New Development

CAELAR LB

CAELAR® LB

Superior Anti-corrosion
Corrosion resistance of
Iron exceed SUS

D-alloy

Completely Chrome-free

Truely high anti-corrosion technology

Nihon Ruspert Co., Ltd.

Corrosion resistance of Iron exceed SUS

Development concept

- The target is even using carbon-steel that the performance of anti-corrosion is equivalent to austenite SUS
- The excellent anti-corrosion treatment have being developed even that the self-drilling screw being drilleded or the coating damage during tightening bolts
- It also can be suitable for austenite SUS that make the SUS with better corrosion resistance

Features

✓ Superior Anti-corrosion

A tough alloy coating combined with zinc-nickel alloy plating and add having further lubricating ability of top coating which 3 complex layers can imporve excellent corrosion resistance

✓ Completely chrome-free

With the consideration to the earth environment, without using the hazardous chromium compound to ensure the health safety

✓ Reduction of hydrogen embrittlement

The release of hydrogen is easy due to microcracked structure of Zn-Ni alloy plating,which can reduce hydrogen embrittlement occourance

✓ Weather Resistance

The products can be maintained even being used at the severe seacoast and industrial area for long term.

✓ Heat Resistance

It is totally secure even being used under high temperature environment thanks to the zinc nickel plating and inorganic coating combination that has a superior heat resistance.

✓ Gas resistance

There is no early rust issue under the environment of high concentration of sulfur dioxide and other corrosive gas.

✓ Electrolytic Corrosion Resistance

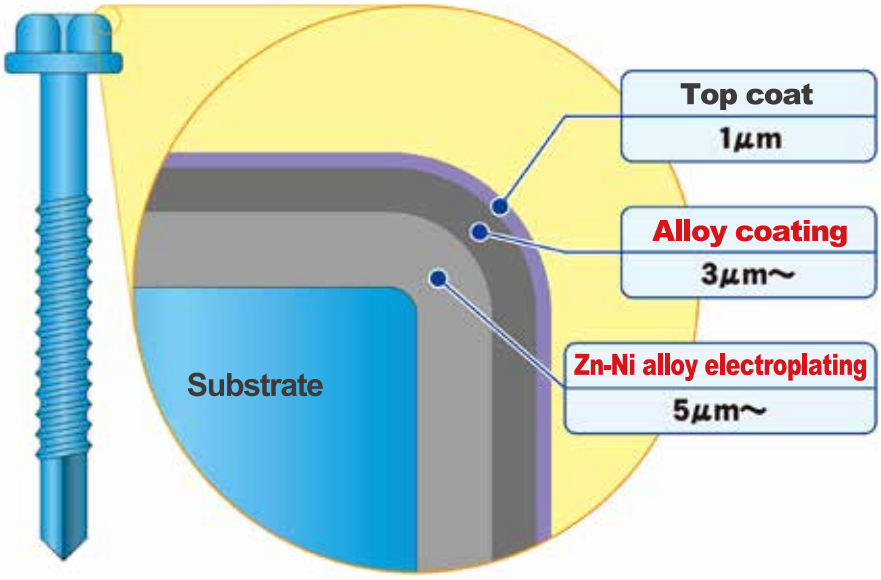
Reduce the dissimilar metal contact corrosion apparently by mean of SUS product with coating tighten in alumium board and plated steel board

✓ Galling prevention

Reduce the galling issue when tightening stainless steel fasteners

Coating film structure and Corrosion prevention structure

Improve the anti-corrosion significantly through combinating three different function anti-corrosion film



Top coat have lubricating ability even though coating damage which can protect 1st and 2nd layer

Enhance anti-corrosion performace by improving edhesion with top coat and passivating alloy coating

Corrosion prevention of substrate is attributed to protective effect of Zn-Ni alloy by self-sacrifice

Test Result

SST 2000 H **No red rust occurred**

- The pictures in left and in right to show the condition of drilling damage before SST, and drilling screw condition after testing
- White material occurred due to the effect of anti-corrosion by self-sacrifice, but no red rust was found

Standard film and Expected corrosion resistance

Utilizing the characteristics Zn-Ni alloy, high corrosion resistance can be achieved with thin film

Standard film				Expected corrosion resistance (Red rust occourred)	
Zn-Ni alloy plating	Alloy coating	Top coating	Total	After drilling(SWCH18A)	
				Salt Spary Test	Over 1000 Hours
				Combined Cycle Test	Over 100 Cycles
5μm~	3μm~	1μm	9μm~	Before drilling	
				Salt Spary Test	Over 3000 Hours
				Combined Cycle Test	Over 300 Cycles

Evaluation after drilling mean that assessment of corrosion protection properties by drilling into and out of the cold rolled steel(thickness:6mm)

Comparison various surface treatement

	carbon steel SWCH18A CAELAR LB	Martensitic stainless steel SUS410 passivating treatment	Austenitic stainless steel SUS304/XM-7 passivating treatment
Corrosion resistance	◎	×	◎
scratch resistance	◎	△	◎
electrolytic corrosion resistance	◎	×	×
acid resistance	◎	×	○
corrosive gas resistance	◎	△	○
salt damage resistance	◎	×	○
weather resistance	◎	×	◎
galling resistance	◎	×	×

◎ Very suitable ○ suitable △ part of suitable × unsuitable

Corrosion resistance test

1. Salt spray test

JIS Z 2371 / 3000H finish

No red rust occurred

Test sample: Bolt M8 x 20
Film thickness: 11μm

Before Test

Carbon steel (SWCH material) CAELAR LB	austenitic stainless steel (sus304) with passivation
	
	

After Test

(After 3000H)

Carbon steel (SWCH material) CAELAR LB	austenitic stainless steel (sus304) with passivation
	
	

2. Combined cycle test

JASO M609-91 / 300 cycle finish

No red rust occurred

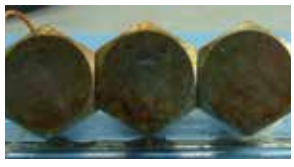
Test sample: Bolt M8 x 20
Film thickness: 11μm

Before Test

Carbon steel (SWCH material) CAELAR LB	austenitic stainless steel (sus304) with passivation
	
	

After Test

(After 300C)

Carbon steel (SWCH material) CAELAR LB	austenitic stainless steel (sus304) with passivation
	
	

Film performance test after Drilling screw in and out of the steel plate cold commercial by one time which have 6mm thickness

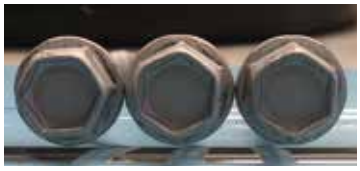
3. drilling test (salt spray test)

spcc 6mm drilling in and out of the iron plate

JIS Z 2371 / 2016H finish **No red rust occurred**

Test sample: hex self-drilling screw M6×70
Material: SUS410 + CAELAR LB
Film thickness: 14.6 μm

Test Before



Test after

(After 2016H)

Electrolytic corrosion resistance test

1. Salt spray test

JIS Z 2371 / 3000H finish

Connecting plate: aluminum
plate material: A6063S-T5 (JIS H-4100) equivalent
AL plate treatment(anodizing 9 μm+clear coating 7 μm)
①·② material: SUS304, SUS316L tighten into Al plate
③ Tighten fastener with Caelar LB treatment Film thickness: 11 μm

		① SUS316L with passivation	② SUS304 with passivation	③ SUS304 + Caelar LB
test before	bolt Head			
	bolt body			
After 3000H	bolt Head			
	bolt body			
After remove	Front			
	Back			
	Fastening			
Test Results		red rust occured after SST1848 in contact position	red rust occured after SST168 in contact position	Surface no change

2. Combined cycle test

JASO M609-91 / 300 cycle finish **No red rust occurred**

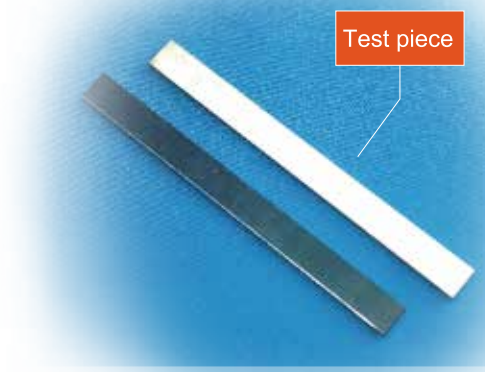
Connecting plate:aluminum
plate material:A6063S-T5(JIS H-4100 equivalent
AL plate treatment(anodizing 9 μm+clear coating 7 μm)
①·② material:SUS304,SUS316L tighten into Al plate
③ Tighten fastener with Caelar treatment Film thickness:11 μm

		① SUS316L with passivation	② SUS304 with passivation	③ SUS304 + Caelar LB
test before	bolt Head			
	bolt body			
After 300C	bolt Head			
	bolt body			
After remove	Front			
	Back			
	Fastening			
Test Results		red rust occured after CCT103C in contact position	red rust occured after CCT262C in contact position	Surface no change
		Electrolytic corroison cause white rust in fastener that it can't remove from AL plate due to adhesnion		

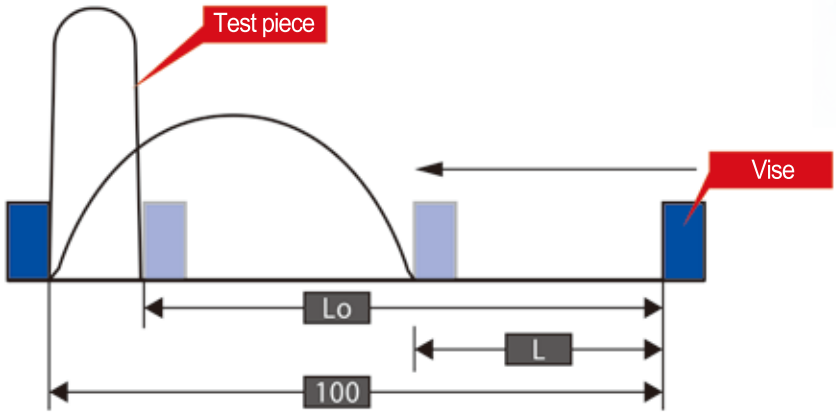
CAELAR LB treatment can reduce the hydrogen embrittlement occured

1. Delta Gauge Method

Delta Gauge Method is invented to bend the steel plate with low speed until snaping which is sensitive to the hydrogen embrittlement and test the falling rate of its tenderness so as to get its hydrogen embrittlement happening rate.



left:substrate right:test piece with plating



The principle of Evaluation Measurement

Hydrogen Embrittlement Rate (%) = (LO-L) 100/LO

Lo: Bending until snaping distance using the piece (substrate)without hydrogen embrittlement issue(mm)

L: Bending until snaping distance using the test piece treated by pickling process with hydrogen embrittlement issue

※ The hydrogen embrittlement rate is relatively compared with the one without any surface treatment. It is not the common data about the happening rate of hydrogen embrittlement by itself. And the hydrogen occlusion quantity can not be measured directly.

Test Result(according to Delta Gauge Method)

Description	Sample A	Sample B	Sample C
Distance until Broken (mm)	85.0	83.2	42.3
	85.0	85.0	36.3
	85.0	84.1	40.2
	85.0	81.2	36.2
	85.0	85.0	35.3
Average distance until broken (mm)	85.0	83.7	38.1

Test piece

Sample A：Substrate (without treatment)
Sample B：CAELAR LB
Sample C：Traditional Zinc Electroplating (No baking treatment)

CAELAR LB treatment can reduce the hydrogen embrittlement occured

※The data shown above according to our test verification which does not guarantee numerical value of all products.

Treatment Processing

The method of Dip-spin

Zn-Ni alloy plating

Alloy coating
baking 250℃
1

Alloy coating
Baking 250℃
2

top coating
Baking 180℃

Inspection
Shippment

※ Alloy coating

Alloy coating →Baking 2 times coating repeated is standard which can change under requirement

The method of spray

Zn-Ni alloy plating

Alloy coating
baking 250℃
1

top coating
Baking 180℃

Inspection
Shippment

※ Alloy coating

1 time coating is standard which can change under requirment

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