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MONITORING INSTRUCTION FOR INSPECTION		Issue No. 01 Rev. No. 01
		Date of Issue 23/06/18
DRIVING BAND (120mm FSAPDS MK-II)		HAPP/QA/SC/H/006

DRAWING NO. : 1006 13 21 00 01 001 00TA

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

END USE : 120 MM FSAPDS MKII (DRIVING BAND)

1.0 TESTING OF RAW MATERIAL PARAMETERS:

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

SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	RAW MATERIAL	THE MATERIAL SHALL BE NYLON TYPE 66GP MOULDING GRADE NATURAL TO SPEC DEF STANDARD 93-8/MARANYLE NYLON A 100 CR MANUFACTURE BY ICI LTD OR ZYTEL 101.	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. GENERAL ENGINEERING STANDARD	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 MATERIALS WILL BE SEALED BY HAPP REPRESENTATIVE AND THE RELEASE OF RAW MATERIAL WILL BE DONE ONLY AFTER WRITTEN APPROVAL FROM HAPP OR PHYSICAL RELEASE BY HAPP REPRESENTATIVE AFTER SATISFACTORY RESULTS OF THE TEST SPECIMENS.
- 3.0 TEST SPECIMENS OF DIMENSIONS AS PER SPECIFICATION ASTM D638(TYPE M III), SHALL BE INJECTION MOULDED FROM EACH BATCH OF RAW MATERIAL AT FIRM'S PREMISES IN PRESENCE OF HAPP REPRESENTATIVE AND PLACED IN A SMALL, DRY AIR TIGHT CONTAINER SUCH AS DESICCATORS' (WITHOUT DESICCANT) IMMEDIATELY AFTER MOULDING.
- 4.0 THE TEST SPECIMENS SO SELECTED BY HAPP REPRESENTATIVE WILL BE FORWARDED TO CQA(ME), PUNE IN AN AIR TIGHT BAG OR CONTAINER (WITHOUT DESICCANT) WITH MINIMUM EXPOSURE TO OPEN ATMOSPHERE FOR TESTING THE FOLLOWING PARAMETERS. THESE SPECIMENS SHALL BE CONDITIONED AT A TEMP. OF 23±3°C FOR 72hrs (Min.) PRIOR TO THE FOLLOWING TESTS.

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SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	TENSILE STRENGTH AT YIELD	76 M PA MIN. AS PER ASTM D-638	6 NOS / BATCH
2	ELONGATION AT BREAK	40 % MIN. AS PER ASTM D-638	6 NOS / BATCH
3	IMPACT STRENGTH (IZOD)	5 KG. CM / CM (MIN.) TO ASTM D-256 OR 53 J / M (MIN)	6 NOS / BATCH
4	ROCKWELL HARDNESS (R SCALE)	R 120 MIN. AS PER ASTM D-785	6 NOS / BATCH * TO BE PERFORMED AT FIRM'S PREMISES

5.0 DETAILS OF TEST AND OTHER INFORMATION

SLNO	TESTS	RESPECTIVE CLAUSE IN QAP
1	TEST FOR VOIDS AND INCLUSIONS	7.1
2	POST MOULDING TREATMENT	7.2
3	TESTING MOLDED BLANKS FOR MECHANICAL PROPERITIES'	7.3

6.0 MACHINING OF BANDS

THE MACHINING OPERATION WILL BE CARRIED OUT IN AIR CONDITIONED ROOM WITH RH 55 ±5% AND DRY BULB TEMPERATURE OF 23±3°C AND DIMENSIONS ARE TO BE CHECKED AFTER A LAPSE OF 72 HRS AFTER MACHINING IN THE SAME ATMOSPHERE

7.0 INSPECTIONS & TESTING OF FINAL MACHINED BANDS TO BE CARRIED OUT AT FIRMS PREMISES BY HAPP OR HAPPS AUTHORIZED INSPECTOR

SL. NO.	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	WORKMANSHIP (VISUAL)	THE MATERIAL SHALL BE FREE FROM LAMINATION, CRACKS, BLOWHOLES, INCLUSIONS & ABSENCE OF CHAMFER	100%
2	TESTING FOR VOIDS AND INCLUSIONS	SHALL BE FREE FROM VOIDS, INCLUSIONS, PIN HOLES WHEN CHECKED USING LIGHT SOURCE	100%
3	DIMENSIONS	AS PER DRAWING	AS PER DEF 131A
4	MOISTURE CONTENT	0.25 % MAX. GENERAL ENGINEERING STANDARD	2 NOS/LOT
5	UTS **	55MPA(MIN)	6NOS/LOT
6	% ELONGATION **	>50%	6NOS/LOT

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IMPORTANT NOTES:

1. FIRM TO OFFER THE LOTS OF COMPLETELY MACHINED BANDS FOR INSPECTION AND TESTING
2. INSPECTION CALL LETTER SHALL BE CLEAR INDICATING QTY, LOT NO, SO NO & RAW MATERIAL BATCH USED / BALANCED 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).

8.0 INSPECTION CHECK TO BE CARRIED OUT ON RECEIPT AT FACTORY

SL. NO	CHARACTERISTICS	SPECIFICATION / REQUIREMENT	SAMPLE SIZE
1	WORKMANSHIP (VISUAL)	MAJOR THE MATERIAL SHALL BE FREE FROM LAMINATION, CRACKS, BLOW HOLES, INCLUSIONS & ABSENCE OF CHAMFER. MINOR THE MATERIAL SHALL BE FREE FROM SHARP EDGES. SURFACE ROUGHNESS SHALL NOT EXCEED 1.6µm	100% AQL 0.25 FOR MAJOR AND 1.5 FOR MINOR /IL II AS PER DEF 131A
2	MARKING	AS PER DRAWING	AS PER DEF 131 A
3	PACKING	STORES MUST BE DELIVERED IN AIR TIGHT SEALED BAGS /CONTAINERS. PACKING SHOULD BE CARRIED OUT IN AIR CONDITIONED ROOM ONLY (23±3°C, and 55 ±5%)	EACH CONSIGNMENT
4	DIMENSIONS	AS PER DRAWING	AQL 0.25 FOR MAJOR /1L-II AS PER DEF 131A

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9.0 VERIFICATION OF ADEQUACY OF INSPECTION DOCUMENTS

SL NO	INSPECTION DOCUMENTS
1	FIRMS TEST REPORTS, MANUFACTURERS TEST REPORT PERTAINING TO RAW MATERIAL (FOR EACH BATCH OF RAW MATERIAL)
2	FIRMS TEST REPORTS PERTAINING TO MOULDED STAGE AND FINAL STAGE INSPECTIONS (FOR EACH LOT)
3	FIRMS DIMENSIONAL & WORKMANSHIP REPORT
4	SHELF LIFE AND GUARANTEE / WARRANTY CERTIFICATE OF SUPPLIER
5	IN ADDITION TO THE ABOVE SOFT COPIES OF ALL THE CERTIFICATES MENTIONED IN SLNO.9 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

Mithlesh

**MITHLESH CHANDRA
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T. Prabh
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CHAIRMAN / MI COMMITTEE**

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Document No.: DRDO-ARDE-DOA-TOT-239-2017
TECHNICAL SPECIFICATION & QUALITY DOCUMENT TO GOVERN
MANUFACTURE, INSPECTION AND SUPPLY OF SHOT 120mm FSAPDS Mk-II Assembly (EMPTY)

9. Component: DRIVING BAND (DB)

- 1. Drawing No : 1006 13 21 00 01 001 00TA
- 2. Method of Manufacture : Injection 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	AHSP intervention
1.	Melting point	255°C to 265°C (ASTM D-789)	CP
2.	Specific Gravity	1.13 to 1.15 (ASTM D-792 or D-1505)	
3.	Moisture Content	0.25% (Max) (Weight Method)	

Mechanical Properties:

*Test to be done at the factory premises, in the presence of rep of AHSP/SQAE .

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

- 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 factory QC and 10% AQL by AHSP/SQAE

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SI	Details of Features	Acceptance Criteria	Defect Classification	AHSP intervention
1.	Cracks, blow holes, Scales, Laminations, Inclusions	Not permitted	Critical	SP

6.2. Dimensional Inspection:

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

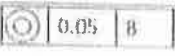

6.2.2. Major Dimensions:

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

SI	Dimension/Feature	Drg Zone	Inspection Method	AHSP intervention
1.	∅110.4+0.2	C2	Plug Gauge	SP
2.	∅125.47-0.20	C7	Ring Gauge	
3.	36.5±0.2	A7	Snap Gauge	
4.	9.0+0.2	B6	Shadowgraph (Sample Size 5 Nos.)	
5.	Taper 1:4.8193	D6	Profile gauge	
6.	29.3+0.2	D3	Width gauge	

6.2.3 Geometrical Features:

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

SI	Dimension/Feature	Drg Zone	Inspection Method	AHSP intervention
1.	 0.05 B	D2	Relation Gauge	SP
2.	 0.05 B	B3	Relation Gauge	

6.2.4 Minor Dimensions: Nil

6.3. Test on Finished Items: Ref. Para 7.1

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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MANUFACTURE, INSPECTION AND SUPPLY OF SHOT 120mm FSAPDS Mk-II Assembly (EMPTY)

- Inspection of voids and inclusions shall be carried out using light source method for 100% blanks, after machining to final dimensions of DB. 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 DB 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, DB 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 (values for average of three samples from each blank)

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Tensile Strength: 55MPa (min)

Elongation at break >50 %

8 Machining:

Machining operations to be carried out in air conditioned room with RH $55 \pm 5\%$ and dry bulb temp. 23 ± 3 Deg 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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Stencilling should be on the edge of the blank. The batch number and quantity must also be stencilled 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 Deg C and RH $55 \pm 5\%$).

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