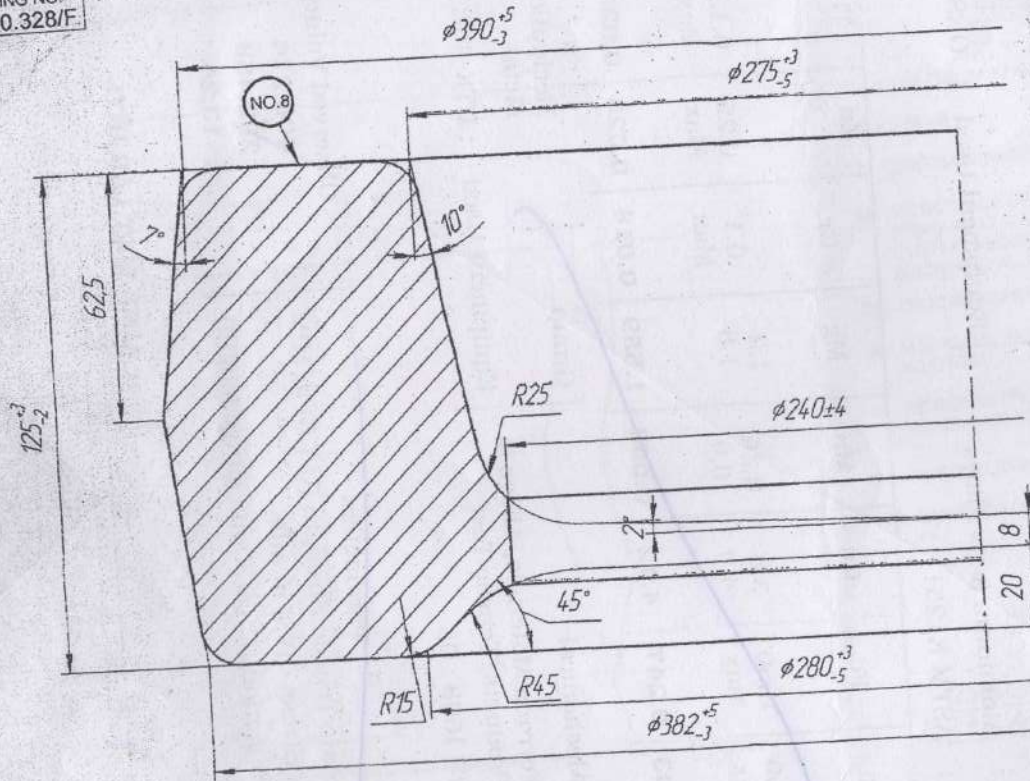


DRAWING NO.
172.40.328/F



forging drawing only for reference only

TECHNICAL REQUIREMENTS

01. SURFACE DEFECTS SHOULD BE WITHIN TOLERANCE LIMITS.
02. IMPRESSION DUE TO CLAMPS SHOULD BE REMOVED COMPLETELY BY CONTROL CUTTING.
03. SHIFT OF AXIS OF DIE IS UPTO 2.0 MM.
04. PROJECTIONS DUE TO CUTTING OF BURR IS UPTO 2.5 MM.
05. ECCENTRICITY OF BROACHING HOLE IS UPTO 3.0 MM.
06. UN-SPECIFIED FILLET RADII R 10
07. DIMENSIONS WITHOUT TOLERANCES NEED NOT BE CHECKED.
08. MARK THE PART NO. "328" AND CODE OF CHIEF
09. PAINT RED OXIDE.

FIRST OPERATION(FORGING)

(SHEET 1 OFF 2)

FORGING IS COMMON FOR
COMPT. NO. 172.40.330/F

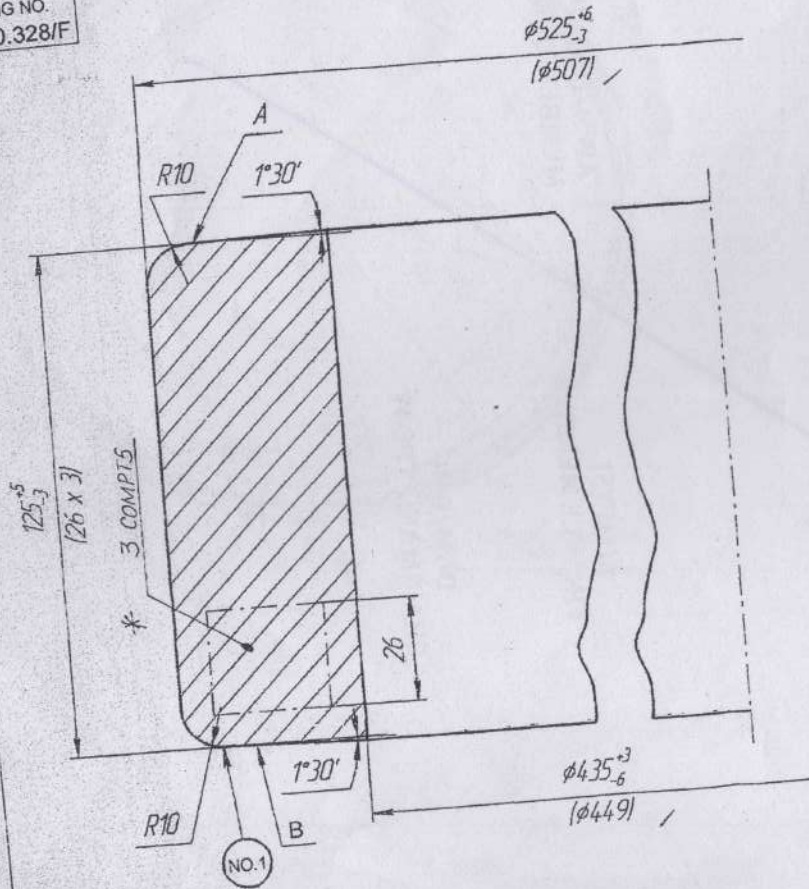
T 90

MATERIAL	FORGING WT.		
20X2H4A GOST 4543-71	68.0 KGS	SCALE	
ALT. MATERIAL	HAMMER	SCALE	
		NTS	
DRAWN	CHECKED	APPROVED	
<i>A. Raju/02</i> 15/8/03	<i>M. J. Raju/03</i>	<i>S. J. Raju/03</i>	
DRAWING NO.	172.40.328/F		
NOMENCLATURE: R.H EXTREME ENGAGING RING			
HEAVY VEHICLES FACTORY			
AVADI, CHENNAI			

5

forging drawing only for reference only

DRAWING NO.
172.40.328/F



NOTE:-
01. THE FORGING TECH.REQUIREMENTS CALL FOR DIE FORGING OPERATION AS WELL AS ROLLING OPERATION.INSPECTION IS REQUIRED AT EVERY STAGE.

02. EACH FORGING CTERS FOR THREE COMPTS.

TECHNICAL REQUIREMENTS.

01. MARK THE PART NO. "328" AND CODE OF CHIEF.
02. ≤ 256 HB
03. DESCALES (SHOT BLASTING)
04. ON SURFACE OF FORGING, OCCASSIONAL DEFECTS WITHOUT THEIR REMOVAL IS ALLOWED, IF THEIR DEPTH IS DETERMINED BY CONTROL CUTTING AND DOESN'T EXCEED 0.5 OF ACTUAL SINGLE SIDED MACHINING ALLOWANCE.
05. ON SURFACES 'A' AND 'B', DRAFTS 3 IS ALLOWED.
06. ALONG THE PARTING LINE OF GAUGES BURRS ARE ALLOWED.
07. DEVIATION FROM CIRCLE AND CYLINDRICITY SHOULD BE WITHIN TOLERANCE LIMITS.
08. IN-COMPLETENESS IN JOINT OF GAUGE SHOULD NOT EXCEED R 15.00 MM
09. PAINT RED OXIDE.

SECOND OPERATION (ROLLING)
(SHEET 2 OFF 2)

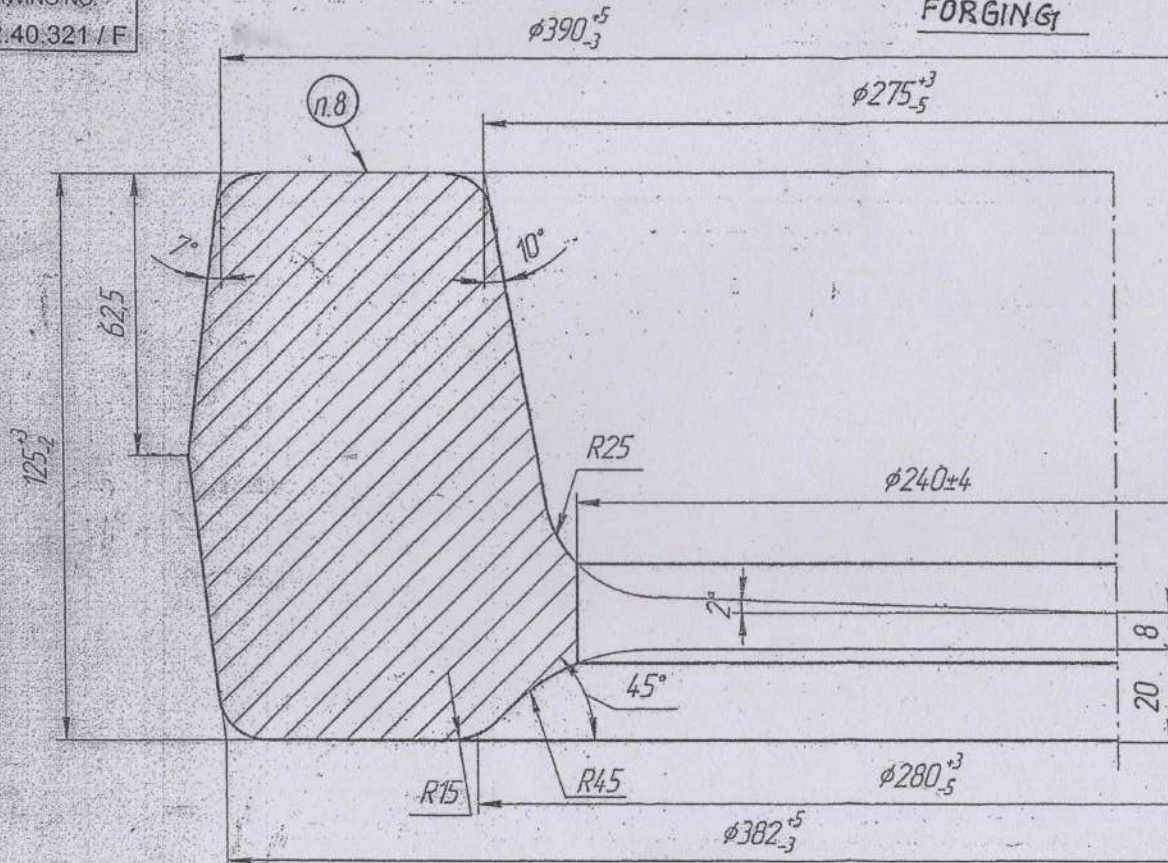
FORGING IS COMMON FOR COMPT. NO.
172.40.330/F

T 90

MATERIAL	FORGING WT.	
20X2H4A GOST 4543-71	68.0 KGS	
ALT. MATERIAL	HAMMER	SCALE
		NTS
DRAWN	CHECKED	APPROVED
<i>A. Ruff</i> 12/12/03	<i>[Signature]</i>	<i>[Signature]</i>
DRAWING NO.	172.40.328/F	
NOMENCLATURE: RH EXTREME ENGAGING RING		
FORGING		
HEAVY VEHICLES FACTORY		
AVADI, CHENNAI		

DRAWING NO.
172.40.321 / F

FORGING



TECHNICAL REQUIREMENTS

01. SURFACE DEFECTS WITHIN THE TOLERANCE LIMITS ARE ALLOWED.
02. LAPS SHOULD BE COMPLETELY REMOVED BY CHIPPING OUT OR GRINDING.
03. SHIFT (MISALIGNMENT OF AXES OF DIES) UPTO 2.0 MM.
04. PROJECTION DUE TO DEBURRING - UPTO 2.5 MM.
05. ECCENTRICITY OF BROACHED HOLE - UPTO 3.0 MM.
06. UNSPECIFIED FILLET RADII - R 10.
07. DIMENSIONS WITHOUT TOLERANCES ARE NOT TO BE CHECKED.
08. MARK PART NO, "321" AND CODE NO. OF SHOP IN-CHARGE.

FIRST OPERATION (FORGING)

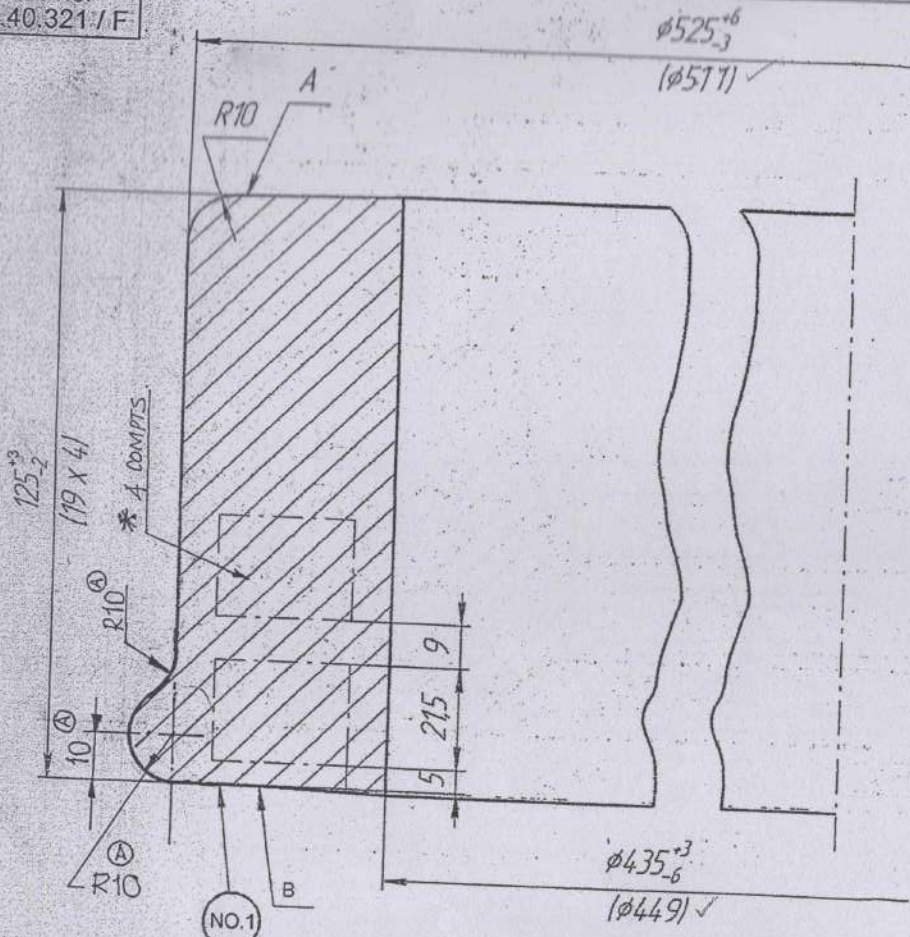
(SHEET 1 OFF 2) T-90

MATERIAL	FORGING WT.	
STEEL 38XC (GOST 4543-71)	68 KG	
ALT. MATERIAL	HAMMER	SCALE
		NTS
DRAWN	CHECKED	APPROVED
<i>A. Ruff</i> 18/08/03	<i>M. S. S.</i> 18/08/03	<i>S. D. S.</i> 18/08/03
DRAWING NO.	172.40.321 / F	
NOMENCLATURE:	BOOSTER FORGING	
HEAVY VEHICLES FACTORY AVADI, CHENNAI		

forging drawing only for reference only

forging drawing only for reference only

DRAWING NO.
172.40.321/F



ROLLING.

TECHNICAL REQUIREMENTS.

01. MARK PART NO. "321" AND CODE NO. SHOP INCHARGE.
02. 286...341 HB.
03. REMOVE THE SCALES. (BY SHOT BLASTING).
04. ON THE SURFACE OF FORGING, OCCASSIONAL DEFECTS MAY BE PERMITTED WITHOUT ELIMINATING THEM, IF THEIR DEPTH DETERMINED BY CONTROL CHIPPING DOES NOT EXCEED 0.5 OF ACTUAL ONE-SIDED ALLOWANCE FOR MACHINING.
05. DRAFT OF 3° MAY BE ALLOWED ON SURFACES 'A' AND 'B'.
06. BURR IS PERMISSIBLE ON THE PARTING LINE OF GAUGES.
07. DEVIATION FROM ROUNDNESS AND CYLINDERICITY IS PERMITTED WITHIN THE TOLERANCE LIMITS.
08. THE GAUGE MAY BE ALLOWED TO FALL SHORT UPTO R 15 WHILE PASSING INTO THE PARTING.
09. PAINT RED-OXIDE

T-90

SECOND OPERATION (ROLLING)

MATERIAL	FORGING WT.		
STEEL 38XC (GOST 4543-71)			
ALT. MATERIAL	HAMMER	SCALE	
		NTS	
DRAWN	CHECKED	APPROVED	
<i>P. Ruffin</i> 18/8/03	<i>[Signature]</i>	<i>[Signature]</i>	
DRAWING NO.	172.40.321/F		
NOMENCLATURE:	BOOSTER FORGING		
HEAVY VEHICLES FACTORY AVADI, CHENNAI			

NOTE :-

THE FORGING TECH. REQUIREMENTS CALLS FOR DIE FORGING OPERATION AS WELL AS ROLLING OPERATION. INSPECTION REQUIRED AT EVERY STAGE.

* EACH FORGING CATER FOR FOUR COMPONENTS

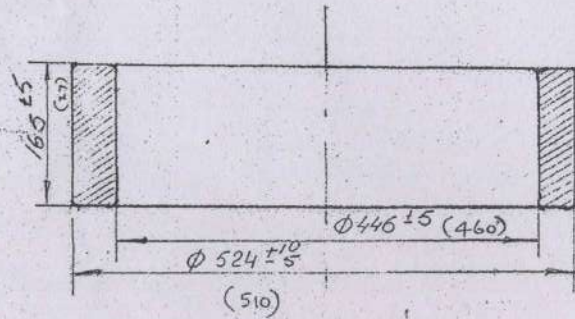
A	TO AVOID MATL. MIX UP THE DIMNS. R-10 AND DIMN. 10mm ADDED IN THE ROLLING PROFILE.	<i>[Signature]</i> 3/12/04
ISS.	MODIFICATION	DATE.

(SHEET 2 OF 2)

forging drawing only for reference only

(A) NOTE:-
ONE FORGING FOR 4 COMPONENTS.

172-40-146/F



- 1. Твердость 207-269 HB
- 2. Радиусы закругления до 5 мм
- 3. Технические требования по ТУ 14-1-1363-75

(B) NORMALISE & TEMPER

- 1. HARDNESS 207-269 BHN.
- 2. ROUNDING OFF RADII 5 mm MAX.
- 3. TECHNICAL REQUIREMENTS TO BE AS PER TУ 14-1-1363-75
- 4. PAINT RED OXIDE

MATL. :- STEEL 20X2H4A
GOST 4543-71.

COMMON FORGING FOR

- 172-40-147
- 172-40-148
- 172-40-149

(A) M/C DIMNS. SHOWN IN BRACKET.

Kg-77.0kg

172-40-146/F

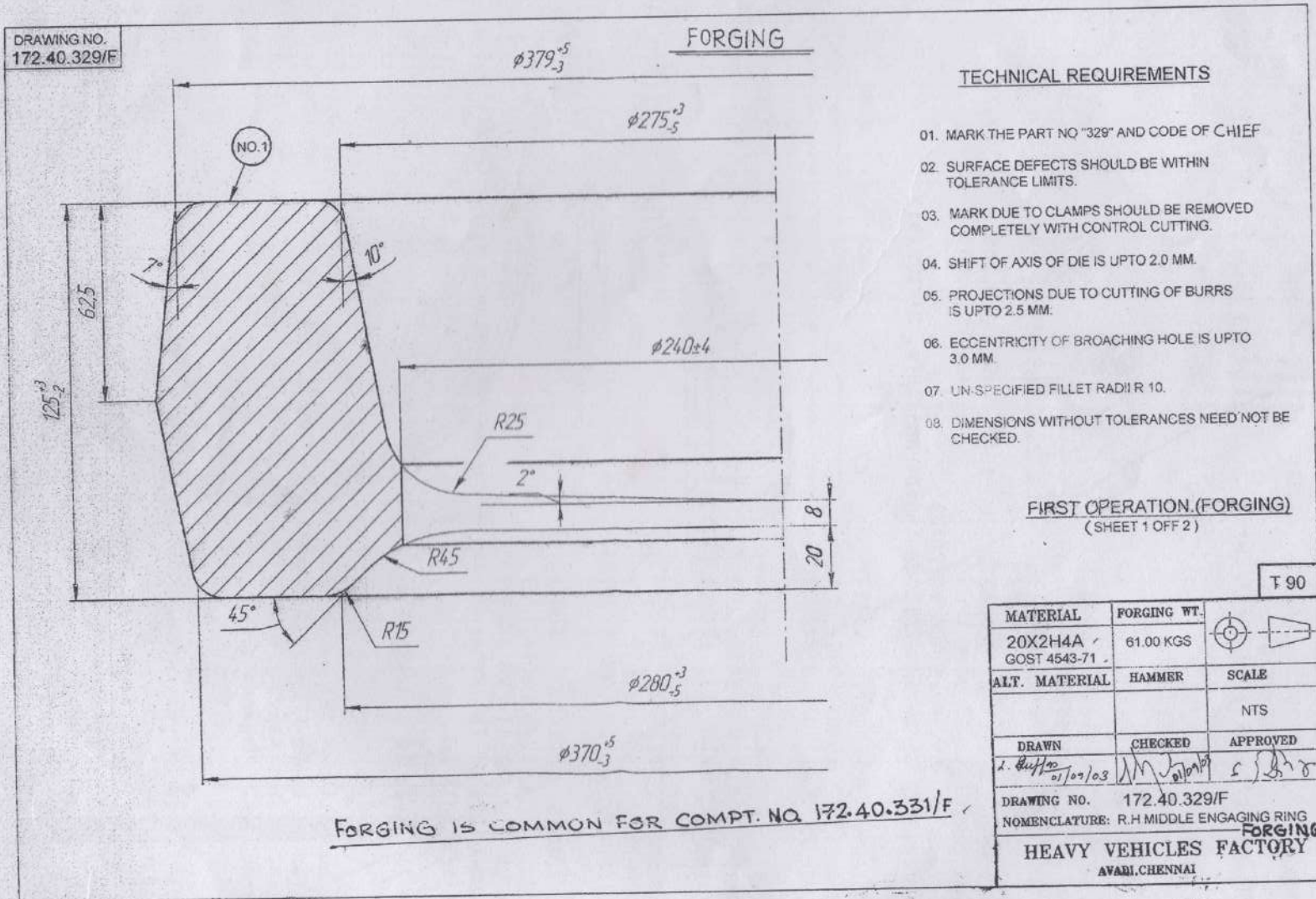
172-40-146/F	172-40-146/F
КОЛЦО	
20094СКОТАННОЕ	
RING	
СМОДЕЛЬОВАНА	
ГОСТ 4543-71	

B	HEAT TREATMENT DETAILS ADDED.	DR/18 ✓
A	NOTE ADDED	DR/2
ISSUE	N. OF A	DR/SIG
MODIFICATION		

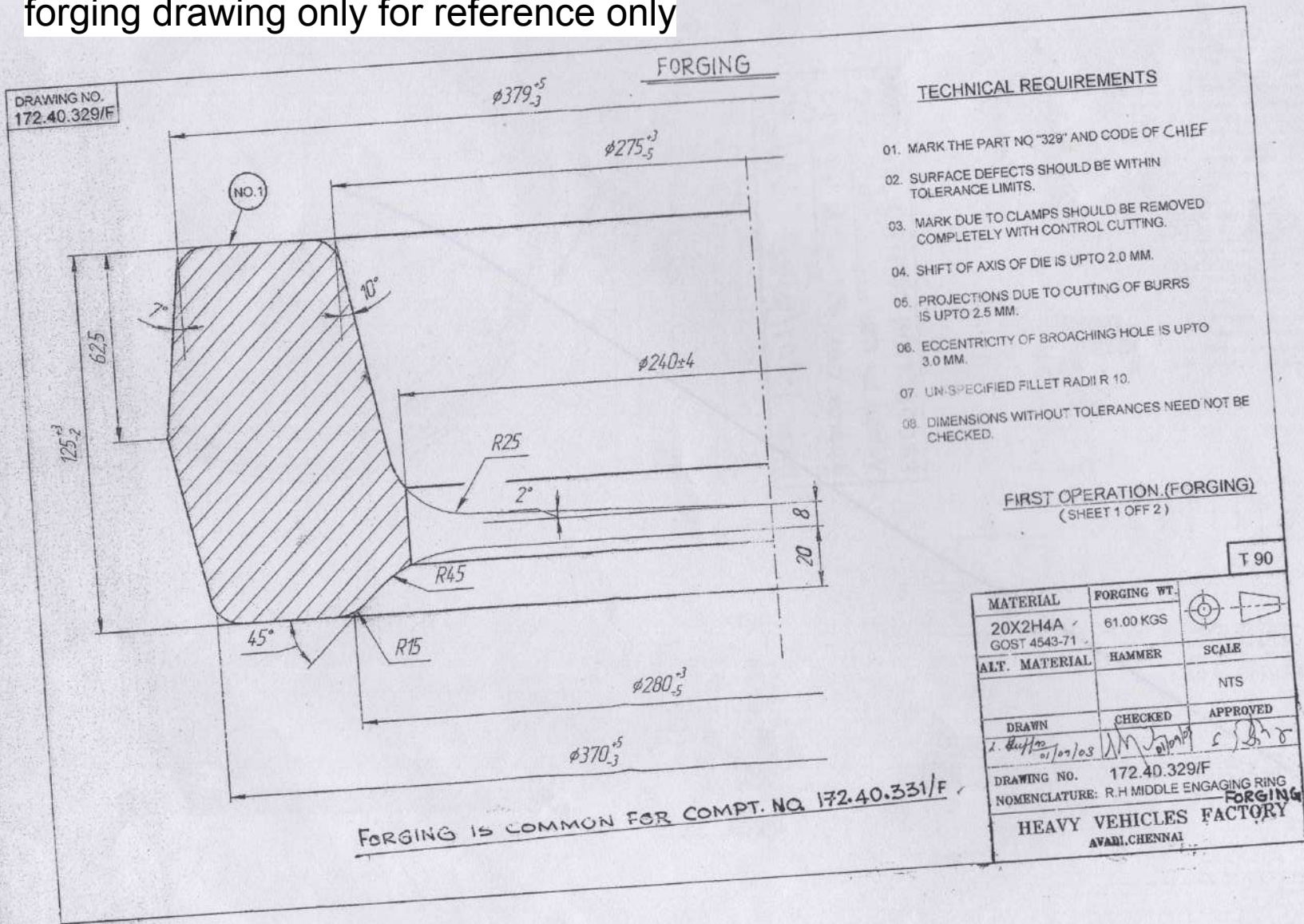
RING

172-40-146/F - TO
172-40-149/F

forging drawing only for reference only



forging drawing only for reference only



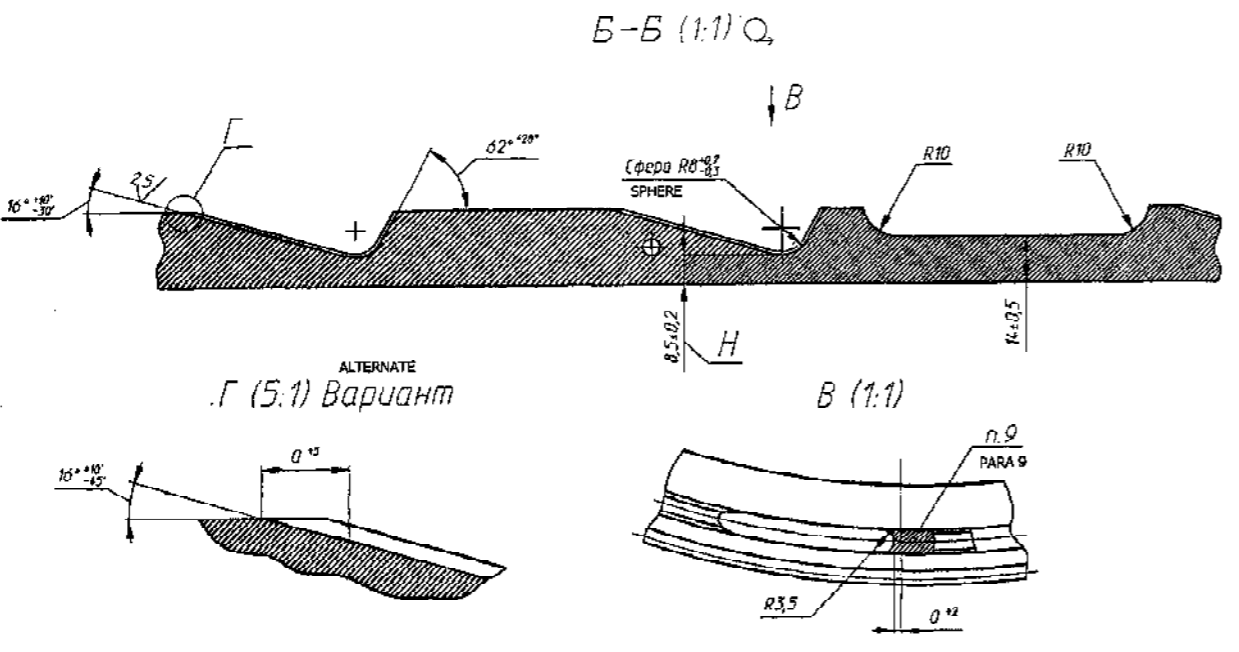
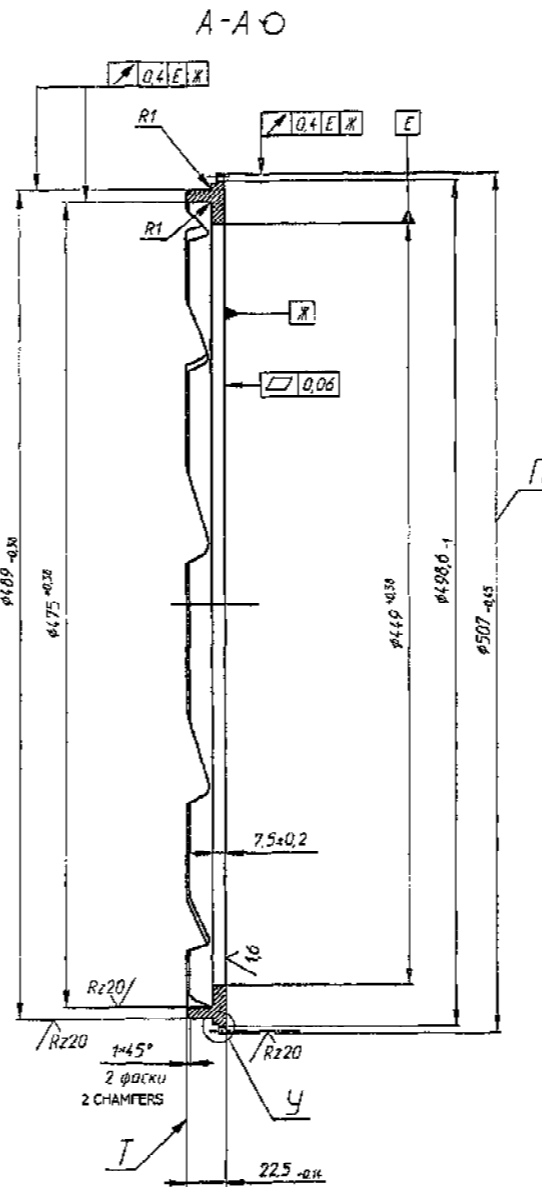
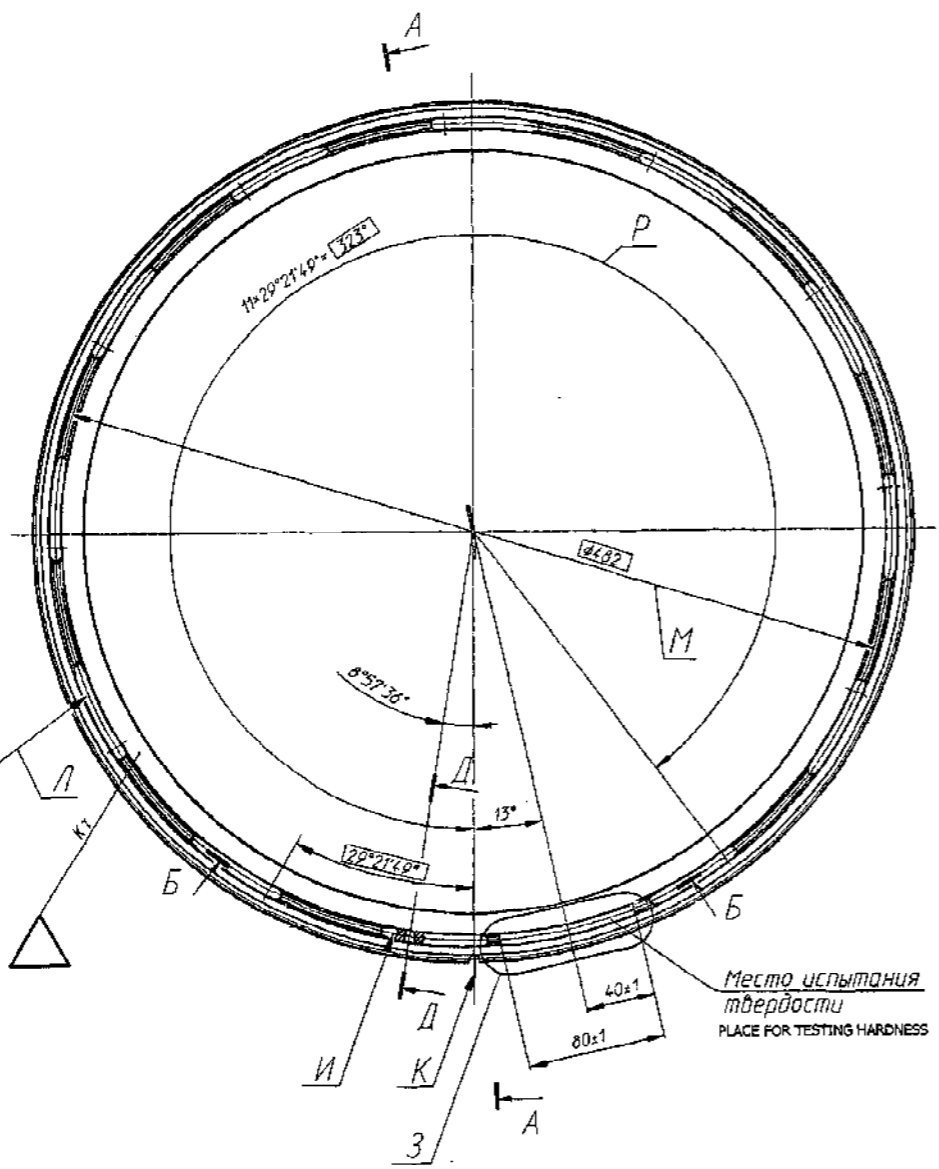
DRAWING NUMBER
172.40.328

SHEET No. 1 OF 1

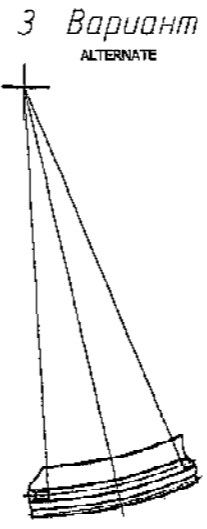
Rz80/√

Module	<i>m</i>	3
Number of tooth	<i>Z</i>	168
BASIC RACK	Profile angle	α 20°
	Co-efficient of addendum	h_a^* 0,7
	Co-efficient of bottom clearance	c^* 0,2
	Fillet radius	ρ_f 0,03
Modification coefficient	<i>x</i>	0
Base tangent length	<i>W</i>	170,89 ^{+0,4} _{-0,7}
Reference circle diameter	<i>d</i>	504
Part no. of drawing of mated components		172.40.303

- BHN 302...341.
- Teeth should be checked for smooth passage with a toothed gauge, made as per lower deviations of mating component.
- On the profile of tooth, longitudinal marks with depth 0^{+0,2} mm are permitted.
- Decreasing of base tangent length up to 169,99 mm in not more than 10 teeth is permitted.
- Difference in dimension of depth of any pair of teeth should be 0^{+0,4} mm, excluding 10 decreased teeth.
- Deviation for longitudinal axis of crater Π from circumference M in areas of coming out to end faces T not exceeding 0,8 mm is permitted.
- During measuring along dimension M shift of center of sphere of crater Π relative to axis of tooth space should be 0^{+0,6} mm.
- Checking of deviation along pitch of crater Π may be replaced by checking the difference in depth of surface of crater form end face \mathcal{K} . During this difference in depth of crater while measuring through equal segments on arc P should not be more than 0,25 mm for all craters.
- On dotted line of surfaces of crater (see B) tool marks and surface finish Rz=40 microns is permitted.
- Difference of dimension H - 0^{+0,07} mm.
- Decreasing of dimension Π up to diameter 506,35 mm is permitted.
- Part must be non-magnetic.
- Other requirements are as per specification 520.TY1.



Д-Д (1:1) О



1A EQUIVALENT MATERIAL: Grade 835M15 (EN39B) to BS: 970-83P1-1
NOTE: Mechanical Properties of Equivalent Material shall be as per Drawing/OEM Material Specification.

DRG. No.: 172.40.328, SUPERSED'S BY ISSUE - NIL, VIDE AUTHORITY NOTIFICATION:- 1884-101:03. DRAWING INCORPORATED BASED ON RUSSIAN ORIGINAL ISSUE-1

SUPPLY CODE
U-01-1-2

F-78
4
SIZE A1

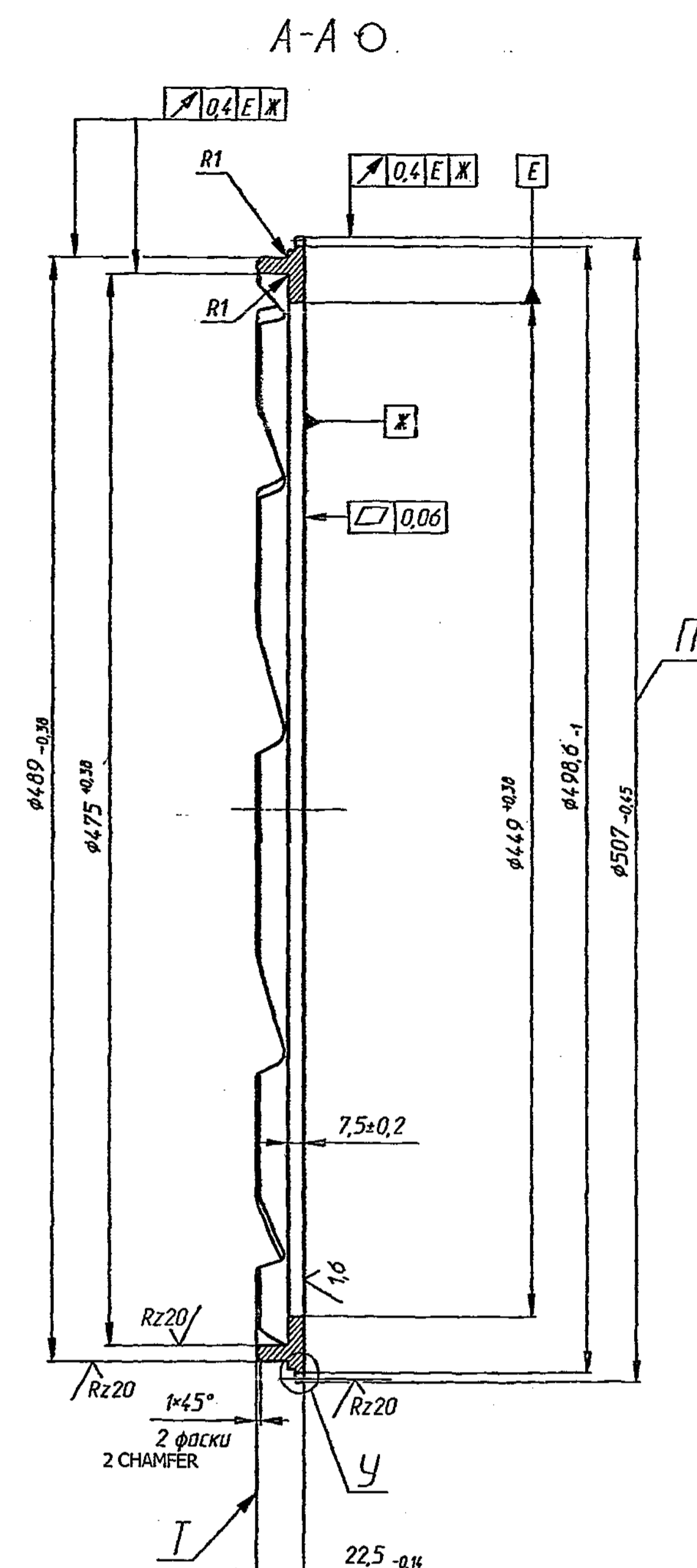
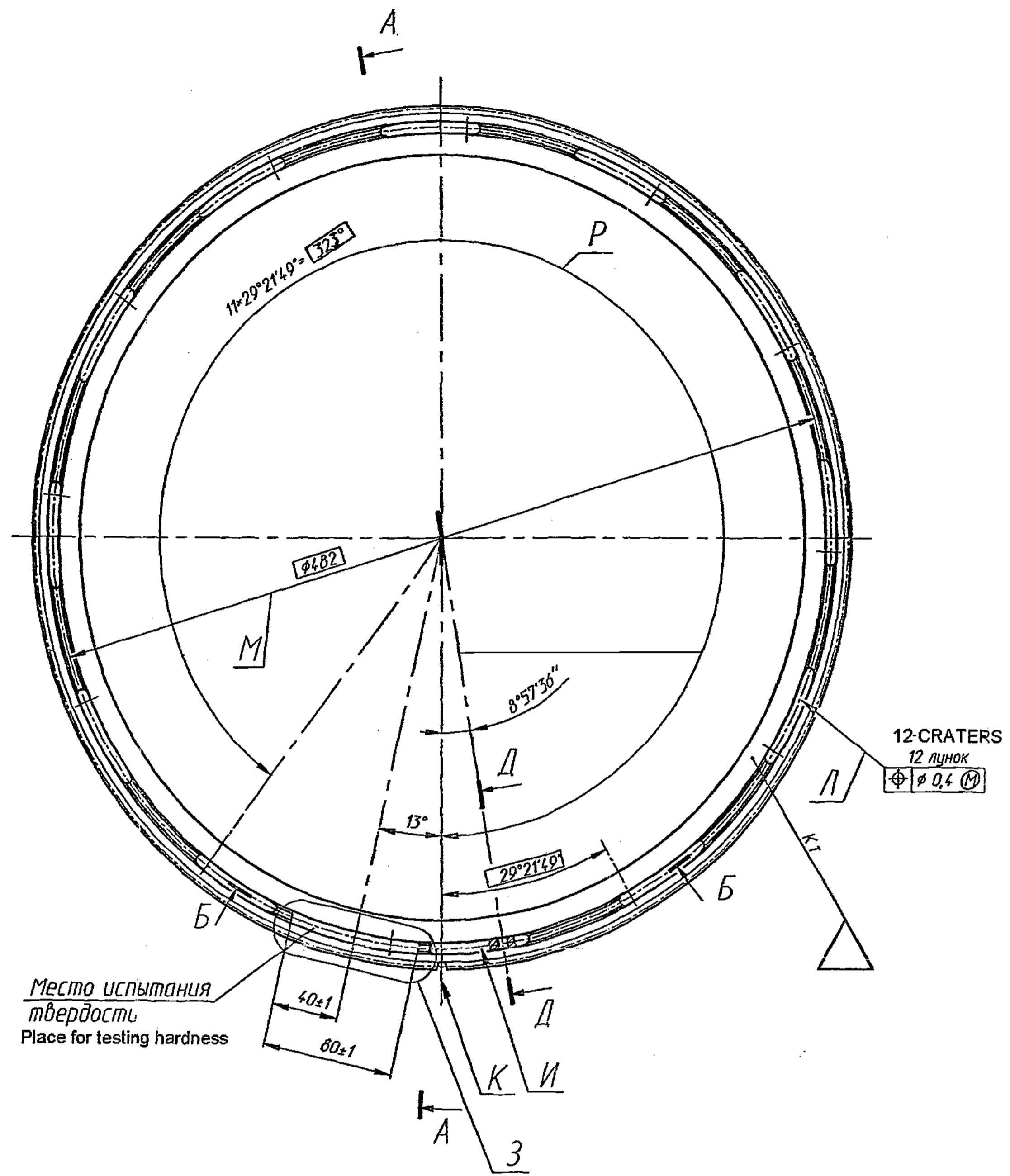
PILOT SAMPLE SHOULD BE APPROVED BY A I S P BEFORE BULK PRODUCTION.

EST. WT. (kg) 3.2 TO BE STAMPED OR MARKED WHERE INDICATED THIS # (LETTERS)

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

DRN	172.40.328	MATERIAL: STEEL 20 X 2H 4A GOST 4543-71	USED ON: 172.40Cb-2Cb 172.40.052Cb Cb.
APPD	172.40.328	CONTROL RATE OF QUALITY ASSURANCE (HEAVY VEHICLES) AVADI	
DATE	29.06.2008	TITLE: RIGHT HAND REAR ENGAGING RING	
SCALE	1:2	D S CAT NUMBER	DRAWING NUMBER 172.40.328
DIMENSIONS IN mm UNLESS OTHERWISE STATED IS: 202-09		ISSUE DATE	NATURE OF AMENDMENTS
1A	15.5.23	DEW No: COA/MV/TY-22/C-0922/2023 dated 24-01-2023	

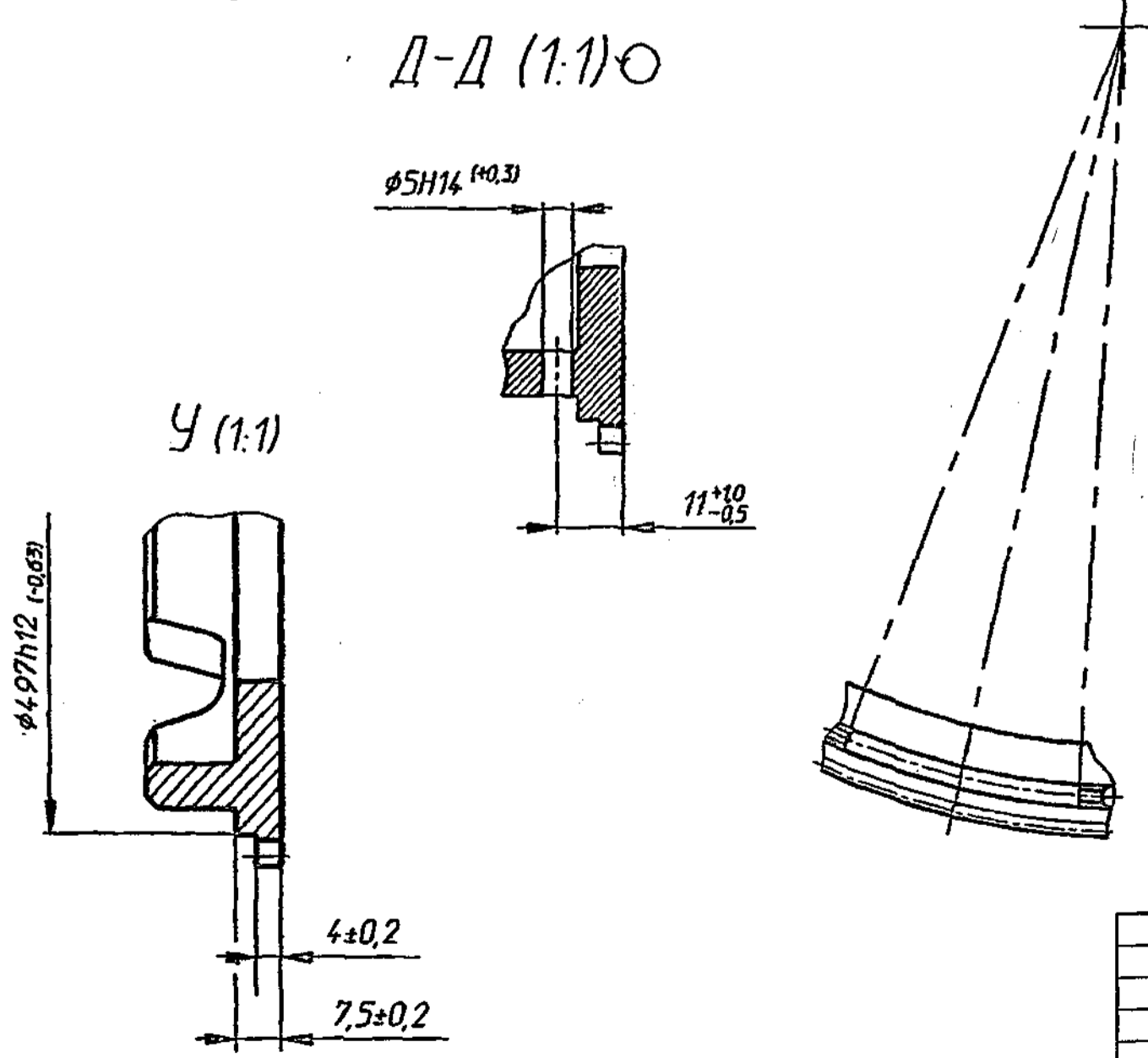
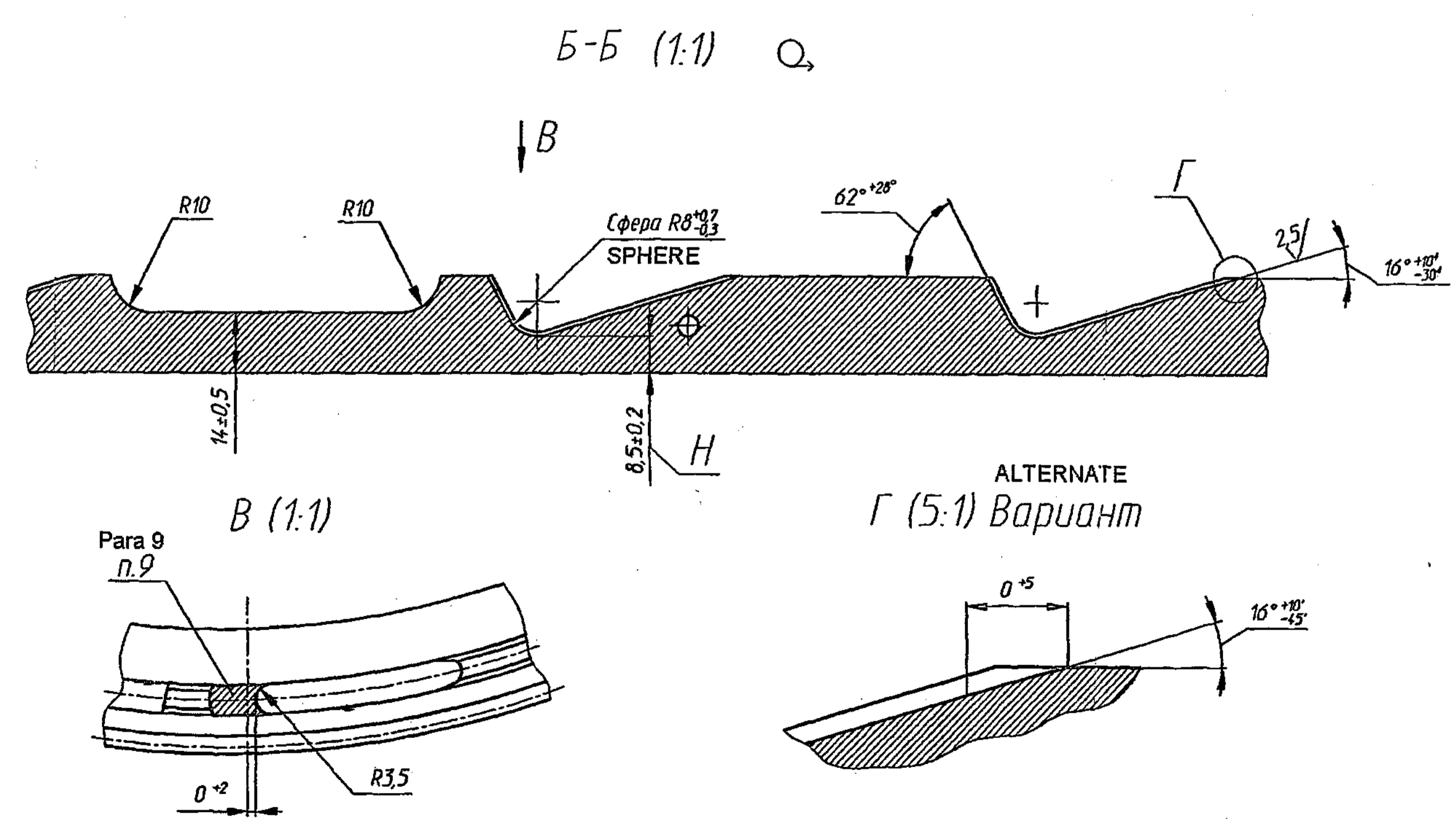
DRG. No.-172.40.330, SUPERSED'S BY ISSUE -NIL, VIDE AUTHORITY NOTIFICATION:- 188-A-101-03. DRAWING INDIANISED BASED ON RUSSIAN ORIGINAL ISSUE-1



Module	<i>m</i>	3
Number of tooth	<i>Z</i>	168
BASIC RACK	Profile angle	α 20°
	Co-efficient of addendum	h_a^* 0,7
	Co-efficient of bottom clearance	c^* 0,2
	Fillet radius	ρ_f 0 ^{+0.3}
Addendum modification coefficient	<i>x</i>	0
Base tangent length	<i>W</i>	170,89 ^{-0.4} _{-0.7}
Reference circle diameter	<i>d</i>	504
Part no. of drawing of mated components		172.40.302

- BHN 302...341.
- Teeth should be checked for smooth passage with a toothed gauge, made as per lower deviations of mating component.
- On the profile of tooth, longitudinal marks with depth 0^{+0.2} mm are permitted.
- Decreasing of base tangent length up to 169.99 mm in not more than 10 teeth is permitted.
- Difference in dimension of depth of any pair of teeth should be 0^{+0.4} mm, excluding 10 decreased teeth.
- Deviation for longitudinal axis of crater П from circumference M in areas of coming out to end faces T not exceeding 0.8 mm is permitted.
- During measuring along dimension M shift of center of sphere of crater И relative to axis of tooth space should be 0^{+0.5} mm.
- Checking of deviation along pitch of crater П may be replaced by checking the difference in depth of surface of crater from end face Ж. During this height difference of crater while measuring through equally spaced points on arc P should not be more than 0.25 mm for all craters.
- On dotted line of surfaces of crater (see B) tool marks and surface finish Rz = 40 microns is permitted.
- Difference of dimension H - 0^{+0.07}mm.
- Decreasing of dimension П up to diameter 506.35 mm is permitted.
- Part must be non-magnetic.
- Other requirements are as per specification 520.TY1.

ALTERNATE 3 Вариант



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

EST. WT. (kg)	TO BE STAMPED OR MARKED WHERE INDICATED THUS # (LETTERS)
3.2	

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

DRN	CHD	APPD	DATE	SCALE	DIMENSIONS IN mm	TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS: 2102-69	ALL THREADS TO CONFORM TO	D S CAT NUMBER	DRAWING NUMBER
			21/06/2008	1:2					172.40.330

MATERIAL:- STEEL 20X2H4A GOST 4543-71

USED ON:- 172.40 Cb-1Cb 172.40.053 Cb Cb.

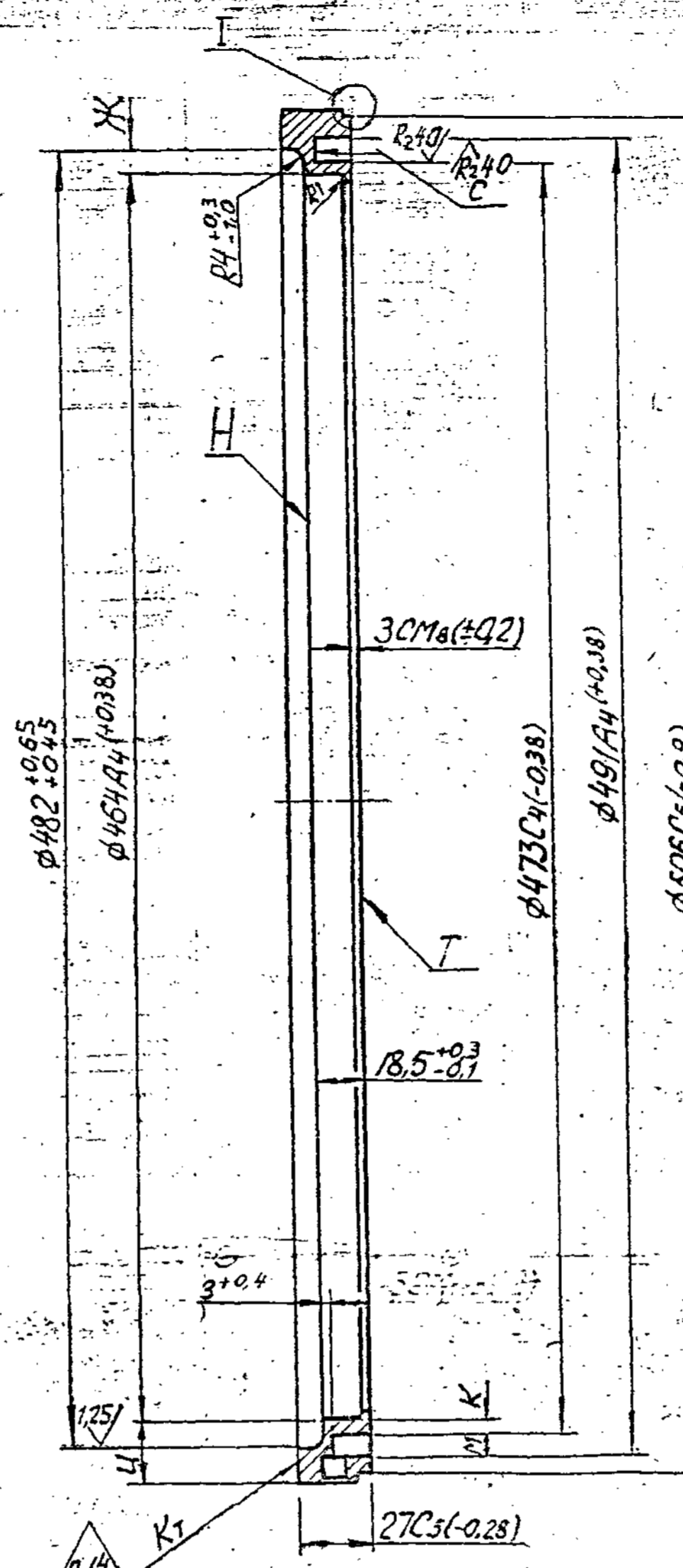
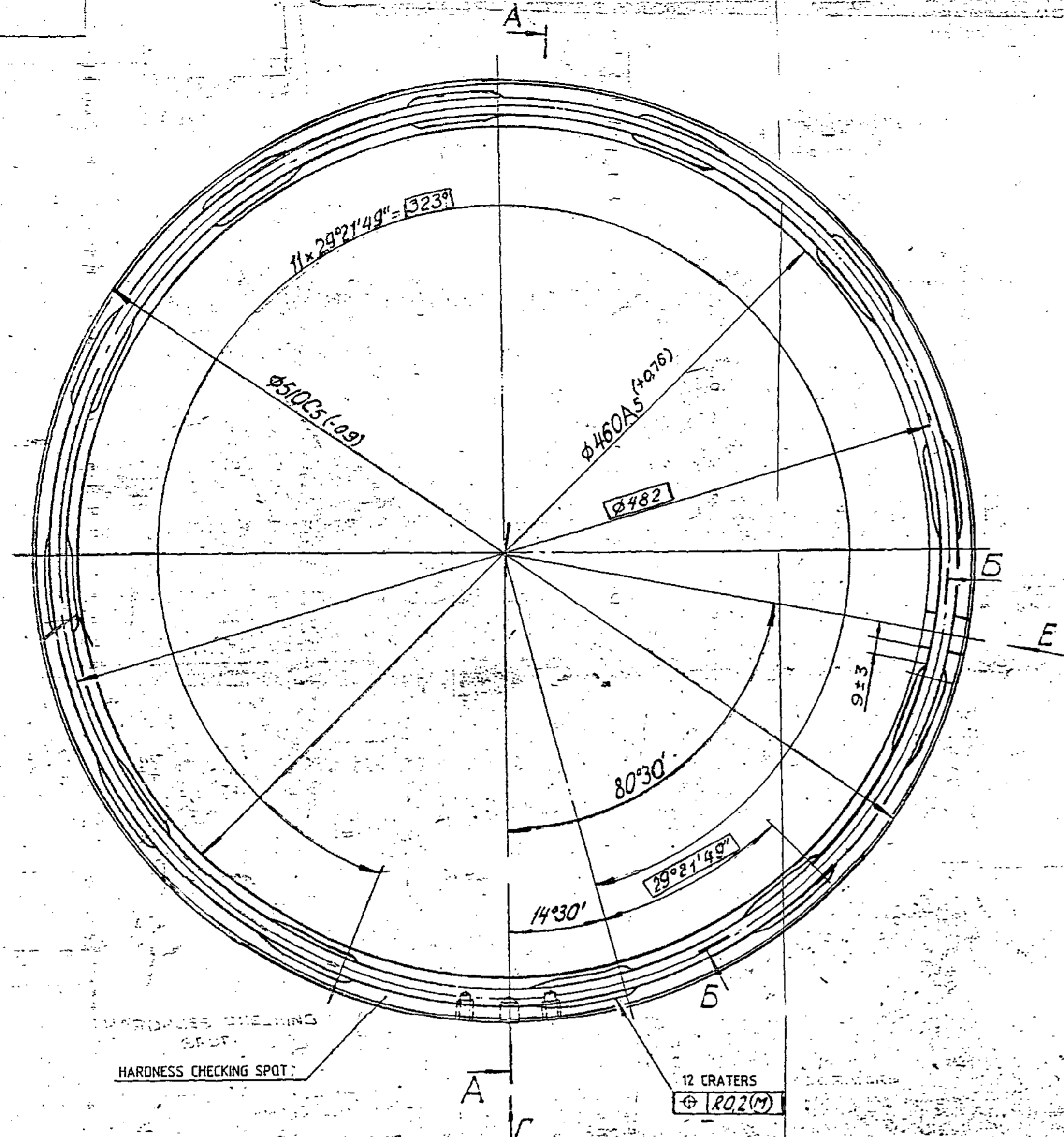
CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES) AVADI

TITLE:- LEFT HAND REAR ENGAGING RING







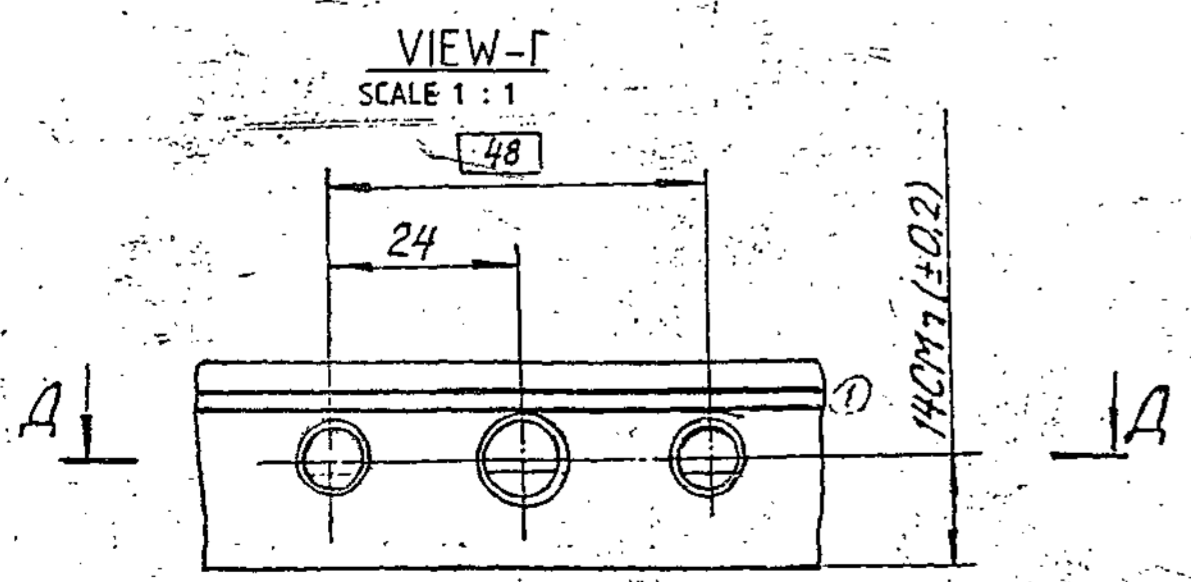
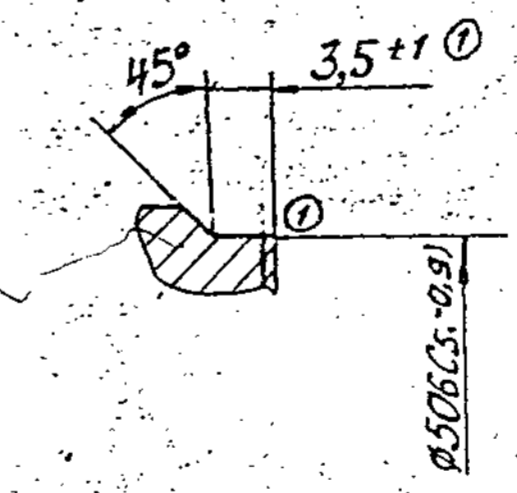
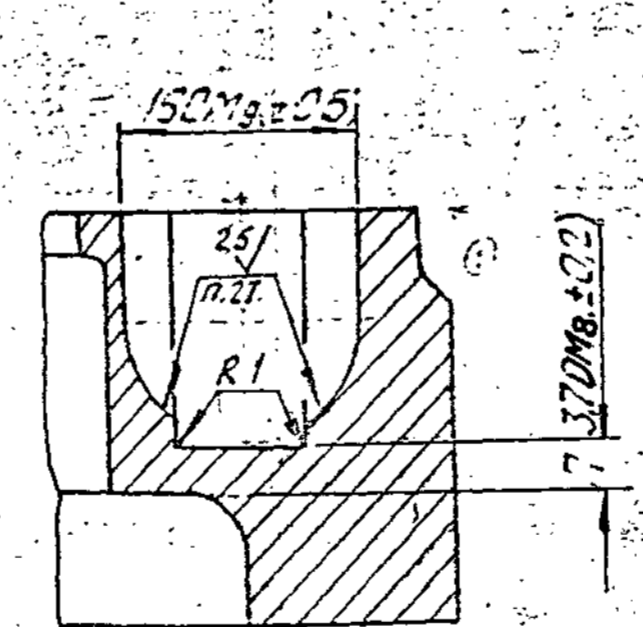
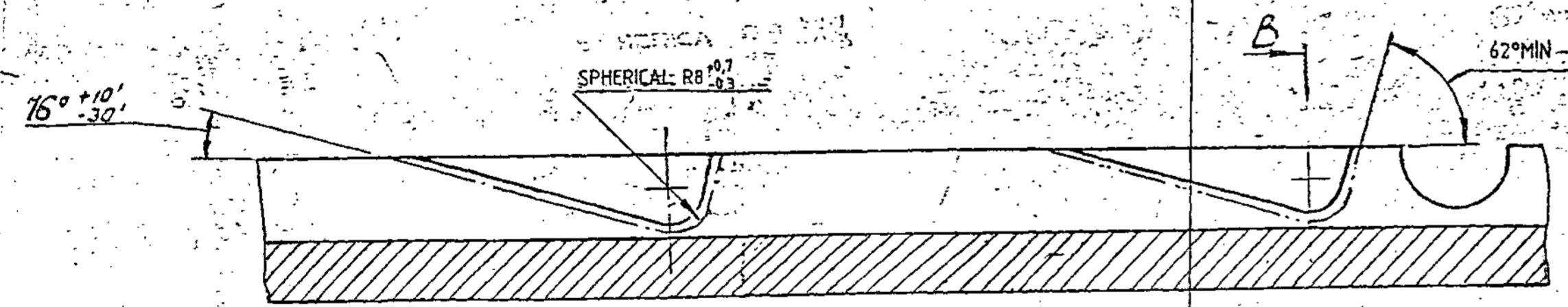


1. BHN 341-302 (DIA OF INDENTATION 3.3-3.5)
2. SURFACE FINISH OF 2.5 IN CRATERS IS TO BE ENSURED ON SLOPE ANGLE OF $16^{\circ} \pm 10^{\circ}$ OVER A LENGTH OF MINIMUM 1.5mm ON BOTH SIDES OF THE GROOVE.
3. DIFFERENCE OF MEASUREMENTS TAKEN ON DIMENSION δ SHOULD NOT EXCEED 0.2 AND ON DIMENSION U, K, M, - ± 0.4 mm.
4. THE SHIFT OF AXIS OF HOLE 'P' RELATIVE TO CRATER WHEN MEASURING δ 482 SHOULD BE 0.5mm MAXIMUM.
5. THE VARIATION OF MEASUREMENTS TAKEN BETWEEN THE AXES OF THE THREADED HOLES AND AXIS OF HOLE 'P' SHOULD BE 0.3mm MAXIMUM.
6. SHIFT OF AXIS OF HOLE 'P' RELATIVE TO THE AXES OF THREADED HOLES (DIMENSION 14 C47) SHOULD NOT EXCEED 0.2mm.
7. THE DIFFERENCE OF MEASUREMENTS TAKEN ON DIMENSION δ SHOULD NOT EXCEED 0.01mm.
8. HOLE 'P' IS TO BE CHECKED TO A DEPTH OF 9mm MINIMUM.
9. IN HOLE 'P' TOOL MARKS ARE ALLOWED.
10. CHECKING OF PITCH DEVIATION OF CRATERS MAY BE SUBSTITUTED BY CHECKING THE DIFFERENCE IN DEPTH OF CRATER RELATIVE TO FACE 'H' IN THIS CASE THE DEPTH VARIATIONS OF CRATER SURFACES WHEN MEASURED AT EQUAL SPACED POINTS OVER ARC OF 323° MUST NOT EXCEED FOR ALL CRATERS 0.25mm.
11. DIMENSION 'P' AND DIFFERENCE OF MEASUREMENTS ON DIMENSION 'P' ARE TO BE CHECKED WITH THE AID OF BALL $\phi 15.081$ mm, GOST 3722-60.
12. DEVIATION OF LONGITUDINAL AXES OF CRATERS FROM CIRCUMFERENCE ϕ 482 AT TRANSITIONS ONTO FACE 'T' SHOULD NOT BE MORE THAN 0.8mm.
13. THE COMPONENT MUST BE DEMAGNETISED.
14. TO BE MARKED.
15. OTHER REQUIREMENTS AS PER 520 TY-1.

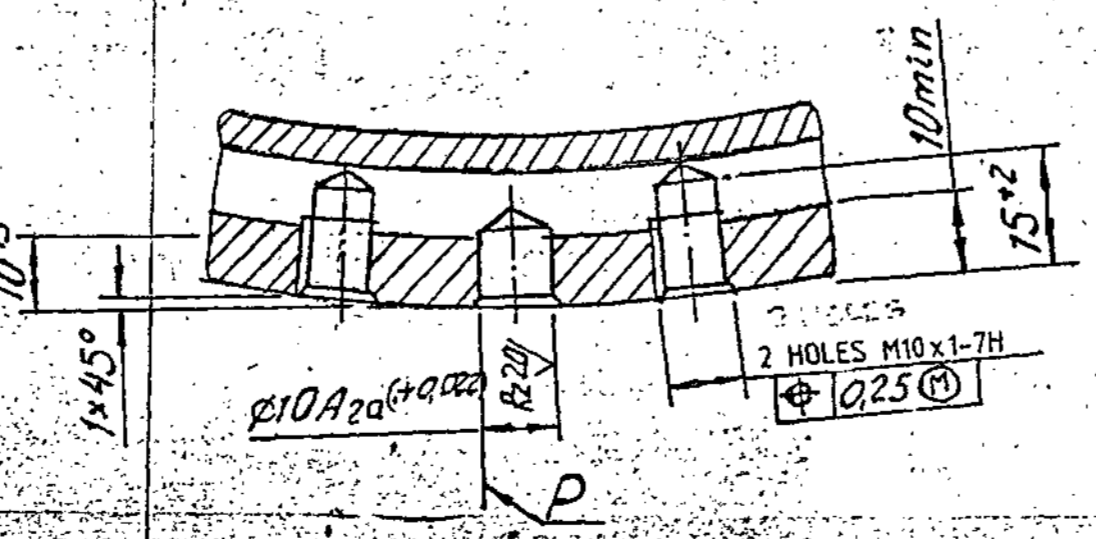
B-B DEVELOPED VIEW SCALE 1:1

B-B SCALE 2:1

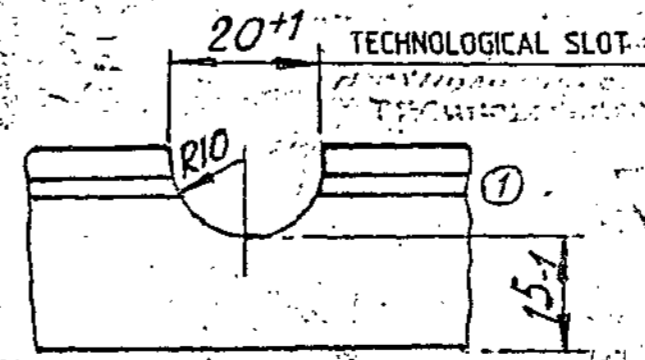
I SCALE 2:1



A-A SCALE 1:1



VIEW-E SCALE 1:1



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

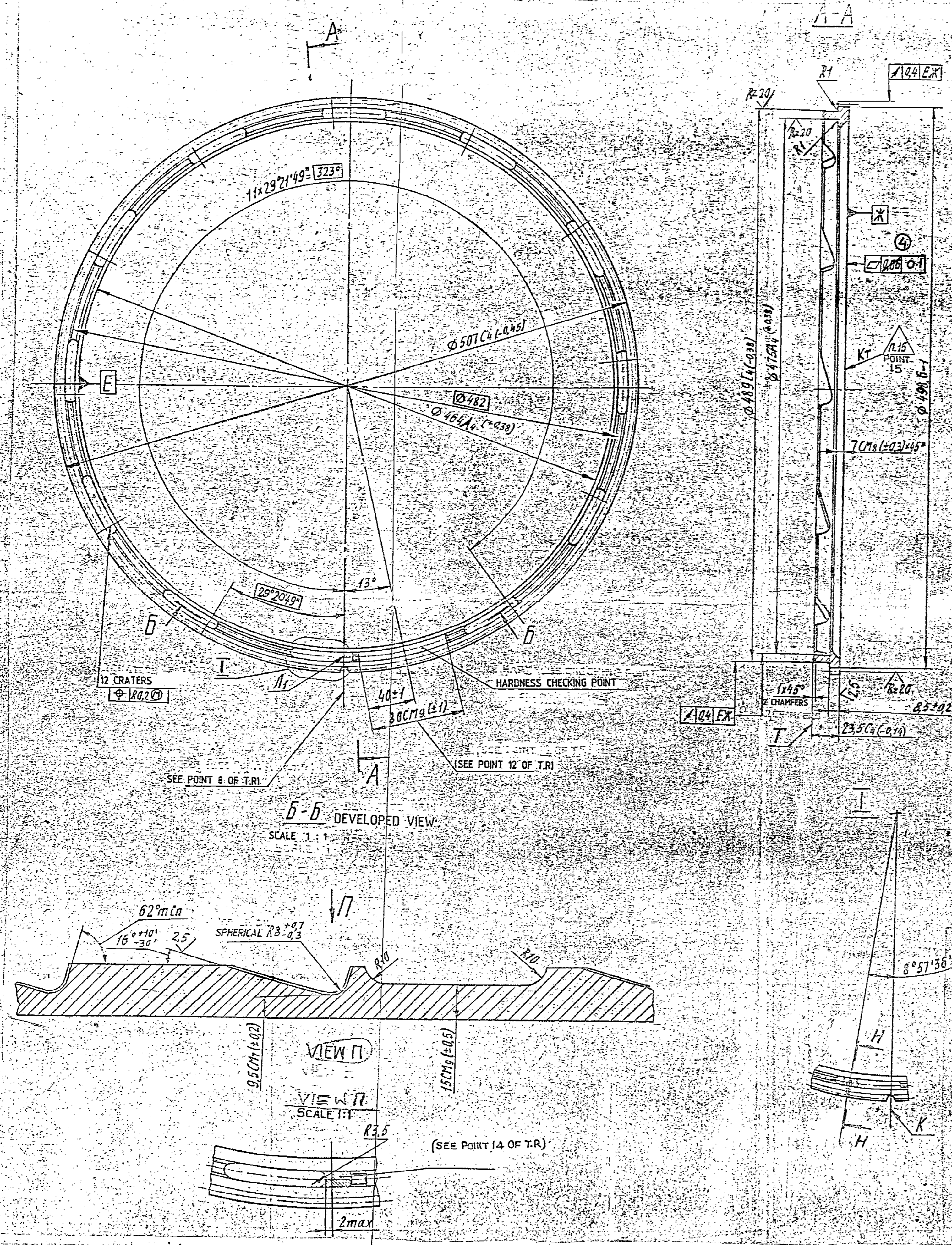
EST. MASS 46 kg TO BE STAMPED OR MARKED WHERE INDICATED THIS # LETTERS) ALL SHARP EDGES AND CORNERS TO BE REMOVED UNLESS OTHERWISE STATED MACHINED CORNERS TO HAVE R OUTSIDE R INSIDE EQUIVALENT CHAMFERS ARE PERMISSIBLE.

DRN	M. Ch. Williams	MATERIAL	STEEL 20X2H4A GOST 4543-71	USED OR -
END				172 40 019 Cb Cb
TED	M. Ch. Williams			175 40 Cb-6 Cb
APPD		CONTROLLERATE OF QUALITY ASSURANCE HEAVY (INDIA)		
DATE		A V A D I		
SCALE	1:1			
DIMENSIONS IN mm				
TOLERANCE ON DIMS UNLESS OTHERWISE STATED IS GOST-66				
ALL THREADS TO CONFORM TO				
ISSUE DATE		NATURE OF AMENDMENTS		



MODULE	m	5
NUMBER OF TEETH	Z	168
PROFILE ANGLE	α	20°
COEFFICIENT OF ADDENDUM	ha*	0.7
COEFFICIENT OF BOTTOM CLEARANCE	c	0.2
FILLET RADIUS	r _f	0.3 max
COEFFICIENT OF ADDENDUM MODIFICATION	x	
BASE TANGENT LENGTH	W	170.89 ± 0.1
BASE CIRCLE DIA	d _o	504

1. BHN 341 to 302 (dia of indentation 3.3 to 3,5)
2. Longitudinal marks of depth not more than 0.2mm are allowed on the profile of the tooth.
3. The dimensional difference on dimension 9.5 (section B-B) should not be more than 0.07mm.
4. The angle of elevation 16°±10' is allowed on a length of not more than 5mm from the end of crater A.
5. The gears are to be controlled for free passage of gear gauge made according to lower deviations of mating component.
6. Increase in pitch by 0.2mm beyond tolerance is allowed on not more than 10 teeth.
7. Deviation not exceeding 0.8mm of longitudinal axis of craters A from circumference $\varnothing 482$ in the places of exit on face T is allowed.
8. Shift of spherical centre of crater A₁ relative to teeth space axis X should not be more than 0.5mm when the measurement is taken on $\varnothing 482$.
9. It is allowed to substitute the checking of the differential height of working surface from face X for checking the deviation of crater A pitch. In this case the variation of height of working surface craters must not exceed 0.25mm for all craters. When measured at equal spaces on arc 323.
10. Increase in dimension $\varnothing 507$ C₄ by 0.2mm beyond tolerance is allowed.
11. Difference in height of every pair of teeth should not be more than 0.4mm with the exception of 10 teeth having an increased pitch.
12. Recess 'M' is allowed to be completed as per dotted line.
13. The component must be demagnetised.
14. On the cross-hatched surface of crater cutting mark is allowed with the surface finish upto Rz 40.
15. Mark.
16. The other requirements as per 520 TY-1.



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

EST. MASS 2.3kg 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	172.40.019Cb	MATERIAL	STEEL 20X2H4A	USED ON	172.40.019Cb
EDD	175.40.019Cb		GOST 4543-71		175.40.019Cb
TCD					
APPD		CONTROLLERATE OF QUALITY ASSURANCE (HEAVY VEHICLES)			
DATE	27-0-88	A V A D I			
SCALE	1:1	TITLE RING ENGAGING			
DIMENSIONS IN mm.		EXTREME RIGHT.			
TOLERANCE ON DIMNS UNLESS OTHERWISE STATED IS 2102-69		D S CAT NUMBER			
ALL THREADS TO CONFORM TO		DRAWING NUMBER			
4-17-892 NOTN. 172M 627 A 89 AL 13/ BK.1		172.40.146			
ISSUE DATE NATURE OF AMENDMENTS					

DRG. INDIANISED BASED ON RUSSIAN ORIGINAL ISSUE -3 COMMON TO BLT

SIZE A1



MACHINED COMPONENTS (GROUP -IV)

Sl No	LF No	Drawing No	Nomenclature
1	6106401050	172.40.146	RING ENGAGING EXTREME RIGHT
2	6106401051	172.40.147	INITIATING RING MIDDLE R.H
3	6106401052	172.40.148	ENGAGING RING EXTREME LH
4	6106401053	172.40.149	ENGAGING RING MIDDLE, LH
5	6106401065	172.40.225	RELEASE RING III FRICTION CLUTCH
6	6101040031	172.40.225-1	3RD FRICTION CLUTCH RELEASING RING
7	6106401068	172.40.229	BOOSTER INNER
8	6106401070	172.40.231	BOOSTER
9	6106401071	172.40.232	BOOSTER
10	6106401084	172.40.246	EPICYCLE OF TRAIN IV
11	6106401085	172.40.247	GEAR CROWN 3RD PLANETARY GEAR SET
12	6106401096	172.40.270	BOOSTER
13	6101040033	172.40.270-1	BOOSTER
*14	6106401097	172.40.271	CROWN
15	6106401098	172.40.308	DISCHARGE RING
16	6101040041	172.40.308-1	RELEASE RING
17	6101040042	172.40.309	CROWN GEAR OF 2ND PLANETARY GEAR SET
18	6101040043	172.40.310	CROWN GEAR OF 3RD PLANETARY GEAR SET
19	6101040044	172.40.311	EPICYCLIC GEAR OF 4TH PLANETARY SET
20	6101040052	172.40.319	DRUM
21	6101040053	172.40.320	CROWN
22	6101040054	172.40.321	BOOSTER
23	6101040055	172.40.322	INNER BOOSTER
24	6101040056	172.40.323	INNER BOOSTER
25	6101040057	172.40.324	BOOSTER
26	6101040059	172.40.326	THRUST DISK
27	6101040061	172.40.328	RIGHT HAND REAR ENGAGING RING
28	6101040062	172.40.329	RIGHT-HAND MIDDLE ENGAGING RING
29	6101040063	172.40.330	LEFT HAND REAR ENGAGING RING
30	6101040064	172.40.331	LEFT-HAND MIDDLE ENGAGING RING
31	6101040108	172.40.366	STOPPING BRAKE HOUSING (RIGHT-HAND)
32	6101040109	172.40.367	STOPPING BRAKE HOUSING (LEFT-HAND)
33	6106404014	172.43.008	PACKING COVER
34	6106401118	175.40.021	HOUSING OF MAIN BRAKE RH
35	6106401119	175.40.022	HOUSING OF MAIN BRAKE L
36	6106401120	175.40.023	BOOSTER INNER
37	6106401127	175.40.025	CROWN GEAR OF 2ND PLANETARY GEAR SET
38	6106401128	175.40.026	DRUM
39	6106401126	175.40.027-2	BOOSTER OUTER
40	6106401131	175.40.030-1	BOOSTER
41	6106401132	175.40.031	THRUST DISC
42	6106401146	175.40.052	BOOSTER BODY RIGHT
43	6106401147	175.40.053	HOUSING LH BOOSTER
44	6106402034	175.41.050	HUB FAN STEEL 38XC
45	6106402035	175.41.051	PLATE PRESSURE
46	6106406229	175.45.112	TOOTHED COUPLING
47	6101041013	188.41.006	FAN HUB

MACHINED COMPONENTS (GROUP -IV)

SI 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 IV) <i>Total items = 47 Nos</i>	<p>TECHNOLOGY-1</p> <p>Turning</p> <p>Milling & Drilling</p> <p>Gear Hobbing</p> <p>Gear Shaping</p> <p>TECHNOLOGY-3</p> <p>Hardening & Tempering</p> <p>Protection coating</p> <p>TECHNOLOGY-4</p> <p>Raw material</p>	<p>CNC Turning dia 600mm suitable to accommodate component of diameter in the range of dia 250 to 600mm with 0.010mm accuracy</p> <p>HMC and/or VMC suitable to the components upto the size 630mm diameter with 0.010 accuracy</p>	<p>Gear Hobbing of Mod 3 x cutting ϕ400 with gear cutting accuracy of class of Din 7 or better accuracy</p> <p>Gear Shaping of Mod 5 with gear cutting accuracy of class of Din 7 or better accuracy.</p> <p>Hardening & Tempering furnace with Oil quenching facility</p> <p>Oxidising Plant</p> <p>Firm should be capable to arrange the raw material like Forging, Casting, Bar material etc as per drawing specification and standard.</p>		

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MACHINED COMPONENTS (GROUP -IV)

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 IV) <i>Total items = 47 Nos</i>	<p>TECHNOLOGY-1</p> <p>Turning</p> <p>Milling & Drilling</p> <p>Gear Hobbing</p> <p>Gear Shaping</p> <p>Hardening & Tempering</p> <p>TECHNOLOGY-3</p> <p>Protection coating</p> <p>TECHNOLOGY-4</p> <p>Raw material</p>	<p>CNC Turning dia 600mm suitable to accommodate component of diameter in the range of dia 250 to 600mm with 0.010mm accuracy</p> <p>HMC and/or VMC suitable to the components upto the size 630mm diameter with 0.010 accuracy</p>	<p>Gear Hobbing of Mod 3 x cutting ϕ400 with gear cutting accuracy of class of Din 7 or better accuracy</p> <p>Gear Shaping of Mod 5 with gear cutting accuracy of class of Din 7 or better accuracy.</p> <p>Hardening & Tempering furnace with Oil quenching facility</p> <p>Oxidising Plant</p> <p>Firm should be capable to arrange the raw material like Forging, Casting, Bar material etc as per drawing specification and standard.</p>		


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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 IV)	TEST / INSPECTION-1	3D CMM	3D CMM 500 x 500mm.		
			Gear Profile Tester		Gear Profile Tester (Max module 5)	
		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	Gear Teeth Micrometer, Vernier Caliper, Groove Vernier, Radius gauge, Feeler Gauge etc. suitable to the requirement of the components			
		Hardness measurement		Brinell / Rockwell Hardness Tester		
		TEST / INSPECTION-2				


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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(J.P.SINGH)
GM-OPERATIONS I


Subhoj
Subhoj Bisht
Att to (NEERAJ KUMAR)
QA-RIG(OE)


(ANIMESH PAIK)
DGM/CA, TRG & RG

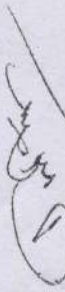
MACHINED COMPONENTS (GROUP -V)

SI No	LF No	Drawing No	Nomenclature
1	6106208025	172.25.008-A	GEAR
2	6106208026	172.25.009-1	CLUSTER GEAR
3	6106208027	172.25.010-1	CLUSTER GEAR
4	6106208028	172.25.011-1	GEAR
5	6106851038	172.25.092	GEAR
6	6101025012	172.25.105	GEAR STEEL 38XC
7	6106209017	172.26.014-1	SHAFT
8	6106209018	172.26.016-1	GEAR
9	6106209011	172.26.020CB	CLUSTER GEAR
10	6106210116	172.27.128	GEAR WHEEL
11	6106211061	172.28.007-1	GEAR
12	6106208046	172.28.009-1	GEAR
13	6106211063	172.28.012-2	CLUSTER GEAR
14	6106211064	172.28.013	GEAR
15	6106211066	172.28.015-1	GEAR
16	6101028039	172.28.015-2	GEAR
17	6106211067	172.28.016-2A	GEAR
18	6106401033	172.40.025	PLANET III TRAIN
19	6106401040	172.40.040-1	SUN GEAR II TRAIN
20	6106401049	172.40.204-2	DELIVERY PUMP GEAR
21	6106401074	172.40.240	GEAR, IDLE
22	6101040039	172.40.305	2ND SUN GEAR
23	6101040045	172.40.312	PLANET PINION Z=15
24	6101040046	172.40.313	PLANET PINION
25	6106404013	172.43.006	PLANET PINION
26	6101043007	172.43.016	PLANET PINION
27	6106407035	172.46.053	GEAR OF DELIVERY PUMP
28	6106407047	172.46.078	GEAR, DRIVE
29	6106407049	172.46.080	GEAR SUCTION PUMP
30	6106407057	172.46.088	GEAR, SUCTION PUMP
31	6106401104	175.40.004	RIGHT HAND GEAR WHEEL
32	6106401105	175.40.005	GEAR L.H.
33	6106401164	175.40.138	PLANET
34	6106401165	175.40.139	PLANET
35	6106401166	175.40.140	PLANET IV TRAIN
36	6101023081	176.23.111	GEAR
37	6101023059	176.23.112	GEAR
38	6106401203	432.40.184-4	LEFT HAND GEAR OF CONTROL LINKAGE
39	6106113089	434.23.127	DRUM, DRIVEN




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) <i>Total items = 39 Nos</i>	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.			
		Heat Treatment	Carburising, Hardening, Induction Hardening & Tempering furnace with Oil quenching facility suitable to the components			
		TECHNOLOGY-2	Protection coating	Oxidising , Phosphating suitable to the components		


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

FOR

(RIGHT HAND REAR ENGAGING RING)

DRG.NO. 172.40.328

(LF NO: 6201040061)

**No HVF/T-72C/QAP/40/RIGHT HAND REAR ENGAGING
RING/242590 - 00**

ISSUE No: 00

DATE: OCT- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI - 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

RIGHT HAND REAR ENGAGING RING

DRG. NO. 172.40.328


PREPARED BY


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

REVIEWED BY


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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

Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	10
16.	INTERCHANGEABILITY	10
17.	CALIBRATION CHECKS	11
18.	MARKING/IDENTIFICATION	11
19.	PRESERVATION CHECK	11
20.	PACKING CHECK	11
21.	DOCUMENTATION	11
22.	REFERENCE	12
23.	ANNEXURE-A	13
24.	FIGURE	14
25.	APPENDIX-A	15

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 **RIGHT HAND REAR ENGAGING RING TO DRG.NO 172.40.328** 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 **RIGHT HAND REAR ENGAGING RING TO DRG.NO:172.40.328.**

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 **RIGHT HAND REAR ENGAGING RING TO DRG. NO. 172.40.328** 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. 172.40CB-2CB -
- 2. 172.40.052CBCB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.328	RIGHT HAND REAR ENGAGING RING	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.328	RIGHT HAND REAR ENGAGING RING	STEEL 20X2H4A 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 RIGHT HAND REAR ENGAGING RING TO DRG.NO 172.40.328

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Place for testing hardness (Refer Drawing).
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 RIGHT HAND REAR ENGAGING RING TO DRG.NO.172.40.328

a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
					MAX			
0.16 to 0.22	0.17 to 0.37	0.30 to 0.60	1.25 to 1.65	3.25 to 3.65	0.025	0.025	0.30	0.30

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

c) **Mechanical properties:** As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES / ACCEPTANCE TEST: RIGHT HAND REAR ENGAGING RING TO DRG.NO: 172.40.328

1. BHN 302...341.
2. Teeth should be checked for smooth passage with a toothed gauge, made as per lower deviations of mating component.
3. On the profile of tooth, longitudinal marks with depth $0^{+0.2}$ mm are permitted.
4. Decreasing of base tangent length up to 169.99 mm in not more than 10 teeth is permitted.
5. Difference in dimension of depth of any pair of teeth should be $0^{+0.4}$ mm, excluding 10 decreased teeth.
6. Deviation for longitudinal axis of crater Π from circumference M in areas of coming out to end faces T not exceeding 0.8 mm is permitted.
7. During measuring along dimension M shift of center of sphere of crater Π relative to axis of tooth space should be $0^{+0.5}$ mm.
8. Checking of deviation along pitch of crater Π may be replaced by checking the difference in depth of surface of crater from end face \aleph . During this difference in depth of crater while measuring through equal segments on arc P should not be more than 0.25 mm for all craters.
9. On dotted line of surfaces of crater (see B) tool marks and surface finish $Rz=40$ microns is permitted.
10. Difference of dimension H – $0^{+0.07}$ mm.
11. Decreasing of dimension Π up to diameter 506.35 mm is permitted.
12. Part must be non-magnetic.
13. Other requirements are as per specification 520.TY1.

GEAR DETAILS:

Module		m	3
Number of tooth		Z	168
BASIC RACK	Profile angle	α	20°
	Co-efficient of addendum	h_a^*	0,7
	Co-efficient of bottom clearance	c^*	0,2
	Fillet radius	ρ_f	0 ^{+0,3}
Modification coefficient		x	0
Base tangent length		W	170,89 ^{-0,4} _{-0,7}
Reference circle diameter		d	504
Part no. of drawing of mated components			172.40.303

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.

22) REFERENCE:

- a) Drawing No: 172.40.328
- b) Material specification as per drawing:
STEEL 20X2H4A GOST 4543-71.
- c) GOST 4543-71.
- d) Specification 520 TY1.

Sl. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	RIGHT HAND REAR ENGAGING RING TO DRG. NO 172.40.328	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302... 341 (BHN)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	W/V	R	SP followed by HVF.
5		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.
6		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.
7		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

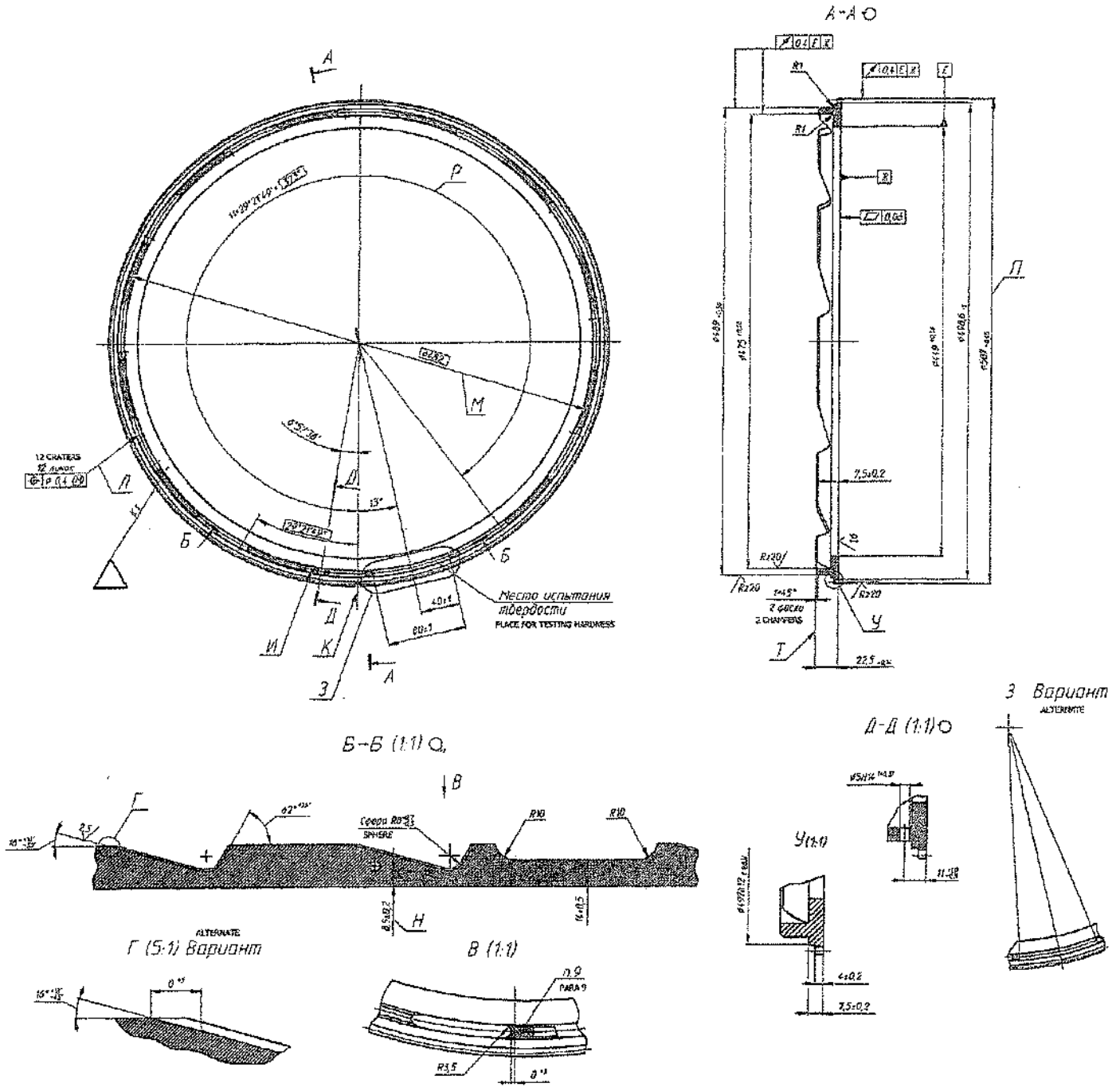


FIG: RIGHT HAND REAR ENGAGING RING TO DRG. NO 172.40.328
 (For reference only)

RECORD OF AMENDMENTS

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

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

**FOR
(LEFT HAND REAR ENGAGING RING)**

DRG.NO. 172.40.330

(LF NO: 6201040063)

**No HVF/T-72C/QAP/40/LEFT HAND REAR ENGAGING
RING/242656 - 00**

ISSUE No: 00

DATE: OCT- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

LEFT HAND REAR ENGAGING RING

DRG. NO. 172.40.330

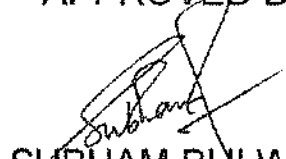
PREPARED BY


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

REVIEWED BY


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APPROVED BY


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ISSUED BY

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

Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	10
16.	INTERCHANGEABILITY	10
17.	CALIBRATION CHECKS	11
18.	MARKING/IDENTIFICATION	11
19.	PRESERVATION CHECK	11
20.	PACKING CHECK	11
21.	DOCUMENTATION	11
22.	REFERENCE	12
23.	ANNEXURE-A	13
24.	FIGURE	14
25.	APPENDIX-A	15

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 **LEFT HAND REAR ENGAGING RING TO DRG.NO 172.40.330** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenously items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

3. AIM

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **LEFT HAND REAR ENGAGING RING TO DRG.NO:172.40.330.**

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 **LEFT HAND REAR ENGAGING RING TO DRG. NO. 172.40.330** 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:

- 1. 172.40CB-1CB -
- 2. 172.40.053CBCB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.330	LEFT HAND REAR ENGAGING RING	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.330	LEFT HAND REAR ENGAGING RING	STEEL 20X2H4A 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 LEFT HAND REAR ENGAGING RING TO DRG.NO 172.40.330

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Place for testing hardness (Refer Drawing).
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 LEFT HAND REAR ENGAGING RING TO DRG.NO.172.40.330

- a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

- b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
					MAX			
0.16	0.17	0.30	1.25	3.25	0.025	0.025	0.30	0.30
to	to	to	to	to				
0.22	0.37	0.60	1.65	3.65				

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

c) Mechanical properties: As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES / ACCEPTANCE TEST: LEFT HAND REAR ENGAGING RING TO DRG.NO: 172.40.330

1. BHN 302...341.
2. Teeth should be checked for smooth passage with a toothed gauge, made as per lower deviations of mating component.
3. On the profile of tooth, longitudinal marks with depth $0^{+0.2}$ mm are permitted.
4. Decreasing of base tangent length up to 169.99 mm in not more than 10 teeth is permitted.
5. Difference in dimension of depth of any pair of teeth should be $0^{+0.4}$ mm, excluding 10 decreased teeth.
6. Deviation for longitudinal axis of crater Π from circumference M in areas of coming out to end faces T not exceeding 0.8 mm is permitted.
7. During measuring along dimension M shift of center of sphere of crater Π relative to axis of tooth space should be $0^{+0.5}$ mm.
8. Checking of deviation along pitch of crater Π may be replaced by checking the difference in depth of surface of crater from end face \mathcal{K} . During this height difference of crater while measuring through equally spaced points on arc P should not be more than 0.25 mm for all carters.
9. On dotted line of surfaces of crater (see B) tool marks and surface finish $Rz \approx 40$ microns is permitted.
10. Difference of dimension H – $0^{+0.07}$ mm.
11. Decreasing of dimension Π up to diameter 506.35 mm is permitted.
12. Part must be non-magnetic.
13. Other requirements are as per specification 520.TY1.

GEAR DETAILS:

Module		m	3
Number of tooth		Z	168
BASIC RACK	Profile angle	α	20°
	Co-efficient of addendum	h_a^*	0,7
	Co-efficient of bottom clearance	c^*	0,2
	Fillet radius	ρ_f	0 ^{+0.3}
Addendum modification coefficient		x	0
Base tangent length		W	170,89 ^{-0.4} _{-0.7}
Reference circle diameter		d	504
Part no. of drawing of mated components		172.40.302	

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.

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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.
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22) REFERENCE:

- a) Drawing No: 172.40.330
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- c) GOST 4543-71.
- d) Specification 520 TY1.

SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGOA	
1	LEFT HAND REAR ENGAGING RING TO DRG. NO 172.40.330	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or Item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302... 341 (BHN)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	W/V	R	SP followed by HVF.
5		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.
6		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.
7		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

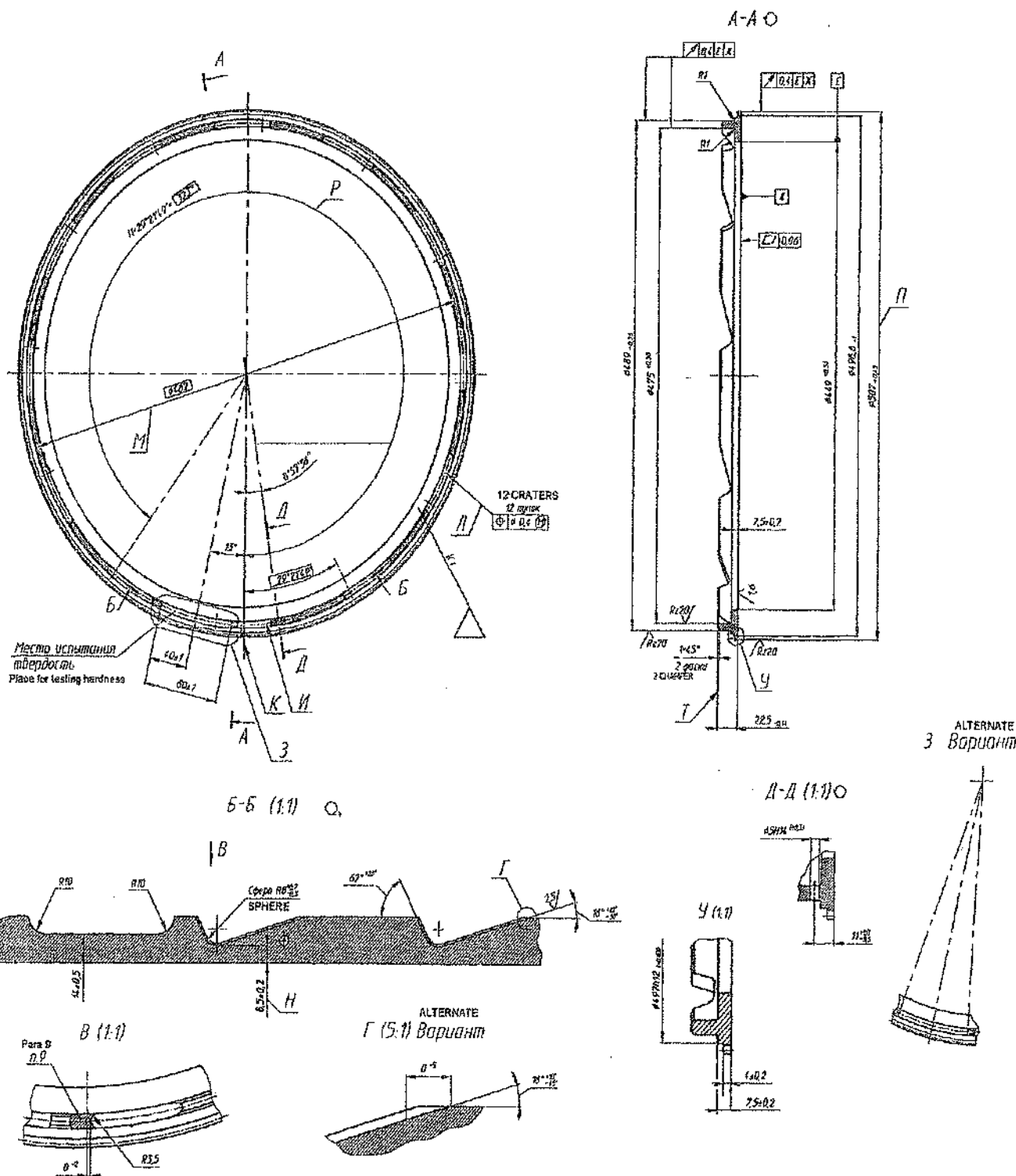


FIG: LEFT HAND REAR ENGAGING RING TO DRG. NO 172.40.330
(For reference only)

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

FOR

(LEFT HAND MIDDLE ENGAGING RING)

DRG.NO. 172.40.331

(LF NO: 6201040064)

**No HVF/T-72C/QAP/40/LEFT HAND MIDDLE ENGAGING
RING/242685 - 00**

ISSUE No: 00

DATE: NOV- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI - 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

LEFT HAND MIDDLE ENGAGING RING

DRG. NO. 172.40.331

PREPARED BY


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

REVIEWED BY


(HANUMANTHA RAO GOLLA)
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Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	10
16.	INTERCHANGEABILITY	10
17.	CALIBRATION CHECKS	10
18.	MARKING/IDENTIFICATION	10
19.	PRESERVATION CHECK	11
20.	PACKING CHECK	11
21.	DOCUMENTATION	11
22.	REFERENCE	11
23.	ANNEXURE-A	12
24.	FIGURE	13
25.	APPENDIX-A	14

1.IMPORTANT NOTE

Note-1

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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 **LEFT HAND MIDDLE ENGAGING RING TO DRG.NO 172.40.331** 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 **LEFT HAND MIDDLE ENGAGING RING TO DRG.NO:172.40.331**.

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 **LEFT HAND MIDDLE ENGAGING RING TO DRG. NO. 172.40.331** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

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

NOTE-I:

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

5. DOCUMENTS:

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

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

6. ITEM USED ON:

1. 172.40.067CBCB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.331	LEFT HAND MIDDLE ENGAGING RING	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.331	LEFT HAND MIDDLE ENGAGING RING	STEEL 20X2H4A 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 LEFT HAND MIDDLE ENGAGING RING TO DRG.NO 172.40.331

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Place for testing hardness (Refer Drawing).
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 LEFT HAND MIDDLE ENGAGING RING TO DRG.NO.172.40.331

- a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.
- b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
					MAX			
0.16 to 0.22	0.17 to 0.37	0.30 to 0.60	1.25 to 1.65	3.25 to 3.65	0.025	0.025	0.30	0.30

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

c) Mechanical properties: As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES / ACCEPTANCE TEST: LEFT HAND MIDDLE ENGAGING RING TO DRG.NO: 172.40.331

1. BHN 302...341.
2. Surface finish $2.5\sqrt{\quad}$ to be ensured on length Π and Y .
3. Difference in dimension of Δ is $0^{+0.2}$ mm; Dimension $K, M, P - 0^{+0.4}$ mm; Dimension $\Pi - 0^{+0.07}$ mm.
4. Shift of axis of hole Δ in relation to hole Π along dimension E should be $0^{+0.5}$ mm.
5. Difference in dimension C should be $0^{+0.3}$ mm.
6. Shift of axis of hole Δ in relation to axis of threaded hole Φ along dimension Y should be $0^{+0.2}$ mm.
7. Dimension Π and difference of dimension Π should be checked with ball $\varnothing 15.081$ mm GOST 3722-81.
8. Hole Δ should be checked on depth 9^{+4} mm, hole Δ - 8^{+3} mm.
9. In hole Δ tool marks are permitted.
10. Checking of deviation along pitch of crater Π may be replaced by checking for height difference of surface of crater from endface H . In this case height difference of crater while measuring through equal cuttings on arc 323° should not be more than 0.25 mm for all crater.
11. Deviation of longitudinal axis of crater from circumference E in areas of coming out of end faces T should not exceed 0.8 mm.
12. Part must be non-magnetic.
13. *Surface finish to be ensured by tool.
14. Other requirements are as per specification 520.TY1.
15. Technological slot \varnothing may not be made.

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:

- a) Drawing No: 172.40.331
- b) Material specification as per drawing:
STEEL 20X2H4A GOST 4543-71.
- c) GOST 4543-71 & GOST 3722-81.
- 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	LEFT HAND MIDDLE ENGAGING RING TO DRG. NO 172.40.331	Pre inspection reports (PIR) of firm	Firm has to produce all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302...341 (BHN)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	W/V	R	SP followed by HVF.
5		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.
6		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.
7		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

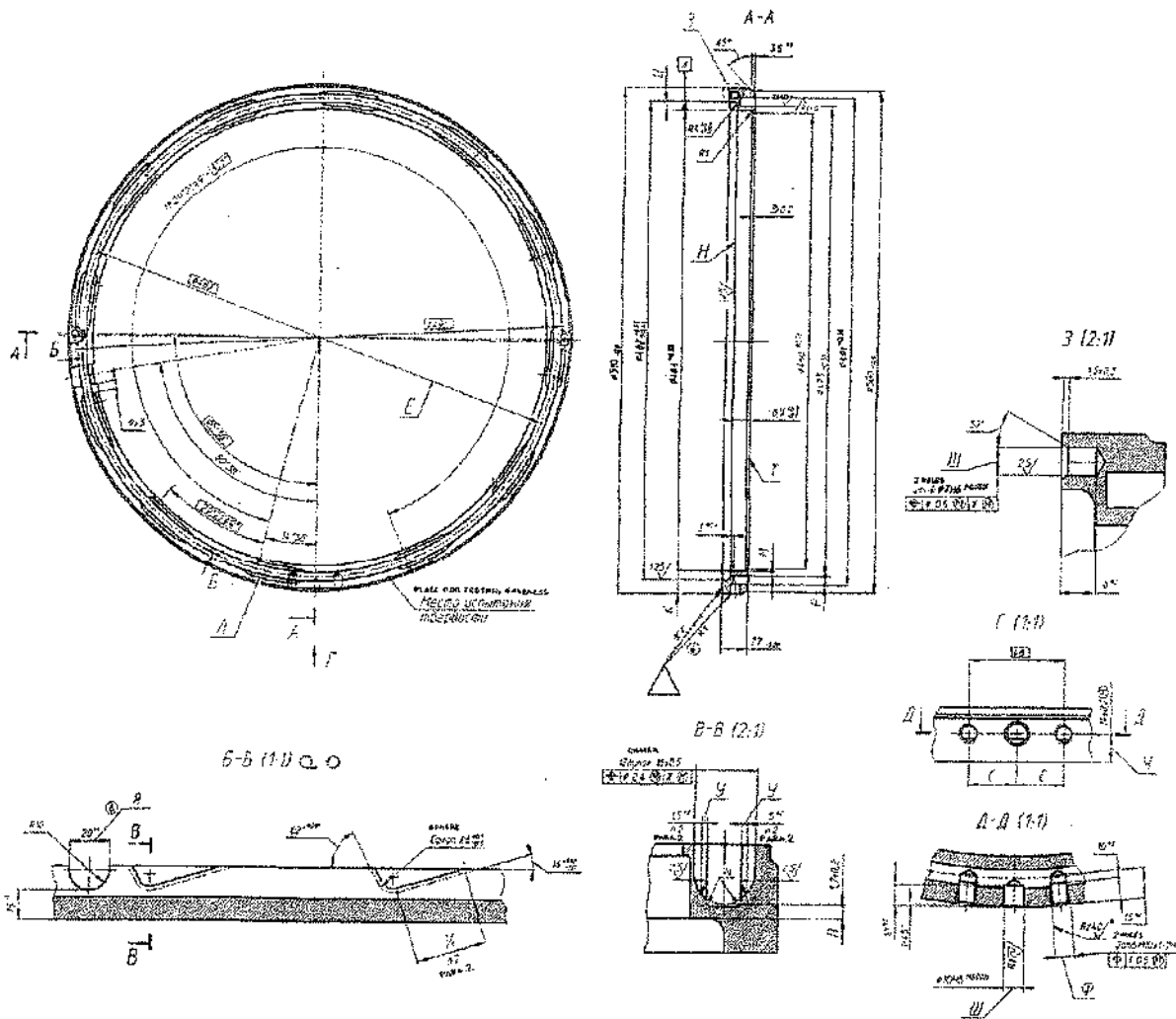


FIG: LEFT HAND MIDDLE ENGAGING RING TO DRG. NO 172.40.331

RECORD OF AMENDMENTS

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

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

FOR

(RIGHT HAND MIDDLE ENGAGING RING)

DRG.NO. 172.40.329

(LF NO: 6201040062)

**No HVF/T-72C/QAP/40/RIGHT HAND MIDDLE ENGAGING
RING/242589 - 00**

ISSUE No: 00

DATE: OCT- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

RIGHT HAND MIDDLE ENGAGING RING

DRG. NO. 172.40.329

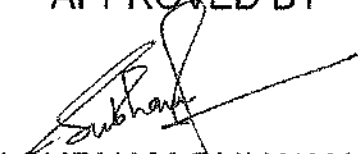
PREPARED BY


(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

Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	10
16.	INTERCHANGEABILITY	10
17.	CALIBRATION CHECKS	10
18.	MARKING/IDENTIFICATION	10
19.	PRESERVATION CHECK	11
20.	PACKING CHECK	11
21.	DOCUMENTATION	11
22.	REFERENCE	11
23.	ANNEXURE-A	12
24.	FIGURE	13
25.	APPENDIX-A	14

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 **RIGHT HAND MIDDLE ENGAGING RING TO DRG.NO 172.40.329** 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 **RIGHT HAND MIDDLE ENGAGING RING TO DRG.NO:172.40.329.**

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 **RIGHT HAND MIDDLE ENGAGING RING TO DRG. NO. 172.40.329** 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.

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- i. Tender enquiry (TE) and supply order (S.O) will be issued with QAP stating that inspection will be done as per QAP.
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sheet / Process Book is not available the details particulars/parameters available in the drawings to be strictly adhered.

6. ITEM USED ON:

1. 172.40.066CBCB - RIGHT HAND MIDDLE.

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.329	RIGHT HAND MIDDLE ENGAGING RING	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.329	RIGHT HAND MIDDLE ENGAGING RING	STEEL 20X2H 4A GOST 4543-71	1

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

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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:

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

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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 RIGHT HAND MIDDLE ENGAGING RING TO DRG.NO 172.40.329

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Place for testing hardness (Refer Drawing).
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 RIGHT HAND MIDDLE ENGAGING RING TO DRG.NO.172.40.329

a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
0.16	0.17	0.30	1.25	3.25	0.025	0.025	0.30	0.30
to	to	to	to	to				
0.22	0.37	0.60	1.65	3.65	MAX			

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

c) **Mechanical properties:** As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES / ACCEPTANCE TEST: RIGHT HAND MIDDLE ENGAGING RING TO DRG.NO: 172.40.329

1. BHN 302...341.
2. Surface finish $2.5\sqrt{\quad}$ to be ensured on length \mathbb{N} and \mathbb{Y} .
3. Difference in dimension of \mathbb{L} is $0^{+0.2}$ mm; Dimension \mathbb{K} , \mathbb{M} , \mathbb{P} - $0^{+0.4}$ mm; Dimension \mathbb{N} - $0^{+0.07}$ mm.
4. Shift of axis of hole \mathbb{M} in relation to crater \mathbb{N} along dimension \mathbb{E} should be $0^{+0.5}$ mm.
5. Difference in dimension \mathbb{C} - $0^{+0.3}$ mm.
6. Shift of axis of hole \mathbb{M} in relation to axis of threaded hole Φ along dimension \mathbb{U} should be $0^{+0.2}$ mm.
7. Dimension \mathbb{N} and difference of dimension \mathbb{N} should be checked with ball $\varnothing 15.081$ mm GOST 3722-81.
8. Hole \mathbb{L} should be checked on depth 9^{+4} mm, hole \mathbb{M} - 8^{+3} mm.
9. In hole \mathbb{M} tool marks are permitted.
10. Checking of deviation along pitch of crater \mathbb{N} may be replaced by checking for height difference of surface of crater from endface \mathbb{H} . During this height difference of hole while measuring through equally spaced points on arc 323° should not be more than 0.25 mm for all holes.
11. Deviation of longitudinal axis of hole from circumference \mathbb{E} in areas of coming out of end faces \mathbb{T} should not exceed 0.8 mm.
12. Part must be non-magnetic.
13. *Surface finish to be ensured by tool.
14. Other requirements are as per specification 520.TY1.
15. Technological slot \mathbb{A} may not be made.

15) FITMENT AND PERFORMANCE TEST:

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

EXPLANATORY NOTE:

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

16) INTERCHANGEABILITY:

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

17) CALIBRATION CHECKS

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

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

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

18) MARKING/IDENTIFICATION

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

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

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

19) PRESERVATION CHECK

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

20) PACKING CHECK

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

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

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

21) DOCUMENTATION

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

22) REFERENCE:

- a) Drawing No: 172.40.329
- b) Material specification as per drawing:
STEEL 20X2H4A GOST 4543-71.
- c) GOST 4543-71 & GOST 3722-81.
- d) Specification 520 TY1.

SL. NO.	CATEGORY	ASSEMBLY/SUB-ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGOA	
1	RIGHT HAND MIDDLE ENGAGING RING TO DRG. NO 172.40.329	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per Para 21 (iv)	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP.	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per-GOST 4543-71.	All the values to confirm with QAP (Para no:13.1 (a), (b) & (c))	P	W/V	R	SP followed by HVF.
4		Hardness checks	Hardness 302... 341 (BHN)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	W/V	R	SP followed by HVF.
5		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.
6		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.
7		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

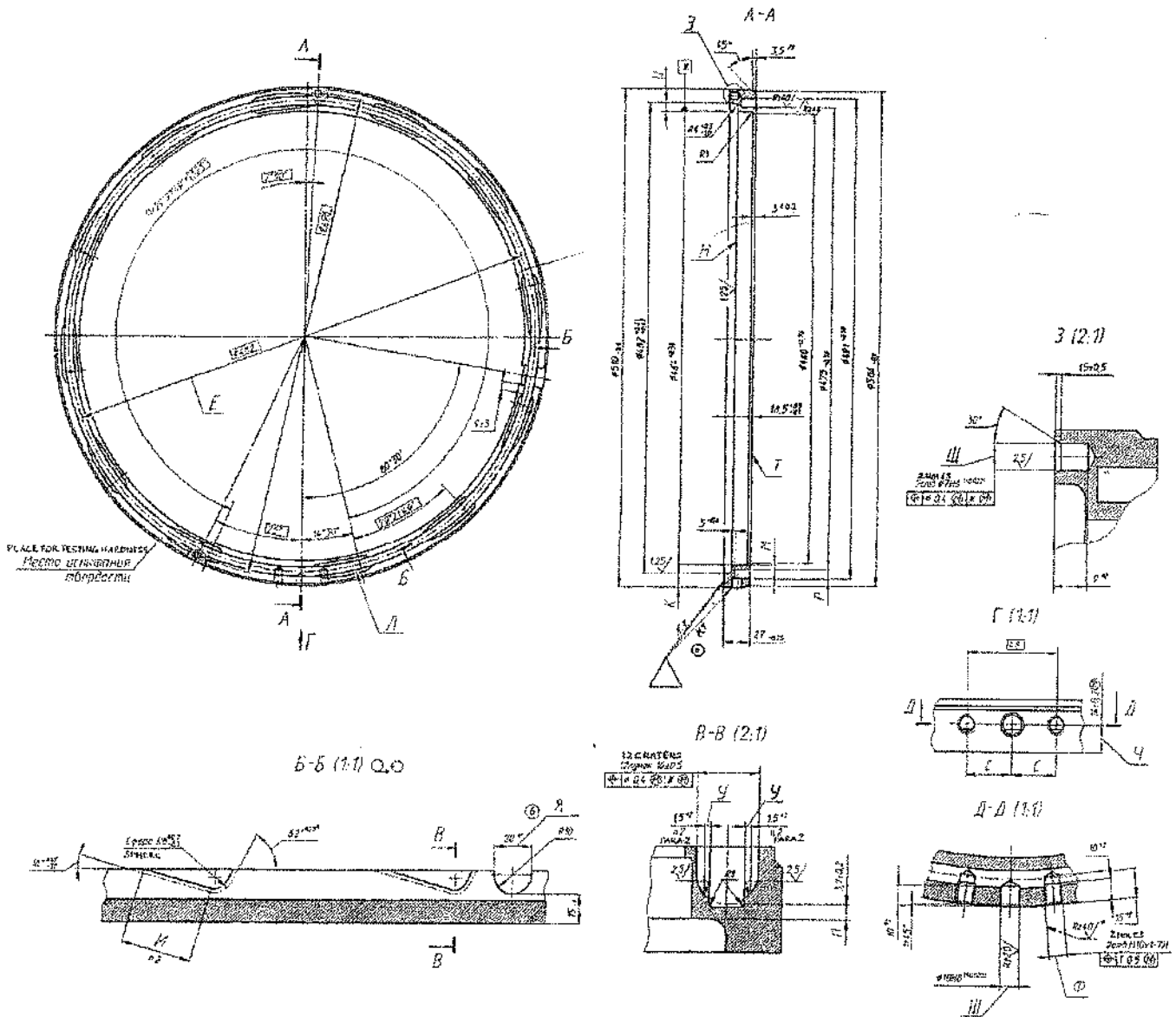


FIG: RIGHT HAND MIDDLE ENGAGING RING TO DRG. NO 172.40.329
 (For reference only)

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

FOR

(INITIATING RING MIDDLE R.H)

DRG.NO. 172.40.147

(LF NO: 6206401051)

**No HVF/T-72/QAP/40/INITIATING RING MIDDLE
R.H/242652 - 00**

ISSUE No: 00

DATE: OCT- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI - 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR

INITIATING RING MIDDLE R.H

DRG. NO. 172.40.147


PREPARED BY


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

REVIEWED BY


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

APPROVED BY


(SUBHAM BIJLWAN)
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ISSUED BY

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

Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	10
16.	INTERCHANGEABILITY	11
17.	CALIBRATION CHECKS	11
18.	MARKING/IDENTIFICATION	11
19.	PRESERVATION CHECK	11
20.	PACKING CHECK	11
21.	DOCUMENTATION	12
22.	REFERENCE	12
23.	ANNEXURE-A	13
24.	FIGURE	14
25.	APPENDIX-A	15

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 **INITIATING RING MIDDLE R.H TO DRG.NO 172.40.147** 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 **INITIATING RING MIDDLE R.H TO DRG.NO:172.40.147**.

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 **INITIATING RING MIDDLE R.H TO DRG. NO. 172.40.147** 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:

- 1. 172.40.019CBCB -
- 2. 175.40CB-6CB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.147	INITIATING RING MIDDLE R.H	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.147	INITIATING RING MIDDLE R.H	STEEL 20X2H4A 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 INITIATING RING MIDDLE R.H TO DRG.NO 172.40.147

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Technological slot (Refer Drawing).
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 INITIATING RING MIDDLE R.H TO DRG.NO.172.40.147

a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
					MAX			
0.16 to 0.22	0.17 to 0.37	0.30 to 0.60	1.25 to 1.65	3.25 to 3.65	0.025	0.025	0.30	0.30

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

c) Mechanical properties: As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

**14) PERFORMANCES / ACCEPTANCE TEST: INITIATING RING MIDDLE R.H TO
DRG.NO:172.40.147**

1. BHN 341-302 (DIA OF INDENTATION 3.3-3.5)!
2. SURFACE FINISH OF 2.5/IN CRATERS IS TO BE ENSURED ON SLOPE ANGLE OF $16^{\circ+10}_{-30}$ OVER A LENGTH OF MINIMUM 1.5mm ON BOTH SIDES OF THE GROOVE.
3. DIFFERENCE OF MEASUREMENTS TAKEN ON DIMENSION $\phi 482$ SHOULD NOT EXCEED 0.2 AND ON DIMENSION U,K,M, - 0.4mm.
4. THE SHIFT OF AXIS OF HOLE 'P' RELATIVE TO CRATER WHEN MEASURING $\phi 482$ SHOULD BE 0.5mm MAXIMUM.
5. THE VARIATION OF MEASUREMENTS TAKEN BETWEEN THE AXES OF THE THREADED HOLES AND AXIS OF HOLE 'P' SHOULD BE 0.3mm MAXIMUM.
6. SHIFT OF AXIS OF HOLE 'P' RELATIVE TO THE AXES OF THREADED HOLES (DIMENSION 14 CM7) SHOULD NOT EXCEED 0.2mm.
7. THE DIFFERENCE OF MEASUREMENTS TAKEN ON DIMENSION 7 SHOULD NOT EXCEED 0.01mm.
8. HOLE 'P' IS TO BE CHECKED TO A DEPTH OF 9mm MINIMUM.
9. IN HOLE 'P' TOOL MARKS ARE ALLOWED.

10. CHECKING OF PITCH DEVIATION OF CRATERS MAY BE SUBSTITUTED BY CHECKING THE DIFFERENCE IN DEPTH OF CRATER RELATIVE TO FACE 'H'. IN THIS CASE THE DEPTH VARIATIONS OF CRATER SURFACES WHEN MEASURED AT EQUAL SPACED POINTS OVER ARC OF 323° MUST NOT EXCEED FOR ALL CRATERS 0.25mm.
11. DIMENSION 'P' AND DIFFERENCE OF MEASUREMENTS ON DIMENSION 'P' ARE TO BE CHECKED WITH THE AID OF BALL $\phi 15.081$ mm, GOST 3722-60.
12. DEVIATION OF LONGITUDINAL AXES OF CRATERS FROM CIRCUMFERENCE $\phi 482$ AT TRANSITIONS ONTO FACE 'T' SHOULD NOT BE MORE THAN 0.8mm.
13. THE COMPONENT MUST BE DEMAGNETISED.
14. TO BE MARKED.
15. OTHER REQUIREMENTS AS PER 520 TY-1.

15) FITMENT AND PERFORMANCE TEST:

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

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

22) REFERENCE:

- a) Drawing No: 172.40.147
- b) Material specification as per drawing:
STEEL 20X2H 4A GOST 4543-71.
- c) GOST 4543-71 & GOST 3722-60.
- d) Specification: 520.TY1.

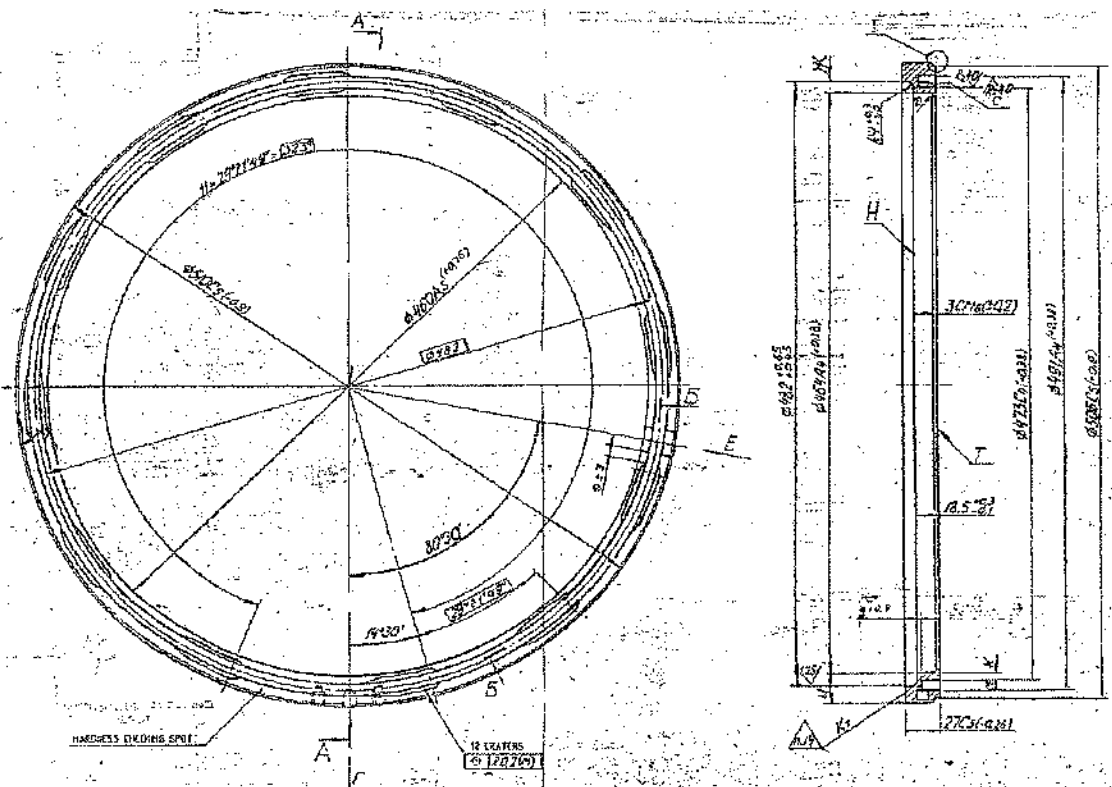
SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGOA	
1	INITIATING RING MIDDLE R.H TO DRG. NO 172.40.147	Pre inspection reports (PIR) of firm	Firm has to produced all the document as per 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 341-302 BHN (Dia of Ind. 3.3 – 3.5)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	W/V	R	SP followed by HVF.
5		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.
6		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.
7		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



E-5 DEVELOPED VIEW
SCALE 1:1

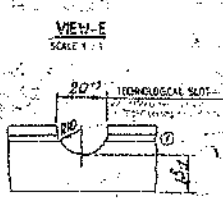
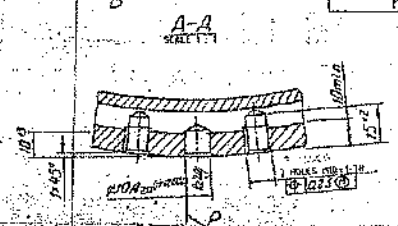
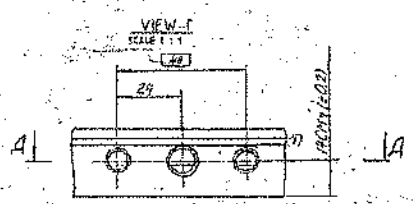
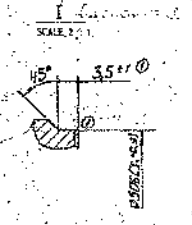
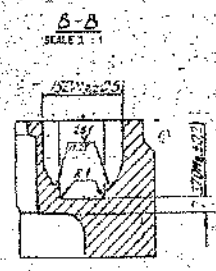
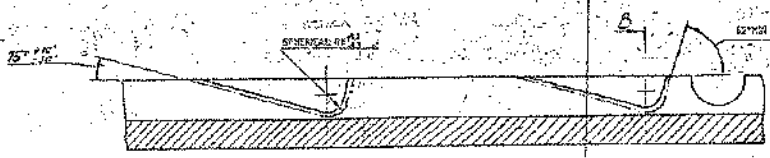


FIG: INITIATING RING MIDDLE R.H TO DRG. NO 172.40.147
(For reference only)

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

FOR

(RING ENGAGING EXTREME RIGHT)

DRG.NO. 172.40.146

(LF NO: 6206401050)

**No HVF/T-72/QAP/40/RING ENGAGING EXTREME
RIGHT/242654 - 00**

ISSUE No: 00

DATE: NOV- 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR


RING ENGAGING EXTREME RIGHT

DRG. NO. 172.40.146

PREPARED BY


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

REVIEWED BY


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APPROVED BY


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AWM/QA-RIG-(SA)

ISSUED BY

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

Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
11.	VISUAL INSPECTION	7
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	8
14.	ACCEPTANCE / PERFORMANCE TESTS	9
15.	FITMENT AND PERFORMANCE TEST	11
16.	INTERCHANGEABILITY	11
17.	CALIBRATION CHECKS	11
18.	MARKING/IDENTIFICATION	11
19.	PRESERVATION CHECK	12
20.	PACKING CHECK	12
21.	DOCUMENTATION	12
22.	REFERENCE	12
23.	ANNEXURE-A	13
24.	FIGURE	14
25.	APPENDIX-A	15

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 **RING ENGAGING EXTREME RIGHT TO DRG.NO 172.40.146** 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 **RING ENGAGING EXTREME RIGHT TO DRG.NO:172.40.146**.

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 **RING ENGAGING EXTREME RIGHT TO DRG. NO. 172.40.146** 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. 172.40.19CBCB -
- 2. 175.40CB-6CB -

7. LIST OF DRAWINGS:

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.146	RING ENGAGING EXTREME RIGHT	-

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

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.146	RING ENGAGING EXTREME RIGHT	STEEL 20X2H 4A 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.
- (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 RING ENGAGING EXTREME RIGHT TO DRG.NO 172.40.146

1. All dimensions should be confirmed as per drawing.
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. Hardness checking point (Refer Drawing).
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 RING ENGAGING EXTREME RIGHT TO DRG.NO.172.40.146

a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543 –71.

CONTENT OF ELEMENTS%								
C	Si	Mn	Cr	Ni	S	P	Cu	Ni
0.16 to 0.22	0.17 to 0.37	0.30 to 0.60	1.25 to 1.65	3.25 to 3.65	MAX			
					0.025	0.025	0.30	0.30

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

c) Mechanical properties: As per STEEL 20X2H4A 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				
1080 (110)	1270 (130)	9	45	(78) 8

Note: For other properties refer GOST 4543-71.

14) PERFORMANCES / ACCEPTANCE TEST: RING ENGAGING EXTREME RIGHT TO DRG.NO:172.40.146

1. BHN 341 to 302 (dia of indentation 3.3 to 3,5)
2. Longitudinal marks of depth not more than 0.2mm are allowed on the profile of the tooth.
3. The dimensional difference on dimension 9.5 (section B-B) should not be more than 0.07mm.
4. The angle of elevation $16^{\circ} + 10'$ is allowed on a length of not more than 5mm from the end of crater A.
5. The gears are to be controlled for free passage of gear gauge made according to lower deviations of mating component.
6. Increase in pitch by 0.2mm beyond tolerance is allowed on not more than 10 teeth.
7. Deviation not exceeding 0.8mm of longitudinal axis of craters A from circumference $\varnothing 482$ in the places of exit on face T is allowed.
8. Shift of spherical centre of crater A relative to teeth space axis K should not be more than 0.5mm when the measurement is taken on $\varnothing 482$.

9. It is allowed to substitute the checking of the differential height of working surface from face \times for checking the deviation of crater Δ pitch. In this case the variation of height of working surface craters must not exceed 0.25mm for all craters. When measured at equal spaces on arc-323.
10. Increase in dimension ϕ 507 G₄ by 0.2mm beyond tolerance is allowed.
11. Difference in height of every pair of teeth should not be more than 0.4mm with the exception of 10 teeth having an increased pitch.
12. Recess 'M' is allowed to be completed as per dotted line.
13. The component must be demagnetised.
14. On the cross-hatched surface of crater cutting mark is allowed with the surface finish upto Rz 40.
15. Mark.
16. The other requirements as per 520 TY-1.

OTHER DETAILS:

MODULE		m	5
NUMBER OF TEETH		Z	168
BASIC RACK	PROFILE ANGLE	α	20°
	COEFFICIENT OF ADDENDUM	h_a^*	0.7
	COEFFICIENT OF BOTTOM CLEARANCE	c	0.2
	FILLET RADIUS	r_f	0.3 max
COEFFICIENT OF ADDENDUM MODIFICATION		x	—
BASE TANGENT LENGTH		W	170.89 - 0.7
BASE CIRCLE DIA		D_o	504

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 (Refer QAP Para No. 14(15)).

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:

- a) Drawing No: 172.40.146
- b) Material specification as per drawing:
STEEL 20X2H 4A GOST 4543-71.
- c) GOST 4543-71.
- d) Specification: 520.TY1.

SL. NO.	CATEGORY	ASSEMBLY/SU B ASSEMBLY	TESTS/INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	RING ENGAGING EXTREME RIGHT TO DRG. NO 172.40.146	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	WV	R	SP followed by HVF.
4		Hardness checks	Hardness 341 to 302 BHN (Dia of Ind. 3.3 to 3.5)	Refer QAP Para no: 14(1)	Confirm to QAP Para no: 14(1)	P	WV	R	SP followed by HVF.
5		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.
6		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18 & 14(15)	Confirm to QAP Para no: 18 & 14(15)	P	V	R	100% by firm/ vendor.
7		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 (WV) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

P-Perform

W-Witness

V-Verify

R-Review

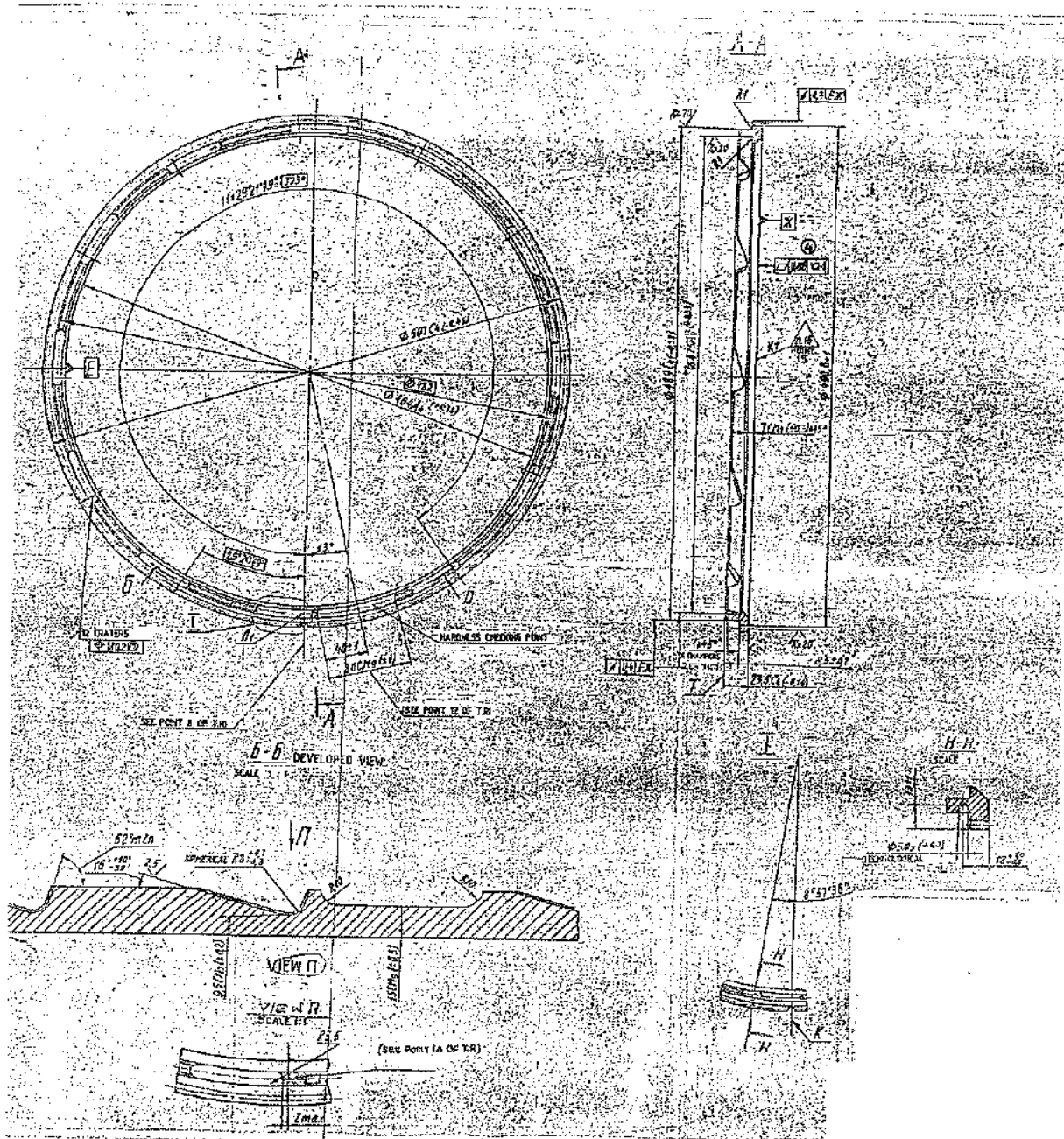


FIG: RING ENGAGING EXTREME RIGHT TO DRG. NO 172.40.146
 (For reference only)

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

FOR

(ENGAGING RING MIDDLE LH) /

DRG.NO. 172.40.149 /

(LF NO: 6206401053) /

No.HVF/T-72/QAP/40/ENGAGING RING/240872-00

ISSUE No: 00

DATE: JUNE – 2021

QUALITY ASSURANCE (RIG-SUB ASSEMBLY)

HEAVY VEHICLES FACTORY

AVADI CHENNAI – 600 054

QUALITY ASSURANCE PLAN (QAP)

FOR


ENGAGING RING MIDDLE LH

DRG. NO. 172.40.149

PREPARED BY


(C. NANDAKUMAR)
JWM/QA (RIG-SA)

REVIEWED BY


(G. HANUMANTHA RAO)
JWM/QA (RIG-SA /TA)

APPROVED BY


(NEERAJ KUMAR)
DGM/QA (RIG-SA)

ISSUED BY

QUALITY ASSURANCE (RIG- SUB ASSEMBLY)
HEAVY VEHICLES FACTORY
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Sl. no	CONTENTS	PAGE .No.
1.	IMPORTANT NOTES	4
2.	INTRODUCTION	4
3.	AIM	4
4.	SCOPE	5
5.	DOCUMENTS	5
6.	ITEM USED ON	6
7.	LIST OF DRAWINGS	6
8.	BILL OF MATERIAL	6
9.	CONDITIONS OF USE/ STORAGE INSTRUCTIONS	6
10.	SAMPLING PLAN	7
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14.	ACCEPTANCE / PERFORMANCE TESTS	10
15.	FITMENT AND PERFORMANCE TEST	11
16.	INTERCHANGEABILITY	12
17.	CALIBRATION CHECKS	12
18.	MARKING/IDENTIFICATION	12
19.	PRESERVATION CHECK	12
20.	PACKING CHECK	13
21.	DOCUMENTATION	13
22.	REFERENCE	13
23.	ANNEXURE - A	14
24.	FIGURE	15
25.	APPENDIX - A	16

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1. This quality plan lays down the inspection and testing procedure to be carried out on the component **ENGAGING RING MIDDLE LH - 172.40.149** 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.

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The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **ENGAGING RING MIDDLE LH - to Drg no. 172.40.149.**

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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.

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This QAP outlines in general terms, the checks and methods to be used during inspection of **ENGAGING RING MIDDLE LH to Drg. no - 172.40.149** including the technical requirements of the drawings. The recommended Quality Plan stipulated herein is mandatory and should be strictly adhered to.

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- 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. 172.40.020cb
- 2. 172.40cb-5cb

7. LIST OF DRAWINGS:

Single (individual) item.

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.40.149	ENGAGING RING MIDDLE LH	-

8. BILL OF MATERIALS:

Single (individual) item, details as below,

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.40.149	ENGAGING RING MIDDLE LH	Steel 20X2H4A To GOST 4543-71	1

Note: Vendor/Contractor may use approved alternate material as per drawing. 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)
 - (ii) Guarantee/ Warranty Certificate
 - (iii) Service and maintenance instructions
 - (iv) Delivery Slip with Inspector's Acceptance Mark
- (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.	01 No	01 No
(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:-

* 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 ENGAGING RING MIDDLE LH (172.40.149)

All dimensions shall be confirmed as per drawing/Specification.

SI. No.	Drawing Dimensions
(i)	Ø510Cs(-0.9) mm
(ii)	Ø482 mm
(iii)	Ø460As(+0.76) mm
(iv)	Ø.122 12 craters
(v)	14°30'
(vi)	29°21'49°
(vii)	80°30'
(viii)	9±3
(ix)	Hx29°21'49°= 323°
(x)	3Cm8(±0.2) mm
(xi)	Ø482 (+0.65/0.45) mm
(xii)	Ø464(+0.38) mm
(xiii)	Ø473C4(-0.38)mm

(xiv)	Ø491A4(+0.38) mm
(xv)	Ø506C5(-0.9) mm
(xvi)	18.5(+0.3/-0.1) mm
(xvii)	27Cs(-0.28) mm
(xviii)	24 mm
(xix)	48 mm
(xx)	14CM7(±0.2) mm
(xxi)	Spherical R8 (+0.7/-0.3) mm
(xxii)	16°(+10'/-30') mm
(xxiii)	62° min
(xxiv)	20 +1 mm (Auxiliary slot)
(xxv)	R10 mm
(xxvi)	15-1 mm
(xxvii)	1x45°
(xxviii)	10+3 mm
(xxix)	Ø10A20(+0.022) mm
(xxx)	15+2 mm
(xxxii)	Ø10x1-7H mm (For positional tolerance refer drawing)
(xxxiii)	10 min
(xxxiv)	16CMS (±0.5)mm
(xxxv)	R1
(xxxvi)	45°
(xxxvii)	3.5 +1 mm
(xxxviii)	Ø506C5(-0.9)mm
(xxxix)	Place for checking Hardness refer drawing
(xxxix)	Surface Finish/ roughness should be confirmed as per the drawing / specification.

For admissible alternate manufacture if any in dimensions/material, refer drawing/specification.

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. The material check will be carried out as per sampling plan. However, if the manufacturer proposes any alternative/equivalent 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 ENGAGING RING MIDDLE LH to Drq. No. 172.40.149

a) The component should be manufactured from STEEL 20X2H4A GOST 4543-71.

b) **Chemical properties:** As per STEEL 20X2H4A GOST 4543-71.

CONTENT OF ELEMENTS %						
C	Si	Mn	Cr	Ni	S	P
					MAX	
0.16 to 0.22	0.17 To 0.37	0.30 To 0.60	1.25 to 1.65	3.25 to 3.65	0.25	0.25

Note: For mass fraction of other elements refer GOST4543-71

c) **Mechanical properties:** As per STEEL 20X2H4A GOST4543-71

Yield point, σ_T N/MM ² (kgf/mm ²)	Ultimate strength, σ_B N/MM ² (Kgf/mm ²)	Relative elongation δ_5 , %	Relative reduction of area ψ , %	Impact strength KCU, ($\frac{\text{kgf.m}}{\text{cm}^2}$)
1080 (110)	1270 (130)	9	45	78 (8)

For other details/parameters refer GOST 4543-71.

d) **Hardness : 322-341 BHN.**

14) PERFORMANCES/ACCEPTANCE TEST: ENGAGING RING MIDDLE LH 172.40.149.

The following technical requirements shall be confirmed for acceptance of the component.

1. SHEN 341-302 (DIA OF INDENTATION 3.3-3.5).
2. SURFACE FINISH OF 2.5 IN CRATERS λ IS TO BE ENSURED ON SLOPE ANGLE OF $16^{\circ} \pm 3^{\circ}$ OVER A WIDTH NOT EXCEEDING 1.5mm. ON BOTH SIDES OF THE GROOVE.
3. VARIATION OF DIMENSION X SHOULD NOT EXCEED 0.2mm AND THAT OF U.K.M. SHOULD NOT BE MORE THAN 0.4mm.
4. THE SHIFT OF AXIS OF HOLE 'P' RELATIVE TO CRATERS WHEN MEASURED ON $\phi 482$ SHOULD BE 0.5mm MAXIMUM.
5. VARIATION OF DIMENSION BETWEEN AXES OF THREADED HOLES AND AXIS OF HOLE 'P' SHOULD BE 0.3mm MAXIMUM.
6. THE SHIFT OF AXIS OF HOLE 'P' RELATIVE TO THE THREADED HOLE AXIS ON DIMENSION 14 cm SHOULD BE MAXIMUM 0.2mm.
7. VARIATION OF DIMENSION SHOULD BE MAXIMUM 0.07 mm.
8. HOLE 'P' IS TO BE CHECKED TO A DEPTH OF 9mm MINIMUM.
9. LOCAL TOOL MARKS ARE ALLOWED IN HOLE 'P'.
10. CHECKING THE DEVIATION OF PITCH OF CRATERS MAY BE SUBSTITUTED BY CHECKING THE VARIATION OF DEPTH OF CRATERS RELATIVE TO FACE H. IN THIS CASE THE VARIATION OF CRATER DEPTH WHEN MEASURED AT EQUALLY SPACED PINTS OVER THE ARC OF 323° MUST NOT EXCEED 0.25mm FOR ALL CRATERS.
11. DIMENSION λ AND VARIATIONS OF DIMENSION λ MAY BE CHECKED WITH THE AID OF BALL $\phi 15.081$ mm. GOST 3722-60.
12. DEVIATION OF LONGITUDINAL AXES OF CRATERS λ FROM CIRCUMFERENCE $\phi 482$ AT THE PLACES OF TRANSITION TO END FACE 'H' SHOULD NOT EXCEED 0.8mm.
13. THE COMPONENTS MUST BE DEMAGNETISED.
14. TO BE MARKED.
15. OTHER REQUIREMENTS, AS PER 520 TY-1.

15) FITMENT AND PERFORMANCE TEST:

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.

- a. 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):

- i. 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.
- ii. The supplier/contractor should submit calibration reports/certificates 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 Para 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 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, 2.Mechanical properties, 3. Pre-forming process, 4. Coating certification (wherever applicable), 5. Calibration reports of instruments and 6. 100% Dimensional inspection reports. 7. Pressure test (leakage test) (wherever applicable) reports, etc.,

22) REFERENCE:

- a) Drawing No: 172.40.149
- b) Material specification Steel 20X2H4A to GOST 4543-71
- c) GOST 4543-71
- d) Specification 520 TY 1

SL. NO.	CATEGORY	ASSEMBLY/SUB ASSEMBLY	TESTS/INSPECTIO N PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	ENGAGING RING MIDDLE LH TO DRG. NO 172.40.149	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		Dimensional checks	Dimensions as per the specification	Refer Specifications & QAP Para no: 12.1	Conform to Specifications and QAP	P	W/P	R	100% by firm/ vendor SP followed by HVF.
4		Material tests	Chemical composition & Mechanical / Physical Properties	Refer GOST 4543-71	All the values to confirm with QAP (Para no:13.1 (a), (b), (c) & (d)	P	W/V	R	SP followed by HVF.
5		Hardness Checks	BHN 302-341	Refer QAP Para no: 14(1) & 13.1 (d)	All the values to confirm with QAP Para no: 14(1) & 13.1 (c)	P	W/V	R	SP followed by HVF.
6		Marking / traceability	Firm has to make marking / traceability records.	Refer QAP Para no: 18 and 14(4).	Confirm to QAP Para no:18 and 14(14)	P	V	R	100% by firm/ vendor.
7		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

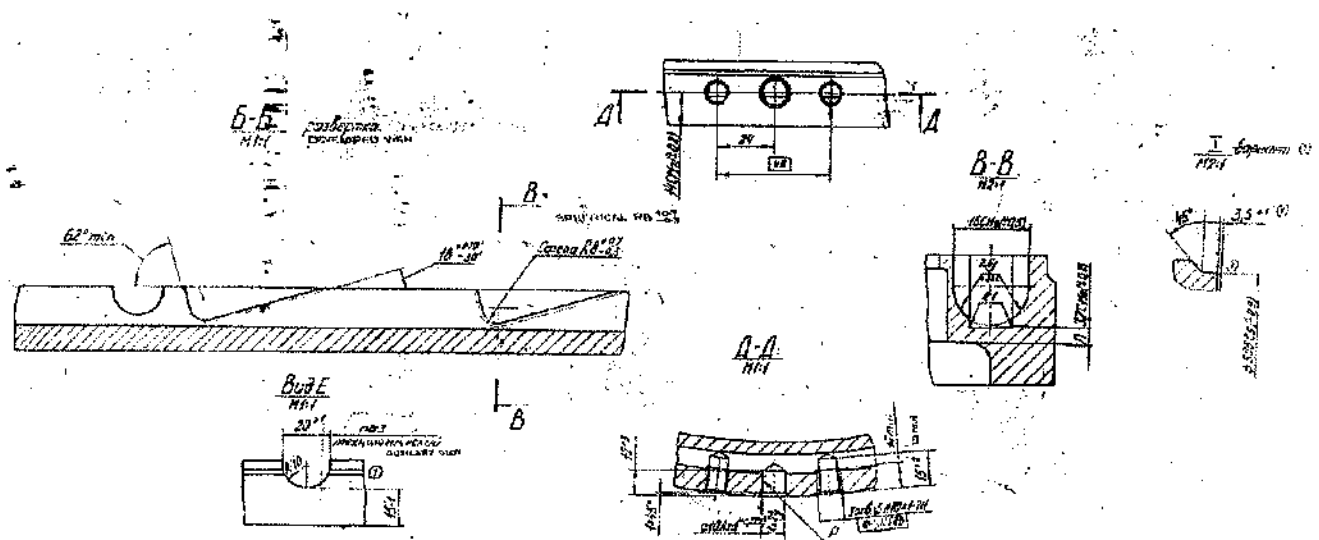
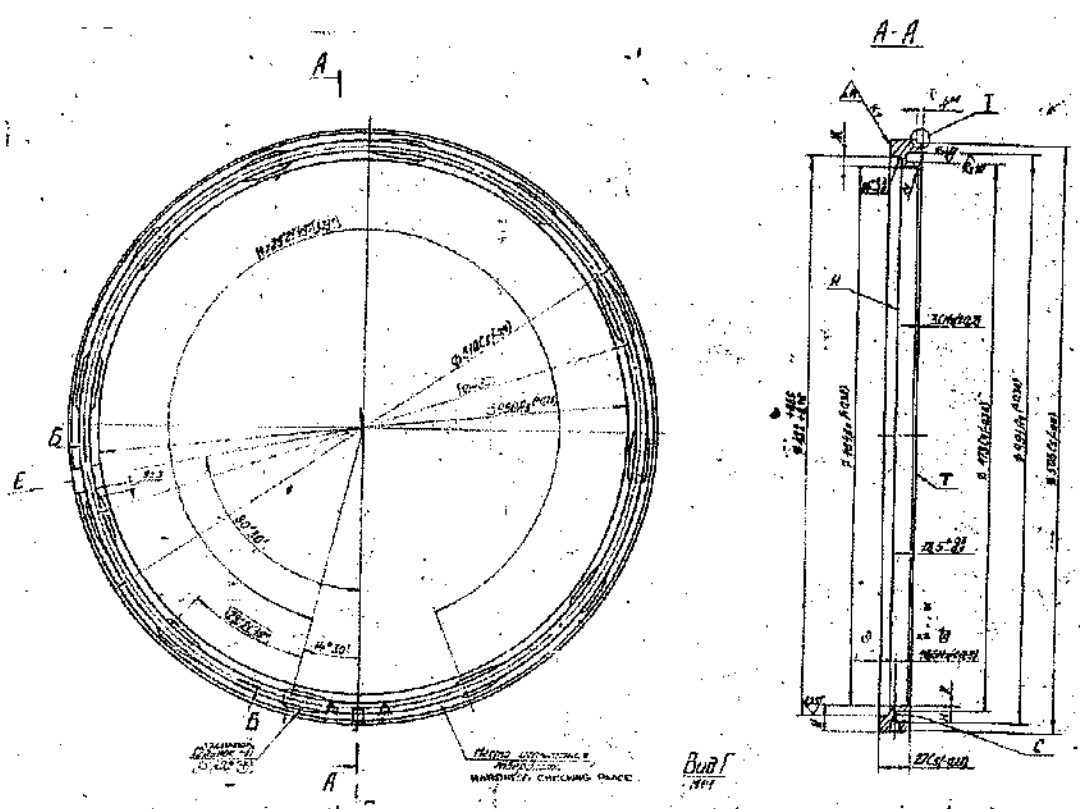


FIG: ENGAGING RING MIDDLE LH TO DRG. NO 172.40.149

