



**ZIRCONIUM METAL POWDER**  
**SPECIFICATION No. ERDL/E/PS/60**



SHOT ON REDMI Y3  
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PROVISIONAL SPECIFICATION FOR  
ZIRCONIUM METAL POWDER  
SKL/E/PS/60

1. SCOPE

This specification is meant to govern supply and inspection of zirconium metal powder to be used in pyrotechnic compositions.

2. DESCRIPTION:

The material is to be in the form of a powder of grey colour free from grit and foreign matter. The material shall comply with appropriate sieving requirements given in clause 4 below.

3. TENDER SAMPLE:

The contractor shall submit a tender sample of 100 g free of charge and conforming to this specification when called for in the tender.

4. TESTING:

Samples taken from any portion of the supply should be in accordance with the clause 2 above and shall comply with the following requirements.

Sl. No.	TEST	LIMIT	TEST-METHOD
1.	Volatile matter at 105°C ± 2°C for one hour.	0.5% max.	JSS 1010 1(a)
2.	Gritty particles/insoluble matter	3.0% max.	Appendix A
3.	Sieving requirements:		
	a) Retained on 150 micrometre IS Sieve	0.5% max.	- JSS 1010 18
	b) Passing 90 micrometre IS Sieve	15% max.	
4.	Zirconium metal content	97% min.	Appendix A
5.	Apparent density	2.5g/cm <sup>3</sup> min.	Appendix A

5. INSPECTION:

a) The zirconium metal powder and the packages in which it is contained shall be subjected to inspection by and approval of the Inspecting Authority.

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b) Samples of the material and of the packages may be taken from any portion of consignment.

c) If on examination any sample be found not to conform to this specification, whole consignment may be rejected.

d) The foregoing provisions shall apply equally to prime contractors and to any sub-contractors.

6. PACKING:

The material shall be supplied in sound, clean, and dry approved packages containing an approved quantity. The inclusion of any foreign matter or impurities in any of the packages will render the whole consignment liable to rejection.

7. MARKING:

Each package or consignment in which the material is supplied shall be clearly and legibly marked with a description of the contents, the contract number, a distinctive lot number, a consecutive package number, the tare and nett weights and the date of supply and the contractor's initials or recognised trade mark.

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APPENDIX - A

Weigh about 0.1g of zirconium powder accurately, and transfer to a 250ml beaker. Dissolve it in 25ml of 1:1 sulphuric acid by heating on a sand bath in a fume chamber. Cool and dilute with 25ml of distilled water. Filter and wash the insoluble matter through Whatman No.42 filter paper. Collect the filtrate and the washings and preserve for the estimation of zirconium. Dry the filter paper with residue at  $100 \pm 5^\circ\text{C}$ . Ignite the dried residue/filter paper in a previously weighed silica crucible. When most of the carbon has been burnt off, heat the silica crucible in an electric muffle at dull red heat for about 30 minutes. Cool and

$$\% \text{ Grit/Insoluble matter} = \frac{\text{Weight of ash} \times 100}{\text{Weight of the sample}}$$

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APPENDIX - B

DETERMINATION OF ZIRCONIUM CONTENT

Dilute the filtrate and the washings, (from Appendix A) to about 150ml with distilled water. Add a freshly prepared 10% aqueous diammonium hydrogen phosphate/ammonium phosphate (A,B) solution in 50 to 100 fold excess (use 10 ml for every 1mg of zirconium present, but not less than 20ml). Boil the solution for a few minutes, allow to digest for 30 minutes in a water bath and allow to cool to about 60°C. Filter the precipitate through Whatman No. 42 filter paper, wash first with 100-150 ml of 2N sulphuric acid containing 2.5g of diammonium hydrogen phosphate in 150ml and finally with cold 5% ammonium nitrate solution until the filtrate is sulphate-free. Dry the precipitate at 100-110°C. Ignite the filter paper along with the precipitate in a silica crucible. Heat the silica crucible in an electric muffle at about 800°C till constant weight (about 3 hrs). Weigh as zirconium pyrophosphate,  $ZrP_2O_7$ .

$$\% \text{ Zirconium} = \frac{0.3441 \times \text{weight of precipitate} \times 100}{\text{weight of sample.}}$$

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APPENDIX - C

DETERMINATION OF APPARENT DENSITY:

20g of the material are introduced into a stoppered glass cylinder, graduated in 0.5ml, the cylinder being approximately 15cm high and having an internal diameter of 2cm. The cylinder is dropped vertically 30 times from a height of 6.5cm on to hard leather pad. The surface of column of zirconium powder is levelled off by the minimum amount of side tapping, and the total volume is read off.

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SAFETY AND PRECAUTIONS IN HANDLING OF ZIRCONIUM POWDER

1. Zirconium powder is a big fire hazard.
2. Partly wet zirconium powder is most dangerous since it bursts with nearly explosive speed and disperses flaming zirconium over a wide area. Zirconium powder with 30% added water is sufficiently wet to prevent ignition.
3. Ignited dry zirconium powder fire may be controlled by covering with powdered limestone or similar material preferably 'Ansul'. Small zirconium fires can be isolated and allowed to burn out. Extinguishers containing water, carbon dioxide, carbontetrachloride or foam extinguishers must not be used in controlling a zirconium powder fire.
4. Spilling or dust accumulations in work areas should be avoided.
5. Drying of zirconium powder, if required should be done in small quantities under vacuum at moderate heat, 60°C to 80°C. Zirconium powder spontaneously ignites in air at about 240°C. If exposure of dry zirconium powder to air is required, the zirconium should not be above room temperature.
6. Persons handling zirconium powder should not use synthetic fibre clothes and should use safety goggles.
7. Zirconium powder is safe to handle with due precautions above 10 micron ~~size~~ size.
8. In presence of air or oxygen it may spontaneously catch fire even at ambient temperature.
9. Zirconium powder is not toxic.

APPROVED

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