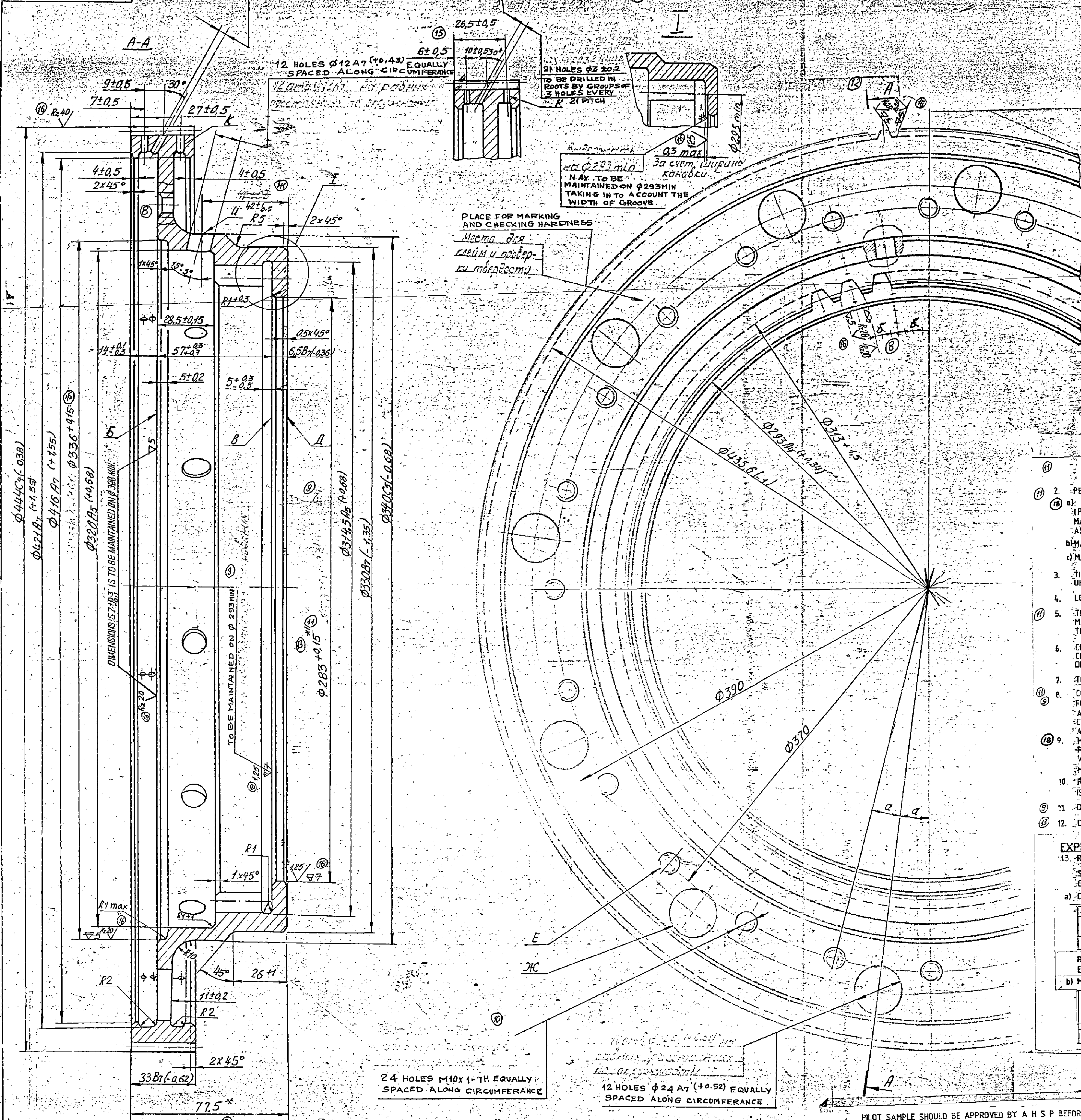


21 HOLES $\phi 3 \pm 0.2$ TO BE DRILLED IN ROOTS BY GROUPS OF 3 HOLES EVERY 21 PITCH

DRILLING OF 21 HOLES $\phi 3 \pm 0.2$ ACCORDING TO ALTERNATIVE 1



MODULE		m	5
BASIC RACK	NUMBER OF TEETH	Z	80
	PROFILE ANGLE	α_n	20°
	COEFFICIENT OF ADDENDUM	f'	0.7
DEPENDENDUM	DEPENDENDUM	f''	1.3
	FILLET RADIUS	r _{fl}	26.5 ± 0.5
COEFFICIENT OF ADDENDUM MODIFICATION	ϵ	0	
ACCURACY AS PER GOST 1643-56			
TOLERANCE FOR COMPOSITE ERROR DOUBLE BLANK		Δa	± 0.19
COMPOSITE ERROR DOUBLE BLANK	TOTAL	δ_{0a}	0.19
	TOOTH TO TOOTH	δ_{0a}	0.11
TOLERANCE FOR BASE-TANGENT-LENGTH		δ_{0L}	0.075
TOTAL ERROR OF DISTORTION		δ_{B0}	0.026
BASE TANGENT LENGTH		L	100.14 ± 0.33
MATING COMPONENT 175.40.158.0			
MODULE		m	3
NUMBER OF TEETH		Z	147
BASIC RACK	PROFILE ANGLE	α_n	20°
	COEFFICIENT OF ADDENDUM	f'	0.7
	DEPENDENDUM	f''	0.9
FILLET RADIUS	r _{fl}	0.3	
COEFFICIENT OF ADDENDUM MODIFICATION	ϵ	0	
BASE TANGENT LENGTH		L	152.04 ± 0.21
TOLERANCE FOR BASE TANGENT LENGTH		δ_{0L}	0.2
REFERENCE DIAMETER		d_a	441
MATING COMPONENT 172.40.031.0			

- PERMISSIBLE TO SURFACE $\phi 283$ AND FACE "A"
- MAXIMUM END PLAY OF FACES "B" AND "B" AND SURFACE $\phi 336$ ON $\phi 300$ (PITCH CIRCLE OF TEETH M=5 ON ROLLER) 0.1mm. CHECKING OF RUN OUT OF $\phi 300$ MAY BE SUBSTITUTED BY CHECKING TEETH M=5 BY MEANS OF STANDARD GEAR AS PER THE PARAMETERS SPECIFIED IN THE TABLE.
 - b) MAXIMUM PLAY OF TIPS OF TEETH $\phi 444$ ϵ_1 0.2mm.
 - c) MAXIMUM PLAY OF ALL OTHER SURFACES 0.3mm.
- THREADED HOLES ARE TO BE COUNTERSUNK AT AN ANGLE OF 90° TO 120° UP TO THE MAJOR DIAMETER OF THREAD ON THE SIDE OF THE FACE "B"
- LOCAL MARKS UP TO 0.2mm DEEP ARE ALLOWED ON SURFACES OF TEETH M=3
- TEETH M=3 SHOULD BE CHECKED FOR INTER CHANGEABILITY WITH TOOTH GAUGE, MADE IN COMPLIANCE WITH THE LOWER DEVIATION OF MATING COMPONENTS. IN THIS CASE, THE GAUGE SHOULD BE ALIGNED TO SUIT $\phi 283$.
- CHECKING OF TEETH FOR VARIATION IN HEIGHT CAN BE ALTERNATIVE TO THE CHECK OF TEETH M=3 PERFORMED WITH TOOTH GAUGE. VARIATION IN DEPTH OF ANY PAIR OF TEETH SHOULD NOT EXCEED 0.3mm.
- TO BE HEAT-TREATED. BHN 341 - 285 (DIA OF INDENTATION 3.3 TO 3.6)
- COATING OF SURFACE $\phi 283$ HARD CHROME PLATING WITH THICKNESS 42 TO 70 MICRONS FOR OTHER SURFACES, CHEMICAL OXIDE - PHOSPHATING. SURFACE FINISH BEFORE AND AFTER CHROMIUM PLATING IS $\sqrt{25}$ CHROMIUM MAY BE APPLIED TO R1 + 0.3, BUT IN THIS CASE ADHESION OF CHROMIUM - PLATED SURFACE. TRACES OF CHROMIUM ON FACE "A" ARE ALLOWED
- MAXIMUM DISPLACEMENT FOR AXES OF HOLES "E" FROM THE TRUE POSITION IS 0.2 mm FOR THOSE OF HOLES "U" AND "K" IT IS 0.5 mm AND FOR THOSE OF HOLES "K" IT IS WITHIN THE WIDTH OF TOOTH SPACE. MARKS LEFT BY DRILL ON THE SIDE SURFACE OF TOOTH $M=3$ AT A HEIGHT OF NOT MORE THAN 1 mm FROM TOOTH ROOT ARE PERMISSIBLE
- RELATIVE POSITION OF HOLES "E" AND "K" WITH RESPECT "U" AND "K" IS OPTIONAL.
- DIMENSION MARKED WITH ASTERISK (*) IS GIVEN FOR REFERENCE.
- DIMENSION MARKED WITH ASTERISK (*) IS GIVEN AFTER COATING.

EXPLANATORY NOTE

13. REFERENCE MATERIAL QUOTED:- STEEL 38Xc GOST 4543-71

STRUCTURAL CHROMIUM SILICON ALLOY STEEL GOOD QUALITY GRADE 38Xc GOST 4543-71.

a) CHEMICAL COMPOSITION: AS PER STEEL GRADE 38Xc GOST 4543-71.

CONTENT OF ELEMENTS%					
C	Si	Mn	Cr	S	P
0.34-0.42	1.0-1.4	0.30-0.60	1.30-1.60	0.035	0.035
MAX					

RESIDUAL CONTENT OF COPPER AND NICKEL SHOULD NOT EXCEED 0.30% EACH

b) MECHANICAL PROPERTIES:- AS PER STEEL GRADE 38Xc GOST 4543-71

TENSILE STRENGTH	YIELD POINT	ELONGATION	REDUCTION IN AREA	IMPACT STRENGTH
Kgf/mm ²	Kgf/mm ²	%	%	Kgm/cm ²
95	75	12	50	7
MINIMUM				

13. POSITIONAL TOLERANCE OF AXES OF HOLE E, R 0.2 (MMC TOLERANCE) U AND * R 0.5 (MMC TOLERANCE)

DRG. INDIANISED BASED ON RUSSIAN ORIGINAL. ISSUE 16. "COMMON TO BLT"

24 HOLES M10x1-7H EQUALLY SPACED ALONG CIRCUMFERENCE

12 HOLES $\phi 24$ A7 (+0.52) EQUALLY SPACED ALONG CIRCUMFERENCE

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

EST. MASS 11.77 Kg. 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	DATE	MATERIAL	USED ON
CHD		STEEL 38Xc GOST 4543-71	172 40 023 Cb
APPD			
DATE	25-07-89		
SCALE	1:1		
DIMENSIONS IN mm.			
TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS 2102-69.			
ALL THREADS TO CONFORM TO			
ISSUE	DATE	NATURE OF AMENDMENTS	
18	22.8.89	172M. 376'A-87. (AL. 9/4)	
17	17-11-88	Amnd. List 6/II, Book-7.	

CONTROL RATE OF QUALITY ASSURANCE (HEAVY VEHICLE) A V A D I

TITLE RIM GEAR, II TRAIN

D S CAT NUMBER 175 40 025



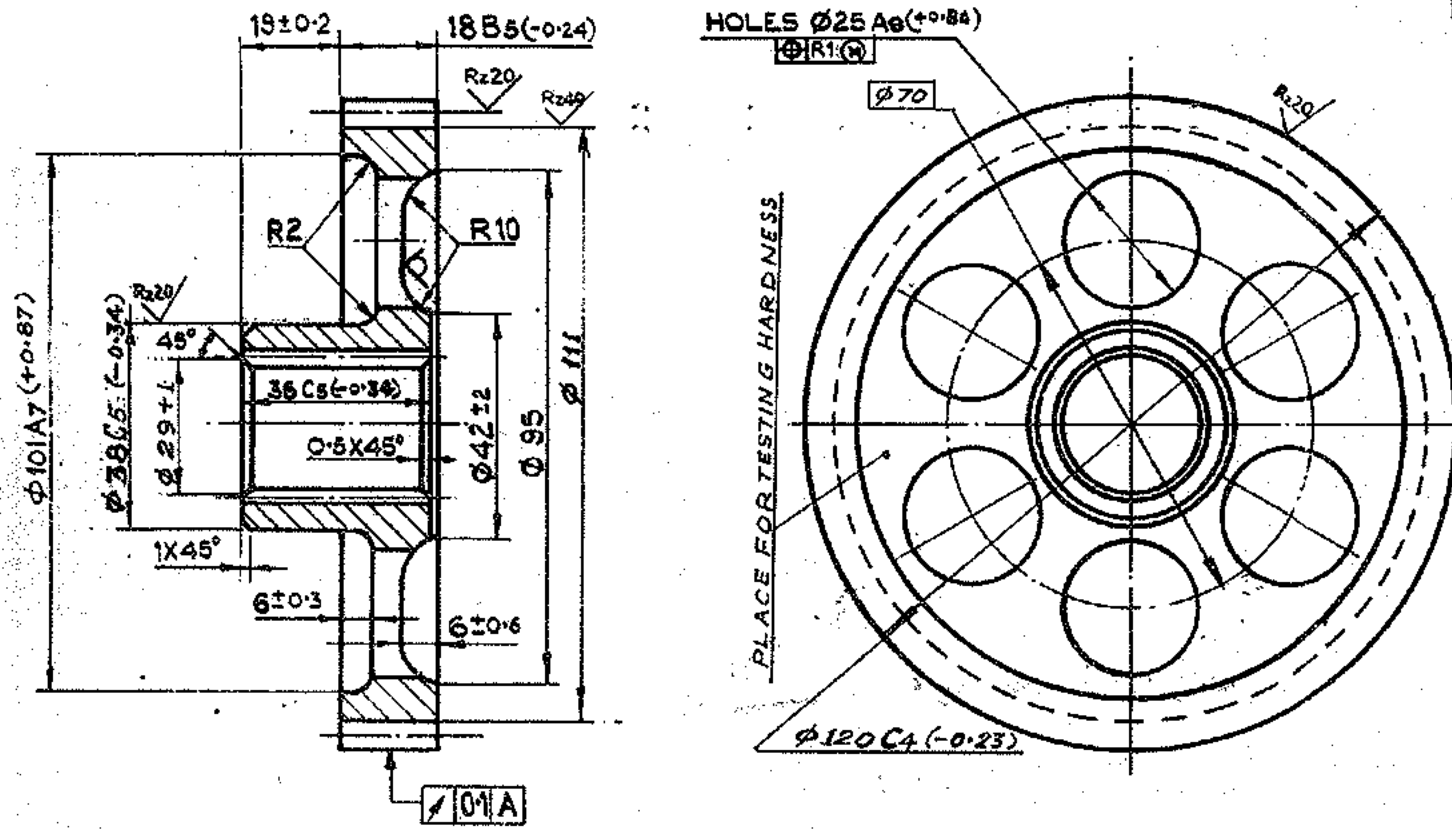
PART No

172-28-016-2A

INSPECTION NOTE:- FOR LIST OF GAUGES AND FIXTURE REFER GAUGE SHT. No. GS(W)-10144, SHT. 1 TO SHT. 2.

Rz 80

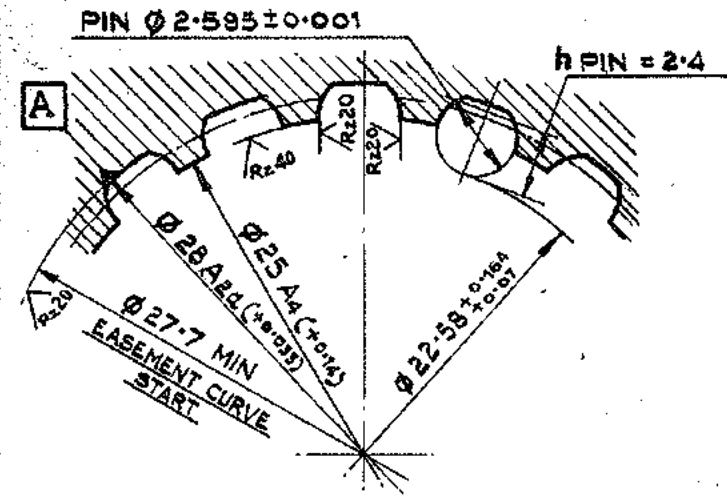
जांची गई सही प्रति
 CERTIFIED CORRECT COPY OF
 मुद्रित दस्तावेज की
 SEALED DRAWING AS ON
 21/3/12
 कृते निदेशक भुषणता
 FOR CONTROLLER OF QUALITY
 आश्वासन (क वा आ) आवडि चेन्ने 54
 ASSURANCE (AVA) AVADI CHENNA 54



MODULE	m	2
NUMBER OF TEETH	Z	59
PROFILE ANGLE	α	20°
BASIC RACK	COEFFICIENT OF ADDENDUM	f1
	ENT OF DEDUNDUM	f''
	FILLET RADIUS	r1
ADDENDUM MODIFICATION COEFFICIENT	g	-0.5
ACCURACY AS PER GOST 164372		Cm 8X
BASE TANGENT LENGTH	L	39.326 ^{+0.14} _{-0.21}
TOLERANCE ON BASE TANGENT LENGTH	δ_{ol}	0.048
TOLERANCE ON COMPOSITE ERROR DOUBLE FLANK	TOTAL TOOTH TO	δ_{oa}
	TOOTH	δ_{ja}
		0.13
		0.055
TOTAL ERROR OF DISTORTION	δ_{θ}	0.021
REFERENCE DIAMETER	da	118
DESIGNATION OF HOLE AS PER GOST 6033-51		3628X1.5X18 A2aS3a
MODULE	m	1.5
NUMBER OF TEETH	Z	18
PROFILE ANGLE OF BASIC RACK	α_0	30°
ADDENDUM MODIFICATION SHIFT	X	-0.25
REFERENCE DIAMETER	da	27
TOOTH SPACE WIDTH ALONG THE ARC OF REFERENCE CIRCLE	S θ	2.067 ^{+0.008} _{-0.003}
FOR CHECKING NOMINAL THICKNESS OF TEETH ALONG THE ARC OF REFERENCE CIRCLE OF COMPLEX GAUGE		2.067
REFERENCE DIMENSION		27.7 MIN. IS TO BE CHECKED WITH COMPLEX GAUGE.

PROFILE OF INNER INVOLUTE SPLINES 3628 x 1.5 x 18 A2a S3a.

SCALE-5:1



NOTES:-

- 1- BHN 302-255 (INDENTATION DIA 3.5-3.8).
- 2- SPLINES ARE TO BE CHECKED FOR INTERCHANGEABILITY WITH COMPLEX GAUGE. TO BE CHECKED AS PER GOST 6528-53.
- 3- COATING: CHEMICAL OXIDIZING/PHOSPHATING; OIL FINISHING OR CHEMICAL OXIDISING; OIL FINISHING.
- 4- THE REMAINING REQUIREMENTS ARE AS PER 520TY-1.

ALT MATL:- STEEL, Gr 708 M 40/U, B5: 970 PE 1-1983.

11-02-10/0055-AVA	DS CAT No. ADDED				
26-6-03/18768-W	INSPECTION NOTE ADDED.				
18-9-17930-W	ALT MATL ADDED.				
31-8-87	RETRACED WITHOUT CHANGE				
DATE	AUTHORITY	ZONE	NATURE	Sig	Sig
				AHSP	DO
AMENDMENTS			MATERIAL:- STEEL 38XC GOST 4543-71		
DRG SEALED:- D C(W) No. 16476-W			PROTECTIVE FINISH:-		
DATE 22-10-86.			DO CI(W)		

GROUP No	F128
40001KD	31
C.Q.A(AVA)AVADI	
DESIGN No.	
PART No.	172-28-016-2A
DS CAT No.	3020-015513

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18814-W HINDI NOMEN ADDED 22-10-03

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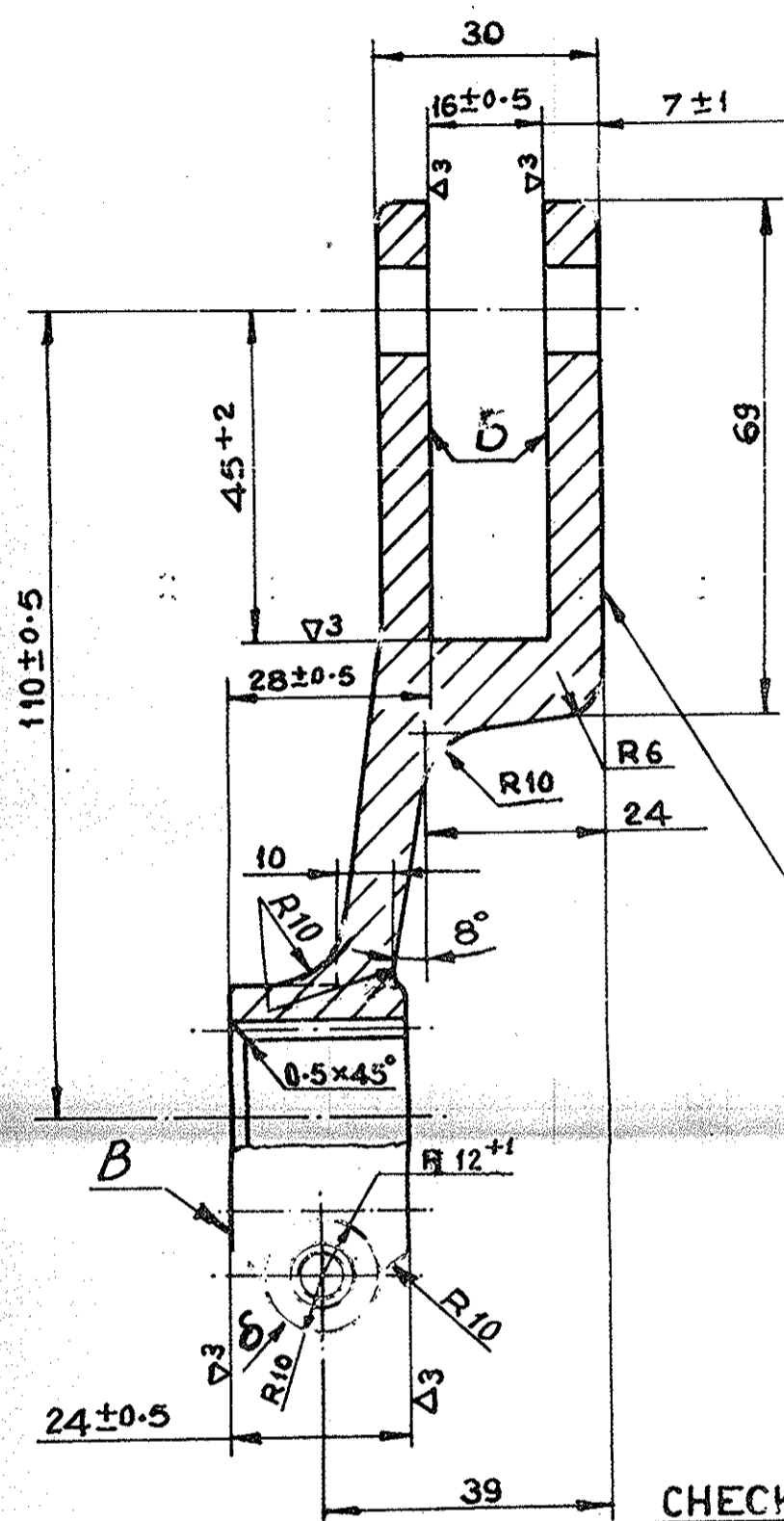
PART No/DS CAT No.

3015-000004

ALT MATL:- STEEL 708 M40, CONDITION T
TO BS-970 PT 1:1983
COATING:- PHOSPHATIN TO JSS-0465-01:93,
CLASS II, FINISH 13 (9)

NOTES:-

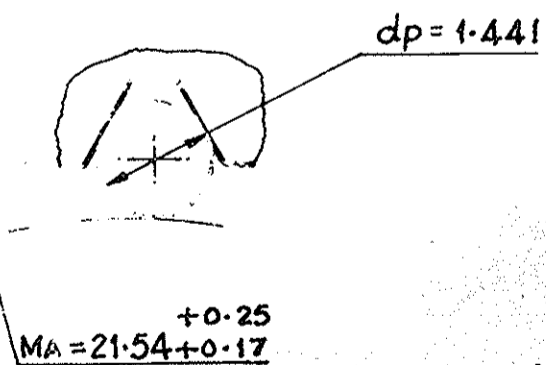
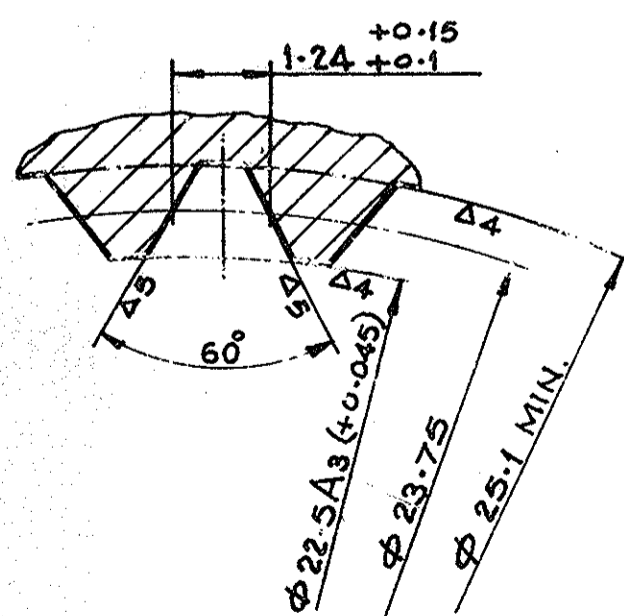
1. TO BE HARDENED. HARDNESS BHN 302-255(DIA.OF IND 3.5-3.8).
2. EXTERNAL DRAFTS SHOULD BE UP TO 7°.
3. PARTING LINE OF DIES IS ARBITRARY.
4. MISMATCH OF DIES SHOULD BE UP TO 1mm.
5. UNDERCUT FLASH SHOULD BE UP TO 1mm.
6. BACKLING OF SURFACES AFTER STAMPING SHOULD BE UP TO 15mm.
7. UNSPECIFIED STAMPING RADII SHOULD BE UP TO 3 mm.
8. TOLERANCES ON STAMPING DIMENSIONS SHOULD BE AS PER GOST 7505-55 III GROUP.
9. NON PARALLELITY OF WALLS "B" OF SLOT HAVING A WIDTH OF 16 mm RELATIVE TO SURFACE "B" SHOULD NOT EXCEED 0.3 mm WHEN OVERALL DIMENSIONS OF SLOT.
10. NON SQUARENESS OF AXIS OF HOLE $\phi 12$ TO WALL "B" OF SLOT WITH A WIDTH OF 16 mm MAY NOT EXCEED 0.5 mm AT SLOT LENGTH.
11. NON SQUARENESS OF AXIS OF SPLINE HOLE TO FACE "B" SHOULD NOT EXCEED 0.3 mm. WHEN OVERALL DIMENSIONS OF COMPONENT.
12. DIMENSION "A" SHOULD BE NOT LESS THAN 5mm, B NOT LESS THAN 2.5 mm.
13. SPLINES SHOULD BE CHECKED FOR INTERCHANGEABILITY WITH SPLINE GAUGE BEFORE SLITTING.
14. TECHNICAL REQUIREMENTS FOR NOT TO BE MACHINED SURFACES SHOULD BE AS PER GOST 8479-57.
15. COATING OF ALL SURFACES, EXCEPT SPLINES AND HOLES. PRIMER α -03K. KHAKI ENAMEL XB-518. REQUIREMENTS AS PER 520 T95.
16. SHIFT OF TOOTH SPACE FROM AXIS γ SHOULD NOT EXCEED 30'.
17. FACE MAY BE MADE TO DIMENSION 24+0.5 BY EMBOSSING.
18. SPOTFACING R12 MAY BE MACHINED AS SHOWN WITH DOTTED LINE.



PLACES OF TESTING HARDNESS

CHECKING ALTERNATIVE OF SPLINE TEETH
SCALE:- 10:1

PROFILE OF SPLINES
SCALE:- 10:1



QTY OF SPLINES Z = 30
PITCH ALONG PITCH CIRCLE ARC $\phi = 2.4871$
DESIGN THICKNESS OF TOOTH ALONG
PITCH CIRCLE, ALONG ARC S = 1.24355
ALONG CHORD S = 1.24308

REV	DATE	DESCRIPTION	BY	CHECKED	DATE	GROUP No.					
13-12-85	17826-W	DESCAT NO. 3015-000004 WAS 1015-003010			22/10/83	18814-W HINDI NOMEN. ADDED.					
27.1.83	17512-W	REF AMDT 13/15. DIMN. R10 SHOWN AT ONE MORE PLACE.			5-3-84	17908-W ALT MATL & COATING NOTE ADDED.					
6.12.91	17163-W	PARA 15 AMENDED.									
4.7.91	17088-W	DS CAT No. ADDED									
9-11-89		RETRACED WITHOUT CHANGE									
DATE		AUTHORITY	ZONE	NATURE	SIG. AHSP	SIG. D.O.	C/D'MAN	D.O.	FOR CQA(W)	ESTD. MASS. 0.46	DESIGN No.
AMENDMENTS			MATERIAL: STEEL 38XC, GOST 4543-61			PROTECTIVE FINISH.			DESIGN No.		
DRG. SEALED: 16469-W			8-10-86			D.O. CQA(W)			PART No.		
									172. 27. 061 A		
									D.S. CAT. No.		
									3015-000004		

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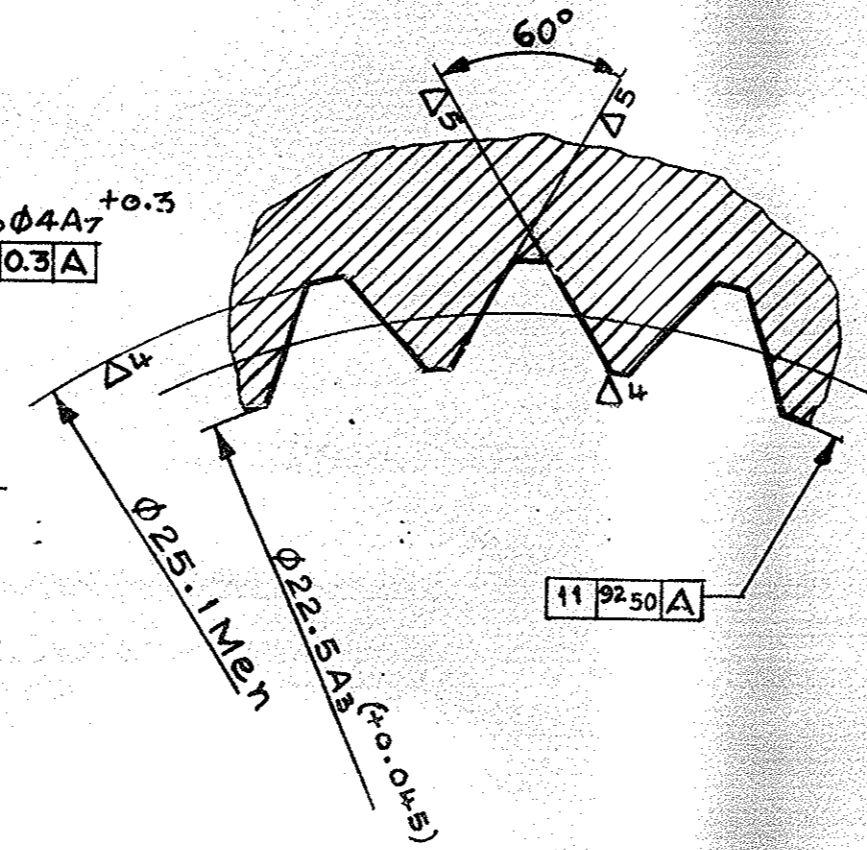
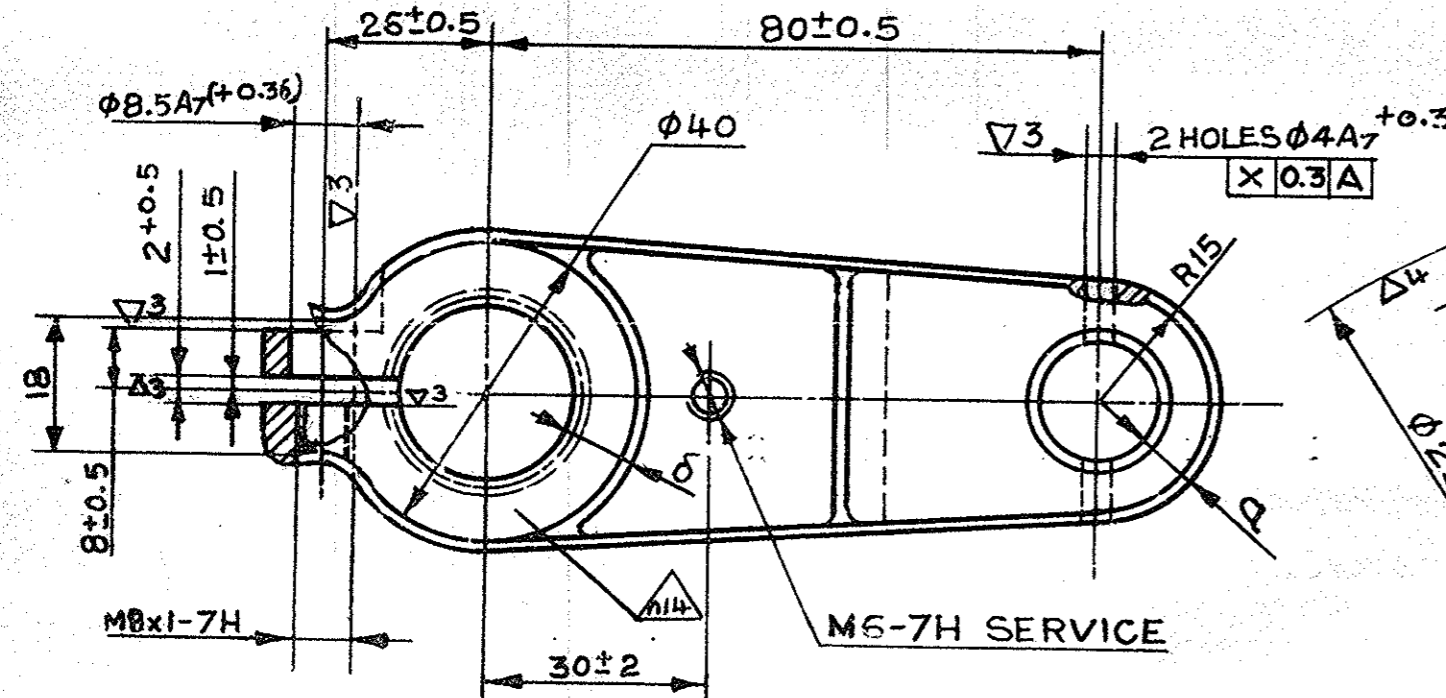
PART No./DS CAT No

1015-003012

ALT MATL :- STEEL, 708 M 40, COND'T OR 709 M 40
TO BS- 970 PE 1: 1983
COATING :- PHOSPHATING TO JSS- 0465- 01 : 1993,
CLASS II / III, FINISH 13 (?)

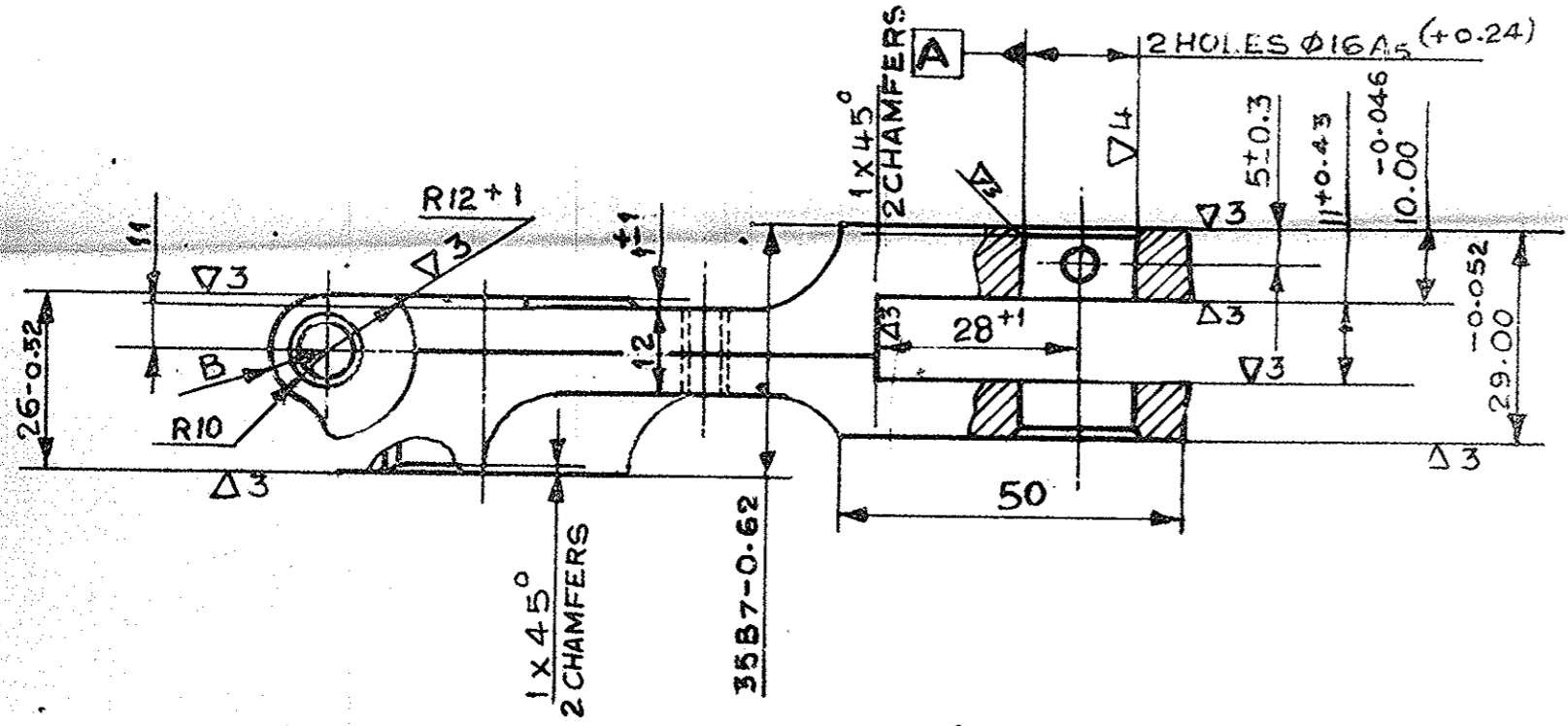
SHAFT SYMBOL		
NUMBER OF TEETH	Z	30
REFERENCE DIAMETER	d_g	23.75
TOOTH-SPACE WIDTH ALONG REF CIRCLE CHORD	S_a	$1.24^{+0.15}$

PROFILE OF TEETH
SCALE 10:1

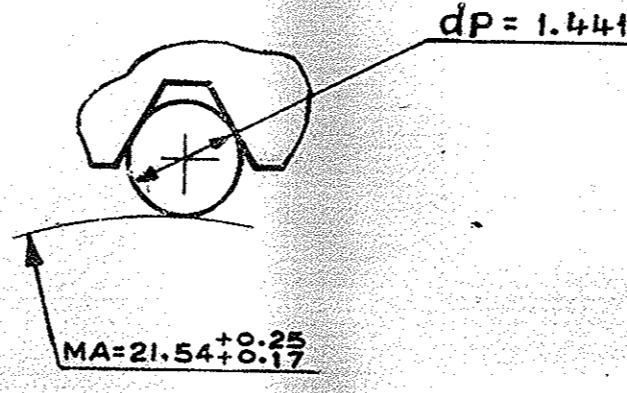


NOTES:

- BHN 302-255 (DIA. OF INDENTATION 3.5-3.8) TO BE CHECKED IN BLANK.
- EXTERNAL DRAFTS UP TO 7° .
- UNSPECIFIED ROUNDING OFF EXTERNAL RADII UP TO 10 mm, INTERNAL RADII UP TO 3 mm.
- TOLERANCES ON ROUGH DIMENSIONS SHOULD BE IN COMPLIANCE WITH GOST 7505-55, ACCURACY III GROUP.
- TECHNICAL REQUIREMENTS ON UNMACHINED SURFACES SHOULD BE IN COMPLIANCE WITH GOST 8479-70.
- DIMENSION "A" SHOULD BE NOT LESS THAN 6 mm, "B" NOT LESS THAN 7.5 mm
"B" - NOT LESS THAN 2.5 mm.
- RADI OF TOOL UP TO R 1.5 mm.
- AXIS PASSING THROUGH LIP OF TWO DIAMETERICALLY OPPOSITE TEETH OF SPLINES, IS TO BE LOCATED ON AXIS, PASSING THROUGH CENTRE OF HOLES $\phi 16$ AND SPLINE ALLOWED SHIFT IS 30' MAX.
- END FACES 26 AND 29 ARE TO BE MADE BY EMBOSSING.
- BUCKLING OF COMPONENT SHOULD BE UP TO 1.5 mm.
- DIE PARTING LINE IS ARBITRARY.
- SPLINES ARE TO BE CHECKED FOR INTERCHANGEABILITY WITH COMPLEX GAUGE BEFORE SLITTING.
- DIMENSION $\phi 22.5 A_3 (+0.045)$ IS TO BE CHECKED BEFORE SLITTING.
- TO BE MARKED.
- COATING : CHEMICAL OXIDIZING PHOSPHATING OR CHEMICAL OXIDIZING.
- COATING OF ALL SURFACES , EXCEPT SPLINES AND HOLES . PRIMER KA-03K. KHAKI ENAMEL XB-518 . REQUIREMENTS ASPER 520 T45.



ALTERNATE OF CHECKING OF TEETH OF SPLINES SCALE 10:1



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CERTIFIED CORRECT COPY
मुद्रित रेखाचित्र की
SEALED DRAWING AS ON
27/2/12
FOR CONTROLLER OF QUALITY
आश्वासन (क वा आ) जाकि वेन - 54
ASSURANCE (AVA) AVADI CHENNAI 54

22-10-03	18814-W		HINDI NOMEN. ADDED.	
01-8-02	18692-W	5-C-D	DIMNS. 10-00-0.046 WAS 10.046 & DIMNS. 29-00-0.052 WAS 29.052.	
11-3-94	17921-W		ALT MATL & COATING NOTE ADDED.	
6.12.91	17163-W		PARA 16 AMENDED.	
4.7.91	17088-W		D S CAT No. ADDED	
8-3-90			RETRACED WITHOUT CHANGE	
DATE	AUTHORITY	ZONE	NATURE	SIG AHSP SIG DO

DRG SEALED: 16469-W
Dt 8-10-86
D O CQA(W)

DRAWN: CHD: ASSY DRG:
TRACED: CHD: DATE:
AHSP FOR CQA(W) ESTD MASS: 0.38

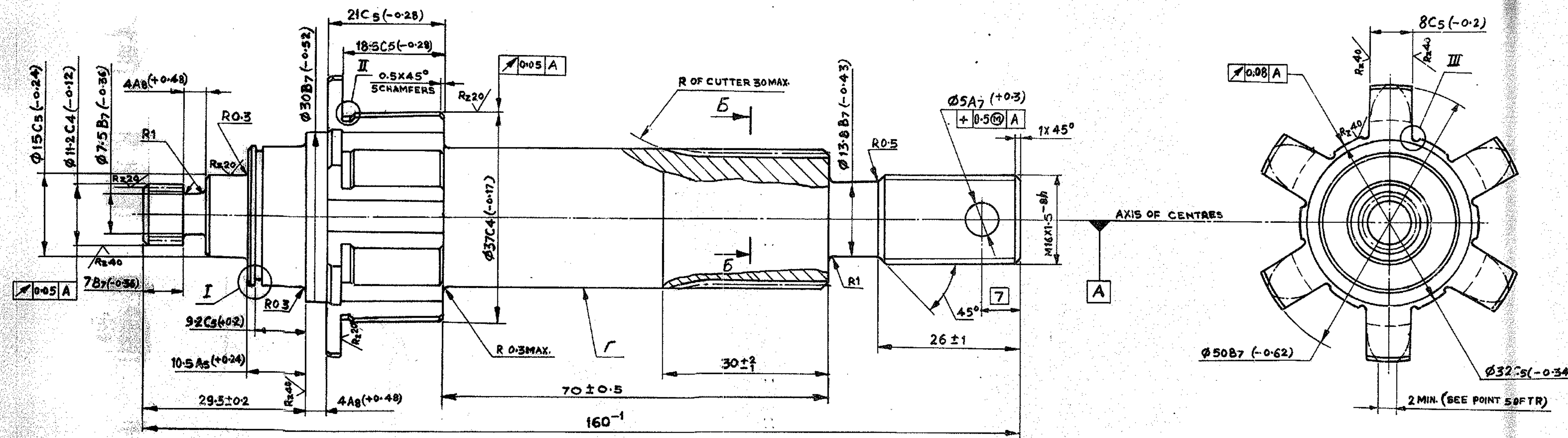
MATERIAL: STEEL 38XC GOST 4543-71
PROTECTIVE FINISH:

GROUP No	F125
40001 KD	11
CQA(AVA) AVADI	
DESIGN No.	
PART No.	172-27-063
D S CAT No.	1015-003012

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PART No/D'S CAT No
3040-002409

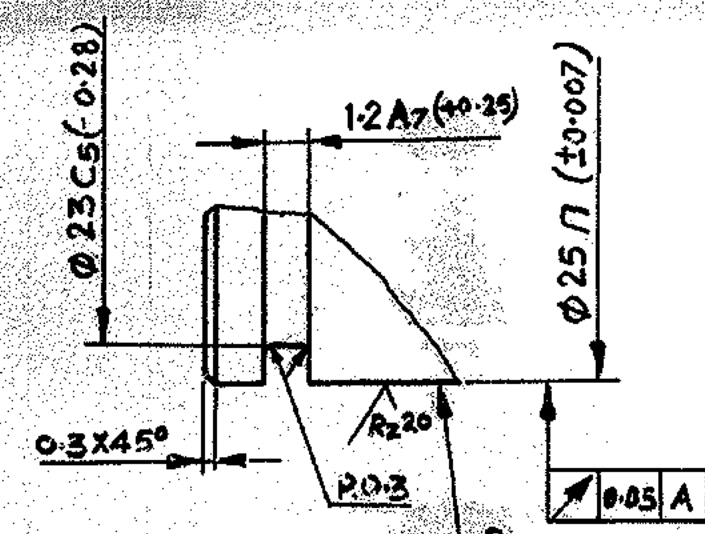
Rz 80/(✓)



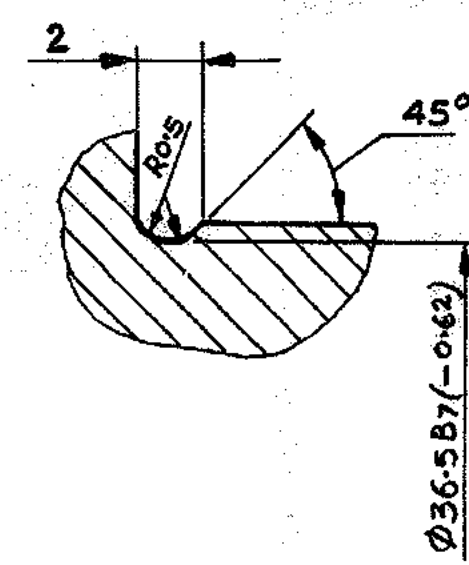
MODULE	m	0.7
NUMBER OF TEETH	z	14
BASIC RACK PROFILE	PROFILE ANGLE	α 20°
	ADDENDUM	f' 1
	DEDENDUM	f'' 1.2
FILLET RADIUS	r_f	0.3
ADDENDUM MODIFICATION COEFFICIENT	ξ	0
DEGREE OF ACCURACY AS PER GOST 1643-56		Cm-8-X
BASE TANGENT LENGTH	L	3.237 ± 0.13
TOLERANCE OF BASE TANGENT LENGTH DEVIATION	δ_L	0.026
TOLERANCE ON COMPOSITE ERROR DOUBLE FLANK	TOTAL	δ_{α} 0.11
	TOOTH TO TOOTH	δ_{α} 0.055
TOLERANCE ON TOOTH DIRECTION	δ_{β}	0.025
DIAMETER OF REFERENCE CIRCLE	d_d	9.8
DRAWING NUMBER OF MATING WHEEL		175.74.008

NOTES:-

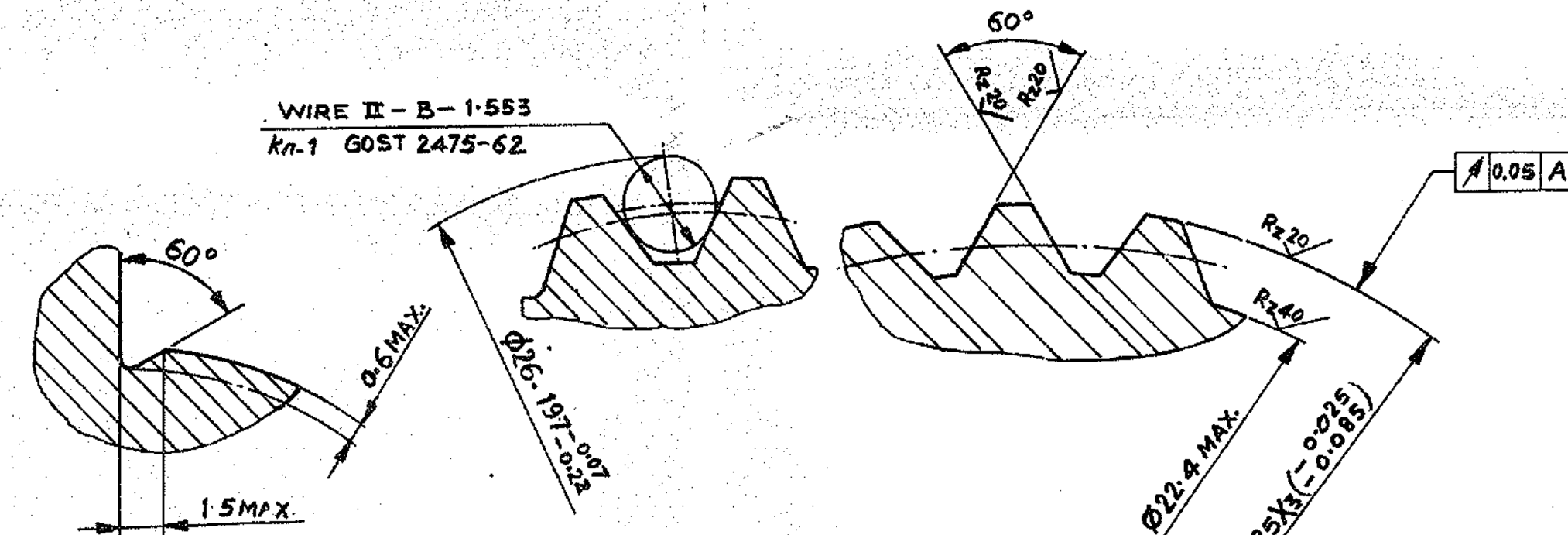
- 1 - B.H. 302...255 (IND DIA 3.5...3.8) TO BE CHECKED IN BLANK.
- 2 - ON SURFACES 'B' AND 'I' TO FACILITATE THE PASS OUT OF CUTTING WHEEL, A GROOVE UP TO 2 mm WIDE AND 0.5 mm DEEP IS ALL WED
- 3 - THE SPLINES ARE TO BE CHECKED FOR THE INTER CHANGEABILITY OF SPLINE GAUGE. STRAIGHT SPLINES ARE TO BE CHECKED AT A LENGTH OF 18.5 (+0.28) MIN.
- 4 - COATING - CHEM. OXID. PHOSP. OIL FINISHING OR CHEM. OXID. OIL FINISHING.
- 5 - ON THE SECTION, LIMITED WITH DIMENSIONS 37C4 AND 50B7 INVOLUTE PROFILED SPLINES MAY BE MADE WITH SURFACE ROUGHNESS $Rz 80$ INVOLUTE PROFILE IS NOT TO BE CHECKED.
- 6 - DURING THE PASSING OUT OF TOOL ON TEETH OF MODULE 0.7 FROM THE SIDE OF GROOVE 7.5, LAYER OF METAL MAY BE REMOVED UP TO 0.1 mm. DEPTH AT A LENGTH OF UPTO 1 mm.



I
SCALE 5:1



II
SCALE 5:1



III
SCALE 5:1

B-5
SCALE 10:1
ALTERNATIVE METHOD FOR CHECKING THE SPLINES

B-5
SCALE 10:1

SHAFT LEGEND	-	TP 25 X 30 S2
NUMBER OF TEETH	z	30
TOOTH THICKNESS ALONG REFERENCE CIRCLE	s_d	1.24 ± 0.08
REFERENCE CIRCLE DIAMETER	d_d	23.75

ALT MATL:- STEEL GRADE 708 M 40 OR 709 M 40 OR 530 M 40 TO BS:970 Pt 1:1983 TO TEST CONDITION 'T'
 PHOSPHATING TO JSS-0465-01:1993, CLASS II / III, FINISH 13 (1)

अवि. सह. सर्वो प्रति
 CERTIFIED CONNECT COMPANY
 मुद्रित संशुद्धि से
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कुले निषेकक गुणत
 FOR CONTROLLER OF QUALITY
 आवादी (के. वी. आ.) आवास, फ-54
 ASSURANCE (AVA) AVADI, CHENNAI, 54

01-8-02	18692-W	DIMN. 18-5C5 (-0.28) WAS 18-5A5 (+0.28)	
11-3-94	17919-W	ALT MATL & PHOSPHATING NOTE ADDED.	
4.7.91	17088-W	D S CAT No. ADDED.	
9.11.90	16973-W	IN FRONT VIEW DIMNS 70±0.5 ADDED & 35A7 (+0.52) DELETED	
24-2-90		RETRACTED WITHOUT CHANGE	
		PREV DCS (I) No: 6473 W & 16749-W DT. 203-83	
DATE	AUTHORITY	ZONE	NATURE
			SIG AHSP DO
AMENDMENTS			
DRG. SEALED:- DC (I) No. 16473-W DATE 16-10-86 D O CQA(W)			

DRAWN -	CHD -	ASSY DRG -	CQA(AVA) AVADI
TRACED - L Singh	CHD - G. P. Thakur	DATE -	
	AHSP	SCALE - 2:1	DESIGN No.
	DO FOR CQA(W)	ESTD MASS - 0.41	
MATERIAL - STEEL 38XC GOST 4543-71			PART No. 172.26.014-1 D S CAT No. 3040-002409
PROTECTIVE FINISH -			

SHAFT

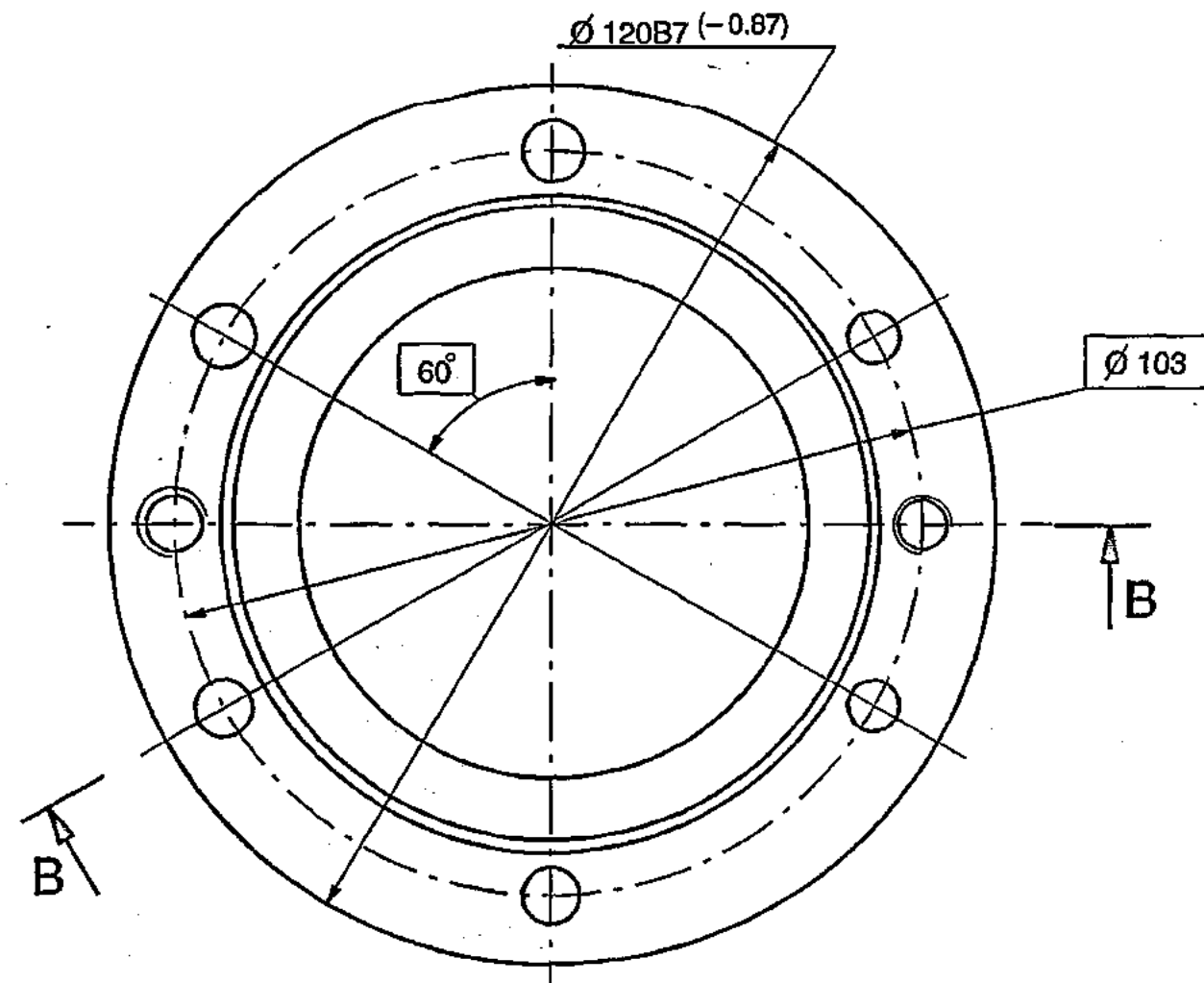
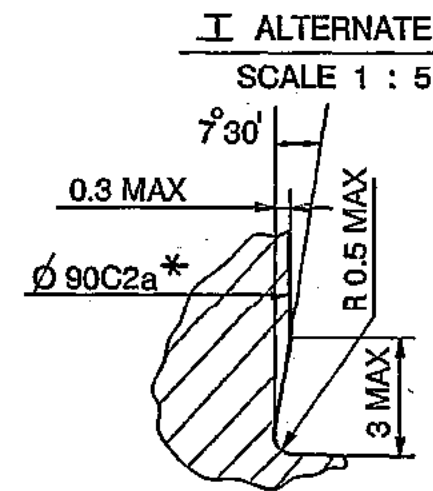
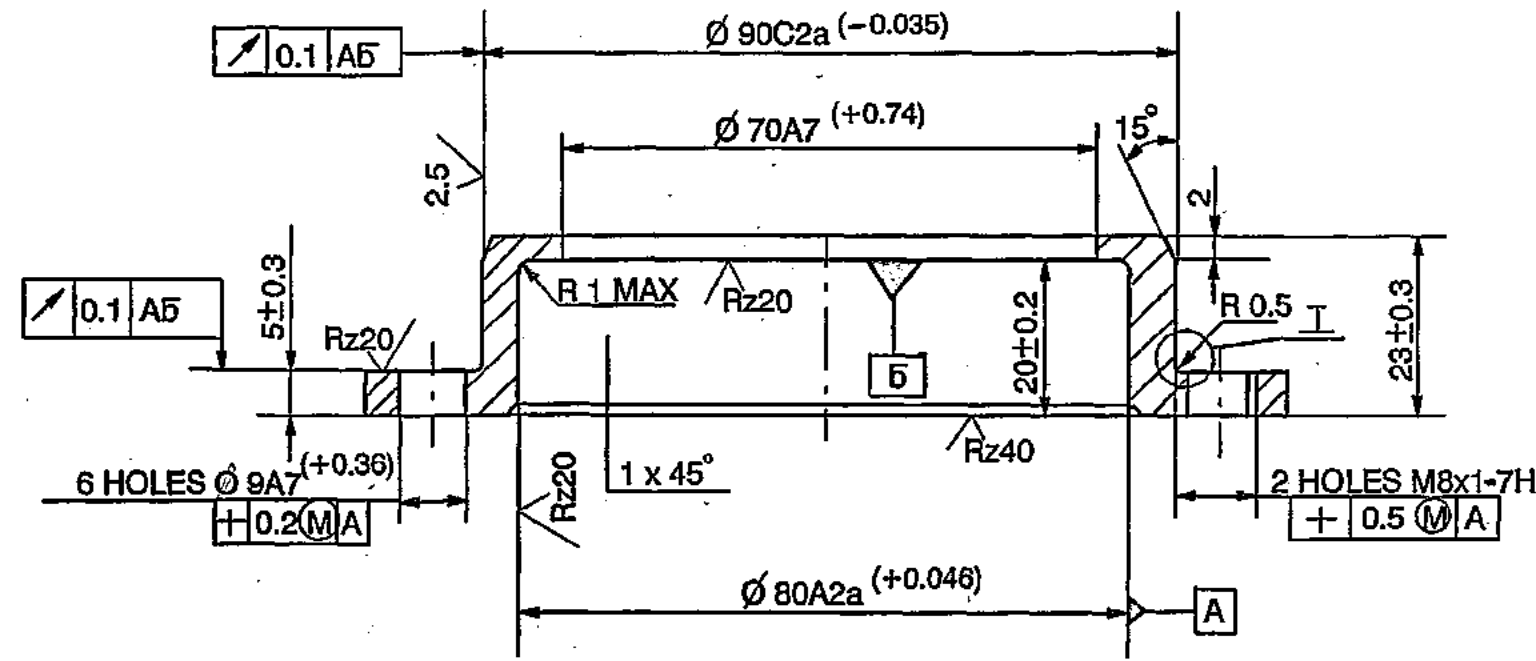
GROUP No. F122
 40001 KA 35

DRAWING NUMBER
176.23.122

SHEET No. 1 OF 1

Rz80 (✓)

B - B



1. BHN 302 ... 255 (DIA OF INDENTATION 3.5 ... 3.8) MAY BE CHECKED IN THE BLANK.
2. ON THE SURFACE 80A2a AND 90C2a. RECESS FOR OUTLET OF TOOL WITH A WIDTH NOT EXCEEDING 2 mm AND DEPTH UPTO 0.3 mm ARE ALLOWED.
3. GROOVES MAY BE MADE OF 90Ca AS PER THE ALTERNATE.
4. ELLIPTICITY FOR CYLINDRICAL SURFACES 80A2a AND 90C2a MAY NOT EXCEED 0.05 mm, PROVIDED THE MEAN ARITHMETIC MEASUREMENTS OF MAXIMUM AND MINIMUM DIAMETERS OF EACH SURFACE REMAINS WITHIN THE LIMITS OF THE DRAWINGS.
5. COATING: CHEMICAL OXIDIZING, OIL FINISH OR CHEMICAL OXIDOPHOSPHATING, OIL FINISH.
6. NOT TO BE STAMPED BY PUNCHING.
7. OTHER REQUIREMENTS ARE AS PER 520 TY 1.
- 8.* DIMENSIONS FOR REFERENCE.

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	Sd/=	MATERIAL:-	USED ON:-
CHD	Sd/=	STEEL 38XC	172.23.012cbCb
APPD	Sd/=	GOST 4543-71	176.23cb-3Cb (2A)
DATE	30.09.88	CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES)	
SCALE:- 1 : 1		AVADI	
DIMENSIONS IN mm		TITLE:-	
TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS : 2102 - 69		SLEEVE	
ALL THREADS TO CONFORM TO		D S CAT NUMBER	DRAWING NUMBER
2A	20.01.04	N OF A.No.CQA(HV)/T-90/23/001	176.23.122
ISSUE	DATE	NATURE OF AMENDMENTS	

IR.RAMANI,JTO
24-05-06

DRG. REINDIANISED BASED ON RUSSIAN ORIGINAL ISSUE -2, VIDE AMDT.LIST 6/II - BOOK-4,
COMMON TO T-90

F-5B
73

SIZE A2

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

FOR

(GEAR)

DRG.NO. 172.28.016-2A

(LF NO: 6206211067)

No HVF/T-72C/QAP/28/GEAR/243309 - 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. 172.28.016-2A


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 **GEAR TO DRG.NO 172.28.016-2A** 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:172.28.016-2A**.

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. 172.28.016-2A** 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	172.28.016-2A	GEAR	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.28.016-2A	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 172.28.016-2A

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. 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.172.28.016-2A

- 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 ²)	Ultimate strength, (Kgf/mm ²)	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm ²)
	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:172.28.016-2A

- 1- BHN 302-255 (INDENTATION DIA 3.5-3.8).
- 2- SPLINES ARE TO BE CHECKED FOR INTERCHANGEABILITY WITH COMPLEX GAUGE. TO BE CHECKED AS PER GOST 6528-53.
- 3- COATING: CHEMICAL OXIDIZING/PHOSPHATING, OIL FINISHING OR CHEMICAL OXIDISING, OIL FINISHING.
- 4- THE REMAINING REQUIREMENTS ARE AS PER 520TY-1.

GEAR DETAILS:

MODULE		m	2
NUMBER OF TEETH		z	59
BASIC RACK	PROFILE ANGLE	α_s	20°
	COEFFICIENT OF ADDENDUM	f_1	1
	COEFFICIENT OF DEDUNDUM	f_2	1.25
	FILLET RADIUS	r_f	0.8
ADDENDUM MODIFICATION COEFFICIENT		ξ	-0.5
ACCURACY AS PER GOST 16437-72			Cm 8X
BASE TANGENT LENGTH		L	39.326 ± 0.14
TOLERANCE ON BASE TANGENT LENGTH		δ_{Ll}	0.048
TOLERANCE ON COMPOSITE ERROR DOUBLE FLANK	TOTAL	δ_{Σ}	0.13
	TOOTH TO TOOTH	$\delta_{j\alpha}$	0.055
TOTAL ERROR OF DISTORTION		$\delta_{\Sigma 0}$	0.021
REFERENCE DIAMETER		d_a	118
DESIGNATION OF HOLE AS PER GOST 6033-81		3828X1.5X18 A2aJ3a	
MODULE		m	1.5
NUMBER OF TEETH		z	18
PROFILE ANGLE OF BASIC RACK		α_0	30°
ADDENDUM MODIFICATION SHIFT		x	-0.25
REFERENCE DIAMETER		d_0	27
TOOTH SPACE WIDTH ALONG THE ARC OF REFERENCE CIRCLE		S_0	2.067 ± 0.02
FOR CHECKING	NOMINAL THICKNESS OF TEETH ALONG THE ARC OF REFERENCE CIRCLE OF COMPLEX GAUGE 2.067		
REFERENCE	DIMENSION 27.7 MIN. IS TO BE CHECKED WITH COMPLEX GAUGE.		

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: 172.28.016-2A
2. Material specification as per drawing:
STEEL 38XC GOST 4543-71.
3. GOST 4543-71 & GOST 6528-53.
4. Specification: 520.TY1.
5. Alternate material:
 - a) STEEL, GR 708 M40/U, BS: 970 PT 1: 1983.
6. **INSPECTION NOTE:** FOR LIST OF GAUGES AND FIXTURE REFER GAUGE SHT.NO.GS (W)-10144, SHT.1 TO SHT.2.

SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	GEAR TO DRG. NO 172.28.016-2A	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 checks	Chemical Oxidizing/ phosphating, oil finishing or Chemical oxidizing, 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.

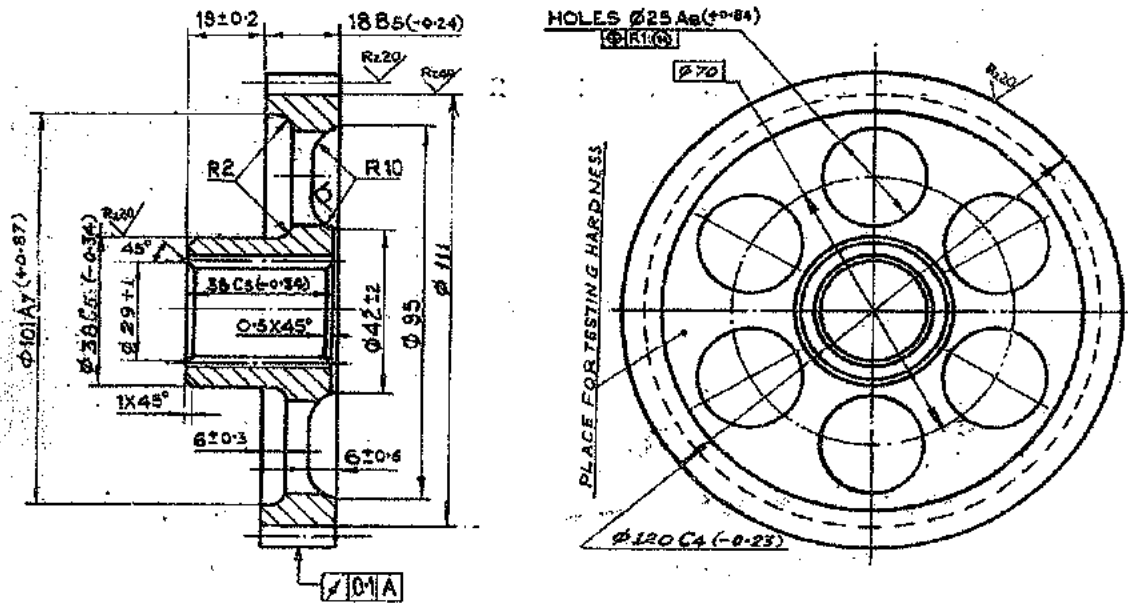
P-Perform

W-Witness

V-Verify

R-Review

SP-Sampling Plan



PROFILE OF INNER INVOLUTE SPLINES 36 28 x 1.5 x 18 A 25 S 30.

SCALE-5:1

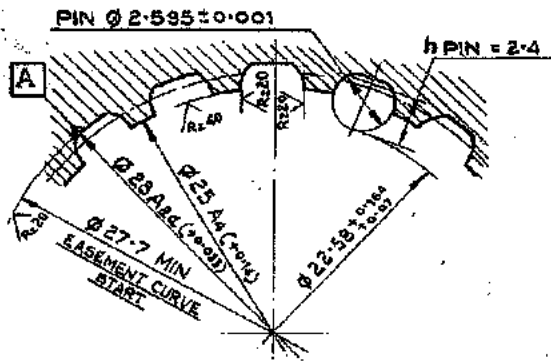


FIG: GEAR TO DRG. NO 172.28.016-2A

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

FOR

(STAND)

DRG.NO. 172.25.088

(LF NO: 6206851034)

No HVF/T-72C/QAP/25/STAND/241186 - 00

ISSUE No: 00

DATE: JAN – 2022

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

STAND

DRG. NO. 172.25.088

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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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 **STAND TO DRG.NO 172.25.088** 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 **STAND TO DRG.NO:172.25.088**.

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 **STAND TO DRG. NO. 172.25.088** 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	172.25.088	STAND	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.25.088	STAND	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 STAND TO DRG.NO 172.25.088

1. All dimensions should be confirmed as per drawing.
2. Place for checking hardness (Refer Drawing).
3. Spline tooth axis refer drawing.
4. Surface finish / Roughness of items should be ensured as per drawing and specification.
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 STAND TO DRG.NO.172.25.088

- 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 ²)	Ultimate strength, (Kgf/mm ²)	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm ²)
	Not less than				
38XC	75	95	12	50	7

Note: For other properties refer GOST 4543-71

14) PERFORMANCES / ACCEPTANCE TEST: STAND TO DRG.NO:172.25.088

1. BHN 444....341 (DIA OF INDENTATION 2.5 TO 3.3) TO BE SUBJECTED TO ISOTHERMAL HARDENING FOR CHECKING HARDNESS. FLATS ALONG $\phi 34^{+0.2}_{-0.1}$ MAY BE MADE AT A DEPTH UP TO 1.5mm.
2. TECHNICAL REQUIREMENTS FOR UNMACHINED SURFACES ARE AS PER GOST 8479-70
3. AFTER HEAT TREATMENT, SPLINES ARE TO BE CHECKED ONLY FOR INTERCHANGEABILITY USING SPLINE GAUGE MANUFACTURED AS PER MINIMUM DIMENSIONS OF MATING COMPONENT.
4. NON-COINCIDENCE OF AXIS OF ONE OF THE SPLINE TEETH WITH THE AXIS OF MIDDLE HOLE $\phi 11A7$ SHOULD NOT EXCEED 1° TOLERANCE IS BASED ON MMC PRINCIPLE.
5. TURNING OF HOLE M8-7H BY 5° MAX FROM NOMINAL POSITION TOWARDS ANY SIDE IS ALLOWED.
6. WHEN MACHINING ALONG DIMENSIONS 50° INCISION OR PROJECTION RELATIVE TO R 22 UP TO 1.5 MM IS ALLOWED.
7. COATING: CHEMICAL OXIDIZING, OIL FINISHING, OR CHEMICAL OXIDIZING, PHOSPHATING, OIL FINISHING.
8. THE REST OF THE REQUIREMENTS ARE AS PER 520.TY 1.
9. * DIMENSIONS TO BE ENSURED BY TOOL.
10. COATING ON RACE NEED NOT TO CHECKED.

STAND DETAILS:

NO. OF TEETH	\pm	37
TOOTH THICKNESS ALONG REFERENCE CIRCLE CHORD	S	1.312 ^{+0.06} _{-0.12}
REFERENCE DIAMETER	d_a	30.92

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 gear profile/spline is to be submitted.

22) REFERENCE:

1. Drawing No: 172.25.088
2. Material specification as per drawing:
STEEL 38XC GOST 4543-71.
3. GOST 4543-71 & GOST 8479-70.
4. Specification: 520.TY1.

ANNEXURE-A

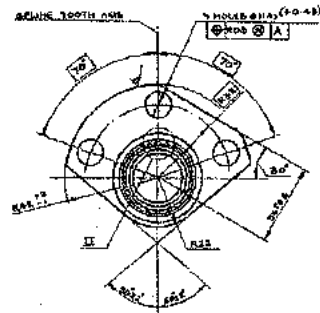
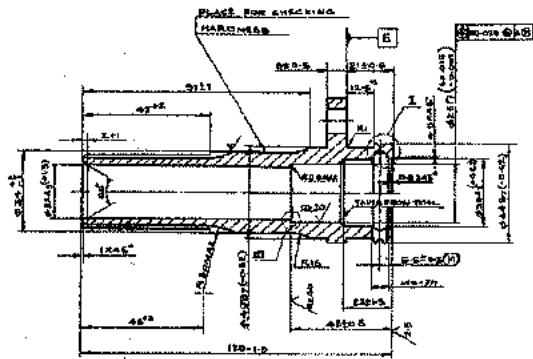
SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	STAND TO DRG. NO 172.25.088	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per 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 444-341 (Dia of Ind. 2.9-3.3)	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(7) & 14(10)	Confirm to QAP Para no:14(7) & 14(10)	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).

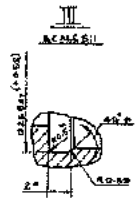
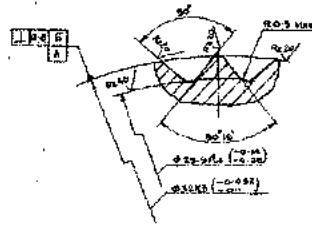
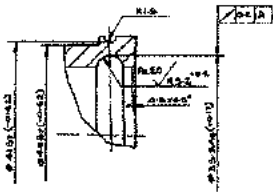
1. One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
2. For cross conformation of material, manufacturer has to submit test sample pieces for the items used /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



I
SCALE 2:1

II
SCALE 10:1



VIEW ALTERNATIVE FOR CHECKING SPLINES
SCALE 2:1

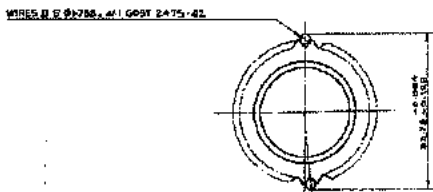


FIG: STAND TO DRG. NO 172.25.088
(For reference only)

RECORD OF AMENDMENTS

Sl. No	Amendment No. & date	Amended by	Date of Insertion	Initial

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

FOR

(LEVER)

DRG.NO. 172.27.061-A

(LF NO: 6206210062)

No HVF/T-72C/QAP/27/LEVER/241150 - 00

ISSUE No: 00

DATE: DEC- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR


LEVER

DRG. NO. 172.27.061-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 **LEVER TO DRG.NO 172.27.061-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 **LEVER TO DRG.NO:172.27.061-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 **LEVER TO DRG. NO. 172.27.061-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.
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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. 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	172.27.061-A	LEVER	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.27.061-A	LEVER	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).
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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 %
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(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 LEVERTO DRG.NO172.27.061-A

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

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 LEVERTODRG.NO.172.27.061-A

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

b)Chemical properties: As per STEEL 38XCGOST 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 ²)	Ultimate strength, (Kgf/mm ²)	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm ²)
	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:172.27.061-A

1. TO BE HARDENED. HARDNESS BHN 302-255 (DIA. OF IND 3.5 - 3.8).
2. EXTERNAL DRAFTS SHOULD BE UP TO 7°.
3. PARTING LINE OF DIES IS ARBITRARY.
4. MISMATCH OF DIES SHOULD BE UP TO 1 mm.
5. UNDERCUT FLASH SHOULD BE UP TO 1 mm.
6. BACKLING OF SURFACES AFTER STAMPING SHOULD BE UP TO 15 mm.
7. UNSPECIFIED STAMPING RADII SHOULD BE UP TO 3 mm.
8. TOLERANCES ON STAMPING DIMENSIONS SHOULD BE AS PER GOST 7505-55 III GROUP.
9. NON PARALLELITY OF WALLS "B" OF SLOT HAVING A WIDTH OF 16 mm RELATIVE TO SURFACE "B" SHOULD NOT EXCEED 0.3 mm WHEN OVERALL DIMENSIONS OF SLOT.
10. NON SQUARENESS OF AXIS OF HOLE ϕ 12 TO WALL "B" OF SLOT WITH A WIDTH OF 16 mm MAY NOT EXCEED 0.5 mm AT SLOT LENGTH.
11. NON SQUARENESS OF AXIS OF SPLINE HOLE TO FACE "B" SHOULD NOT EXCEED 0.3 mm. WHEN OVERALL DIMENSIONS OF COMPONENT.
12. DIMENSION "A" SHOULD BE NOT LESS THAN 5 mm, B NOT LESS THAN 2.5 mm.
13. SPLINES SHOULD BE CHECKED FOR INTERCHANGEABILITY WITH SPLINE GAUGE BEFORE SLITTING.
14. TECHNICAL REQUIREMENTS FOR NOT TO BE MACHINED SURFACES SHOULD BE AS PER GOST 8479-57.
15. COATING OF ALL SURFACES, EXCEPT SPLINES AND HOLES. PRIMER Φ A-03K. KHAKI ENAMEL XB-518. REQUIREMENTS AS PER 520 T 95.
16. SHIFT OF TOOTH SPACE FROM AXIS $\sqrt{\quad}$ SHOULD NOT EXCEED 30°.
17. FACE MAY BE MADE TO DIMENSION 24 \pm 0.5 BY EMBOSSING.
18. SPOTFACING R12 MAY BE MACHINED AS SHOWN WITH DOTTED LINE.

EXPLANATORY NOTE:

QTY OF SPLINES $Z = 30$
PITCH ALONG PITCH CIRCLE ARC $t = 2.4871$
DESIGN THICKNESS OF TOOTH ALONG
PITCH CIRCLE, ALONG ARC $S = 1.24355$
ALONG CHORD $S = 1.24308$

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/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 including reports of gear profile/spline is to be submitted.

22) REFERENCE:

1. Drawing No:172.27.061-A

2. Material specification as per drawing:
STEEL 38XC GOST 4543-61.
3. GOST 4543-71, GOST 4543-61, GOST 8479-57& GOST 7505-55.
4. Specification: 520.TY5.
5. Alternate material:
 - a)STEEL 708 M40, CONDITION 'T' TO BS: 970 PT 1: 1983.
(**COATING:** PHOSPHATING TO JSS-0465-01: 93, CLASS II,
FINISH 13(g)).

ANNEXURE-A

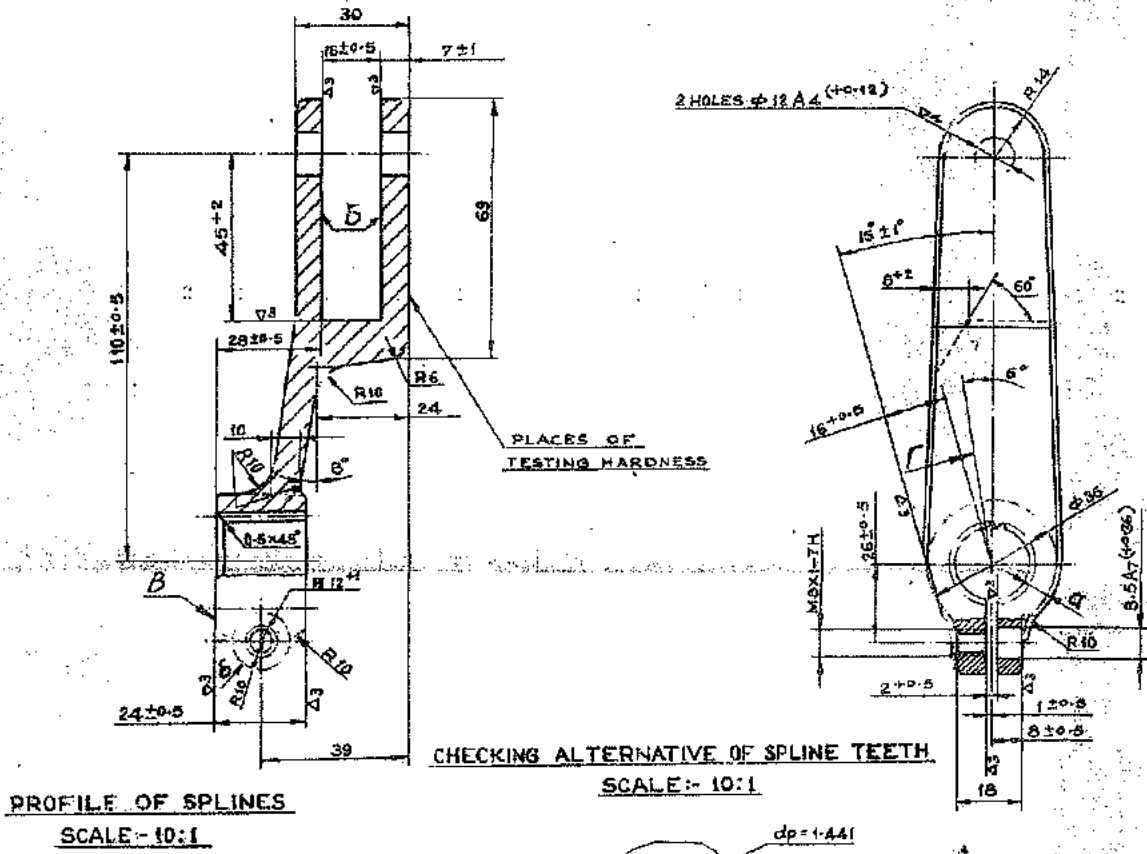
SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGOA	
1	LEVER TO DRG. NO 172.27.061-A	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per 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 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 checks	Coating.	Refer QAP Para no: 14(15)	Confirm to QAP Para no: 14(15)	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).

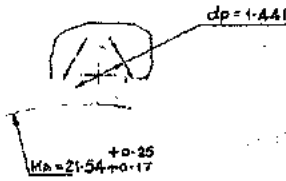
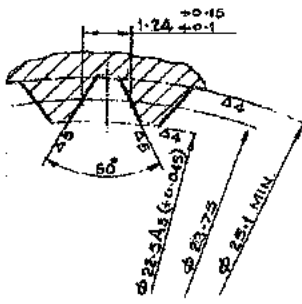
- One sample per heat / batch shall be tested under NABL Lab/Govt. Approved lab by firm. In case of non-compliance to standards entire lot shall be rejected or not to use in production further.
- For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test 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



PROFILE OF SPLINES
SCALE:- 10:1

CHECKING ALTERNATIVE OF SPLINE TEETH
SCALE:- 10:1



QTY OF SPLINES $Z = 30$
 PITCH ALONG PITCH CIRCLE ARC $t = 2.4871$
 DESIGN THICKNESS OF TOOTH ALONG
 PITCH CIRCLE ALONG ARC $S = 1.24355$
 ALONG CHORD $S = 1.24308$

FIG: LEVER TO DRG. NO 172.27.061-A

RECORD OF AMENDMENTS

Sl. No	Amendment No. & date	Amended by	Date of Insertion	Initial

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

FOR

(LEVER)

DRG.NO. 172.27.063

(LF NO: 6206210064)

No HVF/T-72C/QAP/27/LEVER/243303 - 00

ISSUE No: 00

DATE: DEC- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI - 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

LEVER

DRG. NO. 172.27.063

PREPARED BY

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

Rbth

REVIEWED BY

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

APPROVED BY

Subham Bijlwan
(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 172.27.063** 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 **LEVER TO DRG.NO:172.27.063**.

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. 172.27.063** 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	172.27.063	LEVER	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.27.063	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 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 LEVER TO DRG.NO 172.27.063

1. All dimensions should be confirmed as per drawing.
2. Surface finish / Roughness of items should be ensured as per drawing and specification.
3. 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.172.27.063

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 ²)	Ultimate strength, (Kgf/mm ²)	Elongation %	Relative reduction of area %	Impact strength (Kgm/cm ²)
	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:172.27.063

1. BHN 302-255 (DIA, OF INDENTATION 3.5-3.8) TO BE CHECKED IN BLANK.
2. EXTERNAL DRAFTS UP TO 7°.
3. UNSPECIFIED ROUNDING OFF EXTERNAL RADI: UP TO 10 mm, INTERNAL RADI: UP TO 3 mm.
4. TOLERANCES ON ROUGH DIMENSIONS SHOULD BE IN COMPLIANCE WITH GOST 7505-55, ACCURACY III GROUP.
5. TECHNICAL REQUIREMENTS ON UNMACHINED SURFACES SHOULD BE IN COMPLIANCE WITH GOST 8479-70.
6. DIMENSION "A" SHOULD BE NOT LESS THAN 6 mm, "B" NOT LESS THAN 7.5 mm, "B" NOT LESS THAN 2.5 mm.
7. RADI: OF TOOL UP TO R 1.5 mm.
8. AXIS PASSING THROUGH LIP OF TWO DIAMETERICALLY OPPOSITE TEETH OF SPLINES, IS TO BE LOCATED ON AXIS, PASSING THROUGH CENTRE OF HOLES ϕ 16 AND SPLINE ALLOWED SHIFT IS 30' MAX.
9. END FACES 26 AND 29 ARE TO BE MADE BY EMBOSSING.
10. BUCKLING OF COMPONENT SHOULD BE UP TO 1.5 mm.
11. DIE PARTING LINE IS ARBITRARY.
12. SPLINES ARE TO BE CHECKED FOR INTERCHANGEABILITY WITH COMPLEX GAUGE BEFORE SLITTING.
13. DIMENSION ϕ 22.5 A3 (+0.045) IS TO BE CHECKED BEFORE SLITTING.
14. TO BE MARKED.
15. COATING: CHEMICAL OXIDIZING PHOSPHATING OR CHEMICAL OXIDIZING.
16. COATING OF ALL SURFACES, EXCEPT SPLINES AND HOLES. PRIMER 4A-03K. KHAKI ENAMEL XB-51B. REQUIREMENTS AS PER 520 T45.

GEAR DETAILS:

SHAFT SYMBOL		
NUMBER OF TEETH	Z	30
REFERENCE DIAMETER	d_3	23.75
TOOTH-SPACE WIDTH ALONG REF CIRCLE CHORD	S_a	$1.24^{+0.15}_{-0.1}$

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 (Refer QAP Para No: 14(14)).

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: 172.27.063
2. Material specification as per drawing:
STEEL 38XC GOST 4543-71.
3. GOST 4543-71, GOST 7505-55 & GOST 8479-70.
4. Specification: 520.TY5.
5. Alternate material:
 1. STEEL 708 M40 COND 'T' OR 709 M40 TO BS 970 PT 1: 1983 .
(COATING: PHOSPHATING TO JSS 0465-01: 1993, CLASS-II/ III, FINISH 13(g)).

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 172.27.063	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 checks	Coating	Refer QAP Para no: 14(15) & 14(16)	Confirm to QAP Para no: 14(15) & 14(16)	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(14)	Confirm to QAP Para no: 18 & 14(14)	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

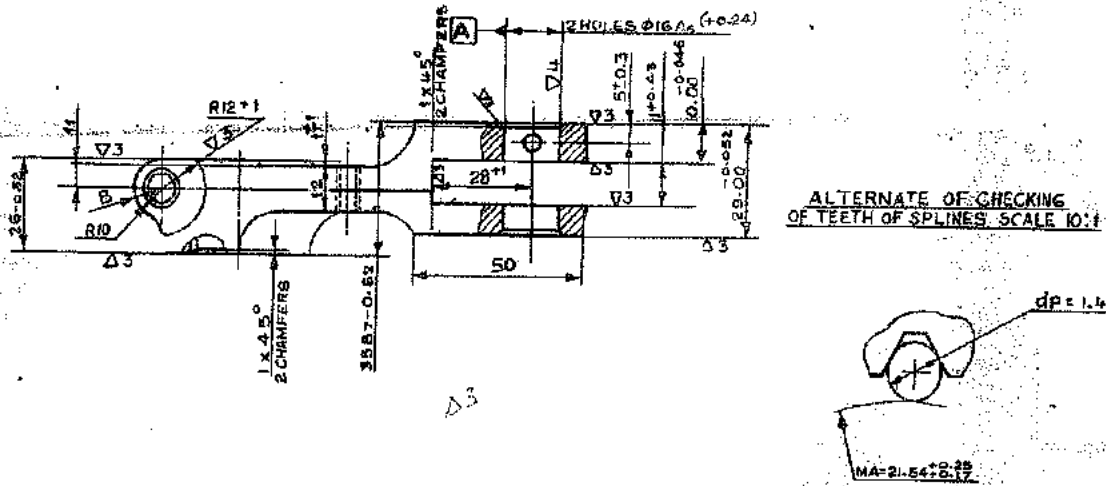
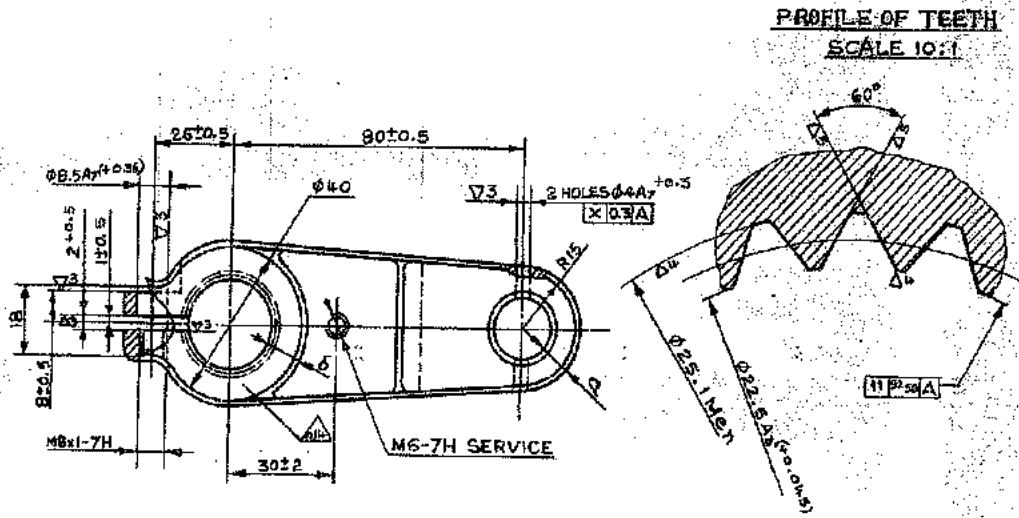


FIG: LEVER TO DRG. NO 172.27.063

APPENDIX 'A'

RECORD OF AMENDMENTS

Sl. No	Amendment No. & date	Amended by	Date of Insertion	Initial

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

FOR

(SHAFT)

DRG.NO. 172.26.014-1

(LF NO: 6206209017)

No HVFIT-72C/QAP/26/SHAFT/240487 - 00

ISSUE No: 00

DATE: JAN- 2022

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI - 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR


SHAFT

DRG. NO. 172.26.014-1

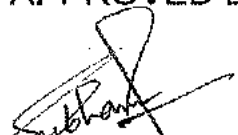
PREPARED BY


(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 **SHAFT TO DRG.NO 172.26.014-1** 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 **SHAFT TO DRG.NO:172.26.014-1**.

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 **SHAFT TO DRG. NO. 172.26.014-1** 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:

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.26.014-1	SHAFT	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.26.014-1	SHAFT	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 SHAFT TO DRG.NO 172.26.014-1

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

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 SHAFT TO DRG.NO.172.26.014-1

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

Note: For other properties refer GOST 4543-71

14) PERFORMANCES / ACCEPTANCE TEST: SHAFT TO DRG.NO:172.26.014-1

- 1 - B.H. 302...255 (IND DIA 35..38) TO BE CHECKED IN BLANK.
- 2 - ON SURFACES 'B' AND 'Γ' TO FACILITATE THE PASS OUT OF CUTTING WHEEL, A GROOVE UP TO 2mm WIDE AND 0.5mm DEEP IS ALLOWED
- 3 - THE SPLINES ARE TO BE CHECKED FOR THE INTER CHANGEABILITY OF SPLINE GAUGE. STRAIGHT SPLINES ARE TO BE CHECKED AT A LENGTH OF 18.5 (±0.30) MIN.
- 4 - COATING - CHEM. OXID. | PHOSP. OIL FINISHING OR CHEM. OXID. OIL FINISHING.
- 5 - ON THE SECTION, LIMITED WITH DIMENSIONS Ø37C4 AND Ø50B7 INVOLUTE PROFILLED SPLINES MAY BE MADE WITH SURFACE ROUGHNESS $R_{a} 80$ INVOLUTE PROFILE IS NOT TO BE CHECKED.
- 6 - DURING THE PASSING OUT OF TOOL ON TEETH OF MODULE 0.7 FROM THE SIDE OF GROOVE Ø7.5, LAYER OF METAL MAY BE REMOVED UP TO 0.1mm DEPTH AT A LENGTH OF UP TO 1mm.

SHAFT DETAILS:

MODULE		m	0.7
NUMBER OF TEETH		z	14
BASIC RACK PROFILE	PROFILE ANGLE	α	20°
	ADDENDUM	s'	1
	DEDENDUM	s''	1.2
	FILLET RADIUS	r_f	0.3
ADDENDUM MODIFICATION COEFFICIENT		ξ	0
DEGREE OF ACCURACY AS PER GOST 1643-56		—	Cm-8-X
BASE TANGENT LENGTH		L	$3.237 = \frac{0.13}{0.28}$
TOLERANCE OF BASE TANGENT LENGTH DEVIATION		δ_{cL}	0.026
TOLERANCE ON COMPOSITE ERROR DOUBLE FLANK	TOTAL	$\delta_{\alpha\alpha}$	0.11
	TOOTH TO TOOTH	$\delta_{\beta\alpha}$	0.055
TOLERANCE ON TOOTH DIRECTION		$\delta_{\beta\alpha}$	0.025
DIAMETER OF REFERENCE CIRCLE		d_b	9.8
DRAWING NUMBER OF MATING WHEEL		—	175.74.008

SHAFT LEGEND	—	Tp 25X3052
NUMBER OF TEETH	z	30
TOOTH THICKNESS ALONG REFERENCE CIRCLE	s_d	$1.24 = \frac{0.05}{0.15}$
REFERENCE CIRCLE DIAMETER	d_a	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 gear profile/spline is to be submitted

v. 22) REFERENCE:

1. Drawing No: 172.26.014-1
2. Material specification as per drawing:
STEEL 38XC GOST 4543-71.
3. GOST 4543-71 & GOST 2475-62.
4. Alternate material:
 - a) STEEL, GRADE 708 M40 OR 709M40 OR 530M40 TO BS: 970 PT 1: 1983 TO TEST CONDITION 'T'
(Phosphating to JSS-0465-01:1993, class II /III finish 13(g)).

ANNEXURE-A

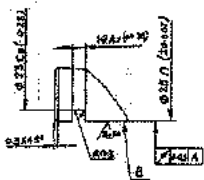
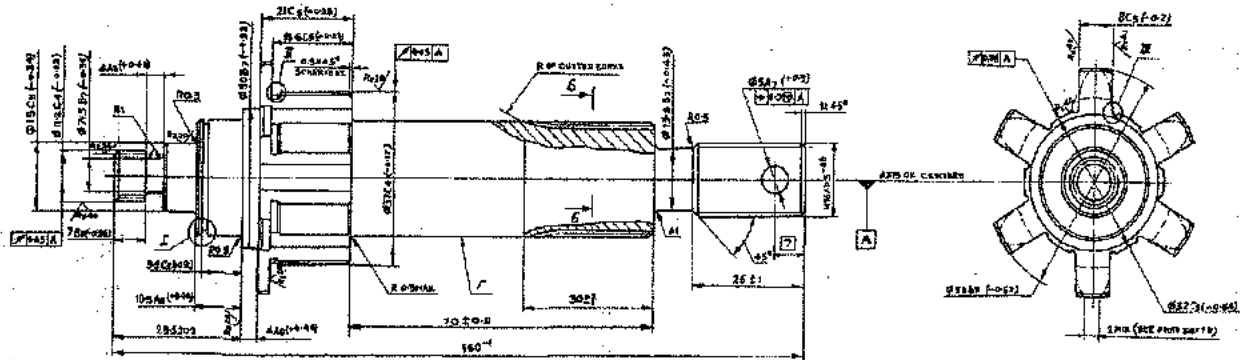
SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	SHAFT TO DRG. NO 172.26.014-1	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per 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 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 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:

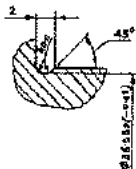
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- For cross conformation of material, manufacturer has to submit test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to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

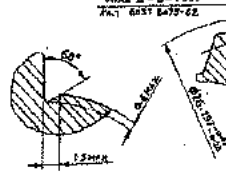
P-Perform W-Witness V-Verify R-Review SP-Sampling Plan



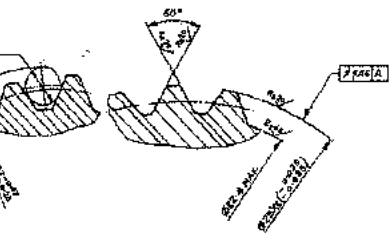
I
SCALE 20



II
SCALE 50



III
SCALE 50



B-B
SCALE 100
ALTERNATIVE METHOD FOR CHECKING THE SPLINE

B-B
SCALE 100

FIG: SHAFT TO DRG. NO 172.26.014-1
(For reference only)

RECORD OF AMENDMENTS

Sl. No	Amendment No. & date	Amended by	Date of Insertion	Initial

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

FOR

(SLEEVE)

DRG.NO.176.23.122

(LF NO: 6206113262)

No: HVF/T-72C/QAP/23/SLEEVE/242788- 00

ISSUE No: 00

DATE: NOV-2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

SLEEVE

DRG. NO. 176.23.122

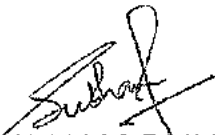
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REVIEWED BY


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

APPROVED BY


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

ISSUED BY

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

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19.	PRESERVATION CHECK	10
20.	PACKING CHECK	10
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24.	FIGURE	13
25.	APPENDIX-A	14

1. IMPORTANT NOTE

Note-1

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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 **SLEEVE TO DRG.NO 176.23.122** 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 **SLEEVE TO DRG.NO:176.23.122**

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 **SLEEVE TO DRG. NO.176.23.122** 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:

1. 172.23.012CBCB -
2. 176.23CB-3CB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	176.23.122	SLEEVE	-

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

Sl. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	176.23.122	SLEEVE	STEEL 38XC GOST 4543-71.	1

Note: Vendor/Contractor may use approved alternate material if any specified in drawing/ specification. *Also refer Para 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	-----	-----
(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/Mandrels/etc.	100 %	100 %
(ix)	Marking/Identification	100%	100%
(x)	Packing/ Preservation	100%	100%

Note:-

* This clause is applicable if mentioned in supply order or project sanction order.

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 SLEEVE TO DRG. 176.23.122

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. 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 SLEEVE TO DRG.NO 176.23.122

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

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES/ACCEPTANCE TEST: SLEEVE TO DRG.NO.176.23.122

1. BHN 302 ... 255 (DIA OF INDENTATION 3.5 ... 3.8) MAY BE CHECKED IN THE BLANK.
2. ON THE SURFACE 80A2a AND 90C2a. RECESS FOR OUTLET OF TOOL WITH A WIDTH NOT EXCEEDING 2 mm AND DEPTH UPTO 0.3 mm ARE ALLOWED.
3. GROOVES MAY BE MADE OF 90Ca AS PER THE ALTERNATE.
4. ELLIPTICITY FOR CYLINDRICAL SURFACES 80A2a AND 90C2a MAY NOT EXCEED 0.05 mm, PROVIDED THE MEAN ARITHMETIC MEASURINGS OF MAXIMUM AND MINIMUM DIAMETERS OF EACH SURFACE REMAINS WITHIN THE LIMITS OF THE DRAWINGS.
5. COATING : CHEMICAL OXIDIZING, OIL FINISH OR CHEMICAL OXIDOPHOSPHATING, OIL FINISH.
6. NOT TO BE STAMPED BY PUNCHING.
7. OTHER REQUIREMENTS ARE AS PER 520 TY 1.
- 8.* DIMENSIONS FOR REFERENCE.

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/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 (Refer QAP Para No. 14(6)).

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 (wherever applicable), 5. Calibration reports of instruments and 6. 100 % Dimensional inspection reports.

22) REFERENCE:

- a) Drawing No: 176.23.122
- b) Material specification as per drawing:
STEEL 38XC GOST 4543-71.
- c) GOST 4543-71.
- d) Specification: 520.TY1.

ANNEXURE-A

SL. NO.	CATEGORY	ASSEMBLY/ SUB ASSEMBLY	TESTS/ INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS	
						Firm	HVF	DGQA		
1	SLEEVE TO DRG. NO 176.23.122	Pre inspection reports (PIR) of firm	Firm has to produce all the document as per QAP	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 of 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).	Confirm to QAP	P	W/W	R	SP followed by HVF.
4		Hardness check	Hardness 302...255 BHN (Dia of Ind. 3.5 to 3.8mm)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	Confirm to QAP	P	W/W	R	SP followed by HVF.
5		Coating check	Chemical Oxidizing, Oil finish or Chemical Oxido Phosphating, Oil finish.	Refer QAP Para no: 14(5)	Confirm to QAP Para no: 14(5)	Confirm to QAP	P	W/W	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	Confirm to drawing and QAP	P	W/P	R	100% by firm/ vendor. SP followed by HVF.
7		Marking / traceability	Marking / traceability	Refer QAP Para no: 18 & 14(6)	Confirm to QAP Para no: 18 & 14(6)	Confirm to QAP	P	V	R	100% by firm/ vendor.
8		Preservation & packing	Preservation & packing	Refer QAP Para no 19 & 20	Confirm to QAP Para no 19 & 20	Confirm to QAP	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 (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P- Perform

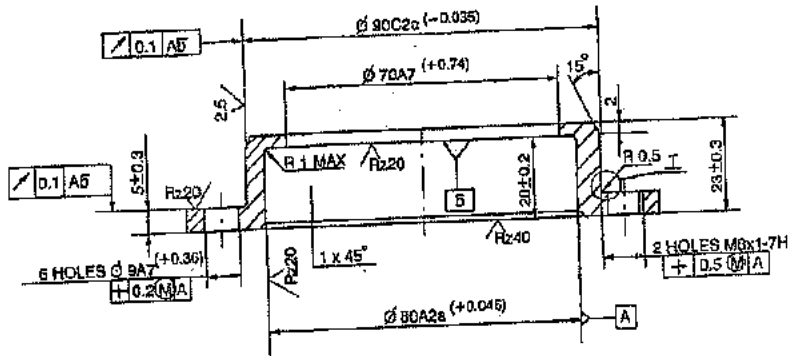
W- Witness

V-Verify

R-Review

SP-Sampling Plan

B - B



∩ ALTERNATE
SCALE 1 : 5

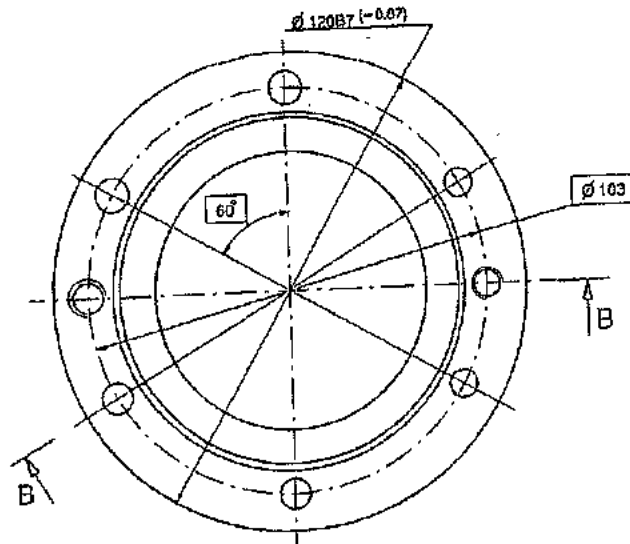
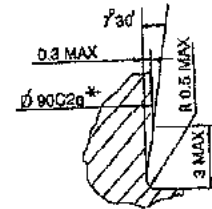


FIG: SLEEVE TO DRG. NO 176.23.122

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-1	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 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	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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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 ϕ 250 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		

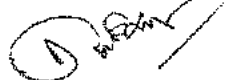

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Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed 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		

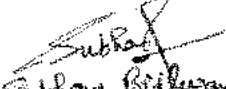
Note : Justification for alternate facilities may be shared to prove that alternate facilities can be utilised to manufacture the item wherever the facilities are mentioned above are not available, but vendor has alternate facilities.


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Subham Brijwan
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(ANIMESH FAIK)
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MACHINED COMPONENTS (GROUP -VI)

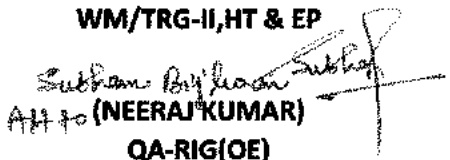
Sl no.	Nomenclature & drawing No.	Manufacturing technology & Testing / Inspection Facilities required to produce the item		Must be possessed by the vendor in his premises (P&M list and testing / inspection equipment list to be submitted)	May be possessed by the vendor in his premises or out sourced (Self declaration to be submitted)	FIRM Compliance (Y/N)	Remarks
1	Components as per enclosed list of Machined Components (Group VI) <i>Total items = 23 Nos</i>	TECHNOLOGY-1	Milling & Drilling	HMC and/or VMC suitable to the components upto the size 250mm x 450mm x 250mm height with 0.010 accuracy			
		TECHNOLOGY-2	Raw material		Firm should be capable to arrange the raw material defect free Aluminium Castings/ sheet metal as per drawing specification and standard.		
		TEST / INSPECTION-1	3D CMM	3D CMM 500 x 500mm.			
			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			

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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WM/TRG-II,HT & EP


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

FOR

(RIM GEAR,II TRAIN)

DRG.NO.175.40.025

(LF NO: 6206401127)

No.HVF/T-72c/QAP/40/RIM GEAR,II TRAIN/245054-00

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QUALITY ASSURANCE (RIG-OP)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

RIM GEAR,II TRAIN

DRG. NO. 175.40.025

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1. IMPORTANT NOTES

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 Chief 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/specifications/GOST issued along with the contract, the latter only will prevail.

2. INTRODUCTION

1. This quality plan lays down the inspection and testing procedure to be carried out on the component **RIM GEAR,II TRAIN TO DRG.NO.175.40.025** 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 Chief 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

This QAP is aimed at standardizing the Inspection procedure and acceptance norm for **RIM GEAR,II TRAIN TO DRG.NO:175.40.025**.

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 **RIM GEAR,II TRAIN TO DRG.NO.175.40.025** 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 Chief General Manager, Heavy Vehicles Factory, Avadi, and Chennai.

Note:

- 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 responsibility of the vendor to obtain copy of QAP and give the statement of compliance that the vendor will follow QAP. However, CGM/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 technical documents for manufacturing (includes details about material, casting/forging, welding, machining, heat processes, QAP against relevant items of this assembly, etc. and up to final inspection) the components like GOST/Drawing/Specification, Technical data book, process sheet etc., and technical instructions on the subject item is to be obtained by the contractor from AHSP through DDO/HVF.
- b) Any clarification required on these documents to be obtained from the Inspecting Authority i.e. The Chief 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:

Brief Technical description on Higher Assembly.

The RIM GEAR,II TRAIN is used in manufacturing final Gear Boxes of Tank.

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	175.40.025	RIM GEAR,II TRAIN	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	175.40.025	RIM GEAR,II TRAIN	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. (If applicable).

- (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
Acceptance test (as below)			
(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 (including Chemical, Mechanical & Physical properties)	1 No	1 No. or qty as specified in specification, GOST for each batch of raw material or heat treatment lot / As required for confirmation of material.
(iv)	Pressure testing	-----	-----
(v)	Machining/Fitment/ Performance trial on higher assembly / Tank	01 No.	01 No. per batch / As required by HVF.
vi)	Interchangeability Test	01 No.	01 No. per batch / As required by HVF.
vii)	Calibration Reports/Certificates of Test stand/Jigs/ Equipment's/Fixtures/ Gauges/Mandrels/etc.	100 %	100 %
viii)	Marking/Identification	100%	100%
ix)	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 including geometrical parameters 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. RIM GEAR,II TRAIN TO DRG.NO:175.40.025

1. All dimensions including geometrical parameters shall be confirmed as per drawing/specification
2. Surface finish/Roughness should be confirmed as per drawing and specification by appropriate method of machining/manufacturing.
3. For admissible alternate method for manufacture in dimensions/material if any, refer drawing/GOST/specification.
4. Spline / Gear details dimensions including profile shall be confirmed as per drawing.
5. Place for marking and checking/testing hardness refer drawing.

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 RIM GEAR,II TRAIN TO DRG.NO:175.40.025

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

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

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

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

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

Yield point, N/mm ² (kgf/mm ²)	Ultimate strength, N/mm ² (Kgf/mm ²)	Elongation %	Relative reduction of area %	Impact strength KCU / (Kgm/cm ²)
Not less than				
735 (75)	930 (95)	12	50	69 (7)

Note: For details of other properties & parameters refer GOST 4543-71.

14) PERFORMANCES/ACCEPTANCE TEST/TR POINTS OF RIM GEAR,II TRAIN TO DRG.NO: 175.40.025

(The following shall be ensured/followed during manufacturing the components)

2. PERMISSIBLE TO SURFACE $\phi 283$ AND FACE "A," (18)
- (18) a) MAXIMUM END PLAY OF FACES "B" AND "B" AND SURFACE $\phi 336$ ~~AND~~ $\phi 300$ (PITCH CIRCLE OF TEETH $M=5$ ON ROLLER) 0.1mm . CHECKING OF RUN OUT OF $\phi 300$, MAY BE SUBSTITUTED BY CHECKING TEETH $M=5$ BY MEANS OF STANDARD GEAR AS PER THE PARAMETERS SPECIFIED IN THE TABLE.
- b) MAXIMUM PLAY OF TIPS OF TEETH $\phi 444$ E_1 : 0.2mm .
- c) MAXIMUM PLAY OF ALL OTHER SURFACES 0.3mm .
3. THREADED HOLES ARE TO BE COUNTERSUNK AT AN ANGLE OF 90° TO 120° UPTO THE MAJOR DIAMETER OF THREAD ON THE SIDE OF THE FACE "B".
4. LOCAL MARKS UPTO 0.2mm DEEP ARE ALLOWED ON SURFACES OF TEETH $M=3$.
5. TEETH $M=3$ SHOULD BE CHECKED FOR INTER CHANGEABILITY WITH TOOTH GAUGE. MADE IN COMPLIANCE WITH THE LOWER DEVIATION OF MATING COMPONENTS. IN THIS CASE, THE GAUGE SHOULD BE ALIGNED TO SUIT $\phi 283$.
6. CHECKING OF TEETH FOR VARIATION IN HEIGHT CAN BE ALTERNATIVE TO THE CHECK OF TEETH $M=3$ PERFORMED WITH TOOTH GAUGE. VARIATION IN DEPTH OF ANY PAIR OF TEETH SHOULD NOT EXCEED 0.3mm .
7. TO BE HEAT-TREATED. BHN 341 - 285 (DIA OF INDENTATION 3.3 TO 3.5).
8. COATING OF SURFACE $\phi 283$, HARD CHROME PLATING WITH THICKNESS 42 TO 70 MICRONS FOR OTHER SURFACES, CHEMICAL OXIDO - PHOSPHATING. SURFACE FINISH BEFORE AND AFTER CHROMIUM PLATING IS $1.25/\mu$ CHROMIUM MAY BE APPLIED TO $R1 + 0.3$, BUT IN THIS CASE ADHESION OF CHROMIUM - PLATED SURFACE. TRACES OF CHROMIUM ON FACE "A" ARE ALLOWED
- (19) 9. ~~MAXIMUM DISPLACEMENT FOR AXES OF HOLES "E" FROM THE TRUE POSITION IS 0.2mm FOR THOSE OF HOLES "U" AND "X". IT IS 0.5mm AND FOR THOSE OF HOLES "K" IT IS WITHIN THE WIDTH OF TOOTH SPACE. MARKS LEFT BY DRILL ON THE SIDE SURFACE OF TOOTH $M=3$ AT A HEIGHT OF NOT MORE THAN 1mm FROM TOOTH. ROOT ARE PERMISSIBLE~~
10. RELATIVE POSITION OF GROOVES OF HOLES "E" AND "X" WITH RESPECT "U" AND "K" IS OPTIONAL.
11. DIMENSION MARKED WITH ASTERISK (*) IS GIVEN FOR REFERENCE.
12. DIMENSION MARKED WITH ASTERISK (*1) IS GIVEN AFTER COATING.

(19) 13. POSITIONAL TOLERANCE OF AXES OF HOLE E, R 0.2 (MMC TOLERANCE) AND * R 0.5 (MMC TOLERANCE)

GEAR/SPLINE DETAILS

MODULE		m	5	
NUMBER OF TEETH		Z	60	
BASIC RACK	PROFILE ANGLE	α	20°	
	COEFFICIENT OF	ADDENDUM	f'	0,7
		DEDENDUM	f''	1,3
	FILLET RADIUS	r_f	1,0	
COEFFICIENT OF ADDENDUM MODIFICATION		ξ	0	
ACCURACY AS PER GOST 1643-56			G8-9-9	
TOLERANCE FOR COMPOSITE ERROR DOUBLE BLANK		Δd	+0,25 -0,11	
COMPOSITE ERROR DOUBLE BLANK	TOTAL	$\delta_o d$	0,19	
	TOOTH TO TOOTH	$\delta_x d$	0,11	
TOLERANCE FOR BASE TANGENT LENGTH		$\delta_o L$	0,075	
TOTAL ERROR OF DISTORTION		δB_o	0,026	
BASE TANGENT LENGTH		L	100,144 ^{19,12} +0,32	
MATING COMPONENT		175.40.138 ©		
MODULE		m	3	
NUMBER OF TEETH		Z	147	
BASIC RACK	PROFILE ANGLE	α	20°	
	COEFFICIENT OF	ADDENDUM	f'	0,7
		DEDENDUM	f''	0,9
	FILLET RADIUS	r_f	0,5 MAX D1 CHAMFER 3 MAX X45°	
COEFFICIENT OF ADDENDUM MODIFICATION		ξ	0	
BASE TANGENT LENGTH		L	152,304 ^{0,1} -0,2	
TOLERANCE FOR BASE TANGENT LENGTH		$\delta_o L$	0,2	
REFERENCE DIAMETER		d_a	441	
MATING COMPONENT		172.40.0310 ©		

Explanatory Note

1. The components and assemblies undergo many manufacturing processes such as Casting, Forging, machining, welding, heat treatment processes painting, coatings, assembling, inspection process and other applicable parameters as indicated in the relevant Documents such as process/TD Books/Drawings/Specifications/GOST related manufacturing this component/Assembly.
2. 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.
3. Firm shall submit details of manufacturing process and inspection details of the components individually/sub-assemblies/assemblies to HVF.
4. If required/applicable HVF shall witness/verify stage wise inspection /process details during manufacturing of the components.
5. The component may be subject to endurance test, when fitted in higher assembly as specified in process / illustration /TD book.
6. Apart from above, all other relevant test for acceptance of the component (i.e. heat treatment process, heat treatment cycles, etc.) as specified in GOST / Specification / drawing / TD book shall be carried out by the firm and the report/ certificates shall be submitted to HVF.
7. Firm has to follow the manufacturing details/parameters for producing the component as specified in the technical data / process book and confirm as per the TD/Process Book. The inspection reports carried out for the same is to be submitted to HVF. HVF will carry out verification for cross confirmation if required.
8. **Forging of component**
During forging of component the instructions of manufacturing should be strictly followed.
 - a) All billets/blooms should be used for manufacturing forgings should be melt wise. The forgings made should be clearly marked to avoid mix up with those melts from other melts.
 - b) Copies of all test certificates of chemistry, grain size, inclusion, microstructure and physical properties etc. as obtained from steel suppliers along with the test certificates are to be submitted.
 - c) The forging should satisfy the required chemical and physical properties, microstructure, grain size, inclusions rating, hardenability, etc.

- d) After normalizing or hardening & tempering, as the case may be, the firms are advised in their own interest to check the microstructure and satisfy themselves for its correctness.
- e) In case of normalized forgings, it has been observed that sometimes microstructure is having banded structure and difficulties are experienced in machining the components, hence banded structure will not be accepted and firms are advised to ensure proper microstructure free from banding.
- f) The forging should be free from any cracks, firm should ensure the same.

15) FITMENT AND PERFORMANCE TEST:

- a. Pilot samples should be checked for fitment/machining trials 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. The component should be free from any defects after machining in trial and should be in line with the parameters as specified in the GOST/drawing and Specification.
- c. The component should be clean, free from distortion, cracks and other harmful defects.
- d. Components will be cleared for bulk supplies only after acceptance of the components in machining trials at HVF.

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, Equipments, 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 Drawing).

19) PRESERVATION CHECK

- a) Preservative coatings are to be strictly adhered to as called for in the drawing. However, equivalent BIS/ IS 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 sheet or bags.

21) DOCUMENTATION

1. Firm has to maintain all the documents as per QAP with respect to the SI.No. Of components to have traceability.
2. 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.
3. The testing/inspection responsibility to test all the parameters as per QAP and drawing specifications as mentioned in Annexure -A (enclosed).
4. Documents to be submitted as Pre inspection reports (PIR) by firm for individual component and for assembly components.

SI. No	Documents
1	Chemical analysis (NABL)
2	Mechanical properties (NABL)
3	Pre-forming process
4	Coating/Varnish certification (wherever applicable),
5	Calibration reports of instruments and gauges etc.
6	100% Dimensional inspection reports (Including geometrical features, spline and gear profiles.)
7	Pressure test (leakage test) if applicable.
8	Hardness checks reports

9	Crack Testing reports (wherever applicable),
10	Guarantee/ Warranty Certificate.(Final)
11	Service and maintenance instructions (If applicable). (Final)
12	Undertaking letter / Certificate of Conformance (As applicable). (Final)
13	Other relevant reports for acceptance of the item as specified in GOST/ Specification / drawings etc.

22) REFERENCE:

- a) Drawing No: 175.40.025
- b) QAP for forging: No: HVF/T-72/QAP/40/GEAR/241292- 00
- c) Material specification as per drawing: STEEL 38XC GOST 4543-71.
- d) GOST 4543-71.
- e) All other relevant Documents(process/TD
Books/Drawings/Specifications/GOST related manufacturing this
component/Assembly

SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQ A	
1	RIM GEAR, II TRAIN TO DRG. NO 175.40.025	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.
2		Pre inspection reports (PIR) of firm	Firm has to produce all the document as per QAP	As per the relevant drawing/specification/TD book/process book and QAP.	Confirm to relevant drawing/specification/TD book/process book and QAP as per bill of material	P	V	R	100% by firm/ vendor.
3		Dimensional checks	Dimensions as per the drawing	Refer drawing / QAP Para no: 12.1	Confirm to drawing and QAP Para no: 12.1	P	W/P	R	100% by firm/ vendor & SP followed by HVF.
4		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/P	R	As per SP of HVF by firm and SP followed by HVF
5		Hardness Checks	Hardness 285 (Dia of indentation 3.3-3.6)	Refer QAP Para no. 14(1)	Confirm to QAP Para no: 14(1)	P	W/V/P	R	100% by firm/ vendor & SP followed by HVF.
6		Coating Checks	OXIDO PHOSPHATING	Refer QAP Para no: 14(11)	Confirm to QAP Para no.14(11)	P	W/V/P	R	100% by firm/ vendor & SP followed by HVF.
7		Marking / traceability	Marking / traceability	Refer QAP Para no 18 & Refer drawing	Confirm to QAP Para no: 18 & Refer drawing	P	V	R	100% by firm/ vendor
8		Preservation & packing	Preservation & packing	Refer QAP Para no 19 & 20	Confirm to QAP Para no 19 & 20	P	V	R	100% by firm/ vendor
9		Other relevant test for acceptance of item / Specification / process / TD book.	As per drawing/specification/TD book/ Process Book GOST	Refer drawing/specification TD book/ Process Book GOST	Confirm to drawing/specification/GOST	P	W/V/P	R	As per SP of HVF by firm and SP followed by HVF

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 and shall not be used in production further.
 - For cross confirmation of material, manufacturer has to submit sufficient quantity (as specified in GOST/Specification/supply order) test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing/Verify/Perform(WV/P) at HVF premises. In case of non-compliance to standards, entire lot will be rejected as per the Terms and Conditions.
 - All other relevant tests as specified in GOST/specification/drawing is to be carried out by firm and to be confirmed.

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

