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Shuttlecocks

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5 Requirements

5.1 Physical Properties The physical properties of a badminton shuttlecock should meet the requirements specified in Table 1.

5.2 Limits on non-natural badminton shuttlecock plasticizers Seven plasticizers found in non-natural badminton shuttlecocks [dibutyl phthalate (DBP), butyl benzyl phthalate (BBP), phthalic acid] Di(2-ethylhexyl) phthalate (DEHP), diisobutyl phthalate (DIBP), diamyl phthalate (DPENP), dihexyl phthalate The content of phthalates (DHEXP) and dicyclohexyl phthalate (DCHP) shall comply with the requirements specified in

5.3.4 of GB 6675.1-2025.

6 Test Methods

6.1 Appearance The inspection is conducted under light, with an illuminance of at least 600 lx. The distance between the viewer and the product should be 200 mm to 300 mm. The determination is made by visual inspection.

6.2 Ball mouth outer diameter Invert the sample so that the ball head faces upward and the opening faces downward, and place it on a measuring instrument with an accuracy of no more than

0.5 mm (see Figure 2). Measure the opening of the ball. The outer diameter D was measured three times, and the arithmetic mean was taken as the test result for a single sample. The result was rounded to one decimal place. The sample size is one cylindrical ball, and the basic outer diameter D of the ball opening is the arithmetic mean of the test results of all samples of this cylindrical ball, with the result rounded to one place. Decimals. Calculate the absolute value of the difference between the outer diameter D of all balls in

the cylinder and the average value, and take the maximum value as the maximum deviation of the sample. The result is then preserved. Leave one decimal place.

6.3 Ball head diameter The diameter d of the ball head is measured using a vernier caliper with an accuracy of no more than

0.02 mm. The measurement is repeated 3 times, and the arithmetic mean is taken as the value of a single sample. The test results are rounded to two decimal places. The sample size is one sphere, and the basic diameter d of the sphere head is the arithmetic mean of the test results of all samples of that sphere, with the result rounded to two decimal places. Decimals. Calculate the absolute value of the difference between the diameter d of the ball head of all the balls in the cylinder and the average value, and take the maximum value as the maximum deviation of the sample. The result is then preserved. Leave one decimal place.

6.4 Ball head height Measure using a height vernier caliper with an accuracy of no more than

0.02 mm. Place the sample on the test table (see Figure 3) and record the sphere height. The height reading h_1 at the highest point of the head and the reading h_2 at the ball head reference surface (excluding the glue layer) are taken as the difference between h_1 and h_2 . The test results for each sample are retained to two decimal places. The sample size is one sphere, and the basic dimension h of the sphere head height is the arithmetic mean of the test results of all samples of that sphere, with the result rounded to two decimal places. Decimals. Calculate the absolute value of the difference between the height h of the ball head of all balls in the cylinder and the average value, and take the maximum value as the maximum deviation of the sample. The result is then preserved. Leave one decimal place.

6.5mm insertion length of the raw film Randomly select one piece of fabric from the sample and measure its insertion length L using a steel ruler with an accuracy of no more than

0.5 mm (see Figure 1). This measurement is taken as a single piece. The test results of the sample are retained to one decimal place. The sample size is one tube ball, and the basic dimension L of the insert length is the arithmetic mean of the test results of all samples of this tube ball, with the result rounded to one decimal place. Decimals. Calculate the absolute value of the difference between the insertion length L of all balls in the cylinder and the average value, and take the maximum value as the maximum deviation of the sample. The result is then preserved. Leave one decimal place.

6.6 line distance Using a steel ruler with an accuracy of no more than

0.5 mm, measure the distance from the ball head reference surface (excluding the glue layer) to the upper and lower coils of the sample. The distance between the center points of the coil is the distance between the upper wire L_{upper} and the lower wire L_{lower} of the sample (see Figure 1), and the result is rounded to one decimal place. The sample size is 1 cylinder ball. The basic dimension of line distance L_{upper} and L_{lower}

are the test results of the upper and lower line distances of all samples of this cylinder ball, respectively. The arithmetic mean of the results, rounded to one decimal place. Calculate the absolute values of the differences between the linear distances L_{upper} and L_{lower} of all spheres inside the cylinder and the average value. Take the maximum value as the maximum deviation of the sample. Round to one decimal place.

6.7 ball weight Using an analytical balance with an accuracy of not less than 0.001g, weigh each ball in a cylinder one by one, and take the arithmetic mean of the results, accurate to 0.01g. Calculate the absolute value of the difference between all the balls in the cylinder and the average value, and take the maximum value as the maximum deviation of the sample, accurate to 0.01g.

6.8 Metallic foreign objects Use a handheld metal detector that meets the requirements of GB 12899 for inspection.

6.9 Landing Characteristics Before the test, adjust the badminton serving machine to ensure that the distance between the landing point of the badminton shuttlecock and the serving machine is (9.5 ± 1.5) m. During the test, 12 samples were placed sequentially into the ball-serving machine, and the equipment was started to continuously and stably hit all the balls. After hitting, it should be ensured that the shuttlecocks... The pom-poms fall freely, undisturbed by any people, air currents, or objects. After all the pom-poms come to a stop, observe and count the distances within the landing point (based on the number of pom-poms). The number of shuttlecocks (based on the center of the head-to-bottom contact point) is as follows: the distance from the landing point of the training shuttlecock to the serving machine is (460 ± 5) mm, and the number of recreational shuttlecocks is... (1000 ± 5) mm, and calculate the pass rate. Repeat the test once, and take the maximum pass rate of the two tests.

6.10 Flight Stability The rotational speed display scale value is no greater than 1 r/min, and the accuracy of the badminton shuttlecock head deviation and shuttlecock mouth deviation measurement system is no greater than [missing value]. The test was conducted using a 0.05mm simulated flight stability tester. Place one sample in a simulated flight stability tester. Adjust the shuttlecock's spin speed according to the product quality grade until the sample reaches the desired stability. After stabilization, observe and record whether the maximum values of the shuttlecock head deviation and the shuttlecock mouth deviation simultaneously meet the ranges in Table 2. The sample consisted of 12 balls, which were inspected one by one, and the pass rate was calculated.

7.1 Factory Inspection

7.1.1 Products shall be inspected by the manufacturer's inspection department before leaving the factory, and only those that meet the requirements of this document may be shipped out.

7.1.2 Factory inspection shall be conducted according to the special inspection level S-3 and normal inspection single sampling plan in GB/T 2828.1-2012, and the inspection sample... Products should be drawn from the same package.

7.1.3 The factory inspection items and the Acceptable Quality Limit (AQL) values are shown in Table 3.

7.2 Type Testing

7.2.1 Type testing shall be conducted annually, but also in the following circumstances.

- When changes in design, process, or materials may affect product quality;
- When there is a significant difference compared to the previous type test;
- When production resumes after a shutdown of more than six months;
- When the national quality supervision department puts forward type testing requirements.

7.2.2 For type testing, two tubes of badminton shuttlecocks shall be randomly selected from the batch that has passed factory inspection, and the test items shall be all the requirements in Chapter 5.

7.2.3 If all type test items meet the requirements, the type test is deemed qualified; if any item fails to meet the requirements, double the sampling is allowed. Then, all items are re-inspected. If the re-inspection meets the requirements, the type test is still deemed qualified; if there are still items that do not meet the requirements, then the type test is deemed qualified. The type test failed.

7.2.4 If the supplier and the buyer have any objection to the inspection results, they may resolve the matter through negotiation or arbitration by a legally recognized institution.

8 Marking, Packaging, Transport and Storage

8.1 Marking Each shuttlecock should have a clear label.

8.2 Packaging

8.2.1 Badminton products shall be marked using one of the following two methods.

- a) Speed marking. The speed marking is based on the product's nominal landing speed;
- b) Quality marking. The nominal weight of the product is used as the marking, with a increment of 0.10g.

8.2.2 The packaging of the sphere tube shall be printed with the product certificate, trademark, product name, model, grade, quantity, speed (quality) marking, and material name. Production date, company name, address, and document number used.