umicore
Electroplating

List of products

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Contents

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid, Nickel-free Colour Gold Electrolytes (Decorative)																					
AURUNA® 215 Non-allergenic coatings since free from nickel and cobalt. Colour-constant over a wide operating range, for rack and barrel.	98.5	Fe/In	220	Approx. 1-2 N	3	2.5 (2.0-3.0)	4.0 (3.8-4.5)	1.5 (0.5-2.0)	0.14	35 (30-35)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■				■	

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Colour Gold Electrolytes (Decorative)																					
AURUNA® 220 Coatings with good corrosion and abrasion resistance as well as high hardness. For rack and barrel. Often used for bathroom fittings.	96.5	Ni/In	270	14 ct Hamilton (pale yellow)	5	4 (3.5-4.5)	3.5 (3.4-3.7)	0.6	0.06	30 (28-32)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 221 Coatings with good corrosion and abrasion resistance as well as high hardness. For rack and barrel.	98	Ni/In	240	Approx. 1 N (pale yellow)	5	5 (4.5-5.5)	3.5 (3.4-3.7)	0.6	0.07	30 (28-32)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 222 Coatings with good corrosion and abrasion resistance as well as high hardness. For rack and barrel.	98.5	Ni/In	200	Approx. 2 N (light yellow)	5	5 (4.5-5.5)	3.5 (3.4-3.7)	1.0	0.12	30 (28-32)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 230 Coatings with good corrosion and abrasion resistance as well as high hardness. High plating speed; for rack and barrel.	96	Ni/In	270	Pale yellow	5	4 (3.5-4.5)	3.5 (3.4-3.7)	2.5	0.3	45 (43-47)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Colour Gold Electrolytes (Decorative)																					
AURUNA® 231 Coatings with good corrosion and abrasion resistance as well as high hardness. For rack and barrel.	97.2	Ni/In	250	Light yellow	5	2.5 (2-3)	3.8 (3.7-3.9)	0.9	0.13	35 (33-37)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 232 Coatings with good corrosion and abrasion resistance as well as high hardness. High plating speed; for rack and barrel.	97.5	Ni/In	250	Approx. 2 N (light yellow)	5	4 (3.5-4.5)	4.2 (4.0-4.4)	2.0	0.25	45 (43-47)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 241 Coatings with good corrosion and abra-sion resistance as well as high hard-ness. For rack and barrel. Hot-water treatment required for stable and uni-form colour.	92.5	Ni	290	Yellow-grey	1	2.5 (2.0-3.0)	4.0 (3.8-4.2)	1.0	0.12	45 (43-47)	Pt/Ti, Ru MMO PLATI-NODE® 147	■		■	■	■	■	■	■	■	■
AURUNA® 246 Coatings with good corrosion and abrasion resistance. For rack and barrel. Post-treatment (cathodic degreasing or hot-water rinse) required for correct and constant colour. Special electrolyte for the bathroom fittings industry (technical term "Noble Brass").	93.5	Co	220	Grey-brown	1	2.5 (2.0-3.0)	4.2 (4.0-4.4)	1.0	0.11	45 (43-47)	Pt/Ti, Ru MMO PLATI-NODE® 147						■				

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Colour Gold Electrolytes (Decorative)																					
AURUNA® 247 Coatings with stable colour, good corrosion and abrasion resistance as well as high hardness. For rack and barrel. Hot-water post-treatment is recommended. Specially for the bath-room fittings industry.	92.5	Ni/Co	290	Yellow-grey	1	2.5 (2.0-3.0)	4.0 (3.8-4.2)	1.0	0.12	50 (48-52)	Pt/Ti, Ru MMO PLATI-NODE® 147						■				

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Gold Electrolytes (Decorative and Technical)																						
AURUNA® 523 High-performance electrolyte with very wide operating range for rack, barrel, and vibratory equipment. Hard, abra-sion-resistant coatings with low, stable contact resistance.	99.7	Ni	140-180 HV_{10}	Yellow	10	I-II C	4 (4-12)	4.4 (4.2-4.6)	Rack 1.0 (0.5-4.0) Barrel 0.5 (0.3-2.0)	0.1-0.8	35 (30-45)	Pt/Ti	■	■								
AURUNA® 526 Only for barrel plating and Vibromat application. Excellent throwing power and optimum thickness distribution (hollow bodies). Stable long-term behaviour of the electrolyte and simple bath maintenance.	99.8	Co	160	Deep yellow	5	I C	4 (2-5)	4.4 (4.0-4.6)	0.3 (0.3-1.0)	0,08	RT up to 30	Pt/Ti		■			■				■	
AURUNA® 527 Only for barrel plating and Vibromat application. Excellent throwing power and optimum thickness distribution (hollow bodies). Very stable long-term behaviour of the electrolyte, even under heavy loading.	99.8	Ni	150	Light yellow	10	I C	4 (2-5)	4.4 (4.0-4.6)	0.3 (0.1-0.5)	0,05 (0.02-0.1)	RT up to 28	Pt/Ti		■			■				■	

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Gold Electrolytes (Decorative and Technical)																						
AURUNA® 528 Hard-gold electrolyte with a high current efficiency, thus low evolution of hydro-gen. Particularly gentle treatment of printed circuit boards with sensitive resists (no lifting). Also for decorative applications.	99.85	Ni	150	Yellow	10	I C	8 (4-12)	4.7 (4.6-4.8)	1.0 (0.8-2.0)	0.3-0.9	35 (33-37)	Pt/Ti	■	■		■	■	■	■	■	■	■
AURUNA® 529 Hard-gold electrolyte with a high current efficiency, thus low evolution of hydro-gen. Particularly gentle treatment of printed circuit boards with sensitive resists (no lifting). Also for decorative applications.	99.75	Co	150-200 HV 0.01	Yellow	10	I-II C-D	4 (3-8)	4.7 (4.6-4.8)	1.0 (0.8-2.0)	0.3-0.8	35 (33-37)	Pt/Ti, Ir MMO PLATI-NODE® 177	■	■			■	■	■	■	■	■
AURUNA® 530 Hard-gold electrolyte with a high current efficiency. For printed circuit boards with aqueous processable resists and electri-cal contacts.	99.7	Co	150-200 HV 0.01	Yellow	5	I-II C-D	4 (3-8)	4.0 (4.0-4.4)	0.8 (0.5-2.0)	0.1-0.5	35 (35-45)	Pt/Ti	■	■								
AURUNA® 535 Electrolyte with simple bath mainte-nance; for rack and barrel. Stainless steel anodes permitted.	99.8	Ni	140-150	Deep yellow	10	I C	4 (3.5-4.5)	4.8 (4.8-5.0)	0.5-1.0	Up to approx. 0.2	RT up to 30	Stainless steel, Pt/Ti	■	■		■	■		■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Gold Electrolytes (Decorative and Technical)																						
AURUNA® 536 Long-term stable electrolyte free from nickel and cobalt for rack and barrel with high plating speed. Good corrosion and abrasion resistance as well as low, stable contact resistance. Metallic con-taminants can be precipitated without problems.	99.7	Fe	150-170	Yellow	10	I-II C	8 (4-12)	4.2 (4.0-4.5)	2-3 (1-4)	0.2-1.0	45 (43-47)	Pt/Ti, Ru MMO PLATI-NODE® 147	■	■		■	■	■	■	■	■	■
AURUNA® 539 Electrolyte with high plating speed for rack and barrel. Ultra-bright hard-gold coatings with good corrosion and abrasion resistance as well as low, stable contact resistance.	99.7	Co	150-220	Yellow	10	II D	8 (4-12)	4.2 (4.0-4.6)	2.5 (1-5)	0.2-1.0	45 (43-47)	Pt/Ti	■	■		■	■	■	■	■	■	■
AURUNA® 535 LC Electrolyte with low gold content and simple bath maintenance. Stainless steel anodes permitted. Mostly used as a gold strike electrolyte or for barrel plating, otherwise similar to AURUNA® 535.	99.5	Ni	140-150	Deep yellow	1	II C	1.0 (0.6-1.0)	4.8 (4.8-5.0)	0.2-0.7	0.06	RT up to 30	Stainless steel Pt/Ti	■	■		■	■					

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Weakly Acid Gold Electrolytes (Decorative and Technical)																						
AURUNA® 536 LC Nickel-free electrolyte with low gold content and simple bath maintenance. Mostly used as a gold strike electrolyte or for barrel plating, otherwise similar to AURUNA® 536.	99.5	Fe	180	Deep yellow	2	II C	2 (1.5-2.5)	4.0 (3.8-4.2)	1.5-2.0	0.2	50 (48-52)	Pt/Ti, Ru MMO PLATI-NODE® 147	■	■		■	■	■	■	■	■	■
AURUNA® 539 LC Electrolyte with low gold content and simple bath maintenance. Mostly used as a gold strike electrolyte or for barrel plating, otherwise similar to AURUNA® 539.	99.5	Co	200	Deep yellow	2	II D	2 (1.0-4.0)	4.0 (3.8-4.2)	1-2	0.15-0.26	50 (48-52)	Pt/Ti	■	■		■	■	■	■	■	■	■
AURUNA® 5300 Electrolyte free from nickel and cobalt for rack and barrel with high plating speed. Good corrosion and abrasion resistance as well as low, stable contact resistance.	99.7	Fe	150-170	Yellow	20	I-II C	8 (2-12)	4.0 (3.8-4.2)	2-3 (0.5-4)	0.1-1.0	45 (43-47)	Pt/Ti	■	■		■	■	■	■	■	■	■
AURUNA® 5400 Electrolyte with very wide operating current density range for rack and barrel. Bright hard gold coatings with high corrosion and abrasion resistance as well as low, stable contact resistance.	99.7	Fe	150-220	Yellow	10	I-II C-D	8 (0.5-12)	4.2 (3.8-4.6)	2.5 (1-5)	0.1-1.0	50 (48-52)	Pt/Ti, MMO PLATI-NODE® 167, 177	■	■		■	■	■	■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.01 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
High Speed Acid Gold Electrolytes																				
AURUNA® 7000* High-speed electrolyte for hard-gold deposition. Simple bath maintenance, no oxidation of the alloy partner, unprob-lematic precipitation of metallic contami-nants. Very well suited to brush applica-tions. Also for use as a gold strike electrolyte.	99.9-99.7	Fe	170-200	Yellow	10	I-II C-D	12 (2-18)	4.2-4.6	2-40*	0.3-8*	55 (45-60)	Pt/Ti	■	■						
AURUNA® 7100* High-speed electrolyte for hard-gold deposition. Suitable for all electronic components where cobalt is specifically demanded. Also for use as a gold strike electrolyte.	99.9-99.6	Co	140-200	Yellow	10	I-II C-D	12 (2-18)	4.2-4.6	2-40*	0.3-8*	55 (45-60)	Pt/Ti	■	■						
AURUNA® 8100* High-speed electrolyte for hard gold deposition with extended operating range and extremely high deposition speed. Also for use as a gold strike electrolyte.	99.9-99.6	Co	120-200	Yellow	10	I-II C-D	12 (2-30)	4.2-4.6	2-80*	0.3-11*	55 (45-65)	Pt/Ti	■	■						

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.01 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
High Speed Acid Gold Electrolytes																				
AURUNA® 8400* High-speed electrolyte for hard gold deposition with extended operating range and extremely high deposition speed. Also for use as a gold strike electrolyte.	99.9-99.6	Ni	130-190	Yellow	10	I-II C-D	12 (2-18)	4.3 (4.2-4.4)	2-80*	0.3-12*	60 (45-60)	Pt/Ti	■	■						

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
Strongly Acid Gold Electrolytes																				
AURUNA® 311 Particularly suitable for the adhesive direct gold-plating of stainless steel and substrates difficult to plate. Very good activation effect – without halogenides. The coatings are ductile, have few pores and protect against corrosion. Suitable as a gold strike electrolyte as well as for thick coatings. Special gold complex required. Also available as a special cobalt-free version.	99.7	Co	165	Deep yellow	10	-	2 (1.0-2.5) or 4 (3.5-4.5)	0.6 (0.1-0.8)	2-6	0.04-0.15	Room tempe-rature up to 40	Pt/Ti, Ir MMO PLATI-NODE® 177		■		■	■	■	■	■
AURUNA® 312 Particularly suitable for the adhesive direct gold-plating of stainless steel and substrates difficult to plate. Very good activation effect – without halogenides. The coatings are ductile, have few pores and protect against corrosion. Suitable as a gold strike electrolyte as well as for thick coatings. Special gold complex required.	99.7	Co	160	Deep yellow	10	-	2 (1-10)	0.3 (0.1-0.8)	2-6	0.08 at 2 g/l Au, 2 A/dm², 25 °C 0.25 at 4 g/l Au, 4 A/dm², 40 °C	25 (20-40)	Pt/Ti, Ir MMO PLATI-NODE® 177		■		■	■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Fine Gold Electrolytes																									
AURUNA® 55 F Weakly acid electrolyte specially for very thin fine gold coatings on lead frames, suitable for Pd PPF. For continuous plating lines and racks.	99.9	-	-	Yellow	0.1	III A	1 (0.5-3)	6 (5.0-6.5)	0.1-2.0 rack 1-30 spray cell	0.08-0.7 depend-ing on equip-ment	50 (45-55)	Pt/Ti			■										
AURUNA® 550 Neutral electrolyte for fine gold coatings with a high current efficiency. Operating conditions gentle to resists, for sensitive printed circuit boards. Excellent bonding and soldering properties, low hardness, low contact resistance.	99.9	-	85	Matt yellow	10	III A	8 (7-12)	6 (5.8-6.2)	0.4 (0.1-0.8)	0.22	50 (45-55)	Pt/Ti	■		■										
AURUNA® 551 Gold strike electrolyte for depositing thin coatings. Good activation of the sub-strate. Protects the main gold electrolyte from contaminants. Electrolyte works at room temperature (RT). Suitable for high-speed equipment.	99.9	-	-	Yellow	0.1	-	1 (0.6-1.2)	4 (3.8-4.2)	0.2-0.8	Flash 0.065	RT (20-30)	Stainless steel, Pt/Ti, Ir MMO PLATI-NODE® 177	■	■	■	■		■	■	■	■	■	■	■	■
AURUNA® 552 Fine gold electrolyte for printed circuit board and electronics applications. Very good soldering and bonding properties, good resist compatibility. Silk-matt coat-ings with good ductility, hardly any inter-nal stress. Simple bath maintenance.	99.99	-	80 HV 0.01	Yellow	10	III A	8 (6.5-12)	6 (5.8-6.2)	0.15-0.5	0.3	70 (66-72)	Pt/Ti	■		■										

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Fine Gold Electrolytes																									
AURUNA® 553 Neutral electrolyte for silk-matt coatings with excellent ductility. The coatings are yellow and smooth even at higher layer thicknesses. Very good soldering and bonding properties.	99.9	-	90 HV 0.01	Yellow	>200	III A	10 (6-10)	6 (5.8-6.2)	0.5 (0.2-0.6)	0.3	70 (60-70)	Pt/Ti	■		■										
AURUNA® 554 Neutral electrolyte for thin, decorative gold-copper or gold-silver coatings. The coating colour can be individually ad-justed from green/yellow to reddish. Layers colour-constant from approx. 0.05 µm, very good throwing power. For rack and barrel.	>90	Ag or Cu	-	Varia-ble	0.25	-	1.0 (0.5-2.0)	7 (6.5-7.5)	Rack 1.0 (0.5-2.0) barrel 0.5 (0.1-0.5)	0.12	50 (25-50)	Stainless steel, Pt/Ti				■	■	■	■			■	■	■	■
AURUNA® 555 Neutral electrolyte for thin coatings. Economic due to low gold content. Due to the particularly good covering and throwing power the full colour effect can be achieved with very thin layers, colour-constant from approx. 0.05 µm. Long lifetime, insensitive to contaminants, without complexing agents. For rack and barrel.	99.9	-	-	Deep yellow	0.25	-	1.0 (0.8-2)	7 (6.0-8.2)	Rack 1.0 (0.5-1.0) barrel 0.5	0.12-0.16	50 (45-55)	Stainless steel, Pt/Ti				■		■	■	■		■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Fine Gold Electrolytes																									
AURUNA® 556 Bright fine gold coatings with high hard-ness. High current efficiency. Preferably for sensitive printed circuit boards, op-erating conditions gentle to resists, no lifting of the resists.	99.9	-	250	Yellow	>200	III D	8 (7-9)	6 (5.8-6.2)	Up to 0.8 (0.2-0.8)	0.5	50 (45-55)	Ru MMO PLATI-NODE® 147	■	■		■		■	■	■		■	■	■	■
AURUNA® 558 Weakly alkaline fine gold electrolyte for silk-matt coatings of high purity, low hardness, very fine grain structure, and excellent bonding properties. Citrate-free, simple bath maintenance, environ-mentally friendly, contains no arsenic, thallium, lead, no carcinogenic substan-ces such as hydrazine of formaldehyde. High current densities and thus high plating speeds possible. For rack and barrel.	99.9	-	70	Light yellow	>20	III A	12 (10-12)	8.2 (8.0-8.4)	2.5 (0.5-4.0)	0.27-2.4	72 (70-75)	Pt/Ti	■		■										
AURUNA® 559* Neutral fine gold electrolyte specially developed for application in high-speed equipment. High current densities and thus high plating speeds possible, de-pending on the flow conditions in the equipment. Excellent bonding proper-ties.	99.9	-	100	Light yellow	>20	III B	16 (14-16)	7.5 (7.3-7.5)	10-25*	6-15*	70 (70-75)	Pt/Ti			■										

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Fine Gold Electrolytes																									
AURUNA® 580* Weakly acid gold strike electrolyte for use in combination with AURUNA® 558 and 559 for depositing thin, bright coatings. For rack, barrel, or high-speed equipment.	99.9	-	-	Deep yellow	0.3	-	2 (1-4)	3.9 (3.8-4.2)	0.5-8*	0.06-1.6*	20-40	Pt/Ti	■		■										
AURUNA® 5000 Neutral fine gold electrolyte with resist-friendly operating conditions, for flexible printed circuit boards in particular. High-purity gold coatings with excellent bonding and soldering properties.	99.95	-	≤85	Mat yellow	5	III A/B	7 (5-9)	6.0 (5.8-6.2)	0.3 (0.1-0.5)	0.17	65 (62-68)	Pt/Ti	■		■										
AURUNA® 5000 LC Neutral gold strike electrolyte for AURUNA® 5000, can also be used alone as fine gold electrolyte with resist-friendly operating conditions, for flexible printed circuit boards in particular. High-purity gold coatings with excellent bonding and soldering properties.	>99.9	-	70-90	Satin, yellow	0.15	III A/B	2 (1-3)	6.0 (5.8-6.2)	0.15 (0.1-0.3)	0.04-0.17	35 (30-65)	Pt/Ti	■		■										

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Fine Gold Electrolytes																									
AURUNA® 5100 Neutral fine gold electrolyte with operating conditions that are gentle to resists, excellent bondability and solderability. High current efficiency, low hardness, low contact resistance. For P-BGA.	99.99	-	85	Lemon yellow	10	III A/B	5 (4-8)	6.0 (5.8-6.2)	0.2 (0.1-0.5)	0.13	65 (60-70)	Pt/Ti	■		■										
AURUNA® 5150 Neutral gold strike electrolyte for AURUNA® 5100 with low gold content. For thin fine gold layers of 0.05-0.1 µm.	99.9	-	-	Lemon yellow	0.1	-	1 (0.5-2)	6.0 (5.8-6.2)	0.5 (0.3-0.8)	0.07	40 (20-45)	Pt/Ti	■		■										

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Alkaline-cyanide Gold Alloy Electrolytes (Decorative)																					
AURUNA®-Color 100-160 Colour gold-plating electrolytes in ap-prox. 20 different, exactly reproducible colour shades including the standard colours. Colour-constant deposition, coatings colour-stable and tarnish-resistant, good abrasion resistance due to hardener. Simple bath maintenance. Not suitable for barrel plating.	>85	Diffe-rent	-	Various	0.2	1 (0.9-1.1)	Alk.	5-10	0.2	65 (62-68)	Stain-less steel	■		■	■	■		■	■	■	■
AURUNA® 500 Gold-saving, red, approx. 18 carat gold-copper coatings. Resistant to tarnishing and corrosion. High hardness, abrasion-resistant. The neutral electrolyte works without free cyanide. Also for technical applications. Can be operated with either 5 or 10 g/l gold.	75	Cu	380-400	Red	10	5 (4.5-5.5) or 10 (9-11)	5 g/l Au: 7.4 (7.2-7.6) 10 g/l Au: 7.2 (7.0-7.3)	5 g/l Au: 0.4 (0.2-0.8) 10 g/l Au: 0.75 (0.3-1.0)	5 g/l Au: 0.14 10 g/l Au: 0.22	5 g/l Au: 45 (40-50) 10 g/l Au: 57 (55-60)	MMO PLATI-NODE® 187 SO	■		■	■	■	■	■		■	
AURUNA® 500 LC Gold-saving, red, approx. 18 carat gold-copper coatings. Resistant to tarnishing and corrosion. High hardness, abrasion-resistant. The neutral electrolyte with low gold content works without free cyanide.	75	Cu	380-400	Red	1	2 (1.5-3)	7.0 (6.8-7.2)	0.3-1.0	0.12	57 (55-60)	MMO PLATI-NODE® 187 SO	■		■	■	■	■	■		■	

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Bathroom fittings	Lighting fixtures	Household articles	Accessories	Cutlery
Alkaline-cyanide Gold Alloy Electrolytes (Decorative)																					
AURUNA® 502 Gold-saving, red, approx. 18 carat gold-copper coatings. Resistant to tarnishing and corrosion. High hardness, abrasion-resistant. The neutral electrolyte works without free cyanide. Also for technical applications.	75	Cu	380-400	Red	10	4 (3.5-4.5)	7.5 (7.2-8.0)	0.5 (0.3-0.8)	0.15	57 (55-60)	Pt/Ti	■		■	■	■	■	■		■	
AURUNA® 570 Gold-saving 18 carat gold-silver coat-ings. Even thick layers are bright. Easy bath maintenance, electrolyte works at room temperature (RT), very stable. For rack and barrel. LC variant with lower gold content for thin layers.	75	Ag	115	Green-yellow	>10	8 (7.5-8.5) LC: 4 (3.6-4.4)	>11	1.0 (0.2-1.8) LC: 0.6 (0.2-1.0)	0.6 LC: 0.3	35 (30-40)	Stain-less steel	■		■	■	■		■	■	■	■
AURUNA® 575 Gold-saving, approx. 12 carat gold-silver coatings. Mainly used for gold-saving intermediate layers under final layers of higher caratage. Resistant to corrosion and tarnishing. Excellent ductility, no cracking when bent. For rack and barrel.	50	Ag	220 HV 0.015	Yellowish white	20	6 (5-6)	11.5 (11.2-11.8)	0.6-0.8	0.3-0.45	45 (40-47)	Pt/Ti	■		■	■	■			■		■

Gold Electrolytes

	Gold content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Spectacle frames	Writing implements	Accessories
Cyanide-free Gold Sulphite Electrolytes																			
AURUNA® 547 Stable electrolyte for rack and barrel plating, mainly for decorative applica-tions. The ductile and hard coatings are colour-constant and resist corrosion and tarnishing. Bright even as very thick layers.	89	Pd/Cu	300	Grey-rose	over 20	-	8 (7-9)	8.4 (8.2-8.8)	0.8-1.6	0.35-0.7	55 (53-57)	Pt/Ti				■	■	■	■
AURUNA® 549 For decorative applications, preferably for spectacle frames and jewellery. The coatings are bright even as thick layers, they are ductile and very corrosion-resistant.	97	Pd	300	Pale rose	10	-	4 (3.5-5.0)	6.9	0.2-0.5	0.25	55 (50-60)	Pt/Ti				■	■	■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Spectacle frames	Writing implements	Accessories
Electroless Gold Electrolytes																			
AURUNA® 510 Immersion gold electrolyte for electro-less deposition by charge exchange, particularly on electrodeposited or electrolessly deposited nickel layers. Specially on printed circuit boards for Chip-on-Board technology (COB) or Surface-Mount technology (SMT). Very good solderability and bondability. Long lifetime, simple bath maintenance. Free from EDTA.	99.9	-	-	Light yellow	0.3	-	2	4.7 on electro-less Ni 4.3 on electro-deposited Ni	-	0.008 on electroless Ni	85 on electro-less Ni 60 on electro-deposited Ni	-	■		■				
AURUNA® 511 Immersion gold electrolyte for electro-less deposition by charge exchange on copper or nickel basis. For thin coatings, decorative and technical applications. Good bonding and soldering properties on electroless nickel (NIRUNA® pro-cess).	99.9	-	-	Light yellow	0.2	-	4 (3-4)	4.5-5.1 on electro-deposited Ni 4.5-4.7 on electro-less Ni 5.7-6.0 on Cu	-	0.005	90-98	-	■		■	■		■	■
AURUNA® 512 Electroless gold electrolyte (charge exchange, immersion gold) similar to AURUNA® 510, it contains EDTA, how-ever. For thin coatings on nickel and nickel alloys.	99.9	-	-	Light yellow	0.2 on electro-deposited Ni	-	3 (1-3)	4.5 (4.2-4.8)	-	0.003-0.006	95 (80-100)	-	■	■	■	■		■	■

Gold Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Classi-fication acc. to ASTM B 488-01	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Spectacle frames	Writing implements	Accessories
Electroless Gold Electrolytes																			
AURUNA® 514 Immersion gold electrolyte with long lifetime and simple bath maintenance. Very good soldering and bonding properties. Particularly suitable for gold-plating electroless or electrolytic nickel on printed circuit boards or ceramic substrates for Chip-on-Board technology (COB) or Surface-Mount technology (SMT) and Ball-Grid-Array applications.	99.9	-	-	Light yellow	0.2 on electro-less Ni 0.3 on electro-lytic Ni	-	2 (1-3)	4.9 on electrol-ess Ni (4.7-5.1) 4.7 on electro-lytic Ni (4.5-4.9)	-	0.008	80 on electro-less Ni (75-85) 60 on electro-lytic Ni (55-65)	-	■		■				

Platinum Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents wt.%	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Platinum Electrolytes and Platinum Alloy Electrolytes																					
PLATUNA® N1 Strongly acidic platinum electrolyte for white and ultra-bright platinum coatings up to approx. 1 µm. For technical and decorative applications, for rack and barrel. Wide operating range.	99.9	-	500	White	1	2 (0.5-4)	<1	1.5 (0.5-5.0)	0.08	30 (25-40)	Pt, Pt/Ti, Pt/Nb, Ir MMO PLATI-NODE® 177				■	■	■	■	■	■	■
PLATUNA®-Alloy 1 Acidic platinum-ruthenium alloy electro-lyte for white, ultra-bright and extremely abrasion-resistant platinum-ruthenium coatings up to approx. 1 µm. For deco-rative applications, for rack use. Wide operating range.	Pt 75	Ru 25	500	White	1	Pt 1 (0.8-1.2) Ru 1 (0.8-1.2	<1	2.0 (0.5-5.0)	0.08	35 (30-40)	MMO PLATI-NODE® 187 SO				■	■	■	■		■	

Rhodium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents wt.%	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Rhodium Electrolytes and Rhodium Alloy Electrolytes																					
RHODUNA® Diamond Bright Brilliant white, ultra-bright coatings of previously unattained lightness and brilliance up to 5 µm layer thickness, for decorative applications. Excellent throw-ing power with high covering speed. For rack and barrel.	99.9	-	800-900	Brilliant white	5	2 (1.6-3)	<1	1-2 (0.5-10)	0,08 at 1 A/dm² 0.10 at 2 A/dm²	40 (20-65)	Pt/Ti, Ir-MMO PLATI-NODE® 177, 187				■	■	■	■		■	■
RHODUNA® J1 Brilliant white, very light coatings up to 0.3 µm layer thickness for decorative applications, specially for jewellery , watches, and spectacle frames. For rack and barrel.	99.9	-	800-900	Brilliant white	0.3	2 (1.6-2.4)	<1	1 (0.5-2)	0.025	35 (20-40)	Pt/Ti, Ir MMO PLATI-NODE® 177				■	■	■	■		■	■
RHODUNA® T For technical applications, e.g. reed contacts. Crack-free coatings up to approx. 3 µm thickness.	99.9	-	800	Light grey	3	5 (4-6)	<1	1	0.14	40 (35-45)	Pt/Ti, Ir MMO PLATI-NODE® 177		■								

Rhodium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents wt.%	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Rhodium Electrolytes and Rhodium Alloy Electrolytes																					
RHODUNA®-Alloy 1 Acidic rhodium-ruthenium alloy electro-lyte for white, ultra-bright and extremely abrasion-resistant rhodium-ruthenium coatings up to approx. 1 µm. For decor-ative applications, for rack and barrel. Wide operating range.	Rh 75	Ru 25	600-900	White	1	Rh 1.6 (0.8-1.8) Ru 0.4 (0.2-0.5)	Acidic	4.0 (3.0-5.0)	0.2	45 (40-50)	MMO PLATI-NODE® 187 SO				■	■	■	■		■	

Ruthenium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Ruthenium Electrolytes																				
RUTHUNA® 474 Black Acidic electrolyte for decorative black coatings up to 0.5 µm layer thickness. Good colour constancy, simple bath maintenance, easy-to-use batch type.	>95	-	Anthracite (black)	0.5	5	1.4 (1.0-1.5)	1.0 (0.5-2.0)	0.08	70 (65-75)	Pt/Ti (2.5 µm Pt), Ir MMO PLATINODE® 177				■	■	■	■		■	
RUTHUNA® 475 Black Acidic electrolyte for decorative black coatings up to 0.3 µm layer thickness. Good colour constancy, simple bath maintenance, easy-to-use batch type.	>95	-	Anthracite (black)	0.3	2	1.1 (0.8-1.3)	1.5 (0.5-3.0)	0.05	65 (60-70)	Pt/Ti (2.5 µm Pt), Ir MMO PLATINODE® 177				■	■	■	■		■	
RUTHUNA® 479 Black Acidic electrolyte for decorative, very dark to black coatings up to 0.3 µm layer thickness, degree of blackening adjust-able. Good colour constancy, simple bath maintenance, long lifetime.	>95	-	Grey to anthracite (black)	0.3	5 (2-10)	1.2 (0.8-1.3)	1.0 (0.5-3.0)	0.12	65 (60-70)	Pt/Ti (2.5 µm Pt), Ir MMO PLATINODE® 177				■	■	■	■		■	
RUTHUNA® 490 Black Neutral electrolyte for decorative dark-grey to anthracite coatings up to 0.3 µm layer thickness. Good colour constancy, simple bath maintenance.	>95	-	Grey to anthracite (black)	0.3	2 (1.8-2.2)	7.0 (6.5-9.0)	1.0 (0.5-3.0)	0.02	65 (60-70)	Pt/Ti (2.5 µm Pt), MMO PLATINODE® 167, 177				■	■	■	■		■	

Palladium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Palladium Electrolytes and Palladium Alloy Electrolytes																						
PALLUNA® 451* For selective deposition in continuous lines, e.g. reel-to-reel, tabplater, and spot-plating equipment. Additionally also for rack plating. The semi-bright to bright coatings are crack-free, they have few pores and a good abrasion resistance. High plating speed, very good soldering and bonding properties, simple bath maintenance.	99.9	-	360	White	3	6-35	8.0 (7.6-8.6)	1-80*	0.6-18.0*	40 (35-50)	Pt/Ti	■	■	■								
PALLUNA® 452 Weakly ammoniacal electrolyte for de-positing pure palladium coatings with excellent bondability and solderability. High plating speed and simple bath maintenance, for continuous lines and racks. For lead-frames.	99.9	-	-	White	0.3	3 (2.5-7)	8.0 (7.5-8.4)	1-2	0.25 at 1 A/dm² 0.50 at 2 A/dm²	55 (50-60)	Ru MMO PLATI-NODE® 167		■	■								
PALLUNA® 457 Weakly alkaline electrolyte for ultra-bright, white pure palladium coatings, crack-free bendable up to 3 µm. Suitable for decorative and technical applications, for rack and barrel.	99.9	-	300-350 HV 0.015	White	5	10 (8-12)	7.7 (7.2-8.2)	Rack 1 (0.5-3) Barrel 0.5 (0.2-0.8)	0.24 at 1 A/dm² 0.12 at 0.5 A/dm²	42 (40-45)	Ru MMO PLATI-NODE® 167	■	■		■	■	■	■	■	■	■	■

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Palladium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Palladium Electrolytes and Palladium Alloy Electrolytes																						
PALLUNA® 458 Neutral palladium electrolyte for white, bright and low-pore pure palladium coatings. The ductile, low-stress layers besides high hardness and good wear resistance exhibit good corrosion and tarnish resistance.	99.9	-	300-350	White	3	10 (9-11)	7.0 (6.8-7.2)	1.0 (0.5-1.5)	0.13-0.38	50 (45-55)	Ru MMO PLATI-NODE® 167	■	■		■	■	■	■	■	■	■	■
PALLUNA® 459 Weakly alkaline palladium electrolyte. Deposits ultra-bright, decorative, light palladium coatings up to 0.5 µm. As palladium strike layer and diffusion barrier, as final layer up to 0.5 µm in the jewellery and spectacle frames industries.	99.9	-	230-250	White	0.5	1.5-2.0	7.0-7.2 or 8.5-9.0	0.5	Up to 0.07	25-30	Ru MMO PLATI-NODE® 167	■	■		■	■	■	■	■	■	■	■
PALLUNA® 462 Ammoniacal palladium-nickel electrolyte. Coatings bright and crack-free up to 10 µm. Ductile, with few pores, resisting corrosion and tarnishing, high hardness. For decorative and technical applica-tions, for rack and barrel.	65-80	Ni	620 HV 0.01	White	10	7 (6-8) or 10 (9-11) or 15 (13-17)	8.2 (8.0-8.4) or 8.5 (8.4-8.7)	1.0 (1.0-2.0)	0.22-0.25	25-35	Ru MMO PLATI-NODE® 167, graphite		■		■		■	■	■		■	■

Palladium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Palladium Electrolytes and Palladium Alloy Electrolytes																							
PALLUNA® 4620 Weakly alkaline palladium-nickel electrolyte for depositing bright white coatings of high hardness. Ductile, corrosion-resistant layers for decorative and technical applications, for rack and barrel. For jewellery and spectacle frames in particular.	80	Ni	500-600 HV 0.01	White	10	10 (8-12)	8.2 (8.0-8.3)	1.0 (0.5-2.5)	0,25	25 (25-35)	Ru MMO PLATI-NODE® 167, graphite		■		■		■	■	■		■	■
PALLUNA® 463 Weakly alkaline palladium-nickel electrolyte. Bright, low-pore and low-stress, ductile coatings with high hardness, resisting corrosion and tarnishing. Stable electrolyte with simple bath maintenance for decorative and technical applications, for rack and barrel.	80	Ni	550	White	10	10 (9-11)	8.2 (7.7-8.7)	1.5 (0.5-2.5)	0.33	25 (20-35)	Ru MMO PLATI-NODE® 167, graphite		■		■		■	■	■		■	■
PALLUNA® 468* High-speed electrolyte for use in continuous lines (jet plating, brush plating, selective dipping, tab plating). Improved plating speed, high current efficiency, constant alloy composition, long lifetime.	80	Ni	580-620	White	10	20 (28-22)	7.5 (7.4-8.0)	Up to 60*	Up to 16*	45 (43-47)	Pt/Ti	■		■								

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Palladium Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thick-ness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Palladium Electrolytes and Palladium Alloy Electrolytes																						
PALLUNA® ACF-100* High-speed electrolyte free of ammonia and chloride for depositing a bright palladium-nickel alloy in reel-to-reel equipment (selective dipping, jet and brush plating, tabplaters).	80	Ni	550	White	2-4	15 (14-16)	5.5 at 60 °C (5.2-5.8)	Up to 70*	Up to 15*	60 (58-62)	MMO PLATI-NODE® 187 SO	■	■	■								
PALLUNA® ACF-200 Palladium-nickel electrolyte free of ammonia and chloride for printed circuit board applications. Ductile, crack-free coatings of high hardness with good corrosion resistance.	80	Ni	530	White	2-4	6 (5-7)	5.2 at 60 °C (5.0-5.5)	Up to 4	Up to 0.9	60 (58-62)	MMO PLATI-NODE® 187 SO	■										
PALLUNA® ACF-800* Palladium electrolyte free of ammonia and chloride for racks and continuous lines. Ductile, ultra-bright and crack-free coatings with very good bonding and soldering properties.	99.9	-	280 HV 0.002	White	1	12 (5-30)	6.5 (6.0-7.0)	Up to 25*	Up to 5.5*	60 (55-65)	MMO PLATI-NODE® 187 SO	■	■	■								

*) For use in special high speed equipment; applicable current density and plating speed depend on the equipment.

Silver Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Silver Electrolytes																						
ARGUNA® ET Semi-bright coatings for (electro)technical and decorative applications, suitable for rack and barrel operation. The deposits have optimum electric conductivity values and a low contact resistance. Good soldering and bonding properties.	99.9	-	110-130	White	>100	30 (25-35)	12.5	0.5-1.5	0.65	18-25	Ag	■	■	■								
ARGUNA® ET-S* High-speed electrolyte for selective deposition of fine silver in continuous lines using flow or spray techniques. Semi-bright coatings with very good soldering and bonding properties. Soluble anodes permitted.	99.9	-	110	White	20	100 (80-120)	12.5	10-150*	12-90*	35 (30-75)	Ag, Pt/Ti		■	■								
ARGUNA® CF* High-speed electrolyte without free cyanide for selective deposition of fine silver in continuous lines using flow or spray techniques. Semi-bright coatings with very good soldering and bonding properties. No immersion silver plating. Electrolyte works with insoluble anodes.	99.9	-	100-130 HV 0.015	White	20	120 (60-120)	8.3 (8.0-8.6)	30-100*	18-60*	75 (65-75)	Pt/Ti		■	■								

*) For use in special high-speed equipment; applicable current density and plating speed depend on the equipment.

Silver Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Silver Electrolytes																						
ARGUNA® S High-performance electrolyte for deco-rative and technical silver plating, for rack and barrel operation. Brilliant-white coatings exhibiting high permanent hardness. Specially developed for heavy silver plating (cutlery, hotelware) up to 50 µm. The electrolyte must not be op-erated in a sulphur-containing atmos-phere.	99.5	-	150-170	Brilliant white	>100	40 (35-45)	>12	1.0 (0.5-2.0)	0.65	20-25 (15-30)	Ag				■		■	■	■	■	■	■
ARGUNA® 621 Bright silver electrolyte for rack and barrel with wide applicable current density range and very good throwing power which can also be used at relatively high temperatures. Brilliant white colour without a blue cast. No silver strike required on nickel.	99.9	-	80-110	Brilliant white	>100	40 (35-45) or 25 (25-30)	Alk.	0.5-5 or 0.5-4	0.64-2.56	Room temp. (20-45)	Ag				■	■	■	■	■	■	■	■
ARGUNA® 630 Bright silver electrolyte for (electro)tech-nical and decorative applications. De-pending on the operating parameters suitable for continuous lines, rack and barrel operation. Coatings with very good electrical and excellent bonding and soldering properties. Reflection density (GAM value) about 1.2 to 1.5.	99.9	-	110-130	White	5-10	30-60	12.5	0.5-40	0.66-13	Room temp. (20-45)	Ag		■	■	■	■	■	■	■	■	■	■

Silver Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Accessories	Cutlery
Silver Electrolytes																						
ARGUNA® 4500* High-speed electrolyte with little free cyanide for selective deposition of fine silver in continuous lines using flow or spray techniques. Bright coatings with very good soldering and bonding properties. The electrolyte works with insoluble anodes.	99.9	-	100-130 HV 0.015	White	5-10	90 (60-120)	9.0 (8.5-11)	50-250*	30-156*	60 (50-70)	Pt/Ti, MMO PLATI-NODE® 167		■	■								

*) For use in special high-speed equipment; applicable current density and plating speed depend on the equipment.

Brush Plating Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Voltage	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
Brush Plating Electrolytes																					
AURUNA® 250 Electrolyte ready for use for selective decorative pencil gold-plating (brush gold-plating). The metal is deposited by means of a wiping touch with a soaked brush. Works at room temperature, application preferably for the direct gold-plating of stainless steel.	99.5	Co	170	Yellow approx.3 N	0.1	20	0.6	10 V (8-15 V)	0.07	20-30	Plating pen	■			■		■	■	■	■	■
AURUNA® 261 Electrolyte ready for use for selective decorative pencil gold-plating (brush gold-plating). The metal is deposited by means of a wiping touch with a soaked brush. Works at room temperature.	99	Diffe-rent	-	Pale light yellow approx.1 N	0.1	20	7.0	10 V (8-15 V)	0.1	20-30	Plating pen				■		■	■	■	■	■
AURUNA® 262 Electrolyte ready for use for selective decorative pencil gold-plating (brush gold-plating). The metal is deposited by means of a wiping touch with a soaked brush. Works at room temperature.	99	Diffe-rent	-	Neutral yellow approx.2-3 N	0.1	20	3.0	10 V (8-15 V)	0.1	20-30	Plating pen				■		■	■	■	■	■

Brush Plating Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Voltage	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
Brush Plating Electrolytes																					
AURUNA® 263 Electrolyte ready for use for selective decorative pencil gold-plating (brush gold-plating). The metal is deposited by means of a wiping touch with a soaked brush. Works at room temperature.	99.5	Diffe-rent	-	Rich deep yellow, fine gold colour	0.1	20	7.0	10 V (8-15 V)	0.1	20-30	Plating pen				■		■	■	■	■	■
AURUNA® 264 Electrolyte ready for use for selective decorative pencil gold-plating (brush gold-plating). The metal is deposited by means of a wiping touch with a soaked brush. Works at room temperature.	90	Cu	-	Rose approx.4-5 N	0.1	20	9.0	6 V (2-8 V)	0.1	20-30	Plating pen				■		■	■	■	■	■
RHODUNA® 271 Electrolyte ready for use for selective decorative pencil rhodium-plating (brush rhodium-plating). Abrasion-resistant, light and bright coatings. High plating speed, fast covering.	99.9	-	800	White	Up to 1	20	<1	8-10 V (max. 12 V)	Up to 0.2	20-40	Plating pen				■		■	■	■	■	■
RHODUNA® 275 Black Electrolyte ready for use for selective decorative pencil rhodium-plating (brush rhodium-plating). Abrasion-resistant, dark, bright coatings. High covering power and plating speed.	Approx. 95	-	-	Anthracite-black	0.2	20	<1	8-10 V (max. 12 V)	Up to 0.1	20-40	Plating pen				■		■	■	■	■	■

Brush Plating Electrolytes

	Metal content in the deposit wt.%	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Voltage	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
Brush Plating Electrolytes																					
RUTHUNA® 279 Black Electrolyte ready for use for selective decorative pencil ruthenium-plating (brush ruthenium-plating). Abrasion-resistant, dark, bright coatings. High covering power.	>95	-	-	Anthracite-black	Up to 0.08	20	<1	10 V (8-12 V)	Up to 0.01	20-40	Plating pen				■		■	■	■		■

Electroforming Electrolytes

	Metal content in the deposit wt.% approx. values	Alloy compo-nents	Hardness of deposit HV 0.025 (Vickers) approx. values	Colour of deposit	Max. coating thickness µm	Metal content g/l	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Printed circuit boards	Connectors/contacts	Semiconductors	Jewellery	Hollow jewellery	Watches	Spectacle frames	Writing implements	Household articles	Cutlery
Electroforming Electrolytes																					
AURUNA® 5500 EF Fine gold electrolyte for manufacturing hard, semi-bright, electroformed hollow jewellery. Heavy plating on precious and/or base metals for the jewellery industry, protective gold-plating of 24 carat solid gold jewellery.	Au >99.9	-	180	Yellow	Several 100	Au 16 (12-20)	5.5 (5.0-6.0)	0.5	0.3	40 (35-45)	Ru MMO PLATI-NODE® 187 SO					■					
AURUNA® 567 EF-14 Electrolyte for manufacturing electro-formed hollow jewellery. Observance of fineness and weight distribution within narrow limits. Using an AURUNA®-Form plant is recommended. 14 carat hall-marking.	Au 60.4	Ag	220	Pale yellow	Several 100	15 Au approx. 5 Ag	10.0-10.2	Initial stage 0.6 1.2-2.0	1.0	45	Pt/Ti					■					
AURUNA® 568 EF-18 Electrolyte for manufacturing electro-formed hollow jewellery. Observance of fineness and weight distribution within narrow limits. Using an AURUNA®-Form plant is recommended. 18 carat hall-marking.	Au 77	Ag	220	Pale yellow	Several 100	15 Au approx. 3 Ag	10.0-10.2	Initial stage 0.6 1.2-2.0	1.0	45	Pt/Ti					■					

Copper Electrolytes

	Hardness of deposit HV (Vickers) approx. values	Max. coating thick-ness µm	Specified content per 1 litre	Consumption per 10,000 Ah	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempera-ture °C	Anode material	Technical Applications	Decorative Applications
Copper Electrolytes											
Umicore Copper 830 Deposition of silk-matt to bright, fine-grained and ductile copper layers in rack and barrel operation. Can be used for zinc die castings.	220 HV 0.1	50	Cu 60 g KCN 35-40 g KOH 2-5 g	BR 1 750 ml BR 2 1500 ml	10.5 (10-11)	Rack 2.0 (1.0-3.0) Barrel 1.0 (0.5-1.2)	0.8 (2 A/dm²) 0.4 (1 A/dm²)	58 (55-60)	Cu	■	■
Umicore Copper 836 Deposition of ultra-bright, levelling and ductile coatings, for rack and barrel operation. Simple bath maintenance, low consumption. Additives free from colourants and flammable solvents.	250 HV 0.1	200	Cu R 60 g B 30 g M 45 g H_2SO_4 R 32 ml B 100 ml M 60 ml Cl 60 mg	BR 1 0.5-2.0 l Lev 1 1.0-2.3 l	<1	Rack 5 (3-8) Barrel 1 (0.5-2)	1.05 (5 A/dm²) 0.21 (1 A/dm²)	22 (max. 40)	Cu-P (0.04-0.06 % P)	■	■

B = barrel, BR = Brightener, Lev = Leveller, M = mixed operation, R = rack

Nickel Electrolytes

	Hardness of deposit HV (Vickers) approx. values	Max. coating thickness µm	Specified content per 1 litre	Consumption per 10,000 Ah	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempera-ture °C	Anode material	Technical Applications	Decorative Applications
Nickel Electrolytes											
NiRUNA® 6450 High-speed electrolyte on sulphamate basis for depositing brightness-retaining, ductile coatings with low internal stress and a very active layer surface. Particularly suitable for ductile interme-diate layers on connectors.	300-400 HV 05	-	Ni 120 g H_3BO_3 40 g Cl 8 g	WA NF 0.3-0.5 l GR 1.0-1.5 l	3.8 (3.6-4.2)	15 (5-40)	3 at 15 A/dm²	57 (50-60)	Pure nickel	■	
NiRUNA® 808 Ductile, brightness-retaining layers on sulphamate basis with low internal stress. Low sensitivity of the electrolyte to metallic and organic contaminants. Either product or air agitation possible. For rack and barrel operation.	350 HV 0.1	Up to 100	Ni 80 g H_3BO_3 45 g Cl 8 g	WA 0.5 l CR 0.5 l WA 1.5 l NF GR	3.8 (3.5-4.1)	Rack 5.0 (2-8) Barrel 1.5 (1-2)	1.0 at 5 A/dm²	57 (55-59)	S-Nickel	■	■
NiRUNA® 808 S Electrolyte additives for producing ultra-bright, ductile nickel coatings with excellent levelling. Wide bright plating range. For sulphate and sulphamate electrolytes.	500	-	Ni 60-90 g H_3BO_3 40-55 g Cl 10-18 g	WA 26 0.3 l WA 27 0.3 l BR 1 0.75-1.0 l BR 2 1.5-2.2 l	3.8-4.5	1-5	0.5 at 2.5 A/dm² (45 °C) 1.0 at 5 A/dm² (60 °C)	40-60	Pure nickel or Nickel S	■	■

BA = Basic Additive, BR = Brightener, GR = Grain Refiner, WA = Wetting Agent

Nickel Electrolytes

	Hardness of deposit HV (Vickers) approx. values	Max. coating thickness µm	Specified content per 1 litre	Consumption per 10,000 Ah	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempera-ture °C	Anode material	Technical Applications	Decorative Applications
Nickel Electrolytes											
NIPHOS® 965 For the electrolytic deposition of nickel-phosphorus alloy layers, phosphorus content 6 – 12 %. Use as intermediate layer prior to subsequent hard gold plating of contact surfaces. Chloride-free, pH-stable, for continuous lines.	550-600 HV 0.05	-	Ni 100 g P 30 g	RS 1 1.0-2.0 l BR 1 0.1-0.2 l	2.6 (2.5-2.7)	20 (10-30)	1-3 at 10-30 A/dm²	60 (55-75)	Ni S, MMO PLATI-NODE® 177	■	
NIPHOS® 966 For the electrolytic deposition of nickel-phosphorus alloy layers, phosphorus content > 11 %. Use as intermediate layer prior to subsequent hard gold plating of contact surfaces. Chloride-free, pH-stable, for rack and barrel.	550-600 HV 0.05	-	Ni 80 g P 25 g	RS 1 2-2.5 l BR 1 0.1-0.2 l	2,6 (2,5-2,7)	Rack 4 (3-5) Barrel 1.5 (1-2)	Rack 0.4 at 4 A/dm² Barrel 0.15 at 1.5 A/dm²	60 (55-75)	Ni S, MMO PLATI-NODE® 177	■	

BR = Brightener, GR = Grain Refiner, RS = Replenisher Solution, WA = Wetting Agent

Copper / Tin / (Zinc)-Electrolytes

	Hardness of deposit HV 0.05 (Vickers) approx. values	Max. coating thick-ness µm depen-ding on sub-strate	Specified content per 1 litre	Consumption per 1 g of alloy deposited	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Electrical engineering/ Electronics	Buttons/Zip fasteners	Jewellery/Watches/Spec-tacle frames/Accessories/	Mechanical engineering	Motor vehicle industry	Chemical and food-processing industries	Textile and printing industries	Other
MIRALLOY® Electrolytes for Decorative and Technical Applications																	
MIRALLOY® 841 Rack electrolyte, coating colour white, similar to silver. Very good metal distribution, high layer hardness, high reflectivity, good wear and cor-rosion protection (substrate: nonferrous metals). Simple bath maintenance.	600 HV 0.025	5	Cu 12.0 g Sn 20.0 g Zn 1.5 g KCN 50.0 g	CuSo 1 5.5 ml SnS 2 0.9 g ZnS 0.06 g BR 1 0.4 ml BR 2 0.5 ml	12	1.0 (0.75-1.25)	0.31 at 1.0 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■	■	■	■	■	■	■
MIRALLOY® 2840 Rack electrolyte, coating colour brilliant white, similar to rhodium. Very good metal distribution, high layer hardness, high reflectivity, low metal content. For thin final layers.	600 HV 0.025	0.5	Cu 0.56 g Sn 2.25 g Zn 0.1 g KCN 5.0 g KOH 2.5 g	CuSo 1 5.4 ml SnS 2 0.9 g ZnS 1 0.08 g BR 1 5.8 ml	>12	0.75 (0.3-2.5)	0.08 at 0.75 A/dm²	55 (53-57)	Ru MMO PLATI-NODE® 167, graphite		■				■	■
MIRALLOY® 2841 Rack and barrel electrolyte, coating colour white, similar to silver. Very good metal distribution, high layer hardness, high reflectivity, good wear and corrosion protection (substrate: nonferrous metals). Simple bath maintenance.	600 HV 0.025	5	Cu 9.0 g Sn 16.0 g Zn 2.0 g KCN 45.0 g	CuSo 1 5.2 ml SnS 2 0.9 g ZnS 1 0.1 g BR 1 0.8 ml BR 2 0.6 ml	12	R 0.5 (0.25-0.75) B 0.25 (0.1-0.4)	0.14 at 0.5 A/dm² 0.07 at 0.25 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■	■	■	■		■	■

B = barrel, BR = Brightener, CuSo = Copper Solution, R = rack, SnS = Tin Salt, ZnS = Zinc Salt

Copper / Tin / (Zinc)-Electrolytes

	Hardness of deposit HV 0.05 (Vickers) approx. values	Max. coating thick-ness µm depen-ding on sub-strate	Specified content per 1 litre	Consumption per 1 g of alloy deposited	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Electrical engineering/ Electronics	Buttons/Zip fasteners	Jewellery/Watches/Spec-tacle frames/Accessories/	Mechanical engineering	Motor vehicle industry	Chemical and food-processing industries	Textile and printing industries	Other
MIRALLOY® Electrolytes for Decorative and Technical Applications																	
MIRALLOY® 2841 HS Electrolyte for use in reel-to-reel lines, coating colour white, similar to silver. Very good metal distribution, high layer hardness, high reflectivity, good wear and corrosion protection (substrate: nonferrous metals), diamagnetic. Simple bath maintenance.	600 HV 0.025	2	Cu 10.5 g Sn 30.0 g Zn 2.7g KCN 40.0 g KOH 1.5 g	CuSo 1 7.5 ml SnS 2 0.9 g ZnS 1 0.27 g BR 3 3.6 ml	Alka-line	4 (3.0-4.0)	0.9 at 4.0 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■		■	■		■	■
MIRALLOY® 842 Rack electrolyte, coating colour white. High tarnish-resistance of the layers. Preferably for colouring thin top coats.	550	2.5	Cu 2.0 g Sn 6.0 g KCN 15.0 g KOH 6.0 g	CuSo 1 5.5 ml SnS 2 1.08 g BR 1 6.4 ml	Alka-line	1.0 (0.5-1.5)	0.14 at 1.0 A/dm²	45 (42-48)	Ru MMO PLATI-NODE® 167, graphite		■						
MIRALLOY® 2842 Rack electrolyte, coating colour white, similar to silver. Giving brightness and slightly levelling, good covering power and metal distribution. Good solderability, high hardness. Insensitive to handling, tarnish-resistant, good wear and corrosion protection (substrate: nonferrous metals).	600	10	Cu 9.5 g Sn 26.0 g Zn 2.0 g KCN 50.0 g KOH 20.0 g	CuSo 1 5.1 ml SnS 2 0.7 g ZnS 1 0.25 g BR 2 0.9 ml	>13	2.0 (1.5-2.5)	0.3 at 2.0 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■		■	■		■	■

B = barrel, BR = Brightener, CuSo = Copper Solution, R = rack, SnS = Tin Salt, ZnS = Zinc Salt

Copper / Tin / (Zinc)-Electrolytes

	Hardness of deposit HV 0.05 (Vickers) approx. values	Max. coating thick-ness µm depen-ding on sub-strate	Specified content per 1 litre	Consumption per 1 g of alloy deposited	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Electrical engineering/ Electronics	Buttons/Zip fasteners	Jewellery/Watches/Spec-tacle frames/Accessories/	Mechanical engineering	Motor vehicle industry	Chemical and food-processing industries	Textile and printing industries	Other
MIRALLOY® Electrolytes for Decorative and Technical Applications																	
MIRALLOY® 2843 Rack electrolyte, coating colour white, similar to silver. Brightening and slightly levelling, good covering power, good metal distribution, good solderability, high hardness value, insensitive to handling, tarnish-resistant, best wear and corro-sion protection (substrate: nonferrous metals).	600	10	Cu 8.5 g Sn 34.0 g Zn 1.0 g KCN 50.0 g KOH 20.0 g	CuSo 1 5.6 ml SnS 2 0.7 g ZnS 0.2 g BR 1-2 1.1 ml BR 2-1 0.9 ml	13	2.0 (1.5-2.5)	0.3 at 2.0 A/dm²	60 (58-62)	MMO PLATI-NODE® 177		■	■	■	■	■	■
MIRALLOY® 844 Barrel electrolyte, coating colour white, similar to silver. Very good metal distribution, good solder-ability, high layer hardness, insensitive to han-dling, tarnish-resistant, high reflectivity, good wear and corrosion protection (substrate: non-ferrous metals).	550	5	Cu 8.5 g Sn 34.0 g KCN 50.0 g KOH 30.0 g	CuSo 1 5.5 ml SnS 2 1.05 g BR 1 0.6 ml BR 2 0.4 ml	>13	0.5 (0.3-1.5)	0.12 at 0.5 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■	■	■	■	■	■	■	■
MIRALLOY® 2844 Barrel and rack electrolyte, coating colour white, similar to silver. Good covering power, very good metal distribution, good solderability, high hardness value, insensitive to handling, tarnish-resistant, high reflectivity, good wear and corrosion protection (substrate: nonferrous metals).	600	5	Cu 8.5 g Sn 27.0 g Zn 0.75 g KCN 50.0 g KOH 30.0 g	CuSo 1 5.5 ml SnS 2 0.71 g ZnS 0.16 g BR 1-1 0.25 ml BR 2 1.25 ml	>13	0.25 (0.1-0.5)	0.06 at 0.25 A/dm²	60 (58-62)	MMO PLATI-NODE® 177	■	■	■	■	■	■	■	■

BR = Brightener, CuSo = Copper Solution, SnS = Tin Salt, ZnS = Zinc Salt, ZnSo = Zinc Solution

Copper / Tin / (Zinc)-Electrolytes

	Hardness of deposit HV 0.05 (Vickers) approx. values	Max. coating thick-ness µm depen-ding on sub-strate	Specified content per 1 litre	Consumption per 1 g of alloy deposited	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Electrical engineering/ Electronics	Jewellery/Watches/Spec-tacle frames/Accessories/ Buttons/Zip fasteners	Mechanical engineering	Motor vehicle industry	Chemical and food-processing industries	Textile and printing industries	Other
MIRALLOY® Electrolytes for Decorative and Technical Applications																
MIRALLOY® 2844 E Rack and barrel electrolyte, coating colour white, similar to silver. Good covering power, very good metal distribution, good solderability, high hard-ness value, insensitive to handling, tarnish-re-sistant, high reflectivity, good wear and corrosion protection (substrate: nonferrous metals). Low metal content.	600	5	Cu 7.0 g Sn 8.5 g Zn 2.0 g KCN 50.0 g KOH 12.0 g	CuSo 1 5 ml SnS 2 0.64 g ZnS 0.18 g BR 1-1 0.25 ml BR 2 0.83 ml	>13	0.3 (0.1-0.5)	0.07 at 0.3 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite	■	■	■	■	■	■	■
MIRALLOY® 2844 LC Barrel electrolyte, coating colour white, similar to silver. Good covering power, very good metal distribution, good solderability, high hardness value, insensitive to handling, tarnish-resistant, high reflectivity, good wear and corrosion protec-tion (substrate: nonferrous metals). Specifically for coating ladling parts.	600	5	Cu 7.5 g Sn 17.0 g Zn 0.6 g KCN 50.0 g KOH 16.0 g	CuSo 1 5.5 ml SnS 2 0.69 g ZnS 0.15 g BR 1-1 0.27 ml BR 2 1.36 ml	>13	0.25 (0.1-0.5)	0.055 at 0.25 A/dm²	60 (58-62)	MMO PLATI-NODE® 177	■	■	■	■	■	■	■
MIRALLOY® 846 S Rack electrolyte, coating colour yellow, particu-larly for undercoats, layer thicknesses up to 20 µm. Good covering power, very good metal distribution, good wear and corrosion protection (substrate: nonferrous metals).	400	20	Cu 16.5 g Sn 10.0 g Zn 2.5 g KCN 55.0 g KOH 10.0 g	CuSo 1 7.8 ml SnS 2 0.37 g ZnSo 1 0.08 ml BR 1 0.65 ml BR 2 0.6 ml	Alka-line	1.5 (1.0-2.0)	0.35 at 1.5 A/dm²	50 (48-52)	Ru MMO PLATI-NODE® 167, graphite		■	■		■	■	■

BR = Brightener, CuSo = Copper Solution, SnS = Tin Salt, ZnS = Zinc Salt, ZnSo = Zinc Solution

Copper / Tin / (Zinc)-Electrolytes

	Hardness of deposit HV 0.05 (Vickers) approx. values	Max. coating thick-ness µm depen-ding on sub-strate	Specified content per 1 litre	Consumption per 1 g of alloy deposited	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempe-rature °C	Anode material	Applications: Electrical engineering/ Electronics	Buttons/Zip fasteners	Jewellery/Watches/Spec-tacle frames/Accessories/	Mechanical engineering	Motor vehicle industry	Chemical and food-processing industries	Textile and printing industries	Other
MIRALLOY® Electrolytes for Decorative and Technical Applications																	
MIRALLOY® 2851 Rack electrolyte, coating colour white, similar to silver. Brightening and slightly levelling, good covering power, good solderability, high hard-ness value, insensitive to handling, tarnish-resistant, good wear and corrosion protection (substrate: nonferrous metals).	600	15	Cu 10.5 g Sn 34.0 g Zn 1.2 g KCN 48.0 g KOH 22.0 g	CuSo 1 5.1 ml SnS 2 0.8 g ZnS 0.2 g BR 1 0.8 ml BR 2 0.8 ml	>13	1.0 (0.5-1.25)	0.25 at 1.0 A/dm²	60 (58-62)	Ru-MMO PLATI-NODE® 167	■	■	■	■	■	■	■
MIRALLOY® 3849 Rack electrolyte, coating colour yellow. Wide operating range, very good metal distribution, good wear and corrosion protection.	400	2000	Cu 15 g Sn 17 g KCN 35 g KOH 25 g	CuSo 1 9 ml SnS 2 0.25 g BR 1 1 ml	>13	3.0 (2.0-4.0)	0.56 at 3 A/dm²	55 (50-60)	Ru MMO PLATI-NODE® 167				■	■		■	■

BR = Brightener, CuSo = Copper Solution, SnS = Tin Salt, ZnS = Zinc Salt, ZnSo = Zinc Solution

Tin Alloy Electrolytes

	Hardness of deposit HV (Vickers) approx. values	Max. coating thick-ness µm	Specified content per 1 litre	Consumption per 10,000 Ah	pH-value	Current density A/dm²	Plating speed µm/min approx. values	Tempera-ture °C	Anode material
Tin Alloy Electrolytes for Technical Applications									
DIALLOY® 822 Alkaline-cyanide electrolyte for depositing silk-matt, white tin-zinc alloy layers in rack or barrel operation. A Sn/Zn alloy ratio of either 80/20 or 70/30 can be deposited. Very good metal distri-bution, good solderability and weldability, excel-lent corrosion protection for iron and iron alloys.	50	50	Sn 22 g Zn 2.4 g	ZnS 1 2 kg SnS 2 15 kg BR 1-1 5-7.5 l	>13	Barrel 1.0 (0.8-1.2) Rack 1.5 (1-2)	0.17 at 1.0 A/dm² 0.25 at 1.5 A/dm²	60 (58-62)	Ru MMO PLATI-NODE® 167, graphite

BR = Brightener, SnS = Tin Salt, ZnS = Zinc Salt

Pre- and Post-treatments

	Specified content / bath makeup per 1 litre	pH-value	Current density A/dm²	Time of exposure	Temperature °C	Electrode material
Pre- and Post-treatments						
Umicore Soak Cleaner 6002 Cyanide-free, alkaline immersion cleaner, mainly for substrates made of copper or its alloys, ferrous metals as well as zinc and zinc die castings. Also suitable for use in ultrasonic equipment.	Makeup Salt 30 g (20-40 g) Umicore Wett. Agent 33 10 (5-20) ml Umicore Wett. Agent 36 3 (1-5) ml	Alkaline	-	2 min (0.5 - 10 min)	60 (40-80)	-
Umicore Cleaner 6032* Electrolytic, alkaline, and cyanide-free cleaner working cathodically or anodically, for nonferrous metals, zinc die castings and steel. May also be used with cyanide.	Salt Mixture 60 g (50-100 g)	Alkaline	12 (5-15) cathodic	30 sec - 3 min	55 (40-60)	Anode: stainless steel 1.4301
Umicore Electropolish 6100* Strongly acidic electrolyte working anodically for brightening copper alloys. For treating plug-in contacts made from brass, bronze, copper in continuous lines and rack operation.	Ready for use, density 1.50-1.55 g/cm³	<1	10-25 anodic	10-50 sec	18-25	Cathode: stainless steel 1.4301
Umicore Activator 6120* Good activation of steel, nonferrous metals, and nickel. Also suitable for derusting and descaling. Simple handling.	Salt Mixture 30-240 g	Acidic	-	15-90 sec	20-70	-
Umicore Activator 49 Removal of oxide rests and activation of surfaces to be plated, copper and nickel in particular.	Salt Mixture 20-150 g	Acidic	-	10-180 sec	20-50	-
Umicore Activator 878 Chloride-free palladium catalyst for printed circuit boards and ceramic substrates. High seed density, selective seeding of copper. Simple bath maintenance with long bath life. For NIRUNA® Process.	Pd 10 mg (5-15 mg) Makeup Concentrate 100 ml (50-150 ml)	≤1	-	30-180 sec	25 (20-40)	-

*For use in continuous plating lines, RT = room temperature

Pre- and Post-treatments

	Specified content / bath makeup per 1 litre		pH-value	Current density A/dm²	Time of exposure	Temperature °C	Electrode material
Pre- and Post-treatments							
Umicore Cleaner 864 Degreasing of nonferrous metals and cleaning of copper surfaces (printed circuit boards). Free from strong complexing agents, good resist compatibility, simple bath maintenance.	Concentrate	100 ml (50-150 ml)	Acidic	-	4 min (3-5 min)	50 (25-60)	-
Umicore Cleaner 865 Degreasing of nonferrous metals and cleaning of copper surfaces (printed circuit boards). Contains phosphate, free from strong complexing agents, good resist compatibility, simple bath maintenance with long bath life.	Concentrate	50 ml (25-100 ml)	1-2	-	3 min (1-6 min)	40 (RT-max. 60)	-

*For use in continuous plating lines, RT = room temperature

Pre- and Post-treatments

	Bath makeup per 1 litre		pH-value	Current density A/dm²	Time of exposure	Tempe-rature °C	Anode material	Removal rate	Max. loading of bath
Pre- and Post-treatments									
Umicore Micro-Etch 910 Cleaning and activation of copper surfaces on printed circuit boards, free from complexing agents. Uniform etch removal, constant etch rate and high copper uptake. Simple bath maintenance and long bath life.	Salt Mixture	40-120 g	1-2	-	0.5 - 6 min	25-35	-	0.2-0.8 µm/min	12 g/l Cu
Umicore Gold Brightening Bath 408 WS Anodic brightening of 8 - 18 carat gold alloys. Capacity max. 2 kg of jewellery per litre.	Makeup Salt	130 g	Alkaline	100-300	-	65-75	Cathode stainless steel	5-10 µm in 5-10 sec	-
Umicore Gold-Stripper 645 Stripping of gold from all common substrates. High stripping speed and capacity, minimal attack on the substrate. Stripper works without external current source.	Makeup Salt	20 g	Alkaline	-	-	RT (20-35)	-	0.5-1 µm/min	20 g/l Au
Umicore Gold-Stripper 647 Stripping of gold from all common substrates. High stripping speed and capacity, minimal attack on the substrate. Stripper works without external current source.	Concentrate	100 ml	Alkaline	-	-	RT (20-35)	-	0.5-1 µm/min	20 g/l Au
Umicore Stripper 648* Cyanide-free stripper for the anodic removal of thin gold and silver coatings, mostly from strip materials. No visible attack on the substrate.	Concentrate	200 ml	12.0	3-5	-	45-55	Cathode stainless steel	0.9 µm/min at 3 A/dm² 1.3 µm/min at 5 A/dm²	-
Umicore Palladium-Stripper 640 Alkaline-cyanide stripper for removing palladium from nickel and cooper alloys. High stripping speed and capacity, can be replenished, works without external current source.	Concentrate NaCN	100 ml 40 g	Alkaline	-	-	20-30	-	0.6 µm/min	20 g/l Pd

*For use in continuous plating lines, RT = room temperature

Pre- and Post-treatments

	Bath makeup per 1 litre		pH-value	Current density A/dm²	Time of exposure	Tempe-rature °C	Anode material	Removal rate	Max. loading of bath
Pre- and Post-treatments									
ARGUNA® Pre-dip 600 Dip process on an aqueous basis for avoiding immersion silver-plating effects during selective silver-plating in silver electrolytes free of potassium and sodium cyanide.	Concentrate	50 ml	Approx. 11	-	25 sec (15-30 sec)	60 (50-70)	-	-	-
Umicore Silver-Stripper 636 Cyanide-free, non-toxic stripper for the anodic removal of silver from all common substrates. High capacity, minimal attack on the base material. Lifetime 4 - 5 days.	Makeup Salt	50 g	9.0 (8.2-9.0)	2-3	-	30-35	Cathode stainless steel	1.2 µm/min at 2 A/dm² 1.8 µm/min at 3 A/dm²	20-35 g/l Ag
Umicore Antitarnish 613 Chromium-free antitarnish protection for silver and copper. Storage protection on an aqueous basis without organic solvents for technical and decorative silver deposits. Solderability and surface resistivity will not be influenced.	Concentrate Wetting Agent 2	250 ml 5 ml	1.5 (1.0-2.0)	-	30 sec (10-120 sec)	35 (20-40)	-	-	10 m²/l
Umicore Sealing 691 / 691 EL FCKW-, CKW-, KW- and chromium-free antitarnish protection for precious metal surfaces. Primarily for technical components e.g. contacts. Good slipperiness and solderability, low contact resistance; colour and brillanze will not be influenced. Sealing 691: Simple immersion process Sealing 691 EL: Electrolytic process	691: Concentrate 691 EL: Concentrate Basic additive	 10 ml 10 ml 5 g	Weakly acidic – neutral 4.3 (4.0-4.6)	- >0.1	2 min (30 sec - 3 min) 5 s (2 – 30 s)	50 (48-52)	- MMO & stainless steel	-	-

Pre- and Post-treatments

	Bath makeup per 1 litre	pH-value	Current density A/dm²	Time of exposure	Tempe-rature °C	Anode material	Removal rate	Max. loading of bath
Pre- and Post-treatments								
Umicore Antitarnish 616 / 616 PLUS Process free from heavy metals based on nanobiotechnology for protecting silver against tarnishing, for decorative and technical applications. Biologically safe, kind to the skin and hypoallergenic. **Antitarnish 616:** Simple immersion process on aqueous basis. **Antitarnish 616 PLUS:** Electrolytic protection process.	**616:** Initial Concentrate 10 ml	6.5 (5-8)	-	5 min	45-55	-	-	-
	616 PLUS: Initial Concentrate 10 ml Makeup Salt PLUS 2.5 g	3.7 (3.3-4)	>0.1	5 min (3-10)	60 (55-65)	MMO PLATI-NODE® 187 SO	-	-

Precious Metal Preparations, AURUNA® Selective Module II

Precious Metal Preparations for Plating

- AURUNA® Ammonium Gold Sulphite Solution 100
- AURUNA® Sodium Gold Sulphite Solution 100
- AURUNA®-Form Silver Conductive Lacquer-2
- Umicore Potassium Gold Cyanide 68.2 %
- Umicore Silver Cyanide 80.5 %
- Umicore Potassium Silver Cyanide 54 %
- Platinum and Palladium Compounds

AURUNA® Selective Module II

Application

The AURUNA® Selective Module II is used for the continuous and highly selective plating of semi-finished strips such as stamped contacts with many different precious metals. The complete module can be easily integrated into existing selective plating lines as an independent unit. The heart of the module is a stationary brush unit.

Functional Principle

The continuous strip to be plated is guided over the brush head while the electrolyte is selectively pumped through the brush body to the plating zone. The strip or contact surfaces to be plated are wetted by means of a special cloth enclosing the whole head. The finely adjustable wetting of the cloth as well as precise strip guidance allow very exact and selective metal deposition at maximum line speed.

AURUNA® Selective Module II

Precious Metal Savings and Selectivity

- Precious metal savings of up to 40 % compared to conventional selective plating techniques.
- Improved selectivity compared to wheel and belt techniques, especially on bent contacts.
- Best possible selectivity due to specifically designed electrolyte guidance in the brush head.

Reliability and Service

- Easy and cost-effective retrofitting of existing reel-to-reel equipment.
- Short set-up times when producing different part geometries.
- Minimal wear due to the use of high-quality materials.
- Spare parts readily available, procurement at short notice.
- Many years of expertise in equipment design and electrolyte development.

Efficiency

- Connecting several AURUNA® Selective Modules in line allows extremely high line speeds, variable thickness distribution and flexible plating of a wide variety of part geometries.

Dimensionally Stable Anodes, Wires and Ribbons

PLATINODE®

Dimensionally Stable Electrodes

Dimensionally stable Umicore electrodes are marketed at Umicore under the brand name PLATINODE®. PLATINODE® describes the refractory metals, such as titanium and niobium, coated with both purest platinum and also with mixed metal oxide. The electrocatalytic functional layers of platinum or various precious metal oxides are used throughout virtually the entire electrochemical industry.

The choice of coating - be it platinum or MMO - and specification of the required layer thickness depends on the customer's specific area of use.

Huge range of uses for Umicore Electrode Systems:

- Precious and non-precious metal electroplating
- Electronics and semiconductor industries
- Photovoltaics
- Anodisation
- Metal recovery
- Electroforming
- Chloralkali electrolysis
- Acid electrolysis
- Cathodic corrosion protection
- Chemical process engineering
- Wastewater treatment
- Drinking water treatment
- Water and swimming pool water disinfection
- Lighting industry

PLATINODE®

- Hard chrome plating
  - Piston rings
  - Piston rods
  - Shock absorbers
  - Hydraulic cylinders
  - Printing cylinders

High Temperature Electrolysis

The high temperature electrolysis (HTE) production division of Umicore electroplating has been involved in the development, construction and production of electrode systems for over three decades. This experience, combined with the in-depth specialist knowledge of its employees and the high technical level of production, enables the company to develop the best possible innovative system solution for its customers.

The customer-specific range of services includes:

- Skilled customer support and advice
- Development and construction of customised electrodes
- Choice of special functional layers
- Fast and documented sample processing
- State of the art, mechanised production site
- Repair and recoating of used electrodes
- Resources available for studying and developing electrode systems
- Project preparation and post-processing with customers and at customers' premises
- Damage analysis using up-to-date analysis methods

Dimensionally Stable Anodes, Wires and Ribbons

PLATINODE®

Mechanical Production

In addition to continuous enhancement of HTE coating, market requirements also necessitate expansion of the mechanical production facilities. Umicore in many fields acts as a systems supplier here. *"Everything from a single source"* – this is the motto of Umicore's customer service with an extensive list of products.

Increasing numbers of items have to be processed at the highest quality level with short delivery times. This is ensured by first-class skilled staff and an extensive range of machinery.

Umicore electroplating is equipped with the following machines in order to offer a high vertical range of manufacture:

- CNC punch press
- CNC bending presses (vertical/horizontal)
- Round bending machines
- Circular cutting machine
- Swing beam shears
- Surface grinding machine
- Inert gas laser welding unit
- Spot welding units
- TIG welding unit
- Pressure blasting units
- Vertical and shuttle storage equipment

Umicore's mechanical production site covers an area of approx. 500 m².

PLATINODE®

Platinized Wires and Ribbons

made of molybdenum, titanium, stainless steel, nickel and nickel alloys etc. are coated with platinum from the molten salt on two continuously operation plants. It is possible in this manner to deposit layers from 0.2 to > 50 µm with excellent density and adhesive strength.

Applications:

- Lighting industry
- Electronics
- Sensor technology
- Cathodic protection etc.

Detailed information on all products in the List of Products is available on request!

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Electroplating