

ICS 71.100.30  
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## **National Standards of the People's Republic of China**

GB XXXX – X

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### **Fireworks and Firecrackers Aerial Double-Bang Firecrackers**

(Draft for approval)

Issue date: X – XX – XX

Implementation date: XX – XX – XX

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**Issued by the General Administration of Quality Supervision, Inspection and Quarantine of  
the People's Republic of China**

**Standardization Administration of the People's Republic of China (SAC)**

### **Preface**

**All of the technical contents of this standard are mandatory.**

Authorisation of this standard is based on the market demand, production and development of fireworks and firecrackers.

Appendix A to this standard is a standardised appendix.

This standard was proposed by China National Light Industry Council (CNLIC) and is under the jurisdiction of the National Standardization Technology Committee of Fireworks and Firecrackers.

The organisations in charge of drafting this standard were the JiangSu province township enterprise fireworks and firecracker Safety and Quality Supervision Inspection Centre; HeBei province Li county DeMao fireworks firecracker factory; Neimeng AoHanQi DeMao fireworks firecracker factory; JiangSu province GaoYou city fireworks and firecracker experiment Ltd; JiangSu province GaoYou city SongQiao fireworks and firecracker Ltd; JiangSu province GaoYou city DongFeng fireworks and firecracker factory; JiangSu province GaoYou city HengFeng fireworks and firecracker factory; JiangSu GaoYou city GuangHua fireworks and firecracker factory.

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## **Fireworks and Firecrackers**

### **Double-Bang Firecrackers**

#### **1 Scope**

This Standard sets the technical terms and definitions, classifications, technical requirements, test

methods and regulations, product labelling, packaging, transportation and storage requirements for double-bang firecrackers.

This standard applies to the manufacture, acceptance checks, sales, transportation, storage and launching of double-bang firecrackers.

## **2 Normative References**

The provisions of the following documents become provisions of this standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. For undated reference documents, the latest versions apply to this standard.

GB 10631 – 2004	Fireworks and Firecracker Safety and Quality
GB/T 10632 – 2004	Fireworks Firecracker Rules of Sampling for Inspection
QB/T 1942	Firecrackers Sound Level Value Test
SN0306.4 - 2006	Safety Inspection Rules for Exporting Fireworks and Firecrackers

## **3 Technical terms and definitions**

The following terms and definitions defined in GB 10631-2004 apply to this standard.

### **3.1**

#### **Double-bang firecrackers**

Double-bang firecrackers have a cylindrical exterior and the main body of the product is filled with propellant and explosive powder. The main body of the product launches into the sky on ignition and produces sound both on its launch and on a second explosion in the sky (accompanied by visual effect).

### **3.2**

#### **Top Seal:**

seals the top part of the tube of explosive powder.

### **3.3**

#### **Bottom seal:**

seals the bottom part of the propellant powder tube.

### **3.4**

The product releases a single sound when set off: either the propellant powder is detonated and the explosive powder does not ignite, or the propellant powder does not ignite and the product is detonated directly by the fuse.

### **3.5 Sudden blasts when product is set off**

The product produces two shock-wave sounds in a split-second, after which cylinder tube fragmentation occurs.

### **3.6**

#### **Low blast**

The second explosion occurs at a distance of less than 10m from the ground.

#### 4 Product classification and type

Double-bang firecrackers are divided into two classifications: Class B and Class C; and five types: 1, 2, 3, 4, 5, see Table1.

### 5 Technical requirements

#### 5.1 Appearance

The external appearance of the firecracker should conform to the requirements set out in Article 5.3 of GB10631-2004.

#### 5.2 Parts

##### 5.2.1 Blasting fuse

**5.2.1.1** The surface of the blasting fuse should be dry and clean, unbroken, and without leaks or mould.

**5.2.1.2** The fuse should be able to ignite the main body of the product within 3s ~ 6s.

**5.2.1.3** The installed blasting fuse should be sufficiently sturdy to hold a 100g weight for 60 seconds without the load falling off.

**5.2.1.4** The fuse installation parts and the instructions for launch should be visible on the same side of the product, with a clear marking to indicate the ignition point.

##### 5.2.2 Cylindrical body

**5.2.2.1** Appropriate material for the cylindrical body of the product is paper cardboard. Strawboard, metal and plastic components must on no account be used in the product.

**5.2.2.2** The cylindrical body must be held together firmly and tightly. Under normal conditions, the cylindrical tube does not split open or come apart during packaging, transportation or storage processes.

**5.2.2.3** The outer diameter, wall thickness and length of the cylindrical body should conform to the requirements set out in Table 1.

**Table1 Powder quantity and dimensions of cylindrical body**

Class	Type	Maximum powder quantity/g			Tube body dimension/mm		
		Quantity of powder per tube	Propellant powder	Explosive powder	Outer diameter	Wall thickness $\geq$	Length $\leq$
C	1	6.0	3.0	3.0	20~23	2.0	110
C	2	7.0	4.0	3.0	24~28	2.5	130
C	3	9.0	5.0	4.0	29~33	3.0	150
B	4	12.5	7.0	5.5	34~39	3.5	180
B	5	15.0	8.0	7.0	40~45	4.0	200

**5.2.2.4** The bottom of the tube should be completely flat as the tube must be able to stand on the

ground without falling over.

### **5.2.3 Top seal and bottom seal**

**5.2.3.1** The top seal should preferably be physically nailed to the product; the bottom seal can be pulled off. Both top and bottom seals should be made of light or fragile materials with a density of less than  $0.75\text{g/cm}^3$ . Rigid materials that do not easily separate are forbidden.

**5.2.3.2** Both the top and bottom seals must be air tight, and powder must not leak out.

## **5.3 Powder type, powder quantity and safety performance**

### **5.3.1 Powder type**

The powder type should conform to the requirements set out in Article 5.5.1 of GB10631-2004.

### **5.3.2 Powder quantity**

**5.3.2.1** The maximum powder load quantity, propellant powder quantity and explosive powder quantity for each double-bang firecracker should conform to the stipulations set out in Table 1.

**5.3.2.2** For products with a maximum powder load of 10g or over, the permissible variation is  $\pm 10\%$ , for products with a powder load of under 10g, the permissible variation is  $\pm 15\%$ .

### **5.3.3 Safety requirements**

In accordance with the requirements set out in Article 5.5.3 of GB10631-2004.

## **5.4 Launch performance**

### **5.4.1 Launch height**

**5.4.1.1** The launch height for Class C products should be at least 20m.

**5.4.1.2** The launch height for Class B products should be at least 30m.

**5.4.1.3** Phenomena such as sudden blasts, low explosions, danger of fire and single bang explosions (propellant powder does not ignite and the fuse detonates the explosive powder directly) must not occur under any circumstances.

### **5.4.2 Launch deflection angle**

When the firecracker is launched into the sky, the deflection angle must not exceed  $22.5^\circ$ .

### **5.4.3 Sound level**

The maximum sound level of the explosion must not exceed 140 dB.

## **6 Test methods**

### **6.1 External appearance**

Use visual estimation method.

### **6.2 Parts**

#### **6.2.1 Blasting fuse**

**6.2.1.1** Appearance of the fuse: use visual estimation method.

**6.2.1.2** Ignition timing test for the blasting fuse

Using two different stopwatches, both with a precision of not less than 0.1s, test the timing of the fuse. The average value of the two readings should be taken using a rounding off method, to a precision of 0.1s. If the difference between the readings produced by the two watches does not exceed 0.5s, then the test result is valid.

**6.2.1.3** Fuse durability test: using weights or a spring balance, exert a pulling force of 100g to the fuse for 60s. The fuse should not fall off.

**6.2.1.4** Fuse installation test: visual estimation as to the correct location of the installed fuse.

#### **6.2.2 Cylindrical body**

**6.2.2.1** Cylindrical body materials: visual estimation

**6.2.2.2** Cylindrical body stabilisation: allow the cylindrical body to free-fall from a 50cm height onto a 3cm-thick hardwood board. Observe whether the tube body splits open or comes apart, repeating the process three times for each sample specimen.

**6.2.2.3** Dimensions of the cylindrical body

**6.2.2.3.1** Length test: using a measuring instrument that conforms to the standard measuring requirements, measure each length of the product three times and calculate the average value.

**6.2.2.3.2** Wall thickness test: using a measuring instrument that conforms to the standard measuring requirements, measure each part of the product three times and calculate the average value.

**6.2.2.3.3** Outer diameter test: using a measuring instrument that conforms to the standard measure requirements, measure the top, middle and bottom parts of the product at different places and in different directions three times, then calculate the average value.

**6.2.3** Top and bottom seal testing

**6.2.3.1** Take the product apart, removing both top and bottom seals, then measure the height and diameter of the top seal and bottom seal respectively. Calculate the volume of the top seal and bottom seal and, using a scale with a sensitivity of 1/1000, weigh the mass of the top seal and bottom seal then calculate the density of the top seal and bottom seal.

**6.2.3.2** Hold the main body in a level position and allow it to drop from a height of 50cm 3cm-thick board. Observe whether the top seal or bottom seal come away from the body of the product, and whether any powder leaks out. Repeat three times for each sample specimen.

## **6.3 Powder type, powder quantity and safety performance test**

### **6.3.1 Powder type test**

Test procedures should be carried out in accordance with the rules and regulations set out in Appendix A of SN0306.4 – 2006.

### **6.3.2 Powder quantity test**

Test procedures should be carried out in accordance with the rules and regulations set out in Article 5.3 of SN0306.4 – 2006.

### **6.3.3 Safety performance test**

Test procedures should be carried out in accordance with the rules and regulations set out in Article 6.4 of GB10631-2004.

## **6.4 Launch performance test**

### **6.4.1 Launch height and launch angle deflection test**

Test procedures should be carried out in accordance with the rules and regulations set out in Articles 6.5.2 and 6.5.3 of GB10631 – 2004.

### **6.4.2 Sound level test**

Test procedures should be carried out in accordance with the rules and regulations set out in QB/T 1942.

## **7 Test rules and regulations**

### **7.1 Batches**

Products of the same variety and specification, manufactured with the same original materials, produced using the same technology on the same production line, and with the same production time scale, constitute the same batch.

## **7.2 Product testing before leaving factory**

**7.2.1** Products should be tested using a sample survey before leaving factories. Random samples should be taken as test specimens from each batch of products in accordance with the rules and requirements set out in GB/T 10632.

**7.2.2** Before leaving the factory, tests should be carried out on the labelling, packaging, external appearance, parts, powder quantity and launch performance of the samples.

**7.2.3** Each batch of products must be tested and examined in accordance with the rules and regulations stipulated by the manufacturer's testing department, so as to certify the product's quality before leaving the factory.

## **7.3 Product type inspection test**

Type inspection tests should be carried out:

a) before new products are put into production;b) if a certain product line has been discontinued for over six months then put back into production;c) if important changes have been made to the original materials or technology;d) according to the requests of the supervision and inspection department.

**7.3.1** Type inspection sample survey test: test procedures should conform to the rules and regulations stipulated in Article 4.1.5 of GB/T10632-2004.

**7.3.2** Type inspection testing items should include all of the technical required items stipulated in this standard.

## **7.4 Acceptance check tests**

Testing procedures should be carried out in accordance with the rules and regulation stipulated in GB/T 10632 – 2004.

## **7.5 Test outcomes/conclusions**

Test conclusions should conform to the requirements set out in Articles 4.4 and 4.5 of GB/T 16032-2004 and to the requirements set out in Appendix A of this standard.

## **8 Labelling, packaging, transportation and storage**

### **8.1 Labelling**

The product label should clearly display the product classification and type and the maximum powder capacity. Warning signs should clearly indicate that holding the product in the hand when launching is strictly forbidden, as is placing the product down in a horizontal, sloped or upended position. The instructions for launching the product should clearly indicate that the product should be placed upright and steady on solid, level ground. Other instructions should conform to the rules and regulations set out in Article 5.1 of GB 10631.

### **8.2 Packaging**

Packaging procedures should conform to the rules and regulations set out in Article 5.2 of GB10631-2004.

### **8.3 Transportation**

Transportation of the products should be carried out in accordance with the rules and regulations stipulated in Article 8.1 of GB10631-2004.

### **8.4 Storage**

Storage of the products should be carried out in accordance with the rules and regulations stipulated in Article 8.2 of GB10631 – 2004.

**Appendix A**  
**(standardised appendix)**  
**Fault categories of double-bang firecrackers**

**Table A: Fault Categories of Double-Bang Firecrackers**



Serial Number	Tested Items	Technical Requirements	Test Methods	Description of Fault	Fault Category
1	Appearance	5.1	6.1	Main body badly damaged by severe mould, and split	a <sub>1</sub>
				Main body slightly damaged, loose powder on surface.	b <sub>1</sub>
				Contaminated: some mould visible on top and bottom; white colour	c <sub>2</sub>
2	Labelling	8.1	Carried out in accordance with requirements of GB10631	No labels and marks on product (inner packaging); no instructions provided as to how to set the rockets off	a <sub>2</sub>
				Incomplete labels and marks; unclear information on labels and marks; covering damaged	b <sub>1</sub>
3	Packaging	8.2	Carried out in accordance with requirements of GB10631	Inner packaging and outer packaging do not meet standard requirements	b <sub>1</sub>
4	Blasting fuse	5.2.1	6.2.1	t<2s	a <sub>1</sub>
				2s≤t<3s; t>6s; mouldy; damaged; empty fuse; insufficient powder - trapped air in fuse	b <sub>1</sub>

				Unstable installation; installed incorrectly - wrong place; ignition point not clearly labelled	c <sub>1</sub>
5	Tube Body	5.2.2	6.2.2	Uses strawboard, metal materials and plastic components	b <sub>1</sub>
				Split; wall thickness does not conform to the required value set out in Table 1	a <sub>1</sub>
				Outer diameter and length of the tube do not conform to the required value stipulated in Table 1	b <sub>1</sub>
				Bottom of the body of the tube is not completely level	b <sub>2</sub>
6	Top seal, Bottom seal	5.2.3	6.2.3	Uses non-dispersed hard materials	a <sub>1</sub>
				Top seal and bottom seal are not air tight, powder leaks	a <sub>2</sub>

7	Powder type and quantity	5.3.1 5.3.2	6.3.1 6.3.2	Used prohibited powder and compounds - total quantity of propellant and explosive powder exceed the required value stipulated in Table 1	a <sub>1</sub>
				Powder quantity exceeds or is under the required value	c <sub>2</sub>
8	Safety Performance	5.3.3	6.3.3	Safety performance does not conform to the requirements set out in Article 5.5.3 of GB10631-2004	b <sub>1</sub>
9	Launch performance	5.4	6.4	Sudden blast; low explosion; danger of fire; single explosion (propellant powder does not ignite and explosive powder is ignited directly by the fuse); sound value exceeds 140dB	a <sub>1</sub>
				Launch height and deflection angle do not conform to requirements; single blast (propellant powder ignites but explosive powder does not	c <sub>1</sub>

				Ignition of the fuse stopped
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Indication:  $t$  indicates the true test of the fuse burning timing recording in seconds.