



techniques
surfaces

Surfaces treatments



A WIDE RANGE OF TREATMENTS TO SOLVE YOUR PROBLEMS OF SURFACES



Techniques Surfaces, jobbing subsidiary of HEF Group, follows its customers worldwide, through more than fifty units in more than 20 countries:

- France
- Germany
- United Kingdom
- Spain
- Italy
- Switzerland
- Hungary
- Czech Republic
- Poland
- Turkey
- USA
- Canada
- Mexico
- Brazil
- China
- Japan
- India
- Thailand
- Vietnam
- Malaysia
- ...

TENIFER™ - QPQ™ HEF patent



Nitro-carburation treatments associate thermochemical diffusion in salt baths with a passivation and a finish treatment. It makes possible to combine corrosion, wear and fatigue resistance properties on steel and cast iron. This treatment is combined with mechanic cleaning operations/polishing as part of QPQ in order to lower the surface roughness.

Treatment parameters: TENIFER treatment temperature is set between 500 and 630°C and treatment time varies between 30 and 210 minutes.

Remarks: The installed equipment allows the treatment of parts until a diameter of 1300 mm and a height of 2300 mm.

Precautions to be taken: Schedule 3-hour thermal stress relieving at a 20°C higher temperature than the treatment temperature before final machining.

Applications examples:

• Gears • Camshafts • Slides • Bearings • Turbine liners • Tumbler
• Racks • Cutting tool • Crankshaft • Hydraulic cylinder • Rockets • Wheel hub • Connecting rods, cardan • Articulation pins • Molds for aluminum alloys flows • Pistons...

ARCOR™ HEF patent



Range of treatment processes intended for ferrous metals, associating highly efficient corrosion protection with good wear resistance. ARCOR treatments realize a passivation by a thermochemical method and an organic dispersion on the surface layers of the treated parts. Parts treated with ARCOR have an excellent black decorative appearance.

Treatment parameters: ARCOR treatment temperature is set between 500 and 630°C and treatment time varies between 30 and 210 minutes.

Remarks: Unlike electrolytic coatings, there is no hydrogen embrittlement with ARCOR. Installed equipment is suitable for treatment of parts to diameter 1,300 mm (51in), height 2,300 mm (90 in).

Precautions to be taken: Schedule 3-hour thermal stress relieving at a 20°C higher temperature than the treatment temperature before final machining.

Applications examples:

• Cylinder rods or shock absorbers • Axle hinges • Crane joint • Electric equipment mechanisms • Hinge pins • Automobile lock mechanisms • Articulation axes • Operating • Screws • Window wiper shafts • Balls for bowling games • Iron industry equipment...

SULF BT™ HEF patent



Molten salt bath electrolytic conversion of the surface of the base material to create an iron sulfide layer to improve resistance to seizure and to strengthen adherence of lubricating films. The layer has excellent self-lubricating properties.

Treatment parameters:

SULF BT treatment is done at a temperature of $190 \pm 5^\circ\text{C}$ ($374 \pm 40^\circ\text{F}$).

emarks:

Treatment is possible on heat-treated steels with low tempering temperature, especially case hardened steels.

Precautions to be taken:

SULF BT is not suitable for steels with chromium content greater than 12%.

Applications examples:

• Surface hardening and case hardened gears • Camshafts • Engine linings • Ball joints • Pushrods • Differential satellites • Differential spiders • Universal joints • Shafts and bushings • Gearboxes forks • Gearboxes spacer rings • Steering screw • Racks- pneumatic hammer pistons • Stop washers for gearboxes...

PHOSPHATIZING



Chemical conversion treatment providing a crystalline phosphate layer (Mn, FeMn, Zn, ZnFe, ZnCa).

Characteristics:

MANGANESE TYPE PHOSPHATIZING:

- Decrease friction,
- Improves adherence of lubricating films.

ZINC TYPE PHOSPHATIZING:

- Improves corrosion resistance
- Excellent base for adherence of top-coat organic coatings.

Materials suitable for treatment:

Ferrous alloys • Aluminum alloys • Zinc alloys • Cadmium coatings.

Applications examples:

Straight gears • Gleason gears • Gearboxes pinions • Camshaft • Rocker shaft • Automatic weapons chambers • Parts for rifles • Fish joints • Valves cocks • Car screws and bolts • All applications for duplicate molding • Free wheels eccentric bearings...

CERTESS™ CARBON



VACUUM DEPOSITIONS FOR TRIBOLOGICAL USE DC, DT, DCX, DCY, DDT

Amorphous carbon depositions DLC (diamond) that cover a large range of hardness and offer very low friction coefficients. These depositions come in multilayers depending on the applications.

Characteristics:

- Hardness 1000 to 3500 Hv
- Excellent friction properties
- No hydrogen embrittlement
- Dimensions and roughness respect

Materials suitable for treatment:

Steels and cast irons • Carbides • Dense sintered • Inconels • Aluminum, copper and titan alloys...

Applications examples:

Engine components • Mechanic • Shaping tools • Elements of plastic injection molds...

VACUUM DEPOSITIONS FOR DECORATIVE USE



Coatings by magnetron cathode spraying of metals or specific metallic alloys, making layers for decorative use on large dimensions parts.

Characteristics:

- Chrome, stainless steel, gold aspect ...
- Large diversity of applicable materials : chrome, aluminum, gold... or specific alloys depending on specifications
- Very high purity of coatings
- Mastery of thicknesses and states of surface
- Resistance to chemical aggression

Remarks:

Application on large dimensions parts.

Materials suitable for treatment:

• Glasses • Plastics • Composites of organic matrix • Ceramics • Cermets • Metals or alloys ...

Applications examples: • Sign-board • Logos...

CERTESS™ NITRO



VACUUM DEPOSITIONS FOR MECHANICAL USE X, N, TI, T, SD, G, HM

PVD coatings family obtained by PEMS processes leading to, depending on the case, depositions with very important hardness, low friction and anti-adhesion coefficients.

Characteristics:

- Temperature of realization: 100 to 450°C
- Hardness 1000 to 4000 HV
- Resistance to abrasive and adhesive wear
- Thermic stability
- Resistance to oxidation

Materials suitable for treatment:

Steels and cast irons • carbides • Dense sintered • Inconels • Aluminum, copper and titan alloys ...

Applications examples:

- Forming and cutting punches • Injection molds • Parts subject to abrasion (Textile machinery, paper processing tools, aeronautic...)
- Medical devices • Electrical components devices...

PROCEM™



VACUUM DEPOSITIONS FOR ELECTROMAGNETIC SHIELDING

Coatings by magnetron cathode spraying of metals or alloys of low resistance on non-conductors or low conductors materials.

Characteristics:

- Discharge of electrostatic charges
- EMI shielding
- Multifunctionality (Resistance to chemical aggressions, friction or abrasion...)
- Negligible impact on the objects mass and precision

Remarks: Can be applied on large dimensions parts.

Materials suitable for treatment:

• Glasses • Plastics • Composites of organic matrix • Ceramics • Cermets • Metals or alloys ...

Applications examples: • Components of armament • Telephony • Connections • Captors • Printed circuits • Heating elements • Antennas for satellites...

CORRALU™ V



VACUUM DEPOSITIONS FOR CORROSION PROTECTION

Deposition of a pure aluminum layer of 10 to 50 um.

Characteristics:

- Anticorrosion protection
- Electrical continuity

Remarks:

Dimension of the centimeter at 2 m, contact us if beyond. Possibility of complementary treatment (SiOx, chemical conversion, Surtec 650, Corralu, varnish, chelylic alcohol).

Materials suitable for treatment:

- Steels • Stainless steels • Aluminum alloys • Refractory alloys • Titans
- All steels compatible with vacuum deposition • Application possible on plastics • Glasses and ceramics.

Applications examples:

- Parts of fighter aircrafts • Screws • Seronautic • Boarded electronic housings • Captors stands • Connectors bodies...

VACUUM DEPOSITION FOR OPTICAL USE



Coatings by magnetron cathode spraying of metals or specific metallic alloys, making layers with reflecting or semi-transparent properties, adapted to the various ranges of wave lengths.

Characteristics:

- Chrome, stainless steel, gold aspect ...
- Large diversity of applicable materials : chrome, aluminum, gold... or specific alloys depending on specifications
- Very high purity of coatings
- Mastery of thicknesses and states of surface
- Resistance to chemical aggression

Remarks: Application on large dimensions parts.

Materials suitable for treatment: • Glasses • Plastics • Composites of organic matrix • Ceramics • Cermets • Metals or alloys • Logos ...

Applications examples:

- Visors • Screens • Bottling • Architecture.

CERTESS™ BLAST



VACUUM DEPOSITIONS FOR EROSION PROTECTION

Multilayers metal/nitride PVD treatment.

Characteristics:

Thickness from 10 to 50 um, the metal nature may vary depending on conditions.

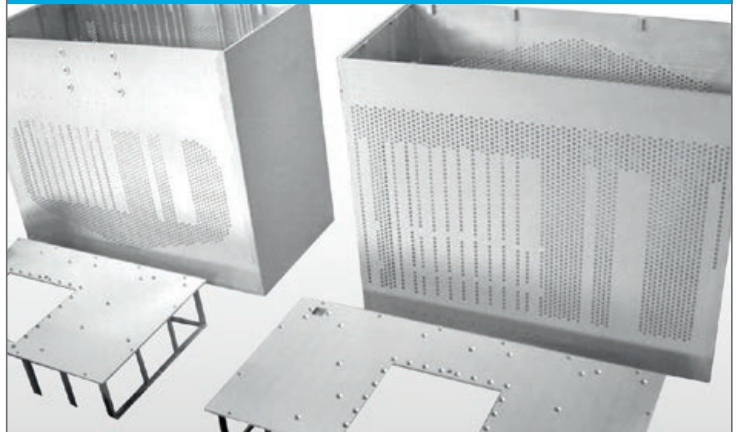
Materials suitable for treatment:

All metallic or ceramic, for polymers or composites, contact us.

Applications examples:

- Motion parts subject to erosion for aeronautic applications
- Power plants

CORRALU™ B



Chemical conversion of aluminum alloys that is HEXAVALENT chrome free both in the applied layer than in the products used to make it. These performances in terms of corrosion, preparation and electric continuity allow Corralu™ B being a solution for the future in the aeronautic field. It allows meeting the rules and directives (DEEE, RoHS, VHU).

Characteristics:

- Elaboration temperature 30-40°C
- Weight of layer 300g/M2
- Application mode loose or fasten
- Temperature resistance until 100°C
- Contact conductivity < 0.8 mOhm/cm²

Remarks: Thanks to mastery in the specific range, CORRALU™ B satisfies requirements of corrosion resistance in a large range of aluminum alloys used in the aeronautic.

SDA™ - GRAPHLUB™



Organic coatings providing solid lubricants to the surface of the treated parts, such as molybdenum or graphite.

Characteristics (depending on type of coating):

- Decrease of friction coefficient, producing a transfer film on the antagonist surface (Solid lubricant/solid lubricant friction)
- Dry friction
- Resistance to corrosion
- Resistance to fretting-corrosion
- Wear resistance
- Decrease of sound levels
- Resistance to radiations

Materials suitable for treatments:

All types of metal substrates.

Application examples:

- Loaders for rifles • Receivers of automatic weapons • Splice axes of cranes • Oil connectors • Slides • Balls of valves • Coatings of molds.

TEGLISS™



Organic coatings using thermal hardened or thermo-stable polymers (PTFE, POLYIMIDE).

Characteristics (depending on type of coating):

- Low friction coefficient
- Seizure resistant
- Anti-adherence
- Chemically inert
- Resistance to fretting-corrosion
- Compatible with foodstuffs

Materials suitable for treatments:

All types of metal substrates.

Application examples:

- Coatings for molds • Valves systems • Hinge axles • Connectors rings • Tie rods • Bearings • Special screws and bolts • Automotive locks • Brake box • Mixers • Molds for industrial pastry.

ROMAX™



POLYMER COATINGS

Organic coatings for technical or decorative purposes.

Characteristics (depending on type of coating):

- Corrosion protection
- High resistivity (electrical insulation)
- Low resistivity (EMI shielding)
- Accepts friction
- Variety of colors

Remarks: Polymer coatings may be classified in two main categories: liquid coatings and powder coatings (fluidized bed, electrostatic spraying, etc.).

Materials suitable for treatments: All types of substrates.

Application examples: • Industrial fans • Industrial cabinets and enclosures • Generators sets • Motor frames • Screw head • Underwater parts and parts of ships • Tunnel equipment • Covers for electronics purposes • Miscellaneous hardware • Body work • Bus bar...

DOT™



Organometallic coatings resisting to extreme conditions of corrosion.

Characteristics:

- Excellent protection against corrosion (can exceed 1000 hours in salt spray test)
- Control of frictions
- No hydrogen embrittlement
- Good resistance in aggressive environment

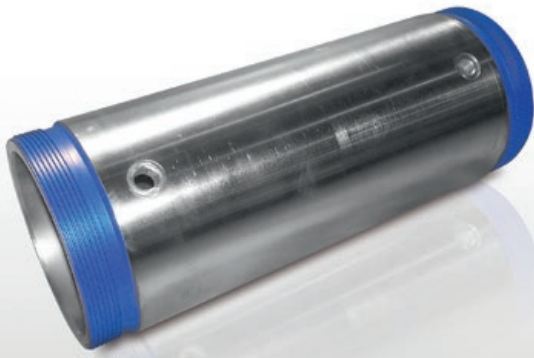
Materials suitable for treatments:

All types of metal substrates.

Application examples:

- Screws • Staples • Washers • Securing clips • Transmissions • Synchronization bushings • Rolls • Seal holders • Springs • Connectors • Locks • Various axes • Collars...

TECHNICAL VARNISHES



Technique Surfaces can intervene as a technical varnish applicator depending on your specific needs:

- Whitford
- Everlube
- Molykote
- ...

Characteristics:

- Low coefficient of friction
- Seizure resistance
- Anti-adherence
- Chemical inertia
- Resistance to fretting corrosion
- Suitable for food

Materials suitable for treatments:

All types of materials.

Application examples: Technique Surfaces is particularly equipped to treat large dimensions parts: Offshore, Oil and gas...

DEPTON™



Zinc/tin alloy and metal deposits by mechanical means to protect ferrous alloy parts against corrosion.

Characteristics:

- Deposited thickness very uniform
- No hydrogen embrittlement
- Ductile plating likely to become deformed after treatment
- Good corrosion resistance

Remarks: Deposit of passivating layers is possible

Materials suitable for treatments:

All steels, especially steels with high elastic limit.

Application examples:

- Automotive hardware • Springs • Washers • Grating attachments • Forks
- Letter box • Locks • Crankshaft pins • Grommets • Locking collars • Set screws • Mirror pin lugs • Mountains climbing accessories • Embedding nails • Retaining clips for automotive boots • Automotive instruments panels...

ABAR™



Organic coatings stopping build-up of mist by modifying the surface tension of the substrate.

Characteristics:

- Preservation of optical properties
- Abrasion resistance
- Good machinability

Materials suitable for treatments:

- Organic glass (polycarbonates) • Mineral glass

Application examples:

- Headsets shields • Helmets visors • Safety optics • Goggles for sports
- Display screens • Dials ...

FOREZ™ HEF patent



Copper-tin alloy electrolytic coating with the friction properties of a high tin content bronze.

Characteristics:

- Improves friction properties of lubricated steels
- Increases slip and fit properties.
- Increases oil film breaking load.
- Solution to fretting-corrosion problems

Materials suitable for treatments:

All steels (carbon steels, alloyed steels, stainless steels, etc.), cast irons and sintered irons.

Application examples:

- Hydraulics cylinder pistons • Journals • Gear reducer wheels • Sliders
- Turbine valve • Attachment pins • Pump drums • Electrical connections
- Hydraulic couplings...

STANAL™ 400 HEF patent



Solid-phase metal diffusion treatment at 400°C (752° F). STANAL™ 400 improves the resistance to seizure of stainless steel parts without changing the corrosion resistance.

Characteristics:

- Improves surface hardness
- Improves wear resistance and resistance to seizure
- Good intrinsic resistance to corrosion
- Excellent base for self-lubricating coating varnishes

Materials suitable for treatment:

- Austenitic stainless steels • Martensitic stainless steels • Structurally hardened stainless steels • Refractory steels • Alloyed steels

Application examples:

- Electrical connectors for aeronautics • Hot gas restart joints on planes reactors • Hydraulic joints • Stainless steel nuts and bolts for nuclear industry • Various parts composing nuclear valves • containers plugs for atomic fuel • articulation axles for submarine doors • Vane fixation brooches for steam turbines • Door hinges for atomic pool sin...

DELSUN™ HEF patent



Surface treatment for the prevention of wear and seizure of copper alloy parts. This treatment is obtained by tin base electrolytic plating followed by diffusion heat treatment at 400°C (752° F).

Characteristics:

- Improves surface hardness
- Improves adherence of lubricating films
- Decreases the friction coefficient when parts are lubricated
- Excellent resistance to abrasion

Materials suitable for treatment:

- Bronze • Brass copper • Aluminum alloys • Copper • Nickel alloys

Application examples:

- Tap and fitting nuts and screws • Shell bearings • Worm screw gear reducer wheels • Spherical gates • Support plates • Pump bodies • Gearboxes synchronizers • Guide bushes • Idle gears forks • Valves • Hinging rings • Machine tool wedges • Bearing blocks • Linkages • Couplings • Valve guides • Stamping dies • Continuous casting molds...

MOAP™ HEF patent



Slippage coatings of graphite base with metal bond.

Characteristics:

- Used for applications in temperature, principally in glassware for gob transfers
- Improves significantly the gob slippage with a perfect regularity over time.
- Excellent wear resistance
- Repetitive use of tooling after a simple cleaning

Materials suitable for treatment:

- Steels • Cast irons • Aluminum alloys • Stainless steels.

Application examples:

Glassware parts particularly for gobtransfer.

PLASMA - ARC SPRAYING



Dense coating of metals, ceramics or cermet by spraying melted particles by plasma arc.

Characteristics:

- Refractory coatings
- Abrasion-erosion resistance
- Resistance to fretting-corrosion
- Wear resistance
- Corrosion resistance
- Conductibility and/or thermal or electrical insulation
- Improves friction properties in severe environments

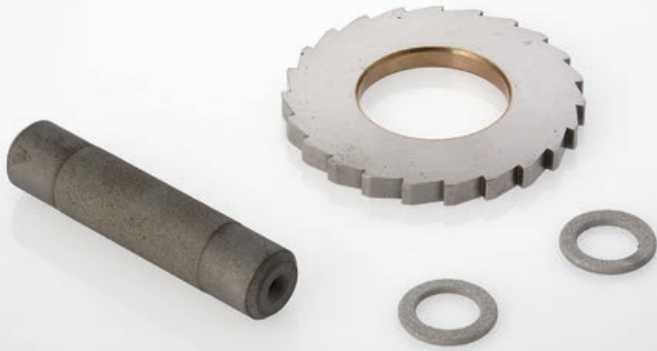
Materials suitable for treatment:

All non-organic materials, except copper.

Application examples:

- Wire guides • Sealing packing • Medical prostheses • Drawing punches • Blocking inserts...

ELECTRIC ARC SPRAYING



OXYACETYLENE - ELECTRIC ARC

Metal and metal alloy coating by spraying melted particles.

Characteristics:

- Wear resistance.
- Corrosion resistance
- Conductibility and/or thermal or electrical insulation
- Decreased friction with lubrication

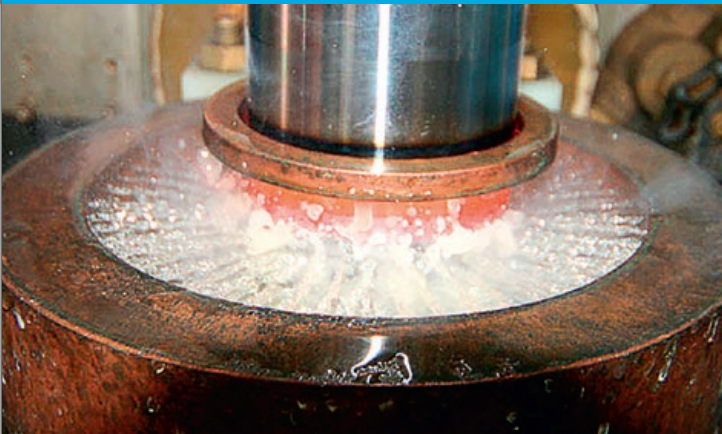
Materials suitable for treatment:

All materials, except copper.

Application examples:

- Capstan rollers • Paper Mill cylinders • Synchronizers and gearboxes forks
- Fan blades • Crankshaft pins • Parts of turbo compressors • Repair of work parts or parts with machining default • EMI shielding.

INDUCTION HARDENING



Characteristics:

- Increase of hardness
- Increase of friction wear resistance
- Increase of tiredness resistance under non-uniform stress (bending, twisting)
- Increase of tiredness resistance by rolling under heavy charges
- Low deformations
- Very localized or total quenching depending on needs

Materials suitable for treatment:

Carbon steels, low-alloy steels, cast irons.

Application examples:

- Axes • Shafts • Bears • Rockets • Axle shafts • Camshafts • Crankshafts
- Gasket surfaces • Bearing seats • Cylinders • Cylinder rods • Racks...

LOW PRESSURE CARBURIZING



Characteristics:

- No surface oxidation and inter granular
- Reduction of deformations
- Removing or reduction of rectification excess thicknesses
- Reaming cementation from few tenths of mm of \emptyset
- Control of the cemented depth ($\pm 5/100$ mm)
- Good repeatability of the results
- Ease to protect areas to save

Materials suitable for treatment:

Any steels of MNCr, MnB, NiCrMo, CrNiMo... (Each product has its specific range of low pressure cementation).

Application examples:

- Gear of gearbox, gears of direction • Gears of assisted direction • Nuts
- Injector • Sprayers • Pump housings • Diverse gears • Bearing bushings
- Wear bushings • Bushings with seal...

SILVER PLATING - TIN PLATING TIN/LEAD ALLOY PLATING



Silver, tin, tin/lead alloy electrolytic coatings suitable for mechanical applications and electrical uses.

Characteristics:

- Very good electrical conductivity
- Excellent friction properties
- Gloss or semi-gloss plating
- Weldable plating
- Ductile deposits
- Very suitable for slip and fitting and deformation

Materials suitable for treatment:

All types of conducting substrates.
Stainless steel when improved resistance to seizing is required.

Application examples:

- Connectors to weld • Crimp connectors • Flexible connectors • Collectors
- Contact blades • Spherical cock • Soldering terminal • Connector bar
- Long linking bars (Line continuous treatment) • Valve seals • Flexible braid connectors ...

NICKEL CADMIUM CADIUM AND ZINC PLATING



Electrolytic zinc coatings intended to improve the corrosion resistance of ferrous alloys.

Characteristics:

- Good resistance to corrosion at high temperature
- Excellent friction property
- Uniform plating
- Ductile plating
- Excellent base for self-lubricating coatings

Remarks:

Several types of finish are available:

- Passivation (colored or plain) • Chromating • Organic

Application examples:

Springs • Special motor frame • Bolts and screws • Sliders • Electric equipment boards • Slicing shafts • Unions • Lock mechanisms • Hydraulic locks • Washers • Cable clamps • Ball joints • Nuts...

ELECTROLESS NICKEL



Phosphorous-nickel alloy base coating obtained by autocatalytic reduction of a nickel salt. May be followed by heat treatment at a temperature between 150 and 650°C (300 and 1200° F) in function of the characteristics required.

Characteristics:

- Plating thickness very uniform
- Excellent resistance to corrosion and wear
- Hardness obtained: from 550 to 1,000 Vickers depending on the final heat treatment.

Materials suitable for treatment:

All types of materials with a surface suitable for a catalytic reaction.

Application examples:

Valves cock • Distributors pistons • Plastics injections molds • Jack bodies • Accumulators bodies • Closing plates for manholes • Molds bearings for glass industry • Synchronizers • Axles for windshield wipers • jack rods • Rods for valves control • Axles for brake control...

NICKEL PTFE



NICKEL PTFE coatings are chemical nickel composite coatings in which are input PTFE submicronals particles spread evenly. The implementation by co-deposition allows answering simultaneously to functionalities, offering a good compromise between chemical nickel and PTFE properties.

Characteristics:

- Self-lubricating, low friction coefficient
- Excellent anti-adherence properties
- Good resistance to corrosion

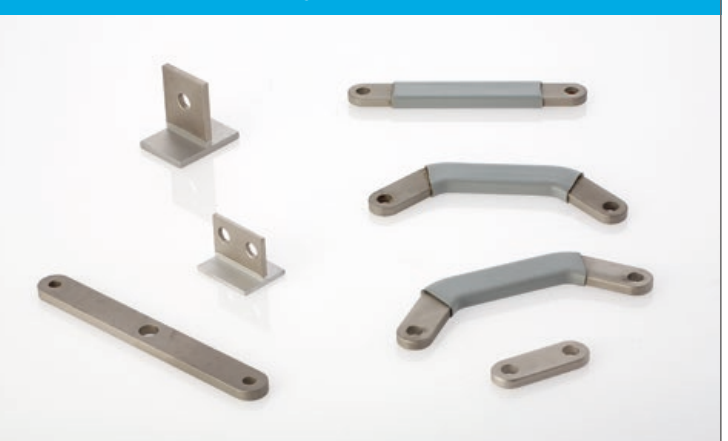
Materials suitable for treatment:

- Steels and cast irons • Stainless steels • Aluminum and alloys • Copper and alloys.

NICKEL PTFE (content of phosphor 7 to 10%)

Content of PTFE	Thick-ness	Hardness	Tempe-rature of treatment	Maximum use temperature	Friction coefficient	Electric resisti- vity
3-11% by mass (11 to 33% by volume)	3-15um	250-350 HV 350-450 HV after T. Th 2 h at 280°C	86-92°C	310-330°C	0.05-0.2 depending on the PTFE content and applied load	150-250 $\mu\Omega$.cm

NICALC Pechiney Licence



Nickel coating plated on aluminum (and alloys) parts to provide optimal electrical conductivity.

Characteristics:

- Globular structure offering numerous contact areas between connected surfaces (contact resistance decreased)
- Very ductile and low residual stress level
- Conductivity very stable when hot

Materials suitable for treatment:

- Pure aluminum • AGS type aluminum alloys.

Application examples:

• Low current signal electrical connections • Copper Aluminum electrical bonds • Power current transmissions in rolling stock and electrical flight controlles aircraft • Automobile connections...



A network close to large industrial sites

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