

ALUMINIUM ALLOY FORGED, PROOF MACHINED RINGS

SPECIFICATIONS & REQUIREMENTS

1.0 Scope of Work: Realisation, qualification as per VSSC:GMMPS:2201F:2019, VSSC:GMMPS:2202F:2019 and VSSC:GMMPS:2701F:2019 and supply of forged rings in proof machined condition as per URSC specified dimensions.

Sl. No.	Doc. Number	To be referred for
1	VSSC:GMMPS:2201F:2019	AA 2014
2	VSSC:GMMPS:2202F:2019	AA 2219
3	VSSC:GMMPS:2701F:2019	AA 7075

2.0 Quantity of rings to be supplied: The following quantities are part of the scope of supply

SL No	SPECIFICATION	SIZE in mm	QUANTITY
01	AA 2014 T652	1428 (OD) X 1247 (ID) X 216 thick	06 Nos
02	AA 2014 T652	1258 (OD) X 1152 (ID) X 97 thick	06 Nos
03	AA 2219 T852	1428 (OD) X 1247 (ID) X 216 thick	03 Nos
04	AA 7075 T7352	1258 (OD) X 1152 (ID) X 97 thick	03 Nos

3.0 Material and supply condition of rings

3.1 Material: AA2014

3.1.1 Supply Condition: T652 temper – solution heat treated, stress relieved by compression to produce a permanent set of 1.5% to 5% and precipitation heat treated. During compression, primary forces shall be applied in the axial direction and on individual rings approximating final dimensions.

3.1.2 Input material specification as per VSSC:GMMPS:2201 B/S (DC):2019

3.2 Material: AA2219

3.2.1 Supply Condition: T852 temper – solution heat treated, stress relieved by compression to produce a permanent set of 1.5% to 5% and precipitation heat treated. During compression, primary forces shall be applied in the axial direction and on individual rings approximating final dimensions.

3.2.2 Input material specification as per VSSC:GMMPS:2202 B/S (DC):2019

3.3 Material: AA7075

3.3.1 Supply Condition: T7352 temper – solution heat treated, stress relieved by compression to produce a permanent set of 1.5% to 5% and precipitation heat treated. During compression, primary forces shall be applied in the axial direction and on individual rings approximating final dimensions.

3.3.2 Input material specification as per VSSC:GMMPS:2701 B/S (DC):2019

4.0 Material Chemical Composition: Forgings shall comply with the following material composition in accordance with ASTM E34 or E607 for AA2014 and AA2219. For AA7075, chemical composition shall comply with AMS4078.

4.1 AA2014

Element	Percentage by Weight	
	Minimum	Maximum
Copper	4.0	5.0
Silicon	0.5	0.9
Manganese	0.4	1.2
Magnesium	0.2	0.8
Iron	-	0.3
Zinc	-	0.25
Titanium	-	0.2
Chromium	-	0.1
Other impurities, each	-	0.05
Other impurities, total	-	0.15
Hydrogen (to be measured at the billet casting stage)	-	0.15ml/100gm of molten metal
Aluminum	Balance	

4.2 AA2219

Element	Percentage by Weight	
	Minimum	Maximum
Copper	5.8	6.8
Manganese	0.2	0.4
Zirconium	0.1	0.25
Vanadium	0.05	0.15
Titanium	0.02	0.1
Iron	-	0.3
Silicon	-	0.2
Zinc	-	0.1
Magnesium	-	0.02
Other impurities, each	-	0.05
Other impurities, total	-	0.15
Hydrogen (to be measured at the billet casting stage)	-	0.15ml/100gm of molten metal

Aluminum	Balance	
----------	---------	--

4.3 AA7075

Element	Percentage by Weight	
	Minimum	Maximum
Zinc	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.28
Iron	-	0.2
Silicon	-	0.15
Manganese	-	0.10
Titanium	-	0.10
Sodium	-	0.0005
Calcium	-	0.001
Pottassium	-	0.001
Other impurities, each	-	0.05
Other impurities, total	-	0.15
Hydrogen (to be measured at the billet casting stage)	-	0.15ml/100gm of molten metal
Aluminum	Balance	

5.0 Dimensional tolerances for all the rings in millimeters: Outer diameter (OD): plus five to zero, Inner diameter (ID): zero to minus five, Thickness: plus five to zero. A dimensional inspection report shall be supplied.

6.0 Mechanical properties

6.1.1 AA2014 Rings shall meet the following mechanical strength criteria

Sl. No.	Ring OD (mm)	Specimen Orientation	Tensile Strength, MPa, Min	Yield Strength at 0.2% offset, MPa, Min	Elongation in 4D %
1	1428	Tangential	385	335	5
2	1428	Axial	385	335	2
3	1428	Radial	370	315	1
4	1258	Tangential	434	379	8
5	1258	Axial	434	379	3
6	1258	Radial	421	379	2

6.1.2 The hardness shall be checked following ASTM E10. The hardness value for AA2014 rings shall not be lower than 120 HB/10/500 or 125 HB/10/1000. However, the products will not be rejected based on hardness if the applicable tensile properties as per 6.1.1 are met.

6.2.1 AA2219 Rings shall meet the following mechanical strength criteria

Sl. No.	Ring OD (mm)	Specimen Orientation	Tensile Strength, MPa, Min	Yield Strength at 0.2% offset, MPa, Min	Elongation in 4D %
1	1428	Tangential	360	285	5
2	1428	Axial	360	260	3
3	1428	Radial	345	260	2

6.2.2 The hardness shall be checked following ASTM E10. The hardness value for AA2019 rings shall not be lower than 120 HB/10/500 or 125 HB/10/1000. However, the products will not be rejected based on hardness if the applicable tensile properties as per 6.3.1 are met.

6.3.1 AA7075 rings shall meet the following mechanical strength criteria

Sl. No.	Ring OD (mm)	Specimen Orientation	Tensile Strength, MPa, Min	Yield Strength at 0.2% offset, MPa, Min	Elongation in 4D %
1	1258	L	363	283	7
2	1258	LT	357	270	3

6.3.2 The hardness shall be checked following ASTM E10. The hardness value for AA7075 rings shall not be lower than 125 HB/10/500 or 130 HB/10/1000. However, the products will not be rejected based on hardness if the applicable tensile properties as per 6.3.1 are met.

6.4 Heat treatment shall be carried out following AMS 2772

6.5 The ring used for mechanical properties testing shall be from the same lot supplied to URSC. For the purpose, vendor shall make an extra ring in each lot i.e. 6 + 1. The extra ring shall be used for all destructive testing and preparation of samples. The cost for the extra ring shall be included in the original qty.

7.0 Test and Test Reports: The following tests to be done and test reports to be supplied

- Ultrasonic inspection on billet and rings. The test shall be repeated again after proof machining.
- Tension test for verification of all properties as listed in 6.0
- Hardness.
- Chemical analysis of the billet casting.
- Metallographic examinations to confirm uniform grain size and orientation. Rings to be free from micro-porosity, stringers, segregation, inclusions, etc.

- f. Die penetrant test before and after proof machining on all rings.
- g. Dimensional inspection report
- h. For AA 7075, Stress corrosion test shall be carried out as per ASTM G 47.

8.0 Packing & Delivery:

- 8.1 Rings shall be wrapped with either thick polythene paper or gunny cloth, packed with four equispaced wooden supports, and packed in wooden containers to avoid damage during transit and handling.
- 8.2 Only one type, class, or size of ring shall be packed in one container.
- 8.3 Material to be shipped only after approval of all inspection and test reports by URSC.
- 8.4 Delivery shall be completed within 20 weeks from the date of PO.
- 8.5 Delivery terms: FOR, U R Rao Satellite Centre, Vimanapura, Bengaluru-560017.

9.0 L1 Criteria:

- 9.1 L1 will be arrived separately for rings in each type of material i.e. L1 will be calculated separately for 2.01 and 2.02 taken together and 2.03 and 2.04. The categories are elaborated in the table below.

Category	Items
1	Ring with 1428 mm (OD) in AA2014 + Ring with 1258 mm (OD) in AA2014
2	Ring with 1428 mm (OD) in AA2219
3	Ring with 1258 mm (OD) in AA7075

- 9.2 Purchase orders will be placed separately for each category as mentioned in 9.1.
- 9.3 Vendors are allowed to bid partially for the categories mentioned above. However vendor shall quote for the complete quantity and items in the respective category they are quoting for.

10.0 Identification: Each ring is to be marked with the following information: name of the manufacturer, heat no, batch no, specification, size, and purchase order number.

11.0 Standards to be referred for testing and qualification

- 11.1 Overall Testing & Qualification shall be as per document numbers given in 1.0.

- 11.2 The standards mentioned in the specifications for various procedures shall be followed.
- 11.3 The latest issue of all the standards mentioned in specifications to be referred to at the time of placement of the order.

12.0 General terms and conditions:

- 12.1 URSC reserves the right to be present during the process and testing. Vendor shall inform URSC at least a week before the initiation of rolling process and testing at various stages
- 12.2 All the logistics for the visit of URSC Engineers will be under scope of URSC.
- 12.3 Vendor shall arrange the necessary permissions for entry of URSC personnels to their facilities during the rolling process and testing.
- 12.4 Vendor shall quote the total cost including realisation of rings and testing as per the specified procedures and packing and delivery to URSC. The tax percentage shall be mentioned separately in quote.