The complete optical disc solution
Welcome to Oerlikon.  
Your partner of choice for high-quality optical disc equipment.

Oerlikon is a leading supplier of complete manufacturing solutions to the optical and magnetic data storage industry. With an installed base of more than 4000 units worldwide, the company has earned an international reputation for innovation and engineering excellence. From leading-edge sputtering to state-of-the-art production lines, Oerlikon supplies high quality, reliable and cost-effective solutions for all formats.

After CD and DVD, now the industry is in full preparation for the third generation of disc products. Blu-ray and HD-DVD are competing to become the next world-wide standard. While a HD-DVD can be manufactured on upgraded DVD replication lines, the higher capacity Blu-ray discs require an entirely new manufacturing technology. A 100 micron thin optical grade and very precise cover layer needs to be created on top of the information layer. Oerlikon is the technology leader for a new spin coating technique, which forms this layer with required precision and reduces manufacturing cost significantly. Oerlikon's INDIGO system is already in production at the major replication facilities of all Blu-ray formats, making Oerlikon the only supplier to offer field proven Blu-ray equipment for all formats.

As the performance of optical discs is continuously increasing in terms of recording speed and storage capacity, the manufacturing process is becoming more and more complex and delicate. Oerlikon has put particular emphasis on supplying its customers with total solutions packages, which include dedicated hardware as well as the required process technology. For this purpose Oerlikon is cooperating with various leading companies, such as Philips, Mitsubishi and Ricoh. By working with these technology creators, Oerlikon is able to develop a much deeper understanding of what it takes to make a disc within the book standards. Accordingly our engineers have compiled a range of process packages, which achieve certification by the standardisation laboratories.

Product portfolio - Systems

ROM pre-recorded discs
- CUBE STAR + SWIVEL +
- MATRIX
- INDIGO

R recordable discs
- CUBE STAR + SWIVEL +
- FUSION
- SPRINTER-9 + INDIGO R/RE

RW / RE rewritable discs
- SPRINTER-9 +
- PARAGON
- SPRINTER-9 + INDIGO R/RE

Product portfolio - Services

- Special product modifications
- Process technology
- Verification support
- Engineer training
- Spare parts supply
- On-site support
The Sputtering Know-How

With the emergence of optical discs as a new storage medium in the early 1980’s, Oerlikon began developing dedicated cathodes to sputter thin films on discs.

Oerlikon has accumulated vast know-how and experience in sputtering during the past 25 years. Today, the company offers innovative sputtering platforms and cathodes, each optimized specifically for a disc format – from the original CD all the way to the new BluRay.

Our cathodes provide the manufacturer with record-setting performance:
- Highest specific sputtering rates
- Highest number of discs per target
- Best layer uniformity
- Lowest overall layer material costs
- Excellent target utilization levels

Metallizers
In parallel with the development of high performance cathodes came the design of a corresponding sputtering platform. Today, our SWIVEL system is the 5th generation in-line sputtering system developed by Oerlikon. It features the world’s fastest cycle time (1.4-seconds) and the capability for target / mask changes in under three minutes – with a simple release mechanism – to get back to production. Oerlikon metallizers are used in over 5,000 disc replication lines around the world.

Metallizers from Oerlikon have a reputation for performance and reliability and remain the overwhelming industry choice for optical and magnetic data storage applications. Over 30% of all hard disks, 70% of all CD-R and DVD-R discs, and over 90% of all rewritable discs are sputtered by our metallizers today.

Oerlikon is synonymous with impeccable process and deposition technology. Our production solutions work because we do thin films better than anyone else.
**SWIVEL & CUBE STAR**

Largest installed base of metallizers

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**SWIVEL**

The industries workhorse
- One cathode system
- Optimized cathodes for different target material and uniformity requirements
- More than 50% target material utilization
- Cycle time down to 2 sec for DVD-R

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**CUBE STAR**

The all-rounder
Unparalleled flexibility with two cathode systems:
- Parallel loading of disc for high throughput DVDs/9
- Two step (soft) sputtering for high quality DVD±R
- Reflection layer and backside coating for Blu-ray disc in one metallizer
- Metal layer plus dielectric buffer/barrier layer for DVD±R Dual layer disc

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**Cathode Solutions**

<table>
<thead>
<tr>
<th>Cathode Name</th>
<th>ARQ 930 S</th>
<th>ARQ 930 LO</th>
<th>ARQ 931</th>
<th>ARQ 950</th>
<th>ARQ 951</th>
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- **Recommended Solution**: 0 Focus Target 0 Flat Target 1 Swivel only
- **Reflectance**

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**Cathode options for DVD±R pre-recorded and recordable disc**

- ARQ 930 S for Ag target
- ARQ 931 LO for Ag semi reflective layer
- ARQ 950 for Ag target with highest uniformity for DVD±R DL semi reflective
- ARQ 21 for RF sputtering
- Further options on request

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**ARQ 950 with field compensation for maximum uniformity. Reflectance absolute +/- 0.8%**
SPRINTER provides high throughput capabilities (>1,200 discs / hour) that are far beyond any other single disc sputtering system available on the market. Over 180 systems are currently installed around the world, which translates into 9 out of 10 rewritable discs being made on SPRINTER.

The SPRINTER platform consists of three models, that can be individually configured according to the customer application:

- SPRINTER-5: based on a five-process chamber configuration, is the dedicated solution for BD-R inorganic; also an ideal (and cost-effective) solution for a wide range of specialized R&D applications
- SPRINTER-9: the standard layout uses a 9-process chamber configuration for mass-production of all current and future RW disc formats
- SPRINTER-13: the advanced layout features a 13-process chamber configuration for highly efficient mass-production processes for DVD-RAM and high throughput rewritable red and blue laser formats.

**Multi-Source – Opening a new material world**

The multisource allows sputtering out 2 or even 4 targets onto the disc surface at the same time. The sputtering rate of each target can be individually power contolled. Both DC and RF techniques are available. By proper target positioning and in combination with the rotation of the disc substrate excellent layer uniformities on the disc surface are accomplished.

This ingenious device can be applied in many ways:

- Realizing 2 or more sputtering steps in a single sputtering station
- Fast development of new phase change materials for rewritable discs
- Creating new types of co-sputtering materials, which are not possible in single target arrangements
- Creating new types of thin-layer-structures

A very strong tool for creating tomorrow's high performance disc structures.

### Main Features

- 5, 9 and 13 chamber models
- Process stations for uniform DC- and RF-sputtering and disc cooling
- Disc rotation during sputtering
- Film thickness uniformity: ±2% within a disc (for most materials)
- “Ultraspeed” disc handling giving >1200 discs/hour throughput
- Small footprint

### Available Options

- FlexiCat
- IndiCat
The Replication Know-how

A finely tuned arrangement of process and technology

In the days of the CD, replication equipment functioned merely as a finishing tool for a substrate, while the molding machine determined cycle times, system output, and other issues. When DVD arrived, more sophisticated processes were needed for uniform metal layers, not to mention bonding two disc halves perfectly and a flawlessly clear lacquer to ensure readability.

Today’s third generation Blu-ray discs bring new production challenges: precise deposition of a cover layer, an optically sensitive resin, other thin film layers, and a marginal role for molding (delivering a pit structure layer).

Modern replication lines combine accessibility and a compact footprint with economical cost of ownership values, high throughput and the ability to meet specific production needs. Ultimately, disc production is a finely tuned arrangement of processes working with just the right degree of automation to deliver a faultless result.

Oerlikon replication lines clearly embody this concept of “design to process” and “design to cost.”

Easy to operate
Developed together with input from numerous customer production sites, our “design to process” concept integrates “easy-to-use” features in the system software and the user interface. An understandable and flexible information flow (including system status, current order log, order backlog, etc.) via touch screen monitor helps the operator efficiently manage disc production – and respond quickly when needed.

A spin coating future
Renewed attention has been given to the spin coating process, most recently with BD formats. Building on its excellent uniformity characteristics, Oerlikon began early with the optimization of a spin coating process. Our production solutions for both DVD dual layer and BD disc formats owe a good deal of their market success to a reliable and precise spin coating process.

The cleaner the better
Achieving a consistently high number of good discs requires precise control of the process sequence and the line modules. Managing any disc deviation from the initial molding stage, through metallization, applying the resins, and final inspection is a key part of reproducible, high quality output. All Oerlikon replication lines feature clean room operating conditions and comprehensive climate control to ensure an ideal production environment.

Speedy automated handling
The seamless – and extremely rapid – transport of substrates from molding all the way to output is a central part of high line output and yield. The efficiency of an automated handling system determines the overall production cycle time (along with the processes). Our handling systems utilize a proven disc center gripper mechanism that makes every 1/10th of a second count.
**MATRIX**
For DVD and HD-DVD

Offering state-of-the-art performance for both DVD and HD DVD production, MATRIX offers both a convincing combination of high uptime, consistent throughput and low material costs – helping assure reduced manufacturing costs.

The layout of the line is compact and streamlined. Integrating the CUBE STAR metallizer – with a dual cathode configuration – results in a small line footprint of only 5m² – without sacrificing higher output and performance, accessibility and serviceability.

**Bonding**
Our "wet-to-wet" vacuum bonding process applies UV resin to both DVD halves; then spin coats, aligns, and joins them in a vacuum chamber. Compared to conventional bonding technologies, the space layer is set at the spin coating step, rather than the joining step. This assures a very consistent space layer thickness between the disc halves thanks to spinning without capillary forces. This process also delivers outstanding layer performance for HD-DVD by simply adjusting the process parameters; no hardware changes are necessary.

**Metallizing**
Pre-recorded DVD and HD-DVD require the sputter deposition of two layers: the semi-reflective L0 and reflective L1 layers. CUBE STAR with a dual cathode setup enables high throughput, but also provides the flexibility to select different cathodes to also meet pre-recorded requirements. The standard configuration comes with ARQ931, ideal for DVD runs. This cathode sputters the L0 and L1 layers with silver alloy and aluminium targets. The silver alloy target yields over 1 million shots (L0), and more than 200'000 shots with aluminium. ARQ950 is the perfect HD-DVD performer. The source provides layer uniformity of less than ±1.3 % for the semi-transparent layer.

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**FUSION**
For DVD and HD-DVD

Fusion is the proven system for brand label disc manufacturing. MATRIX offers both a process quality for DVD+R 16x certified by Philips verification laboratory. Reduced complexity combined with faster cycle time results in a maximum output at lowest cost of ownership.

Originally developed in partnership with Mitsubishi, the Fusion became the system of choice for brand label disc manufacturing. The reason for the Fusion success is the clear commitment to the highest standard product quality. Accordingly Fusion provides best in class molding technology, dye handling, disc bonding and takes care of all the little details in-between.

The Fusion grew in parallel with the DVD±R performance, to handle 4x, 8x and finally 16x recording speeds. At the same time the cycle time has been reduced from 4 sec to 2.5 sec cycle time out of two injection moulding machines. Oerlikon also provides special Fusion models that can produce the new Dual Layer dye discs in "inverse stack" or "2P" type production mode.

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**Main Features**
- Formats: DVD Pre-Recorded, Single/Dual Layer HD-DVD Pre-Recorded, Single/Dual Layer
- Cycle time: < 2.0 secs for DVD
- Cycle time: < 3.0 secs for HD-DVD
- Bonding: Vacuum Bonding
- Metallizing: Cube Star with ARQ931 / ARQ950

**Available Options**
- CD, DVD and HD-DVD dedicated versions

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**Main Features**
- Formats: DVD+R 16x, DVD-R 16x
- Cycle time: <2.5 secs

**Available Options**
- Dedicated CD-R version
- 1 or 2 cathode sputtering system
- Special version DVD±R DL with "inverse stack" technology
- Special version DVD±R DL with "2P" technology
**INDIGO R/RE**

**Bundling the core competence**

Recordable and rewritable Blu-ray discs will strongly increase the available storage capacity on an optical disc. INDIGO R/RE is the fully automated replication system on which these discs will be produced. It features the top technologies from Oerlikon including single- as well as multilayer sputtering and cover layer spin coating.

As of today, the recordable Blu-ray discs will be using inorganic materials and be made by multilayer sputtering. The benefit for the manufacturer will be a well controlled and clean process, which does not depend on factors like room climate conditions and not require on site chemical labs.

Oerlikon is the industry expert for multilayer sputtering applications and has been completing the SPRINTER platform for the new Blu-ray disc generation by introducing a 5 chamber model for the manufacturing of one time recordable BD-R discs. For the rewritable BD-RE version, a 9 chamber system is recommended to achieve maximum throughput.

INDIGO R/RE has been designed for the requirements of multilayer sputtering applications. It includes additional disc cooling capabilities, cleaning stations and disc buffers compared to the INDIGO for pre-recorded Blu-ray discs. Furthermore a SWIVEL metallizer can be adapted to create a moisture barrier backside coating.

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**INDIGO ROM**

**Enabling the Blu-ray future**

Of the whole BD manufacturing process, the cover layer process to produce the 0.1 mm layer on top of the 1.1 mm substrate is one of the most difficult and quality critical steps.

Oerlikon has developed a highly controlled spin coating process, which can consistently produce the BD cover layer with a high quality and uniformity well within the BD uniformity specification, solving the well known edge bump problem.

**Two good reasons to choose spin coating**

The spin coating process developed by Oerlikon already shows significant costs savings over today’s foil bonding technique at around half the material costs, and will remain well ahead in the race to drive down costs in the future. The spin coating process is also much closer to the existing DVD manufacturing process, easier to master and integrate within a production environment.

**Modularity – the flexible platform approach**

As the cover layer process is common to all BD formats, it makes sense to go for a platform approach for a Blu-ray line. Two separate modules – the “cooling module” and “cover layer module” – with a clear interface give the best flexibility for all of the customer’s future needs. Indigo is exactly this way.

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**Main Features**

- **Format:** BD Pre-Recorded Single Layer
- **Cycle time:** < 5 secs
- **Cover Layer:** Spin Coating 100 ± 3 µm

**Available Options**

- Single sputter source
- Adaptation of BCA module
- Upgradable to BD DL media production

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**Main Features**

- **Format:** BD-R/RE Inorganic
- **Cycle time:** < 5 secs
- **Cover Layer:** Spin Coating 100 ± 2 µm

**Available Options**

- SPRINTER-5, -9 or -13 integration
- Backside coating
- Adoption of BCA / Initializing Module
- Upgradeable for BD DL formats
The Hollywood studios want to take advantage of the enormous storage capacity of a BD50 disc, to deliver an unprecedented video and audio experience to the consumer home. For this reason, the availability of 50GB dual layer Blu-ray discs is a clear must for the pre-recorded formats. Therefore certainly recordable dual layer discs will be required in a not to distant future, to back up the pre-recorded content. It should be noticed, that 50GB BD RE discs are already available on the Japanese market since some time.

Generally two technologies are available for creating an additional information layer on a substrate surface: the 2P stamper disc process and the embossing process.

The 2P process uses a molded disc as a soft stamper. This disc is bonded to the substrate and then removed and disposed. It leaves behind a surface with the pit structure of the soft stamper disc. Advantage of this method is that it can be applied to any kind of Blu-ray disc. However, it comes with the additional cost of a second injection molding machine and higher consumable cost.

The embossing technique has close analogy with the molding process itself. A second information layer is created by embossing a stamper into a liquid resin and curing that resin while the stamper is still embossed within it. The benefits of this process are that it provides a very fine pit geometry and therefore generates a flawless electrical signal.

Oerlikon has both process technologies in the portfolio. First market release will be the wet embossing machine displayed below for the pre-recorded market.

Both dual layer processes require an excellent uniformity of the space layer between the two information layers with approx 25±1 micron. This space layer is created by our field proven spin coating process and uses resin heating and curing as important elements to achieve the required uniformity. Finally the BD50 disc requires a precise 75 micron cover layer. This process will be done in the standard cover layer unit.

Every single INDIGO line in the field can be upgraded with either 2P or embossing technology, to produce 50GB Blu-ray discs. Oerlikon does not leave you behind!

For certain new or special application cases, a standard product might not have the required features or performance. Therefore Oerlikon provides special engineering services, to adopt the optical disc systems according to customer requirements. Sometimes this activity leads to spin-off products like the Offline Bonder described below.

The Oerlikon bonding process is specially suited for DVD or HD-DVD formats, which require a very good bonding uniformity. Such improved uniformity is particularly required for DVD±R DL discs, which for the first time allow recording on two different dye layers and therefore need a very uniform space layer thickness.

In order to make the bonding technology available for this challenging application and the specific customer requirements, a standalone Offline Bonder was created. For this purpose the bonding module used in Matrix and Fusion was combined with a spindle buffer for loading and receiving the discs. With this new bonding system the customer was able to produce his DVD±R DL discs with superior uniformity and high throughput. The Offline Bonder can be used in offline production or for integration into a replication line.

**Available Options**
- Adaptation of standard products to special requirements
- Re-combination of standard modules for new functionalities
- Upgrades of installed lines for performance improvement
- Entire systems for new applications
The Process Technology and Service Know-How

Customer Support – “Ahead of customers needs”

Oerlikon Balzers Coating Systems provides our partners with the most advanced technologies available in the world today by leveraging our research & development, equipment engineering and manufacturing competencies.

The challenge for us is to provide the highest level of service and parts support globally in every region on a 24-hour-a-day basis to meet our customers’ production requirements. Our customers are developing and driving all of the advancing technologies and new applications for the consumer market place. They are also faced with the challenge of predicting where the market is going and producing devices as quickly as they can at the lowest cost in order to remain competitive.

Our path forward in Customer Support is to develop advanced methodologies of providing service by utilizing the latest applications available on the market today and further developing efficiencies within our current systems to provide our customers optimized support in four key areas:

- Field Service
- Technical Support
- Spare Parts
- Training

Through optimization of these areas we will ensure our position in the future for further capacity purchases and growth within the different industry segments that we support. Oerlikon is aligning the skill, resources and best working practices to provide “world class” service and support to our customers.
As the performance of optical discs is continuously increasing in terms of recording speed and storage capacity, the manufacturing process is becoming more and more complex and delicate. Oerlikon has put particular emphasis on supplying its customers with total solutions packages, which include dedicated hardware as well as the required process technology.

For this purpose Oerlikon is cooperating with various leading companies, such as Philips, Mitsubishi and Ricoh. By working with these technology creators, Oerlikon is able to develop a much deeper understanding of what it takes to make a disc within the book standards. Accordingly our engineers have compiled a range of process packages, which achieve certification by the standardisation laboratories. At this moment verified process packages for DVD+RW 2.4x, 4x and 8x as well as DVD+R 16x are available. Various BD process packages are in preparation.

Oerlikon process engineers offer the following services to our customers:
- Development of process technology for new formats in cooperation with strategic partners
- Verification of certain key process packages at standardization laboratories
- Dedicated improvement of our products to meet production requirements
- High-level training of engineers and management
- In-house performance demonstration of Oerlikon equipment
- Process implementation at customer site after machine installation
- High level production support and trouble shooting
- Execution of special projects

Oerlikon has set up a state of the art optical disc laboratory equipped for measuring all relevant disc characteristics.

Testing Capabilities
- Mechanical disc properties like thickness, shape, edge profile
- Optical disc properties like birefringence
- Microscopic disc properties and details of the groove or pit structure
- Disc defects as defined in the book specifications
- Properties of sputtered layers like thickness, n and k values
- Optical properties of spin coated dye layers, bonding layers and cover layers
- Recording of discs in commercial drives or professional systems as used in standardization laboratories
- Signal testing of discs in production type or standardization-lab type analyzers

At Oerlikon we have a clear understanding of what supplying Total Solutions actually means. Receiving your replication line is only just the beginning of your relationship with customer support. Oerlikon engineers will meet with you to tailor a dedicated support package to meet your needs.

Together our objectives will be to maximum the number of good discs per day, and in turn ensure the best cost of ownership.

This itself is a function of three factors:
- Cycle time
- Uptime
- Yield

Cycle time is inherent to the machine architecture and process, whilst uptime and yield are factors which can be optimized, day in, day out. This is where Customer Support comes in. Training, maintenance, performance monitoring and improvement packages are just a few of the products which customer support offers to this end.
Customer Service
Your individual Service Package

Customer Support service packages
In order to ensure our customers daily production result, Customer Support developed a new Service Concept, based on the needs of daily production.

It contributes with all the necessary modules to achieve your individual production targets and takes care of your cost of ownership.

To fulfill your specific request we offer a highly flexible set of modules.

Example: Reliability Improvement Programme
Oerlikon implemented a reliability programme with a major customer in 2002. During this time there was a permanent measuring and improvement of production parameters such as uptime and reliability.

Based upon the data collected and upon further analysis, Oerlikon developed and implemented an action plan to increase the uptime with the following results:
- 2% uptime increase
- Significant increase in DVD production capacity
- Increased stability allows more accurate planning and greater availability

The table shows the provisional results, which clearly demonstrates that sputtering uptime has improved by 2%. The table also shows the increase in production capacity and the improvement in reliability.

Region Country Place Oerlikon Agent Tel No.

EUROPE
Europe Liechtenstein Vaduz ☑
Germany Munich ☑
The Netherlands Utrecht ☑
Spain Madrid ☑
Italy Milan ☑
Russia Moscow ☑
Overall ☑
Asia
Israel Kfar-Azar ☑
Japan Tokyo ☑
Taiwan Taipei ☑
China Shanghai ☑
China Shanghai ☑
Singapore Singapore ☑
South East Asia
India Hyderabad ☑
Americas
USA Irisi ☑
Brazil São Paulo ☑
Argentina Buenos Aires ☑
Chile Santiago ☑
Colombia Bogota ☑
Venezuela Caracas ☑
Perú Lima ☑
South Africa JHB ☑
Australia
Australia ☑
Africa
South Africa Johannesburg ☑

Austria, Poland and the Czech Republic are covered by Oerlikon Germany. Portugal is covered by our Spanish agent. Scandinavia is covered by Oerlikon Netherlands. South East Asia is covered by Oerlikon Assembly Equipment Pte Ltd.

For full Oerlikon contact details visit www.oerlikon.com/datastorage