

B.Q.W.

BEST QUALITY WIRE CO., LTD.

Ultra S.S.

螺絲技術白皮書



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1. Background & Market Demand

▲ Demand gap 市場需求缺口

In corrosive environments (such as solar rooftops, humid areas, and marine equipment), traditional screws face the following challenges:

在腐蝕環境（如太陽能屋頂、潮濕地區及海洋設備）中，傳統螺絲面臨以下挑戰：

- **Corrosion:** 304 or bi-metal screws are prone to pitting or coating damage in high-salt or acidic environments.

腐蝕問題：傳統 304 或複合式螺絲在高鹽或酸性環境中易出現點蝕或鍍層損壞。

- **Short lifespan:** The welding points and the black iron parts of composite screws are prone to corrosion, leading to early failure.

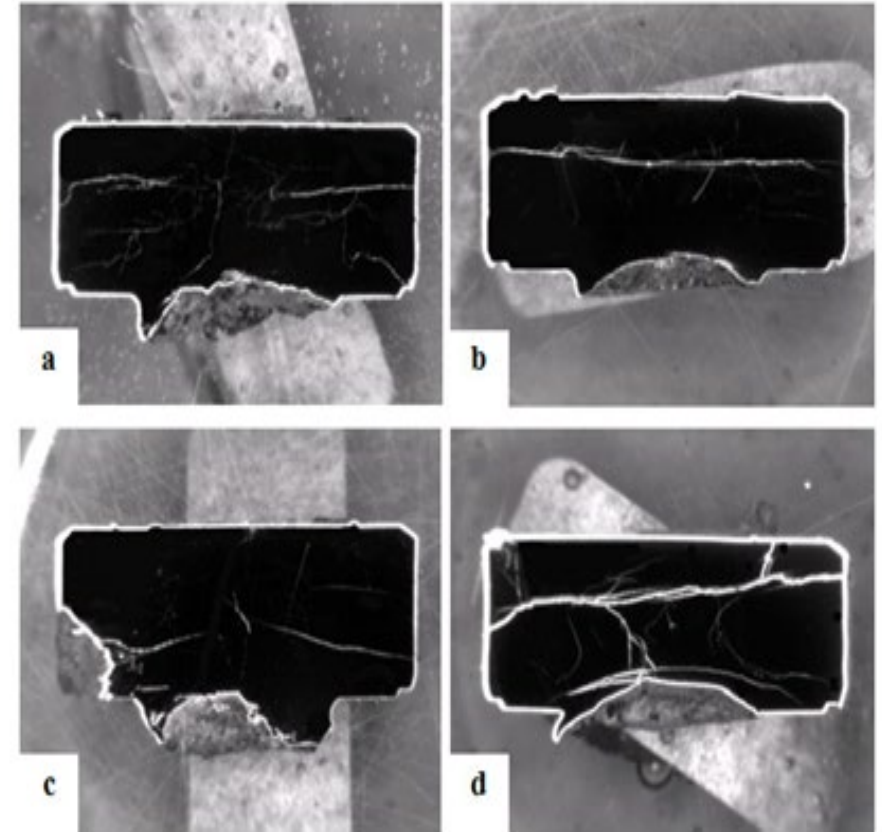
壽命短：複合螺絲的焊接點和黑鐵部分易腐蝕，導致早期失效。

- **High Maintenance Costs:** Frequent replacements and upkeep drive up overall expenses.

維護成本高：頻繁更換或維護增加總成本。

- **Insufficient mechanical strength:** Temperature fluctuations cause expansion, contraction, loosening, and deformation of screws on outdoor roofs.

機械性質不足：戶外屋頂經高溫低溫熱漲冷縮影響鎖緊力，螺絲鬆脫變形。



▲ The Creation of Ultra S.S

Ultra S.S. 螺絲的誕生

Ultra S.S. combines vacuum heat treatment with high-performance unique steel to solve above problems of bi-metal screws.

Ultra S.S. 螺絲結合真空熱處理技術與高性能不銹鋼材料，解決傳統螺絲的上述痛點。



設計理念：

Concept

- A better solution for screws - Super resistances toward corrosion, high tensile strength & hardness.
提供 超耐腐蝕與高強度機械性質
- Reduce carbon footprint (30% lower) for sustainability.
降低產品碳足跡，支持永續發展
- Improve cost efficiency throughout the product lifecycle.
提高產品壽命週期內的性價比

ULTRA S.S. Anti-corrosion screw



High Strength



Avoid Galvanic
Corrosion



Anti-corrosion
up to 30 years



Save Expensive
rectification costs



2. SGS Test Results and Performance Data

SGS Test Results SGS 測試數據

Salt Spray Test: The salt spray resistance exceeds 3,000 hours.
鹽霧測試：經 SGS 測試，耐鹽霧時間達 3000 小時

Acid Rain Cycle Test: passed 30 cycles with no significant corrosion or oxidation.
酸雨循環測試：通過 30 次酸雨循環測試，材料表面無明顯點蝕或氧化現象

Overall Evaluation of Corrosion & Acid Rain Resistance			
Screw Type	Corrosion Resistance	Salt Spray Test Period	Notes
Ultra S.S. Anti-Corrosion Screw	High, suitable for marine and harsh environments	Over 3,000 hours	Exhibiting excellent long-term performance in corrosion resistance and fastening.
8.8 Grade Bolt	Medium, depending on surface treatment	Around 500 to 1,000 hours	Suitable for general environments, but requires regular maintenance to ensure its performance.
Stainless Steel 316	High, suitable for chemical processing and marine environments	1,000 to 2,000 hours	Performs well in chemical environments, but requires special attention in highly salty environments.
SCM435	Medium, should avoid high corrosion environments	200 to 500 hours	Poor corrosion resistance, not suitable for long-term use in humid environments.
A2-70	Medium, sensitive to highly salty environments	Around 300 hours	Applicable in normal environments, but may experience corrosion with long-term exposure to humid conditions.

鹽霧試驗 Salt Spray

SGS

Material and Engineering Laboratory-Kaohsiung

Test Report

Report No. : KK-24-02429A
Page No. : 1 OF 2
Issuance Date : Jul. 30, 2024
Reissuance Date : Jul. 30, 2024

BEST QUALITY WIRE CO., LTD.
No. 296, Beishanwei 1st Rd., Annan Dist., Tainan City 709035, Taiwan (R.O.C.)

Product Name Ultra S.S. Screw
Product Type Hex Washer Screw
Product Color Plain
Manufacturer BEST QUALITY WIRE CO., LTD.
Supplier BEST QUALITY WIRE CO., LTD.
Product Submitted By BEST QUALITY WIRE CO., LTD.
Date of Sample Received Mar. 08, 2024
Date of Testing Mar. 08, 2024~Jul. 30, 2024
Testing Method ASTM B117-19
Remark The information mentioned in the above section and the following report content marks # are provided by Client.(Exclude Test Witnessed By, Test Method, Number of test, Date of Sample Received and Date of Testing)

Test Results :

#Specimen Name	Salt Spray Test
Ultra S.S. Screw- Hex Washer Screw	No red rust appeared on the test position after test for 3000 hours.

Test Condition :

1. Salt Solution Concentration : 4.9~5.5 %
2. pH of Collected Solution : 6.8~7.0
3. Air Supply : 1.0 kg/cm²
4. Temperature in the Salt Spray Chamber : 34.8~35.2°C
5. Saturated Air Temperature : 46.8~47.2°C
6. Total Test Time : 3000 hours
7. Volume of Salt Solution Collected : 1.3~1.6 mL/hr
8. Specific Gravity of Solution Collected : 1.030~1.034
9. The Tested Surface is Supported From the Vertical : 16°

Remark:

1. Execution date of salt spray test: 2024/3/15~2024/7/18.
2. Sample description: same as Before Test picture.
3. The test position refers to the bolt head.
4. The testing site is the same as laboratory address.
5. This Test Report is an additional original report of KK-24-02429. Issued date : Jul.30.2024.

----- 1 -----

The required specification(s) offered in this test report is/are for reference only.
The conformity judgment is at the Applicant's final verdict.

Signed for and on behalf of
SGS Taiwan Ltd.



before the test

#試件名稱: Ultra S.S. Screw-六角華司螺絲

試驗前



after the test
SGS 3000 hr

#試件名稱: Ultra S.S. Screw-六角華司螺絲

試驗後

酸雨試驗 Acid Rain Cycle

Test Report

Report No : DK-24-00284A
Page No : 1 OF 2
Issuance Date : Apr. 23, 2024
Reissuance Date : Apr. 23, 2024

BEST QUALITY WIRE CO., LTD.
No. 296, Beishanwei 1st Rd., Annan Dist., Tainan City 70955, Taiwan ,R.O.C.

Product Name : Ultra S.S. Screw
Product Type : Hex Washer Screw
Product Color : Plain
Manufacturer : BEST QUALITY WIRE CO., LTD.
Supplier : BEST QUALITY WIRE CO., LTD.
Product Submitted By : BEST QUALITY WIRE CO., LTD.
Date of Sample Received : Mar. 13, 2024
Date of Testing : Mar. 15, 2024~Apr. 14, 2024
Remark :
1. The information mentioned in the above section and the following report content marks # are provided by Client. (Exclude Test Witnessed By, Test Method, Number of test, Date of Sample Received and Date of Testing)
2. The sample was transferred by SGS M&E Laboratory-Kaohsiung. (Application No. KK-24-02427. Received date: Mar. 08, 2024) for the testing item(s) as below to be performed in SGS M&E-Laboratory-Douliu.

The laboratory tests according to the test requests and samples provided by client, and the results are as follows:

Test Request : Sulfur Dioxide Corrosion Test (Kesternich Test)
Test Method : DIN 50018 (2013) - AHT 2.0 S
Quantity : 3 units
Test Duration : 30 cycles
Test Result :

Visual Observation

No red rust was found on the surface of the specimens. (as show in Fig. 3 ~ 4)

Test Conditions :

Test Equipment	TGCT-A2		
Test Chamber Capacity	300 L		
SO ₂ Concentration	2.0 L (0.67%) / Cycle		
Method of Supporting specimens	As show in Fig. 2		
Test Cycle	1st test phase	Test Time	8 Hours
		Test Temp.	40±3°C
		Test Humidity	Approximately 100%
	2nd test phase	Test Times	16 Hours
		Test Temp.	18~28°C
		Test Humidity	75% max.

----- 1 -----
The required specification(s) offered in this test report is/are for reference only.
The conformity judgment is at the Applicant's final verdict.

Chia-min
Signed for and on behalf of
SGS Taiwan Ltd.

樣品照片：

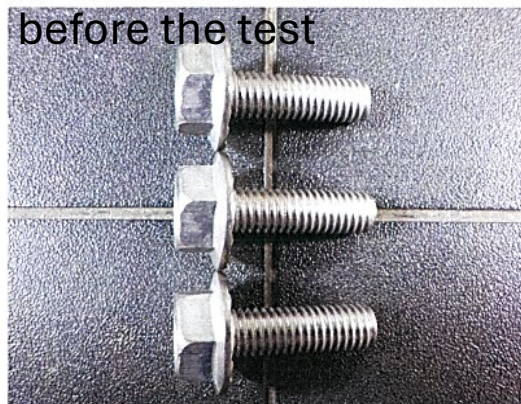


圖 1：試驗前

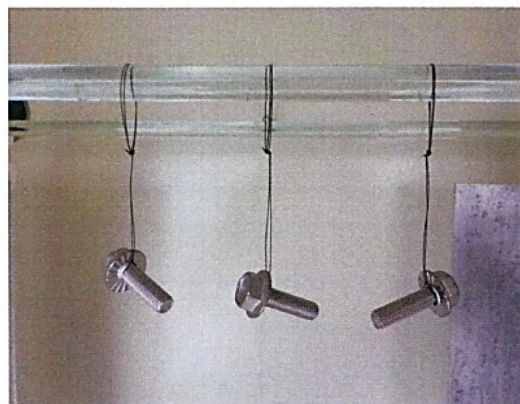


圖 2：擺放方式

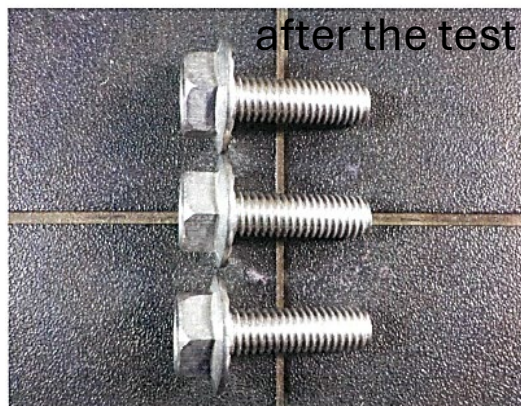


圖 3：試驗結束



圖 4：試驗結束

passed 30 cycles



◀ Mechanical Performance 機械性能



Performance and Property Test Result				
Items	Ultra S.S. Anti-Corrosion Screw	Conventional Bi-metal Screws	SUS 410	
表面硬度	Surface Hardness	550-650HV	210-250HV	561-578HV
心部硬度	Core Hardness	520-550HV	---	561-578HV
抗拉係數	Tensile Strength	173 kgf/cm ²	70.7 kgf/cm ²	145-147 kgf/cm ²
抗腐蝕	Corrosion Resistance	Over 3,000 hours	240-1,000 hours (after surface treatment)	Below 50 hours
抗酸雨	Acid Rain Resistance	Over 30 cycles	---	Below 5 cycles

- Hardness:** Ultra S.S. reaches HV550 after vacuum heat treatment, significantly higher than 304 (HV200-250)
 硬度: 經真空熱處理 · Ultra S.S. 螺絲達到 HV550 · 遠超一般 304 (HV200-250)
- Tensile Strength:** With superior strength, 2.5 times greater than 304 and 316
 抗拉強度: 比 SS304 和 SS316 螺絲高出約 2.5 倍
- Anti-Loosening:** Improve stability and safety, lower upkeep, withstand vibrations, enable easy installation, and support diverse applications.
 防鬆脫: 提升穩定性、安全性 · 減少維護成本 · 適應振動環境 · 安裝便捷 · 應用廣泛。
- Preventing Galvanic corrosion:** When dissimilar metals (such as aluminum alloy and steel) come into contact, corrosion is accelerated. Ultra S.S.'s nano-ceramic coating effectively isolates the potential difference and extending the lifespan of the structure.
 防止電位差腐蝕: 異種金屬 (如鋁合金與鋼材) 接觸時會加速腐蝕 Ultra S.S.的奈米陶瓷塗層能有效隔絕電位差 · 延長結構壽命。

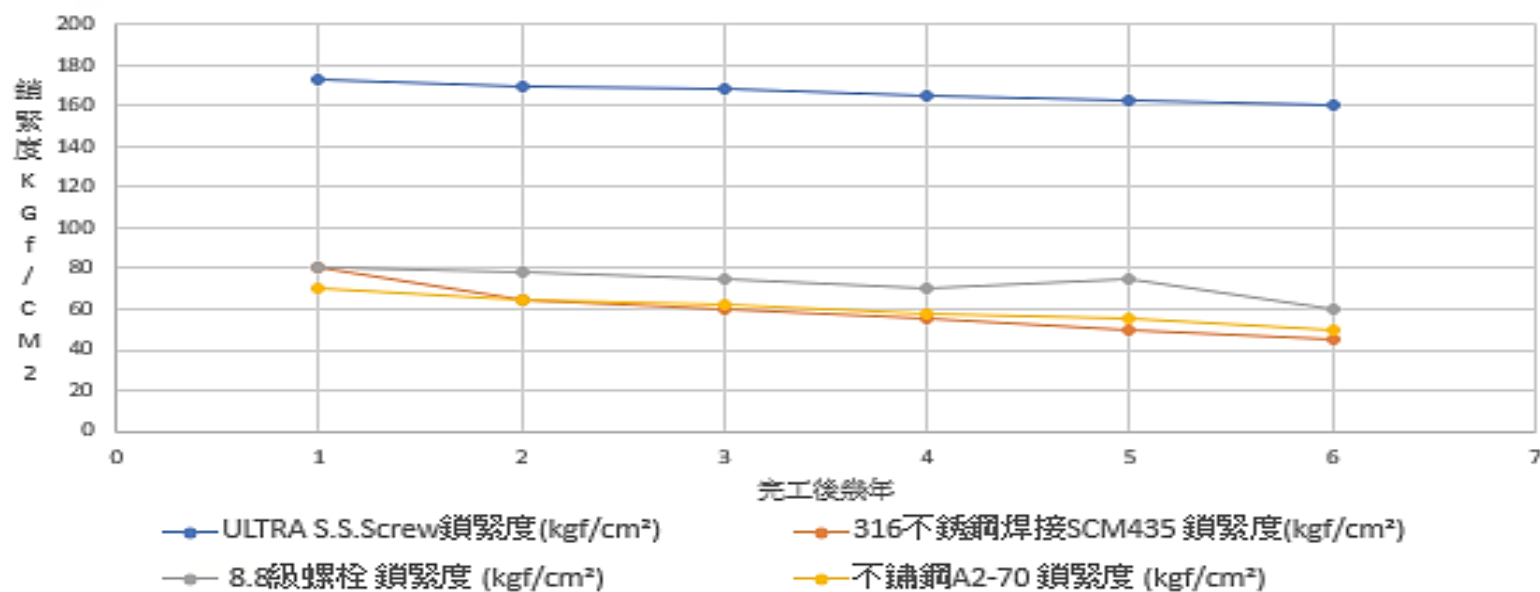


時間 Period	ULTRA S.S.Screw 鎖緊度(kgf/cm ²)	316 + SCM435 Bi-metal 鎖緊度(kgf/cm ²)	8.8 Grade Bolt 鎖緊度 (kgf/cm ²)	Stainless Steel A2-70 鎖緊度 (kgf/cm ²)
0 year	173	80	80	70
2 year	170	65	78	65
5 year	168	60	75	62
10 year	165	55	70	58
15 year	163	50	65	55
20 year	160	45	60	50



鎖緊力
K
G
f
/
C
M²

緊固力測試



防鬆脫測試 Vibration test



Report No.: HG2502180244A-1
Version: A
Confidentiality level: Strictly confidential

VIBRATION TEST REPORT

Customer Company: Best Quality Wire Co., LTD.

Customer Address: No. 298, BEI SHAN UEI RD., TAINAN CITY 70855, TAIWAN, R.O.C.

Laboratory Address: No.19, Puding Rd., East Dist., Hsinchu City 300, Taiwan (R.O.C.)

Sample Name: Nut

Model Name: Ultra S.S.

Date Received: FEB 20, 2025

Date Tested: MAR 04, 2025 ~ MAR 05, 2025

參考美國航太標準- NAS3350 進行
撞擊振動測試，螺帽鎖附於治具上
經水平與垂直方向振動 17分鐘 /
30,000 次循環 -) 不鬆脫！

Ultra S.S. -
refers to
NAS 3350
vibration test

TESTING LABORATORY IS APPROVED BY:

IECQ Certificate of Approval No.: IECQ-L DEKRA 18.0002 For Independent Test Laboratory
According to ISO/IEC 17025

ISO 9001 certificate is approved by TUV CERT certification body of TUV NORD Cert GmbH

WE HEREBY CERTIFY THAT:

The test(s) shown in the attachment were conducted according to the indicating procedures.
We assume full responsibility for the accuracy and completeness of these tests and vouch for
the qualifications of all personnel performing them.

	Name	Signature	Date
Test Engineer	Alex Chen	Alex Chen	Mar 12, 2025
Manager	Daniel Chuang	Daniel Chuang	Mar 12, 2025

NOTE:

- This report will be invalid if reproduced in part or altered in any way.
- This report refers only to the specimen(s) submitted to test, and is invalid if used otherwise.
- This report is ONLY valid with the examination seal and signature of this institute.
- The tested specimen(s) will only be preserved for thirty days from the date tested, if not collected by the applicant.



2.1 TEST EQUIPMENT

Model	Serial Number	Calibration Date
SHINKEN G-5215NS	SG-5590	FEB 16, 2025

2.2 LABORATORY AMBIENCE CONDITION

Temperature: 25 °C ± 10 °C

Relative humidity: 50 % ± 25 %

2.3 REFERENCE DOCUMENT

The test refers to NAS3350 (2012) specification.

2.4 TEST CONDITION

Units are non-operating.

Vibration waveform: Sine waveform

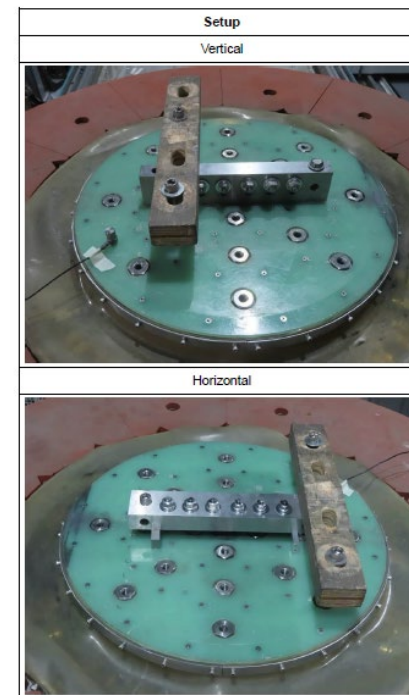
Vibration frequency: 30 Hz

Vibration acceleration: 19 g

Vibration displacement: 11 mm

Resonance dwell duration: Dwell 30000 cycles

Setup position: Vertical and horizontal



* The test showed that the test piece attached to a fixture vertical & horizontal vibrating for 17 minutes / 30,000 cycles not coming loose.

2.5 SUMMARY OF TEST

2.5.1 After testing, visual inspection showed no physical defect and functional degradation on units.

2.5.2 After testing, the locked torque of unit is shown in below:

	Before testing	After testing
M8	12.6 N.m	12.6 N.m
M10	18.2 N.m	18.2 N.m

電位差測試

Galvanic Corrosion of Different Metal Screws



CSCTC

【GA-T180-X21-07(006)】

Report No. : T18-114-000

Page : 5/XX

試樣之平均開路電位

Table 1 Average OCP of the tested specimens

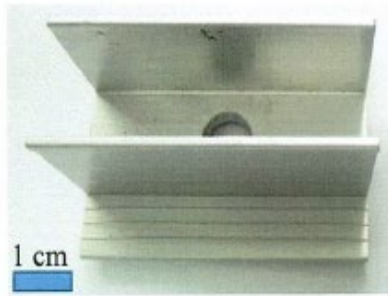
試樣編號 Specimen ID	Ultra S.S.	304 SS	Al alloy
平均開路電位 OCP (V vs. SCE)	-0.1533	-0.1073	-0.9258



(a) Ultra S.S. 高強度耐腐蝕不銹鋼螺絲(長度約 2.5 cm)
Ultra S.S. anti-corrosion screw (about 2.5 cm in length)



(b) A2-70 不銹鋼螺栓(長度約 5 cm)
A2-70 stainless steel bolt (about 5 cm in length)



(c) 鋁合金壓塊
aluminum alloy fastener

圖 1 送測樣品之外觀照片

Fig. 1 Appearances of the as-received samples

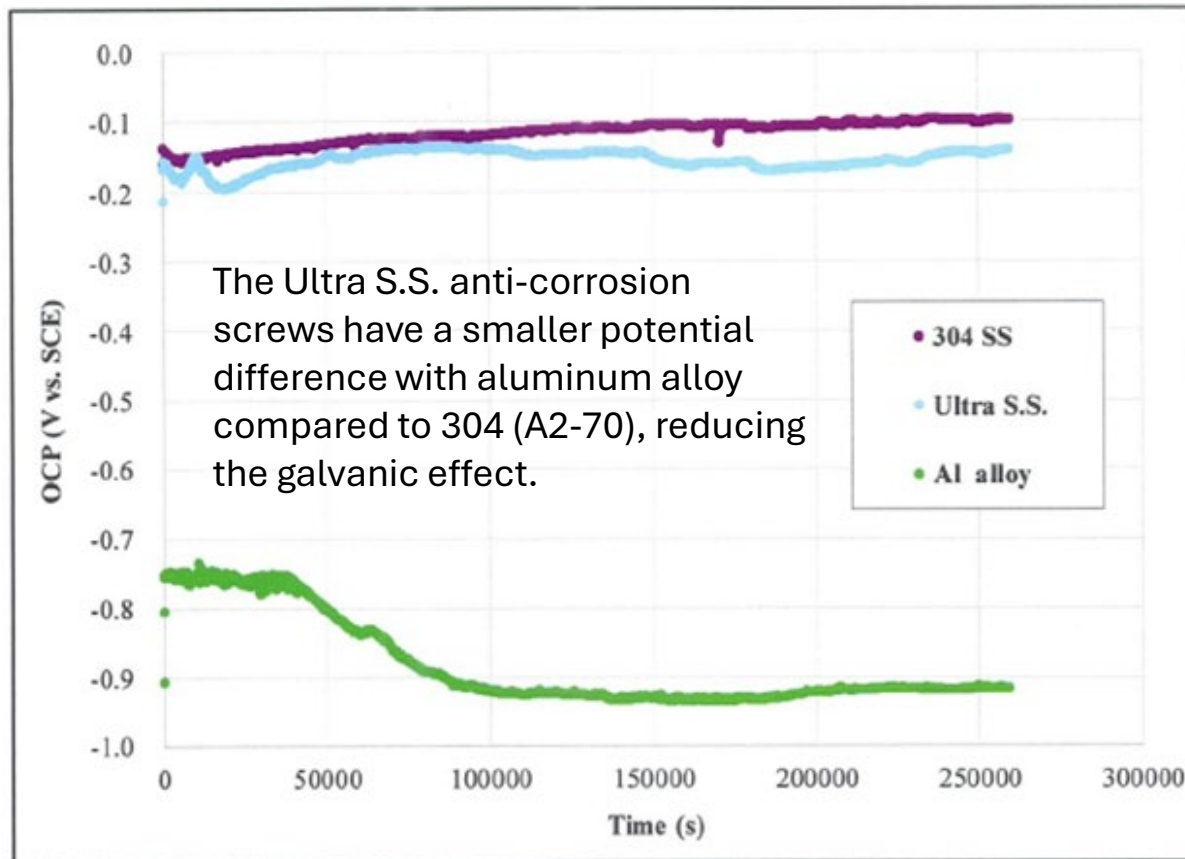
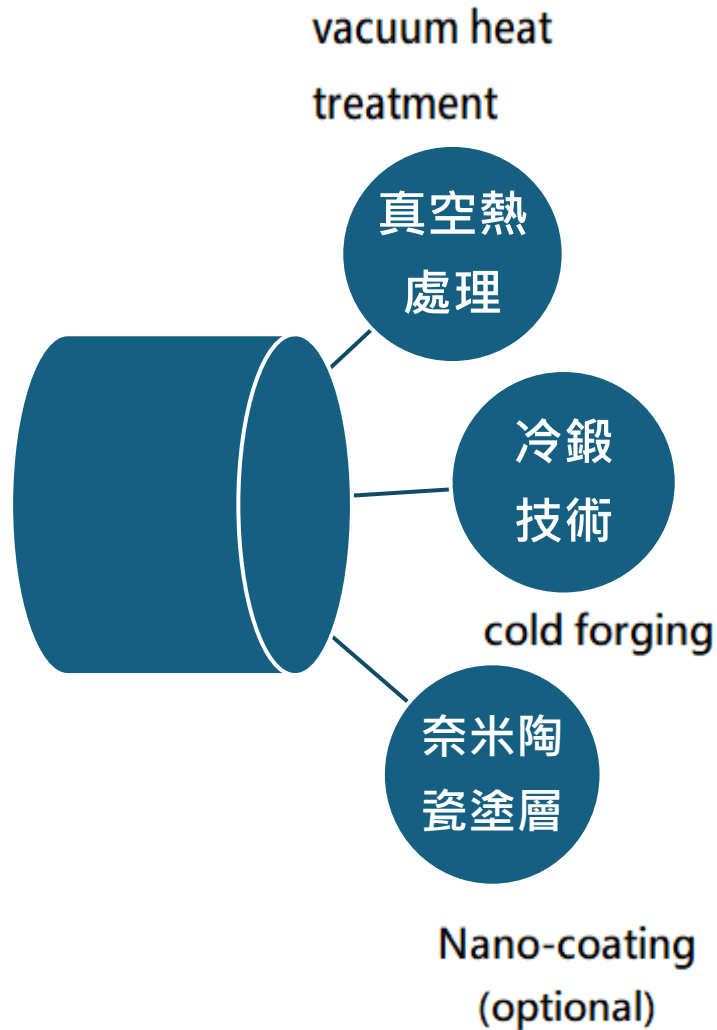


圖 2 試樣於常溫 5 wt.% NaCl 溶液(pH 4.5)中之開路電位曲線

Fig. 2 OCP curves of the tested specimens in 5 wt.% NaCl solution (pH 4.5) at the ambient temperature

和304 (A2-70) 相比，Ultra S.S. 高強度耐腐蝕不銹鋼螺絲與鋁合金間的電位差較小，能降低接合後所產生的加凡尼效應

3. Production Techniques & Material properties



Production Techniques

製造工藝

Through precise temperature control technology, improve the stability of the material's internal grain structure while increasing hardness and corrosion resistance.

透過精密控溫技術，提升材料內部晶粒結構穩定性，同時增加硬度和耐腐蝕性

Enhance the structural density of the threaded and nut components to optimize mechanical performance.

提高螺紋與螺帽部分的結構密度，增強機械性能

Completely eliminate galvanic corrosion to further enhance durability in extreme corrosive environments.

隔絕電位差腐蝕，在極端腐蝕環境中進一步提升耐久性

Material Properties

材料特性

ULTRA S.S. Screw



一站到位

One-stop process

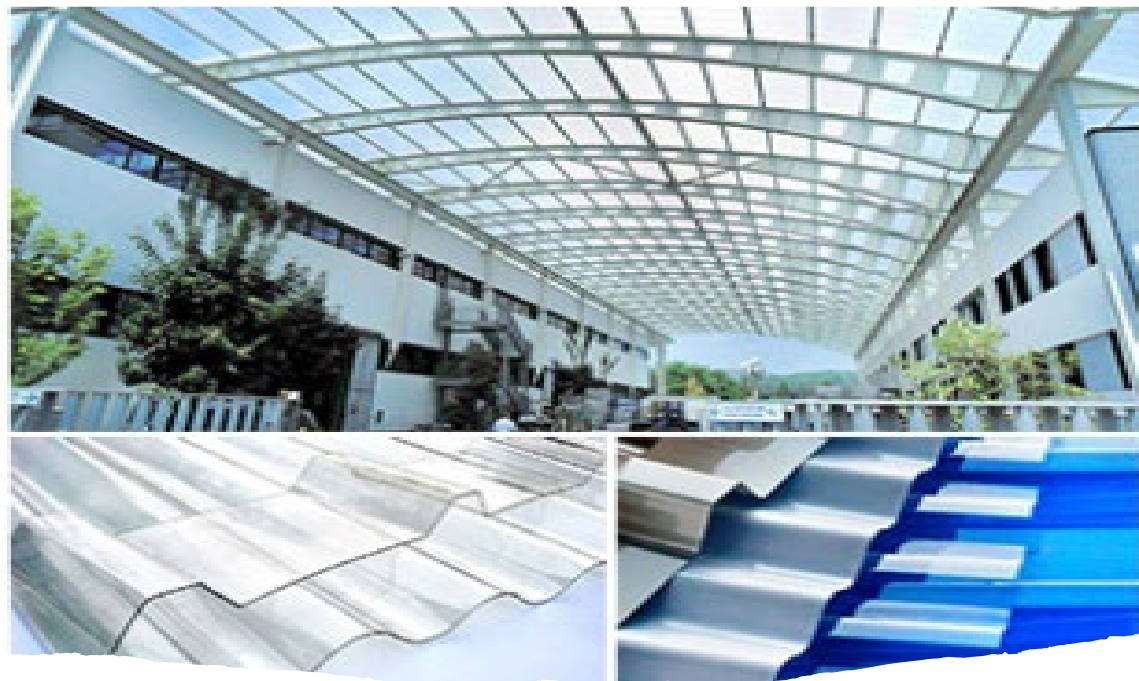
成本較低 - 可輕量化
交期較短

Competitive Cost:
Both lead time and money

高耐腐蝕性
Strong anti-corrosive

高強度機械性質
High Strength

製程對環境影響低
Low Environmental Impact



4. Application

▲ Target markets 重點市場

- **Roof:** Acid rain resistance, extending structural lifespan.
屋頂：耐酸雨，延長結構壽命。
- **Solar energy:** Anti salt spray corrosion, suitable for offshore installation site.
太陽能：抗鹽霧腐蝕，適用於近海設備。
- **Building Structure:** Concrete screws maintain long-term stability in high humidity and acidic environments.
建築結構：水泥螺絲，在高濕度、酸性環境中保持長期穩定



▲ **Potential Markets**
機會市場

- **Shipbuilding/ Yacht Industry**
造船業 / 遊艇業
- **Defense Industry**
軍工業
- **UAVs/ Drones**
無人機
- **AI Machines**
智能機械



5. Environmental and Sustainability

- Carbon Footprint
碳足跡數據

	原料階段 Raw Material Extraction	製造階段 (主廠) Manufacturing (main)	製造階段 (外包) Manufacturing (outsourcing)	運輸階段 Transportation	產品總碳排 Total Carbon Emissions
Carbon Emissions (kgCO ₂ e)	2.2661	0.0759	0.4401	0.4795	3.2616
Percentage (%)	69.48%	2.33%	13.49%	14.70%	100.00%

減少30%排放
-30% Emission

- Carbon emissions reduced by 20-30% , making it more eco-friendly than Bi-metal screws
碳排放量降低 20–30% , 比複合式螺絲製程更環保。
- ESG support: Providing low-carbon reports to help customers meet ESG requirements.
ESG 支持 , 提供低碳報告 , 幫助客戶滿足 ESG 要求。



B.Q.W.

**Greenhouse Gas
Inventory Report
available**

CBAM READY

上冠品有限公司有限公司 2024年產品碳足跡研究報告書



**ISO 14067 : 2018
Carbon Footprint
Reporting,
3.2616 kgCO₂e
lower than 304.316**

2024年 8月 16日
新版發行

GHG inventory
and report



B.Q.W.

溫室氣體盤查報告書
Greenhouse Gas Inventory Report



盤查年度：2024 年

製作單位：上冠品有限公司

發布日期：2025 年 3 月 1 日

保存期限：6 年

304、316、Ultra S.S、鈦螺絲性能與成本對比表

304、316、Ultra S.S、Titanium screws Performance & Cost Comparison

Item	304	316	Ultra S.S	Titanium
Corrosion Resistance 耐蝕性	★★★☆☆ General corrosion resistance, easily affected by moist environments	★★★★☆ Better CRE. than 304, suitable for marine environments	★★★★★ Exceptional CRE. enhanced by nano-ceramic coating, superior to 316	★★★★★ Excellent CRE. long-term application in marine and chemical environments
Mechanical Strength 機械強度	★★★☆☆ TS 500-700 MPa	★★★★☆ TS 550-750 MPa	★★★★★ TS 1000 MPa ↑	★★★★☆ TS 900 MPa, varies with TA grade
Hardness 硬度	★★★☆☆ HV 200-250	★★★★☆ HV 200-250	★★★★★ HV550 ↑ through vacuum treatment + carburization	★★★★☆ HV300-400, varies with TA grade
Cost 成本	★★★☆☆ Lower cost, similar to carbon steel screws	★★★☆☆ 20-30% higher than 304	★★★☆☆ Higher upfront cost, but has a long lifespan with minimal maintenance cost	★★★★★ Highest cost, about 3-5 times that of 304
Galvanic Corrosion 電位差腐蝕	★★★☆☆ Prone to galvanic corrosion when in contact with black iron	★★★★☆ Moderate resistance to galvanic corrosion, but still requires attention	★★★★★ Nano-ceramic coating provides effective insulation, superior to	★★★★★ A TiO ₂ layer on its surface effectively protects substrate from further metal corrosion
Application 適用場景	General construction, industrial equipment, non-marine environments	Shipbuilding, chemical industry, outdoor exposure environments	Rooftop solar, shipbuilding, high-corrosion industries	Shipbuilding, aerospace, medical device, harsh environments

6. Performance & Cost Comparison

- 304 : Ideal for general industry and construction. Low cost, but with relatively average corrosion resistance and mechanical performance.
- 316: More corrosion resistant than 304, suitable for harsh environments but with higher costs.
- **Ultra S.S. : Superior to 316 in corrosion resistance and strength, requiring minimal maintenance. Ideal for high-corrosion applications such as solar and marine use.**
- Titanium Screws: Superior corrosion resistance but high cost, ideal for aerospace, medical devices..etc.

優於 316 的耐蝕性與機械強度，減少因生鏽、斷裂導致的維修成本，提升長期投資報酬率

7. Conclusion & Action Recommendations



- Ultra S.S. screws offer an optimal solution for high performance and low carbon emissions ideal for highly corrosive and demanding applications.

Ultra S.S. 螺絲 是高性能、低碳排的最佳解決方案，特別適用於高腐蝕、高要求的應用場景。

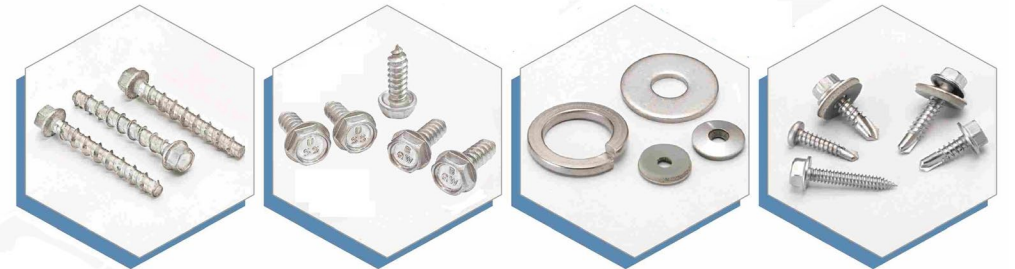
- We recommend customers to:
我們建議客戶

1. Contact us for technical information or samples.

聯繫我們索取技術資料或樣品。

2. Schedule on-site testing to verify product performance.

安排現場測試，驗證產品性能。



innovate develop

BEST QUALITY WIRE CO., LTD.

NO. 296, BEI SHAN UEI RD., TAINAN CITY 70955, TAIWAN

TEL: +886-6-284-2568 FAX: +886-6-284-0791


E-mail: sales@bqw.com.tw

www.fastener-world.com/en/supplier/best-q

www.bqw.com.tw



8. Appendix


中華民國專利證書

發明第 I 796861 號

發明名稱：可直接鎖鎖之不銹鋼螺絲成型方法

專利權人：吳祥


發明人：吳祥

專利權期間：自 2023 年 3 月 21 日至 2041 年 12 月 2 日止

上開發明業經專利權人依專利法之規定取得專利權

經濟部智慧財產局 代理局長 **廖承威**

中華民國 112 年 3 月 21 日



注意：專利權人未依法繳納年費者，其專利權自原權費期限屆滿後消滅。

Patent -Taiwan

 Bundesrepublik Deutschland 

Urkunde

über die Erteilung des
Patents Nr. 10 2021 006 491

Bezeichnung:
VERFAHREN ZUR HERSTELLUNG EINES BEFESTIGUNGSELEMENTS AUS
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07.06.2023

Die Präsidentin des Deutschen Patent- und Markenamts


Eva Schewior



München, 07.06.2023

Den aktuellen Rechtsstand und Schutzzumfang entnehmen Sie bitte dem DPMAregister unter www.dpma.de.

Patent
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United States of America



The Director

of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, the United States

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grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 3540(d) or (e), subject to the payment of maintenance fees as provided by 35 U.S.C. 409. See the Maintenance Fee Notice on the inside of the cover.


Katherine Kelly Vidal

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE