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भारत सरकार

रक्षा मंत्रालय

(गुणता आश्वासन महानिदेशालय)

GOVERNMENT OF INDIA

MINISTRY OF DEFENCE

(DGQA ORGANISATION)

SARATH

QUALITY ASSURANCE INSTRUCTIONS

NO.CQA(ICV)/QAI/ 004

FOR

HYDRAULIC SHOCK ABSORBER

DRAWING NO. 765-32-Sb 116

ISSUED BY

गुणता आश्वासन नियंत्रणालय (स्थल सेना लडाकू वाहन)

रक्षा उत्पादन तथा आपूर्ति विभाग

रक्षा मंत्रालय

येद्दुमैलाराम (आं.प्र) -५०२ २०५.

CONTROLLERATE OF QUALITY ASSURANCE (INFANTRY COMBAT VEHICLES)
DEPARTMENT OF DEFENCE PRODUCTION & SUPPLIES
MINISTRY OF DEFENCE
YEDDUMAILARAM 502 205

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QUALITY ASSURANCE INSTRUCTIONS

FOR

HYDRAULIC SHOCK ABSORBER

DRAWING NO. 765-32-Sb 116

CONTROLLERATE OF QUALITY ASSURANCE

INFANTRY COMBAT VEHICLES

YEDDUMAILARAM - 502 205

ADDITIONS/AMENDMENTS

Sl No	Page & Para	Brief description of Additions/ Amendments	Date on which addition/ amendments made	Authority letter Number

QUALITY ASSURANCE INSTRUCTIONS FOR HYDRAULIC SHOCK ABSORBER TO DRAWING NO. 765-32-Sb 116

I. INTRODUCTION/SCOPE: This Quality Assurance Instructions is the property of Government of India. This is based on acceptance standards and inspection methods generally in vague. It has been compiled for guidance of the inspector during inspection of Hydraulic-Shock Absorber to drawing No.765-32-Sb-116 used in the suspension system of article-675 and to ensure that the stores accepted are qualitatively meeting the service requirements. This QAI deals with pilot and bulk inspection requirements for determining the quality and performance of Hydraulic Shock Absorber Assembly.

This QAI is liable to be amended as and when required by the Controller CI(ICV). During inspection, if the inspector finds any points which could be included in this QAI, he should refer such points to the Controller CI(ICV). Before commencing the inspection, the inspector will make himself fully conversant with terms and conditions of the contract including specifications, drawings and other literature.

II Description/Construction: Qty six Shock Absorbers are fitted in each vehicle at Bogie Wheel Stations, First Second & Sixth on either side. The total mass of the vehicle in laden condition is 14.0 $\pm$ 2% tonnes. Shock Absorbers are designed to damp the vibrations of the chasis caused due to oscillating torsional members of the suspension and thus ensuring smooth movement of the vehicle. The Shock Absorbers are hydraulic telescopic double acting type filled with a mixture of Transformer Oil (50%) to specification GOST 10121-76 and Turbine Oil (50%) to specification T30 GOST 32-74.

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Each shock absorber contains 760 cm^3 of this liquid. Through the upper eye, the hydraulic shock absorber is connected to the vehicle and through the lower eye to the suspension road wheel arm.

The ok lower cylinder part of the shock absorber is the body. In the lower part the body, the eye containing the valves and throttle holes is fitted. Inside the body, the working cylinder is supported. The working cylinder butts against the rest contained in the upper portion of the body. The packing housing is secured along with the rest in the upper portion of the body. The piston rod passes through the packing housing. The upper end of the piston rod is fitted in the upper eye. The piston which operates inside the working cylinder has throttle hole and valves. The annular surface between the body and the working cylinder acts as the compensating reservoir of the shock absorber fluid.

The working of the shock absorber is as under. During slow movements of the piston, the hydraulic fluid moves from the working cylinder to the other side of the piston and vise-versa through the throttle holes in the piston and lower eye. The valves provided in the piston and in the eye do not operate during the slow movements of the piston. The damping forces are due to the resistance to flow offered by these narrow throttle holes.

During high speed movement of the piston in compression stroke, the pressure inside the lower chamber of the working cylinder increases causing sufficient pressure rise to open the valves. The oil flows from the working [illegible] chamber to the other side through those valves and also through throttle holes. During rebound stroke also the appropriate valves open due to the excess pressure on the upper side of the piston. The flow is through these valves and throttle holes.

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III QUALITY ASSURANCE Provisions:

Inspection Responsibility: The supplier is responsible for satisfactory performance of the item during inspection and subsequent usage. Inspection and test records shall be kept complete and made available to the Inspector.

Qty 18 Nos (3 vehicle sets) are required to be submitted as pilot samples before commencing the bulk production. Clearance for bulk production will be accorded only after evaluation / approval of pilot samples. Inspection of pilot samples and bulk supplies will be carried out in accordance with these Quality Assurance Instructions, relevant drawings and material specifications. The following method of inspection will be adhered:

Sl No	Description of test to be carried out	Sampling Size	
		Pilot	Bulk
1	Visual Inspection	100%	100%
2	Dimensions	100%	10%
3	Material tests	1 No	1 No against each S/O
4	Priming Test	100%	100%
5	Dynamic test	100%	100%
6	Endurance test	2 Nos	1 No out of every 300 Nos
7	Fitment/Performance Trials	9 Nos	1 set for eac supply order

IV Methods of Tests to be carried out

1. Visual Inspection: The shock absorber assembly shall be inspected visually to ensure that;

a) Workmanship is satisfactory

b) External surfaces of shock absorber assembly are coated with primer ФЛ-03К GOST 9109-76 and painted enamel п Ф-1131 Khaki Technical Specifications Ty 6-10-12-89-72, Butt ends of plugs (Ref.No.41 & 42 shown in drawing 765-32-Sb 116) are painted with enamel п Ф-223 red GOST 14923-78

c) All joints particularly those of top and bottom eyes shall be sufficiently sound and strong. Welded joints shall be neat and uniform.

d) Eye bushes are fitted properly with respect to the eyes. Finish at the inside dia of bush should be good and in no cases rusty bushes shall be accepted.

e) Piston rod is capable of free rotation with respect to the body.

f) No leakage of oil at shock absorber filling plug and at all joints of the reservoir with the body.

g) Thread formation of thread components is satisfactory. One assembly may be stripped for visual examination.

2. Dimensions: Each procurement is guided by the contract and connected specifications and drawings mentioned there on. The Assembly Shock Absorber shall strictly conform to the drawing No.765-32-Sb 116/firms drawings. In case the procurement is as per the manufacturer's design, the manufacturer has to submit detailed drawings including material specifications and other relevant data alongwith the pilot-samples for approval and guidance during inspection.

Regarding non-metallic components, the manufacturer has to submit a certificate from their vendors in case of pilot samples stating that the materials used in the manufacturer are strictly as per relevant specifications. During first bulk inspection the manufacturer has to submit necessary test slabs/test specimens and the same shall be tested as per specifications. If the results are within the limits the bulk shall be considered for acceptance.

4. Priming Test: Before commencement of priming test, fill the shock absorbers completely with operating fluid as per conditions 10 & 11 of Drg.No. 765-32-Sb 116. The operating fluid is a mixture of 50% Transformer Oil conforming to specificatio GOST 10121-76 and 50%, Turbine Oil Conforming to specification T30 GOST 32-74. Physical and Mechanical properties of the above oil shall be checked for every bulk supply including pilot batch. Properties of oil shall strictly conform to specifications.

11) Mount the shock absorber assembly vertically keeping the shackel (Ref.No.5 shown in the drawing 765-32-Sb 116) upward on the test rig and prime for 5 minutes with double strokes 30 per minute and stroke length of 130-150mm During priming, removal of liquid by piston roots should not exceed 3 drops. In other places of joints leakage of operating liquid is not allowed. Temperature of body in the end of priming should be within the limits of 50 to 90°C. Temperature shall be checked in the upper part of the body

During inspection of pilot samples, before assembling the shock absorber, each component shall be checked for its dimensions as per the relevant drawing. In order to carry out this check the manufacturer as and when all the components are ready prior to assembling shall send the intimation to the inspecting officer. Bulk supplies shall be checked for the following overall dimensions and mounting dimensions:

Description	Limits
a) Expanded length between centers of top and bottom eyes.	344.0 $^{+\ 0.00}_{-\ 1.00}$ mm
b) Compressed length between centers of top and bottom eyes.	377 $^{+\ 1.00}_{-\ 0.00}$ mm
c) Stroke length.	165 mm
d) i) Width of the bush in the top eye	38.0 - 0.28 mm
ii) Width of the bushes in the top and bottom eyes.	39.0 - 0.62 mm
e) Clearance between the shock absorber body and the outer casing.	1.5 $\pm$ 0.15 mm
f) Outer casing diameter.	As per drawing 765-32-77
g) Shock absorber body dia.	As per drawing 765-32-103

3. Material tests: Hydraulic Shock Absorber Assembly shall be manufactured using the raw materials specified in the relevant drawings. The manufacturer shall make available to the inspector all records pertaining to raw materials used in the assembly.

Test specimens/test bars shall be drawn from component production line for checking chemical analysis and mechanical properties as per relevant specifications and the results shall conform to the specified limits.

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iii) After priming test wash the shock absorber internal cavities with shock absorber liquid as per procedure given at condition 13 of drawing 765-32-Sb116. After washing fill the shock absorber completely with shock absorber fluid (50% Transformer oil and 50% Turbine oil) about 760 cm^3 Again prime the shock absorber for 3 minutes on the test rig at the rate of 30 double strokes per minute and stroke length of 130 to 150mm. Leakage of liquid through thread connection shall not be permitted.

Dynamic/Capacity Test:

Para 5.1

The shock absorber shall be mounted vertically keeping the Piston rod end shackle upwards on a dynamic testing machine and load characteristics diagram shall be taken for each shock absorber as given below. The load diagram should preferably be taken at cycle between 4th and 6th cycle including 6th cycle.

Stroke mm	Cycles/ Minutes	Piston Velocity cm/s	DAMPING FORCE IN KG	
			Compression	Tension
20	100	10.5	300	80
40	100	21.0	1100	200
80	100	42.0	3000	750

Para 5.2

The actual values of damping force obtained during testing shall be within the tolerance of 10% of the above values.

5.4 Low resistance values could be due to insufficient fluid in the shock absorber. In such cases the shock absorber shall be topped up.

5.5 During Dynamic test, check and ensure that there is no leakage of fluid.

6. Life/Endurance test: The life test shall be conducted on shock absorber by mounting in a vehicle position. No testing shall be carried out for two million cycles at any one of the following strokes with corresponding cycles per minute.

Stroke	Cycles per minute (CPM)	(Aprrox)
100 mm	38	20 cm/sec
90 mm	42	"
80 mm	48	"
70 mm	55	"

The temperature of the shock absorber shall be maintained between 50°C to 90°C which will be measured on the outer surface of the body. The method of cooling is left to descretion of the manufacturer. At the end of the test, no leakage or breakage shall be permitted. After the endurance test the shock absorber shall be again subjected to Dynamic test. The loss in resistance shall not exceed 20% of original values in compression and rebound strokes.

7. Fitment/Performance Trials : Qty 6 Nos of pilot samples shall be fitted on the vehicle for rigorous field trials for 40000 KM. The vehicle will be allowed to run on different terrains at various speeds, trench crossing (2.5m width)

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vertical

negotiating vertical obstacle of 0.7m height. During trial run, there shall be no leakage of shock absorber fluid. The temperature of shock absorber body recorded during each trial run shall be within the limits of 50 - 90°C.

Depending upon the outcome of the above performance trials, the Inspecting Authority may order further trials as deemed necessary.

8. Painting : External surfaces of assembly Hydraulic Shock Absorber shall be coated with primer ФЛ-03К GOST 9109-76 and shall be painted with enamel НЦ-1131, Khaki Technical Specifications Ty-10-12-89-72. Butt end of plugs (Ref.41 & 42 as mentioned in Drg.No. 765-32-Sb 116) with enamel paint НЦ-223 red GOST 14923-78.

9. Identification Marks: Each shock absorber assembly shall bear the name plate with the following identification marks:

a) Manufacturer's Symbol
b) Supply Order No. and date.
c) Code & Part No./Drg.No.
d) S.No. & Date of manufacture.

10. Packing: Each shock absorber assembly shall be wrapped in oil paper and packed in strong container properly supported by corrugated board to prevent damage in handling and transit. The container shall bear the following markings.

a) Manufacturer's name or Symbol
b) Supply Order No. & Date
c) Part No. & Date of manufacture.

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