



AR

Ultra Flexible Unit

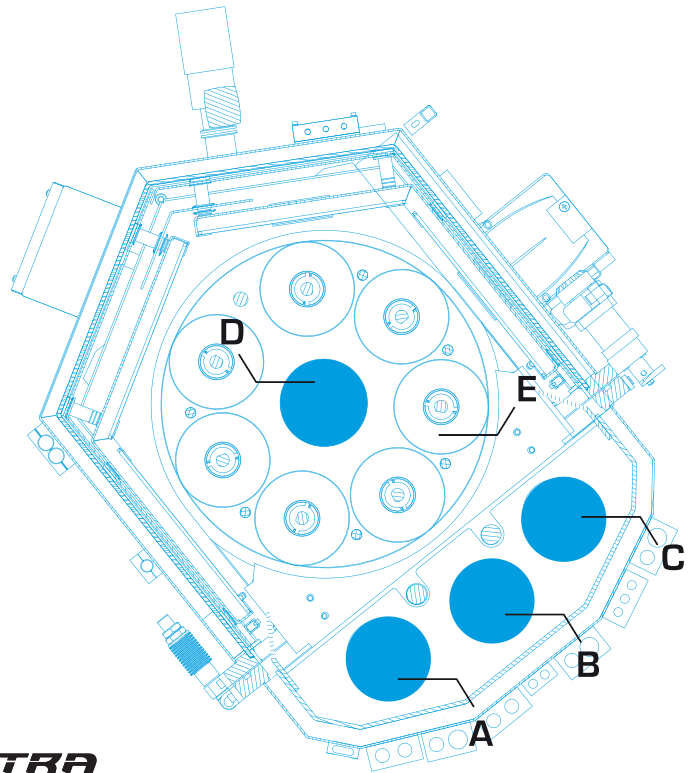


PLATIT® 11 - Series

411 Ultra Flexible Unit

The broad variety of configuration options as well as the flexibility made possible by the rotating cathodes allows for the development of customer-specific top-performance coatings. Thus, this coating unit addresses the needs of customers who are seeking maximum flexibility with a full range of coating technologies easily accessible in one machine.

- A** LARC AMF Cathode
- B** LARC AMF Cathode or LARC RM Cathode
- C** LARC AMF Cathode
- D** Optional SCIL or FMS Cathode



411 *ULTRA Flexible*



Due to its modular design and the range of available technologies, the Pi411 G3 is the world's most flexible coating unit. Its basic configuration as an ARC unit with three rotating cathodes inside the door can be modularly upgraded on-site with SPUTTER technology (SCIL, FMS, LARC RM cathodes) as well as with PECVD and OXI processes. Unique to this unit is also the availability of LACS hybrid technology, which allows for the simultaneous deposition of coatings using both ARC and SPUTTER technology.

Options for Pi411 G3



ECO: Basic configuration with 3 × LARC AMF (Lateral Rotating Cathode with Adjustable Magnetic Field) inside the door for ARC deposition

LARC RM (Rotating Magnetron): Integrated SPUTTERING cathode in the door enables complementary deposition steps and compact system design for multi-process flexibility

SCIL (SPUTTERED Coating Induced by Lateral Glow Discharge): High-performance SPUTTERING from the central cathode

FMS (Focus Magnetron Sputtering): High-density SPUTTERING from the central cathode with enhanced coating performance and efficiency

Hybrid LACS: Simultaneous ARC and SPUTTER processes with LARC AMF inside the door and a central SCIL cathode

PECVD (DLC2): For a-C:H:Si coatings

OXI: For oxide coatings in a corundum structure

Cathodes
3 - 4



Hybrid
LACS®



Signature
Coatings



Cycle
≥ 5 h



Max. Load
200 kg



Solution
Turnkey



Service
Worldwide



411 Ultra Flexible Unit

FMS: High-performance sputtering cathode with maximum efficiency

Focused Magnetron Sputtering (FMS) is a breakthrough innovation. The cathode's sputtering power is concentrated in a constantly moving small region ("ring") with very high target power density. This results in a dense plasma with high ionization rates,

while at the same time delivering significantly faster deposition rates. With both superior performance and productivity, the patented FMS technology sets the new benchmark for DCMS and HiPIMS coatings for tools and components.



Industrial relevance and comparison to existing technologies

By simultaneously achieving HiPIMS-level plasma densities and DCMS-like productivity, FMS outperforms both and presents itself as a viable alternative to arc evaporation—without its drawbacks, such as droplet formation. FMS introduces new capabilities to the coating industry. By providing a stable, robust, and cost-effective process, it sets a new benchmark in sputtering technology—offering enhanced coating performance, increased productivity, and greater industrial scalability.



Highlights:

- **High plasma density:** FMS concentrates power into a small region ("ring"), resulting in 40x higher target power density than DCMS – a range that can otherwise only be achieved by HiPIMS technology. Due to the high plasma density of FMS, coating properties result in higher hardness as well as improved wear and corrosion resistance.
- **Higher deposition rate:** FMS has a higher deposition rate compared to HiPIMS technology, as it compresses the plasma spatially to achieve high ionization rates rather than concentrating power into short pulses. This enables FMS for industrial applications with high demands towards productivity and makes it a viable alternative to arc evaporation.



- **Enhanced coating homogeneity and reduced material loss:** The focused plasma minimizes uncontrolled particle formation, improving coating quality and purity. Thanks to the central cathode placement and unique magnetic confinement design of FMS (360° deposition), FMS ensures minimal target material loss and enhances coating efficiency.
- **Coating thickness uniformity:** By continuously moving the magnetic field vertically, the FMS technology ensures precise control of the coating thickness over the substrate height.
- **Higher ionization rates at lower costs:** FMS delivers high ionization degree without the need for expensive HiPIMS power supplies. Combined with its higher productivity, it achieves significantly lower costs per tool for high-end PVD coatings in comparison to HiPIMS technology.



411 Ultra Flexible Unit

Specifications

Etching technologies applied:

- LGD (Lateral Glow Discharge)
- Plasma etching with argon, glow discharge
- Metal ion etching (Ti, Cr)

Load and cycle times:

- Max. coating volume: \varnothing 540 × H 500 [mm]
- Max. coating height with defined coating thickness:
400 mm (ECO), 345 mm (SCIL), 420 mm (FMS)
- Max. load: 200 kg

Batch times Pi411 G3*:

Shank tools (2 μ m):	\varnothing 10 × 70 [mm]	504 pcs.	5–6 h
Inserts (3 μ m):	\varnothing 12 × 4 [mm]	4,788 pcs.	6–7 h
Hobs (4 μ m):	\varnothing 80 × 120 [mm]	42 pcs.	7–8 h

* Average cycle times in an ongoing production with max. number of cathodes in use.

Modular carousel systems:

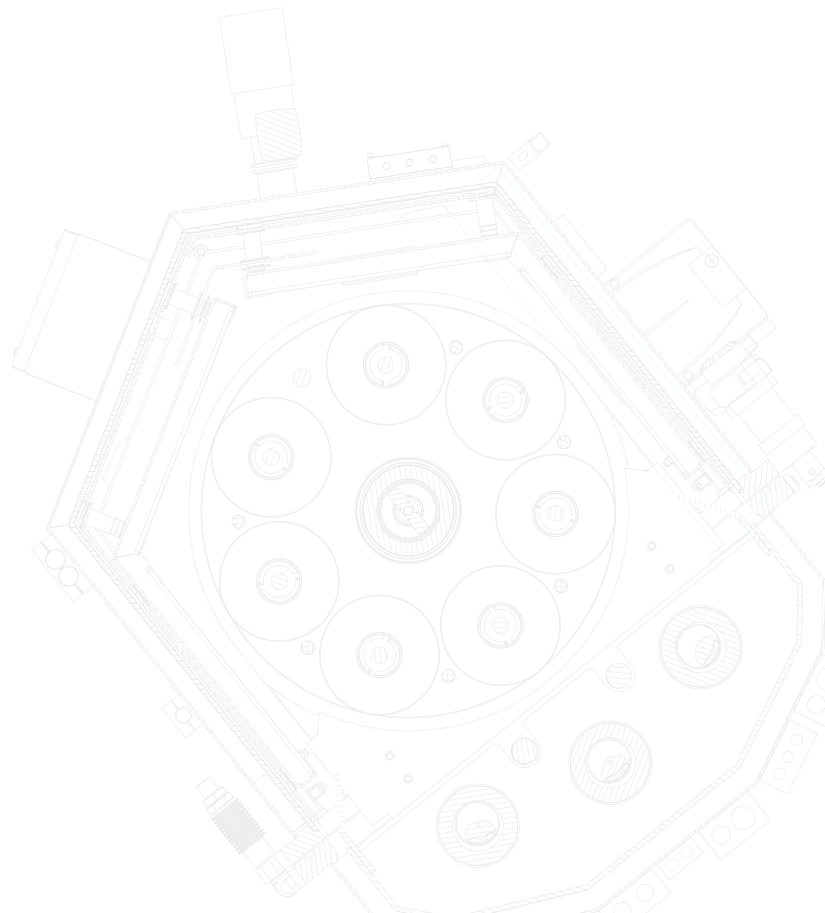
- 1 to 14 axes

Software:

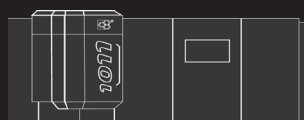
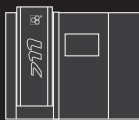
- Simple use and maintenance
- PLATIT SmartSoftware (PC and PLC system)
- Modern control system with touch screen
- Data recording and real-time display of process parameters and flow
- Manual and automatic process control
- Remote diagnostics and maintenance

Machine dimensions:

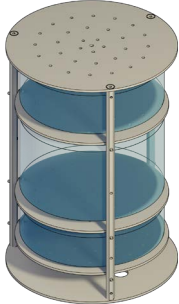
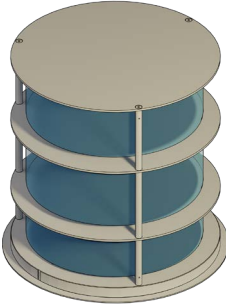
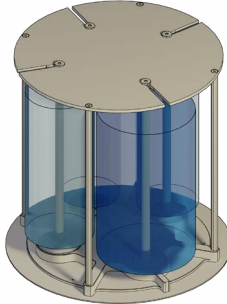
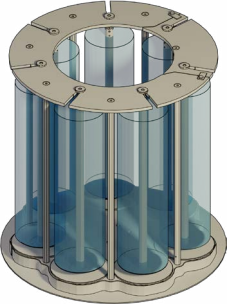

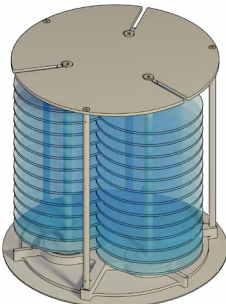
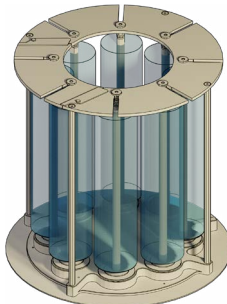
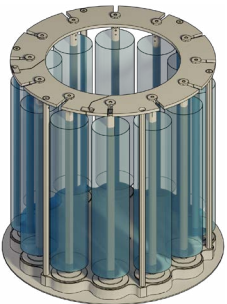
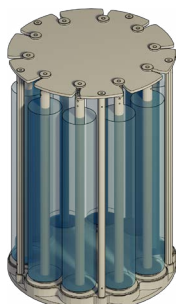
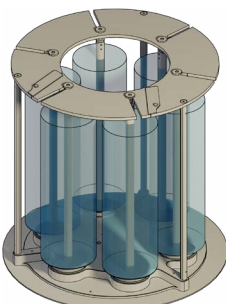
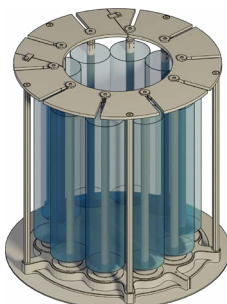
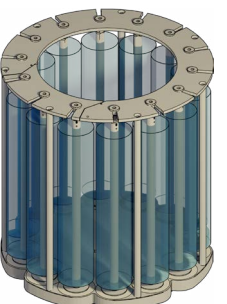
- Footprint: W 2,950 × D 1,900 × H 2,400 [mm]



11-SERIES ACCESSORIES



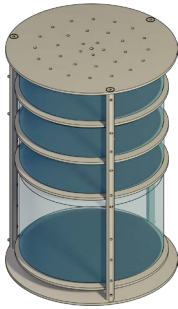
Carousels

	111	411		
Max. coatable height	498 mm	500 mm		
	 <p>Single rotation D ≤ 355 mm</p>	 <p>Single rotation D ≤ 500 mm for saw blades, D ≤ 460 mm for molds & dies</p>	 <p>4 asymmetric axes D3 ≤ 183 mm, D1 ≤ 250 mm</p>	 <p>7 axes for triple rotation for gearboxes D ≤ 143 mm</p>
	 <p>4 axes for continuous triple rotation for gearboxes D ≤ 143 mm</p>	 <p>3 axes for saw blades with overlap D ≤ 285 mm</p>	 <p>4/8 axes D4 ≤ 215 mm / D8 ≤ 115 mm</p>	 <p>6/12 axes D6 ≤ 145 mm / D12 ≤ 100 mm</p>
	 <p>10 axes for continuous double rotation D ≤ 77 mm</p>	 <p>3/6 axes D3 ≤ 220 mm / D6 ≤ 150 mm</p>	 <p>5/10 axes D5 ≤ 175 mm / D10 ≤ 94 mm</p>	 <p>14 axes D ≤ 85 mm</p>

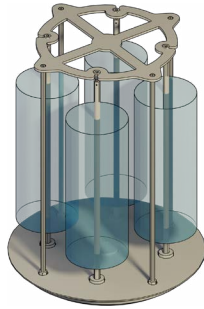
Exemplary illustrations
Special carousels available upon request

1011

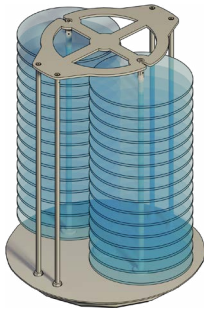
805 mm



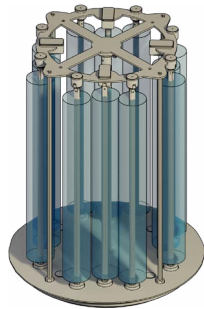
Single rotation
D ≤ 715 mm



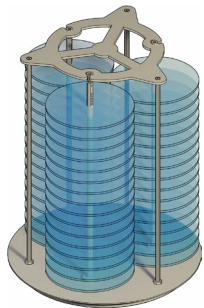
4 axes for kicker
D ≤ 270 mm



2 axes for saw blades with overlap
D ≤ 450 mm



4/8/12 axes for kicker
D ≤ 170 mm

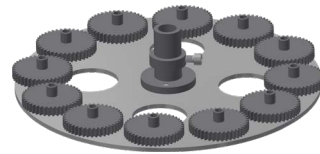


3 axes for saw blades
D ≤ 420 mm with overlap,
D ≤ 250 mm without overlap



10 axes for gearboxes
D ≤ 143 mm

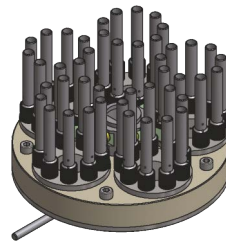
HOLDERS



Disc with gears



Gearbox with triple rotation



Quad gearbox for quad rotation

Loading capacities

Pi111 G3

Tool type	Tool diameter	Tool length	Satellites	Discs/ satellite	Holders/ disc	Tools/ holder	Tools/ disc	Tools/ batch	Holder type
Mirco Tool	3 mm	48 mm	4	4	8	10	80	1,280	H
	6 mm	48 mm	4	4	8	6	48	768	H
Shank Tool	3 mm	50 mm	4	5	8	10	80	1,600	D
	6 mm	50 mm	4	4	5	9	45	720	G
	6 mm	50 mm	4	4	8	4	32	512	D
	6 mm	50 mm	4	4	18	1	18	288	A
	8 mm	60 mm	4	4	18	1	18	288	A
	10 mm	70 mm	4	4	18	1	18	288	A
	20 mm	100 mm	4	3	12	1	12	144	A
Insert	12 mm	4 mm	4	38	18	1	684	2,736	C
Hob	75 mm	120 mm	10	3	1	1	1	30	F
	140 mm	120 mm	4	3	1	1	1	12	F

Pi111 TRM

Tool type	Tool diameter	Tool length	Satellites	Discs/ satellite	Holders/ disc	Tools/ holder	Tools/ disc	Tools/ batch	Holder type
Mirco Tool	3 mm	48 mm	4	4	8	10	80	1,280	H
	6 mm	48 mm	4	4	8	6	48	768	H
Shank Tool	3 mm	50 mm	4	4	8	10	80	1,280	D
	6 mm	50 mm	4	3	5	9	45	540	G
	6 mm	50 mm	4	4	8	4	32	512	D
	6 mm	50 mm	4	4	18	1	18	288	A
	8 mm	60 mm	4	4	18	1	18	288	A
	10 mm	70 mm	4	3	18	1	18	216	A
	20 mm	100 mm	4	3	12	1	12	144	A
Insert	12 mm	4 mm	4	38	18	1	684	2,736	C
Hob	75 mm	120 mm	10	3	1	1	1	30	F
	140 mm	120 mm	4	3	1	1	1	12	F

Pi411 ECO

Tool type	Tool diameter	Tool length	Satellites	Discs / satellite	Holders / disc	Tools / holder	Tools / disc	Tools / batch	Holder type
Micro Tool	3 mm	48 mm	7	4	8	10	80	2,240	H
	6 mm	48 mm	7	4	8	6	48	1,344	H
Shank Tool	3 mm	50 mm	7	4	8	10	80	2,240	D
	6 mm	50 mm	7	4	5	9	45	1,260	G
	6 mm	50 mm	7	4	8	4	32	896	D
	6 mm	50 mm	7	4	18	1	18	504	A
	8 mm	60 mm	7	4	18	1	18	504	A
	10 mm	70 mm	7	4	18	1	18	504	A
	20 mm	100 mm	7	3	12	1	12	252	A
Insert	12 mm	4 mm	7	38	18	1	684	4,788	C
Hob	80 mm	120 mm	14	3	1	1	1	42	F
	140 mm	120 mm	7	3	1	1	1	21	F

PL1011 SAT

Tool type	Tool diameter	Tool length	Satellites	Discs / satellite	Holders / disc	Tools / holder	Tools / disc	Tools / batch	Holder type
Shank Tool	6 mm	50 mm	4	7	15	4	60	1,680	E
	6 mm	50 mm	4	7	42	1	42	1,176	B
	8 mm	60 mm	4	7	42	1	36	1,176	B
	10 mm	70 mm	4	6	42	1	30	1,008	B
	20 mm	100 mm	4	5	23	1	23	460	B
Insert	12 mm	4 mm	4	2 × 35	42	1	1470	11,760	C
Hob	120 mm	120 mm	12	6	1	1	1	72	F
	140 mm	120 mm	10	6	1	1	1	60	F

Holder type:

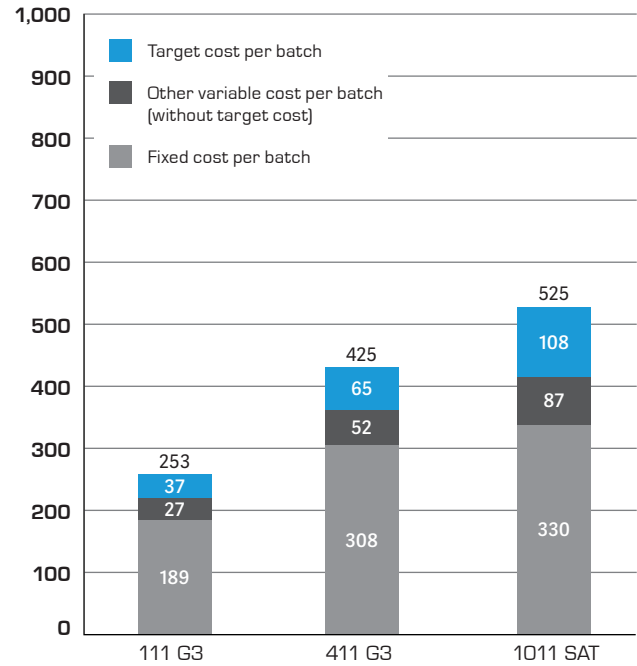
- A Tool in a sleeve, driven by a gearbox
- B Tool in a sleeve, driven by a kicker
- C Insert with a hole, speared on a rod
- D Tool in a revolver, driven by a gearbox
- E Tool in a revolver, driven by a kicker
- F Hob on a satellite / rod
- G Tool in a sleeve, driven by a quad gearbox
- H Tool in a micro tool holder, driven by a gearbox

Process cost comparison

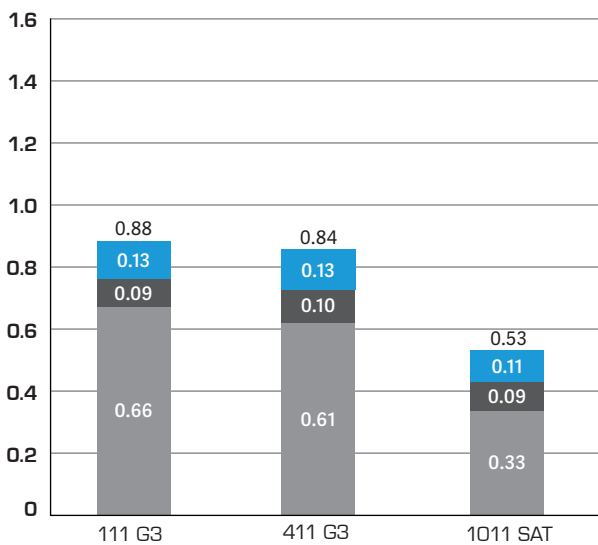
When calculating an investment in a PVD coating turnkey system, there are several variables to be taken into consideration. On this page we give you further insights about how fixed and variable costs add up for different PLATIT coating systems. We are using the case of a German SME coating 10 × 70 mm shank tools with three different coatings – AlTiN, Omnis and TiXCo3.

The diagram on the right visualizes that the majority of the batch costs of a PVD system are determined by the fixed costs. The main cost drivers are depreciation costs for the investment and the personnel costs for the operators. The variable costs, on the other hand, typically amount to less than one sixth of the total operating costs. In particular, the cost of the targets accounts for only 15–20% of the total cost per batch.

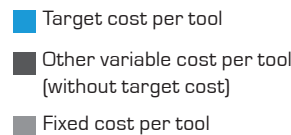
Cost per batch [CHF]:



Cost per tool [CHF]:



The diagram on the left visualizes the breakdown of cost per tool in different PLATIT coating systems. As it is shown in the diagram, the cost per tools decreases significantly in large-sized PVD coating units due to scale effects.



Detailed case description:
 German tool manufacturer, 10 × 70 mm shank tools
 Coatings: AlTiN (40 %), Omnis (40 %), TiXCo3 (20 %), 2µm on tool
 Costs included:
 Fixed costs: Investment in PVD system incl. production accessories, depreciation (8 years), operator wages (240 working days per year: 5am to 11pm), rental costs for space, unit maintenance
 Loading: Pi111 = 288 pc; Pi411 = 504 pc; PL1011 = 1008 pc.

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COMPENDIUM

