

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

**FOR  
(GEAR)**

**DRG.NO. 172.28.015-1A**

**(LF NO: 6206211066)**

**No.HVF/T-72/QAP/28/GEAR/241946-00**

**ISSUE No: 00**

**DATE: AUG -2021**

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

**HEAVY VEHICLES FACTORY**

**AVADI CHENNAI – 600 054**

QUALITY ASSURANCE PLAN (QAP)

FOR

GEAR

172.28.015-1A

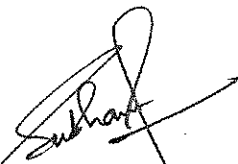
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HEAVY VEHICLES FACTORY  
AVADI CHENNAI – 600 054

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	8
12.	DIMENSIONAL CHECKS	8
13.	MATERIAL CHECKS	9
14.	ACCEPTANCE / PERFORMANCE TESTS	10
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 OF THE SAMPLE	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 **GEAR TO DRG NO. 172.28.015-1A** being procured indigenously. This is prepared, based on the acceptance standards and inspection parameters laid down in collaborators documents and on the inspection test standards followed in respect of similar indigenous items.
2. This QAP is the property of Government of India and is liable for amendments as and when required. The Sr. General Manager, Heavy Vehicles Factory, Avadi, Chennai – 600 054, is the inspecting Authority for this assembly. Any query / clarification on the content of this QAP shall be referred to this Factory. Any departure from these instructions is allowed only after written approval from the above authority. Notwithstanding the tests indicated in this QAP, the inspecting Officer has the right to carry out any test to check conformance to the paper particulars quoted in the Supply Order, which he may consider necessary to satisfy himself about the stores which he has to accept.

## **3. AIM**

The QAP is aimed at standardizing the Inspection procedure and acceptance norm for **GEAR TO DRG NO. 172.28.015-1A**.

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

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

This QAP outlines in general terms, the checks and methods to be used during inspection of **GEAR TO DRG NO. 172.28.015-1A** 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. 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. 175.28.001CB-1/PL- REDUCTION GEAR UNIT OF CELL LIFTING.

**7. LIST OF DRAWINGS:**

Single (individual) item

SI. NO.	DRG. NO	NOMENCLATURE	REMARKS
1	172.28.015-1A	GEAR	-

**8. BILL OF MATERIALS:**

Single (individual) items, details as below,

SI. NO	DRG. NO	NOMENCLATURE	MATERIAL SPECIFICATIONS	Qty
1	172.28.015-1A	GEAR	STEEL 20-I GOST 977-88.	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	100%	-----
(v)	Pressure testing	-----	-----
(vi)	Machining / Fitment/ Performance trial on higher assembly / Tank	02 Nos.	-----
vii)	Interchangeability Test	02 Nos.	02 Nos. per batch on randomly basis, except selective assembly.
viii)	Test stand/Jigs/ Fixtures/Gauges/Mandrels/etc.	100 %	100 %
ix)	Marking/Identification	100%	100%
x)	Packing/ Preservation	100%	100%

**Note:-**

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

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

During acceptance of castings, the following are to be checked as per Specification: (For details refer Specification 172.TY 10 & GOST 977-88).

1. Chemical composition of steel;
2. Mechanical properties of steel;
3. External view (absence of defects) and quality welding of casting defects;
4. Dimensions;
5. Hardness;
6. Absence of internal defects;
7. Macrostructure/Microstructure.

## **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/Flaws/blowholes/shrinkage/porosities
- Fitment of all components
- Presence of foreign particles
- Moisture and dust
- Corrosion of metal parts
- Mechanical imperfections & distortion
- Any form of deterioration of material and finishing.

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

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

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

### **12.1 GEAR TO DRG.NO: 172.28.015-1A**

1. All dimensions shall be confirmed as per drawing/specification
2. Surface finish/Roughness should be confirmed as per drawing and specification.
3. For admissible alternate method for manufacture in dimensions/material if any, refer drawing/specification.
4. Refer Table – 1 and drawing for dimensions of respective items.



**Table-1**

MODULE		m	0.7
No. OF TEETH		Z	85
BASIC RACK	PROFILE ANGLE	$\alpha$	20°
	COEFFICIENT OF ADDENDUM DEDENDUM	$h_a$	1
		$h_f$	1.25
FILLET RADIUS		$r_f$	0.3
ADDENDUM MODIFICATION COEFFICIENT		X	0
ACCURACY AS PER GOST 9173-59		—	Cm 8X
BASE TANGENT LENGTH		W	20.465 $\pm$ 0.055 $\pm$ 0.130
TOLERANCE FOR BASE TANGENT LENGTH		$F_{vw}$	0.05
TOTAL COMPOSITE ERROR DOUBLE FLANK		$F_i''$	0.080
TOOTH TO TOOTH COMPOSITE ERROR DOUBLE FLANK		$F_{fs}$	0.025
TOLERANCE FOR DIRECTION OF TEETH		$F_\beta$	0.180
REFERENCE DIAMETER		$L$	59.5
MATING COMPONENT		172-28-013	

**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 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.

For each heat code/batch the test bars/test samples as specified in GOST/specification is to be submitted for testing chemical, mechanical, physical properties and other parameters of the casting and also the test certificates for the same tested by the supplier is to be submitted.

**13.1 GEAR TO 172.28.015-1A.**

a) The component should be manufactured from STEEL 20-I GOST 977-88.

b) **Chemical properties:** As per STEEL 20-I GOST 977-88.

CONTENT OF ELEMENTS %							
C	Si	Mn	Cr	Ni	S	P	V
MAX							
0.17 to 0.25	0.20 to 0.52	0.45 to 0.90	---	---	0.040	0.040	---

**Note:** For mass fraction of other elements refer GOST 977-88.

**c) Mechanical properties:** As per STEEL 20-I GOST 977-88.

Grade of steel	Strength category	Yield stress, M Pa	Ultimate strength M pa	Elongation %	Reduction of area %	Impact strength KCU k J / m <sup>2</sup>
		Not less than				
Normalization or normalization with tempering						
Structural						
20	K20	216	412	22	35	491

**Note:** For other properties refer GOST 977-88.

**14) PERFORMANCES/ACCEPTANCE TEST: GEAR to Drg. No. 172.28.015-1A.**

1. Alternate Material: STEEL 25 I, 30 I, 40 I, 45 I & 50 I GOST 977-88.
2. Component should comply with 172 TY 10.
3. Casting defects on teeth surface are not allowed.
4. Coating:- Chemical Oxide Phosphating, Oil Finish or Chemical Oxidation Oil Finish.
5. Other requirements as per 520 TY1.

**Note:**

The Casting Manufacturers are required to follow the instructions strictly so far as supply of castings (Refer Specification 172.TY 10 & GOST 977-88.)

**15) FITMENT / MACHINING AND PERFORMANCE TEST:**

- a. Pilot samples should be checked for fitment/machining trials and Performance test to ascertain the efficacy of the system under different operating conditions by fitting in higher assembly and repeating it for functional checks, wherever required.
- b. The item should possess appropriate material for machining as indicated in the drawing and should be supplied in such a way that the components to suit in machine/fixtures/Jigs etc to carry out machining.
- c. The component should be free from any defects after machining in trial and the casting should be in line with the parameters as specified in the GOST and Specification.
- d. The casting shall be clean, free from porosity blowholes, hard spots, Cold shut, distortion, cracks and other harmful defects as per the specification.
- e. The casting shall be well dressed and fettled and shall be readily machinable.
- f. Casting shall be cleaned / shot blasted and preservation coating is to be done after heat treatment as called for in the specification.
- g. No weld/repair should be carried out without prior permission from HVF.

- h. Testing methods for acceptance of the casting refer Specification 172 TY 10 & GOST 977-88.

**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, templates 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/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

**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, 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) if applicable, 8. Hardness checks, 9. Certificates for Macro/micro structure (wherever applicable), 10. Fracture test (if applicable) and other relevant test reports for acceptance of the Casting, etc.

## **22) REFERENCE:**

- a) Drawing No: 172.28.015-1A
- b) Material specification as per drawing:  
STEEL 20-1 GOST 977-88.
- c) GOST 977-88.
- d) Specification 172.TY10 & 520 TY1.
- e) Alternate Material:
  - a. STEEL 25 I, 30 I, 40 I, 45 I & 50 I GOST 977-88.
  - b. STEEL 708M40, BS: 970 Pt.1-1983.  
(Coating:- Phosphating as per JSS: 0465-01: 1983).

## ANNEXURE-A

SL. NO.	CATEGORY	ASSEMBLY/ SUB ASSEMBLY	TESTS/ INSPECTION PARAMETERS	STANDARDS TO BE REFERRED	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY			REMARKS
						Firm	HVF	DGQA	
1	GEAR TO DRG. NO 172.28.015-1A	Pre inspection reports (PIR) of firm	Firm has to produce all the document as per QAP	As per the relevant drawing and QAP.	Confirm to drawing and QAP as per bill of material	P	V	R	100% by firm/ vendor.
2		Bill of material (BOM)	Firm has to prepare the BOM as per QAP	Refer QAP Para no: 8 or item list.	Confirm to QAP	P	V	R	100% by firm/ vendor.
3		Material tests	Chemical composition & Mechanical / Physical Properties	As per GOST 977-88.	All the values to confirm with QAP ( Para no:13. 1(a) & (b),(c))	P	W/V	R	SP followed by HVF.
4		Coating check	Chemical Phosphating, Oxide Finish or Chemical Oxidation Oil Finish.	Refer QAP Para no:14(4)	Confirm to QAP Para no:14(4)	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	Marking / traceability	Refer QAP Para no:18	Confirm to QAP Para no:18	P	V	R	100% by firm/ vendor. SP followed by HVF.
7		Preservation & packing	Preservation & packing	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 sufficient quantity (as specified in GOST/Specification/supply order) test sample pieces for the items used / test slab and button for rubber items / HVF will draw samples from supplied lot for Witnessing (W) at HVF premises. In case of non-compliance to standards entire lot will be rejected.

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

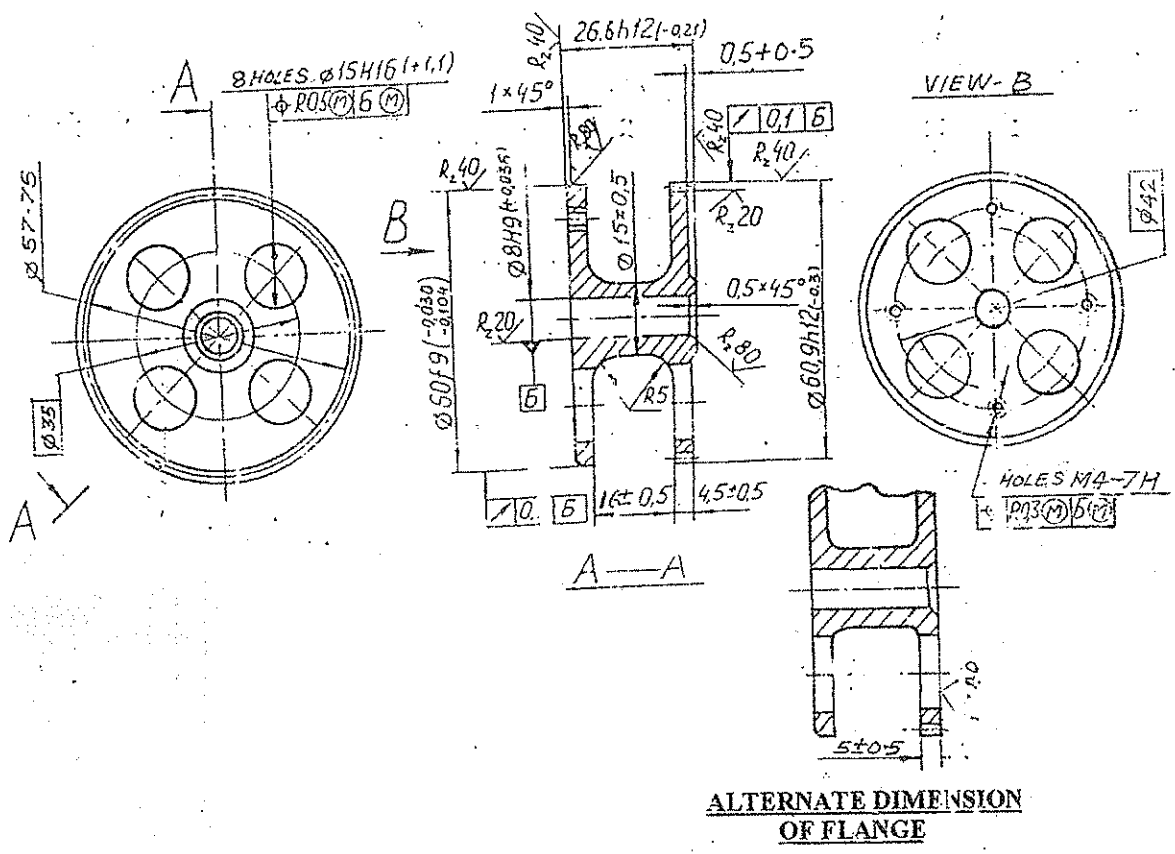


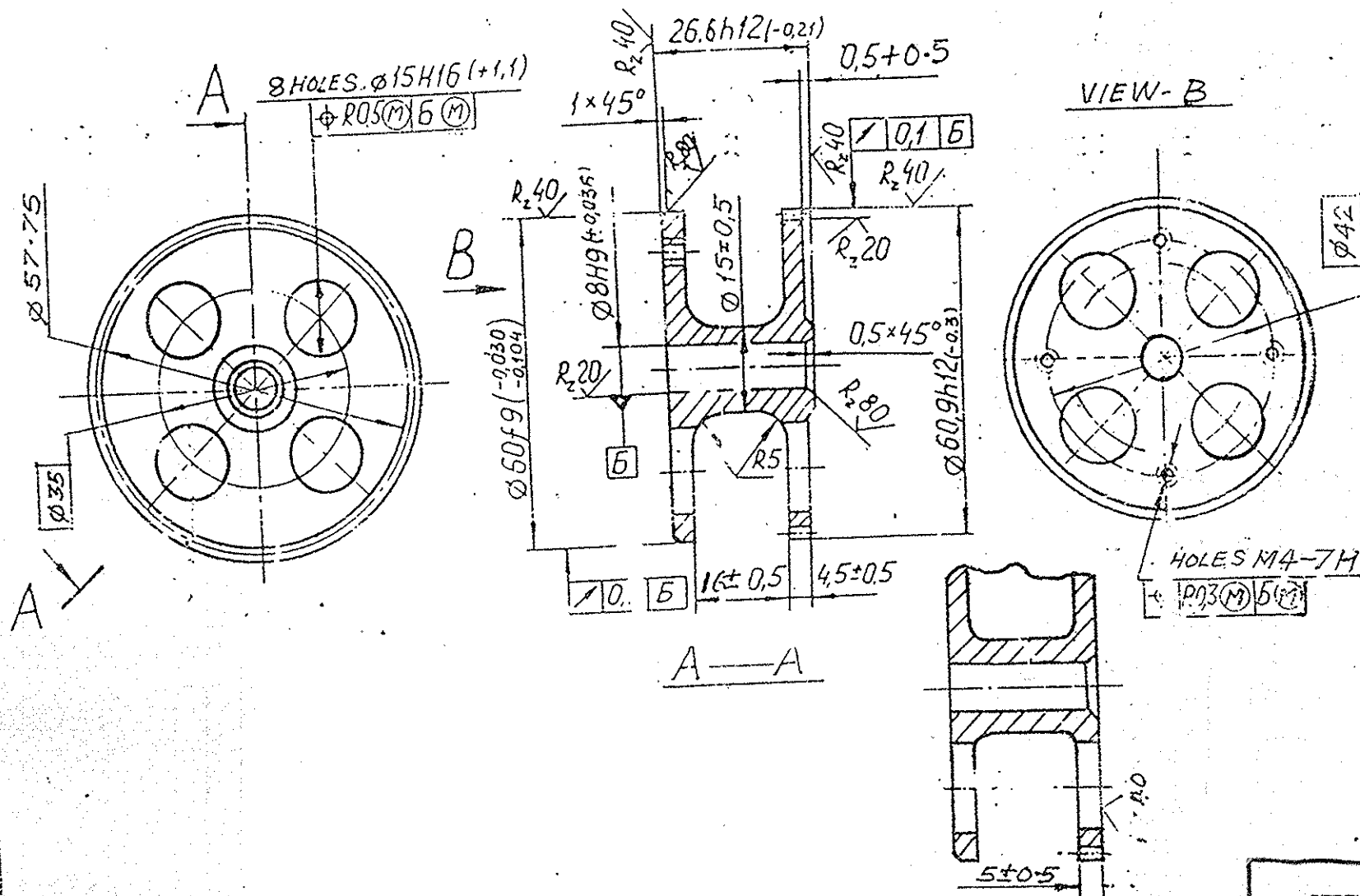
FIG: GEAR TO DRG. NO 172.28.015-1A



172-28-015-1A

PART/DS CAT No.

DIMENSIONS ARE IN mm



MODULE		m	0.7
No. OF TEETH		Z	85
BASIC RACK	PROFILE ANGLE	$\alpha$	20°
	COEFFICIENT OF ADDENDUM OF DEDENDUM	$h$ $h_f$	1 1.25
FILLET RADIUS		$r_f$	0.3
ADDENDUM MODIFICATION COEFFICIENT		X	0
ACCURACY AS PER GOST 9173-59			Cm 8X
BASE TANGENT LENGTH		W	20.465 <sup>+0.055</sup> / <sub>-0.130</sub>
TOLERANCE FOR BASE TANGENT LENGTH		$F_{TW}$	0.05
TOTAL COMPOSITE ERROR DOUBLE FLANK		$F_{T''}$	0.080
TOOTH TO TOOTH COMPOSITE ERROR DOUBLE FLANK		$F_{T'}$	0.025
TOLERANCE FOR DIRECTION OF TEETH		$F_{\beta}$	0.180
REFERENCE DIAMETER		L	59.5
MATING COMPONENT			172-28-013

NOTES :-

1. ALTERNATE MATERIAL STEEL 25 L30 L40 L45 L50 I GOST 75, 7-88
  2. COMPONENT SHOULD COMPLY WITH 172 TY 10.
  3. CASTING DEFECTS ON TEETH SURFACES ARE NOT ALLOWED
  4. COATING :- CHEMICAL OXIDE PHOSPHATING, FINISH OR CHEMICAL OXIDATION OIL FINISH.
  5. OTHER REQUIREMENT AS PER 520 TY 1
- ALT. MATL. STEEL, 708 L40, BS : 970 Pt. 1 : 1983.  
COATING :- PHOSPHATING AS PER JSS : 0465-01 : 1988.

INSPECTION NOTE :- FOR LIST OF GAUGES AND FIXTURE REFER GAUGE SHT.No.GS(W)-10145, SHT.1.

ALTERNATE DIMENSION OF FLANGE

जांची गई सही प्रति  
CERTIFIED CORRECT COPY OF  
मुद्रित रेखाचित्र की  
SEALED DRAWING AS ON

11/3/12

कृते नियंत्रक यंत्रणा  
FOR CONTROLLED QUALITY  
आश्वासन (क वा अ) अवादी चेन्ना 54  
ASSURANCE (AVA) AVADI CHENNA 54

29-3-09	0042-AVA	DS CAT No. ADDED	
26-6-03	18768-W	INSPECTION NOTE ADDED.	
7-1-03		POLY NEGATIVE PREPARED.	
		PREV. DCs 17217-V, 17218-W & 17930-W Dt. 18-3-94	
DATE	AUTHORITY	ZONE	NATURE
			SIG 'AHSP' : SIG 'DO'
AMENDMENTS			
DRG SEALD' DC No. 17217-W Dt. 6-2-92 DRG. SEALED PROV. DO CQAW			

DRN	CH	ASSLY DRC
TCD	1-1D	DATE
C.D. MAN	OR CQAW	SCALE
MATL. - STEEL 20 - I GOST 977-88		ESTD MASS 0.17
PROTECTIVE FINISH		

CQA(AVA) AVADI	
DESIGN No.	
PART No.	172-28-015-1A
DS CAT No.	3020-001185

GEAR



### MACHINED COMPONENTS (GROUP -V)

Sl 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)  Total items = 39 Nos	TECHNOLOGY-1	Turning	CNC Turning machine suitable to accommodate component upto 150 mm diameter with 0.010mm accuracy			
			Milling & Drilling	HMC and/or VMC suitable to the components upto the size 630mm diameter with 0.010 accuracy			
			Gear Hobbing	Gear Hobbing of Mod 8 x cutting $\phi$ 250 with gear cutting accuracy of class of Din 7 or better accuracy			
			Grinding	Internal/ External /Surface grinding machine as per component requirement with 0.010mm accuracy			
			Gear Grinding	Generation and/ or Profile type Gear grinding machine to accommodate Mod 8 x 200mm gear with gear grinding accuracy class of Din 5 or better accuracy			
			Broaching		Broaching as per component requirement		
			Honing		Honing for Dia 20mm to 100mm with accuracy of 0.002 mm.		
		TECHNOLOGY-2	Heat Treatment		Carburising, Hardening, Induction Hardening & Tempering furnace with Oil quenching facility suitable to the components		
		Protection coating		Oxidising , Phosphating suitable to the components			

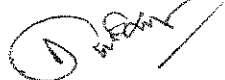
  
**(D.SATHISH KUMAR)**  
 WM/QA(NF& QMSC)


  
**(LUXMAN SINGH)**  
 WM/TRG-II,HT & EP

  
**(K.DURAIRAJ)**  
 JWM/Trans -II


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


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

  
(D.SATHISH KUMAR)  
WM/QA(NF& QMSC)

  
(LUXMAN SINGH)  
WM/TRG-II, HT & EP

  
(K.DURAIRAJ)  
JWM/Trans -II

  
(J.P.SINGH)  
GM-OPERATIONS I

  
Subham Bijlwan  
AH to (NEERAJ KUMAR)  
QA-RIG(OE)

  
(ANIMESH PAIK)  
DGM/CA, TRG & RG