	TECHNICAL INFORMATION	Code: TISA 015
		Rev. N°: 1
		Date: 12/02/2016
<i>Title:</i>	Ru 50S – Ru 5S – Ru 5B SOLUTIONS	Page: 1 of 4

General information

These products are designed to meet the growing demand in galvanic nickel-free treatments, in accordance with European Union Directives.

Using these solutions it's possible to produce very stable coatings, even with a high thickness, with colors ranging from white to gunmetal black, suitable both for functional treatments, that for decorative purposes.

The metal deposited with this electrolyte is hard and shiny, has a good electrical conductivity, similar to that of rhodium, and it is very stable in time. Protective treatments with transparent lacquers aren't requested.

Thanks to these characteristics, ruthenium can be considered a valid alternative to the use of platinum and rhodium in certain fields of application.

The electrolytic bath is easy to manage, considering the remarkable stability of the electrolyte and the wide range of concentration under which you can work.


Electroplating equipment

In order to obtain a good quality coating, it is recommended to make use of plants built in PTFE or reinforced PP, able to withstanding the operating temperature.

The plant should be provided with:

- Current rectifier with ampere meter and with a low residual AC voltmeter.
- Fume extraction system.
- Thermostated heating system.
- Platinum-coated Titanium anodes (2.5µm of Platinum).
- Ampere minutes counter.
- Magnetic drive filter pumps with at least 5µm cartridge (boiling and washing the artridges with demineralized water before use is recommended to prevent organic contamination)

	Written	Approved
Function	<i>R&D Manager</i>	<i>R&D Manager</i>
Signature	Giacomo Ghini	Giacomo Ghini

	TECHNICAL INFORMATION	Code: TISA 015
		Rev. N°: 1
		Date: 12/02/2016
<i>Title:</i>	Ru 50S – Ru 5S – Ru 5B SOLUTIONS	Page: 2 of 4

Operating parameters

Parameter	Ru 50S White	Ru 5S Steel	Ru 5B Gunmetal black
Ruthenium (g/l)	3 – 20	3 - 10	3 - 10
pH	1 – 1.8	1 – 1.8	1 – 1.8
Temperature (°C)	50 -70	50 -70	50 -70
Current Density (A/dm ³)	1 - 4	1 - 4	0.5 - 2
Density (°Bè)	3 - 20	3 - 15	3 - 15
Stirring	mild	mild	mild
Anodes	Ti/Pt	Ti/Pt	Ti/Pt
Anode/cathode ratio	1:1 – 3:1	1:1 – 3:1	1:1 – 3:1
Cathode efficiency (mg/Amin)	4 - 12	3 - 10	1 - 4


Ruthenium concentration: since this parameter influences the cathode efficiency, which considerably decreases at low concentrations, it's advisable to maintain constant the concentration of electrolyte. Don't let the metal content drop over 10-20% of the initial value.

pH: a continuous monitoring is not requested, but it is important to keep the pH within the range reported in the table, especially during the production of thick coatings. For any correction, use ammonium hydroxide to raise pH or HU001 additive to decrease it.

Temperature: it can affect the cathode efficiency and the deposition rate, but if it's maintained within the expected range it doesn't influence the quality of the coating. It is advisable to work at about 70°C, in particular if the metal concentration is kept close to the lower limit of the range.

Anodic current density: it should be in the range reported in the table. It is also advisable to use anodes with a surface area at least double compared to that of the objects to be treated, in order to avoid the oxidation of the Ruthenium or the decomposition of its complexes.

	Written	Approved
Function	<i>R&D Manager</i>	<i>R&D Manager</i>
Signature	Giacomo Ghini	Giacomo Ghini

	TECHNICAL INFORMATION	Code: TISA 015
		Rev. N°: 1
		Date: 12/02/2016
<i>Title:</i>	Ru 50S – Ru 5S – Ru 5B SOLUTIONS	Page: 3 of 4

Deposition time: it depends on the type of deposit to be made and on the concentration of Ru in solution. In particular, to have a gunmetal-black coating it's necessary a higher deposition time due to the limited cathode efficiency of this bath. To obtain functional deposits, to be used only for decoration and not for protection, it is necessary a deposition time of 5 minutes with solutions 3 g/l of ruthenium, while it is possible to reduce the time to 3 minutes with more concentrated solutions.

Solution density: it is not a critical parameter for a good deposition. Nevertheless it is necessary to check it periodically and bring it within the optimum values, reported in the table, adding conductive salts.

Anodes: due to the acidity of the bath, we recommend the use of platinum-coated titanium anodes of good quality.

Stirring: A fast stirring is not necessary, but it is advisable to use a filter pump able to ensure a good filtration of the liquid and a rapid removal of hydrogen, which develops as a result of electrolysis in presence of low cathode performance.

Recommended processing

Pre-treatments: No special treatment is required if surfaces are perfectly clean. Nevertheless we suggest to plate an intermediate layer of gold or palladium on the cathode to increase the adhesion and the resistance of the ruthenium coating, especially when working with the gunmetal black one. A palladium flash is necessary before plating copper or copper alloys, to prevent diffusion.

Bath preparation: RU 5S (Steel) and RU 5B (Gunmetal black) are ready-to-use galvanic baths at the concentration of 5 g/l. No preparation is required. RU 50S is a concentrated solution (50 g/l). It can be used as a white finish, after diluting it ten times with demineralized water (900 ml of water for 100 ml of RU 50S), as well as for replenishment.


Post-treatment: Remove the electrolyte from the surface as quick as possible. Wash with distilled water at 70-80 °C and dry. If some defects can be seen after drying, we suggest to wash for 4-5 minutes with a cold 50% ammonia solution.

Contamination: The electrolyte withstands quite well any possible contamination by other metals, except for copper, that can be removed through electrolytic purification. To solve any problems arising from the presence of organic substances in the galvanic bath, a treatment with activated carbon is recommended.

Bath maintenance: periodic replenishment is necessary both for metal and for additives. For perfect galvanic bath performance it is advisable to maintain the ruthenium concentration not under the 20% of the initial concentration (e.g. working with a solution containing 5 g/l of ruthenium, don't let the concentration fall below 4 g/l).

Use only recommended products for the replenishment: Ru50S solution for ruthenium, AC01 or NE01 solutions for the additives, according to the following guidelines:

	Written	Approved
Function	<i>R&D Manager</i>	<i>R&D Manager</i>
Signature	Giacomo Ghini	Giacomo Ghini

	TECHNICAL INFORMATION	Code: TISA 015
		Rev. N°: 1
		Date: 12/02/2016
<i>Title:</i>	Ru 50S – Ru 5S – Ru 5B SOLUTIONS	Page: 4 of 4

Product to be added after the consumption of 100g of ruthenium	Ru 50 S White	Ru 5S Steel	Ru 5 B Gunmetal black
Ru 50 S	2 liters	2 liters	2 liters
AC 01	-	0.1 – 0.8 liters	-
NE 01	-	-	4 liters

Safety information

Being an acidic solution, the electrolyte is corrosive and irritant to the skin, eyes and mucous membranes. Caution should be taken when using the product, avoiding contact with eyes and skin. Use gloves and safety goggles. Keep away from cyanide based chemicals. Waste solution must be managed in strict compliance with Local, State, and Federal laws governing such matters. Consult the Material Safety Data Sheet (MSDS) for more specific information.

Disclaimer

The information supplied in this document corresponds to the best of our knowledge and is based on test methods and equipment available to Cabro Spa. Cabro does not assume any liability arising out of the use of its products by third parties.

	Written	Approved
Function	<i>R&D Manager</i>	<i>R&D Manager</i>
Signature	Giacomo Ghini	Giacomo Ghini