

KES Kawasaki Engineering Standard	Quality Standard for Plating	KES-No.	H-001-1
		Issued	Sept. 2003
		Reconfirmed	Jan. 2007

1. Scope of Application

This standard is applied to the quality of plating with regard to the electroplate parts (hereinafter referred to as Plated Parts), which are electroplated for the purpose of decoration, corrosion prevention and rust prevention, among the various parts used for the products manufactured in our Company.

Finishing of base surface prior to plating shall be in accordance with the separate standard KES-D-001 “Quality Standard for Appearance Finish of Casting, Forging and Pressing”.

2. Plating Grade

The plating quality shall be classified to one of the three grades, MS, MA and MB, based on (1) the appearance grade of the product to which the Plate Part is attached and (2) the fixing location of the Plated Part and its appearance requirements.

Type of Part Appearance Grade of Product	High appearance part	Regular Appearance Part	Non-appearance Part
High Grade (GI)	MS	MA	MB
Regular Grade (GII)	MA	MA	MB
Other Grade (GIII)	MA	MB	MB

MS: Plating for a high appearance part that requires high decorativeness and high resistance to corrosion.

MA: Plating for a high appearance part and regular appearance part that requires decorativeness and resistance to corrosion.

MB: Plating for a regular appearance part and non-appearance part that require resistance to corrosion rather than decorativeness.

3. Standard of Quality Requirements for Plated Part

(1) Plating appearance standard

As to the plating appearance quality (e.g. sightlines, workmanship, etc.), standard samples and criteria samples shall be exchanged part by part, if necessary, between the contractors/suppliers and our Company, in conjunction with KES-D-001 “Quality Standard for Appearance Finish of Casting, Forging and Pressing” for the base surface finishing prior to plating.

(2) Plating Performance Standard

Grade classification of the plating performance standard shall be in accordance with Appendix Table 1 “Plating Performance Standard”.

NOTE: Followings are exempted from application of the standard. Instructions will be separately provided if necessary.

- Portion touched up.
- Portion to be processed after surface treatment.

This standard is also applied to the Hexavalent chromium-free parts (parts with Trivalent chromate treatment over Zinc plating and Zinc-alloy plating) that are used as countermeasure for the Environmentally-Unfriendly Substances. The type of plating and the symbol of plating should be replaced referring the “Table for Replacement of Type and Symbol of Zinc Plating” (Appendix Table 2).

4. Designation of Plating Grade

A plating grade shall be designated on the immediate right of the applicable KES No., as shown below, in NOTE, the title block, the details table and the tabular of the drawing.

<Designation example>

KES H-001-MA

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Applicable KES No. Grade

In addition, the type of plating shall be indicated (e.g. [Ep-Fe/Ne, Cr]) in the title block and others.

Plating Performance Standard

Appendix Table 1

Type of Plating	Basis Material for Plating	Symbol of Plating	No	Test Items (JIS No.)	Test Methods	Judging Criteria							
						MS			MA			MB	
			0	Conditions prior to test.	Test methods and conditions other than those specified in this table shall be in accordance with the applicable JIS test method.	Judgment shall be made in accordance with the criteria provided in this table.							
Decorative chrome plating	Iron	Ep-Fe/Ni,Cr	1	Anti-corrosion test (NOTE 1) - CASS test (H8502)	One test cycle shall be 16 hours. The test cycle shall be repeated the specified number of times.	Rating shall be No. 9 and over after two test cycles.			Rating shall be No. 9 and over after one test cycle.			Rating shall be No. 7 and over after one test cycle.	
			2	Adhesion test - Direct flame thermal shock test - Bending test (H8504)	Heat the part with direct flame. Stop heating just before the part gets red hot and cool it rapidly with water. Repeat this cycle three times before the bending test. Bend the part two times to test.	There shall be no peeling and blistering on the thermally tested area of the part after the test.							
			3	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 2, 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	The measured total plating film thickness shall be not less than the corresponding minimum film thickness (in μm) shown in the table below.							
			Ni layer	Layer 2 (d)	Layer 3 (t)	Layer 2 (d)	Layer 2 (d)	Layer 3 (t)	Layer 2 (d)	Layer 3 (t)			
			Cu	-	-	5	-	-	-	-			
			Ni	25	20	15	20	15	15	10			
Cr	0.15	0.15	0.15	0.15	0.15	0.15	0.15						
Total	25	20	20	20	15	15	10						
Decorative chrome plating	Plastics	Ep-PL/Ni,Cr	4	Anti-corrosion test (NOTE 1) - CASS test (H8502)	One test cycle shall be 16 hours. The test shall be carried out specified number of cycles.	Rating shall be No. 9 and over after two test cycles.			Rating shall be No. 9 and over after one test cycle.			-	
			5	Temperature cycle test - Plastics temperature cycle test (H8630)	The temperature of the part shall be controlled according to the following steps (1) ~ (4), which is one test cycle. Repeat the cycle three times.(1) -30 °C x 1 hr. (2) Room temperature x 0.5 hr. (3) +80 °C x 1 hr. (4) Room temperature x 0.5 hr.	There shall be no peeling and blistering on the thermally tested area of the part after the test.							-
			6	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 2, 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	The measured total plating film thickness shall be not less than the corresponding minimum film thickness (in μm) shown in the table below.							-
			Ni layer	Layer 2 (d)	Layer 3 (t)	Layer 2 (d)							
			Cu	20	20	15							
			Ni	15	10	10							
Cr	0.15	0.15	0.15										
Total	35	30	25										
Decorative chrome plating	Aluminum	Ep-AL/Ni,Cr	7	Anti-corrosion test (NOTE 1) - CASS test (H8502)	One test cycle shall be 16 hours. Repeat the test cycle the specified number of times after the No. 8 Thermal shock test, using the identical test piece.	Rating shall be No. 9 and over after two test cycles.			Rating shall be No. 9 and over after one test cycle.			-	
			8	Adhesion test - Thermal shock test (H8504)	(Heating in the oven at 180 °C x 20 min. → Cooling in water of normal temperature) /cycle. Repeat the test cycle five times.	-			There shall be no peeling and blistering on the part after the test.			-	
			9	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 2, 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	The measured total plating film thickness shall be not less than the corresponding minimum film thickness (in μm) shown in the table below.							-
			Ni layer	Layer 2 (d)	Layer 3 (t)	Layer 2 (d)	Layer 3 (t)						
			Cu	20	20	20	20						
			Ni	25	20	20	15						
Cr	0.15	0.15	0.15	0.15									
Total	45	40	40	35									
Zinc plating (Chromating)	Iron	Ep-Fe/Zn B	10	Neutral salt spray test (H8502) The state of the plating surface shall be inspected after the specified period of time.	Period of time: 24 hours on white byproduct, 96 hours on red rust.	-			-			There shall be no distinct white byproduct, red rust and blistering. Blackened area shall be less than 20% of the total area.	
		Ep-Fe/Zn D			Semi bright*1								
		Ep-Fe/Zn C			Colored								
		Ep-Fe/Zn K			Black*2 (Delete)								
		Ep-Fe/Zn G			Green								
		Ep-Fe/Zn			Trivalent chromate • white								
Ep-Fe/Zn	Trivalent chromate • black												
Zinc-Iron alloy plating (Chromating)	Iron	Ep-Fe/Zn-Fe C	11	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	-			There shall be no distinct white byproduct, red rust and blistering. Blackened area shall be less than 20% of the total area.			-	
		Ep-Fe/Zn-Fe K											Black
		Ep-Fe/Zn-Fe											Trivalent chromate • white
		Ep-Fe/Zn-Fe											Trivalent chromate • black
		Ep-Fe/Zn-Ni C											bright
		Ep-Fe/Zn-Ni K											Black
Ep-Fe/Zn-Ni	Trivalent chromate • white												
Ep-Fe/Zn-Ni	Trivalent chromate • black												
Stain coat (Zinc-Nickel alloy plating + K-coat)	Iron	Ep-Fe/Zn-Ni C + K-coat	12	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	-			There shall be no distinct white byproduct, red rust and blistering. Blackened area shall be less than 20% of the total area.			-	
		Ep-Fe/Zn-Ni + K-Coat											Trivalent chromate
Zinc plating (Chromating)	Iron	Ep-Fe/Zn B	13	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	-			-			8	
		Ep-Fe/Zn D											Semi bright*1
		Ep-Fe/Zn C											Colored
		Ep-Fe/Zn K											Black*2 (Delete)
		Ep-Fe/Zn G											Green
		Ep-Fe/Zn											Trivalent chromate • white
Ep-Fe/Zn	Trivalent chromate • black												
Zinc-Iron alloy plating (Chromating)	Iron	Ep-Fe/Zn-Fe C	14	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	-			8			-	
		Ep-Fe/Zn-Fe K											Black
		Ep-Fe/Zn-Fe											Trivalent chromate • white
		Ep-Fe/Zn-Fe											Trivalent chromate • black
Zinc-Nickel alloy plating (Chromating)	Iron	Ep-Fe/Zn-Ni C	15	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	-			5			-	
		Ep-Fe/Zn-Ni K											Black
		Ep-Fe/Zn-Ni											Trivalent chromate • white
		Ep-Fe/Zn-Ni											Trivalent chromate • black
Stain coat (Zinc-Nickel alloy plating + K-coat)	Iron	Ep-Fe/Zn-Ni C + K-coat	16	Film thickness test - Microscopical examination of cross section (H8501) (NOTE 3 and 4)	This test shall be in accordance with JIS H8501 Microscopical examination of cross section. Following simple methods may be applicable. (1) Coulometric thickness test (2) Eddy current method (3) X-ray spectrometric method	8			5			-	
		Ep-Fe/Zn-Ni + K-Coat											Trivalent chromate

Table for Replacement of Type and Symbol of Zinc Plating

* The type and symbol of Zinc plating described in Appendix Table 1 "Plating Performance Standard" should be replaced as follows for the parts with Trivalent chromate treatment.

Existing			Replaced	
Type of Plating	Symbol of Plating		Type of Plating	Symbol of Plating
Zinc plating (Bright chromate)	Ep-Fe/Zn-B		Zinc plating (Trivalent chromate• white)	Ep-Fe/Zn (Trivalent chromate• white)
Zinc plating (Semi bright chromate)	Ep-Fe/Zn-D			
Zinc plating (Colored chromate)	Ep-Fe/Zn-C			

Zinc plating (Black chromate)	Ep-Fe/Zn-K		Zinc plating (Trivalent chromate• black)	Ep-Fe/Zn (Trivalent chromate• black)
Zinc plating (Green chromate)	Ep-Fe/Zn-G			

Stain coat (Zinc-Nickel alloy plating + K-coat)	Ep-Fe/Zn Ni-C + K-coat		Stain coat (ZINLOY 5 μ m• Trivalent chromate + K-coat)	Ep-Fe/Zn-Ni5 (Trivalent chromate) + K-coat
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