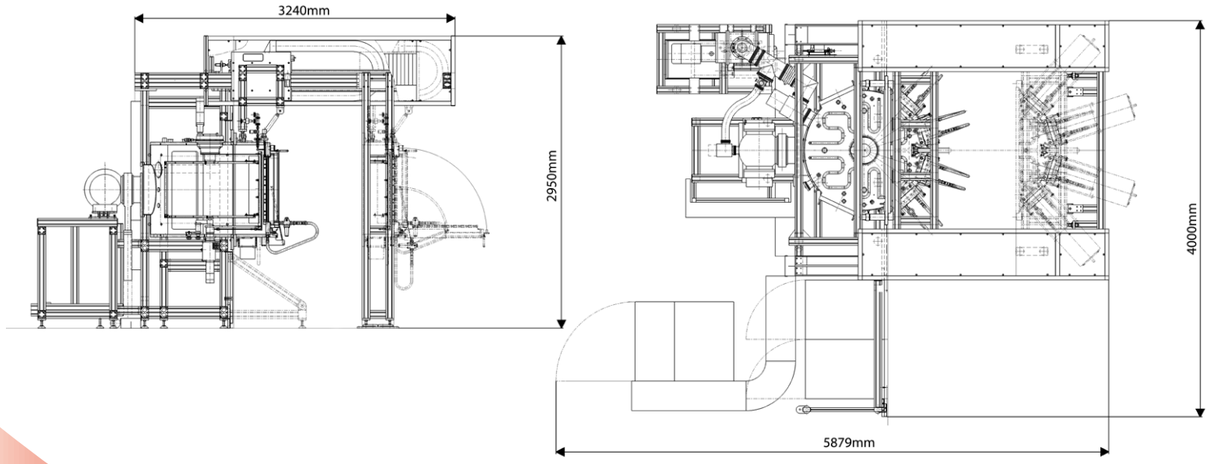
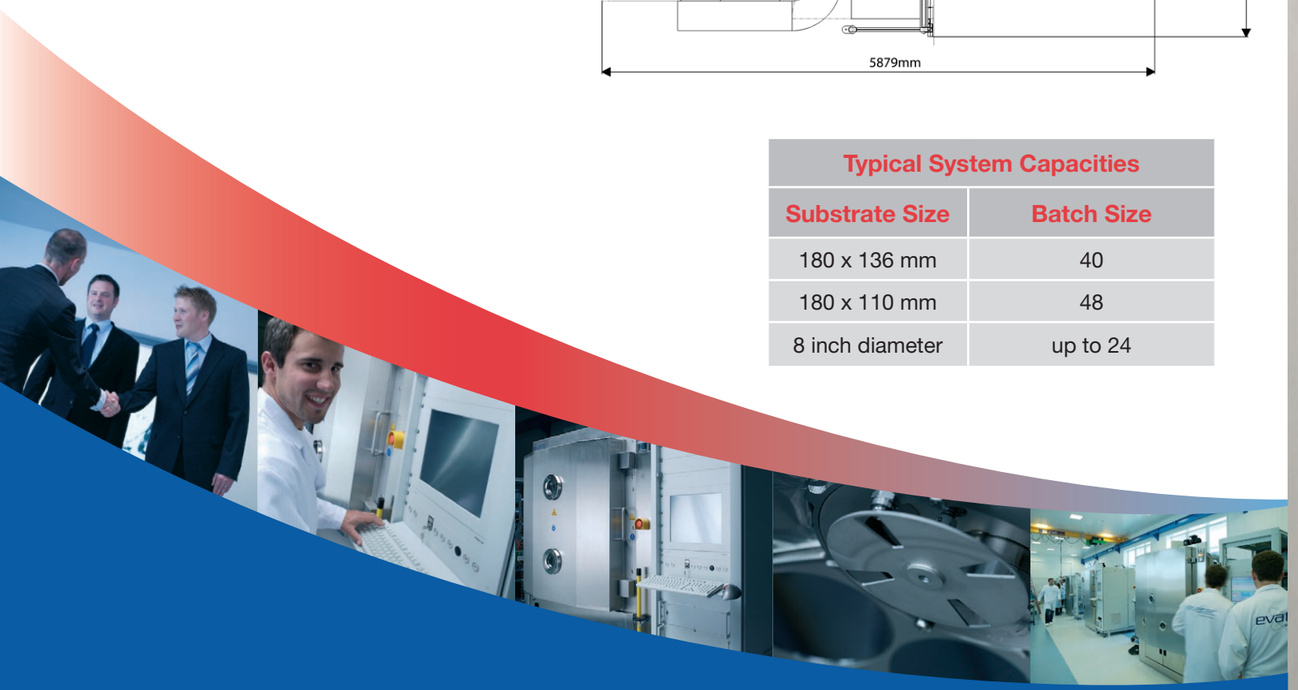
evatec
process systems



Typical System Capacities	
Substrate Size	**Batch Size**
180 x 136 mm	40
180 x 110 mm	48
8 inch diameter	up to 24



About Evatec

Evatec offers complete solutions for thin film deposition and etch in the optical and semiconductor markets. Evatec engineers are able to offer practical production advice from R&D to prototyping and mass production. We recognize that no single technique offers the answer to all problems. With a technology portfolio including standard and enhanced evaporation as well as sputter, we are ready to offer sampling services and custom engineering to meet out customers individual needs.

We provide sales and service through our global network of local offices. For more information visit us at www.evatecnet.com or contact our head office.

Evatec Ltd.
Lochrietstrasse 14
CH-8890 Flums
Switzerland
Tel: + 41 81 720 1080
Fax: + 41 81 720 1081
info@evatecnet.com
www.evatecnet.com

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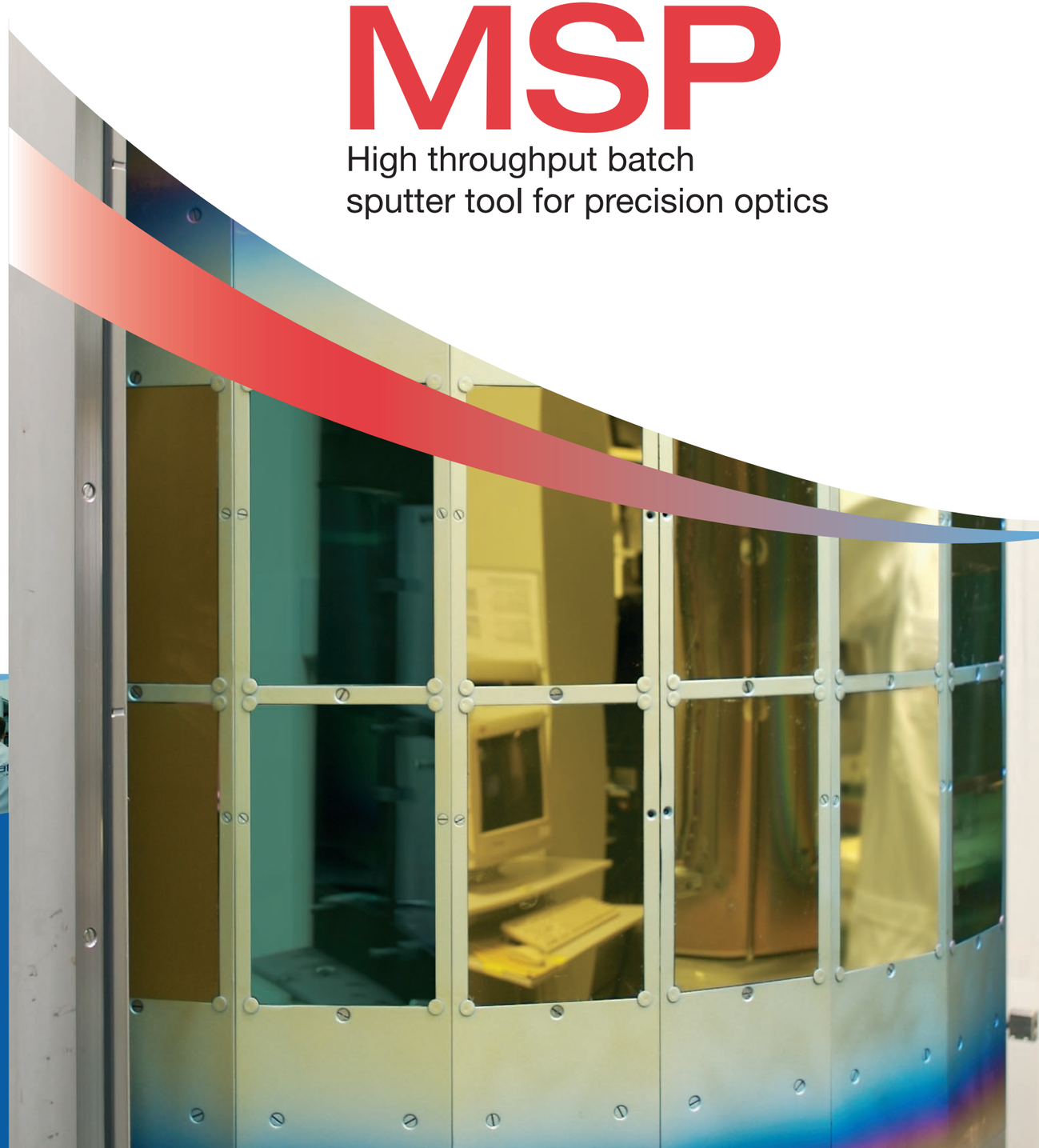
MSP

High throughput batch sputter tool for precision optics



MSP

Why sputter technology for optical thin films

Sputter technology offers the potential to deposit hard, dense, oxide films with superb environmental and temperature stabilities. Key to its successful deployment in the manufacture of precision optical thin films is the ability to achieve high precision time after time. This requires integration of the right cathode & control technology onto a robust production platform. For selected mass production applications with the most demanding optical performance, sputtering is then a powerful tool to produce coatings at the lowest unit manufacturing costs.

Sputter technology benefits

- Superior spectral stability
- Superior spectral precision
- Cold processing

MSP-technology based on intellectual property licenced from Oerlikon Trading, Trübbach.

MSP

The Evatec Advantage

MSP technology

- Best process repeatability
- Proven in mass production

As home of the industry standard Balzers BAK thin film batch evaporator, Evatec designers and application engineers have the benefit of more than 50 years experience in delivering robust production tools for thin film deposition and etch.

The “MSP” Sputter tool builds on the knowledge gained in optimising coating tool architecture and system control by starting with a mechanical platform for the best production reliability. It then incorporates proprietary sputter and process control technology to achieve highly stable optical films at low temperature over large areas in a high throughput vertical batch sputter tool. Incorporating 4 process cathodes, the tool is ideal for the production of edge and bandpass filters, TCOs and antireflection coatings on glass and polymeric substrates.

With unique access to the knowledge gained in day to day production of sputtered films, Evatec offers turnkey process solutions for cost-effective mass production.

TCOs & Anti-reflection Coatings
Edge & Bandpass Filters **Projection Display**
Notch Filters Imaging TiO_2 Nb_2O_5 Ta_2O_5 SiO_2

MSP

5 steps to the best production solution

1. The coating chamber is pumped by a Turbomolecular and Meissner combination for rapid processing of glass and polymeric substrates. The motor-driven chamber door is removed completely during load / unload to allow easy access to cathodes and substrate drum.

2. Substrates are loaded into simple segments and mounted onto a 1 metre diameter carrier drum. The same drum can be fitted with a whole range of segment designs according to the substrate size.

3. Four vertically mounted cathodes are optimised for large area precision coating over a 380mm long deposition zone. Proprietary magnet tuning systems ensure the highest uniformity levels can be maintained easily by operating personnel during the target life.

Cathodes are operated in DC or mid frequency AC mode depending upon process materials for;

- Direct deposition of fully oxidized optical quality films
- Low substrate temperatures for processing sensitive polymer or cemented substrates
- Deposition uniformities of better than ±1%

…and all without any internal uniformity masks!

4. The MSP employs two key in situ process control technologies;

Closed loop plasma process monitoring and control ensures that cathode technology runs with optimum chemistry and stability in a reactive gas environment.

Broadband Optical Monitoring with direct substrate measurement is used for end point control enabling production of the most complex multilayer coatings.

5. Evatec's Khan control platform is built on a standard industrial server running under Windows XP and offers complete closed loop control of the system, deposition sources and control systems. Features include:

- Graphical User Interface with up to 4 windows
- Full integration of plasma emission and optical monitoring process control systems
- Five Operating Levels with password protection for individual users
- Automatic Process Control (Start, Stop, Hold, Abort, Retry Step, Next Step)
- Real Time and hiostorical trending (up to 25 user-selected values) can be monitored and analyzed
- Process Run and Maintenance Statistic

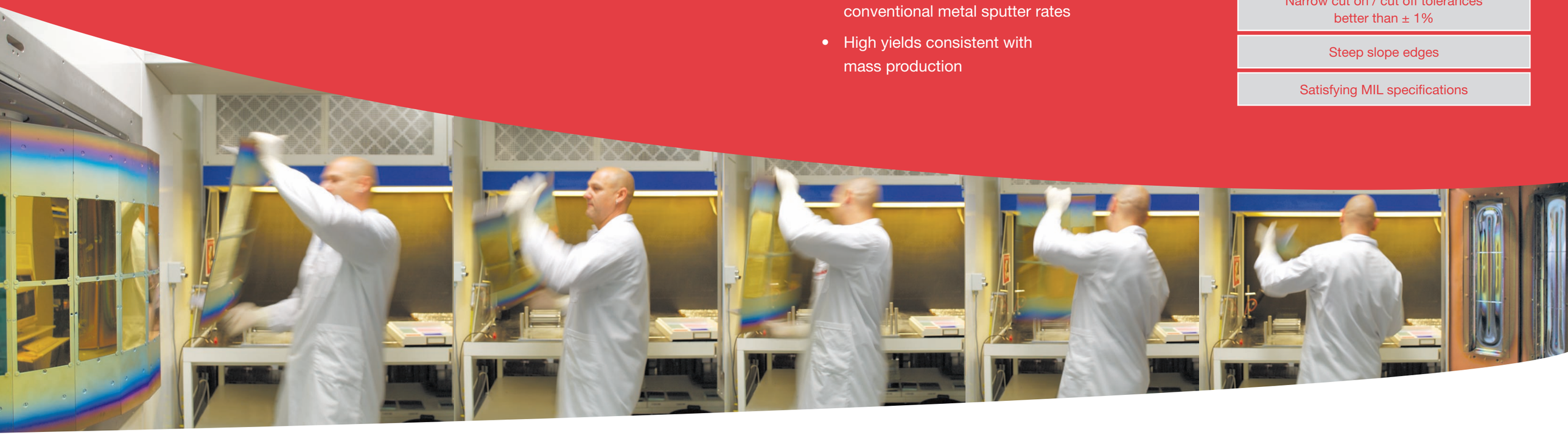
Evatec MSP

The optical quality speaks for itself…

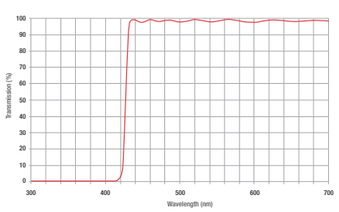
…and with the best production economics to match

- Fast processes - at up to 40% of the conventional metal sputter rates
- High yields consistent with mass production

Quality features of MSP sputtered films at a glance
High transmittance
Temperature shift<1nm from 25C to 120C
No humidity shift
Narrow cut on / cut off tolerances better than ± 1%
Steep slope edges
Satisfying MIL specifications



No Temperature Shift

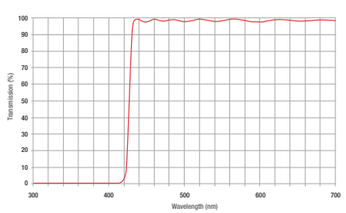


Spectrum measured at increased filter temperature

Spectrum Stability
No change in spectral performance!

Substrate Specification	T< 1.0% Abs (300-400nm) (%)	T= 50% 430 ±3.5nm (nm)	T>95% avrg. (436-650nm) (%)	T> 93% Abs. (446-650nm) (%)
Sample at RT	0.03	427.1	98.47	97.18
Sample at 120°C	0.03	427.5	98.51	97.34
Sample at 180°C	0.04	427.8	98.47	97.24

Stable against exposure to high temperature

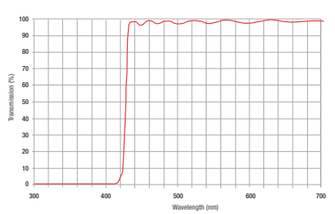


Spectrum measured at RT after extended exposure to high temperature (300°C)

Spectrum Stability
No change in spectral performance!

Substrate Specification	T< 1.0% Abs (300-400nm) (%)	T=50% 430 ±3.5nm (nm)	T>95% avrg. (436-650nm) (%)	T> 93% Abs. (446-650nm) (%)
Sample at RT	0.01	428.0	98.4	96.9
After 48hrs at 300°C	0.01	427.9	98.5	97.3
After 200hrs at 300°C	0.01	427.8	98.5	97.1

Stable against exposure to high Humidity



Spectrum measured at RT after extended exposure to high humidity (MIL-C-14806A)

Spectrum Stability
No change in spectral performance!

Substrate Specification	T< 1.0% Abs (300-400nm) (%)	T= 50% (430 ±4nm) (nm)	T> 95% avg. (436-650nm) (%)	T> 93% Abs. (446-650nm) (%)	T> 94% Abs. (530-570nm) (%)	Slope (20% - 80%) (nm)
Sample 1 at RT after coating	0.01	427.3	98.44	96.63	97.57	5.1
Sample 1 after humidity Test (MIL-C-14806A)	0.01	427.4	98.18	96.10	97.33	5.1