCUMENTS ISSUED BY HAPP INSPECTOR. 5. GUARANTEE AND WARRANTY CERTIFICATES.	EACH CONSIGNMENT

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13. TYPE TESTING SAMPLES FOR NEW SOURCES OF COMPONENT

200 no's each of CB & DB duly accepted will be assembled with 120mm FSAPDS MK II Shot and will be fired at the firing range. These shots have to pass the following test conditions.

LOT/ BATCH SIZE	STATIC TEST	NO OF SAMPLES FOR FUNCTIONING AND CONSISTENCY PROOF AND TEST CONDITIONS			OBSERVATIONS & ACCEPTANCE CRITERIA
		-10°C	+27°C	+55°C	
200 Nos	As per QAP DRDO-ARDE- DOA-TOT-239- 2017 APPENDIX B	8	8	8	<ul style="list-style-type: none"> - HSD & VSD of minimum 6 rds (excluding 1 round as sighter cum warmer and 1 as wild round) ≤0.3 mils at +27°C. HSD & VSD for -10°C & +55°C is for information only - HSV for all rounds to observe functioning - MV recordings for all rounds
		Total – 24 no's			

Note:

1. If results are not satisfactory, double samples are to be fired at that temperature condition where failure occurs. During DRP, if the results are not meeting the requirements the lot/batch shall be rejected.

14. VERIFICATION OF INSPECTION DOCUMENTS.

FOLLOWING INSPECTION DOCUMENTS MUST BE ENCLOSED ALONG WITH EACH SUPPLY OF RAW MATERIAL.

SL NO	INSPECTION DOCUMENTS
1.	PACKING SLIP DETAILS, INDICATING THE RAW MATERIAL ORIGINAL MANUFACTURER'S CERTIFICATE, DETAILS OF HEAT NUMBER, SUPPLY ORDER, LOT NO. , QTY. & H/T CONDITION.
2.	TEST CERTIFICATES FOR PHYSICAL, CHEMICAL, MECHANICAL FROM NABL ACCREDITED LAB OR GOVT. APPROVED LABORATORY
3.	DIMENSION REPORT INCLUDING VISUAL.
4.	SHELF LIFE AND GUARANTEE / WARRANTY CERTIFICATE OF SUPPLIER.
5.	IN ADDITION TO THE ABOVE SOFT COPIES OF ALL THE CERTIFICATES MENTIONED IN SLNO.10 SHALL BE SENT TO e-mail ID's. happqa.ofb@ofb.gov.in , mmhapp.ofb@ofb.gov.in
NOTE	EXPLICITLY DEVIATION(S) IF ANY SUCH AS TYPOGRAPHICAL ERROR, VALUES, NUMERIC, OTHER PARAMETER, ETC IS/ARE FOUND IN MONITORING INSTRUCTION OF THE ABOVE STORES, THE RELEVANT STANDARDS CONFORMING TO THE CONCERNED SPECIFICATIONS SHALL BE REFERRED TO CONFIRM THE PARAMETER

[Signature]
28/11
C.PANDI SELVA DURAI
WM / ASSY
MEMBER / MI COMMITTEE

[Signature]
29/11/18
T.PRABHU
JT.GM / QA
CHAIRMAN / MI COMMITTEE

[Signature]
28/11/18
D.BHASKAR RAO
WM / E
MEMBER / MI COMMITTEE

16. Component: CENTERING BAND (CB) (120mm FSAPDS MK-II)

1. Drawing No : ARDE 2120 Det No. 6 Sht 2 (1006 13 21 01 03 003 00TA)
 2. Method of Manufacture : Moulding & Machining
 3. Receiving Inspection
 3.1 Raw Material : Nylon Type 66 GP Moulding Grade Natural to spec DEF
 Stan 93-8 /Maranyl Nylon 'A' 100, manufactured by ICI Ltd OR Zytel 101 of Dupont

Sl. No.	Properties	Acceptance Criteria	Defect Classification	AHSP Intervention
1.	Melting point	255°C to 265°C (ASTM D-789)	Major	SP
2.	Specific Gravity	1.13 to 1.15 (ASTM D-792 or D-1505)	Major	
3.	Moisture Content	0.25% (Max)	Major	

Mechanical Properties:

***Test to be done at the factory premises, rep of AHSP/SQAE may witness the test.**

Sl	Parameter	Acceptance Criteria (average of 5 samples)	Test Method	Defect Classification	AHSP Intervention
1.	Tensile Strength at yield	76 MPa (min)	ASTM D-638	Major	SP
2.	% Elongation at break	40% (min)	ASTM D-638	Major	
3.	Izod Impact Strength	53 J/m (min)	ASTM D-256	Major	
4.	Rockwell Hardness (R Scale)	R 120 (Min)	ASTM D-785	Major	

4. In-Process Inspection : ---NA---

5. Stage Inspection : ---NA---

6. Final Inspection.

6.1. Visual Inspection:

6.1.1. Features for Visual Examination and Acceptance Criteria:

Sample Size: 100% by manufacturer/factory QC and 10% by AHSP/SQAE

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 TECHNICAL SPECIFICATION & QUALITY DOCUMENT TO GOVERN
 MANUFACTURE, INSPECTION AND SUPPLY OF SHOT 120mm FSAPDS Mk-II Assembly (EMPTY)

SI	Details of Features	Acceptance Criteria	Defect Classification	AHSP Intervention
1.	Cracks, blow holes, scales, laminations, inclusions	Not permitted	Major	SP

6.2 Dimensional Inspection:

6.2.1 Critical Dimensions :----NA----

6.2.2 Major Dimensions:

Sample Size: 100% by manufacturer/factory QC and 10% by AHSP/SQAE

(Dimensions are to be checked after a lapse of 72 hours after machining)

SI.	Dimension/Feature	Drg. Zone	Inspection Method	AHSP Intervention
1.	Ø121.0-0.5	D1	GO and NO GO Gauge	SP
2.	Ø111.8+0.1	D1	GO and NO GO Gauge	
3.	15.1-0.1	B2	Height Gauge	
4.	1.6 +0.2	C2	Vernier	
5.	3 Notches at 120°±30' with included angle 120°+1°	D3	Profile Projector	

6.2.3 Geometrical Features:

6.2.4 Minor Dimensions:

Sample Size: 100% by manufacturer/factory QC and 10% by AHSP/SQAE

SI	Dimension/Feature	Drg Zone	Inspection Method	AHSP intervention
1.	11	F2	Gauge	SP
2.	45°	F2	Template	

6.3. Test on Finished Items : -----Refer para 7.1 below-----

7. Details of Tests and other information:

7.1 Testing for voids and inclusions:

- ♦ The acceptance level for voids and inclusions shall be as per level-II of ASTM D-2562 (Table-I only).

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- Inspection of voids and inclusions shall be carried out using light source method for 100% blanks, after machining to final dimensions of CB. Supplier shall replace all material found not as per specification stated above. Consignee's verdict on rejection shall be final and binding on contractor.

7.2 Post moulding treatment:

- After moulding, the CB blanks shall be cooled to ambient temperature and then annealed and moisture conditioned in boiling water for 72 hrs. to achieve the prescribed properties.
- After annealing and moisture conditioning, the CB blanks shall be held for 72 hrs in a controlled environment with temperature $23 \pm 3^{\circ}$ C and RH $55 \pm 5\%$ before being checked for dimensions (Mould dimensions may be initially adjusted to get blanks as per drawing dimensions given in supply order).
- After annealing, moisture content of blanks will be checked by Weight Method. Acceptance level shall be 2.5 to 3% by weight.

7.3 Testing of molded blanks for mechanical properties after operation at para 7.2 above.

At least five nylon blanks taken from one batch should be machined to a thickness of 1.5 to 2.0 mm range. The recommended machining parameters are given as follows:

- (a) Critical rake angle : 30 degrees
 - (b) Speed : 50 m/min
 - (c) Depth of cut : 0.15 mm
 - (d) Coolant : Soluble Oil type
- Above machined blanks to be cut along the axis to render into strips. Tensile specimen dumb bell shape similar to ASTM D-638 Type IV to be punched to evaluate the tensile strength and percentage elongation. These specimens should be conditioned for 72 hrs at $23 \pm 3^{\circ}$ C and relative humidity $55 \pm 5\%$ RH before testing the tensile strength properties.
 - Acceptance criteria for mechanical properties of nylon blanks are given provisionally as follows: (Average of 3 samples per blank)

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TECHNICAL SPECIFICATION & QUALITY DOCUMENT TO GOVERN
MANUFACTURE, INSPECTION AND SUPPLY OF SHOT 120mm FSAPDS Mk-II Assembly (LMPTY)

Tensile Strength: 55 MPa (min)

Elongation at break >50 %

8 Machining:

Machining operations to be carried out in air conditioned room with RH 50 to 60% and dry bulb temp. 23 ± 3 °C. Dimensions are to be checked after a lapse of 72 hours after machining in air conditioned room.

9 Marking:

Painting, marking and stencilling will be done as per the relevant drawing. The moldings will be marked with stickers showing the following details:

Abbr. for the firm	Month of Mfg.	Year of Mfg.	CB	Batch No.
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Stenciling should be on the edge of the blanks. The batch number and quantity must also be stenciled on outer package.

10. Packing:

Store must be delivered in air tight sealed bags/containers. Packing should be carried out in air conditioned room only (23 ± 3 °C and RH $55 \pm 5\%$).