

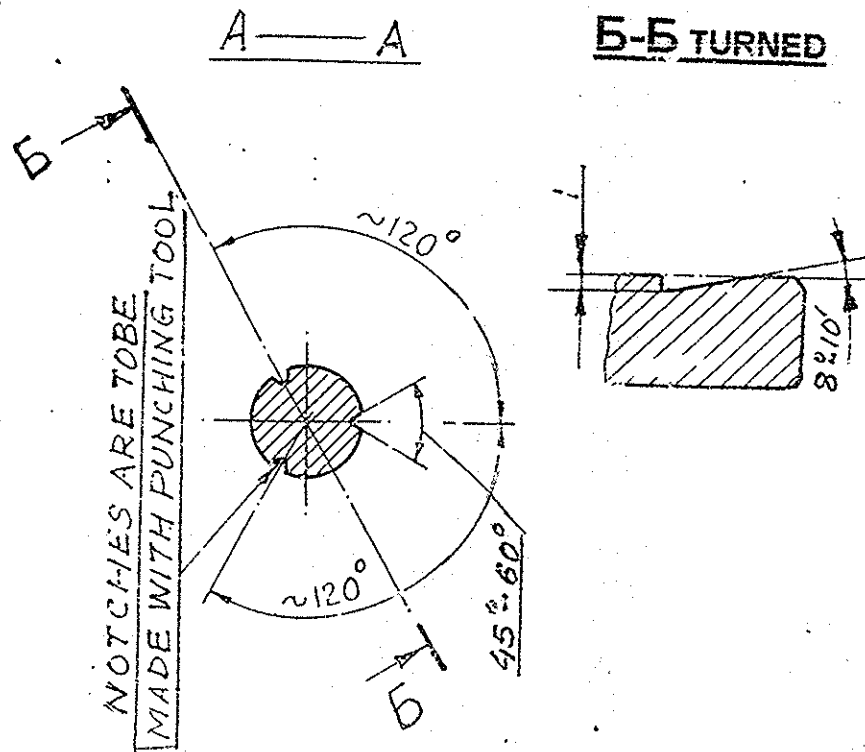
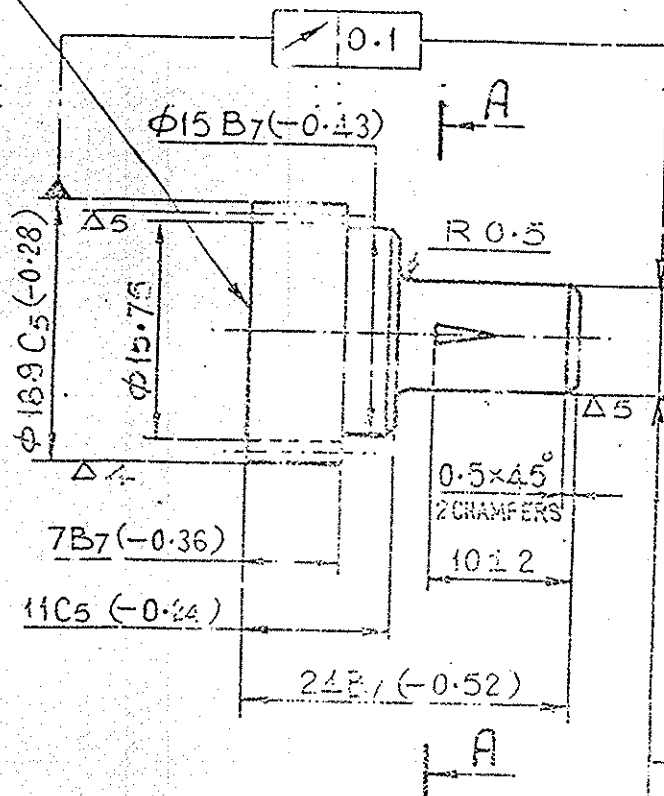




172-28-013

PARV. IVD. LRV. DIMENSIONS ARE IN mm

PLACE FOR TESTING HARDNESS



Ø 8 H7/p13 (+0.005/-0.035)  
TO BE CHECKED BEFORE MAKING THE NOTCHES.

		MODULE	m	0.7	
BASIC RACK	No. OF TEETH	Z	25		
	PROFILE ANGLE	α	20°		
	COEFFICIENT OF	ADDENDUM	f	1	
		DEDENDUM	f'	1.25	
	FILLET RADIUS	Zr	0.25		
ADDENDUM MODIFICATION COEFFICIENT		ξ	0		
ACCURACY AS PER GOST 9178-59				Ct 8X	
BASE TANGENT LENGTH		L	5.411	$\frac{m}{\cos^2 \alpha} \cdot \frac{Z+2}{2}$	
TOLERANCE ON BASE TANGENT LENGTH		δ <sub>L</sub>	0.05		
TOLERANCE ON COMPOSITE ERROR	TOTAL	δ <sub>oa</sub>	0.064		
	TOOTH TO-TOOTH	δ <sub>ra</sub>	0.025		
TOTAL ERROR OF DISTORTION		δ <sub>sa</sub>	0.120		
REFERENCE DIAMETER			11.5		
MATING COMPONENT				172-28-013-1	

- NOTES:**
- BHN 302-255 (INDENTATION DIA 3.5-3.8)
  - ON SURFACE Ø 8 GROOVE AS PER GOST 8820-60 IS ALLOWED.
  - DAMAGE OF SHOULDERS OF NOTCHES IS NOT ALLOWED.
  - COATING: CHEMICAL OXIDISING, OIL FINISHING OIL. CHEMICAL OXIDISING / PHOSPHATING, OIL FINISHING.
- ALL MATL. STEEL Gr 709 M40, BS: 970 Pt-1-1970  
COATING: PHOSPHOTING TO ISS: 0400-01-1983.

**INSPECTION NOTE: - FOR LIST OF GAUGES AND FIXTURES REFER GAUGE SHEET NO. GS(W) - 10134, SHT-1.**

जांची गई मही प्रति  
CERTIFIED CORRECT COPY OF  
मुद्रित रेखाचित्र की  
SEALER DRAWING AS ON

11/3/12

कृते नियंत्रण गुणता  
FOR CONTROLLER OF QUALITY  
आश्वासन (क वा आ) आवडि चेन्ने 54  
ASSURANCE (AVA) AVADI CHENNAI 54

29-3-05	0042-AVA	DS CAT No. ADDED	DRN	CHD	ASSEMBLY DRG:
22-10-88	18814-W	HINDI NOMEN ADDED	TCD	CHD	DATE
7-5-03	18759-W	INSPECTION NOTE ADDED.	CD MAN	AHSP	SCALE N.T.S.
17-1-05		POLY NEGATIVE PREPARED. PREV. DCs 17930-W, 18184-W, 18692-W & 18728-W Dtl. 5-12-02	DO	FOR QA/W	ESTD MASS 0.012
DATE	AUTHORITY	ZONE	NATURE	SIG AHSP	SIG DO
AMENDMENTS					
DRG SEALD					
LC No. 16476-W Dtl. 22-10-86					
DO QA/W					

**CQA(AVA)AVADI**

DESIGN No.

PART No. **172-28-013**

DS CAT No. **3020-015418**

**GEAR गियर**

44

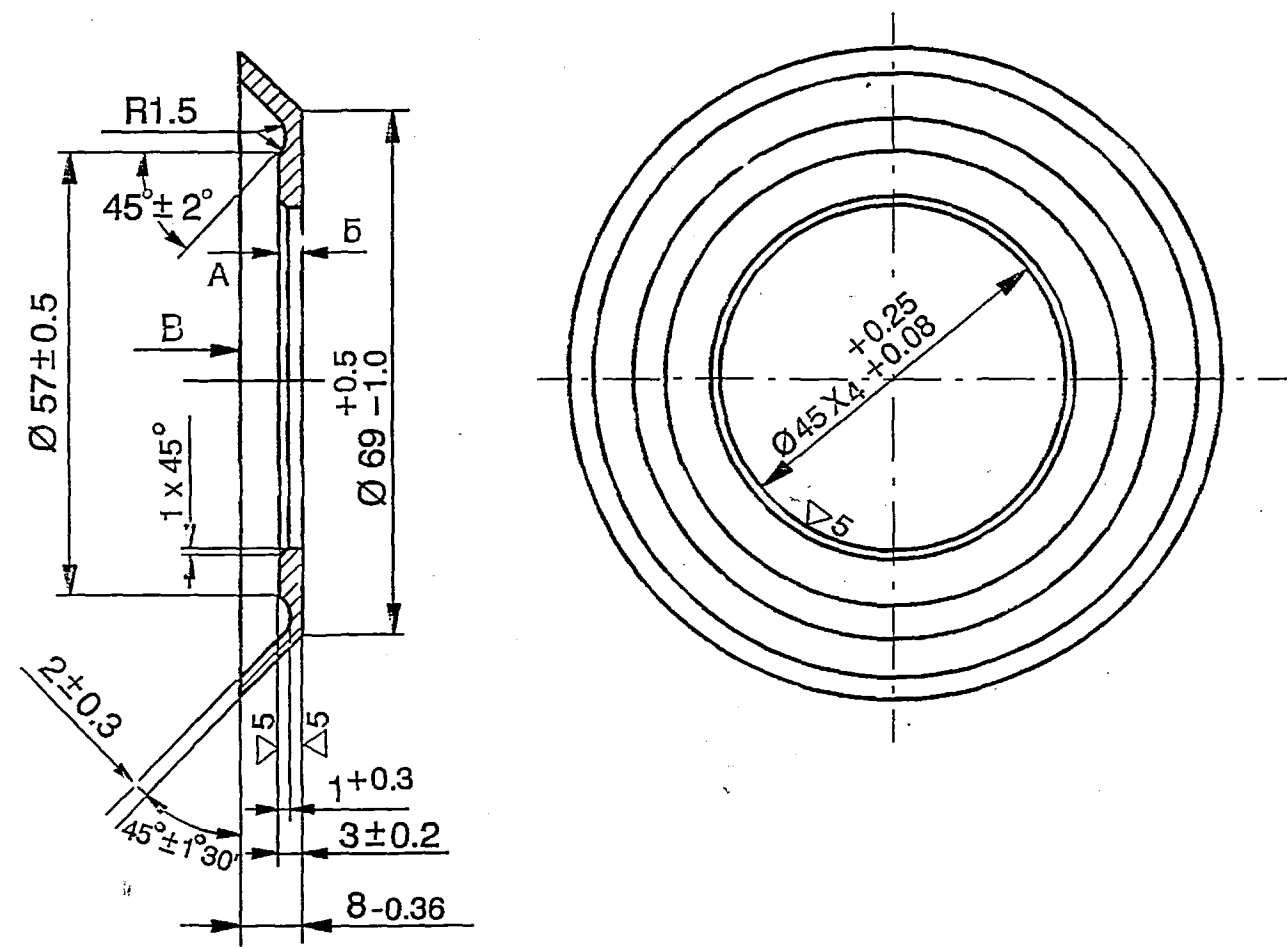
44

"COMMON TO T-90" & BLT  
DRG. RE-INDIANISED BASED ON RUSSIAN ORIGINAL ISSUE - NIL  
(R.RAMANI),JTO  
24-01-06

DRAWING NUMBER  
**54.08.135-A**

SHEET No. 1 OF 1

UNLESS OTHERWISE SPECIFIED  $\nabla 3$



1. RELATIVE TO  $\varnothing 45$  & FACE "A" THE FOLLOWING IS ALLOWED.
  - a) RUN-OUT OF FACE B, SHOULD NOT EXCEED 0.08 MM.
  - b) RUN-OUT OF TAPER SURFACE & FACE "B" SHOULD NOT EXCEED 0.3 MM.
2. TO BE MADE RED HOT, HARDNESS HB 341 TO 285 ( $\varnothing$  OF IND. 3.3 TO 3.6).
3. FACES SHOULD BE MARKED WITH ACIDIC MARK.
4. OXIDIZING / PHOSPHATING.
5. THE HARDNESS OF COMPONENT MAY BE CHECKED ON JOB.

\*\* PV572.0711.0093 (C)

(D) ALT. MATL. STEEL 817M40 (En24) TO RS 970 Part-1:1983

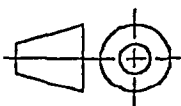
188.45.001cb-3Cb (A)

PILOT SAMPLE SHOULD BE APPROVED BY A H S P BEFORE BULK PRODUCTION.

EST. WT. (Kg) 0.083 TO BE STAMPED OR MARKED WHERE INDICATED THUS # ( LETTERS)

ALL SHARP EDGES AND CORNERS TO BE REMOVED UNLESS OTHERWISE STATED MACHINED CORNERS TO HAVE R OUT-SIDE R INSIDE EQUIVALENT CHAMFERS ARE PERMISSIBLE.

ISSUE	DATE	NATURE OF AMENDMENTS
C	26.11.12	55150/CQA(HV)/DB/BLT T-72 Dt. 19.07.11
B	07-07-06	AUTHY Lt.No.80001/CQA(HV)/GEN Dt.15.10.05
A	25.10.04	N OF A No.CQA(HV) / T90 / 45 / 001

DRN	Sd/=	MATERIAL :- STEEL 38XC GOST 4543 - 61	USED ON :- $\nabla 5.45cb$ ** $\nabla 72.45.060cbCb$ $\nabla 175.41.008cb-1Cb$
CHD	Sd/=		
APPD	Sd/=		
DATE	22-02-88	CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES) AVADI	
SCALE:- 1:1		TITLE :- 	<b>OIL DEFLECTOR</b>
DIMENSIONS IN mm			
TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS : 2102 - 69		D S CAT NUMBER	DRAWING NUMBER <b>54.08.135-A</b>
ALL THREADS TO CONFORM TO			

F-187  
34  
SIZE A3

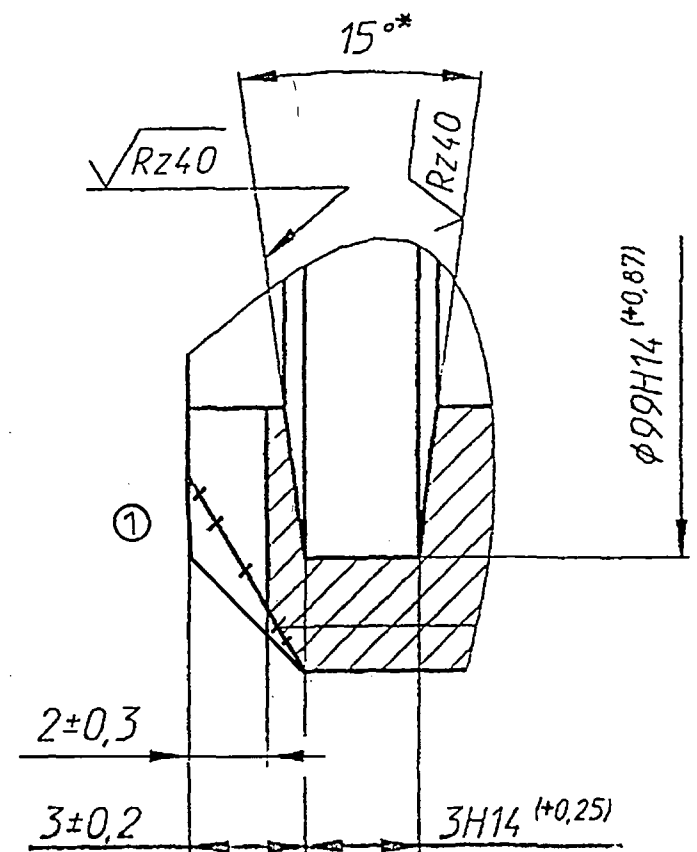
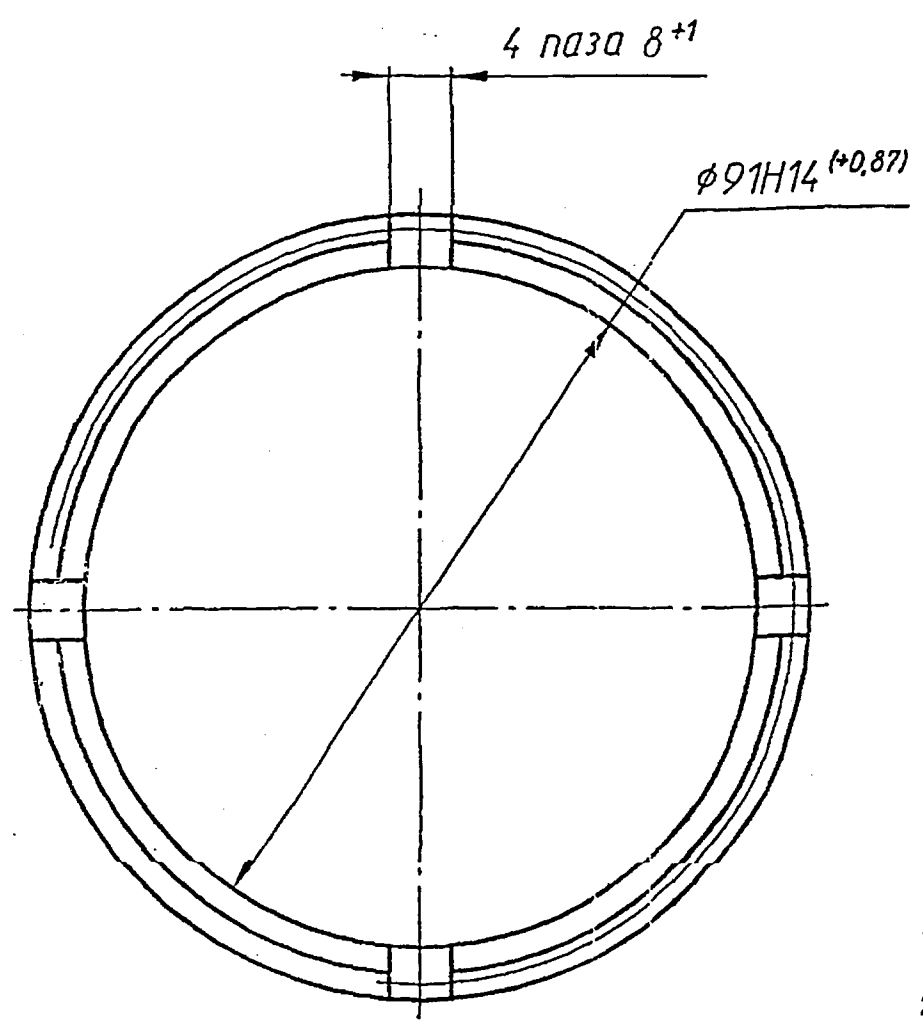
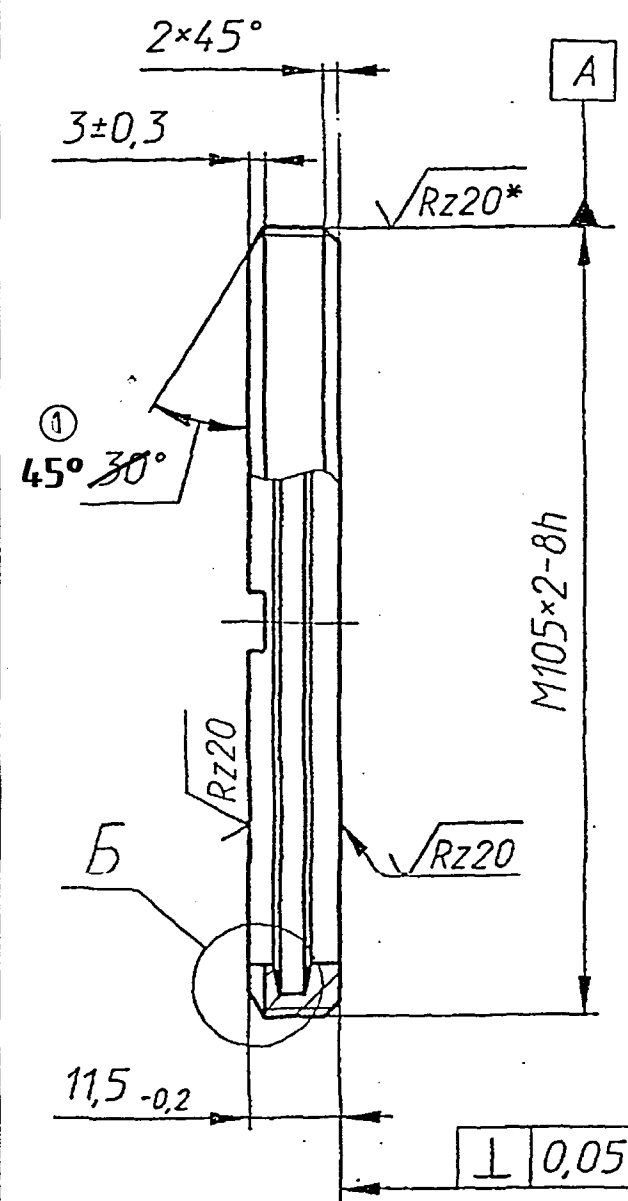


DRAWING NUMBER  
172.23.112

SHEET No. 1 OF 1

B (5:1)

$\sqrt{Rz80}$  (✓)



1. 255 ... 302 HB.
2. ALTERNATE MATERIAL STEEL 30XГCA GOST 4543-71.
3. \* DIMENSIONS AND SURFACE FINISH ARE TO BE ENSURED BY TOOL.
4. COATING CHEMICAL PHOSPHATING OXIDIZING OIL FINISH OR CHEMICAL OXIDIZING OIL FINISHING.
5. OTHER REQUIREMENTS AS PER 520 TY 1.

DRG. INDIANISED BASED ON RUSSIAN ORIGINAL ISSUE -NIL  
DRG INTRODUCED ISSUE -NIL VIDE Notn. No. 188/19-08

PILOT SAMPLE SHOULD BE APPROVED BY A H S P BEFORE BULK PRODUCTION.

EST. WT. (Kg) 0.30 TO BE STAMPED OR MARKED WHERE INDICATED THUS # ( LETTERS)

ALL SHARP EDGES AND CORNERS TO BE REMOVED UNLESS OTHERWISE STATED MACHINED CORNERS TO HAVE R OUTSIDE R INSIDE EQUIVALENT CHAMFERS ARE PERMISSIBLE.

			DRN	<i>J. Desai</i>	MATERIAL :- STEEL 38XC GOST 4543-71	USED ON :- 176.23Cb-3
			CHD	<i>J. Desai</i>	CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES) AVADI	TITLE :- <b>NUT</b>
			APPD	<i>Pranav</i>		
			DATE	12.10.11		
			SCALE:- 1 : 1		D S CAT NUMBER	DRAWING NUMBER 172.23.112
			DIMENSIONS IN mm			
			TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS : 2102 - 69			
			ALL THREADS TO CONFORM TO IS:4218.PART-4			
1	01.11.12	NOTN.No. 188A.19-09	ISSUE	DATE	NATURE OF AMENDMENTS	

356  
F-95  
SIZE A3





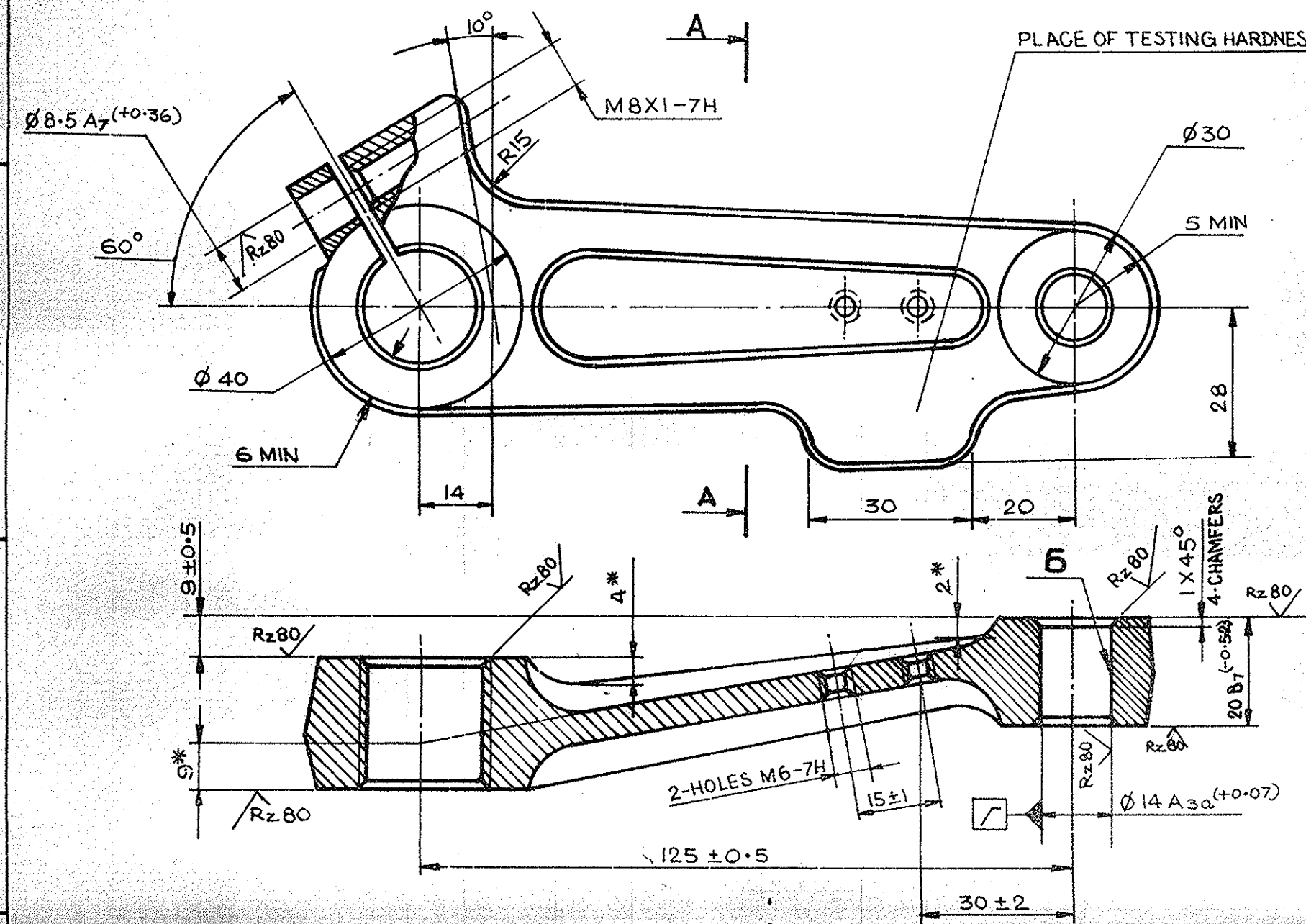
PART No./DS CAT No

1015-004047

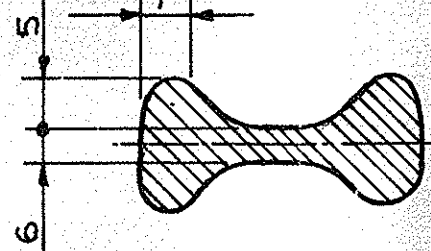
✓ (✓)

ALT MATL :-  
 STEEL 708 M 40, CONDITION 'T' TO BS: 970 Pt 1: 1983  
 COATING :-  
 PHOSPHATING TO JSS-0465-01: 93,  
 CLASS II, FINISH 13(9)

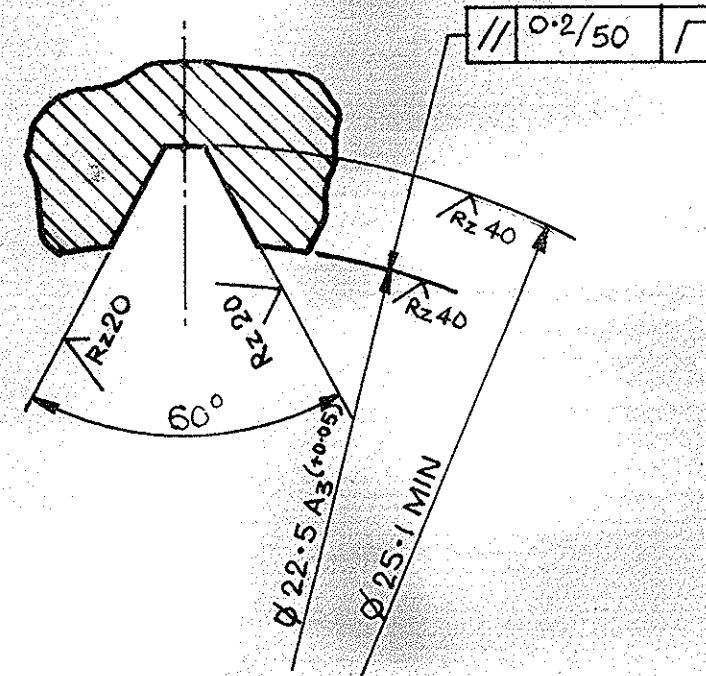
SYMBOL	-	TP25X30-S2
NUMBER OF TEETH	Z	30
WIDTH OF TOOTH-SPACE ALONG REFERENCE CIRCLE CHORD	S <sub>d</sub>	1.24 $\begin{matrix} +0.15 \\ +0.1 \end{matrix}$
REFERENCE DIAMETER	d <sub>d</sub>	23.75



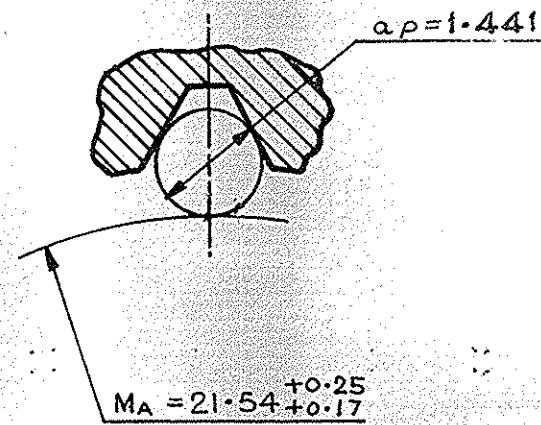
**A-A (TURNED)**



**TEETH PROFILE SCALE: 10:1**



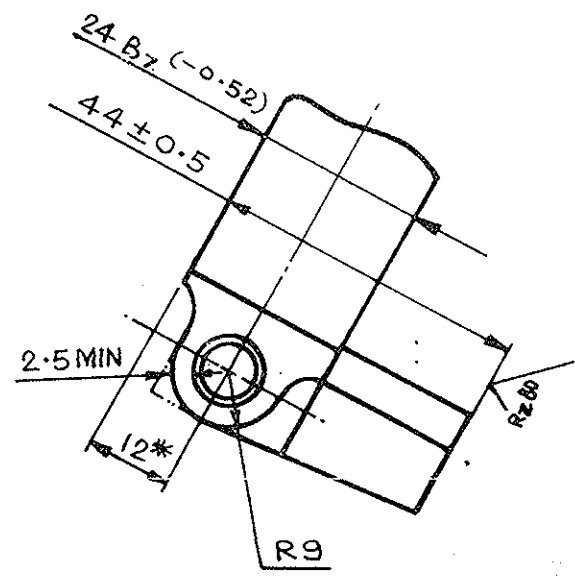
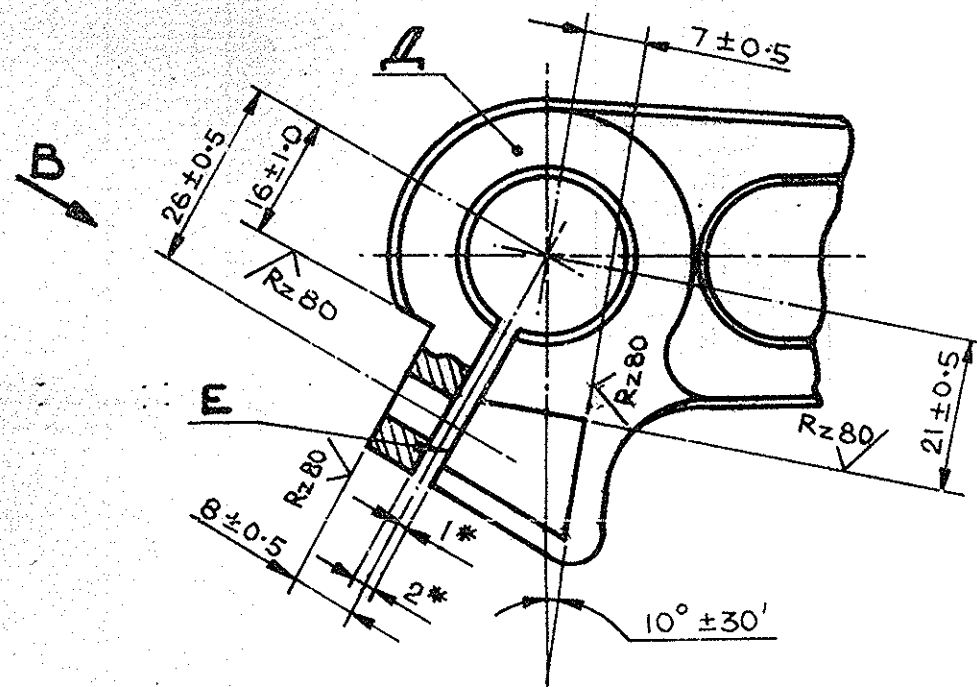
**CHECKING ALTERNATIVE OF SPLINE TEETH SCALE: 10:1**



**NOTES:**

- BHN 302-255 (DIA OF IND. 3.5-3.8).
- UNSPECIFIED INTERNAL RADII 10 mm MAX EXTERNAL - 3 mm MAX.
- BUCKLING OF NOT TO BE MACHINED SURFACES 2 mm MAX.
- BULGE OF METAL AT PLACES OF STAMPED RECESS ARE ALLOWED.
- AXIS PASSING THROUGH TIP OF TWO DIAMETERICALLY LOCATED TEETH OF SPLINES AND CENTRE OF SPLINE HOLE SHOULD BE LOCATED ON AXIS PASSING THROUGH CENTRE OF HOLE = 'b' MAY BE TURNED BY 30 MAX.
- SPLINES SHOULD BE CHECKED FOR INTERCHANGEABILITY WITH SPLINE GAUGE.
- DIMENSIONS OF SPLINE HOLE DIMENSIONS 10 ± 30, 7 ± 0.5 AND PARALLELITY OF HOLES SHOULD BE CHECKED BEFORE SLITTING.
- NON COINCIDENCE OF SIDE OF SLOT AND SURFACES E OF BOSS SHOULD NOT BE MORE THEN 1 mm.
- SHOULDERS OF 0.5 mm MAX FROM TO MILLING ON SURFACES F ARE ALLOWED.
- COMPONENT MAY BE MACHINED AS SHOWN WITH CONNECTIONAL LINE.
- COATING: CHEMICAL OXIDIZING PHOSPHATING, OIL FINISHING.
- REST OF REQUIREMENTS SHOULD BE IN COMPLIANCE WITH 520 TY1.
- \* DIMENSIONS FOR REFERENCE.
- \* COATING OF ALL SURFACES, EXCEPT SPLINES AND HOLES. PRIMER IS A-03K, WHITE ENAMEL IS A-115 OR WHITE ENAMEL IS A-223-02. REQUIREMENTS AS PER 520 TY5.

**VIEW-B**



कांजी गई सही प्रति  
 CERTIFIED CORRECT COPY  
 मुद्रित रेखाचित्र को  
 SEALED DRAWING AS ON

कृते नियंत्रक गुणता  
 FOR CONTROLLER OF QUALITY  
 आश्वामन (क वा आ) आवदि वेन्स  
 ASSURANCE (AVA) AVAD, HENNA 54

01-8-02	18692-W	BC4-5	DIMN. DIA=ap=1.441 WAS DIA=ap 14.41.						GROUP No	F-125
5-3-94	17909-W		ALT MATL & COATING NOTE ADDED.						40001 KD	107
6.12.91	17163-W		PARA 12 AMENDED.							
4.7.91	17088-W		DS CAT No ADDED.							
8-9-89			RETRACED WITHOUT CHANGE.							
DATE	AUTHORITY	ZONE	NATURE	SIG AHSP	SIG DO	C/D MAN	DO	FORCQA(W)	ESTD MASS	0-6
DRG SEALED			AMENDMENTS	MATERIAL STEEL 38XC GOST 4543-71				DESIG No.		
			16469-W 8-10-86	PROTECTIVE FINISH				PART No. 172.27.195		
				DO CQA(W)				DS CAT No. 1015-004047		

**LEVER**

133

**RESTRICTED  
(DRAFT/PROVISIONAL)  
QUALITY ASSURANCE PLAN**

**FOR**

**(GEAR)**

**DRG.NO. 172.25.105**

**(LF NO: 6201025012)**

**No HVF/T-90/QAP/25/GEAR/243209 - 00**

**ISSUE No: 00**

**DATE: DEC- 2021**

**QUALITY ASSURANCE (RIG-SUB ASSEMBLY)**

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**



**QUALITY ASSURANCE PLAN (QAP)**

**FOR**

**GEAR**

**DRG. NO. 172.25.105**

PREPARED BY

*Dak*  
( C.NANDA KUMAR )  
JWM/QA (RIG-SA)

*Rohini*

REVIEWED BY

*H*  
(HANUMANTHA RAO GOLLA)  
JWM/QA (RIG-SA / TA)

APPROVED BY

*S*  
( SUBHAM BIJLWAN )  
AWM/QA-RIG-(SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)  
HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054

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## **1.IMPORTANT NOTE**

### **Note-1**

This is only a provisional and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without permission of The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 54.

### **Note –2**

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

### **Note-3**

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

### **Note-4**

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-“A”.

### **Note-5**

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

## **2.INTRODUCTION**

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **GEAR TO DRG.NO 172.25.105** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3.AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **GEAR TO DRG.NO:172.25.105**.



It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

#### **4. SCOPE:**

This QAP outlines in general terms, the checks and methods to be used during inspection of **GEAR TO DRG. NO. 172.25.105** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

#### **NOTE-I:**

- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
- ii. In case of TE, It is responsibility of the vendor to obtain the copy of QAP and give the statement of compliance that vendor will abide by the QAP in case supply order is placed.
- iii. In case of S.O, it is the responsible of the vendor to obtained copy of QAP and give the statement of compliance that the vendor will follow QAP. However, GM/HVF reserves the right to revise/update the QAP from time to time.

#### **5. DOCUMENTS:**

- a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
- b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalent to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
- c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.
- d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges

etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

**6. ITEM USED ON:**

-----

**7. LIST OF DRAWINGS:**

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.25.105	GEAR	-

**8. BILL OF MATERIALS: (Individual items as mentioned in table to Para 7)**

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.25.105	GEAR	STEEL 38XC GOST 4543-71	1

**Note:** Vendor / Contractor may use approved alternate material if any specified in drawing/ specification.\* Also refer Para no.13.

**9. CONDITIONS OF USE/STORAGE INSTRUCTIONS**

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

- (a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.
- (b) If the item consists of assemblies, each assembly should be packed separately.
- (c) The stores are to be suitably covered for preventing ingress of dust and Dirt/entry of sunlight / moisture.
- (d) The packaging slip shall contains
  - (i) Certificate of testing- NABL Certificate.
  - (ii) Guarantee/ Warranty Certificate
  - (iii) Service and maintenance instructions
  - (iv) Delivery Slip with Inspector's Acceptance Mark
  - (v) Undertaking letter / certificate of conformance (As applicable).
- (e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.

## 10. SAMPLING PLAN:

Sl. No.	Sampling Plan	Pilot	Bulk
(i)	Visual Inspection	100%	100%
(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	100 %	100 %
(v)	Pressure testing	-----	-----
(vi)	Machining/Fitment/ Performance trial on higher assembly / Tank	01 No.	01 No. per batch/As required.
vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
viii)	Test stand/Jigs/ Fixtures/Gauges/Man drels/etc.	100 %	100 %
ix)	Marking/Identification	100%	100%
x)	Packing/ Preservation	100%	100%

### Note:-

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

## 11. VISUAL INSPECTION[Sampling plan as per Para- 10 (i)]

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts



- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

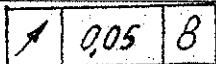
Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

## 12. DIMENSIONAL CHECK [Sampling plan as per Para- 10(ii)]

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing. Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

### 12.1 GEAR TO DRG.NO 172.25.105

All dimensions should be confirmed as per drawing.

Sl. No.	Drawing Dimension
1.	20±0.3 mm
2.	1±0.3 mm
3.	30°
4.	5±2 mm
5.	5H15 <sup>(+0.48)</sup> mm
6.	14h12 <sub>(-0.18)</sub> mm
7.	0.5X45°
8.	φ16.5h12 <sub>(-0.18)</sub> mm
9.	φ11h12 <sub>(-0.18)</sub> mm
10.	
11.	8° <sup>+4°</sup>
12.	45° <sup>+15°</sup>
13.	φ8u8(+0.050 / +0.028) mm
14.	Surface finish / Roughness of items should be ensured as per drawing and specification.

Refer drawing/specification for admissible alternate manufacture in dimensions/material if any specified for the component.

### 13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. NABL test reports for all the parameters as per relevant specifications to be submitted. Test samples to be submitted by the vendor to HVF, if required. The material check

will be carried out as per sampling plan.\* However, if the manufacturer proposes any alternative material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

**13.1 GEAR TO DRG.NO.172.25.105**

a) The component should be manufactured from STEEL 38XC GOST 4543-71.

b) **Chemical properties:** As per STEEL 38XC GOST 4543-71.

Grade	CONTENT OF ELEMENTS%							
	C	Si	Mn	Cr	S	P	Cu	Ni
	MAX							
38XC	0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.035	0.035	0.30	0.30

**Note:** For mass fraction of other elements refer GOST 4543-71.

c) **Mechanical properties:** As per STEEL 38XC GOST 4543-71.

Grade	Yield point, (kgf/mm <sup>2</sup> )	Ultimate strength, (Kgf/mm <sup>2</sup> )	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm <sup>2</sup> )
	Not less than				
38XC	75	95	12	50	7

**Note:** For other properties refer GOST 4543-71

**14) PERFORMANCES / ACCEPTANCE TEST: GEAR TO DRG.NO:172.25.105**

1. BHN 255...302.
2. Tolerance for run out should be checked before the deposition of dents.
3. Coating: Chemical phosphatising, Oxidizing oil finish or Chemical oxidizing and oil finish.
4. Other requirements are as per specification 520.TY1.

**GEAR DETAILS:**

Module	m	1
No. of teeth	Z	14
Basic rack		GOST 13755-81
Addendum modification co-efficient	X	+0,25

Accuracy as per GOST 1643-81		-	8-B
Tolerance for	Tooth-to-tooth composite error double flank	$F_i'$	0,063
	total composite error double flank	$f_i''$	0,028
Base tangent length		$W$	$4,795_{-0,180}^{+0,106}$
Tolerance for Base tangent length		$F_{ww}$	0,028
Total error of distortion		$F_{\beta}$	0,018
Reference circlediameter		$d_d$	14

#### 15) FITMENT AND PERFORMANCE TEST:

- a. Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.
- b. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

#### EXPLANATORY NOTE:

- 1) Stage wise process and inspection of the component as specified in TD Book/ Process Book/ illustration book/specification is to be confirmed by the supplier during manufacturing the components.
- 2) Firm shall submit details of manufacturing process, inspection process and also reports for the same to HVF.
- 3) If required/applicable HVF shall witness/verify stage wise inspection /process details during manufacturing of the components.
- 4) The component may be subject to endurance test, when fitted in higher assembly as specified in process / illustration /TD book.

#### 16) INTERCHANGEABILITY:

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.



## **17) CALIBRATION CHECKS**

### **(TEST STANDS/JIGS/FIXTUERS/GAUGES/INSTRUMENTS):**

The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

The supplier/contractor should submit calibration reports for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

## **18) MARKING/IDENTIFICATION**

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification.

## **19) PRESERVATION CHECK**

a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject to the thickness of the coating/preservative is maintained as per the drawing/specification.

b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

## **20) PACKING CHECK**

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.

## **21) DOCUMENTATION**

- i. Firm has to maintain all the documents as per QAP with respect to the Sl.No.to have traceability.
- ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time

of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.

- iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
- iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis (NABL Certificate), 2. Mechanical properties (NABL Certificate), 3. Pre-forming process, 4. Coating certification. 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports.

**22) REFERENCE:**

- 1. Drawing No: 172.25.105
- 2. Material specification as per drawing:  
STEEL 38XC GOST 4543-71.
- 3. GOST 4543-71.
- 4. Specification: 520.TY1.
- 5. Alternate material:
  - a) IS: 5517-04 DESIGNATION 42Cr6 V1 (TEST CONDITION: LRS 40) OR DESIGNATION 42Cr4 Mo2 (TEST CONDITION: LRS 30).(COMPONENTS TO BE SUITABLY HEAT TREATED TO ACHIEVE THE HARDNESS AS STIPULATED IN THE DRAWING).

SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	GEAR TO DRG. NO 172.25.105	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302... 255 BHN	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	V	R	SP followed by HVF.
5		Coating checks	Chemical Phosphatising, oxidizing oil finish or Chemical oxidizing and oil finishing	Refer QAP Para no: 14(3)	Confirm to QAP Para no: 14(3)	P	V	R	SP followed by HVF.
6		Dimensional checks	Dimensions as per the drawing	Refer drawing /QAP Para no: 12.1	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
7		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18	Confirm to QAP Para no: 18	P	V	R	100% by firm/ vendor.
8		Preservation & packing	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.

**Note:**

For conformity of the items (Chemical/Physical/Mechanical properties).

- One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
- For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P- Perform

W- Witness

V-Verify

R-Review

SP-Sampling Plan



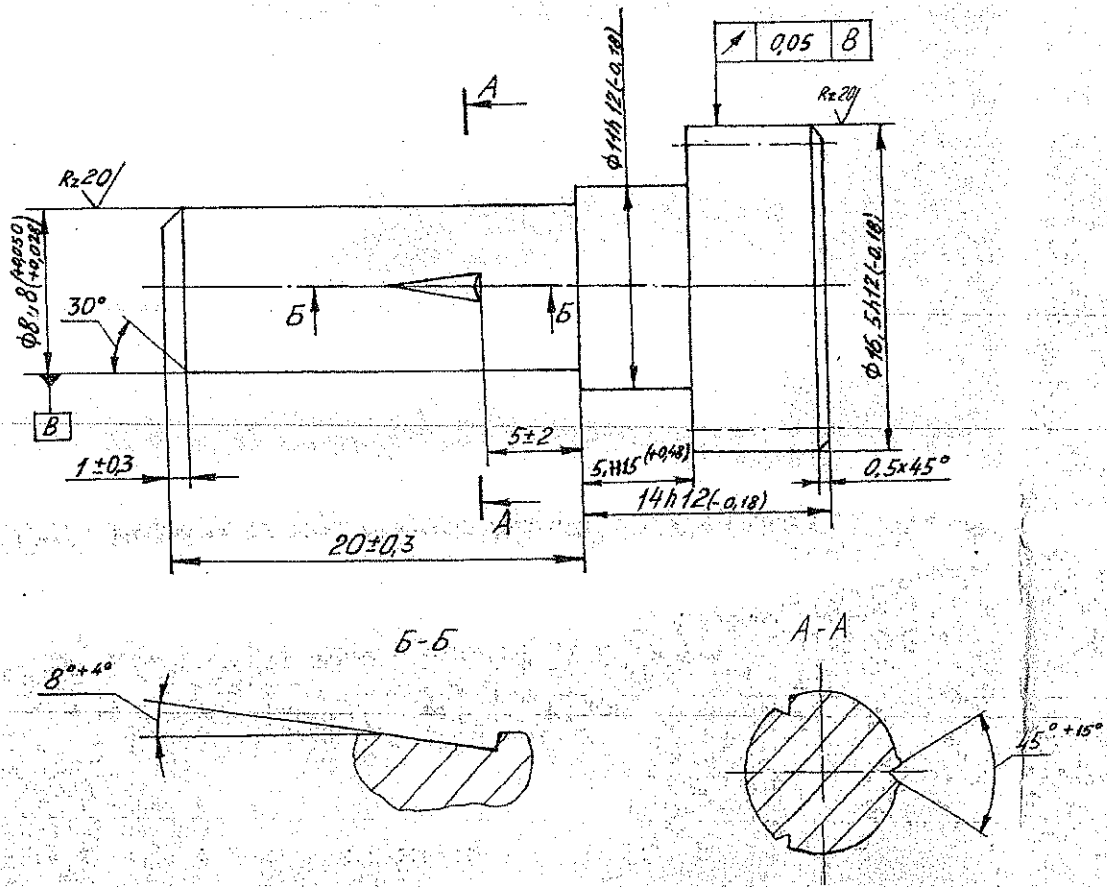


FIG: GEAR TO DRG. NO 172.25.105  
(For reference only)



**RESTRICTED  
(DRAFT/PROVISIONAL)  
QUALITY ASSURANCE PLAN**

**FOR**

**(GEAR)**

**DRG.NO. 172.28.013**

**(LF NO: 6206211064)**

**No HVF/T-72C/QAP/28/GEAR/243222 - 00**

**ISSUE No: 00**

**DATE: DEC- 2021**

**QUALITY ASSURANCE (RIG-SUB ASSEMBLY)**

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**

**QUALITY ASSURANCE PLAN (QAP)**

**FOR**

**GEAR**

**DRG. NO. 172.28.013**

PREPARED BY

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( C.NANDA KUMAR )  
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APPROVED BY

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ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)  
HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054



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## **1.IMPORTANT NOTE**

### **Note-1**

This is only a provisional and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without permission of The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 54.

### **Note –2**

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

### **Note-3**

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

### **Note-4**

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-“A”.

### **Note-5**

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

## **2.INTRODUCTION**

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **GEAR TO DRG.NO 172.28.013** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3. AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **GEAR TO DRG.NO:172.28.013**.

It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

#### **4. SCOPE:**

This QAP outlines in general terms, the checks and methods to be used during inspection of **GEAR TO DRG. NO. 172.28.013** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

#### **NOTE-I:**

- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
- ii. In case of TE, It is responsibility of the vendor to obtain the copy of QAP and give the statement of compliance that vendor will abide by the QAP in case supply order is placed.
- iii. In case of S.O, it is the responsible of the vendor to obtained copy of QAP and give the statement of compliance that the vendor will follow QAP. However, GM/HVF reserves the right to revise/update the QAP from time to time.

#### **5. DOCUMENTS:**

- a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
- b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalent to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
- c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.
- d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges

etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

**6. ITEM USED ON:**

-----

**7. LIST OF DRAWINGS:**

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.28.013	GEAR	-

**8. BILL OF MATERIALS: (Individual items as mentioned in table to Para 7)**

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.28.013	GEAR	STEEL 38XC GOST 4543-71	1

**Note:** Vendor / Contractor may use approved alternate material if any specified in drawing/ specification.\* Also refer Para no.13.

**9. CONDITIONS OF USE/STORAGE INSTRUCTIONS**

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

- (a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.
- (b) If the item consists of assemblies, each assembly should be packed separately.
- (c) The stores are to be suitably covered for preventing ingress of dust and Dirt/entry of sunlight / moisture.
- (d) The packaging slip shall contains
  - (i) Certificate of testing- NABL Certificate.
  - (ii) Guarantee/ Warranty Certificate
  - (iii) Service and maintenance instructions
  - (iv) Delivery Slip with Inspector's Acceptance Mark
  - (v) Undertaking letter / certificate of conformance (As applicable).
- (e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.



## 10. SAMPLING PLAN:

Sl. No.	Sampling Plan	Pilot	Bulk
(i)	Visual Inspection	100%	100%
(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	100 %	100 %
(v)	Pressure testing	-----	-----
(vi)	Machining/Fitment/ Performance trial on higher assembly / Tank	01 No.	01 No. per batch/As required.
vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
viii)	Test stand/Jigs/ Fixtures/Gauges/Man drels/etc.	100 %	100 %
ix)	Marking/Identification	100%	100%
x)	Packing/ Preservation	100%	100%

### **Note:-**

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

## 11. VISUAL INSPECTION[Sampling plan as per Para- 10 (i)]

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts

- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

**12. DIMENSIONAL CHECK [Sampling plan as per Para- 10(ii)]**

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing. Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

**12.1 GEAR TO DRG.NO 172.28.013**

1. All dimensions should be confirmed as per drawing.
2. Place for testing hardness (Refer Drawing).
3. To be checked before making the notches (Refer Drawing).
4. Notches are to be made with punching tool (Refer Drawing).
5. Surface finish / Roughness of items should be ensured as per drawing and specification.
6. Refer drawing/specification for admissible alternate manufacture in dimensions/material if any specified for the component.

**13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]**

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. NABL test reports for all the parameters as per relevant specifications to be submitted. Test samples to be submitted by the vendor to HVF, if required. The material check will be carried out as per sampling plan.\* However, if the manufacturer proposes any alternative material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

**13.1 GEAR TO DRG.NO.172.28.013**

a) The component should be manufactured from STEEL 38XC GOST 4543-71.

b) **Chemical properties:** As per STEEL 38XC GOST 4543-71.

Grade	CONTENT OF ELEMENTS%							
	C	Si	Mn	Cr	S	P	Cu	Ni
					MAX			
38XC	0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.035	0.035	0.30	0.30

Note: For mass fraction of other elements refer GOST 4543-71.

c) Mechanical properties: As per STEEL 38XC GOST 4543-71.

Grade	Yield point, (kgf/mm <sup>2</sup> )	Ultimate strength, (Kgf/mm <sup>2</sup> )	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm <sup>2</sup> )
	Not less than				
38XC	75	95	12	50	7

Note: For other properties refer GOST 4543-71

#### 14) PERFORMANCES / ACCEPTANCE TEST: GEAR TO DRG.NO:172.28.013

1. BHN 302-255(INDENTATION DIA 3.5-3.8)
2. ON SURFACE Ø 8 GROOVE AS PER GOST 8826-69 IS ALLOWED.
3. DAMAGE OF SHOULDERS OF NOTCHES IS NOT ALLOWED.
4. COATING; CHEMICAL OXIDISING OIL FINISHING OR CHEMICAL OXIDISING/PHOSPHATING, OIL FINISHING

#### GEAR DETAILS:

MODULE		m	0.7
No. OF TEETH		Z	25
BASIC RACK	PROFILE ANGLE	$\alpha$	20°
	COEFFICIENT OF ADDENDUM	$f^1$	1
		$f^2$	1.25
	FILLET RADIUS	$Z_i$	0.25
ADDENDUM MODIFICATION COEFFICIENT		$\xi$	0
ACCURACY AS PER GOST 9178-59		—	Ct 8X
BASE TANGENT LENGTH		$L$	$5.411 - \frac{0.095}{Z}$
TOLERANCE ON BASE TANGENT LENGTH		$\delta_{L\%}$	0.05
TOLERANCE ON COMPOSITE ERROR DOUBLE FLANK	TOTAL	$\delta_{0a}$	0.064
	TOOTH-TO-TOOTH	$\delta_{ra}$	0.025
TOTAL ERROR OF DISTORTION		$\delta_{\delta_a}$	0.120
REFERENCE DIAMETER		$d$	17.5
MATING COMPONENT			172-28-013-1

#### 15) FITMENT AND PERFORMANCE TEST:

- a. Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.

- b. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

**EXPLANATORY NOTE:**

- 1) Stage wise process and inspection of the component as specified in TD Book/ Process Book/ illustration book/specification is to be confirmed by the supplier during manufacturing the components.
- 2) Firm shall submit details of manufacturing process, inspection process and also reports for the same to HVF.
- 3) If required/applicable HVF shall witness/verify stage wise inspection /process details during manufacturing of the components.
- 4) The component may be subject to endurance test, when fitted in higher assembly as specified in process / illustration /TD book.

**16) INTERCHANGEABILITY:**

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.

**17) CALIBRATION CHECKS**

**(TEST STANDS/JIGS/FIXTUERS/GAUGES/INSTRUMENTS):**

The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

The supplier/contractor should submit calibration reports for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

**18) MARKING/IDENTIFICATION**

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification.

**19) PRESERVATION CHECK**

- a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject

to the thickness of the coating/preservative is maintained as per the drawing/specification.

- b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

## 20) PACKING CHECK

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.

## 21) DOCUMENTATION

- i. Firm has to maintain all the documents as per QAP with respect to the SI.No.to have traceability.
- ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.
- iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
- iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis (NABL Certificate), 2.Mechanical properties (NABL Certificate), 3. Pre-forming process, 4. Coating certification. 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports.

## 22) REFERENCE:

- 1. Drawing No: 172.28.013
- 2. Material specification as per drawing:  
STEEL 38XC GOST 4543-71.
- 3. GOST 4543-71.
- 4. Alternate material:

ALT. MATL. : STEEL Gr 709 M40, BS : 970 Pt.-1 : 1983  
COATING :- PHOSPHOTING TO JSS : 0400-01-1983.

- 5. **INSPECTION NOTE:** FOR LIST OF GAUGES AND FIXTURES REFER GAUGE SHEET NO.GS (W)- 10134, SHT-1.



SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1		Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no: 13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302-255 BHN (Indentation Dia:3.5-3.8)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	V	R	SP followed by HVF.
5	GEAR TO DRG. NO 172.28.013	Coating checks	Coating	Refer QAP Para no: 14(4)	Confirm to QAP Para no: 14(4)	P	V	R	SP followed by HVF.
6		Dimensional checks	Dimensions as per the drawing	Refer drawing /QAP Para no: 12.1	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
7		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18	Confirm to QAP Para no: 18	P	V	R	100% by firm/ vendor.
8		Preservation & packing	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.

**Note:**

For conformity of the items (Chemical/Physical/Mechanical properties).

- One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
- For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P. Perform

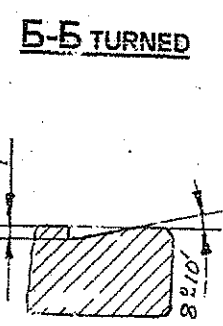
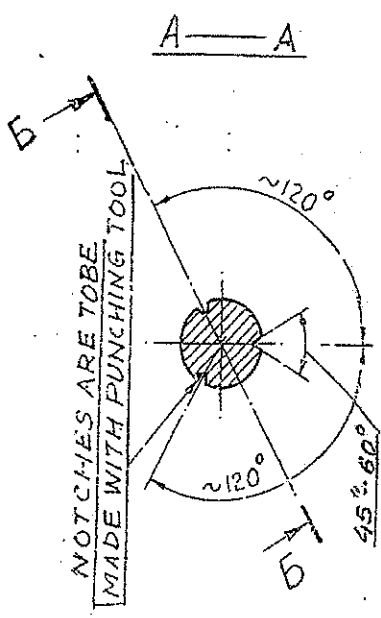
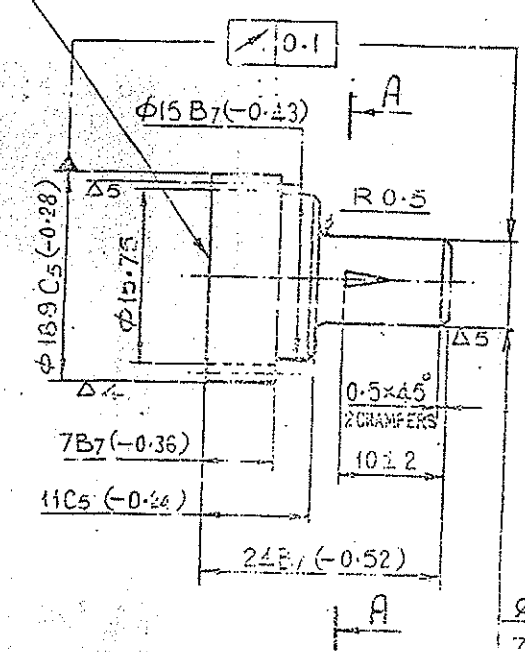
W- Witness

V-Verify

R-Review

SP- Sampling Plan

PLACE FOR TESTING HARDNESS



$\phi 8 \text{H} 7 \text{h} 6$  ( $\pm 0.035$ )  
 TO BE CHECKED BEFORE MAKING THE NOTCHES.

FIG: GEAR TO DRG. NO 172.28.013  
 (For reference only)



**RESTRICTED  
(DRAFT/PROVISIONAL)  
QUALITY ASSURANCE PLAN**

**FOR**

**(OIL DEFLECTOR)**

**DRG.NO. 54.08.135-A**

**(LF NO: 6206406250)**

**No HVF/T-72C/QAP/08/OIL DEFLECTOR/243213 - 00**

**ISSUE No: 00**

**DATE: DEC- 2021**

**QUALITY ASSURANCE (RIG-SUB ASSEMBLY)**

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**


**QUALITY ASSURANCE PLAN (QAP)**

**FOR**

**OIL DEFLECTOR**

**DRG. NO. 54.08.135-A**

PREPARED BY

  
( C.NANDA KUMAR )  
JWM/QA (RIG-SA)

REVIEWED BY

  
(HANUMANTHA RAO GOLLA)  
JWM/QA (RIG-SA / TA)



APPROVED BY

  
( SUBHAM BIJLWAN )  
AWM/QA-RIG-(SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)  
HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054

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## **1.IMPORTANT NOTE**

### **Note-1**

This is only a provisional and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without permission of The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 54.

### **Note –2**

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

### **Note-3**

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

### **Note-4**

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-“A”.

### **Note-5**

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

## **2.INTRODUCTION**

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **OIL DEFLECTOR TO DRG.NO 54.08.135-A** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3.AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **OIL DEFLECTOR TO DRG.NO:54.08.135-A**.

It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

#### **4. SCOPE:**

This QAP outlines in general terms, the checks and methods to be used during inspection of **OIL DEFLECTOR TO DRG. NO. 54.08.135-A** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

#### **NOTE-I:**

- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
- ii. In case of TE, It is responsibility of the vendor to obtain the copy of QAP and give the statement of compliance that vendor will abide by the QAP in case supply order is placed.
- iii. In case of S.O, it is the responsible of the vendor to obtained copy of QAP and give the statement of compliance that the vendor will follow QAP. However, GM/HVF reserves the right to revise/update the QAP from time to time.

#### **5. DOCUMENTS:**

- a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
- b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalents to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
- c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.
- d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges

etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

**6. ITEM USED ON:**

- 1. PV572.0711.0093 -
- 2. 188.45.001CB-3CB -
- 3. 172.45.060CBCB -
- 4. 175.41.008CB-1CB -

**7. LIST OF DRAWINGS:**

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	54.08.135-A	OIL DEFLECTOR	-

**8. BILL OF MATERIALS:** (Individual items as mentioned in table to Para 7)

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	54.08.135-A	OIL DEFLECTOR	STEEL 38XC GOST 4543-61	1

**Note:** Vendor / Contractor may use approved alternate material if any specified in drawing/ specification.\* Also refer Para no.13.

**9. CONDITIONS OF USE/STORAGE INSTRUCTIONS**

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

- (a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.
- (b) If the item consists of assemblies, each assembly should be packed separately.
- (c) The stores are to be suitably covered for preventing ingress of dust and Dirt/entry of sunlight / moisture.
- (d) The packaging slip shall contains
  - (i) Certificate of testing- NABL Certificate.
  - (ii) Guarantee/ Warranty Certificate
  - (iii) Service and maintenance instructions
  - (iv) Delivery Slip with Inspector's Acceptance Mark
  - (v) Undertaking letter / certificate of conformance (As applicable).
- (e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.

**10. SAMPLING PLAN:**

SI. No.	Sampling Plan	Pilot	Bulk
(i)	Visual Inspection	100%	100%

(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	100%	100%
(v)	Pressure testing	-----	-----
(vi)	Machining/Fitment/Performance trial on higher assembly / Tank	1 No.	1 No. per batch / As required.
vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
viii)	Test stand/Jigs/Fixtures/Gauges/Man drels/etc.	100 %	100 %
ix)	Marking/Identification	100%	100%
x)	Packing/Preservation	100%	100%

**Note:-**

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

**11. VISUAL INSPECTION [Sampling plan as per Para- 10 (i)]**

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts
- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

**12. DIMENSIONAL CHECK [Sampling plan as per Para- 10(ii)]**

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing.

Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

### 12.1 OIL DEFLECTOR TO DRG.NO 54.08.135-A

All dimensions should be confirmed as per drawing.

Sl. No.	Drawing Dimension
1.	R1.5 mm
2.	45°±2°
3.	1X45°
4.	Φ57±0.5 mm
5.	Φ 69 (+0.5 / -1.0) mm
6.	2±0.3 mm
7.	45°±1°30'
8.	1 <sup>+0.3</sup> mm
9.	3±0.2 mm
10.	8 <sub>-0.36</sub> mm
11.	Φ45X <sub>4</sub> (+0.25 / +0.08) mm
12.	Surface finish / Roughness of items should be ensured as per drawing and specification.

Refer drawing/specification for admissible alternate manufacture in dimensions/material if any specified for the component.

### 13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. NABL test reports for all the parameters as per relevant specifications to be submitted. Test samples to be submitted by the vendor to HVF, if required. The material check will be carried out as per sampling plan. \*However, if the manufacturer proposes any alternative material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

### 13.1 OIL DEFLECTOR TO DRG.NO.54.08.135-A

- a) The component should be manufactured from STEEL 38XC GOST 4543-61.

b) **Chemical properties:** As per STEEL 38XC GOST 4543-61 & GOST 4543-71.

Grade	CONTENT OF ELEMENTS%							
	C	Si	Mn	Cr	S	P	Cu	Ni
	MAX							
38XC	0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.035	0.035	0.30	0.30

**Note:** For mass fraction of other elements refer GOST 4543-71.

c) **Mechanical properties:** As per STEEL 38XC GOST 4543-61 & GOST 4543-71.

Grade	Yield point, (kgf/mm <sup>2</sup> )	Ultimate strength, (Kgf/mm <sup>2</sup> )	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm <sup>2</sup> )
	Not less than				
38XC	75	95	12	50	7

**Note:** For other properties refer GOST 4543-71.

**14) PERFORMANCES / ACCEPTANCE TEST: OIL DEFLECTOR TO DRG.NO:54.08.135-A**

1. RELATIVE TO Ø 45 & FACE "A" THE FOLLOWING IS ALLOWED.
  - a) RUN - OUT OF FACE B , SHOULD NOT EXCEED 0.08 MM.
  - b) RUN - OUT OF TAPER SURFACE & FACE "B" SHOULD NOT EXCEED 0.3 MM.
2. TO BE MADE RED HOT, HARDNESS HB 341 TO 285 ( Ø OF IND. 3.3 TO 3.6).
3. FACES SHOULD BE MARKED WITH ACIDIC MARK.
4. OXIDIZING / PHOSPHATING.
5. THE HARDNESS OF COMPONENT MAY BE CHECKED ON JOB.

**15) FITMENT AND PERFORMANCE TEST:**

- a. Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.
- b. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

**16) INTERCHANGEABILITY:**

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.

**17) CALIBRATION CHECKS**

**(TEST STANDS/JIGS/FIXTURES/GAUGES/INSTRUMENTS):**

The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

The supplier/contractor should submit calibration reports for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

**18) MARKING/IDENTIFICATION**

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification (Refer QAP Para No: 14(3)).

**19) PRESERVATION CHECK**

a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject to the thickness of the coating/preservative is maintained as per the drawing/specification.

b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

**20) PACKING CHECK**

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.



## **21) DOCUMENTATION**

- i. Firm has to maintain all the documents as per QAP with respect to the SI.No.to have traceability.
- ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.
- iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
- iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis (NABL Certificate), 2.Mechanical properties (NABL Certificate), 3. Pre-forming process, 4. Coating certification. 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports.

## **22) REFERENCE:**

1. Drawing No: 54.08.135-A
2. Material specification as per drawing:  
STEEL 38XC GOST 4543-61.
3. GOST 4543-61 & GOST 4543-71.
4. Alternate Material:
  - a. STEEL 817M20 (En24) to BS 970 Part-1: 1983.

SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS	
						Firm	HVF	DGQA		
1	OIL DEFLECTOR TO DRG. NO 54.08.135-A	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.	
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.	
3		Material tests	Chemical composition & Mechanical/ Physical Properties	As per-GOST 4543-61 & GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.	
4		Hardness checks	Hardness	341 to 285 HB ( $\phi$ of IND. 3.3 to 3.6)	Refer QAP Para no: 14(2) & 14(5)	Confirm to QAP Para no: 14(2) & 14(5)	P	V	R	SP followed by HVF.
5		Coating checks	Oxidizing/ Phosphating	Refer QAP Para no: 14(4)	Confirm to QAP Para no: 14(4)	P	V	R	SP followed by HVF.	
6		Dimensional checks	Dimensions as per the drawing	Refer drawing /QAP Para no: 12.1	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.	
7		Marking / traceability	Firm has to make marking / traceability records	Refer QAP Para no: 18 & 14(3).	Confirm to QAP Para no: 18 & 14(3).	P	V	R	100% by firm/ vendor.	
8		Preservation & packing	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.	

**Note:**

For conformity of the items (Chemical/Physical/Mechanical properties).

1. One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.

2. For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (WV) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P-Perform      W-Witness      V-Verify      R-Review      SP-Sampling Plan

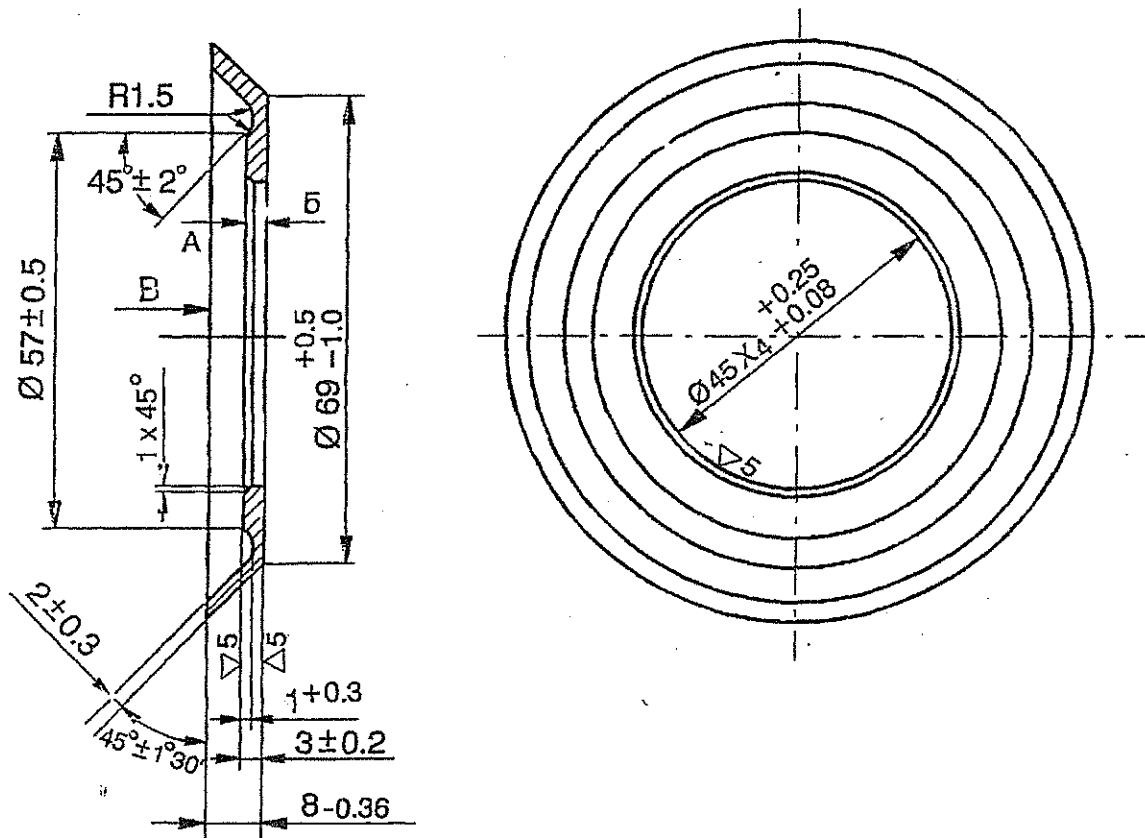


FIG: OIL DEFLECTOR TO DRG. NO 54.08.135-A



**RESTRICTED  
(DRAFT/PROVISIONAL)  
QUALITY ASSURANCE PLAN**

**FOR**

**(NUT)**

**DRG.NO. 172.23.112**

**(LF NO: 6201023089)**

**No HVF/T-72C/QAP/23/NUT/243215 - 00**

**ISSUE No: 00**

**DATE: DEC- 2021**

**QUALITY ASSURANCE (RIG-SUB ASSEMBLY)**

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**

**QUALITY ASSURANCE PLAN (QAP)**

**FOR**

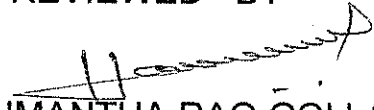
**NUT**

**DRG. NO. 172.23.112**

PREPARED BY

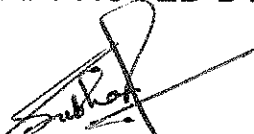
  
( C.NANDA KUMAR )  
JWM/QA (RIG-SA)

REVIEWED BY

  
(HANUMANTHA RAO GOLLA)  
JWM/QA (RIG-SA / TA)



APPROVED BY

  
( SUBHAM BNLWAN )  
AWM/QA-RIG-(SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)  
HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054

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## **1.IMPORTANT NOTE**

### **Note-1**

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### **Note –2**

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

### **Note-3**

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

### **Note-4**

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-"A".

### **Note-5**

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

## **2.INTRODUCTION**

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **NUT TO DRG.NO 172.23.112** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3.AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **NUT TO DRG.NO:172.23.112**.

It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

#### **4. SCOPE:**

This QAP outlines in general terms, the checks and methods to be used during inspection of **NUT TO DRG. NO. 172.23.112** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

#### **NOTE-I:**

- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
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#### **5. DOCUMENTS:**

- a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
- b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalents to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
- c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.
- d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges

etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

**6. ITEM USED ON:**

1. 176.23CB-3

**7. LIST OF DRAWINGS:**

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.23.112	NUT	-

**8. BILL OF MATERIALS: (Individual items as mentioned in table to Para 7)**

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.23.112	NUT	STEEL 38XC GOST 4543-71.	1

**Note:** Vendor / Contractor may use approved alternate material if any specified in drawing/ specification.\* Also refer Para no.13.

**9. CONDITIONS OF USE/STORAGE INSTRUCTIONS**

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

- (a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.
- (b) If the item consists of assemblies, each assembly should be packed separately.
- (c) The stores are to be suitably covered for preventing ingress of dust and Dirt/entry of sunlight / moisture.
- (d) The packaging slip shall contains
  - (i) Certificate of testing- NABL Certificate.
  - (ii) Guarantee/ Warranty Certificate
  - (iii) Service and maintenance instructions
  - (iv) Delivery Slip with Inspector's Acceptance Mark
  - (v) Undertaking letter / certificate of conformance (As applicable).
- (e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.

## 10. SAMPLING PLAN:

Sl. No.	Sampling Plan	Pilot	Bulk
(i)	Visual Inspection	100%	100%
(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	100%	100%
(v)	Pressure testing	-----	-----
(vi)	Machining/Fitment/ Performance trial on higher assembly / Tank	-----	-----
vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
viii)	Test stand/Jigs/ Fixtures/Gauges/Man drels/etc.	100 %	100 %
ix)	Marking/Identification	100%	100%
x)	Packing/ Preservation	100%	100%

### Note:-

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

## 11. VISUAL INSPECTION [Sampling plan as per Para- 10 (i)]

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts

- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.


Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

## 12. DIMENSIONAL CHECK [Sampling plan as per Para- 10(ii)]

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing. Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

### 12.1 NUT TO DRG.NO 172.23.112

All dimensions should be confirmed as per drawing.

SI. No.	Drawing Dimension
1.	3±0.2 mm
2.	2±0.3 mm
3.	15° *
4.	3H14 <sup>(+0.25)</sup> mm
5.	Φ99H14 <sup>(+0.87)</sup> mm
6.	8 <sup>+1</sup> mm (4 Places) (Refer Drawing)
7.	Φ91H14 <sup>(+0.87)</sup> mm
8.	3±0.3 mm
9.	2x45°
10.	45°
11.	M105x2-8h
12.	11.5 <sub>-0.2</sub> mm
13.	
14.	Surface finish / Roughness of items should be ensured as per drawing and specification.

Refer drawing/specification for admissible alternate manufacture in dimensions/material if any specified for the component.

### 13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. NABL test reports for all the parameters as per relevant specifications to be submitted. Test

samples to be submitted by the vendor to HVF, if required. The material check will be carried out as per sampling plan. \*However, if the manufacturer proposes any alternative material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

**13.1 NUT TO DRG.NO.172.23.112**

a) The component should be manufactured from STEEL 38XC GOST 4543-71.

b) **Chemical properties:** As per STEEL 38XC GOST 4543-71.

Grade	CONTENT OF ELEMENTS%							
	C	Si	Mn	Cr	S	P	Cu	Ni
	MAX							
38XC	0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.035	0.035	0.30	0.30

**Note:** For mass fraction of other elements refer GOST 4543-71.

c) **Mechanical properties:** As per STEEL 38XC GOST 4543-71.

Grade	Yield point, (kgf/mm <sup>2</sup> )	Ultimate strength, (Kgf/mm <sup>2</sup> )	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm <sup>2</sup> )
Not less than					
38XC	75	95	12	50	7

**Note:** For other properties refer GOST 4543-71.

**14) PERFORMANCES / ACCEPTANCE TEST: NUT TO DRG.NO:172.23.112**

1. 255 ... 302 HB.
2. ALTERNATE MATERIAL STEEL 30X1CA GOST 4543-71.
3. \* DIMENSIONS AND SURFACE FINISH ARE TO BE ENSURED BY TOOL.
4. COATING CHEMICAL PHOSPHATING OXIDIZING OIL FINISH OR CHEMICAL OXIDIZING OIL FINISHING.
5. OTHER REQUIREMENTS AS PER 520 TY 1.

**15) FITMENT AND PERFORMANCE TEST:**

- a. Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.

- b. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

**16) INTERCHANGEABILITY:**

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.

**17) CALIBRATION CHECKS**

**(TEST STANDS/JIGS/FIXTURES/GAUGES/INSTRUMENTS):**

The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

The supplier/contractor should submit calibration reports for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

**18) MARKING/IDENTIFICATION**

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification.

**19) PRESERVATION CHECK**

- a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject to the thickness of the coating/preservative is maintained as per the drawing/specification.
- b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

**20) PACKING CHECK**

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.

## **21) DOCUMENTATION**

- i. Firm has to maintain all the documents as per QAP with respect to the SI.No.to have traceability.
- ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.
- iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
- iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis (NABL Certificate), 2.Mechanical properties (NABL Certificate), 3. Pre-forming process, 4. Coating certification. 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports.

## **22) REFERENCE:**

1. Drawing No: 172.23.112.
2. Material specification as per drawing:  
STEEL 38XC GOST 4543-71.
3. GOST 4543-71.
4. Specification: 520 TY1.
5. Alternate Material:
  - a. STEEL 30XГCA GOST 4543-71.



SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	NUT TO DRG. NO 172.23.112	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per--GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 255 – 302 HB	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	V	R	SP followed by HVF.
5		Coating checks	Coating	Refer QAP Para no: 14(4)	Confirm to QAP Para no: 14(4)	P	V	R	SP followed by HVF.
6		Dimensional checks	Dimensions as per the drawing	Refer drawing /QAP Para no: 12.1	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
7		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18	Confirm to QAP Para no: 18	P	V	R	100% by firm/ vendor.
8		Preservation & packing	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.

**Note:**

For conformity of the items (Chemical/Physical/Mechanical properties).

- One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
- For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P-Perform      W-Witness      V-Verify      R-Review      SP-Sampling Plan

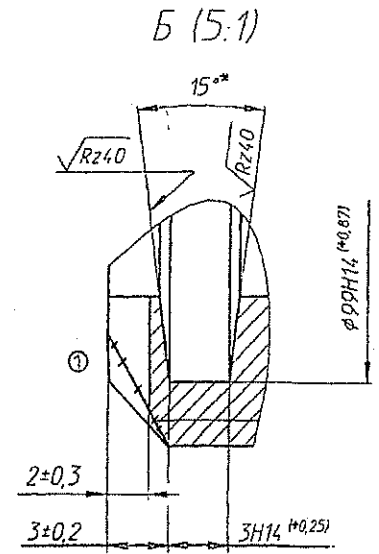
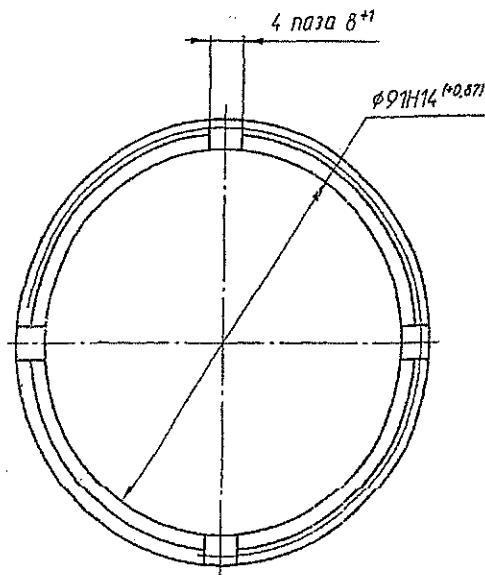
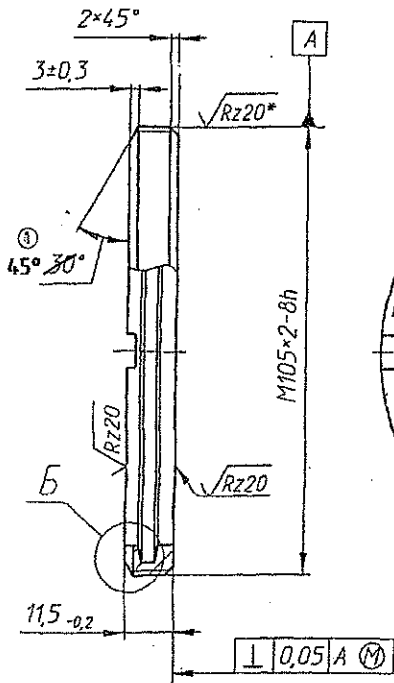


FIG: NUT TO DRG. NO 172.23.112



**RESTRICTED  
(DRAFT/PROVISIONAL)  
QUALITY ASSURANCE PLAN**

**FOR**

**(LEVER)**

**DRG.NO. 172.27.195**

**(LF NO: 6206210169)**

**No HVF/T-72/QAP/27/LEVER/241585- 00**

**ISSUE No:00**

**DATE: FEB-2022**

**QUALITY ASSURANCE (RIG-SUB ASSEMBLY)**

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**

**QUALITY ASSURANCE PLAN (QAP)**

**FOR**

**LEVER**

**DRG. NO. 172.27.195**

PREPARED BY

  
(C.NANDA KUMAR )  
JWM/QA (RIG-SA)

REVIEWED BY

  
(HANUMANTHA RAO GOLLA)  
JWM/QA (RIG-SA /TA)

APPROVEDBY

  
(SUBHAM BIJLWAN )  
AWM/QA-RIG-(SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)  
HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054

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## **1.IMPORTANT NOTE**

### **Note-1**

This is only a provisional and will be amended from time to time according to the requirement. No addition, deletion and reproduction will be done without permission of The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 54.

### **Note –2**

Any instruction contained in this does not prejudice the terms and conditions of the contract what so ever. In case of any contradiction between the contents of this QAP and the clause in the contract, the latter will prevail.

### **Note-3**

The stores should be manufactured strictly only as per the drawings supplied by the Inspection Authority and not as per the samples, if any received by the manufacturer for guidance purpose.

### **Note-4**

Any amendment issued by the Inspection Authority shall be incorporated in the QAP and the records for the amendments carried out should be maintained as per the Performa at Appendix-"A".

### **Note-5**

In case of any contradiction between the contents of this QAP and drawings issued along with the contract, the latter will prevail.

## **2.INTRODUCTION**

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **LEVER TO DRG.NO 172.27.195** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenously items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3.AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **LEVERTO DRG.NO:172.27.195**.

It also aims at giving adequate information to the manufacturer on the quality requirements so that the required quality control methods are established. This is also meant to guide authorized Inspection Officer in his routine inspection and to set out main points to which his attention must be drawn to ensure that the accepted stores meet the stipulated standards.

#### **4. SCOPE:**

This QAP outlines in general terms, the checks and methods to be used during inspection of **LEVER TO DRG. NO. 172.27.195** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

For inspection purpose, only the latest issue of this QAP will be made applicable and copies of this QAP can be obtained from the issuing authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

#### **NOTE-I:**

- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
- ii. In case of TE, It is responsibility of the vendor to obtain the copy of QAP and give the statement of compliance that vendor will abide by the QAP in case supply order is placed.
- iii. In case of S.O, it is the responsible of the vendor to obtained copy of QAP and give the statement of compliance that the vendor will follow QAP. However, GM/HVF reserves the right to revise/update the QAP from time to time.

#### **5. DOCUMENTS:**

- a) On placement of firm supply order, One set of relevant specification and technical instructions on the subject item can be obtained by the contractor from AHSP through DDO/HVF
- b) Any clarification required on these documents should be obtained from the Inspecting Authority i.e. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054. Equivalentents to the collaborators specifications and standards will be decided only by the Inspecting Authority and should not be unilaterally decided. For any change in the specifications, standards or written approval, any alterations in specification can be affected and not otherwise.
- c) The process instruction sheets supplied by the collaborators are available with the Authority Holding Sealed Particulars, i.e. The Controllerate of Quality Assurance (Heavy Vehicles), Avadi, Chennai for the reference. The relevant process sheets may be studied at the premises of the AHSP after obtaining necessary permission.
- d) The supplier after scrutiny of the concerned process sheets and connected paper particulars should establish the necessary production and inspection facilities. Particularly the inspection test rigs, stands, fixtures, template, gauges



etc should be provided as recommended in these process sheets. If process sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

**6. ITEM USED ON:**

**7. LIST OF DRAWINGS:**

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.27.195	LEVER	-

**8. BILL OF MATERIALS:(Individual items as mentioned in table to Para 7)**

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.27.195	LEVER	STEEL 38XC GOST 4543-71.	1

**Note:** Vendor/Contractor may use approved alternate material if any specified in drawing/ specification.\* Also refer Para no.13.

**9. CONDITIONS OF USE/STORAGE INSTRUCTIONS**

This assembly/item should be properly packed to protect from transit / handling damage and influence of atmospheric precipitations. In addition, the following parameters should be ensured:

- (a) The threaded parts if any should be covered with suitable plastic caps to prevent damages.
- (b) If the item consists of assemblies, each assembly should be packed separately.
- (c) The stores are to be suitably covered for preventing ingress of dust andDirt/entry of sunlight / moisture.
- (d) The packaging slip shall contains
  - (i) Certificate of testing- NABL Certificate.
  - (ii) Guarantee/ Warranty Certificate
  - (iii) Service and maintenance instructions
  - (iv) Delivery Slip with Inspector's Acceptance Mark
  - (v) Undertaking letter / certificate of conformance (As applicable).
- (e) The stores are not permitted to be stored together with oils. Petrol, acids, alkaline and other substances to avoid damage to the metal / rubber components.

## 10. SAMPLING PLAN:

Sl. No.	Sampling Plan	Pilot	Bulk
(i)	Visual Inspection	100%	100%
(ii)	Dimensional Inspection	100%	General Inspection level III, single sampling, Normal Inspection, AQL 2.5 of IS 2500 (Part-I)-2000
(iii)	Material Inspection	1 No	1 No. for each batch of raw material or heat treatment lot as required by specifications.
(iv)	Acceptance test	100 %	100 %
(v)	Pressure testing	-----	-----
(vi)	Machining/Fitment/ Performance trial on higher assembly / Tank	01 No.	01 No. per batch/As required.
(vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
(viii)	Test stand/Jigs/ Fixtures/Gauges/Man drels/etc.	100 %	100 %
(ix)	Marking/Identification	100%	100%
(x)	Packing/ Preservation	100%	100%

### **Note:-**

A New (First time supplier of this item) supplier should obtain clearance from HVF for bulk production which will be issued only after inspection/evaluation of pilot samples by HVF.

## 11. VISUAL INSPECTION [Sampling plan as per Para- 10 (i)]

The stores are to be visually examined on 100 % of pilot /bulk and same should be free from any defects and all the finishing requirements shall satisfy as indicated in technical conditions of the assembly / component drawing.

The components shall be checked for the following and should be free from the defects:

- Defects in construction
- Cracks/Dents/Scratches
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts

- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

**12. DIMENSIONAL CHECK[Sampling plan as per Para- 10(ii)]**

The dimensions of individual component, sub assembly and major assembly shall be checked and ensured as per respective drawing. Dimensional check should be carried out as per sampling plan. However, the inspecting authority/rep. may at his discretion, tighten the inspection level and acceptance quality level on the critical items and adopt check point during manufacture.

**12.1 LEVER TO DRG.NO172.27.195**

1. All dimensions should be confirmed as per drawing.
2. Place for testing hardness refer drawing.
3. Surface finish/Roughness of items should be ensured as per drawing and specification.
4. Spline/Gear details dimensions including profile is to be confirmed as per drawing.
5. Refer drawing/specification for admissible alternate manufacture in dimensions/material if any specified for the component.

**13) MATERIAL CHECKS [SAMPLING PLAN AS PARA – 10 (iii)]**

Material specimen /test bars of the components shall be in conformity as per the material mentioned in the relevant documents/drawing. NABL test reports for all the parameters as per relevant specifications to be submitted. Test samples to be submitted by the vendor to HVF, if required. The material check will be carried out as per sampling plan.\*However, if the manufacturer proposes any alternative material at the stage of tender enquiry, the same has to be approved and a written concurrence should be obtained from AHSP through DDO/HVF, before usage of such materials.

**13.1 LEVER TO DRG.NO.172.27.195**

a)The component should be manufactured from STEEL 38XC GOST 4543-71.

b)Chemical properties: As per STEEL 38XC GOST 4543-71.

Grade	CONTENT OF ELEMENTS%							
	C	Si	Mn	Cr	S	P	Cu	Ni
					MAX			
38XC	0.34 to 0.42	1.00 to 1.40	0.30 to 0.60	1.30 to 1.60	0.035	0.035	0.30	0.30

Note: For mass fraction of other elements refer GOST 4543-71.

c) Mechanical properties: As per STEEL 38XC GOST 4543-71.

Grade	Yield point, (kgf/mm <sup>2</sup> )	Ultimate strength, (Kgf/mm <sup>2</sup> )	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm <sup>2</sup> )
	Not less than				
38XC	75	95	12	50	7

Note: For other properties refer GOST 4543-71

**14) PERFORMANCES/ACCEPTANCE TEST: LEVER TO DRG.NO:172.27.195**

1. BHN 302-255 (DIA OF IND. 3.5-3.8).
2. UNSPECIFIED INTERNAL RADII 10 m.m MAX EXTERNAL-3 m.m MAX.
3. BUCKLING OF NOT TO BE MACHINED SURFACES 2 m.m MAX.
4. BULGE OF METAL AT PLACES OF STAMPED RECESS ARE ALLOWED.
5. AXIS PASSING THROUGH TIP OF TWO DIAMETERICALLY LOCATED TEETH OF SPLINES AND CENTRE OF SPLINE HOLE SHOULD BE LOCATED ON AXIS PASSING THROUGH CENTRE OF HOLE = 'b' MAY BE TURNED BY 30 MAX.
6. SPLINES SHOULD BE CHECKED FOR INTERCHANGEABILITY WITH SPLINE GAUGE.
7. DIMENSIONS OF SPLINE HOLE DIMENSIONS  $10 \pm 30$ ,  $7 \pm 0.5$  AND PARALLELITY OF HOLES SHOULD BE CHECKED BEFORE SLITTING.
8. NON COINCIDENCE OF SIDE OF SLOT AND SURFACES E. OF BOSS SHOULD NOT BE MORE THEN 1 m.m.
9. SHOULDERS OF 0.5 m.m MAX FROM TO MILLING ON SURFACES A ARE ALLOWED.
10. COMPONENT MAY BE MACHINED AS SHOWN WITH CONNECTIONAL LINE.
11. COATING: CHEMICAL OXIDIZING PHOSPHATING, OIL FINISHING.
12. COATING OF ALL SURFACES, EXCEPT SPLINES AND HOLES. PRIMER 8A-03K. WHITE ENAMEL 118-115 OR WHITE ENAMEL 118-223-02. REQUIREMENTS AS PER 520 T95.
13. REST OF REQUIREMENTS SHOULD BE IN COMPLIANCE WITH 520 TY1.
14. \* DIMENSIONS FOR REFERENCE.

**SPLINE DETAILS**

SYMBOL	-	Tp 25X30-S2
NUMBER OF TEETH	Z	30
WIDTH OF TOOTH-SPACE ALONG REFERENCE CIRCLE CHORD	S <sub>0</sub>	1.24 $\pm 0.15$ $\pm 0.1$
REFERENCE DIAMETER	d <sub>0</sub>	23.75

**15) FITMENT AND PERFORMANCE TEST:**

- a. Pilot samples should be checked for fitment and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.
- b. Items of Bulk supplies may be subjected to performance trial in tank in case of repeated failure/defects during exploitation.

**EXPLANATORY NOTE:**

- 1) Stage wise process and inspection of the component as specified in TD Book/ Process Book/ illustration book/specification is to be confirmed by the supplier during manufacturing the components.
- 2) Firm shall submit details of manufacturing process, inspection process and also reports for the same to HVF.
- 3) If required/applicable HVF shall witness/verify stage wise inspection /process details during manufacturing of the components.
- 4) The component may be subject to endurance test, when fitted in higher assembly as specified in process / illustration /TD book.

**16) INTERCHANGEABILITY:**

The assemblies/component should be interchangeable component wise and assembly wise, except the Component are to be supplied as a set and to be assembled selectively as per sampling plan.

**17) CALIBRATION CHECKS**

**(TEST STANDS/JIGS/FIXTUERS/GAUGES/INSTRUMENTS):**

The supplier / Contractor should have suitable Instruments, Test Stand, jigs, fixture, mandrels and gauges to carry out quality checks, to ensure conformance of components/assembly as per drawing and Specification /T.R points.

The supplier/contractor should submit calibration reports for instruments/fixtures/gauges/mandrels etc., which are used during process of inspection activities.

**18) MARKING/IDENTIFICATION:**

Marking of the items is to be carried out as called for in the relevant drawing, drawing/T.R points.

Inscription if any on the components is to be carried out as called for in the drawing/T.R points. Unless otherwise specified in the drawing/ specification, marking should not be carried out over the components.

For traceability, marking of part No., Manufacturer name, supply order No, Serial No/Qty, batch No. and manufacture date & year are to be carried out. Suitable method can be adopted, provided that the above parameters are legible and considering the parameters mentioned in the drawing and specification.

**19) PRESERVATION CHECK**

- a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS Standards can also be followed, subject to the thickness of the coating/preservative is maintained as per the drawing/specification.
- b) Other preservations as necessary to prevent damages due to moisture and dust during process, storage and transit are to be carried out. Conventional Methods can also be resorted to.

**20) PACKING CHECK**

Components / Assemblies are to be packed separately to avoid damages during transit / handling of the same. Part No. and No. of sets are to be marked on the packing.

Packing and preservation should be ensured as per drawings/relevant TY specification (To be ensured on receipt at consignee end).

Finished products shall be wrapped / packed using black and opaque polyethylene sheet or bags.

**21) DOCUMENTATION**

- i. Firm has to maintain all the documents as per QAP with respect to the SI.No.to have traceability.
- ii. Vendor has to submit Bill of materials, Material test reports, Class 'C' /Endurance test reports (wherever specified in drawing/TY specification/QAP) and Complete PIR (pre-inspection report)at the time of offering the item for inspection. HVF will commence inspection only after scrutiny of these documents.
- iii. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
- iv. Pre inspection reports (PIR) of firm like, 1. Chemical analysis (NABL Certificate), 2.Mechanical properties(NABL Certificate), 3. Pre-forming process, 4. Coating certification. 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports including reports of spline / gear profiles.

**22) REFERENCE:**

- 1. Drawing No:172.27.195
- 2. Material specification as per drawing:  
STEEL 38XC GOST 4543-71.
- 3. GOST 4543-71
- 4. Specification: 520 TY 1 & 520 TY 5
- 5. Alternate Material :

ALT MATL :-

STEEL 708 M 40, CONDITION 'T' TO BS : 970 Pt 1 : 1983

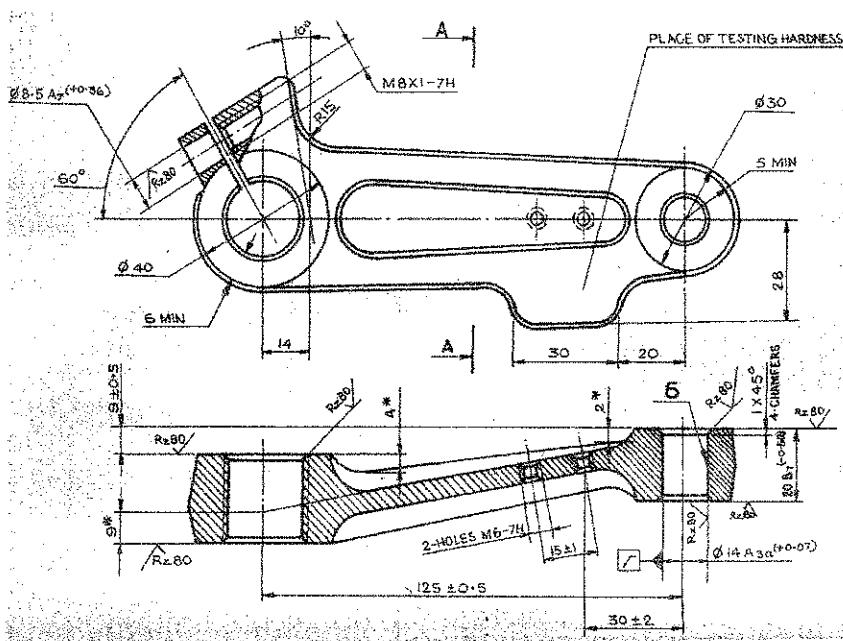
COATING :-

PHOSPHATING TO JSS - 0465 - 01 : 93,

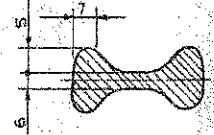
CLASS II, FINISH 13 (9)

**ANNEXURE-A**

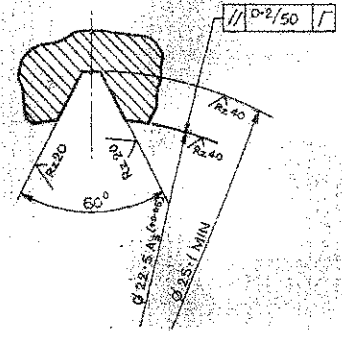
SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	LEVER TO DRG. NO 172.27.195	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP(Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness BHN 302-255 (Dia of Ind. 3.5-3.8)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	V	R	SP followed by HVF.
5		Coating	Coating	Refer QAP Para no: 14 (11) & 14(12)	Confirm to QAP Para no: 14(11) & 14(12)	P	V	R	SP followed by HVF.
6		Dimensional checks	Dimensions as per the drawing	Refer drawing /QAP Para no: 12.1	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
7		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18	Confirm to QAP Para no: 18	P	V	R	100% by firm/ vendor.
8		Preservation & packing	Firm has to make Preservation & packing records	Refer QAP Para no: 19 & 20	Confirm to QAP Para no: 19 & 20	P	V	R	100% by firm/ vendor.
<p><b>Note:</b> For conformity of the items (Chemical/Physical/Mechanical properties).</p> <p>1. One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.</p> <p>2. For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.</p>									
<b>P- Perform</b>		<b>W- Witness</b>		<b>V-Verify</b>		<b>R-Review</b>		<b>SP-Sampling Plan</b>	



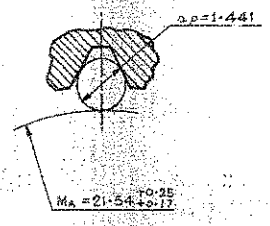
**A-A (TURNED)**



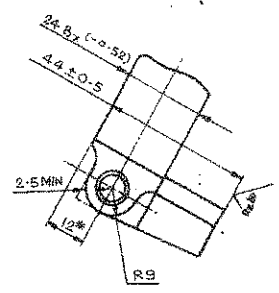
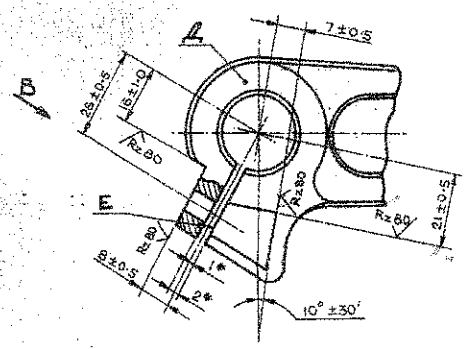
**TEETH PROFILE SCALE: 10:1**



**CHECKING ALTERNATIVE OF SPLINE TEETH SCALE: 10:1**



**VIEW-B**



**FIG: LEVERTO DRG. NO 172.27.195  
(For reference only)**






**MACHINED COMPONENTS (GROUP -V)**

Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
1	Components as per enclosed list of Machined Components (Group V)  Total items = 39 Nos	TECHNOLOGY-1	Turning	CNC Turning machine suitable to accommodate component upto 150 mm diameter with 0.010mm accuracy			
			Milling & Drilling	HMC and/or VMC suitable to the components upto the size 630mm diameter with 0.010 accuracy			
			Gear Hobbing	Gear Hobbing of Mod 8 x cutting ø250 with gear cutting accuracy of class of Din 7 or better accuracy			
			Grinding	Internal/ External /Surface grinding machine as per component requirement with 0.010mm accuracy			
			Gear Grinding	Generation and/ or Profile type Gear grinding machine to accommodate Mod 8 x 200mm gear with gear grinding accuracy class of Din 5 or better accuracy			
			Broaching		Broaching as per component requirement		
			Honing		Honing for Dia 20mm to 100mm with accuracy of 0.002 mm.		
		TECHNOLOGY-2	Heat Treatment		Carburising, Hardening, Induction Hardening & Tempering furnace with Oil quenching facility suitable to the components		
		Protection coating		Oxidising , Phosphating suitable to the components			

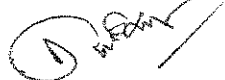
  
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Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks	
1	Components as per enclosed list of Machined Components (Group VI)	TECHNOLOGY-3	Raw material				Firm should be capable to arrange the raw material like forging, bar material etc as per drawing specification and standard.	
		TEST / INSPECTION-1	3D CMM	3D CMM 300 x 300mm				
			Surface Roughness Tester			Surface Roughness Tester for Ra & Rz values		
			Gauges	Standard Gauges for checking Holes and threads suitable to the requirement of the components. Firm should submit the undertaking in this regard that they will create the facilities within 6 months from the date of receipt of order.				
			Measuring Instruments	Vernier Caliper, Groove Vernier, Gear tooth Micrometer, Radius gauge, Feeler Gauge etc. suitable to the requirement of the components		Roll tester with required master gears Profile projector with 10x magnification		
		TEST / INSPECTION-2	Hardness measurement			Brinell / Rockwell Hardness Tester		


**Note : Justification for alternate facilities may be shared to prove that alternate facilities can be utilised to manufacture the item wherever the facilities are mentioned above are not available, but vendor has alternate facilities.**

  
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(ANIMESH PAIK)  
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### MACHINED COMPONENTS (GROUP -I)

Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks	
1	Components as per enclosed list of Machined Components (Group I) <i>Total items = 114 Nos</i>	TECHNOLOGY-I	Turning	CNC Turning machine suitable to accommodate components upto dia 100mm diameter with 0.010mm accuracy				
			Milling & Drilling	HMC/VMC machine suitable to component requirement with 0.010mm accuracy				
			Grinding	Internal/ External /Surface grinding machine as per component requirement upto 0.010mm accuracy				
		TECHNOLOGY-2	Heat Treatment		Carburising, Hardening, Induction Hardening & Tempering furnace with Oil quenching facility suitable to the components			
			Protection coating		Oxidising , Phosphating, Zinc chromatising, Hard Chromium Plant suitable to the components			
		TECHNOLOGY-3	Raw material		Firm should be capable to arrange the raw material like forging, casting, bar material etc as per drawing specification and standard.			

  
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Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item	Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
1	Components as per enclosed list of Machined Components (Group I)	TEST / INSPECTION-1	3D CMM	3D CMM 300 x 300 mm		
			Surface Roughness Tester		Surface Roughness Tester for Ra & Rz values	
			Gauges	Standard Gauges for checking Holes and threads suitable to the requirement of the components. Firm should submit the undertaking in this regard that they will create the facilities within 6 months from the date of receipt of order.		
			Measuring Instruments	* Vernier Caliper, Groove Vernier, Radius gauge, Feeler Gauge etc. suitable to the requirement of the components		
		TEST / INSPECTION-2	Hardness measurement		Brinell / Rockwell Hardness Tester	

**Note : Justification for alternate facilities may be shared to prove that alternate facilities can be utilised to manufacture the item wherever the facilities are mentioned above are not available, but vendor has alternate facilities.**

  
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### MACHINED COMPONENTS (GROUP -II)

Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
1	Components as per enclosed list of Machined Components (Group II) <i>Total items = 48 Nos</i>	TECHNOLOGY-1	Turning	CNC Turning machine suitable to accommodate component upto 150 mm diameter with 0.010mm accuracy			
			Milling & Drilling	HMC/VMC machine as per component requirement with 0.010mm accuracy			
			Grinding	Internal/ External /Surface grinding machine as per component requirement with 0.010mm accuracy			
			Gear machining *		Gears machining by Hobbing / Gear Shaping/ Broaching method as per component requirement with class 7 accuracy		
		TECHNOLOGY-2	Heat Treatment		Carburising, Hardening, Induction Hardening & Tempering furnace with Oil quenching facility suitable to the components		
			Protection coating		Oxidising , Phosphating, Zinc chromatising, Hard Chromium Plant suitable to the components		
		TECHNOLOGY-3	Raw material		Firm should be capable to arrange the raw material like forging, casting, bar material etc as per drawing specification and standard.		

  
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Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
1	Components as per enclosed list of Machined Components (Group II)	TEST / INSPECTION-1	3D CMM	3D CMM 300 x 300mm			
			Surface Roughness Tester		Surface Roughness Tester for Ra & Rz values		
			Gauges	Standard Gauges for checking <del>holes and threads</del> suitable to the requirement of the components. Firm should submit the undertaking in this regard that they will create the facilities within 6 months from the date of receipt of order.			
			Measuring Instruments	* Vernier Caliper, Groove Vernier, Gear tooth Micrometer, Radius gauge, Feeler Gauge etc. suitable to the requirement of the components	Profile projector for checking profiles / splines of 10X magnification		
		TEST / INSPECTION-2	Hardness measurement		Brinell / Rockwell Hardness Tester		

**Note : Justification for alternate facilities may be shared to prove that alternate facilities can be utilised to manufacture the item wherever the facilities are mentioned above are not available, but vendor has alternate facilities.**

  
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