The Nickel Plated special protections has been studied with the purpose to satisfy the customers requirements for the actuator use on aggressive chemical environmental.

CHEMICAL NICKEL FEATURES.

The chemical nickel plating process allows to protect the aluminum body and caps surfaces with a well anchored thickness of 15 micron Nickel layer.
By means of a typical electrolytic treatment the actuator parts are plated with a uniform deposit of chemical Nickel with tolerance of +0 -5 micron in order to give to the actuator optimum abrasion and chemical resistance.

The Chemical Nickel composition used in the electrolytic treatment is the Nickel-Phosphorus with a percentage of Phosphorus between 9 and 13%.
The Phosphorus gives to the deposit two means features:
- very smooth surface with less attrition
- best hardening value from 400 to 550 Vickers

The chemical nickel result can be compared with the hard chrome, but it has the advantage to full cover with high uniformity especially in difficult and complex body profiles.

The Nickel plated Actuators are classified no-toxic, and can be used in contact with foods and beverages.
Sometime the Nickel plated Actuators can be used as an alternative of stainless steel actuators.

MECHANICAL PROPERTIES

Hardness: 400-550 Vickers
Traction elasticity limit: > 700 N/mm²
Ductility: 4-6%

PHYSICAL CHARACTERISTICS

The characteristics are similar to the stainless steel austenitic.

CORROSION RESISTANCE.

Salt fog test shows the chemical nickel better protection performances than the electrolytic, whether for the nickel layer plated less porosity and the presence of phosphorus.
The corrosion resistance is optimum against alkaline environmental (not ammoniac), and in presence of most of the organic acid. and not aired places.

The following tables shows the nickel plated corrosion resistance to chemical products at ambient temperature (Table n° 1) and the nickel plated suitability classifications for different chemical solutions at different concentrations and temperatures (table n° 2).

TABLE N° 1

CHEMICAL NICKEL CORROSION RESISTANCE ON DIFFERENT ENVIRONMENTAL	
DENOMONATION	CORROSION: micron/year
Distilled water	0
Sea salt water (Salt 3,5 %, 95°C)	0
Nitric acid (1%)	25
Hydrochloric acid (2%)	27
Sulphuric acid (65%)	9
Phosphoric acid (85%)	3
Acetic acid glacial	0.8
Citric acid	7
Oxalic acid (10%)	3
Ironed chloride (1%)	200
Sodium hydroxide (45%)	0
Sodium hydroxide (50% -95°)	0.2
Potassium hydroxide (50%)	0
Sodium carbonate	1
Sodium sulphate (10%)	0.8
Ammonia (25%)	16
Ammonium nitrate (20%)	15
Ammonium sulphate	3
Benzole	0
Phenol (90%)	0.2
Acetone	0.08

The following table N°2 shows the chemical Nickel corrosion resistance per different chemical solutions express in a table of three levels of evaluation:

A : Very good application with no corrosion
B : Good application with exception for some high product concentration
C : Not available with the loosing of the protective nickel layer due of corrosion

SOLUTION	CONCENTRATION	TEMPERATURE	CORROSION RESISTANCE
Sulphuric acid	100%	ambient	C
Sulphuric acid	2-60%	ambient	C
Sea (salt) water		ambient	B
Carbon tetrachloride	100%	Boiling point	A
Toluol		95° C	A
Trichloroethylene	100%	95° C	A
Water demineralized			A
Vine	100%	ambient	A
Whisky		ambient	A
Zinc chloride	Satured solution	ambient	B
Acetone	100%	540 °C	A
Aluminium chloride	Satured solution	ambient	C

SOLUTION	CONCENTRATION	TEMPERATURE	CORROSION RESISTANCE
Aluminium sulphate	Satured solution	ambient	C
Ammonium chloride		ambient	C
Ammonium hydroxide	5-28%	ambient	C
Ammonium nitrite	Satured solution	ambient	C
Apple juice	Satured solution	ambient	A
Ethyl alcohol	100%	ambient	A
Ethylene	100%	ambient	A
Barium chloride	2-40%	ambient	A
Barium hydroxide	2-50%	60°C	A
Benzole	100%	ambient	A
Petrol	100%	ambient	A
Benzoic acid	Satured solution	ambient	C
Boric acid	Satured solution	ambient	C
Nickel chloride	Satured solution	ambient	C
Nickel sulphide	Satured solution	ambient	C
Orange juice		ambient	A
Oxalic acid	Satured solution	ambient	B
Palm oil	100%	ambient	A
Paraffin	100%	ambient	A
Phenol	100%	90°C	A
Phosphoric acid	20-80%	ambient	C
Polymeric	100%	20..200°C	A
Raw oil	100%	ambient	A
Nitric acid	2-100%	ambient	C
Hydrochloric acid	10%	ambient	C
Sulfur hydrogen	100%	ambient	C
Sulfur acid	10%	ambient	C
Potassium hydroxite	2-50%	ambient	A
Calcium hydroxite	Satured solution	ambient	A
Copper chloride	Satured solution	ambient	C
Copper nitrate	Satured solution	ambient	C
Copper sulphate	2-30%	ambient	C
Linen oil	100%	ambient	A
Magnesium chloride	2-50%	ambient	A
Magnesium hydroxide	2-100%	ambient	A
Uncooked molasses		ambient	A
Methyl alcohol	100%	ambient	A
Milk		ambient	A
Lactic acid	85%	ambient	C
Mineral oil	100%	ambient	A
Sodium bicarbonate	Satured solution	ambient	B
Sodium carbonate	Satured solution	ambient	A
Sodium chloride	Satured solution	ambient	A
Sodium hydroxide	2-73%	60°C	A
Sodium nitrate	10%	ambient	B
Chromium acid	2-100%	ambient	C
Condensed steam		80°C	A
Peanuts oil	100%	ambient	A

SOLUTION	CONCENTRATION	TEMPERATURE	CORROSION RESISTANCE
Kerosene	100%	ambient	A
Winnigar	100%	ambient	C
Acetic acid	100%	ambient	C
Fatty acid	100%	ambient	B
Hydrofluoric acid	2-100%	ambient	C
Fruits juice		ambient	A
Glucose	Satured solution	ambient	A
Glycerine	100%	ambient	A
Urea	Satured solution	ambient	A
Coffee		Boiling point	A
Potassium carbonate	Satured solution	ambient	A

Attention:

In particular cases , we suggest carrying out practical tests to ascertain the actual compatibility in specific working condition.
Please note that this tables provides just a first guide to the material selection , but it does not provide any guarantee for this data.
On request , our technical department will be pleased to examine all compounds and condition which have been listed in this table , yet.