

Solutions for metalizing.

- Lighting
- Decorative
- Anti-fingerprint



Bühler solutions for metalizing.

Together we make cars even better.



As an important step toward expanding the Advanced Materials division within Bühler with a strategic focus on environmentally friendly and energy-saving technology, Leybold Optics was acquired in May 2012. With this acquisition, Leybold Optics became part of a family-owned conglomerate of specialists and technology partners for plant, equipment and services for various industries.

Bühler holds leading market positions in transforming raw materials into valuable food. The company is also a global innovation leader in aluminum die casting, wet grinding technologies for automotive paints and in large-scale lithium-ion battery electrode slurry production. The industrially proven vacuum thin-film coating solutions made by Bühler Leybold Optics perfectly complement this portfolio for automotive and other applications.

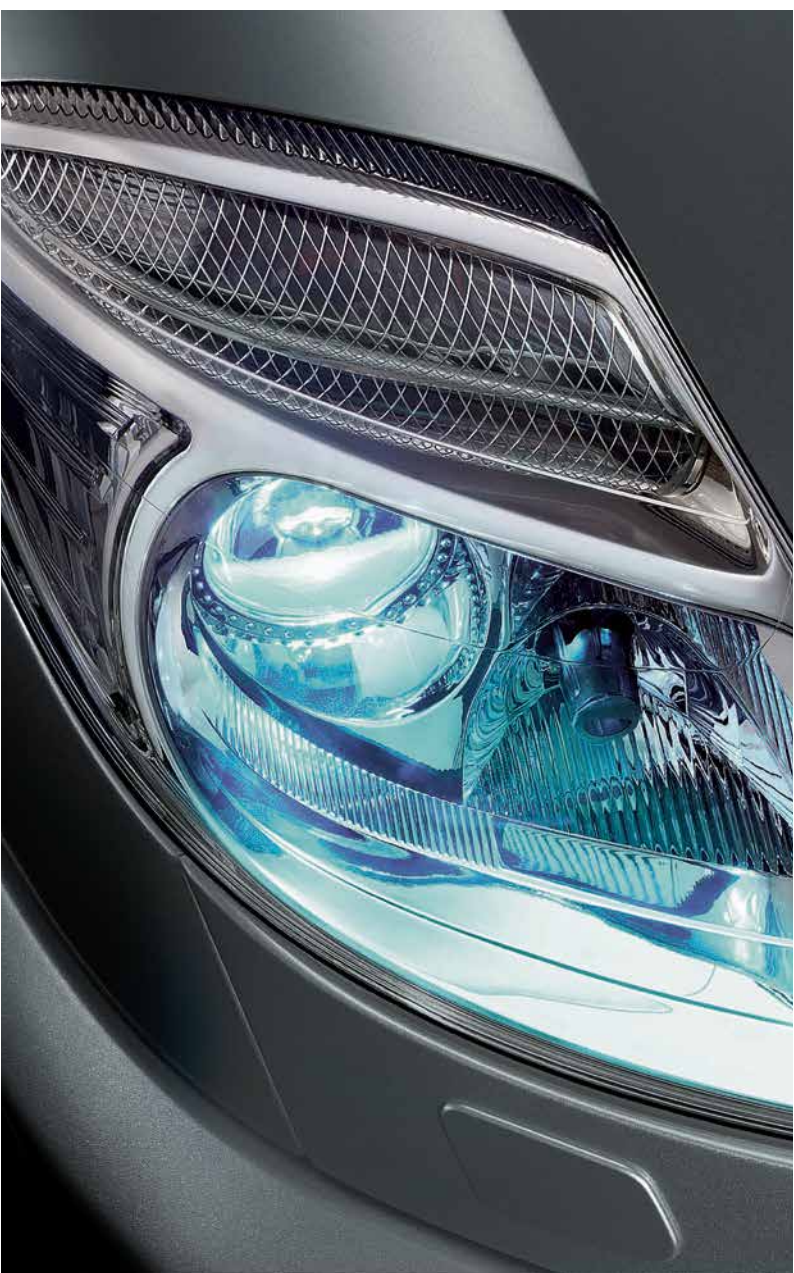
Within Bühler, we are stronger than ever and in an even better position to drive our most modern coating solution, process expertise and 1st class service and thus keep our leading role in optical thin-film vacuum deposition equipment. Over the next few years, we plan to focus on our existing expertise in emerging markets with our most eco-friendly coating solution and an outstanding cost-performance ratio. Additionally, we will invest in high-class technology for developed markets to provide new applications.

We are centering our efforts on ensuring our customers' success by improving our core component technologies with a strong focus on cost of ownership.

Every year we spend a significant amount on basic research and applied development to further improve our technology with regard to quality and precision, sustainability, serviceability and the ecological footprint of our design and systems.

Yours sincerely

Antonio Requena
Managing director
Bühler Alzenau GmbH
Leybold Optics



Metalizing solutions – portfolio overview.

Leybold Optics evaporation systems.

CompactMet

The CompactMet is a high-vacuum metalizing system designed for the continuous production of complex plastic, metal, glass and ceramic substrates.

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AluMet 1800V

The AluMet 1800V coats even the most complex parts with ease while meeting exacting, precise demands regarding quality and flexibility.

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Applications:

- Reflectors for automotive and vehicle lighting
- Reflectors for interior and exterior lighting
- Decorative coatings for parts like perfume bottles, designer jewelry

Leybold Optics special application system.

Atalanta

The Atalanta batch system was designed to meet the individual market's requirement for easy-to-clean coatings in mass production.

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Application:

- Hydrophobic layer process for antifinger-print application

Leybold Optics sputtering systems.

DynaJet

The DynaJet is a sputtering batch system for 3D coatings. It is designed to achieve the lowest cost per piece, also by minimizing energy consumption.

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DynaLine

The DynaLine series is designed for coating reflectors, bezels and other parts with complex 3D geometries.

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DynaMet 4V

The DynaMet 4V is a fully automated, ultra-fast, load/lock type sputtering machine, which can be integrated into fully automated conveyor systems.

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PylonMet

The PylonMet combines high throughput with excellent coating results and is of particular interest for industries with demanding requirements.

Page 24



Applications:

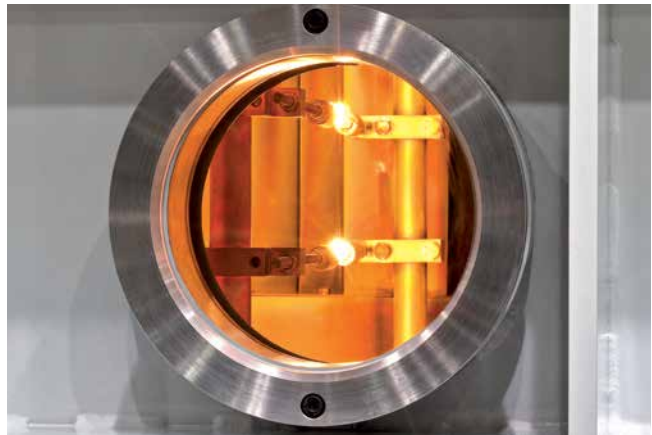
- Reflectors for automotive and vehicle lighting
- Reflectors for interior and exterior lighting
- Decorative coatings for parts like perfume bottles, designer jewelry
- Color coatings by sputter processes
- Semi-transparent layer coatings
- Mirror coatings

CompactMet – flexible evaporation system. Fast cycle time for the production line.

The CompactMet batch coater is designed to meet the market's requirement for a system with an improved value. The system is a high-vacuum metalizing solution for the continuous production of complex plastic, metal, glass, and ceramic substrates.



Evaporator and substrate inside the chamber



Evaporation in process

High reliability thanks to smart und robust design

The CompactMet is deployed in daily mass production in the automotive industry and has demonstrated unmatched reliability and productivity. Maintenance requirements have been kept to a minimum through the consistent implementation of a robust and smart machine design.

Efficient processing for high productivity and flexibility

Besides the intuitive and state-of-the-art HMI, the machine concept itself offers considerable benefits for industrial mass production applications. The double-door "clam shell" configuration, with two substrate holders per door, facilitates highly efficient processing.

Consistent and perfect end product quality through reliable and innovative technology

Well-proven key components such as the high-rate thermal aluminum evaporator unit and the high-performance PECVD station, with its four MF-powered electrodes, ensure an excellent and consistent quality of the deposited aluminum and siloxane protective top-coat layers.

Compact design for space-saving deployment and fast repositioning

With an optimized footprint (approx. 30 m² in total), the CompactMet is mounted in a compact and easy-to-handle steel frame. This allows easy and fast installation and, if necessary, relocation, of the system. Once installed, the CompactMet system occupies a minimum of facility floor space.



CompactMet by Leybold Optics



Technical information:

Key figures of the system

- Substrate holder dimensions: 1,500 x 540 mm
- Coating area: 5.1 m²
- Cycle time: 5–7 min

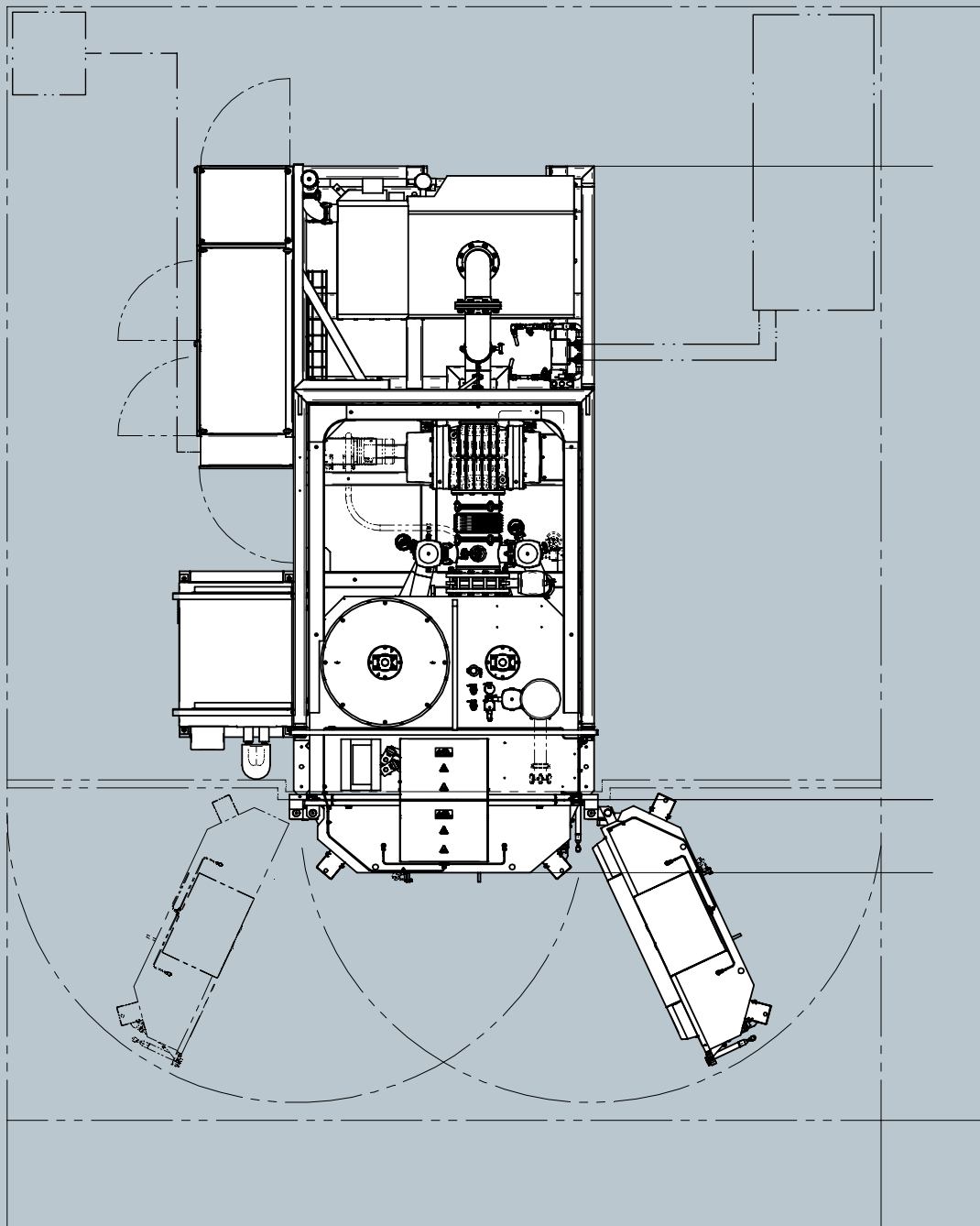
Features

- Single-frame mounted design
- One chamber, two doors, vertical orientation
- Advanced controller with simple control interface and remote service access online

- Automatic process control
- Batch report and data logging for quality control, process evaluation and optimization
- Plasma polymerization technology
- Single bar plasma electrode, easy to exchange
- Monomer box for HMDSO with temperature stabilization
- Standard monomer feed with needle valve

CompactMet – flexible evaporation system. Fast cycle time for the production line.

Floor plan





AluMet 1800V – productive evaporation system. For a high output of complex parts.

The AluMet 1800V batch coater is the perfect solution for coating even the most complex parts with ease while meeting exacting demands regarding quality and flexibility.

Generous load capacity and short cycle time

The intuitive, state-of-the-art HMI of the AluMet 1800V and its fully automated process control consistently guarantee high throughput with perfect results. Highly efficient processing is further aided by the double-door

design with a set of six pylons per door. The powerful vacuum pumping system, the highly efficient thermal evaporators and high-rate PECVD (Plasma Enhanced Chemical Vapor Deposition) sources are the key to short cycle times.

AluMet 1800V by Leybold Optics





Door fully loaded with substrates

Low production cost

The AluMet 1800V uses the consumables that drive production costs, such as evaporator filaments and aluminum evaporation material, highly efficiently. Furthermore, the optimized aluminum evaporator geometries allow maximum collection efficiency, which results in a high evaporation material utilization.

Robust design for high reliability

Deployed in the automotive industry worldwide, the AluMet 1800V is more than capable of demonstrating its unique reliability and robustness in a mass production context. All key components, such as the evaporators and the PECVD stations, are designed for 24/7 production and, to ensure a high machine uptime, all serviceable components are easy to access and simple to maintain.

Versatile pylon system for more flexibility

The planetary substrate holder system with its six pylons per door is capable of handling a wide range of substrate types and sizes. This makes Bühler Leybold Optics' AluMet 1800V a very versatile and flexible system, suitable for many different production scenarios and environments. In addition, the ergonomic design of the pylon holder system allows fast and easy handling of the pylons during loading/unloading of substrates.

Compact design means minimum floor space

The AluMet 1800V is mounted in a compact and easily handled steel frame. As a result, the system has a space-saving footprint of approx. 45 m² in total. The machine's steel frame makes its installation and, if required, relocation, fast and straightforward.

Technical information:

Key figures of the system

- Substrate holder dimensions, for example with 6 pylons: 1,500 x 540 mm
- Coating area: 15.2 m²
- Cycle time: 15–25 min

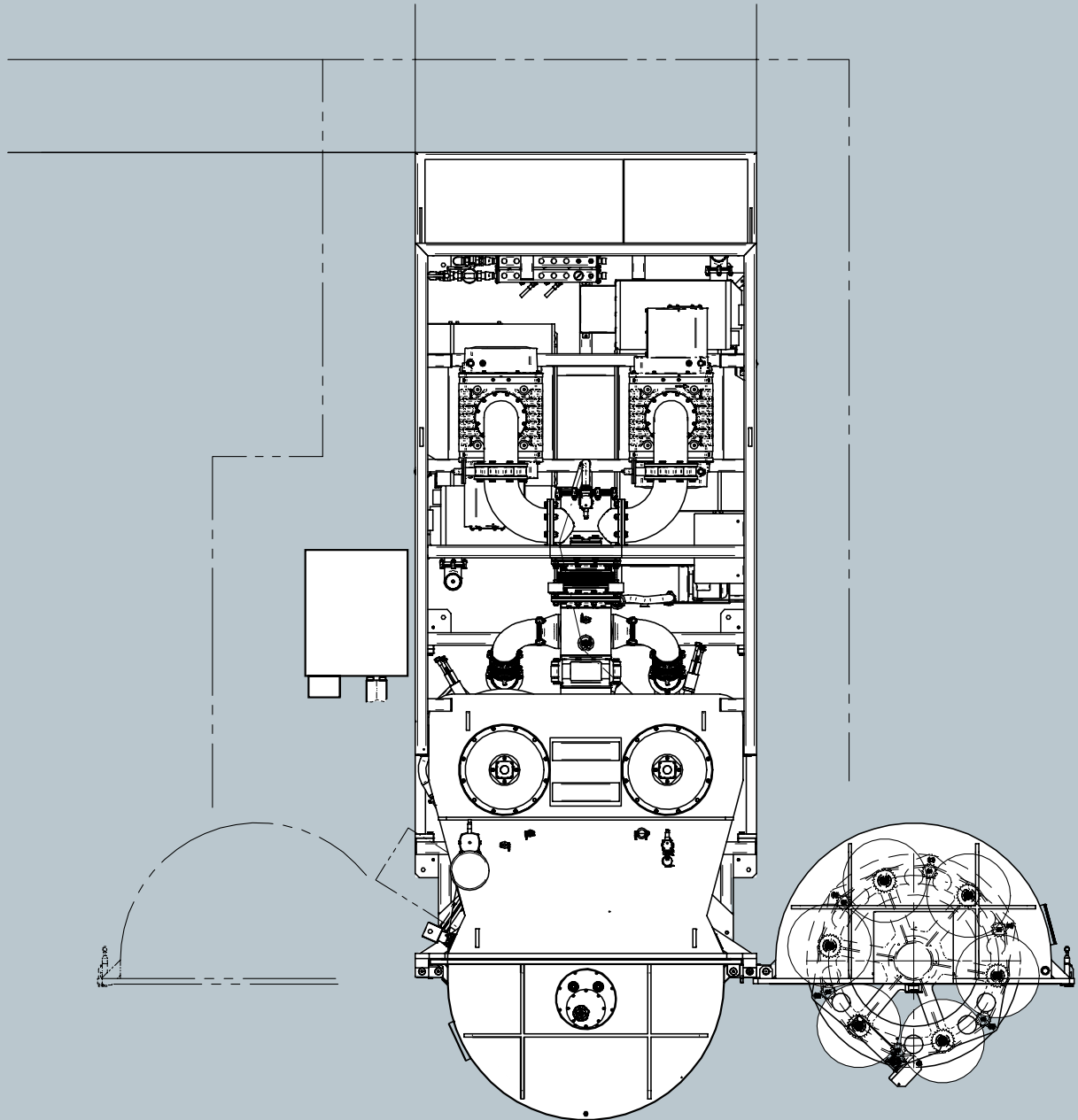
Features

- One chamber, two doors, vertical orientation
- 1,800 mm diameter chamber

- Prepared for the future, e.g. with long tail lamps
- Compact footprint
- Improved product flow, less work in progress
- Easy to operate
- Powerful pump set for short cycle times and high productivity
- Single-frame mounted design
- Advanced controller with simple control interface

AluMet 1800V – productive evaporation system. For a high output of complex parts.

Floor plan



Atalanta – special application system. Hydrophobic layers for anti-fingerprint coating.



The Atalanta batch coater is tailored for the market requirements of various industries and offers improved value. With this system, anti-fingerprint coatings can be applied to complex plastic, metal, glass, and ceramic substrates in a continuous production process.

High productivity thanks to flexible double-door design

The double-door design offers clear advantages when it comes to high productivity and flexibility in large-scale production. One door's pylons can be loaded/unloaded while the pylons on the second door are being processed. This helps to minimize the times between batches while also offering considerable flexibility in respect of your up- and downstream production.

High-performance PECVD station for consistently brilliant end product quality

The high-performance PECVD station, with its four MF-powered electrodes, consistently guarantees the exact SiO_x base-coat characteristics for perfect anti-fingerprint layer adhesion and strength, while the high-rate thermal evaporator unit ensures an outstanding and consistent quality of the deposited anti-fingerprint coating itself.

Robust and smart design for high machine uptimes and reliability

The robust and smart machine design keeps maintenance to a minimum, with all serviceable parts easily accessible and simple to maintain, ensuring a high machine uptime.

Minimum facility floor space thanks to compact design

The Atalanta is mounted in a compact and easy-to-handle steel frame, a configuration that enables fast and uncomplicated machine installation or, if required, relocation. Once installed, the Atalanta occupies only a minimum of facility floor space, approx. 30 m² in total.

Atalanta by Leybold Optics



Technical information:

Key figures of the system

- Substrate holder dimensions: 1,500 x 540 mm
- Coating area: 5 m²
- Cycle time: 8–10 min

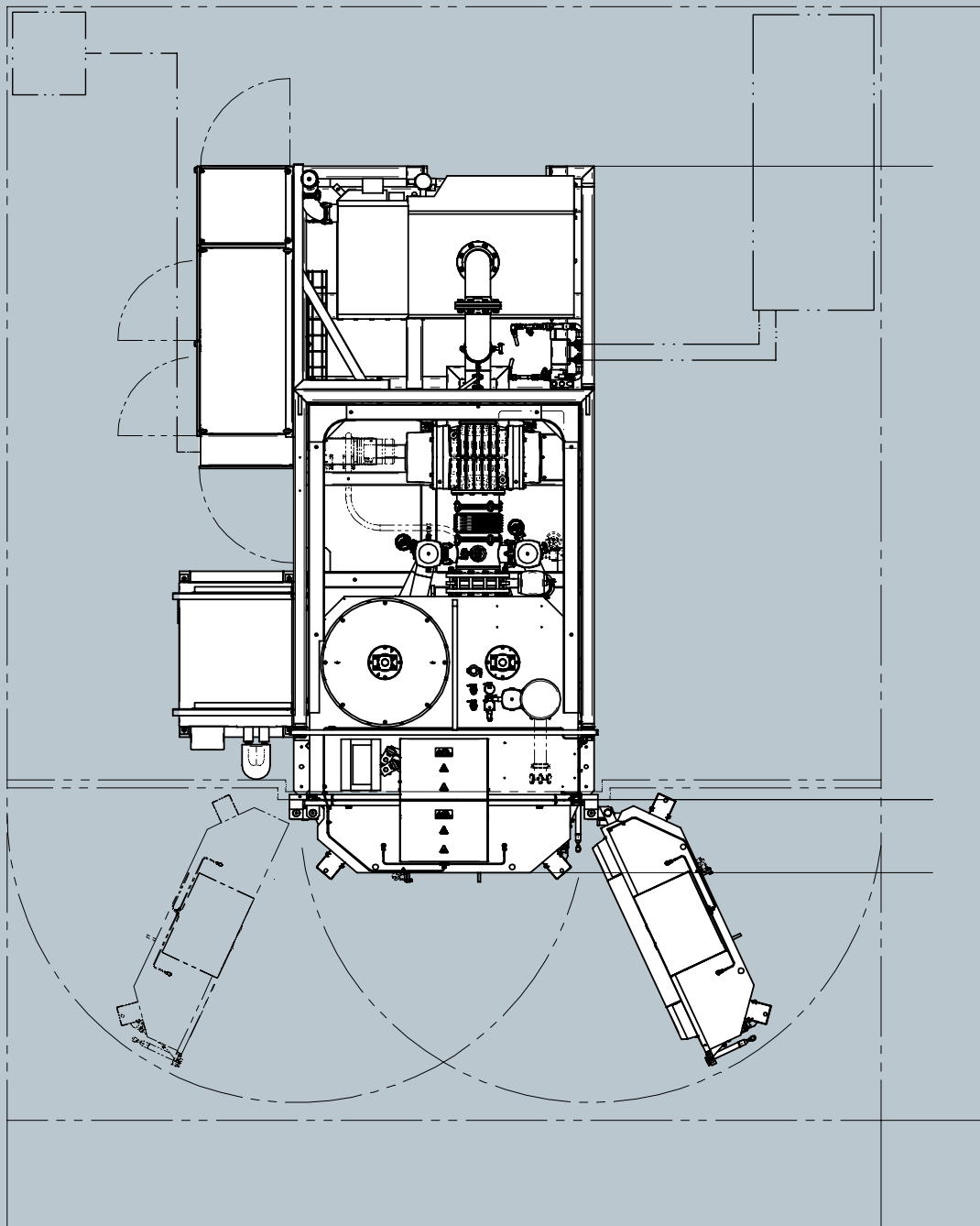
Features

- High productivity thanks to flexible double-door design

- High-performance PECVD station for consistently brilliant end product quality
- Robust and smart design for high machine uptimes and reliability
- Minimum facility floor space thanks to compact design

Atalanta – special application system. Hydrophobic layers for anti-fingerprint coating.

Floor plan



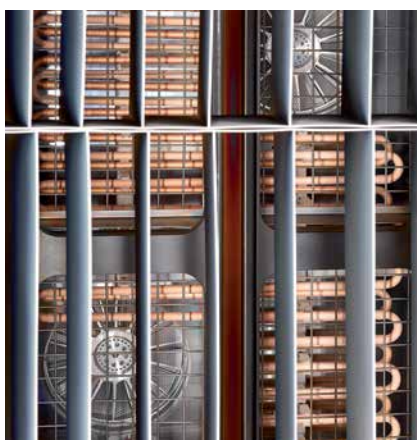
DynaJet – vacuum sputter system.

Energy- and cost-efficient coating.

The DynaJet is the newest member of the DYNA family of PVD systems from Bühler. This batch sputtering system combines the best of all the PVD expertise that Bühler has to offer. Rotatable cathodes provide a new dimension in productivity. And the high target utilization offers lower cost of ownership due to a long target lifetime. The turbo molecular pumps of the DynaJet need only a fraction of the electrical energy and cooling water compared to conventional systems. All this allows a significant reduction of the yearly ownership costs.



Rotary cathode



Turbomolecular pumps behind cold trap and chevron



Energy saving turbomolecular pump

New perspective for the automotive industry

With the DynaJet, Bühler combines innovations from Large Area Glass Coating, Roll-to-Roll Flexible Web Coating, and 3D Coating to bring a fresh perspective to the mature automotive marketplace.

As a result, lowest energy usage, less environmental impact and lower maintenance costs are the key features of this new sputtering system.

Targets – long lifetime and easy maintenance

The DynaJet offers highest target utilization with 70–80 %. As a result, the target lifetime can be increased by 4 times. Cathode side doors offer easy handling for changing targets. A system-mounted crane for easier handling is available as an option.

Compact system with smart features

The small machine footprint is a further advantage of the DynaJet. A stand-alone pre-vacuum pump set can be placed anywhere around the system, even on a mezzanine. The open design of the system makes components easily accessible.

The optional automated slide door allows for single-point human or robot loading of the system. An open floor plan provides proper heat distribution and heat control.



DynaJet by Leybold Optics



Technical information:

Key figures of the system

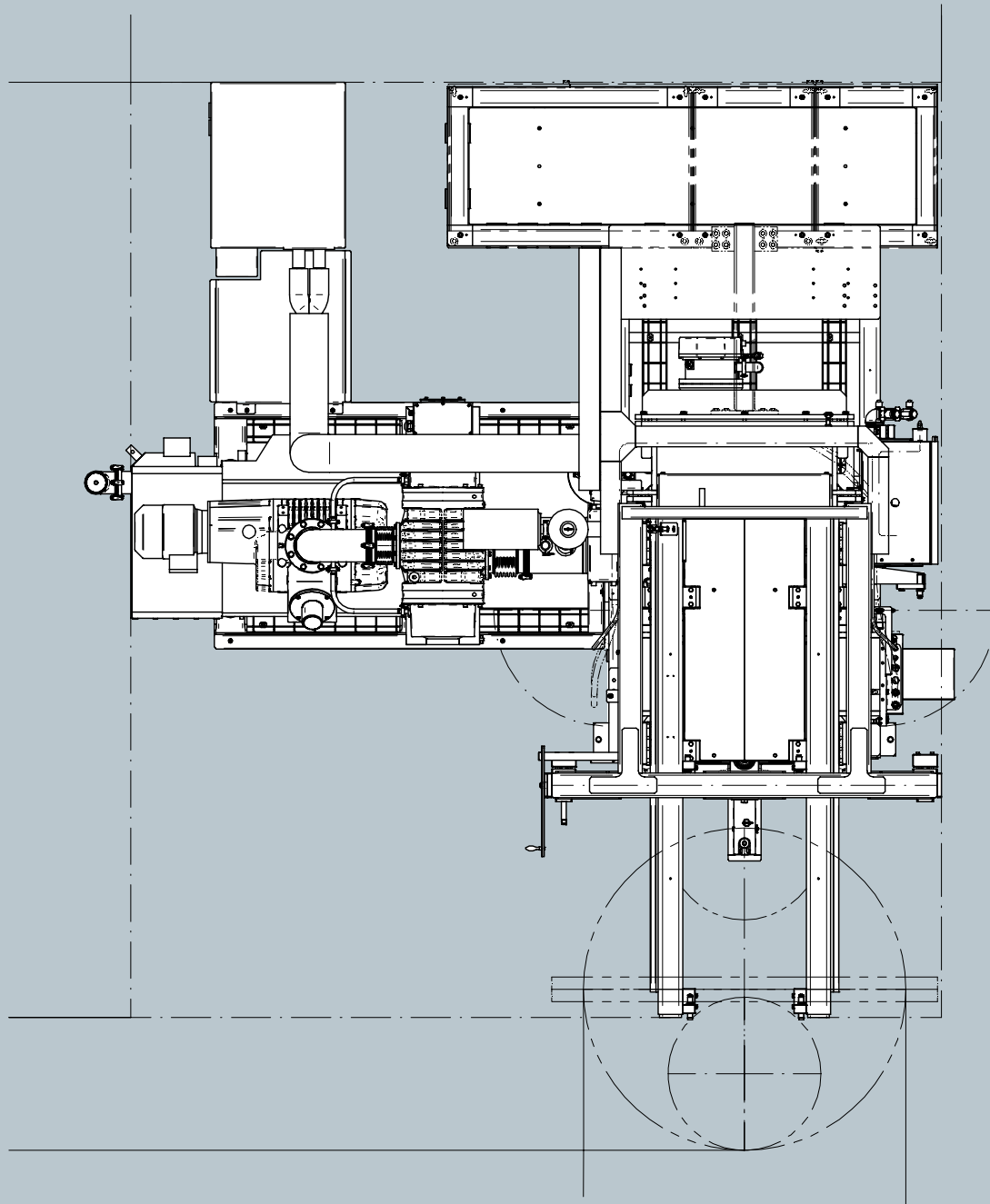
- Substrate holder dimensions: 1,270 x 750 mm
- Coating area: 3 m²
- Cycle time: 4–6 min

Features

- Save 800,000 kWh of electrical energy in 10 years/ reduce consumption costs for electrical power and cooling water
- Symmetrically arranged cryo-coil over the pylon length for homogeneously distributed outgassing
- Rotatable cathode for maximum target utilization and lower cost of ownership
- Very fast CVD process with frequency-controlled three-stage pump unit
- Remote online service access

DynaJet – vacuum sputter system. Energy- and cost-efficient coating.

Floor plan





DynaLine – high-throughput sputter system. Inline sputtering for large and small parts.

The DynaLine series provides coating of reflectors, bezels and other parts with complex geometries with high throughput rates. DynaLine is able to coat both large and small 3-dimensional parts. The modular concept ensures precise adaptation to customer needs, with flexible expansion options to allow multiple process chambers in the future. The system offers a compact footprint and can be integrated easily into an automatic conveyor system.

Perfect for fully automated conveyor systems

The DynaLine is a fully automated modular inline sputtering machine for the automotive industry.

Thanks to the modular concept, the machine can be integrated into fully automated conveyor systems and can be customized to specific configurations. Substrates are loaded into a carrier and will be processed sequentially by means of static deposition processes.

Tailored for high throughput production

The backbone of the system is the magnetron sputter deposition with IPT (Inter Pole Targets) for the high-rate deposition of metals and the advanced MF (Mid-Frequency) PECVD (Plasma Enhanced Chemical Vapor Deposition) for the deposition of siloxane top coat.

Highly efficient pumping systems, a robust carrier drive and precise vacuum lock systems are further advantages of the machine.



Metalization module with IPT cathodes



PECVD station with electrodes

DynaLine by Leybold Optics



Technical information:

Key figures of the system

- Substrate holder dimensions: 1,200 x 900 mm
- Depth: 250 mm
- Coating area: 1.08 m²
- Cycle time: 60 sec

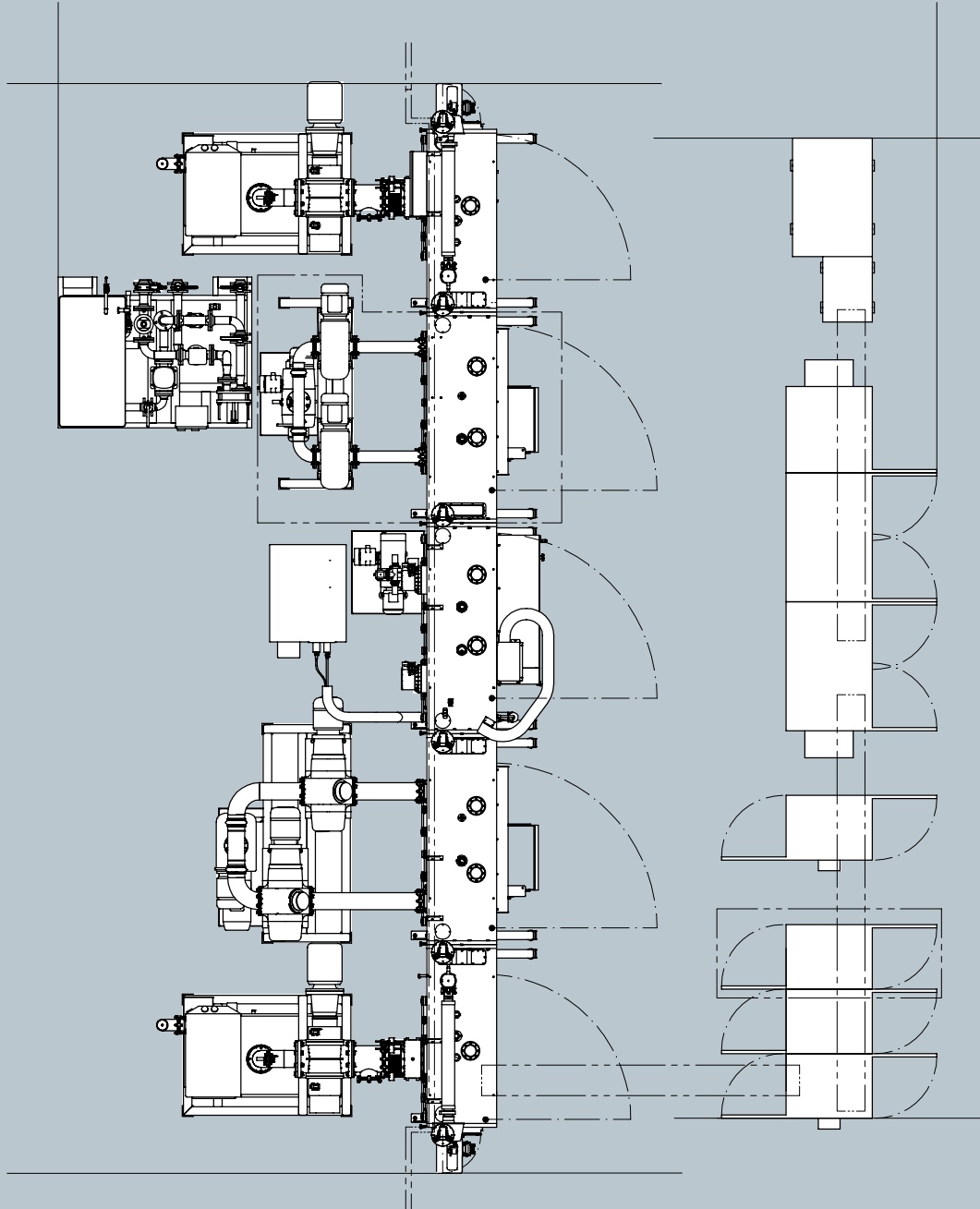
Features

- High-speed, plasma-assisted metalization with protective polymer coating of plastic and glass substrates
- Vertical orientation of chambers and substrates
- Rectangular carrier for substrate transport

- High-speed carrier movement between process stations
- Static deposition onto front of substrate
- Al metallization by high-rate magnetron sources (IPT) in sputter chamber
- Plasma polymerization assisted by MF glow system in PECVD chamber
- High-speed vacuum pumping system for quick pump-down
- Data logging of process data with individual carrier tracking

DynaLine – high-throughput sputter system. Inline sputtering for large and small parts.

Floor plan



DynaMet 4V – vacuum sputter system.

Fully automated vertical sputtering.



The DynaMet 4V is a fully automated, ultra-fast, load/lock type sputtering machine for the coating of 3-dimensional parts. The machine can be integrated into fully automated conveyor systems. The substrates, loaded into a carrier, will be processed sequentially by means of static deposition processes. The backbone of the system is the cycle-time-optimized drum-type carrier movement system, high-rate IPT (Inter Pole Target) magnetron metal deposition sources and a PECVD (Plasma Enhanced Chemical Vapor Deposition) source for the deposition of top coats. A highly efficient pumping system is a further characteristic of the machine.

Rotary carrier movement system offers high productivity

With regard to cycle time, the backbone of the DynaMet 4V vertical coating machine is the rotary carrier movement system. In combination with the high-rate IPT (Inter Pole Target) magnetron for metal deposition and the PECVD (Plasma Enhanced Chemical Vapor Deposition) sources for top-coat deposition, very fast cycle times can be achieved.

Inline process ensures a maximum process reliability

Due to the quasi inline process approach of the DynaMet 4V, the individual processing areas are constantly under perfect process conditions. This machine configuration allows maxi-

mum process reliability and stability, resulting in an excellent and constant layer quality.

Better economy thanks to full automation capability

The DynaMet 4V is well prepared for loading and unloading of the work pieces using fully automated robot or conveyer technology. When applied, automatic substrate handling effectively reduces the cost per piece and therefore increases the overall profitability of the system significantly.



DynaMet 4V by Leybold Optics



Technical information:

Key figures of the system

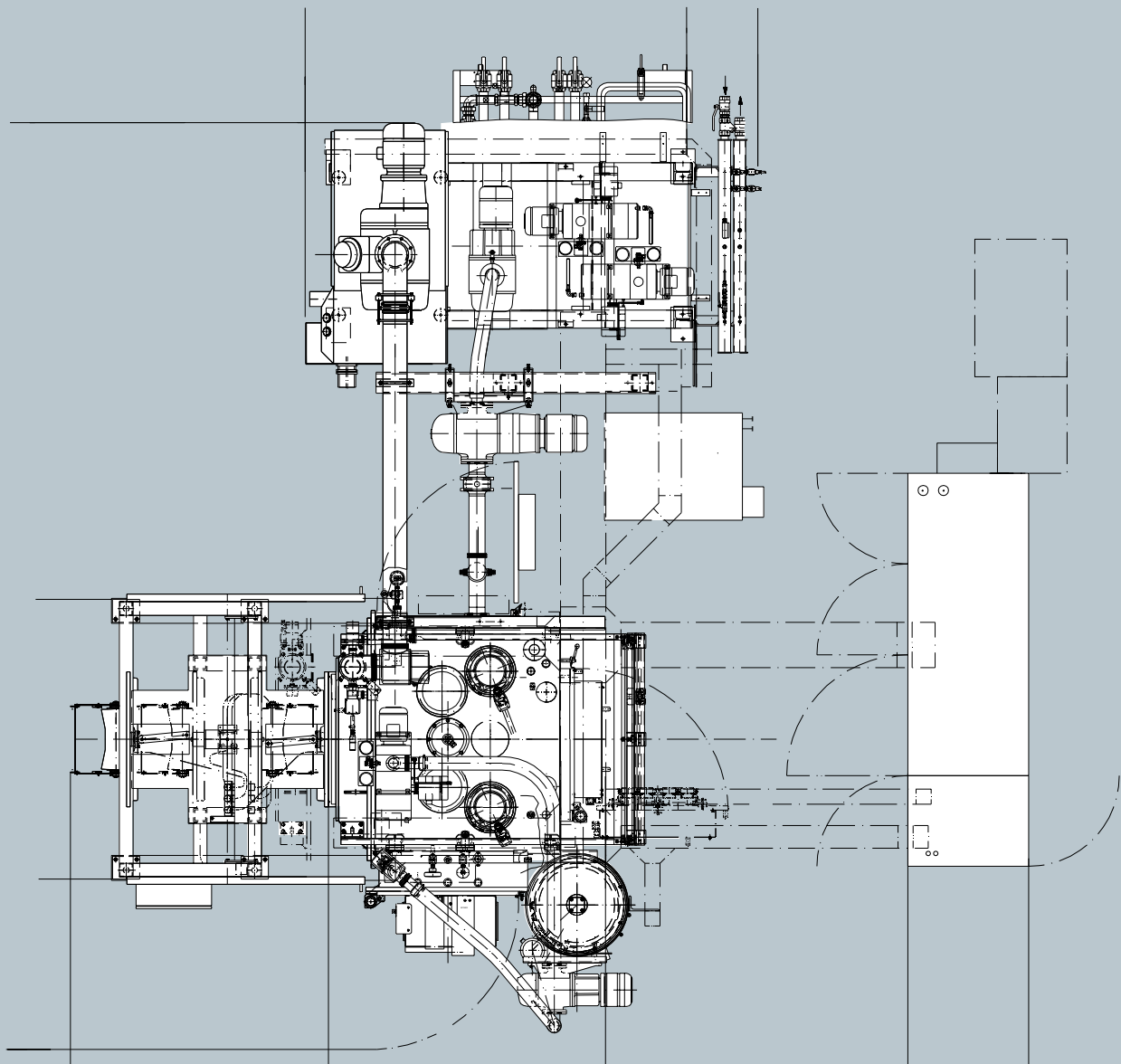
- One carrier per cycle, usable coating area:
840 x 440 mm
- Depth: 250 mm
- Cycle time: 36 sec

Features

- Vertical arrangement
- Load-lock type circular system
- Substrate carrier configuration, capable of being integrated into a fully automated conveyor system

DynaMet 4V – vacuum sputter system. Fully automated vertical sputtering.

Floor plan



PylonMet – color vacuum sputter system.

Sputtering coater for just-in-time processes.



Reflectors with colored coating



Various colors are available

The PylonMet enables industries to meet the requirements of “just-in-time” manufacturing by combining high throughput with excellent coating results. PylonMet is a batch-type sputtering system, capable of handling the metalization of large substrates, and offers an impressive process capability, including color coatings, gray tones, and plasma polymerization.

High productivity due to swivel-type front door design

The swivel-type front door allows highly productive processing and loading/unloading sequences. Substrates are loaded to an easy-to-access pylon or optionally to a planetary-substrate-fixuring system.

Flexible sputtering system for a wide range of applications

The machine concept allows flexible configuration and accomplishment of a wide range of applications. This includes magnetron sputter deposition with IPT (Inter Pole Targets) for the high-rate deposition of metals and reactive magnetron sputtering with IPT or rotatable targets for the deposition of metal-nitride or metal-oxide layers.

The advanced MF (Mid-Frequency) PECVD (Plasma Enhanced Chemical Vapor Deposition) deposition source allows the deposition of transparent top coats and enhanced wipe-resistant layers.

Efficient pumping units and easy handling thanks to single-frame mounted system

Further key elements are the efficient vacuum pumping system including an effective cryo-coil system and a flexible process-gas management system. The entire machine is installed in an easy-to-handle steel frame. This single-frame mounting ensures rapid installation at the customer's site.



PylonMet by Leybold Optics



Technical information:

Key figures of the system

- Substrate holder dimensions: 1,270 x 750 mm
- Coating area: 3 m²
- Cycle time: 4–7 min

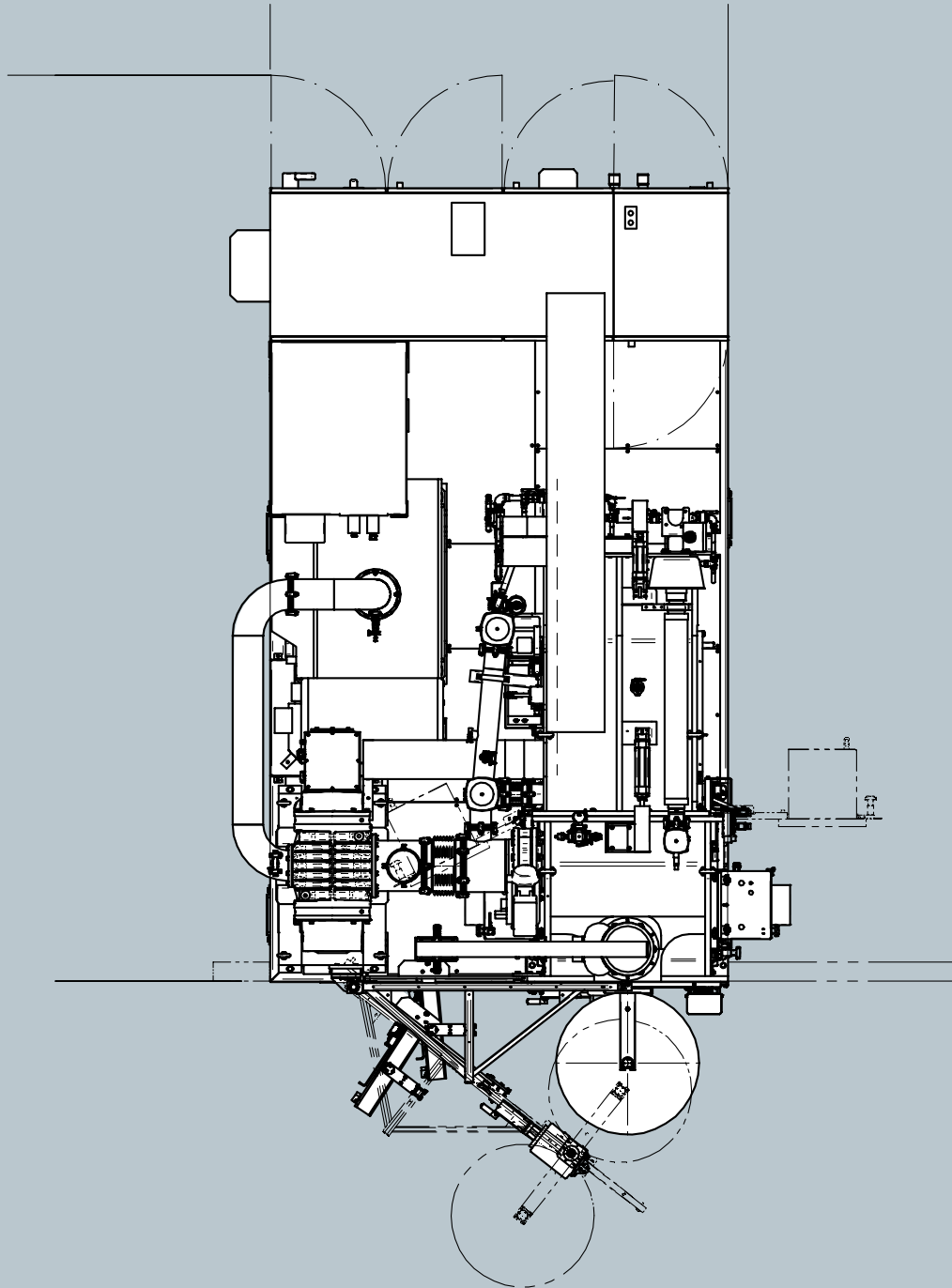
Features

- Modular sputtering power supplies the 90 kW OEM version (30 kW modules) with fast Bühler arc management

- Reduced distance between sputter target and outer diameter of the pylon (increased sputtering rate)
- WH4400 roots blower, optimized frequency controlled for faster cycle times
- Optional, color-coating kit (for standard system only)

PylonMet – color vacuum sputter system. Sputtering coater for just-in-time processes.

Floor plan



Leybold Optics metalizing systems. First-class industry solutions since decades.



Bühler Leybold Optics – milestones at a glance:

- 1950's** Application of metalized coatings.
- 1960's** Industrial applications through bell-jar batch systems.
- 1970's** AluMet evaporative batch metalizing system.
- 1990's** Development of DynaMet sputter metalizing system.
- 2000's** Development of PylonMet for metalizing large complex parts.
- 2006** Development of DynaLine inline sputter metalizing system and vertical AluMet batch metalizing system.
- 2007** Development of PylonMet for color process.
- 2008** Development of CompactMet evaporation metalizing system.
- 2011** Development of Atalanta evaporation system for easy-to-clean processes.
- 2014** Development of DynaJet sputter metalizing system.
- 2015** Development of new generation AluMet sputter metalizing system.

Leybold Optics metalizing solutions. Technologies at a glance.

Evaporator systems

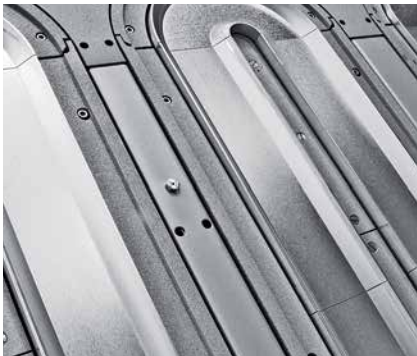


Filament loaded with Al



View inside the process chamber

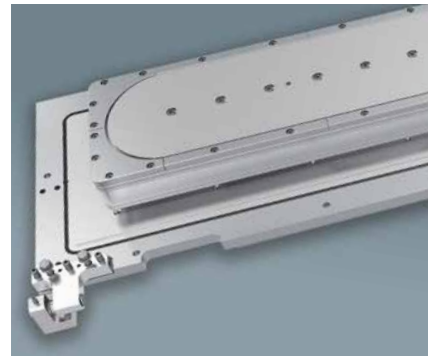
Sputter cathode systems



IPT cathode



Rotary cathode



HLK cathode

PECVD systems



High speed PECVD provides best results for distribution over the length and depth:

- Large electrode surface in optimized position
- Optimized power-electrode relationship
- Electrical supplies are available for
 - DC
 - AC
 - MF 40 kHz
 - RF 13,56 MHz

Treatments.

Plasma pre-treatment, glow discharge

This process increases the adhesion by cleaning and activating the substrate surface.

Basecoat

This process improves the quality of the surface and prepares the growth of the subsequent metalization.

Metalizing by evaporation or sputtering

This process transfers the metal onto the substrate to form an optically reflective layer. Alternatively reactive sputtering can be used to modify the characteristic properties such as transparency, conductivity, hardness and color.

Plasma post-treatment, topcoat

Metal reflectors – especially aluminum – require a transparent protection layer against corrosion. Such a layer is made by plasma-polymerization of silicones such as Glipoxan™.

Surface energy adjustment by plasma post-treatment

Depending on application requirements, a high (hydrophilic) or low (hydrophobic) surface energy is required. This is reached by plasma post-treatment steps. “Haze-no-More” or “Hydroxan™” are process names known in the industry for hydrophilic surface finishes.

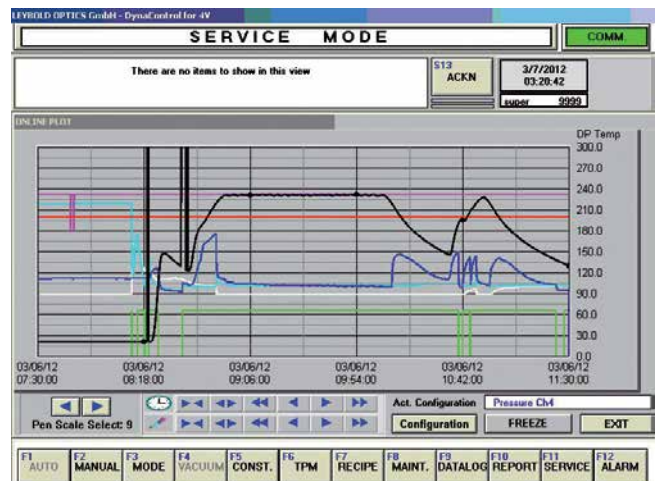
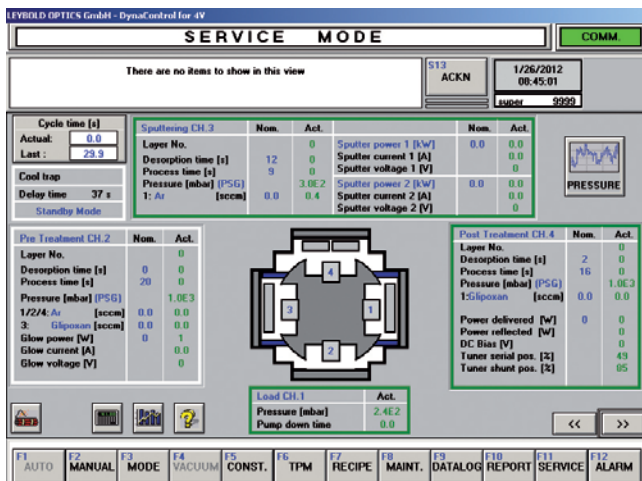
Software features.

Process control software (PLC)

Configurations are available with modules of Beckhoff, Siemens and Allen Bradley.

Human machine interface visualization

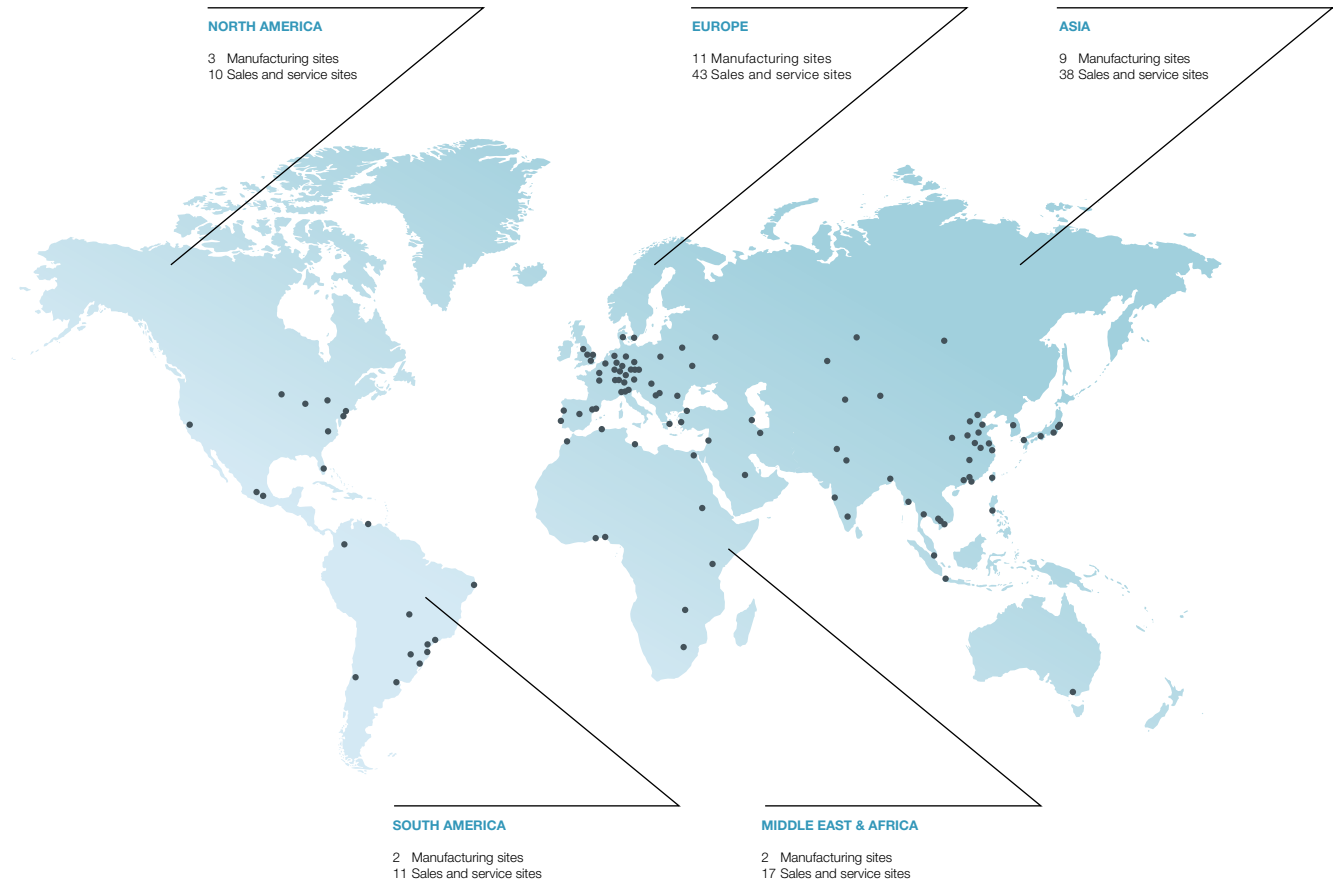
- Touch screen monitor for quick operation
- Batch report for fast production overview
- Trend view to visualize both historical and actual data as graph
- Data logging for complete analysis



Customer support and services.

Always on hand to sustain your business.

Global presence of Bühler



Bühler Leybold Optics' relationship with its customers does not end once the machines start production — it is a continuation and an extension of a close partnership. Wherever Bühler Leybold Optics machines are, one of the worldwide centers of competence is close to your site. The company therefore ensures that you receive the right support so that your machines deliver perfect product quality and benefit from high uptime.

Bühler's worldwide customer service as well as the fast delivery of replacement and wear-and-tear parts are just two important aspects of customer support. Preventive maintenance and inspection together with machine re-conditioning and upgrading round off the after-sales services. Contact information for Bühler's worldwide

services can be found on the company's homepage: www.buhlergroup.com.

Bühler Leybold Optics' service commitment to customers guarantees fast identification of parts, components or consumables, tracked and logged to ensure readiness for shipment within one day so that fast delivery to any country in the world is possible.

Bühler is a specialist and technology partner for metalizing solutions. With its expertise and over 150 years of experience, Bühler continuously rolls out unique and innovative solutions for its customers, helping them achieve success in the marketplace. The Bühler Group operates in more than 140 countries and has a global payroll of over 10,000.



HELPDESK

- Always available during German, US and Asian business hours: contact the Helpdesk of your local service or at headquarters. The phone numbers are:
EUROPE: +49 6023 500 777 (or +41 71 955 1900)
USA: +1 919 657 7100
CHINA: +86 (10) 67803366-537
- Problems are analyzed promptly via remote diagnosis

FITNESS CHECK

Preventive maintenance and inspection

- Full check of all machine functions
- Comprehensive, customer-specific maintenance service for continued optimal productivity and cost savings when repairs are needed
- Monitoring of the maintenance cycle allows timely appointment scheduling

FLEXCARE / TOTALCARE

Customer service and consultation

- Flexible and adapted to your needs, these service contracts consist of an annual contingency allowance of hours, selectable in different packages – BRONZE, SILVER and GOLD
- Qualified service engineers worldwide
- Quick response times through local resources and close cooperation with suppliers

REPLACEMENT PARTS AND ACCESSORIES

- Worldwide replacement-part-management network, shipment of main parts in one day
- Guaranteed original parts for safe production and highest uptime
- Proven quality for accessories for best qualitative products
- The parts are manufactured by Bühler Leybold Optics or by first-class material specialists like UMICORE with highest availability

RENOVATION OF MACHINES AND ASSEMBLIES

- Software optimization
- PLC and HMI exchange
- Full exchange of electric cabinet and PLC and HMI exchange
- Improved cycle times
- For Leybold Optics products and other machines

OVERHAUL AND UPGRADES

- Upgrade to new components
- Machine extensions
- Improved performance and longer equipment life
- Used machines with «buy back option» for all Leybold Optics products and other machines

RELOCATION OF MACHINES

- Relocation of one machine or a full production site to another production location

TRAINING

Thoroughly trained and motivated personnel will raise the quality standard that you achieve in utilizing Bühler equipment and will ensure your long-term success. Would you like to increase your employees' level of training to the latest standards in maintenance and operations? To achieve this, Bühler offers you various training courses in a specialized Training Center. In a group of five persons and more, training can be tailored to specific requirements.

- Safety and regulations
- Basics of vacuum technology
- Basics of coating tools
- Basic theoretical training in equipment and technology
- Practical training in preventive maintenance
- Practical training in machine operation
- In-depth training on EB-Gun, Ion source, optical or physical measurement units and process analysis, leak detection, etc.

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