

## OX-HS HARD ANODIZING

OX-HS is a hard anodizing treatment of aluminium in sulphuric acid in compliance with MIL-A-8625 Type III, ISO 10074, and UNI 7796 standards.

The OX-HS hard anodizing process transforms the aluminium alloy surface, creating an inert and compact layer of aluminium oxide. The electrochemical process takes place in a sulphuric acid solution at temperatures below 0°C, making it possible to reach very high treatment thicknesses.

The OX-HS treatment features surface hardness that protects the aluminium base from abrasive and adhesive wear. The coating is customarily used in the automotive sector and for industrial machinery to extend the lifetime of parts subject to wear and sliding motion.

The non-conductivity, compactness, and chemical resistance of the coating make it possible to protect the aluminium substrate from corrosion, exceeding 1000 hours of salt spray without the onset of corrosion. For this reason, the coating is used to protect submarine components and components in the maritime and military sectors.



### FEATURES

#### HIGH CORROSION RESISTANCE

The compact OX-HS film protects the substrate material from corrosion, exceeding 336 hours of salt spray exposure with no trace of corrosive attack.

#### HIGH WEAR RESISTANCE AND HARDNESS

The hardness and compactness of the layer of aluminium oxide allows the achievement of high abrasive and adhesive wear resistance, comparable to that of hard chrome.

#### HIGH THICKNESS 40-60MM

The high treatment thickness, typically 40-60µm, makes it possible to obtain extended durability in aggressive environments.

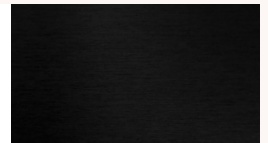
#### OX-HS-PTFE LOW FRICTION VARIANT

To reduce the friction coefficient and impart non-stick properties, the OX-HS treatment can be impregnated with PTFE nanoparticles.

### AVAILABLE COLORS

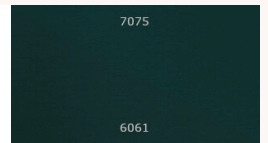
#### OX-HC - BLACK COLOR

OX-HS treatment can be colored in deep black. The deep black allows the color to be equalized on different aluminium alloys.



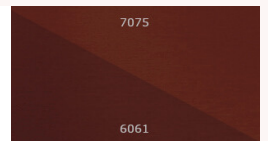
#### OX-HB - BLUE COLOR

OX-HS treatment can be colored blue. The color shade depends on the treated aluminium alloy. The picture is an indicative representation of the color obtainable on alloy 7075 and alloy 6061.



#### OX-HR - RED COLOR

OX-HS treatment can be colored red. The color shade depends on the treated aluminium alloy. The picture is an indicative representation of the color obtainable on alloy 7075 and alloy 6061.



## TECHNICAL SPECIFICATIONS

### COMPOSITION AND APPLICABLE STANDARDS

#### COMPOSITION

The OX-HS treatment transforms the aluminium substrate into a compact layer of aluminium oxide. The coating composition is thus strongly dependent on the starting alloy.

Al	O	S	IMPURITIES
20÷40%	50÷70%	3÷5%	Depending on the alloy

#### TECHNICAL STANDARDS

ISO 10074

UNI 7796

MIL-A-8625 I Type III

#### ROHS COMPLIANCE

RoHS compliant. No restricted substances present in amounts greater than the maximum tolerated concentrations.

#### REACH COMPLIANCE

REACH compliant. No SVHCs present in amounts higher than 0.1% by weight.

### ANODIZABLE ALLOYS

#### WROUGHT ALLOYS

#### CHARACTERISTICS

WROUGHT ALLOYS	CHARACTERISTICS	
Series 2000	Hardness	★★★★☆
	Wear resistance	★★★★☆
	Corrosion resistance	★★★★☆
	Maximum thickness	★★★★☆
Series 5000 (with >2% Mg) and 7000	Hardness	★★★★☆
	Wear resistance	★★★★☆
	Corrosion resistance	★★★★☆
	Maximum thickness	★★★★☆
Series 6000 (except 6082, 6061)	Hardness	★★★★★
	Wear resistance	★★★★★
	Corrosion resistance	★★★★★
	Maximum thickness	★★★★★
6082, 6061	Hardness	★★★★★
	Wear resistance	★★★★★
	Corrosion resistance	★★★★★
	Maximum thickness	★★★★☆

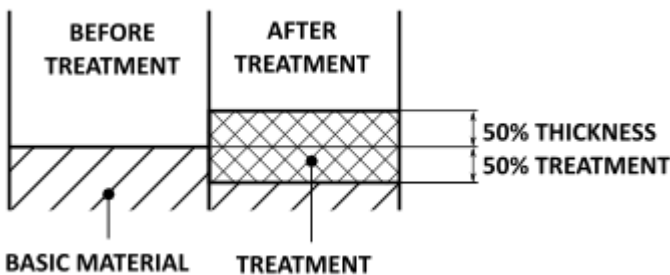
CASTING ALLOYS	CHARACTERISTICS	
Alloys with Si > 8% or Cu > 2%	Hardness	★☆☆☆☆
	Wear resistance	★☆☆☆☆
	Corrosion resistance	★☆☆☆☆
	Maximum thickness	★☆☆☆☆
Die castings with Si < 8% or Cu < 2%	Hardness	★☆☆☆☆
	Wear resistance	★☆☆☆☆
	Corrosion resistance	★☆☆☆☆
	Maximum thickness	★☆☆☆☆
Other alloys	Hardness	★☆☆☆☆
	Wear resistance	★☆☆☆☆
	Corrosion resistance	★☆☆☆☆
	Maximum thickness	★☆☆☆☆

**TREATMENT THICKNESS AND AESTHETIC APPEARANCE**

**COATING THICKNESS**

STANDARD THICKNESS	TOLERANCE
50µm	±10µm

50% of the treatment thickness is due to external film growth and 50% is due to film growth in the surface of the aluminium part. The radial dimensional increase can thus be calculated as half the treatment thickness.



Uniform thickness over the entire external surface. Reduced thickness in holes.

**AESTHETIC APPEARANCE**

- Slightly matt appearance with dark grey color. The color depends on the base alloy and the treatment thickness. Reproduces the morphology of the machined part.
- Option of black coloration in the OX-HC version
- Possibility of blue coloring in the OX-HB version
- Possibility of red coloring in the OX-HR version

**TRIBOLOGICAL PROPERTIES**

**HARDNESS**

The OX-HS treatment produces high film hardness values. The value varies in accordance with the treated alloy.

**HARDNESS VALUE**

**ALLOY**

>280HV	Series 2000
>330HV	Series 5000 (with >2% Mg) and 7000
>400HV	Other wrought alloys

**WEAR RESISTANCE**

OX-HS offers very high resistance to abrasive and adhesive wear. The value varies in accordance with the treated alloy.

**WEAR VALUE, TWI-CS17**

**ALLOY**

THE LOWER THE NUMBER, THE HIGHER THE PERFORMANCE - MIL-A-8625F 3.7.2.2 AND ISO 10074 B.3- TABER ABRASER WEAR TEST - CS 17 ABRASIVE WHEELS - 1 KG LOAD

< 35 mg / 10 000 cycles	Series 2000
< 25 mg / 10 000 cycles	Series 5000 (with >2% Mg) and 7000
< 15 mg / 10 000 cycles	Other wrought alloys

**FRICTION COEFFICIENT**

The OX-HS-PTFE variant has an impregnation treatment of the anodized layer with PTFE nanoparticles. The impregnation process makes it possible to obtain a non-stick, self-lubricating surface with a low friction coefficient.

**CHEMICAL PROPERTIES**

**CORROSION RESISTANCE**

The OX-HS treatment makes it possible to achieve high corrosion and oxidation resistance. The treated surface passes 336 hours of salt spray exposure, with no trace of corrosion.

**CORROSION RESISTANCE VALUE**

**SUBSTRATE MATERIAL**

NSS IN COMPLIANCE WITH ISO 9227 AND ISO 10074

≥336 hours without corrosion	6000 alloy
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**CHEMICAL RESISTANCE**

Chemical compatibility values. The actual environmental resistance must anyway be tested in the field.

- ✓ Hydrocarbons (e.g. petrol, diesel, mineral oil, toluene)
- ✓ Alcohol, ketones (e.g. ethanol, methanol, acetone)
- ✓ Neutral saline solutions (e.g. sodium chloride, magnesium chloride, seawater)
- ✗ Dilute reducing acids (e.g. citric acid, oxalic acid)
- ✗ Acid oxidizing agents (e.g. nitric acid)
- ✗ Concentrated acids (e.g. sulphuric acid, hydrochloric acid)
- ✗ Dilute bases (e.g. dilute sodium hydroxide)
- ✗ Base oxidizing agents (e.g. sodium hypochlorite)
- ✗ Concentrated bases (e.g. concentrated sodium hydroxide)