ROLL-TO-ROLL PĀRKLĀŠANAS VAKUUMA IEKĀRTAS IEGĀDE
(PURCHASE OF ROLL-TO-ROLL VACUUM COATING SYSTEM)

1. SCOPE

The system equipped with:

- vacuum pumps, sealings, valves and gauges with control units;
- gas feed and distribution system;
- electrical system;
- roll to roll winding system for flexible substrates;
- cooled drum;
- two planar magnetrons, including the power sources;
- cooling system for pumps and magnetrons;
- cooling system for the drum;
- machine control and visualisation system;
- process control and monitoring system;
- additional flanges and feedthroughs where possible.

The system must comply with CE marking requirements and safety regulations in force in Republic of Latvia.

2. APPLICATION

The system is intended for R&D deposition of thin film coatings on flexible substrates by reactive magnetron sputtering.

3. TECHNICAL REQUIREMENTS

3.1.	**VACUUM AND GAS DISTRIBUTION SYSTEM**	
3.1.1.	Turbo molecular pump	Approx. 1500 l/s, Pfeiffer HiPace1800 DN 200 ISO-F PMP04071 or equivalent.
3.1.2.	Forevacuum pump	Suitable for operation with turbomolecular pump of 3.1.1.
3.1.3.	Gate valve between the turbo molecular pump and chamber	VAT gate valve, electrically operated. Position of valve seal on the turbo pump side.
3.1.4.	Base pressure in chamber without substrate	≤ 1 x 10^{-6} Torr after 24 hour pumping.
		≤ 5 x 10^{-6} Torr after 3 hour pumping.
3.1.5.	Process gas	Separate inlet channels for Argon (working gas), Oxygen and Nitrogen (reactive gases). Mass flow controllers: 200 sccm for Ar, 50 sccm for O_2, 20 sccm for N_2.
3.1.6.	Process pressure	1 mTorr – 30 mTorr, achieved by partly closing the gate valve.
3.1.7.	Valves	Electromagnetic, installed where necessary.

3.1.8.	Gauges	Gauges provided for base and process pressure ranges.
3.1.9.	Chamber venting	Electromagnetic valve. Chamber vented by ambient air.
3.1.10.	Chamber door	Chamber door open/close movement mechanism to provide convenient access to chamber interior upon service and maintenance.
3.2.	**SUBSTRATES AND COATINGS**	
3.2.1.	Substrate	Plastic web and metal foil, between 10 and 200 micrometers thick.
3.2.2.	Coating	Metals, oxides, and nitrides.
3.2.3.	Uniform coating width	At least 150 mm wide coating with +/- 2% thickness uniformity.
3.2.4.	Web width	Adapted to the uniform coating width according to 3.2.3., plus 5 - 20 mm uncoated margin each side.
3.2.5.	Web length	Adapted to maximum possible diameter of unwind / rewind rolls considering the space available, to be confirmed upon design phase.
3.2.6.	Web core diameter	3"
3.3.	**MAGNETRON SPUTTERING DEVICES**	
3.3.1.	Quantity	2 pc.
3.3.2.	Type	Planar balanced magnetrons, suitable for DC, RF, HIPIMS modes of operation. Externally mounted. Indirectly cooled. Dimensions adapted to the uniform coating width of 3.2.3.
3.3.3.	Power supply included in delivery	Pulsed DC suitable for dual target operation, 1 kW.
3.3.4.	Magnetron mounting geometry	Both magnetrons facing the same coating window on the substrate.
3.3.5.	Target to substrate separation	8 - 12 cm.
3.4.	**PROCESS CONTROL AND MONITORING**	
3.4.1.	Machinne control system	Based on PC. Intuitive, user friendly.
3.4.2.	Machine visualization system	Intuitive, user friendly.
3.4.3.	Sputtering process control	Reactive gas flow controlled by Optical Emission Spectroscopy or discharge voltage upon operator's choice.
3.4.4.	OES control system	EMICON SA process monitoring and control system by Plasus GmbH or equivalent.

3.4.5.	Transmittance and Reflectance inline monitoring	ThinProcess system by Zeiss or equivalent.
3.4.6.	Resistance inline monitoring	Contactless measurement, range 10 - 200 ohm/square.
3.4.7.	Recipes	Recipes for WO_3 and ITO film (100-500 nm) deposition.
3.5.	**WINDING SYSTEM**	
3.5.1.	Mechanical parts and tensioning	Suitable for handling of substrates according to 3.2.1.
3.5.2.	Winding direction	Winding both directions, coating in one direction.
3.5.3.	Winding speed	Adjustable between 0,1 and 1 m/min.
3.6.	**DRUM**	
3.6.1.	Drum type	Cooled, see 3.7.3. for cooling requirements.
3.6.2.	Drum diameter	Adapted to the space available.
3.6.3.	Coating window on the drum	Dimensions adapted to requirements of 3.2.3., 3.2.4. and 3.6.2.
3.6.4	Drum shields	Cooled by tap water, see 3.7.4. for requirements.
3.7.	**COOLING SYSTEM**	
3.7.1.	Magnetrons	Cooled by tap water. Reliable water line connectors, easy to use upon frequent service and maintenance.
3.7.2.	Pumps	Cooled by tap water. Reliable water line connectors, easy to use upon frequent service and maintenance.
3.7.3.	Drum	Closed loop cooling with the liquid suitable for the temperature adjustable between -15°C and +20°C. The liquid and the cooling unit included in delivery.
3.7.4.	Drum shields	Cooled by tap water. Reliable water line connectors, easy to use upon frequent service and maintenance.
3.8.	**ELECTRICAL SYSTEM**	
3.8.1.	Eletrical system	Designed to ensure proper functioning of the sputtering chamber.
3.9.	**DOCUMENTATION**	

3.9.1.	Operations manual	Operations manual in English and manuals of all main components purchased from subcontractors included in delivery.
3.9.2.	Bill of materials	List of the components (including manufacturer, model no., serial no., description) used to manufacture the system included in delivery.

4. MISCELLANEOUS

4.1. All power sources and control units mounted in a rack.

4.2. Extra set of drum shields included in delivery.

4.3. 1 - 3 KF40 blind flanges for future use where possible, positions confirmed upon design phase.

5. ACCEPTANCE TESTS

	Acceptance tests are carried out at customers site.	
5.1.	Machine control and visualization	Demonstrated to function properly.
5.2.	Vacuum and gas distribution	
5.2.1.	Pump down	Pump down times demonstrated according to 3.1.4.
5.2.2.	Gas distribution	MFCs demonstrated to feed the correct flows according to 3.1.5.
		Gate valve adjustment demonstrated to provide the process pressure according to 3.1.6.
5.2.3.	Venting	Demonstrated to function properly.
5.3.	Magnetron sputtering devices	Demonstrated to function properly according to 3.3.
5.4.	Process control and monitoring	Demonstrated to function according to 3.4.
5.4.1.	Thin film deposition	Demonstrated to function according to 3.4.7.
5.5.	Coating uniformity	Uniformity according to 3.2.3. demonstrated in a reactive process.
5.6.	Winding system	Demonstrated to function according to 3.5.
5.7.	Cooling system	Demonstrated to function according to 3.7.
5.8.	Operations manual and bill of materials	According to 3.9.

6. INFORMATION

6.1.	All system components must be new.

6.2.	An option - a vacuum chamber (drawing provided in Appendix 1) provided by the customer is available for manufacturers, which can be used to construct the system.