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**INDUSTRY STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

SN/T 5274-2020

Fireworks bomb launch dynamic pressure test sensor method

礼花弹发射动态压力测试 传感器法

(English Translation)

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Table of Contents

Foreword	
1 Scope	
2 Normative references	
3 Terms and definitions	
4 Equipment and materials	
4.1 Test device	
4.2 Piston pressure gauge	
4.3 Calipers	
5 Test preparation	
6 Test procedure	
7 Data processing	
7.1 Calculation of launch pressure	
7.2 Calculation of launch impulse	

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard was proposed and managed by the General Administration of Customs of the People's Republic of China.

Drafting organization of this standard. Changsha Customs of the People's Republic of China.

1 Scope

This standard specifies the equipment, materials, test procedures and data processing required for the sensor method to test the dynamic pressure in the cylinder when the firework bomb is launched.

This standard is applicable to the test of the peak pressure in the barrel and the launch impulse when the firework shells of 50 mm~25 mm are launched.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article Pieces. For undated

reference documents, the latest version (including all amendments) is applicable to this document.

GB 19594 Fireworks and Firecrackers JJG 59 Piston Pressure Gauge

3 Terms and definitions

The following terms and definitions defined in GB 19594 apply to this document.

Launch pressure

When the fireworks is set off, the maximum value of the pressure change in the launching cylinder is expressed in megapascals (MPa).

Ascent along time

The time interval during which the pressure in the launching barrel increases from 1% of the launch pressure value to the maximum value when the fireworks is set off.

Descent along time

When the fireworks is set off, the time interval between the change in pressure in the launch barrel from the maximum value to 1% of the launch pressure value.

Launch impulse

The gas produced when the firework propellant burns acts on the impulse of the launching tube.

4.1 Test device

4.1.1

The test device consists of a launch tube, ignition device, sensor, data collector, control and data processing software system (system group for the schematic diagram, see Figure A.1 in Appendix A).

4.1.2

The launch tube used for the test is a set of steel tube with closed ends made of medium carbon steel. The specifications should meet the requirements of Table 1. Each steel cylinder in the bottom center is drilled to fix the pressure sensor.

4.1.3

The detonator can provide DC power with voltage ≥ 6 V and power ≥ 50 W, with remote control trigger function, control distance ≥ 120 m.

4.1.4

Ignition device, composed of electric ignition head for fireworks and attached wires, total resistance ≤ 3 ohm, electric ignition head bridge wire resistance 0.9 ohm~1.2 ohm, the

dose is 40 mg.

4.1.5

Piezoelectric pressure sensor, range 0 MPa~30 MPa, nonlinearity $\leq \pm 0.2\%$, response frequency ≥ 200 kHz, temperature tolerance ≥ 150 °C, interface thread M20x1.5.

4.1.6

Dynamic pressure acquisition system, sampling frequency ≥ 100 kHz, sampling duration ≥ 5 s, trigger mode is internal trigger or manual trigger (can be Option), can zoom in on the curve, find the extreme value or the difference between two points, time integration and other operations.

4.2 Piston pressure gauge

Should meet the requirements of JJG 59.

4.3 Calipers

Accurate to 0.1 mm.

5 Test preparation

Use piston pressure gauge (4.2) and pressure acquisition system to statically calibrate the test pressure sensor.

6 Test procedure

6.1

Measure the projectile diameter of the sample with a caliper (4.3), and select a suitable test launch tube according to the measured value according to the requirements of Table 2. Bullet diameter does not meet table 2 Samples with deviations specified in the above cannot be used for subsequent testing. Measure and record the inner diameter of the launch tube.

6.2

Erect the launch tube with the pressure sensor upright and keep it firmly. Put the sample to be tested into the launch tube.

6.3

Set the sampling frequency, sampling duration, trigger mode and trigger level of the pressure acquisition system according to the specifications of the test sample.

6.4

The sample is ignited, and the pressure acquisition system records the pressure change curve measured by the pressure sensor over time.

Use the data acquisition system to record the peak pressure (P_p) of the pressure curve and the rising and falling time of the pressure during launch.

6.5

Repeat the operations described in 6.1~6.4. For each size of firework bombs, at least 5 tests are carried out.

7.1 Calculation of launch pressure

Take the maximum peak pressure value (P_p) in 5 times as the test result.

7.2 Calculation of launch impulse

I —the launch impulse of a single measurement, the unit is Newton second (N·s);

D —the inner diameter of the sample launching tube, in meters (m);

P_i —the instantaneous emission pressure during a single measurement, in Pa (Pa);

t_{ai} —the rising edge time in a single measurement, in seconds (s);

t_{di} —the falling edge time of a single measurement, in seconds (s);

t —time, in seconds (s);

I —the average value of the launch impulse, the unit is Newton second (N·s);

N —The number of measurements.

7.3 If applicable, the maximum peak pressure and emission impulse can be directly calculated through the data processing software.

Appendix A

(Informative appendix) Drawings of test equipment and materials