



भारत सरकार
GOVERNMENT OF INDIA
रक्षा मंत्रालय
MINISTRY OF DEFENCE

संयुक्त सेवा विनिर्देश
JOINT SERVICES SPECIFICATION

ON

FERRO SILICON

	DS Cat Part No.	NSN
LUMPS	6810-001 044	6810720397976
106 MICROMETRE	6810-001 162	6810720398002
63 MICROMETRE	6810-001 163	6810720398003

मानकीकरण निदेशालय
रक्षा उत्पादन विभाग
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'एच' - ब्लॉक, निर्माण भवन डाकघर
नई दिल्ली-११००११

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RECORD OF AMENDMENTS

Amendment		Amendment pertains to S. No./Para No./ Column No.	Authority	Amended by	Signature & Date
No.	Date			Name & Appointment (In Block Letters)	

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0. FOREWORD

0.1 This Joint Services Specification has been prepared by the Armament Standardisation Sub Committee on the authority of the Standardisation Committee, Ministry of Defence.

0.2 This specification has been approved by the Ministry of Defence and is mandatory for use by the Defence Services.

0.3 This JSS 6810-130 : 2020 (Fourth Revision):

- a) was prepared in the year 1995.
- b) was revised in the year 2000, 2010 and 2015.
- c) is revision of 6810-130 : 2015 (Third Revision) and supersedes the same.

0.4 This specification is meant to govern Manufacture, Supply and Quality Assurance of Ferro-silicon.

0.5 Quality Assurance Authority for the item covered in this specification is The Controller, Controllerate of Quality Assurance (Military Explosives), Aundh Road, Pune-411020. (email id cqamear-dgqa@nic.in). Enquiries regarding technical parameters shall be addressed to the Quality Assurance Authority, while other enquiries shall be referred to:

The Director,
Directorate of Standardisation,
Ministry of Defence,
'H' Block, Nirman Bhawan PO,
New Delhi-110011.
Secretary ASSC, e-mail id-assc.defstand@gov.in

0.6 Non-registered users can obtain the following on payment:

a) Copies of IS from:

Bureau of Indian Standards,
Manak Bhawan,
9, Bahadur Shah Zafar Marg,
New Delhi-110002,
or
their regional/branch offices.

b) Copies of JSSs/JSGs from:

The Director,
Directorate of Standardisation,
Standardisation Documents Centre,
Ministry of Defence,
Room No. 05, 'J' Block,
Nirman Bhawan PO,
New Delhi-110011.

0.7 Indian Standard (IS) specifications are available free of cost for registered users on:

Directorate of Standardisation Website:

www.ddpdos.gov.in

For registration, visit our website.

0.8 This specification holds good only for the supply order for which it is issued.

0.9 Directorate of Standardisation Website-All the approved JSSs/JSGs are available on the Directorate of Standardisation Website ***www.ddpdos.gov.in***. Defence Organisations desirous of accessing a copy of this document are requested to approach the Directorate of Standardisation for obtaining user id/password to access the website.

1. SCOPE

This specification is meant to govern Manufacture, Supply and Quality Assurance of Ferro-silicon suitable for use in the Pyrotechnic Compositions.

2. RELATED SPECIFICATIONS/DOCUMENTS

Reference are made in this specification to:

Table 1

S. No.	Specifications/ Documents No.	Nomenclature
a)	IS 138 : 2018 (Fourth Revision)	Ready Mixed Paint, Marking, for Packages and Petrol Containers-Specification
b)	IS 460 (Part 1) : 1985 (Third Revision) Amd 1 Reaffirmed 2018	Specification for Test Sieves Part I Wire Cloth Test Sieves
c)	IS 2552 : 1989 (Third Revision) Amd 1 Reaffirmed 2018	Steel Drums (Galvanized and Ungalvanized)- Specification
d)	JSG 0112 : 2015 (Second Revision)	General Methods of Tests and Assessment of Impurities in Chemicals/Materials used in the Manufacture of Explosives and Ammunition of Impurities in Chemicals/Materials

3. MATERIAL

The Ferro-silicon shall be of good quality material commercially known as 80% to 85% grade, free from impurities and foreign matter. It shall be either in powder or lump form as specified in the terms of the contract.

4. MANUFACTURE

Ferro silicon be manufactured by a process which will produce the product conforming to this specification.

5. TENDER SAMPLE

The manufacturer/supplier/contractor shall submit a tender sample of 250 g essentially from the same batch/lot of manufacture, free of all charges and conforming to this specification, when called for in the tender.

6. PRE-INSPECTION OF STORES/CONSIGNMENT

6.1 Manufacturers/contractors must satisfy themselves that the stores are in accordance with the terms of the contract and fully conform to the required specification, by carrying out a thorough pre-inspection of each lot before actually tendering the same for inspection to the Quality Assurance Officer nominated under the terms of the contract. A declaration by the contractor that a necessary pre-inspection has been carried out on the stores tendered will be submitted along with the challan. The declaration will also indicate the method followed in carrying out pre-inspection showing the features checked/tested and will have the test certificate attached to the challan/declaration.

6.2 If the Quality Assurance Officer finds that the pre-inspection of the consignment as required above has not been carried out, the consignment is liable for rejection.

7. QUALITY ASSURANCE

7.1 Inspection

The Ferro-silicon and packages in which it is contained shall be subject to inspection by and to the approval of the Quality Assurance Officer/Quality Assurance Authority.

7.2 Sampling

A representative sample of 250 g shall be drawn from each container. Normally the number of containers to be selected at random from batch/lot shall depend on the size of the batch/lot and shall be in accordance with the following table:

Table 2

No. of Containers in a Batch/Lot	No. of Containers to be Sampled
Up to 25	3
26 to 50	4
51 to 100	5
101 to 150	6
151 to 300	7
301 to 500	8
501 and above	10

7.3 Criteria for Conformity

7.3.1 If on examination, any sample is found not to conform to this specification, the whole batch/log/consignment shall be rejected.

7.3.2 The foregoing provisions shall apply equally to prime contractors and to any sub-contractor.

7.4 Test Requirements

Samples from any portion of batch/lot/consignment shall conform to clause 3 and in addition shall conform to the following test requirements:

Table 3 Test Requirements of Ferro-Silicon

S. No.	Characteristics	Passing Standard	Test Method
a)	Moisture content at 105°C, % by mass	0.05 <i>Max</i>	JSG 0112 Method 1 (a)
b)	Water soluble matter, % by mass	0.25 <i>Max</i>	JSG 0112 Method 3
c)	Reaction of 2.5 % aqueous extract		JSG 0112 Method 5 (a)
	1) Acidity to Methyl orange	Nil	
	2) Alkalinity to Methyl, orange, calculated as Sodium carbonate (Na ₂ CO ₃) %	0.1 <i>Max</i>	
d)	Total Silicon, calculated as Silicon %	85.0 <i>Min</i>	Appx 'A'
e)	Sieving requirements		
	1) Size 106 micrometre Retained on 106 micrometre IS Sieve	Nil	
	2) Size 63 micrometre		
	i) Retained on 90 micrometre IS Sieve	Nil	
	ii) Retained on 63 micrometer IS Sieve, %	10 <i>Max</i>	

NOTE - Particulars of IS Sieves shall conform to IS 460 (Part 1).

8. WARRANY

The stores supplied against the contact shall be deemed to be warranted against the defective material and performance by the contractor for a period of 12 months from the date of receipt of the stores at the consignee's end and shall retain the properties described above. If during this period any of the stores supplied is found defective, the same shall be replaced by the manufacturer/supplier/contractor free of charges at the consignee's permises.

9. PACKAGING

9.1 The Ferro-silicon shall be supplied in sound, clean and dry galvanised mild steel drums to IS 2552. The net mass of the material to be packed in each drum should not exceed 50 kg.

9.2 The inclusion of any foreign matter or impurities in any of the packages shall render the whole consignment liable to rejection.

10. MARKING

10.1 All packages containing the material shall be indelibly any legibly marked with the following details:

- a) Nomenclature and Specification Number of the Material
- b) Name and Address of the Consignee
- c) A T or S O Number and Date
- d) Consignment Number
- e) Batch Number and Date of Manufacture
- f) Gross and Net Mass
- g) Consecutive Number of Package and Total Number of Packages in the Consignment
- h) Date of Supply
- j) Manufacturer's Initials or Recognised Trademark

10.2 In addition to the above, the Quality Assurance Officer may suggest some more markings/identifications suitable at the time of inspection.

10.3 The paint used for marking should conform to IS 138 and to the satisfaction of the Quality Assurance Officer/Quality Assurance Authority.

11. DEFENCE STORES CATALOGUE NUMBER/NATO STOCK NUMBER

Defence Store Catalogue Number and Nato Stock Number allotted to this stores are as under:

Table 4

S. No.	Nomenclature	DS Cat Part No.	NSN
a)	Lumps	6810-001 044	6810720397976
b)	106 Micrometre	6810-001 162	6810720398002
c)	63 Micrometre	6810-001 163	6810720398003

12. SAFETY OF OPERATIONS

Nothing in this specification shall relieve the manufacturer/supplier/contractor of his responsibility for the safety of operations in the manufacture, storage, transit or use of this store.

13. SUGGESTIONS FOR IMPROVEMENT

Any suggestion for improvement in this document may be forwarded to:

The Director,
Directorate of Standardisation,
Ministry of Defence,
'H' Block, Nirman Bhawan PO,
New Delhi-110211.

DETERMINATION OF TOTAL SILICON

A-1. Accurately weigh about 0.2 g of sample into a Nickel crucible and mix it well with 5 g of fusion mixture, (See note below). Sprinkle a further 2 g fusion mixture over the surface of the material already in the crucible, melt a little fusion mixture on the inner surface of the crucible lid, and place the lid on the crucible. Insert the crucible in a muffle furnace fitted with a large size Meker Burner or in an electric muffle furnace with a temperature controller. Heat gently and gradually first at 600 °C and then more strongly at 900°C to 1000°C and finally at a full heat for one hour.

A-2. Remove the crucible from the furnace and quench it immediately by immersing it to half its depth in cold distilled water in order to cool the melt quickly and facilitate the removal from the crucible. Place the crucible and lid in a 500 ml beaker, add 50 ml hot distilled water, cover the beaker with a watch glass, and allow the beaker to stand for 1 hour on the water-bath.

A-3. With clean tongs, remove the crucible and lid from the beaker and wash them well with hot distilled water to ensure freedom from residues of the fused mass. Acidify the liquid in the beaker by careful addition of concentrated Hydrochloric acid. Evaporate to dryness and allow to bake for one hour on sand bath at low heat, cool, moisten with dilute Hydrochloric acid and add 50 ml hot distilled water. Filter through a Whatman No. 41 paper, using a rubber "Policeman" a glass rod to ensure removal of all traces of Silica adhering to the beaker. Wash the precipitate well with hot distilled water, and retain it.

A-4. Transfer the filtrate to the original beaker, and again evaporate to dryness. Bake for half an hour on a sand-bath at low heat, moisten with dilute Hydrochloric acid, and add 50 ml hot distilled water. Filter through a Whatman No. 41 paper as before.

A-5. Place both precipitates in a Platinum crucible dry in the 140°C oven, ignite, and finally heat in the Electric muffle at a bright red heat (900°C) for 1 hour. Transfer crucible to a Desiccators, allow to cool and weight.

A-6. Treat the ash with a few drops of concentrated Sulphuric acid and about 10 ml of Hydrofluoric acid and allow to evaporate on the hot plate. Finally heat the crucible in the blowpipe till all the acid fumes are expelled, cool and weigh. The loss in mass is equivalent to Silicon. Carry out a blank determination using 10 ml of Hydrofluoric acid and few drops of concentrated Sulphuric acid as used above alone and make a correction for the residue left by the Hydrofluoric acid on evaporation.

A-7. Calculate the corrected loss in mass to Silicon per cent on the original sample.

$$\text{Silicon, \% by mass} = \frac{\text{Corrected mass of SiO}_2 \times 0.4672 \times 100}{\text{Mass of Sample}}$$

NOTE - Fusion Mixture

A-7.1 Ingredients

69 g Anhydrous Sodium Carbonate.

53 g Anhydrous Potassium Carbonate.

3 g Potassium Nitrate.

A-7.2 Mix these ingredients by passing them together four times through a No. 600 micrometre IS sieve.

SIEVING

Weigh out 10 g \pm 0.5 g of the material and brush it gently on the specified sieve. Carry out the sieving by light brushing/tapping for 15 minutes or until no further material passes through the sieve (whichever is the shortest time). Express the mass of the material retained by the sieve as a percentage of the original sample.

Calculation

$$\begin{array}{l} \text{Material retained,} \\ \text{\% by mass} \end{array} = \frac{\text{Mass retained in the sieve}}{\text{Mass of sample}} \times 100$$