

MIL-P-223B

26 FEBRUARY 1962

SUPERSEDING

JAN-P-223A

12 JANUARY 1949

MILITARY SPECIFICATION**POWDER, BLACK**

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 Scope. This specification covers black powder intended for use in ammunition.

1.2 Classification. The black powder shall be of the following designated classes analogous to the corresponding nominal granulations (sieve size) (see 6.1, 6.2, 6.3, and figure 1).

Class	Sieve sizes
1	4 by 8
2	6 by 12
3	8 by 16
4	16 by 30
5	16 by 40
6	20 by 50
7	40 by 100
8	100 by 200
9	Sphere-hexagonal

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, form a part of this specification to the extent specified herein:

SPECIFICATIONS**FEDERAL**

- RR-S-366 — Sieves; Standard for Testing Purposes.
- SS-S-789 — Sulfur, Commercial Grade.

MILITARY

- JAN-G-155 — Graphite (For Use in Ammunition).
- JAN-P-156 — Potassium Nitrate.
- JAN-C-178 — Charcoal (For Use in Munitions).

STANDARDS

- MIL-STD-105 — Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 — Marking for Shipment and Storage.
- MIL-STD-286 — Propellants, Solids: Sampling, Examination, and Testing.

FSC 1375

MIL-P-223B**DRAWINGS****ORDNANCE CORPS**

- F 7548321 — Drum Steel Packing for Black Powder, Assembly Details, Packing and Marking.
- F 7548323 — Drum Steel Packing for Black Powder, Details.
- F 7548077 — Container, Metal, Packing for Black Powder, Assembly.
- F 7548078 — Container, Metal, Packing for Black Powder, Details.

BUREAU OF NAVAL WEAPONS

- LD 299212 — Container, Powder, Mk 3, Mod 0.

PUBLICATIONS**ORDNANCE CORPS**

- ORD-M608-11 — Procedures and Tables for Continuous Sampling by Attributes.

(Copies of specifications, standards, drawings, and publications, required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise

indicated, the issue in effect on date of invitation for bids shall apply.

INTERSTATE COMMERCE COMMISSION

- 49 CFR 71-90 — Interstate Commerce Commission Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Interstate Commerce Commission Regulations are now a part of the Code of Federal Regulations (1949 Edition-Revised 1956) available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Orders for the above publication should cite "49 CFR 71-90 (Rev. 1956)").

3. REQUIREMENTS

3.1 Material. The constituent materials used in the manufacture of black powder shall comply with the requirements of the following specifications:

<i>Constituent material</i>	<i>Conforming to</i>
Graphite	Specification JAN-G-155, Grade III
Potassium nitrate	Specification JAN-P-156, Class a
Charcoal	Specification JAN-C-178, Class a
Sulfur	Specification SS-S-789 Commercial-Grade, Type I.

3.2 Composition. The composition of the black powder shall comply with the requirements specified in table I, when determined as specified in 4.4.4.

TABLE I. *Composition*

Constituent	Classes 1 through 7 and class 8 percent	Class 8 only
Potassium nitrate	74.0 plus or minus 1.0	74.0 plus 1.0 minus 2.0
Sulfur	10.4 plus or minus 1.0	10.4 plus 1.5 minus 1.0
Charcoal	15.6 plus or minus 1.0	15.6 plus 1.5 minus 1.0

3.3 Moisture content.

3.3.1 *Applicable to classes 2 through 9.* The moisture content of the black powder shall be 0.70 percent maximum (max) when determined as specified in 4.4.3.

3.3.2 *Applicable to class 1 only.* The moisture content of the black powder shall be 0.60 maximum when determined as specified in 4.4.3.

3.4 Ash content. The ash content of the

MIL-P-223B

black powder shall be 0.80 percent, max., when determined as specified in 4.4.6.

3.5 Specific gravity (not applicable to class 7, 8, and 9). The specific gravity of the black powder shall not exceed the limits of 1.72 minimum (min.) and 1.80 max., for glazed powder or 1.69 min. and 1.76 max. for unglazed powder, when determined as specified in 4.4.7.

3.6 Apparent density. The apparent density of the black powder shall be based on its use in ammunition as follows:

3.6.1 For general bulk loading of components in which the weight-volume ratio is not critical the apparent density (applicable

to classes 1 and 2 only) shall be 1.03 grams, per milliliter min., when determined as specified in 4.4.8.

3.6.2 At the option of the procurement agency the apparent density of classes 1 to 6 may be specified as follows: For specific applications involving close weight-volume tolerances the apparent density of classes 1 and 2 shall be 1.10 gm per ml min., and apparent densities of classes 3 to 6 inclusive shall be 1.03 gm per ml min. and 1.10 gm per ml max., when determined as specified in 4.4.8.

3.7 Granulation. The granulation for the applicable class of black powder shall be as specified in table III, when determined as specified in 4.4.9.

TABLE II. Granulation

Class	Retained on United States (U.S.) standard sieve		Passing through U.S. Standard sieve	
	Sieve No.	Max. percent	Sieve No.	Max. percent
1	4	3	8	5
2	6	3	12	5
3	8	3	16	5
4	16	3	30	5
5	16	3	40	5
6	20	3	50	5
7	40	3	100	7
8	100	5	270	50
9 a				

(a) 125 plus or minus 2 grains per pound (lb.), 0.6 inch grain diameter spherio-hexagonal shaped.

3.8 Gritty or fibrous particles. The powder shall be free of all gritty or fibrous particles, when determined as specified in 4.4.5.

3.9 Glaze finish (not applicable to classes 7, 8 or 9). Unless otherwise specified in the contract, the black powder shall be glazed with graphite, when determined as specified in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 General quality assurance provisions. The supplier is responsible for the perform-

ance of all inspection requirements specified herein. Except as otherwise specified, the supplier may utilize his or any other inspection facilities and services acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

MIL-P-223B

4.2 Initial production inspection. During initial production the provisions 4.3 and 4.4 shall apply and the black powder examination and tests therein shall be performed except that the tests shall be conducted on the sample quantities specified in this paragraph rather than in 4.3.3.1 beginning with the first lot produced and continuing until three consecutive lots have passed the acceptance criteria prescribed.

4.2.1 *Sampling*. Seven containers shall be selected at random from the lot. If a lot contains less than seven containers all the containers shall be selected. A sufficient quantity of the material to form a sample of approximately 1 pound shall be removed by means of scoop from each selected container. If any sample fails to comply with the requirements the lot shall be rejected.

4.3 Inspection provisions.

4.3.1 *Lot formation*. A lot shall consist of one or more batches of black powder, produced by one manufacturer, in accordance with the same specification, or same specification revision, under one continuous set of operating conditions. Each lot shall contain black powder of one class only. Each batch shall consist of that quantity of black powder that has been subjected to the same unit chemical or physical process intended to make the final product homogeneous.

Each lot shall contain:

- (a) Graphite from one manufacturer with one lot number.
- (b) Potassium nitrate from one manufacturer with one lot number.
- (c) Charcoal from one manufacturer with one lot number.
- (d) Sulfur from one manufacturer with one lot number.

4.3.2 *Examination*. Sampling plans and procedures for the following classification of defects shall be in accordance with Standard MIL-STD-105. Continuous sampling

plans, in accordance with Handbook ORD-M608-11 may be used if approved by the procuring activity. AQL's and sampling plans may be applied to the individual characteristics listed using an AQL of 0.40 percent for each minor defect and an AQL of 0.25 percent for each major defect.

4.3.2.1 *Container prior to sealing*.

Categories	Defects	Method of inspection
Critical—None defined.		
Major—None defined.		
Minor—AQL 0.40 percent.		
201. Liner improper		Visual

4.3.2.2 *Container sealed (see drawing 7548321, 7548322, 7548077 or 7548078)*.

Categories	Defects	Method of inspection
Critical—None defined.		
Major—AQL 0.25 percent.		
101. Weight maximum		Scale
102. Improperly sealed		Visual
Minor—AQL 0.40 percent.		
201. Marking misleading or unidentifiable		Visual

4.3.3 *Testing*.

4.3.3.1 *Sampling*. Two containers shall be selected at random from the lot. Sufficient of the material to form a sample of approximately 1 pound shall be removed by means of scoop from each selected container. If any sample fails to comply with the requirements the lot shall be rejected.

4.4 Test Methods and procedures. The following test shall be performed on all one-pound samples.

4.4.1 *Determination of glass finish*. The black powder shall be examined visually to ascertain that it has been glazed with graphite and that surfaces of the grains do not have dull or mottled appearance, which may indicate inadequate glazing or high moisture content.

4.4.2 *Preparation of sample for analysis*.

MIL-P-223B

A 1-ounce portion of the 1-pound primary sample shall be ground in a suitable mortar to pass a No. 60 U.S. Standard sieve complying with Specification RR-S-366. (Class 8 need not be ground or screened unless, upon visual examination, the powder exhibits lumps or clusters.) All precautions shall be taken to avoid unnecessary exposure of the sample of the air; hence, as soon as a portion is ground, it shall be placed in a bottle and tightly stoppered. If the grinding and sifting does not require more than 3 minutes per portion, there will be no appreciable change in the moisture content due to hygroscopicity. Additional 1-ounce portions shall be ground as needed. The powdered sample shall be mixed well before analysis.

4.4.3 Determination of moisture content. From the ground portion of the 1-pound primary sample, an accurately weighed portion of approximately 2 gm shall be transferred to a tared weighing dish or covered watch glass and dried for 4 hours at 70° to 75°. The dish shall be covered, cooled in a desiccator and weighed. (As an alternative method, the portion may be dried for 72 hours at room temperature in a desiccator over concentrated sulfuric acid). The loss in weight shall be calculated in terms of percent moisture. Three such determinations shall be made and the average of the three results reported as the percent moisture in the lot.

4.4.4 Composition.

4.4.4.1 Determination of potassium nitrate content.

4.4.4.1.1 Gravimetric method. From the ground portion of the 1-pound primary sample, a weighed portion of approximately 10 gm shall be transferred to a 400-ml beaker and 200-ml of distilled water added. The beaker shall be placed on a steam bath and the contents brought to a boil and held for 15 minutes. The contents of the beaker shall

be filtered through a tared filtering crucible and washed with successive portions of 10 to 15 ml of hot water. The wash water passing through the crucible shall be tested with an excess of concentrated sulfuric acid containing a few crystals of diphenylamine, until there is no blue color. (A blue color indicates the presence of nitrate). The crucible shall be dried for 4 hours at 70° to 75° C. or until all moisture is removed, cooled in a desiccator, and weighed. The loss in weight represents moisture and potassium nitrate. The percent potassium nitrate shall be calculated on a moisture free basis, utilizing the result obtained in 4.4.3 as the percent moisture. The crucible and contents shall be reserved for the determination of sulfur (see 4.4.4.2).

4.4.4.1.2 Nitrometer method. The potassium nitrate shall be determined in accordance with Standard MIL-STD-286, method 209.3. In case of dispute or doubt the Nitrometer method shall be used as the standard method.

4.4.4.2 Determination of sulfur content. After the determination of potassium nitrate, as specified in 4.4.4.1, the crucible shall be placed in an extractor on a water bath, and extracted for 4 hours with carbon disulfide. After the extraction, the crucible shall be washed once with alcohol and once with ether, using suction, dried for 1 hour at 100° plus or minus 3° C., cooled in a desiccator, and weighed. The loss in weight shall be obtained by subtracting this weight from the weight of the crucible and contents, after extraction, obtained in 4.4.4.1 and the result calculated to percent sulfur on a moisture-free basis. The crucible and contents shall be reserved for the determination of charcoal (see 4.4.4.3).

4.4.4.3 Determination of charcoal content. The residue remaining in the crucible, reserved from 4.4.4.2, shall be considered to be charcoal. Its weight shall be determined by subtracting the tare weight of the fil-

MIL-P-223B

tering crucible from the total weight of the crucible and residue. This weight shall be calculated to percent charcoal on a moisture-free basis.

4.4.5 Determination of gritty or fibrous particles content. The residue remaining in the crucible, reserved from 4.4.4.3, shall be visually examined to observe that it is entirely free from all gritty or fibrous particles.

4.4.6 Determination of ash content. The crucible with its residue (see 4.4.4.3) shall be ignited in a muffle furnace or over a Bunsen burner until all the carbon is burned off, cooled in a desiccator and weighed. The weight of residue shall be calculated as percent ash. If it is desired to perform this analysis simultaneously with the composition analyses, specified in 4.4.4, a separate 5 gm portion from the ground portion of the 1-pound primary sample, shall be transferred to 400 ml beaker. The potassium nitrate shall be extracted as specified in 4.4.4.1, the residue ignited and the ash determined as specified herein.

4.4.7 Specific gravity (not applicable to classes 7, 8, or 9).

4.4.7.1 Preferred method. A weighed portion of approximately 10 mg of the 1-pound primary sample shall be transferred to a 25-ml specific gravity bottle. Clean mercury of known temperature, shall be added until the bottle is approximately $\frac{1}{2}$ to $\frac{2}{3}$ full.

The remaining air in the bottle shall be displaced with mercury as follows: A piece of heavy rubber tubing, approximately 2 feet long, shall be attached to the bottle. The other end of the tubing shall be connected to one arm of a Y-tube. By means of another piece of rubber tubing and a short piece of glass tubing, the other arm of the Y-tube shall be extended to dip into a vessel containing mercury. The stem of the Y-tube shall be connected to a vacuum line. The rubber tubing leading to the mercury vessel shall be closed by means of a pinchcock. The vacuum line shall be opened in order to evacuate the specific gravity bottle. After evacuation, the vacuum line shall be closed by means of a pinchcock placed close to the Y-tube. The pinchcock on the tubing leading to the stem of the mercury vessel shall be opened and the mercury allowed to flow into the bottle. This operation shall be repeated until the bottle is filled with mercury. The bottle containing the powder and mercury shall be weighed. The same bottle, filled with mercury shall be weighed. The specific gravity shall be calculated as follows:

Specific gravity — AB divided by (A plus C minus D) where:

A = weight of sample taken for test.

B = density of mercury at test temperature.

C = weight of vessel filled with mercury.

D = weight of vessel, powder, and mercury.

TABLE III. Specific gravity of mercury.

Temp. °C.		0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
0°	13.5	9545	9298	9051	8804	8558	8311	8065	7818	7572	7326
10°		7079	6833	6587	6341	6095	5849	5604	5358	5113	4867
20°		4622	4376	4131	3886	3641	3396	3151	2906	2661	2416
30°		2171	1927	1682	1437	1193	0949	0704	0460	0216	9972
40°	13.4	9728	9484	9240	8996	8752	8508	8265	8021	7778	7534

MIL-P-223B

4.4.7.2 *Alternate method.* In case of dispute or doubt, the preferred method shall be the standard. Add exactly 100 grams of 1-pound primary sample to a clean, standardized bulb. Place the bulb in a vertical position, with the lower stem immersed in the mercury reservoir, attach the vacuum pump to the upper stem, and proceed to exhaust the air and to fill the space within the bulb with mercury. Dislodge air bubbles that may cling around the powder grains or to the wall of the bulb by tapping the bulb gently with a rubber stopper while the air is being exhausted. Alternately exhaust the air and allow the mercury to flow up into the bulb in four repeated operations as described. After finally drawing the mercury up into the upper stem of the bulb, and after disconnecting the vacuum pump, allow the mercury to settle back into the bulb. Close both stopcocks, empty both upper and lower stems of all excess mercury, wipe the exterior globules of mercury and weigh the bulb containing mercury and powder. This weight represents the value of "Y" in the formula shown below. Determine the temperature of the mercury in degrees C. at the time of making the determination. Table III shows the specified 0° gravity of mercury "D," at various temperatures ranging from 0° to 4° C.

100 D divided by (X minus Y plus 100)
= Specific gravity of powder in which:

X = Total weight in grams of bulb filled with mercury.

Y = Total weight in grams of bulb filled with mercury and 100 gm. powder.

D = Specific gravity of mercury at temperature of test. (See table III, section 4.4.7.1).

4.4.8 *Apparent density (see 3.6 for applicability).* A 50-ml graduated cylinder, having an internal diameter of approximately 1 inch, shall be weighed to the nearest 0.1 gm. The cylinder shall be filled with a

portion of the 1-pound primary sample as close as possible to the 50-ml mark. The cylinder shall be suspended in an upright position by a length of cord, and allowed to fall 30 times from a height of 1 inch onto a rubber cushion. (A standard laboratory rubber stopper, having a diameter slightly larger than that of the base of the graduated cylinder, has been found satisfactory for use.) Care shall be taken to prevent any oscillation or sidewise motion. Upon completion of the 30 drops, sufficient powder to raise the level to the 50-ml mark shall be added. The cylinder and contents shall be weighed to the nearest 0.1 mg. The apparent density shall be calculated as follows:

Apparent density = A minus B divided by 50

where:

A = weight of cylinder plus black powder.

B = weight of empty cylinder.

4.4.9 *Granulation (not applicable to class 9).* The specified sieves for the applicable granulation (see table II) shall be properly superimposed and assembled with a bottom pan. The sieves shall comply with Specification RR-S-366. An accurately weighed portion of approximately 100 gm of the 1-pound primary sample shall be placed on the topmost sieve of the assembly. The assembly shall be covered and shaken for 3 minutes by hand or by means of a mechanical shaker geared to produce 300 plus or minus 15 gyrations and 150 plus or minus 10 taps of the striker per minute. The portions retained or passed by the various sieves, as required, shall be weighed and the results calculated to a percentage basis.

5. PREPARATION FOR DELIVERY

5.1 Packaging.

5.1.1 *Level A.* When specified (see 6.1.1), black powder should be packaged in easily

MIL-P-223B

ignited high strength flax paper bags of either 1-ounce capacity or 4-ounce capacity. Either one 4-ounce bag or four 1-ounce bags should be packaged in a plain, bright finish tin can with a slip-on cap. The can shall be sealed with metal foil backed pressure sensitive tape (see 6.4).

5.2 Packing (see 6.2).

5.2.1 Level A.

5.2.1.1 *Bulk powder.* Bulk black powder shall be packed in steel drums complying with Drawings F7548321 and F7548323 and having liners of 0.003 inch minimum thickness polyethylene. When specified, the drum shall have muslin liners in accordance with Drawing LD299212 (see 6.4).

5.2.1.2 *Cans.* Black powder packaged as specified in 5.2.1.1 shall be packed in boxes complying with Specifications 14, 15A, or 16A of Interstate Commerce Commission (ICC) Regulations 49 CFR 71-90 for the Transportation of Explosives and other Dangerous Articles.

5.2.2 Level C.

5.2.2.1 *Bulk powder.* Bulk powder shall be packed in metal containers complying with Drawings F7348077 and F7548078, with an 0.003 inch minimum thickness polyethylene liner.

5.2.2.2 *Alternative bulk packing.* Bulk black powder may be packed in metal kegs of 25 pounds capacity complying with Specifications 13 of the ICC Regulations.

5.3 Marking.

5.3.1 *Packaging.* The cans specified in 5.1.1 shall have the contents identified on a paper label attached to the body of the can. Additional information shall be as specified by the contracting officer.

5.3.2 *Packing.* Marking shall be in accordance with applicable drawings. Containers constructed in accordance with ICC Regulations shall be marked in accordance with ICC Regulations and Standard MIL-STD-129.

6. NOTES

6.1 *Intended use.* Black powder is intended for the following principal uses:

Class 1 — JATO and rocket igniters, artillery primers and igniter pads.

Class 2 — JATO and rocket igniters, ignition ends for bag charges, primers, propellant charges for line throwing guns.

Class 3 — JATO and rocket igniters, ejection charges for base ejection shell, and in pyrotechnic items.

Classes 4 and 5 — JATO and rocket igniters, relay pellets, igniting charge for illuminating candles, charges in target practice shell, ejection charges for base ejection shell, igniter charges in primer detonators, and fuze delay elements and tracer igniters.

Classes 6 and 7 — JATO and rocket igniters, relay pellets, delay and igniter charges in primer detonators; delay elements, practice hand grenade fuzes, and in Navy squibs.

Class 8 — Propellant charges for rocket signals.

Class 9 — Depth charge cartridges.

6.2 *Ordering data.* Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Class required (see 1.2 and table II).
- (c) Type of packing required (see 5.1).

6.3 Drawings prepared prior to the issuance of this Military Specification which

MIL-P-223B

specified black powder, may have specified them to be in accordance with Specification JAN-P-223A. Figure I illustrates the correlation between the Army and Navy designations in Specification JAN-P-223A and this Military Specification. In addition, the following substitutions shall apply for Navy applications:

<i>Drawing or specification requirement</i>	<i>New classes to be used</i>
Cannon	Class 2
Musket	Class 4
FFG	Class 4
Shell	Class 6
FFFG	Class 6
Fuze	Class 7
FFFFG	Class 7
Meal	Class 8

6.4 Intended packaging use.

(a) Cans, paragraph 5.1.1 — Intended

for U.S. Coast Guard use.

(b) Muslin liners, paragraph 5.2.1.1 —
Intended for U.S. Navy use.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Custodian:

Preparing activity:

Army—Ord

Army—Ord

Navy—Wep

MIL-P-223B

GRANULATION NOMENCLATURE

CORRELATION OF SPECIFICATION JAN-P-223A WITH
MILITARY SPECIFICATION MIL-F-223B

U.S. STD SIEVE SERIES	FOR SPECIFICATION MIL-P-223B		FROM SPECIFICATION JAN-P-223A	
	ARMY-NAVY	NAVY	ARMY	NAVY
4				
5				
6				
7				
8				
10				
12				
14				
16				
18				
20				
25				
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35				
40				
45				
50				
60				
70				
80				
100				
120				
140				
170				
200				
250				
270				
325				
400				

FIGURE 1

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR☐ USER☐ MANUFACTURER☐ OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER (Last, First, MI) - Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)

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