025

भारत सरकार

रक्षा मंत्रालय

(गुणता आश्वासन महानिदेशालय)

GOVERNMENT OF INDIA

MINISTRY OF DEFENCE

(DGQA ORGANISATION)

SARATH

QUALITY ASSURANCE INSTRUCTIONS

NO.CQA(ICV)/QAI/ 025

FOR

RELAY PM6-1C

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

RELAY PM6-1C

CONTROLLERATE OF QUALITY ASSURANCE
INFANTRY COMBAT VEHICLES
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ADDITIONS/AMENDMENTS

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

QUALITY ASSURANCE INSTRUCTIONS FOR RELAY PM6-1C

1. INTRODUCTION : This QAI deals with inspection of Relay PM6-1C designed to pull in the armature on closing of T&A switch on the central panel and connecting the inlet and outlet pipe unions, thereby ensureing the flow of fuel from main pipe line to the fuel pump of smoke generating system.

1.1 General Instructions for Inspection :

This QAI is issued to assist and guide Inspector in his inspection and nothing in this instruction absolves the Inspector from his responsibility to ensure that the inspection is carried out strictly as per terms of contract and the accepted stores are as per drawing and the specifications quoted in the contract in every respect.

1.2 Before commencing inspection, the Inspector will make himself fully conversant with all the terms and conditions of the contract, including specifications, drawings, process sheets and other literature of the collaborators.

1.3 The Inspector will ensure that the stores manufactured are in conformity with the relevant specifications and drawings quoted in the contract, with a view that the stores accepted are qualitatively meeting the service re-quirements.

1.4 In the course of inspection, if the Inspector finds any points which could be included in this QAI, he should bring such points to the notice of the AHSP.

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1.5 The supplier may be shown this QAI in order to acquaint himself with the standard of inspection, so that he endeavours to improve his product.

1.6 This QAI is the property of Government of India. It is liable for amendment at any time and should not be used unless authorised by Controller, CI(ICV), Secunderabad. For inspection purposes only the latest issue of this QAI will be made applicable and required number of copies of this QAI can be obtained from the issuing authority, ie., the Controller, CI(ICV), 6th floor, Chandralok Bldg, Secunderabad-500 003. Amendments issued by CI(ICV) from time to time shall be recorded in the amendment sheet enclosed.

1.7 Any technical queries on this QAI should be referred to issuing authority. For any departure from this QAI, the AHSP should be approached in writing and only after obtaining the written approval for the departure, the manufacturer should commence production.

1.8 A set of applicable drawings and specifications will be forwarded to the manufacturer/supplier and the respective inspection authority on placement of supply order. For any changes in the drawings, specifications, standards or written texts, prior approval in writing should be obtained from AHSP before commencement of production. Equivalance of collaborator's specifications with other international or national specifications and standards will be decided only by the AHSP.

1.9 The supplier should provide all standard test facilities for conducting inspection smoothly, viz., inspection gauges, instruments, test stands/rigs, fixtures

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templates and also those recommended in the drawings, specifications, process sheets. The supplier should maintain a calibration record sheet for all the measuring instruments/machines and gauges, which will be periodically checked by the Inspector.

1.10 The supplier should take up suitable corrective measures immediately if any defects/short comings are noticed during line, process and assembly inspection. In case the defects noticed on any consignments are attributable to manufacturing defects warranting rectification of earlier supplies, the supplier should resort to rectification of these defects in the supplies already made in consultation with the AHSP and consignee.

2. CONSTRUCTION & OPERATION : The relay is attached to the valve body with the help of two bolts and clamping strap. The relay is energised through lead in, upon closing switch TAA on the central panel. The armature of the relay is connected with valve rod by means of a pin. As the switch TAA is closed, the armature is pulled in, thus displacing the valve rod and valve and connecting the inlet and outlet pipe unions. The fuel flows from the main line to the fuel pump of smoke generating system.

3. BASIC PARAMETERS : The relay should have the following basic parameters :

a) Rated voltage — 27V D.C

b) Force of relay in normal climatic conditions

i) at voltage of 24V and 10mm clearance between armature and core — 1.5 kgf min.

ii) at voltage of 26V and 4.5mm clearance between armature and core — 3.5 kgf min.

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iii) At voltage of 24V and 0.5mm clearance between armature and core - 10 kgf min.

c) Coil resistance at 20°C - 5.9 to 6.9 ohms

d) Mode of operation - Intermittent 7 trippings with duration of 10 sec. and intervals of 5 sec. between them.

e) Type of connection - Double wire.

f) Version - Dust proof and splash proof with exception of armature outlet place.

g) Operation position - Arbitrary

h) Mass - 0.5 kg max.

4. QUALITY ASSURANCE PROVISIONS

4.1 Inspection Responsibility: The supplier is responsible for satisfactory performance of the item during usage and for performance of all inspection requirements specified herein.

4.2 The supplier should carry out 100% pre-inspection before offering the items to the inspector for inspection. A test certificate indicating all the tests carried out by the supplier should be given to the inspector/AHSP, while tendering the stores for inspection. The contractor should provide free access for scrutiny of all the documents to the Inspector/AHSP in order to ensure that the items offered are of the highest quality.

4.3 Supply of Literature: The supplier should provide sufficient copies of the literature of the items, such as illustrated partslist, operating instructions, assy schedule, maintenance/overhaul instructions, system layout charts, list of indigenous materials etc., to the AHSP for vetting and distribution.

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5. PILOT/BULK INSPECTION :

5.1 Contractor should tender 6 pilot samples representing the bulk supplies to the inspecting officer for the pilot samples evaluation. The pilot samples tendered should bear the regular serial number in addition to the identification number in red paint as under :

"PS_1, PS_2, PS_3, -- -- -- -- PS_6

5.2 All inspection/testing facilities for evaluation of pilot samples will be provided by the supplier at supplier's premises. The supplier should inform in advance in writing about the facilities available with them for evaluation of pilot samples. Any additional test facilities required for pilot sample evaluation will be intimated by the inspecting officer and the AHSP. Vehicle trials will be conducted as per the directions of the AHSP.

5.3 All bought out articles like bearings, brushes, etc., will be inspected by the Inspecting officer, if considered necessary. Inspecting officer will also conduct stage inspection during manufacture, if necessary.

5.4 Pilot samples will be considered for acceptance only after completion of all tests indicated herein. Bulk production clearance will be accorded by the AHSP only after the approval of pilot samples. Inspection of pilot samples and bulk supplies of the item shall be carried out in accordance with this QAI and relevant drawings/specifications.

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5.5 The pilot samples will be allocated for evaluation as per the details given under:

Sl. No.	Tests	Inspection level	No.of pilot samples undergoing evaluation
a)	Visual inspection	all 6 samples	1 to 6
b)	Dimensional check	- do -	- do -
c)	Performance tests	- do -	- do -
d)	Environmental tests	2 samples	1 to 2
e)	Dynamic tests	2 samples	3 to 4
f)	Interchengeability tests	2 samples	1 & 2
g)	Endurance tests	1 sample	5
h)	Fitment/performance tests on vehicles	1 sample	6
j)	Weighment check	all 6 samples	1 to 6
k)	Preservation/packing/ identification check	- do -	1 to 6

5.6 Disposal of pilot samples will be intimated by the AHSP to all concerned.. Inspector should punch the acceptance mark (V mark) on the name plate and body of the relay, if it complied with the requirements of this QAI in all respects. Inspector should ensure that any repairs/rectifications carried out on the items are within the acceptable limits and will not impair the performance and also complies the requirements given in this QAI. All samples rejected during the inspection should be punched with the rejection mark (R mark) distinctly on the name plate and body to

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avoid mixing of the same with the accepted stores.

5.7 Only approved electrical/electronic hardware such as connectors, cables, wires, plugs, sockets, insulation tapes etc., shall be used for the relay. The supplier will be responsible for obtaining the approval for the electronic hardware from CIP, Bangalore

5.8 Method of Inspection : The inspection requirements and procedure for quality assessment of the item are given as under.

S.No.	Description of the test to be carried out	Sampling Size	
		Pilot	Bulk
1.	Visual inspection.	100%	100%
2.	Materials:	one set of test bars against each material specn.	test bars against each material specn.per lot.
3.	Production line inspection of individual components	100%	10%
4.	Assembly inspection	100%	10%
5.	Weighment	100%	100%
6.	Performance Tests		
	a) Checking of armature for jamming	100%	100%
	b) Checking the parameters of relay		
	i) Developed force & current consumption in normal climatic condition	100%	100%
	ii) Developed force in hot condition	2 nos.	2 nos. per lot
	iii) Coil overheating temp.	2 nos.	2 nos. per lot

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Sl. No.	Description of the test to be carried out	Sampling Size Pilot	Bulk
C)	Insulation resistance test		
	i)Under normal climatic conditions	100%	100%
	ii)Under increased temp.conditions	2 nos.	2 nos. per lot
	iii)Under increased himidity conditions	2 nos.	2 nos per lot
d)	Testing for electric strength of insulation.	100%	100%
e)	Testing for moisture resistance	2 nos.	2 nos. per lot
f)	Testing for dust proofness	2 nos.	2 nos. per lot
g)	Testing for splash proofness test	2 nos.	2 nos. per lot.
7.	Enqironmental Tests		
a)	Testing for the effect of vapours/ fumes of antifreeze agent and fuels/lubricants	1 no.	1 no. per lot
b)	Testing for effect of increased ambient temperature.	1 no.	- do -
c)	Testing for effect of lower ambient temperature.	2 nos.	2 nos. per lot
d)	Testing for resistance to the effect of hear frost and dew	2 nos.	2 nos. per lot.
e)	Testing for effect of sea(salt) fog	2 nos.	- do -
f)	Testing for effect of cyclic changes of temperature	2 nos.	2 nos. per lot.
8.	Dynamic Tests		
a)	Vibration strength test	2 nos.	2 nos per lot.
b)	Impact strength	2 nos.	- do -
c)	Single impact test with high acceleration.	1 no.	1 no. per lot.

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S.No.	Description of test to be carried out	Sampling Size	
		Pilot	Bulk
9.	Testing for interchangeability	2 nos.	2 nos. per lot
10.	Endurance tests (guaranteed life test & service life tests)	1 no.	1 no. per lot
11.	Fitment/performance trials	1 no.	1 no. per lot
12.	Preservation/packing/ identification check	100%	100%

6. The details of various tests mentioned above are explained below :

6.1 Visual Inspection : The following checks will be carried out on the relay.

a) Completion of the assembly as per main assy drg.
b) Quality of external finishing/coating.
c) Presence of loose parts/fasteners.
d) Mechanical damages/defects.
e) Correct markings
f) Correct soldering of terminals.
g) Check for free travel of armature.

6.2 Materials : Raw material used in the manufacture of each component shall conform to the specifications mentioned in the relevant drawings. Manufacturer shall make available to the Inspector all records pertaining to the raw materials used in the assembly. The raw materials shall be counter checked with relevant speci-

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fications. Test specimens and test bars representing the pilot/bulk shall be drawn from the component production line and tested for chemical composition and mechanical properties. Results shall be within the specified limits. Material test specimens for insulating varnishes, adhesives, insulating tapes, solders and paints etc., shall be drawn at random and tested at recognised laboratories/test houses.

6.3 Production Line Inspection of Individual Components

Detailed dimensions of all components shall be checked as per the drawing before the assembly. Any special parameters/checks indicated in the drawing like hardness, heat treatment, surface finish, protective coating, dimensional tolerance shall also be checked at this stage. The components shall also be checked for presence of defects like cracks, dents, burrs, undercuts etc.,

6.4 Assembly Inspection : All assemblies shall be checked for dimensions as per the drawing. Any special parameters given in the drawing like hardness, heat treatment, surface finish, protective coating etc., shall be checked. All assemblies shall be examined for presence of defects like improper assembling, defects in soldering, brazing, loose parts/fasteners, etc., The following electrical tests as indicated in the drawings shall be carried out on respective assembly.

PM5-1C.020CB, Coil:

i) Check resistance of coil at 20°C which should be 5.9 to 6.9 ohms.

ii) Check winding for turn-to-turn short circuiting and electrical strength by 500V, 50Hz for one minute with a minimum power source of 0.5 KVA.

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6.5 Weighment : Weight of individual component shall be controlled during production in such a way that the total weight of Relay should not exceed 0.5 kg.

6.6 Performance Tests: The relay shall withstand the following performance tests.

Sl. No.	Description of Test.	Characteristics	Test procedure as per specn. PMG-IC.COOTY para no.
(1)	(2)	(3)	(4)
	Performance Tests		
	e) Checking of armature for jamming	The armature of the relay should move in the coil without any jamming	3.3
	b) Checking of functional parameters		
	i) Developed force in normal climatic conditions :		
	At voltage of 24V and 10mm clearance between armature and core.	The relay is considered to have passed the test, if it raises a load of 1.5 kgf min when clearance is 10 mm, a load of 5.5 kgf min when clearance is 4.5 mm and 10 kgf min when clearance is 0 mm.	3.4e
	At voltage of 26V and 4.5mm clearance between armature and core.		
	At voltage of 24V and 0 mm clearance between armature and core		

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(1)	(2)	(3)	(4)
	ii) Current consumption in normal climatic conditions	The current consumption should not be more than 4.2A in normal climatic condition at a voltage of 24V	3.4a
	iii) Developed force in hot condition	The relay should develop a force of 1.2 Kgf, min, at relay temperature + 135°C and voltage 24V when clearance between armature and core is 10mm and force of 10 Kgf, min when clearance between armature and core is 0 mm.	3.4b
	iv) Coil over heating temperature	a) The overheating temperature of the coil should not be more than 115°C when voltage of 26V is supplied for 2 minutes.	3.5
		b) The overheating temperature of the coil should not be more than 85°C at a voltage of 24V after 7 trippings with duration of 10 secs each and intervals of 5 secs between trippings.	3.5
C.	Insulation Resistance Test		
	i) In normal climatic conditions	Insulation resistance between coil & body should be minimum 20 megohms.	3.6
	ii) In increased temperature conditions,	Insulation resistance between coil & body should be 5 megaohms minimum.	
	iii) In increased humidity conditions	Insulation resistance between coil & body should be minimum 1 megohms.	

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(1)	(2)	(3)	(4)
	d) Electrical insulation strength	In normal climatic conditions, insulation between coil and body should withstand test voltage of 500V (effective valve), 50Hz without breakdown of surface flash over.	3.7
	e) Testing for moisture resistance	Relay is considered to have passed the test if it meets the requirements of para 6.6 (b) (i), (ii) & (iii), free from scaling of paint and varnish coatings and traces of corrosion and after holding in normal climatic conditions, the insulation resistance between coil and body should be as per the requirements indicated in para 6.6 (c) (i) and 6.6 (d)	3.9
	f) Testing for dust proofness g) Testing for splash proofness	Design of relay should be dust proof and splash proof with an exception of outlet place of armature.	3.20 & 3.21
6.7	Environmental Tests		
	a) Testing for the effect of vaponrs/fumes of antifreeze agent and fuels/lubricants	Relay should be serviceable in operation and maintain its parameters in conditions given in OST B3-1164-72.	This test is to be conducted during full scale testing of main vehicle during the performance trials.

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(1)	(2)	(3)	(4)
	b) Testing for the effect of increased ambient temperature.	Relay is considered to have passed the test, if it conforms to the performance tests 6.6(b)(i) and 6.6 (c) (ii) indicated above.	3.11
	c) Testing for the effect of lower ambient temperature.	Relay is considered to have passed the test, if the force conforms to the performance test 6.6(b) (i).	3.10
	d) Testing for resistance to the effect hear frost and dew.	Relay is considered to have passed the test if the holding force conforms to the performance test 6.6(b) (i).	3.12
	e) Testing for the effect of sea(salt) fog.	Relay is considered to have passed the test, if it is free from corrosion and no damages to paint and varnish coatings are detected.	3.13.
	f)Testing for the effect of cyclic changes of temperature.	Relay is considered to have passed the test if it conforms to the requirements of performance test 6.6 (b) (i).	3.14
6.8 Dynamic Tests			
	a) Vibration strength test	Relay is considered to have passed the test if no mechanical damages are detected during visual inspection and relay meets requirements of performance tests 6.6 (b) (i) & (ii).	3.15
	b) Impact strength test	- do -	3.16

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(1)	(2)	(3)	(4)
	c) Single impact test with high acceleration	Relay should be serviceable in operation and maintain its parameters in conditions given in OST B3-1164-72.	This test is to be conducted during full scale testing of main vehicle during the performance trials.

6.9 Testing for Interchangeability : Assemblies/components of relay should be interchangeable assemblywise/componentwise. Selective assembly is not permitted. The relay assemblies are stripped and their armatures are exchanged. Relays are considered to have passed the check for interchangeability if parts and assembly units correspond to drawings after exchange and conform to performance tests 6.6 (a), (b) (i) and (ii), C (i).

Endurance Tests

Guaranteed Service Life Test

6.10 Relay is tested for guaranteed life as per the following procedure :

a) A clearance of 4.5 mm is set between armature and core with a load of 5.5 kgf is suspended from armature, 20 cycles of trippings should be carried out.

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At voltage 22V -- 2 cycles
At voltage 27V -- 16 cycles
At voltage 29V -- 2 cycles

Each cycle consists of 15 trippings. Duration of each tripping is 20 secs and interval between trippings is 3 minutes, interval after three trippings is minimum one hour, after 15 trippings interval should be upto complete cooling. Forced air cooling is allowed.

b) A clearance of 10mm is set between armature and core with a load of 1.5 kgf is suspended from armature, 10,000 trippings should be carried out.

At voltage 22V -- 2500 trippings
At voltage 27V -- 5000 trippings
At voltage 29V -- 2500 trippings

Trippings are carried out by series each containing 7 trippings. Duration of each tripping is 10 secs, interval between trippings is 5 secs, interval after 7 trippings should be upto complete cooling. Forced air cooling is allowed.

After completion of guaranteed life test, 100 more trippings are carried out additionally at a voltage of 27V. The relay is considered to have passed the test, if it meets the requirements of performance tests 6.6 (b)(i) and (ii).

Service Life Tests

6.11 After guaranteed service life tests an additional 10,000 trippings are carried out as per para 6.10 (b) above.

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After service life test, 50 more trippings are carried out additionally at a voltage of 27V. The relay is considered to have passed the test, if it meets the requirements of performance tests 6.6 (b)(i) and (ii).

6.12 Fitment/Performance Trials : Fitment and performance of relay should be compatible to the system. Integrated system check will be carried out as per the directions of the AHCP by fitment of relay in 'valve, Drg.No.765-84-Cb210' in the vehicle and the whole system is checked. The following points should be ensured during fitment and operation on the vehicle.

a) Protection from ingress of dust and water splashes at armature outlet.

b) Adjustment of armature movement.

c) Any misalignment of armature.

d) Absence of armature displacement in axial direction when the relay is switched off under vibration and impact loads.

The performance of the relay will be checked and compared with the original already fitted in the vehicle.

6.13 Preservation/Marking/Packing : Plating, painting and preservation coating shall be in conformity with the specifications quoted in the relevant drawings. The name plate showing the following identification marks shall be fixed on the body of relay.

a) Manufacturer's symbol
b) Supply Order No. and Date
c) Designation and type
d) Drawing No. (e) S.No. & date of manufacture.

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Each unit should be packed separately by the vendor so that it is protected from moisture and dust. The units can be packed in a box which shall withstand transportation/storage before their consumption in the assembly.

6.14 Guarantee : The manufacturer has to furnish the following certificate as under :

> "The guaranteed life of relay is 500 operating hours of the vehicle engine within the 6000 or 8000 kms run in compliance with the guarantee for the vehicle".

The guaranteed storage life of the relay preserved as per OST B3-2381-74 in store houses of customer should not exceed 5 years or 8 years when packed in sealed bags as per OST B3-2381-74.