

Wheel Balancing Weights for Automobiles

1. Scope

This standard specifies to wheel balancing weights (hereinafter referred to as balance weights), specifically, clip type balance weights, for automobiles.

Remarks: In this standard, units and numerical values are based on SI (International System of Units), while units and numerical values given in { } are customary unit system, shown for reference.

2. Purpose

This standard aims to standardize balance weights and ensure their proper quality, and thus assure the safety of automobiles on the road.

3. Types

The type of balance weight varies depending on the type of rim used as shown in **Table 1**. Balance weight structure comes in a one-piece mounting type and an assembly mounting type.

4. Designation of Each Part

Name of each part of the balance weights shall be as shown in **Fig. 1**. (The figure shows an example.)

Table 1

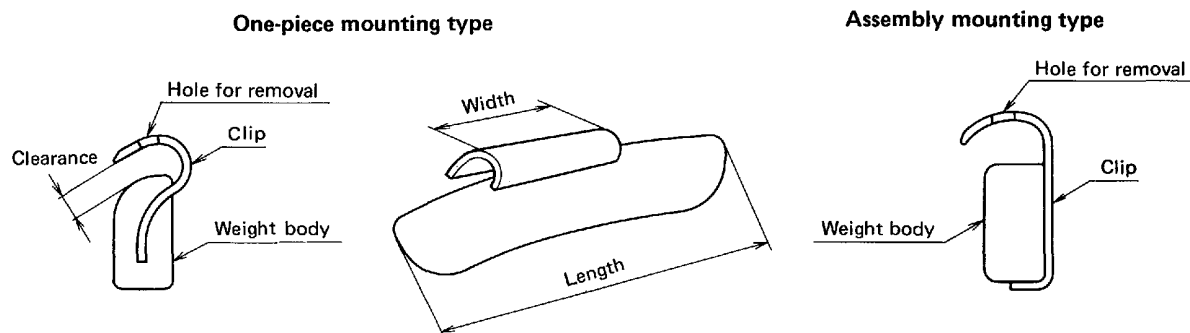
Unit: mm

Type symbol		Applicable type of rim and mark	Standard rim thickness	Standard clip clearance	Use (Nominal rim diameter)
P	1	Drop center rim DC	2.0	1.4	For sub-compact cars (10, 12)
	2	Drop center rim DC Wide base drop center rim WDC	2.5	1.8	For sub-compact cars, passenger cars For small trucks, small buses (12, 13, 14, 15)
	3	Drop center rim DC Wide base drop center rim WDC	3.6	2.5	For small trucks, small buses (15, 16)
S	1	Shallow drop center rim SDC	5.0	3.5	For small trucks, small buses (15, 16)
	2	Flat base rim IR	7.0	5.0	For trucks and buses (18, 20)
T	1	15° Drop center rim 15° DC	5.0	3.5	For small trucks, small buses For tubeless tires (17.5)
	2	15° Drop center rim 15° DC	7.0	5.0	For trucks and buses For tubeless tires (22.5)
A	1	Drop center rim DC Wide base drop center rim WDC	5.0	4.0	For 2 or 3 pieces light alloy wheel (10, 12, 13, 14, 15, 16)
	2	Drop center rim DC Wide base drop center rim WDC	6.0	5.0	For 1-piece light alloy wheel (10, 12, 13, 14, 15, 16)

Applicable Standards: Refer to page 5

Reference Standards: Refer to page 5

Fig. 1



5. Dimensions

5.1 Mass and Tolerance

The mass and tolerance of the balance weights shall be as specified in Table 2.

Table 2

Unit: g

Mass (g) Symbol	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120	150	200	250	300
P1	±1			±1.5				±2		±2.5		±3											
P2, P3	±1			±1.5				±2		±2.5		±3		±3.5		±4		±5					
S1				±1.5				±2		±2.5		±3		±3.5		±4				±5			
S2		±1		±1.5		±1.5		±2		±2.5		±3		±3.5		±4				±5			
T										±2.5									±5		±5		
A	±1			±1.5				±2		±2.5		±3		±3.5		±4							

5.2 Weight Body Length

Weight body length shall be as specified in Table 3.

Table 3

Unit: mm

Mass (g) Symbol	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120	150	200	250	300
P1	20 max.	30 max.		40 max.		50 max.		60 max.		70 max.		80 max.											
P2, P3	20 max.	30 max.		40 max.		50 max.		60 max.		70 max.		80 max.		90 max.		100 max.		110 max.					
S1				40 max.		50 max.		60 max.		80 max.		80 max.		90 max.		100 max.			110 max.		120 max.		
S2		30 max.		40 max.		50 max.		60 max.		80 max.		80 max.		90 max.		100 max.			110 max.		120 max.	130 max.	150 max.
T										80 max.								110 max.		110 max.	120 max.		
A	20 max.	30 max.		40 max.		50 max.		60 max.		70 max.		80 max.		90 max.		100 max.							

6.3 Corrosion Resistance

The corrosion resistance of a clip and weight body in an assembled state shall be such that, when the salt spray test specified in 10.3 is conducted, it will take 48 hours or more for the clip to develop red rust.

In cases where higher corrosion resistance is required, or where assemblies are painted or otherwise treated for corrosion resistance to prevent electrocorrosion, etc. of light-alloy wheels, corrosion resistance specifications shall be as agreed upon between the supplying and receiving parties concerned.

7. Appearance

Appearance shall be as specified below.

- (1) Shall be free of cracks, pinholes, ingot shrinkage, flaws, or other defects that will adversely affect the strength.
- (2) The clip ends shall be free of detrimental flaws or burrs.

8. Materials

8.1 Weight Body

The weight body shall be made of a material consisting of pig lead, which meets the specifications of JIS H 2105 (Pig Lead), 1% to 5% of antimony, which meets the specifications of JIS H 2112 (Antimony Metal), and less than 0.5% of other constituents than lead and antimony.

8.2 Clip

The clip shall be made of a material of SK5 or SK7, which meets the specifications of JIS G 4401 (Carbon Tool Steels), or equivalent or better.

- (1) **Heat treatment**
Shall be hardened and tempered.
- (2) **Hardness**
HRC 40 to 48
- (3) **Surface treatment**
Surface treatment shall be given so as to satisfy the corrosion resistance requirements specified in 6.3. In cases where MFZn5 and gloss chromate treatment is given as specified in JIS H 8610 (Electroplated Coatings of Zinc on Iron and Steel), treatment for removing hydrogen brittleness shall be given after electroplating.

9. Manufacturing Methods

The weight body of the balance weights shall be manufactured by either of the following methods as a rule.

- (1) Gravity casting
- (2) Diecasting

10. Tests

10.1 Mountability and Removability Test

10.1.1 Testing Method

Mount balance weights on a disc wheel that has a tire fitted on, and remove the balance weights from it using the mounting/removal tool. Repeat it five times.

10.1.2 Test Conditions

- (1) **Tire and wheel combination**
Of the wheels corresponding to the vehicle classified by type symbol of the balance weights in Table 1, use those with the largest and smallest rim diameters in combination with tires which meet the specifications of JIS D 4202 (Dimensions of Tires for Automobiles) and the Japan Automobile Tire Association Standard, and which has the largest width and the largest aspect ratio. In cases where use is limited to a specific type of vehicle (hereinafter referred to as limited use), the tire and wheel combination shall be as specified for that type of vehicle.
- (2) **Rim thickness**
Check the rims used in (1) for maximum and minimum thicknesses.
- (3) **Tire inflation**
Maximum air pressure corresponding to the nominal size of tire used in (1), or the recommended air pressure in case of limited use.

10.1.3 Precautions for Tests

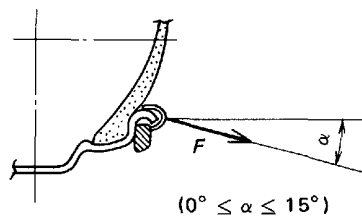
Balance weights shall be mounted firmly until they are in normal condition of use. The balance weight clearance shown in Fig. 1 shall not be adjusted during tests.

10.2 Tension Test

10.2.1 Testing Method

Mount a weight on the rim of a disc wheel, apply a force (F) to the center of the clip in the direction shown in Fig. 2 as slowly as possible, and measure the force (F) that is used to detach the weight from the rim.

Fig. 2



10.2.2 Test Conditions

Same as those in 10.1.2.

10.2.3 Precautions for Tests

Use enough samples for measurement, considering the dispersion that may occur in mounting balance weights.

10.3 Salt Spray Test

A salt spray test shall be conducted as specified in JIS Z 2371 (Salt Spray Testing).

11. Inspection

11.1 Dimensional Inspection

The specifications of section 5 shall be satisfied.

11.2 Performance Inspection

The specifications of section 6 shall be satisfied.

11.3 Appearance Inspection

The specifications of section 7 shall be satisfied.

11.4 Material Inspection

Material inspection shall be conducted as specified below.

- (1) Inspection shall be conducted as specified in JIS H 0321 (General Rules for Inspection of Non-ferrous Metal Materials), and the specifications of 8.1 shall be satisfied.
- (2) Inspection shall be conducted as specified in JIS Z 2245 (Method of Rockwell and Rockwell Superficial Hardness Test), and the specifications of 8.2 (2) shall be satisfied.

11.5 Surface Treatment Inspection

The plating specifications shall satisfy JIS D 0201 (General Rules of Electroplating for Automobile Parts), and the painting specifications shall satisfy JIS D 0202 (General Rules of Coating Films for Automobile Parts).

12. Markings

The following markings shall be made by casting or engraving in such a position as allows identification after mounting balance weights on wheels.

- (1) **Name or trademark of manufacturer**
- (2) **Mass:** Mass shall be expressed by numerals in grams.
- (3) **Type of use:** Type of use shall be expressed by the symbols as in Table 1. Numerals may be omitted if common use is allowed.

Example of marking

5P2	(5-gram weight for DC/WDC, standard rim thickness 2.5 mm)
10P	(10-gram weight for DC/WDC, standard rim thickness 2.0 mm, 2.5 mm, 3.6 mm)
300S2	(300-gram weight for IR, standard rim thickness 7.0 mm)
55A1	(55-gram weight for DC/WDC 2 or 3 pieces light-alloy wheel, standard rim thickness 5.0 mm)

Applicable Standards:	JIS D 0201-76	General Rules of Electroplating for Automobile Parts
	JIS D 0202-71	General Rules of Coating Films for Automobile
	JIS D 4202-82	Dimensions of Tires for Automobiles
	JIS G 4401-83	Carbon Tool Steels
	JIS H 0321-73	General Rules for Inspection of Non-ferrous Metal Materials
	JIS H 2105-55	Pig Lead
	JIS H 2112-58	Antimony Metal
	JIS H 8610-77	Electroplated Coating of Zinc on Iron and Steel
	JIS Z 2245-81	Method of Rockwell and Rockwell Superficial Hardness Test
	JIS Z 2371-76	Methods of Salt Spray Testing
	JATMA Year Book (The Japan Automobile Tire Manufacturers Association, Inc.)	
Reference Standards:	JIS D 4218-81	Contours of Rims for Automobiles
	JIS G 3311-68	Cold Rolled Special Steel Strip
	JASO C 603-80	Steel Disc Wheels for Automobiles
	JASO C 608-75	Light Alloy Disc Wheels for Automobiles

**Explanatory Note
on
JASO C 303-86 Wheel Balancing Weights for Automobiles**

Introduction

Automobiles have been so much improved in performance and speed recently, and there are increasing opportunities of driving at high speed, particularly in view of the expansion of the expressway network. Under such circumstances, it has become necessary more than ever before to correct the unbalance of wheel tire assemblies that use balance weights in order to reduce automobiles vibration during high-speed driving and ensure safe, comfortable drive.

In view of this situation, it was decided to make the following revisions.

- (1) To classify weight mass in greater detail to allow unbalance correction more accurately.
- (2) To standardize the retaining performance of balance weights to eliminate problems for high-speed drive.
- (3) To re-evaluate anti-corrosive quality according to the improvement of appearance and quality of wheels, etc.
- (4) To rationalize identification markings for proper use on the market.
- (5) To modify the specifications of materials, hardness, etc. to meet the existing conditions. It was borne in mind that the standard would be so revised as to be a concise, rational one which would appropriately conform to the existing conditions. The revisions, particularly those which require explanation, will be explained below. (The section or item numbers are the same as in the text.)

3. Types

The classification of balance weights by use was re-examined on the basis of the combination of chip clearance and rim thickness on which retaining performance depends, apart from the type and use of applicable rims. (Refer to **Explanatory Figs. 1 and 2.**) Considering the existing conditions of use, standard clip clearance and standard rim thickness were determined as summarized in **Table 1** in the text. The classification symbols P, S, T, and A are the capital letters of passenger car, side-ring type, truck or tubeless, and aluminum, respectively.

5. Dimensions

The dimension specifications were re-examined to specify weight mass more in detail so that remaining errors in unbalance correction will be minimized. Mass tolerance was specified in detail according to the existing standard for the purpose of maintaining accuracy. The dimensions of the weight body and clip were also reviewed as to the present scope of use for the purpose of securing the retaining performance.

6. Performance**6.2 Retainability**

As for retainability on the rim, a tension test was selected out of the generally practiced static bench tests for reasons of data reliability, and the standard value of retainability was determined from the existing data.

6.3 Corrosion Resistance

Because the one-piece type balance weight, specifically, the anti-corrosive coating of its clip, is liable to be adversely affected by heat during lead casting, the performance standard in an assembled state was specified. Coating specifications were also examined in view of expected demands for higher quality and electro-corrosion prevention of light-alloy wheels.

8. Materials**8.1 Weight Body**

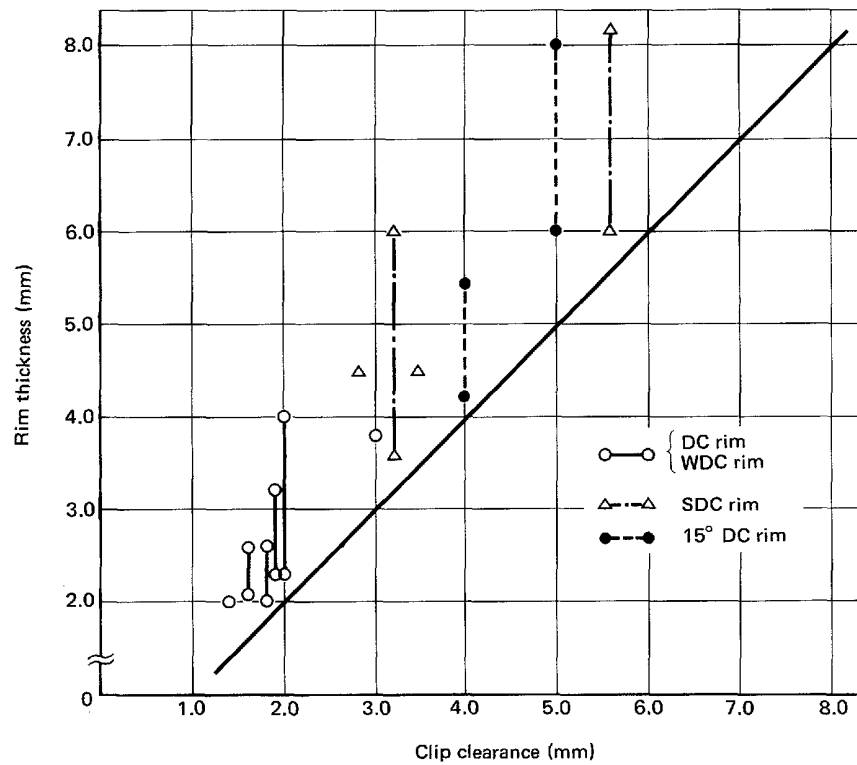
The lower limit of antimony content of the weight body was changed from 2% to 1% to meet the existing conditions.

8.2 Clip

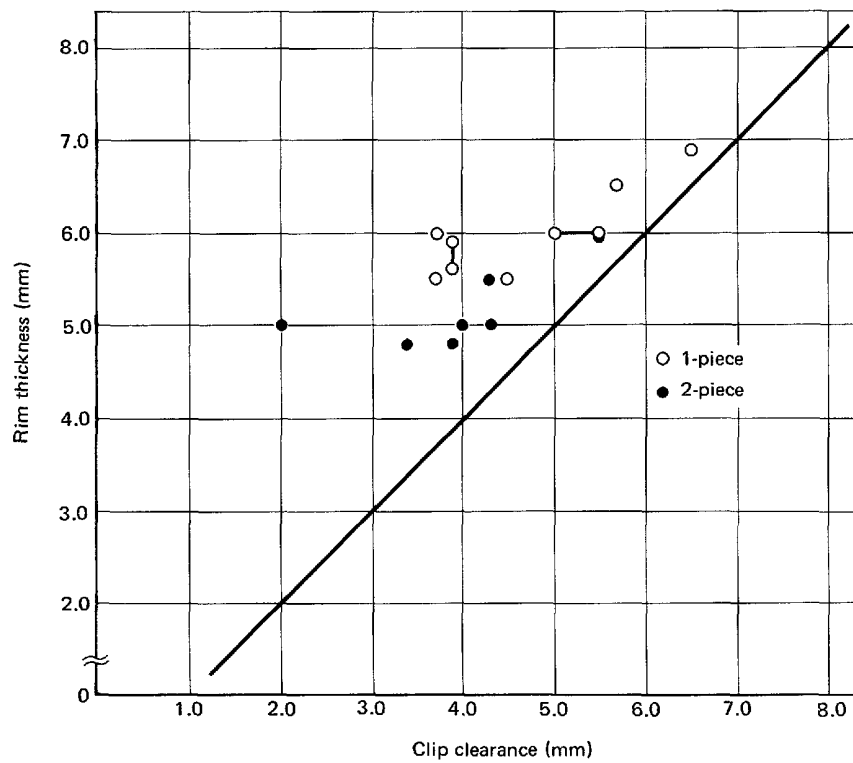
Because SK7 is often used as clip material, SK7 was added as clip material.

S70CM, etc. that meet the specifications of **JIS G 3311** (Cold Rolled Special Steel Strip) are also used in some instances, it is an improved version in terms of moldability and hardenability, and is basically equivalent to SK in mechanical properties.

Explanatory Fig. 1 Steel Wheel



Explanatory Fig. 2 Light-Alloy Wheel



- (2) The individual materials were examined in view of the existing conditions of hardness, and HRC42 $\pm$ 3 was revised to HRC40 to HRC48 for preventing yield.

10. Tests

10.1 Mountability and Removability Test

This test is to check the characteristics relating to dispersion, damage and deterioration due to the way of mounting balance weights. The number of times of repeating mounting balance weights was specified as 5 because retainability stabilizes after deterioration. It may be noted, however, that repeated use of balance weights is not recommended.

10.2 Tension Test

The direction of applying force in the tension test was specified from 0 to 15° to match the existing conditions. An example of test jig is shown in **Explanatory Fig. 3** for reference. It was specified that data be taken upon initial mounting, and that enough samples be used for measurement, considering individual dispersion.

10.3 Salt Spray Test

The salt spray test was specified to conform to **JIS Z 2371** (Methods of Salt Spray Testing).

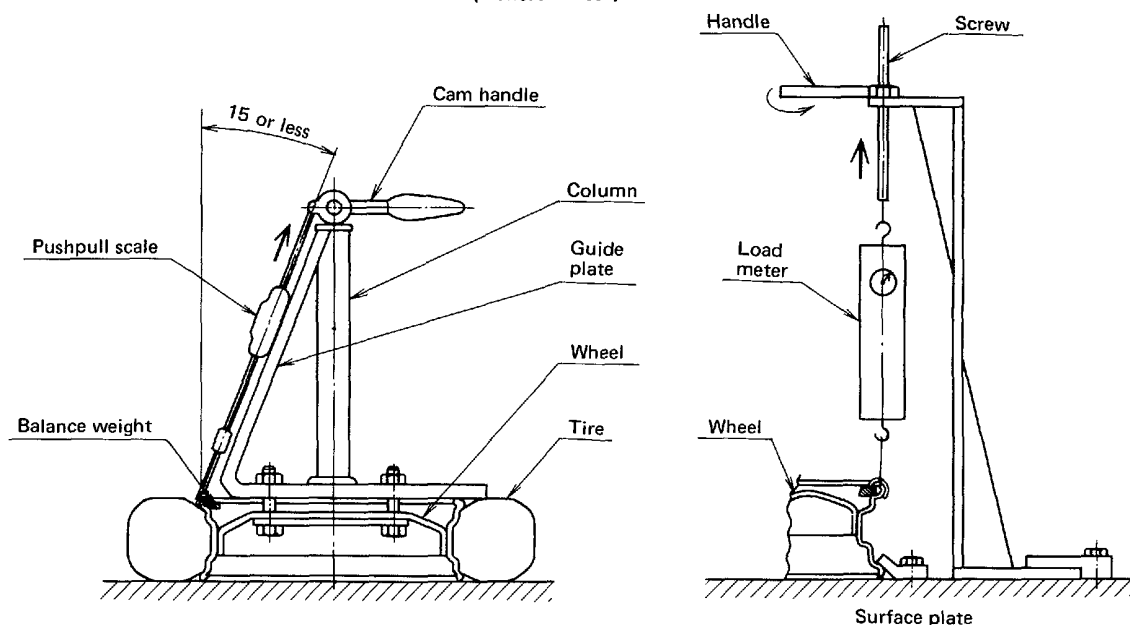
11. Inspection

Painting specifications were added for surface treatment inspection.

12. Markings

Provisions were included to specify type of use according to the classification of **Table 1** based on retainability and allow use of balance weights in proper combination with rims.

Explanatory Fig. 3 Example of Test Jig (Tension Test)



In the event of any doubt, the original standards in Japanese should be referred.

 : SECOND PHASED STANDARD

(The standard where customary units and converted values are given in brackets after specified values of SI units.)

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5.3 Clip

5.3.1 Clip Width

Clip width shall be as specified in Table 4.

Table 4

Unit: mm

Mass (g) Symbol	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120	150	200	250	300
P1	5 ~25	10~15		10~25				15~25															
P2, P3	5 ~25	10~15		10~25				15~25															
S1				10~25				15 ~25		15 ~25		15 ~25		15~25					15~25				
S2		10 ~15		10 ~25		10 ~25		15 ~25		15 ~25		15 ~25		15 ~25					15~25				
T										15 ~25								15 ~25		15~25			
A	5 ~25	10~15		10~25				15~25															

5.3.2 Clip Thickness

Clip thickness shall be as specified in Table 5.

Table 5

Unit: mm

Type symbol	Nominal rim diameter	Clip thickness
P1	10, 12	0.8 ~ 1.2
P2, P3	12, 13, 14, 15, 16	
A	10, 12, 13, 14, 15, 16	
S1	15, 16	1.0 ~ 1.4
S2	18, 20	1.0 ~ 1.6
T	17.5, 22.5	

6. Performance

6.1 Mountability and Removability

Mountability and removability in a static state shall be such that, when the mountability and removability test specified in 10.1 is conducted, the weight body attached to a rim will have no play with the clip, and the clip will be free of cracks, looseness or remarkable deformation.

6.2 Retainability

The force for detaching a balance weight from a rim shall be such that, when the tension test specified in 10.2 is conducted, the values specified in Table 6 will be satisfied.

Table 6

Unit: N { kgf }

Mass (g)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120	150	200	250	300
Detaching force	50 { 5 } or more	100 { 10 } or more		150 { 15 } or more						200 { 20 } or more									300 { 31 } or more				