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Report No.: CT2025070054-CPB01

中国认可
国际互认
检测
TESTING
CNAS L10793

TEST REPORT

Sample Name: Copper-clad Steel

Client: Beijing Zhutie Chengjin Electromechanical Equipment Co., Ltd.

Test Type: Type Test

Marine Equipment Inspection & Testing Co., Ltd.

National Center for Marine Equipment Quality Inspection & Testing (Shandong)

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8. The Client information and sample information such as sample names, specifications/models, manufacturers, are provided by the client, and our company is not responsible for their authenticity.

Org: Marine Equipment Inspection & Testing Co., Ltd.

National Center for Marine Equipment Quality Inspection & Testing (Shandong)

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Test Report

Client	Name	Beijing Zhutie Chengjin Electromechanical Equipment Co., Ltd.		
	Address	2nd Floor, Building 11, Zone 3, No. 188 South 4th Ring West Road, Fengtai District, Beijing, China		
	Tel.	13501370522	E-mail	13501370522@139.com
Sample Information	Name	Copper-clad Steel		
	Model/ Specification	Φ12/ 0.6		
	Sample No.	CT2025070054		
	Origin of the Sample	☑ Supplied by Client ☐ Random Sampling		
	Date of Receipt	Jul. 7, 2025		
Test Type	Type Test			
Test Location	Building 1, 7 and 8, No.118, Qiyunshan Yilu, Aoshanwei Street, Jimo, Qingdao, Shandong		Date of Test	Jul. 7 to Aug. 21, 2025
Test Items	Size, Surface quality, Bending test, Bonding test, Resistivity and relative conductivity, Electrical and corrosion tests			
Test Standard	DL/T 1312-2023 Requirements for copper-clad steel in power engineering grounding			
Verdict Standard	Same as test standard			
Test Result	Sample complied with the requirements of standard DL/T 1312-2023			
Compiled by	刘玉凤	**Verified by**	杨玉.	**Approved by** 纪尹
Test Items	Copper layer thickness, Tensile test			
Test Standard	DL/T 1312-2023 Requirements for copper-clad steel in power engineering grounding			
Verdict Standard	Same as test standard			
Test Result	Sample complied with the requirements of standard DL/T 1312-2023			
Compiled by	文源李	**Verified by**	王燕	**Approved by**

Other Description	1. According to the requirements of the client, the test items cover all type tests in standard DL/T 1312-2023, the verdict of result is according to CCS CC 20-0.6-Φ12 in standard DL/T 1312-2023, the samples are copper-clad steel used for horizontal grounding electrodes 2. Samples are provided by the client, and Marine Equipment Inspection &Testing Co., Ltd. has not participated in any sampling process

Marine Equipment Inspection &Testing Co., Ltd.

National Center for Marine Equipment Quality Inspection & Testing (Shandong)

Date of Issuance: Aug. 13, 2026

1. Sample Description

Manufacturer	Name	Anhui Zhutie Chengjin Electromechanical Equipment Co., Ltd.		
	Address	No. 10 Wuyi 1st Road, Mingguang Subdistrict, Mingguang City, Chuzhou City, Anhui Province, China		
	Tel.	13501370522	Zip Code	239400
Sample Mark	/			
Sample Color	/			
Sample Quantities	3 rods			
Sample Condition	Normal			

2. Test Result Details

No.	Test Items	Unit	Requirements	Test Results			Verdict
1	Sample serial number Size —Diameter	- mm	- 12.00～12.35	1 12.04	2 12.04	3 12.04	N P
2	Surface quality	-	The surface of the copper layer should be finely crystallized, evenly colored, smooth and clean, without obvious pinholes, pits, pockmarks, blisters, peeling, scabs, cracks, burns and sedimentary impurities and surface contaminants. There should be no uncovered areas, floating copper and black spots	Pass	Pass	Pass	P
3	Copper layer thickness —Minimum	mm	≥0.60	0.60	0.61	0.60	P
4	Tensile test —Tensile strength	N/mm^2	≥300	484	489	484	P
5	Bending test —90° bending test (3 times)	-	The copper layer has no cracks, fissures, pits or other defects that would impede the material's corrosion resistance	Pass	Pass	Pass	P
6	Bonding test	-	There shall be no separation between the copper layer and the steel core	Pass	Pass	Pass	P
7	Resistivity and relative conductivity —Resistance (20℃) —Resistivity —Relative conductivity (The volume resistivity of annealed copper is $1.7241\times10^{-8}\Omega\cdot m$)	 Ω/km Ω·m %	 - $\leqslant 8.62\times10^{-8}$ ≥20	 0.49425 5.63×10^{-8} 31	 0.49473 5.63×10^{-8} 31	 0.49378 5.62×10^{-8} 31	 N P P

Meaning of "verdict": P: Test result does meet the requirement; F: Test result does not meet the requirement; N: Test result does not require verdict.

No.	Test Items	Unit	Requirements	Test Results			Verdict
8	Electrical and corrosion tests						
8.1	Initial resistance(20℃)	Ω/km	-	0.494	0.495	0.494	N
8.2	Current temperature cycle test (350℃, held at this temperature for 1 h, then cooled to room temperature, 25 cycles in total)						
	—Resistance(20℃)	Ω/km	-	0.498	0.499	0.499	N
	—Resistance change rate	%	≤10	1	1	1	P
8.3	Freezing thawing test (-10℃, held at this temperature for 2 h, then raised the temperature to 20℃ and held for another 2h, 10 cycles in total)						
	—Resistance(20℃)	Ω/km	-	0.495	0.497	0.495	N
	—Resistance change rate	%	≤10	-1	-0.4	-1	P
8.4	Neutral salt spray corrosion test (5% NaCl solution, 500h)						
	—Resistance(20℃)	Ω/km	-	0.499	0.498	0.498	N
	—Resistance change rate	%	≤10	1	0.2	1	P
	—Surface quality	-	The surface should not have defects such as blisters, cracks or melting that hinder the corrosion performance of the material	Pass	Pass	Pass	P
8.5	Power frequency high current test (The test currents of samples 1, 2 and 3 are 5.38 kA, 5.38 kA and 5.38 kA respectively, 10s, 3 times each)						
	—Resistance(20℃)	Ω/km	-	0.496	0.496	0.495	N
	—Resistance change rate	%	≤10	-1	-0.4	-1	P

"Meaning of "verdict": P: Test result does meet the requirement; F: Test result does not meet the requirement; N: Test result does not require verdict.

No.	Test Items	Unit	Requirements	Test Results			Verdict
8.6	After electrical and corrosion tests						
	—Final resistance change rate	%	≤30	0.4	0.2	0.2	P
	—Surface quality	-	The surface should not have defects such as blisters, cracks or melting that hinder the corrosion performance of the material	Pass	Pass	Pass	P

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"Meaning of "verdict": P: Test result does meet the requirement; F: Test result does not meet the requirement; N: Test result does not require verdict.