

# Machinery for Laminated Glass Production

***LiSEC***

## Facts and figures:

- 1961 founding year
- 1 strong brand
- 1,100 employees
- over 20 sites
- 213 million Euros turnover (2021)
- over 90% export rate
- 7 % of turnover for R&D
- more than 330 patents

Reliable processes, good quality, solid profit: LiSEC solutions provide flat glass processors around the world with security and drive in a challenging environment.

For the last 60 years, we have been working hard to enable you to sustainably boost the efficiency, the system availability and the quality output of your flat glass production process. Thanks to forward-looking thinking, continuously striving to find the best solution and a great deal of personal commitment from our employees, we have grown from a one-man company to a technology leader.

Our advanced solutions generate a great cost-to-benefit ratio throughout the entire lifecycle of your machines and systems.

Customers around the world can benefit from this: be they experienced manufacturers or newcomers to the industry; from family businesses to industrial glass processors. Three main factors are essential for long-term success:



## **1. Turn Key Solutions**

Everything from a single source including software. Customers benefit from the only company in the flat glass machine industry that can comprehensively plan and develop large projects - also thanks to the widest product range in the industry.

## **2. Excellent Service**

Investment security and the highest availability and productivity enable the large, global LiSEC service network. A contact person familiar with the local language and customs is available close to you.

## **3. Performance through software integration**

Integration of the production management software and the machinery control (digitalization/Industry 4.0) allows top operation and optimization of all integrated machines or whole glass factories.

### **The benefits:**

- Over 60 years of partnership, pioneering spirit and stability
- Investment security due to the size of our company
- Leading technology with a high resale value
- Great cost-to-benefit ratio throughout the entire system lifecycle



# Machinery for Laminated Glass Production

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# The new LiSEC Lamination Portfolio

## The best of 2 technologies, more than 170 installed lamination lines - Decades of experience

Lamination, a well-known process in the glass industry has gotten more attention – not only due to the new safety standards but also due to the development of new glass products such as smart glass or display glass.

LiSEC has combined the best of two technologies and created an attractive product portfolio for lamination products. Through this process LiSEC can provide the perfect match with attractive price for each customer requirement.

Studies and further developments have been conducted to enhance process stability always with the focus on quality and customer advantage. Additional research projects and experience, achieved through customer requests for complex, innovative and new products, allows us to also provide technology that fits the future.

Having the experience of two different press technologies allows providing the fastest and most compact lamination furnace. The quick and easy change of the recipes during the production allows reducing cycle-time and therefore also production costs.

The smart control system and the recipe management highly supports the operator in the selection of the right production parameters, which are important for constant high product quality. The training period of the operator is also significant shortened by the self-explaining visualization.

Especially the press was built for complex products and high accuracy what allows to laminate very thin glass or multilayer to create special bulletproof glasses.

The very gentle and accurate press is not only highly important for such complex glass products but also for different glass shapes mostly used for sophisticated architectural projects.

It is well known that the future of architecture glazings draws, especially, on new low-e coatings and new types of interlayers. The combination of the LiSEC press and its smart heating system allows to easily handle the future challenges.

However, complex and special customer products include more risk and increase the production costs.

With the LiSEC press this risk can be reduced and profitability can be increased due to higher process stability.

## Key Advantages

### High performance through smart technology

Fast Pre-Nip lamination speed on very short furnace length due to combination of special radiation & convection system.

### Energy efficient due to intelligent heating system

Advanced radiators heating up from approx. 25 °C to over 900 °C in less than 60 seconds. The heaters are only in use when glass is actually being processed in the pre-lamination machine. In addition the automatic glass width detection at the infeed controls the switch between half and full radiator width.

### Precise adjustment of press force and gap due to servomotor-controlled press

Double-sided electrical control of the presses with servo spindles ensures perfectly parallel pressing with exact press force and enables easy, toolless fine adjustment of the presses.

### High positioning accuracy

The positioning accuracy of the glass is +/-0.5 mm.

### Positive feasibility studies with 1 mm thin tempered glass

The gentle accurate press technology allows to laminate very thin glass.

### Turn-key package solution

When additional equipment, such as autoclave and clean room, is purchased from LiSEC, we take care of the complete coordination to provide a turn-key production for composite and laminated safety glass



1

A COMBINATION OF TWO  
TECHNOLOGIES PROVIDES  
THE BEST SOLUTION AND  
A MATURE TECHNOLOGY



2

THE ATTRACTIVE  
LAMINATION PORTFOLIO  
— THE PERFECT,  
AFFORDABLE PRODUCT  
FOR EACH SEGMENT



3

DECADES OF  
EXPERIENCE — MORE  
THAN 170 INSTALLED  
LINES IN THE PAST 20  
YEARS



4

FROM STANDARD TO  
COMPLEX PRODUCTS —  
EVERYTHING IS POSSIBLE



5

- 1 Complex products such as Interlayer with mesh wire
- 2 Standard lamination products & multilayer
- 3 Automatic processing for shaped glass
- 4 Vacuum technology for display and smart glass
- 5 Unbeatable accuracy allows to laminate 1mm thin glass







# LINES

We created lamination lines which fit your production requirements. The combination of the strength of LiSEC in different areas such as process, software and machine engineering does lead to a highly stable lamination system.

In order to use the full efficiency of our lamination products, cross-line software solutions are available.



# PlusLam

## Semi- to fully automated lamination line

Proven quality meets wide-ranging requirements. The LiSEC PlusLam is a semi-automated and affordable lamination line and therefore very suitable as an entry product.

The LiSEC PlusLam is a standard line equipped with sophisticated machinery and laminating technology. This semi-automatic laminated glass line is distinguished by its manual interlayer placement and manual interlayer trimming. In combination with an accurate high-pressure autoclave, the PlusLam is suitable for the production of all common composite and laminated safety glass products.

A variety of options in combination with the basis line can increase the automatization level up to a fully automated lamination line and generates a strong and powerful equipment for each production.

Depending on the requirements the PlusLam can be configured with a 1-Nip or as option with a 2-Nip press, if higher output is required.

### Highlights

- Cost-effective entry-level lamination line
- Simple operation
- Smart and precise press technology
- Flexible production from special shapes and architectural glass
- Lamination line in straight and u-form available

### Options

- 6 roll foil magazine above the line
- Automatic foil laying and length cutting
- Speed assembling
- Paternoster foil storage rack for 6 additional rolls beside the line
- Foil tray for buffering residual foil direct at the line
- Eco-heaters for saving energy up to 40%
- Connection to ERP software
- Double-Nip with an additional pre-heating zone and press

## Fastest lamination speed with compact Pre-Nip length



### Technical Data

	PlusLam S2040	PlusLam S2650	PlusLam S3360	PlusLam U2040	PlusLam U2650
Maximum size	2,000 x 4,000 mm	2,600 x 5,000 mm	3,300 x 6,000 mm	2,000 x 4,000 mm	2,600 x 5,000 mm
Minimum glass size	400 x 250 mm (600 x 400 mm for S3360)				
Glass thickness	3 - 19 mm				
Maximum laminate thickness	60 mm / 100mm				
Working height	920 mm				
PNM speed SingleNip 66.2 mm PVB	2.3 m/min				
PNM speed DoubleNip 66.2 mm PVB	2.7 m/min				

\* PlusLam S3360 only with Double-Nip available





	L (m)	B (m)	H (m)	Power (kVA)
PlusLam S2040	33.1	8.0	4.9	250
PlusLam S2650	37.3	9.0	4.9	280
PlusLam S3360	46.9	9.7	4.9	420
PlusLam U2040	19.6	13.5	4.9	250
PlusLam U2650	22.9	14	4.9	280



# MaxLam

## Fully automated and high output lamination line

MaxLam is a high-speed and fully automated lamination line appropriate for customers with a large production volume of lamination glasses. This concept sets the focus strongly on elements important for each organization, such as production cost reduction. New and further developed machinery can, compared to the PlusLam, increase the output on a top level.

In combination with the accurate, patented and further developed Pre-Nip the MaxLam does not only provide a highly stable lamination process for different glass shapes such as rectangular or triangular glasses but is also one of the fastest lamination lines on the current market.

The MaxLam is the perfect choice for a three shift fully automated high output production for different products as well as for a Jumbo laminated glass production directly connected after a Float glass production.

This line is only available with a 2-Nip lamination furnace system.

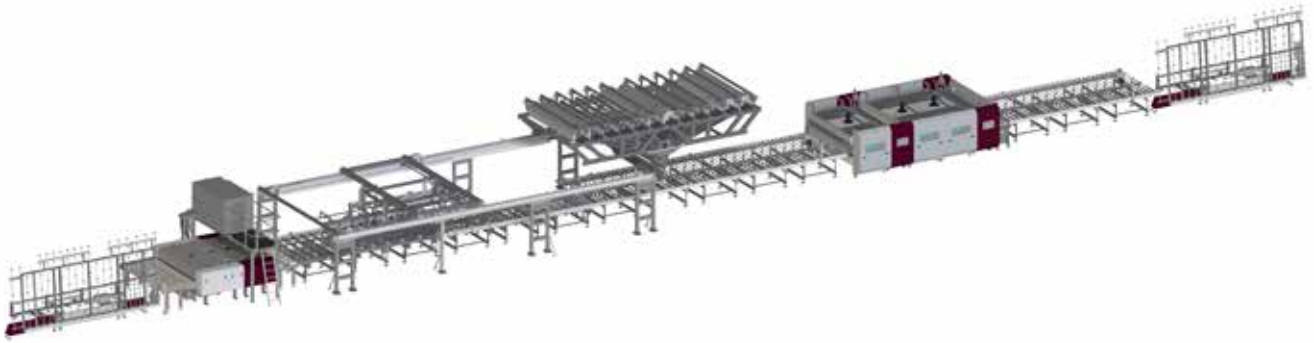
### Highlights

- Fully automatic high output lamination line
- Automatic foil laying and length cutting
- Smart press technology
- Lamination line only in straight form available
- Tilting table for glass loading and unloading

### Options

- 18 roll foil magazine
- Carry over lift with automatic side shiftment for step units
- Automatic foil trim cutter for rectangular glass
- Speed assembling
- Eco-heaters for saving energy up to 40%
- Connection to ERP software

## Fastest lamination speed with compact Pre-Nip length



### Technical Data

	MaxLam S2650	MaxLam S3360
Maximum size	2,600 x 5,000 mm	3,300 x 6,000 mm
Minimum glass size	400 x 250 mm	600 x 400 mm
Glass thickness	3 - 19 mm	
Maximum laminate thickness	60 mm	
Working height	920 mm	
PNM speed 66.2 mm PVB	2.7 m / min	

	L (m)	B (m)	H (m)	Power (kVA)
MaxLam S2650	44.3	9.3	6.5	370
MaxLam S3360	52.5	10.0	6.5	450









# STAND-ALONE MACHINES

Machines used for the lamination line can also support your production as a stand-alone machine. Furthermore, these types of machines enable you to change elements of your existing line.



# HWM-B

## Horizontal washing and drying machine for flat glass

Automatic washing and drying machine also for glass shapes and low-e coated glass.

### Highlights

- High-quality components and stainless materials
- Extremely gentle washing process
- Drip-free drying of the glass sheets due to noise-insulated high-performance fan
- Fully automatic glass thickness measurement
- Glass thickness and transfer speed are set automatically
- Individual motor for each brush to lower the downtime
- Easy maintenance thanks to 500 mm opening of the upper part

### Options

- Lifting brushes for soft coated glass and low-e detector on the inlet conveyor
- Soft brushes on the top side for soft coated glass
- Separate prewash module at the inlet table of the washing machine
- Antistatic bar to remove the electrostatic charge
- Water treatment system



### Technical Data

	HWM-B20	HWM-B26	HWM-B33
Maximum size	2,000 x 4,000 mm	2,600 x 5,000 mm	3,300 x 6,000 mm
Minimum glass size	400 x 200 mm		
Glass thickness	2- 25 mm		
Working height	920 - 950 mm		
Transport speed	max. 12 m / min		





	L (mm)	B (mm)	H (mm)	Power (kVA)
HWM-B20	5,720	3,880	3,650	47
HWM-B26	5,720	4,480	3,650	55
HWM-B33	5,720	5,180	3,650	70



# Autoclave

## Temperature and pressure process for final bonding of laminated glass

The autoclaving process is the last step in the production of laminated glass for the final bonding of glass and mostly PVB or SGP SentryGlas foil is used. The autoclave is electrically heated, and an installed fan recirculates the air to achieve a uniform temperature distribution in the autoclave. Laminates are typically placed vertically on racks in the autoclave with adequate spacing between them.

The quality of this process depends on the right temperature, pressure and time according the interlayer type. The right settings for the process parameters yield an end product with the required properties.

Thicker, large-format laminates require an autoclaving process that differs from that for thinner laminates. Thicker lamination products have to be heated and cooled down more slowly to reduce the stress within the lamination product to prevent bending, which has a negative impact on the adhesion between interlayer and glass.

The entire cycle time depends on the machinery equipment, amount of glass, pressure level and temperature curve and can vary between 2 and 6 hours. A pressure of 10 to 13 bar is set at a holding temperature of 130 to 145°C.

### Highlights

- Autoclave including electric heating and cooling water register
- Control cabinet including control system
- Autoclave trolley (consisting of a trolley with undertrolley for loading and unloading)

### Options

- Turn-Key Autoclave



Technical Data			
	ACL-B40/20I	ACL-B50/26I	ACL-B60/33I
Maximum size	2,000 x 4,000 mm	2,600 x 5,000 mm	3,300 x 6,000 mm

# Climatic Clean Room

## White room for the assembly of glass and foil at a lamination line

The climatic clean room is necessary to produce laminated glass with PVB or SGP SentryGlas foil with the right moisture content and assemble the foil dust free between the glasses. The air conditioner and dehumidifier device control the temperature in the room at 18°C and the humidity at 25%, depending to the interlayer type. Air filters reduce the particles in the air. Insulated wall panels reduce the energy consumption for the cooling of the climatic clean room.

Depending on the configuration of the lamination line and positioning of the foil magazine an one or two storage climatic clean room is used.

### Highlights

- Cladding: Standard = 0.6 mm galvanised steel, painted on both sides with polyester coating
- Insulation: FCKW and HFCKW free PIR rigid foam core
- Two doors and windows
- A/C unit including control cabinet







# SOFTWARE

With our broad product portfolio we offer our customers a modular set-up, from single-user to complex group solutions with central administration and decentralized sales and production branches.

Our whole team supports the development and service of our products, with the goal of generating the greatest benefit for our customers.



## Production Planning Software for the Flat Glass Industry

prod organises your production processes from the jumbo plate stock to the laminating process, the insulating glass production or any other kind of production process to the packaging of your products. The prod basic package already covers all main production planning functions relevant for the flat glass industry: production planning, scheduling, glass cutting optimisation, sequencing and remake management.

### Extensions and additional products:



tso



dynopt



oad



proschedule



bar



analytics



cadcam



ident



pack



delivery



prodmon



scancam

### Highlights

- Overview of the running production
- Machine load and bottleneck warning
- Packing optimisation
- Stock location management
- Avoiding manual sorting
- Flexible reporting
- Simultaneous optimisation of multiple variants
- Remake management and integration

### Interfaces:

Bottero, Hegla, Intermac, Bavelloni, Bystronic, etc.

### Functions

- Production planning and control system
- Material- und Maschinenoptimierung
- Dynamic optimisation
- Rack optimisation
- Label printing (grafical generator)
- Capacity planning
- Flexible reporting and analyses
- Delivery- / route planning
- Order management
- Process overview via asset check
- Integrated quality management
- Production status
- Control of LiSEC and foreign machines

The screenshot displays the 'Batch Overview' window of the prod software. It features a complex table with multiple columns, including 'Order', 'Date', 'Status', 'Machine', 'Material', 'Quantity', 'Start Date', 'End Date', and 'Production Status'. The table is filled with data rows, each representing a specific production batch. The interface also includes various filters and controls at the top and bottom, allowing users to navigate and analyze the production data effectively.

Overview of the Running Production





With the help of Analytics, it is possible to gain a precise insight into production, identify potential scope for improvement and derive appropriate measures. Analytics makes data from production available in an appropriate format and facilitates analysis. Key figures such as overall equipment effectiveness (or OEE) are automatically calculated for both machines and lines and on the basis of the shift schedule.

### Highlights

- Greater transparency in production
- Identification of improvement potentials
- Analysis of downtimes
- Breakdown according to products and shapes

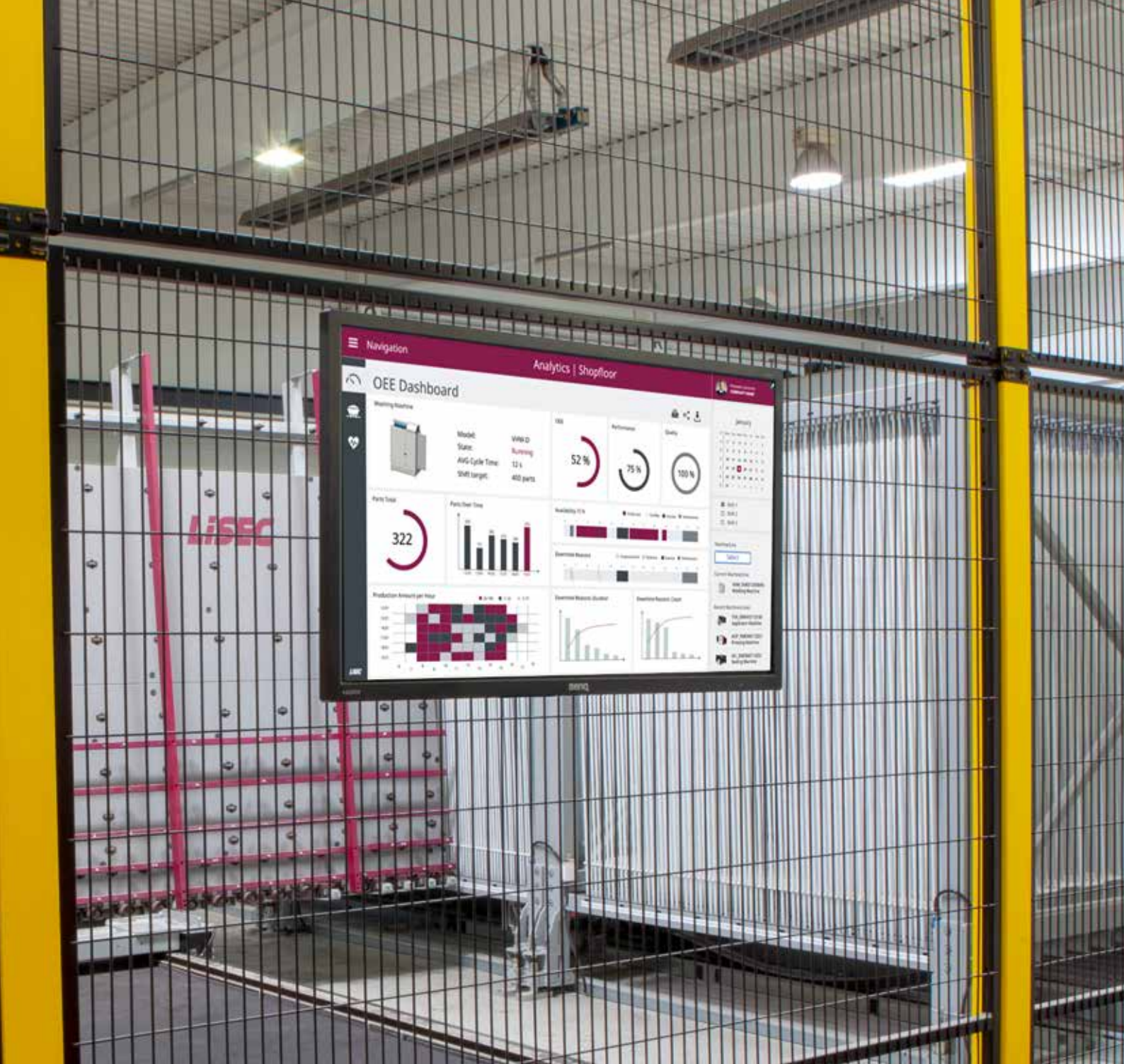
### Functions

- Custom dashboard for the transparent presentation of production figures in real time
- OEE dashboard



OEE Dashboard





### Visualisation of output key figures per machine

Based on the configurable shift plan, the respective output can be compared over several days and even on an hourly basis in order to derive appropriate measures

### Calculation of OEE for machines and lines

By combining several machines into lines, the OEE figure can be calculated not only for individual machines but also for entire lines.

### Analysis of the causes of problems (alarms, product mix, availability, ...)

If the output does not meet expectations, the causes can be found by analysing alarms that have occurred, the product mix or the reasons behind individual stoppages in more detail.

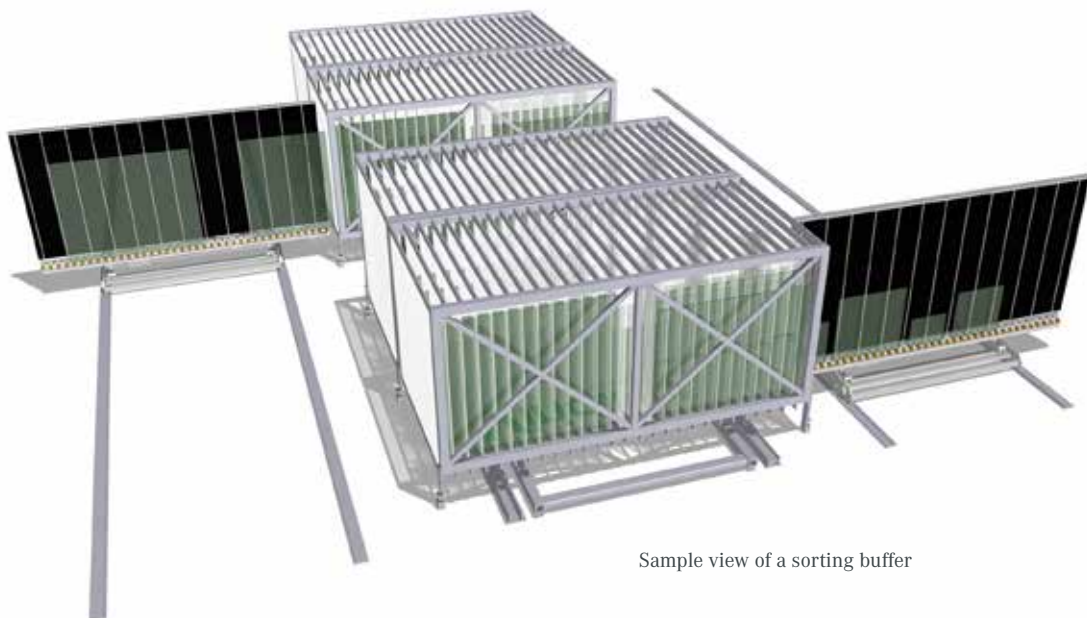
autofab is the heart of the automatic sorting and/or buffering solution. This solution allows online control of a completely automated glass production process. The system automatically connects to all machines, controls, regulates and supervises the production processes, and reports the current status of e.g. the sorting systems, etc. With the system it is even possible to separate cutting from production sequence. This way, glass waste is minimised and is guaranteed an optimum production sequence on an insulating glass line, a furnace, etc.

## Highlights

- Individual production sequences per machine
- The operator is informed about the current status
- Traceability over the whole production sequence
- Optimum utilisation of machines, buffers etc.
- Support of different sorting systems

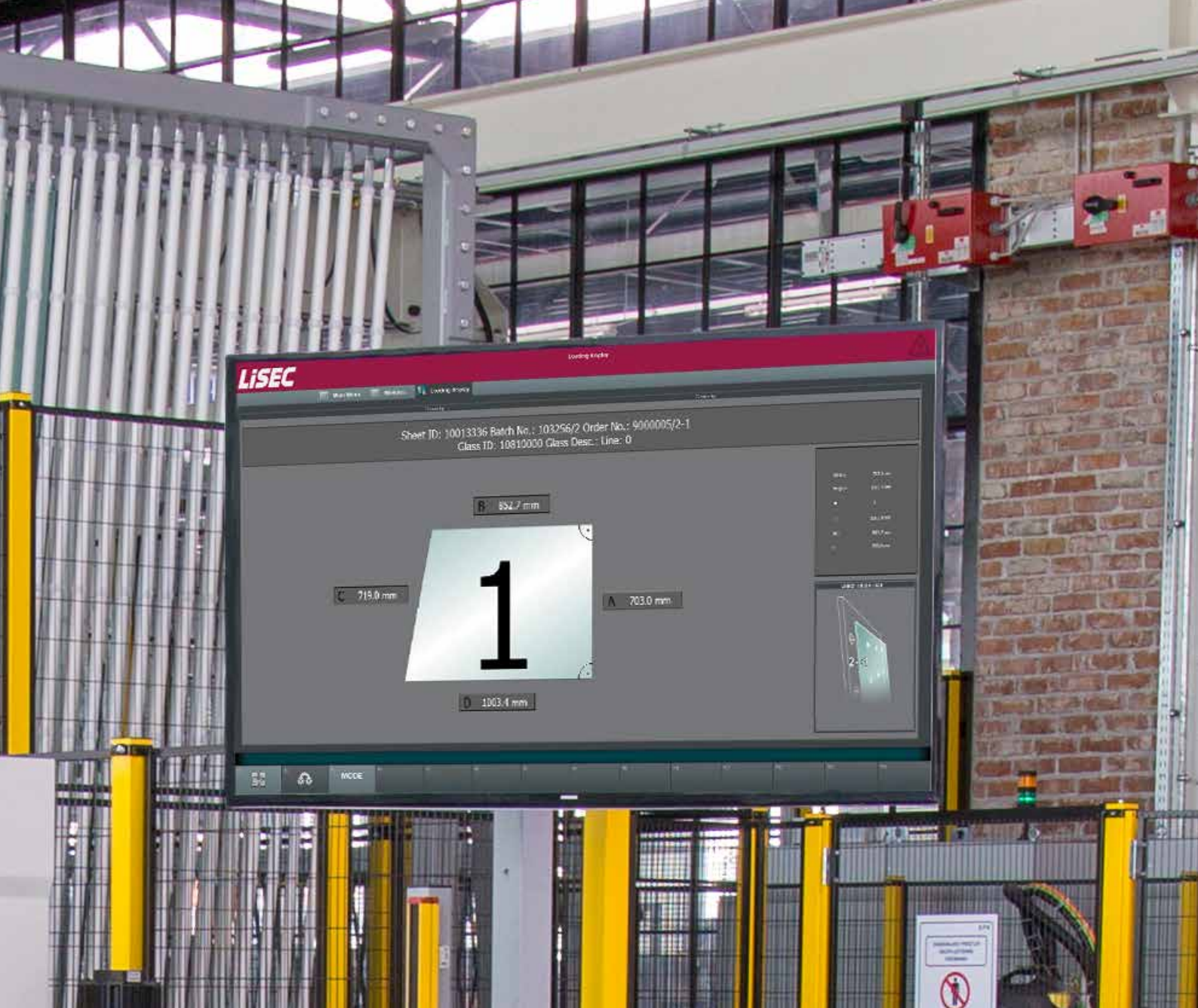
## Functions

- Support of loading / unloading Robot
- Support of piece rotation during furnace bed loading and unloading
- Automatic calculation of suction cup activation for pieces with cut outs
- Control of automatic dynamic cork applicator (for single glass)
- Support of North Glass Furnace
- Support of hourly movement figures
- Integration with LiSEC Analytics Platform
- Support of washing machine and scanning in stock area
- Support of 2D data matrix code marking and reading
- Additional furnace bed optimization parameters
- Enhanced use of formulas for configuration
- Enhanced integration of preproduction pieces into main batches
- Ready messages to be shown in GPS.autofab overview
- Enhanced integration of capacity worksteps in the GPS.autofab logic
- Improved shape analysis
- Support of buffer resorting



Sample view of a sorting buffer





### Toughening Bed Load

Sheets are automatically optimised into a toughening bed, taking the furnace criteria into consideration. The furnace is automatically supplied with the sheets and the recipe data. After the tempering process the scanner and ripple data are automatically evaluated. Depending on the next processing step (delivery/IG), the individual sheets are automatically transported from the toughening bed to the correct position. Diverse tempering furnaces and scanning systems can be integrated.

### Loading Display

The loading display supports the operator loads the sheets onto the transport into the sorting system. The loading display shows all relevant information to load the sheets in the sorting system specified sequence, with the correct base edge and glass side.

### Traceability over the Whole Production Sequence

The fully automated glass production records every glass sheet. Each production step can be retraced.

### Optimum Space Utilisation

The function „Chaotic Sorting“ allows an optimum use of the harp cars. With fully automatic control the production becomes more efficient and economical.



## Information and Ready Messaging Terminal at the Production



The main function of ident is to inform the user within the production about relevant details resp. to register remakes and ready messages and transfer the information to the ERP system. The program also supplies work step specific information (e.g. shape position) and generates control codes for machines from third-party suppliers.

LiSEC.prdCtrl - Mobile App for industrial scanners and smartphones in production. This app offers useful functions that support the daily work on the shop floor. By simply scanning barcodes, ready and breakage messages can be triggered. The administration of the transport racks is also considerably simplified.

### Extensions and additional products:



#### Highlights

- Paperless production list
- Ready messages to release capacities and actualization of the status e.g. for an order
- Remake messages for fast post-production
- Detail display for shapes and processings for error prevention
- Higher flexibility through real time adaptation at production planning
- Mobile app for production tracking and management of racks

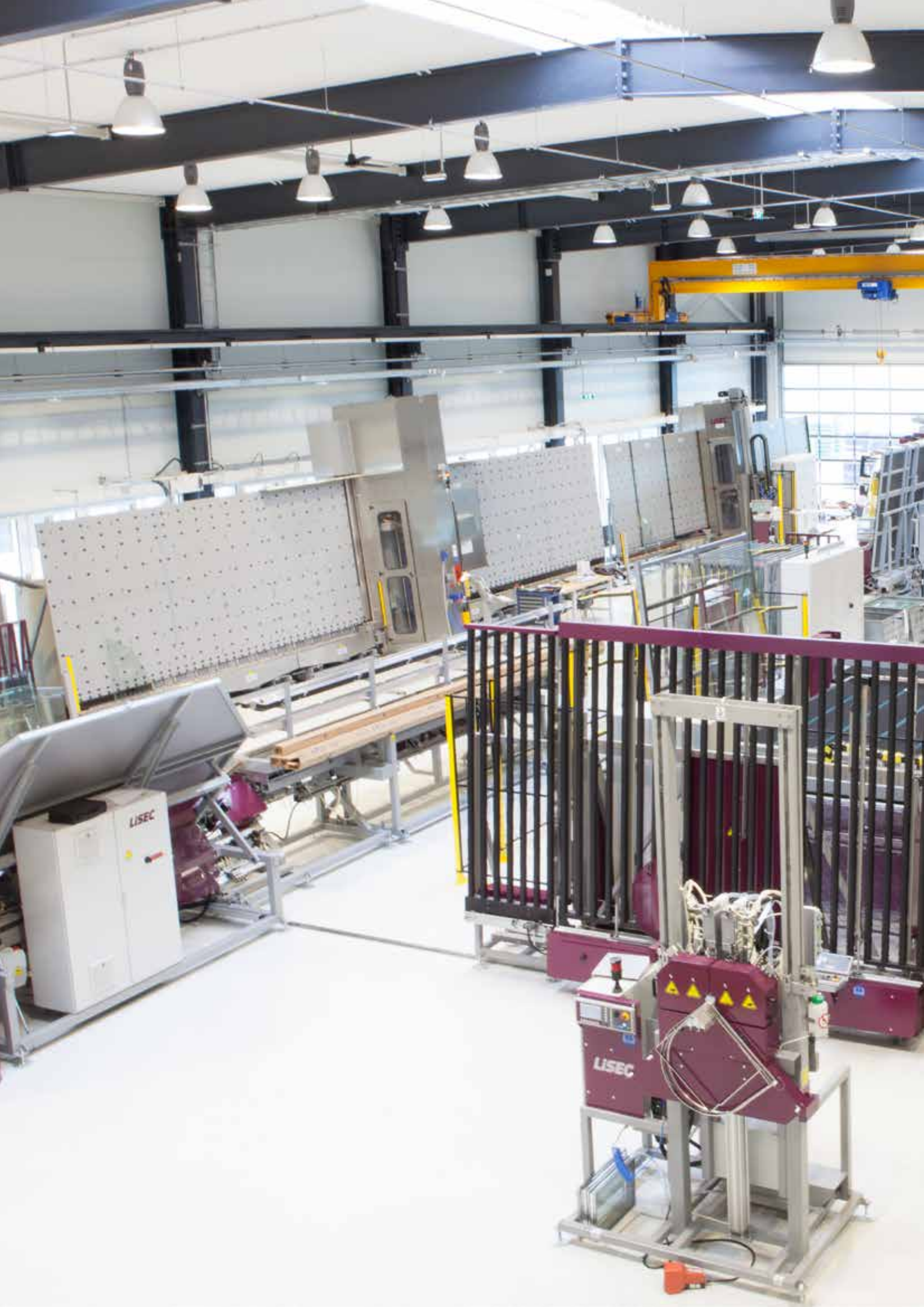
#### Functions

- Display of production drawings
- Entry of rack number and stock location
- Entry of remakes
- Online connection to processing machines
- Synchronising to other ident
- Material management
- Label printout (switching production / customer label)
- Status display











# SERVICE

Machines and systems for flat glass processing are in use for many years, sometimes even for decades. Ongoing maintenance and optimisation are essential to keep performance, efficiency and availability at a consistently high level and to ensure high-quality glass products.



# Services

**We offer you worldwide service and the fastest possible supply of spare parts.**



From machine installations to modernization of existing systems, we offer a wide range of services, and stay on your side as a competent and reliable partner throughout the entire life cycle of your systems. Whether you need a customized training program, detailed machine inspections, online support, spare parts or upgrades – the LiSEC service team will take care of it for you.

## Facts & figures:

- More 140 service engineers worldwide
- Global network with local partners all over the world
- Spare part deliveries worldwide within shortest time
- Super-fast problem solving via remote service
- Competent technical consulting

## Service Products

- Online Support
- Hotline
- Service / Maintenance
- Training
- LONGLiFE
- Spare parts
- Installation
- Repairs

## Online Support

Telephone support with direct data connection to your LiSEC machinery for the immediate and targeted diagnosis and correction of faults and errors.

### Machinery

Sunday 10:00 p.m. – Friday 09:00 p.m. (CET)

**Phone:** +43-7477 405-5701  
**E-Mail:** tbe.service@lisec.com

#### Emergency contact for urgent issues outside our working hours:

Saturday 6:00 a.m. – 10:00 p.m. (CET)  
Sunday 6:00 a.m. – 10:00 p.m. (CET)  
**Phone:** +43-7477 405-5701

### Software

Monday 07:45 a.m. – Friday 09:00 p.m. (CET)

**Phone:** +43-7477 405-5702  
**E-Mail:** support@lisec.com

#### Emergency contact for urgent issues outside our working hours:

**Phone:** +43-7477 405-5702





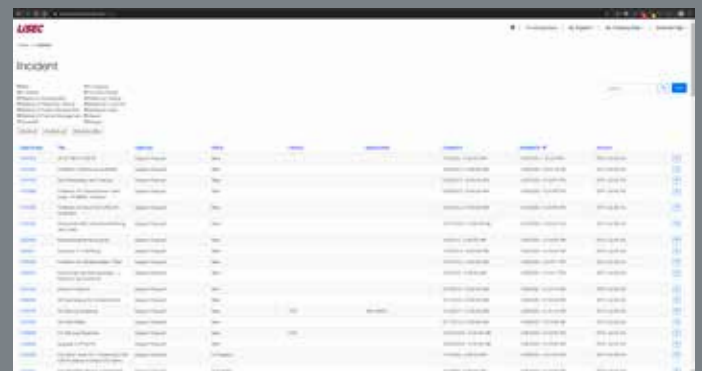
# My LiSEC

## Service portal

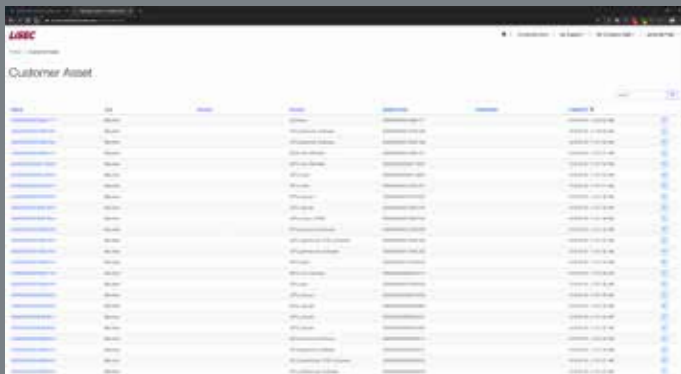
As a customer with a maintenance contract, you have access to the LiSEC Service Portal. Besides the possibility to open service tickets, the LiSEC Service Portal offers access to software and machinery documentation as well as an overview of the currently installed software packages.



1



2



3

### Machines and Software Service Portal

- Service Requests
- Ticket tracking and processing
- My documents / documentation
- Machines / plants product overview
- Overview of software products and maintenance contract
- Spare parts
- News

### Overview of all open service tags / tickets

The communication between you as a customer and our specialists in Service, Project Management or Sales can be called up at any time, clearly and chronologically structured.

- Overview of all installed software products and their maintenance status



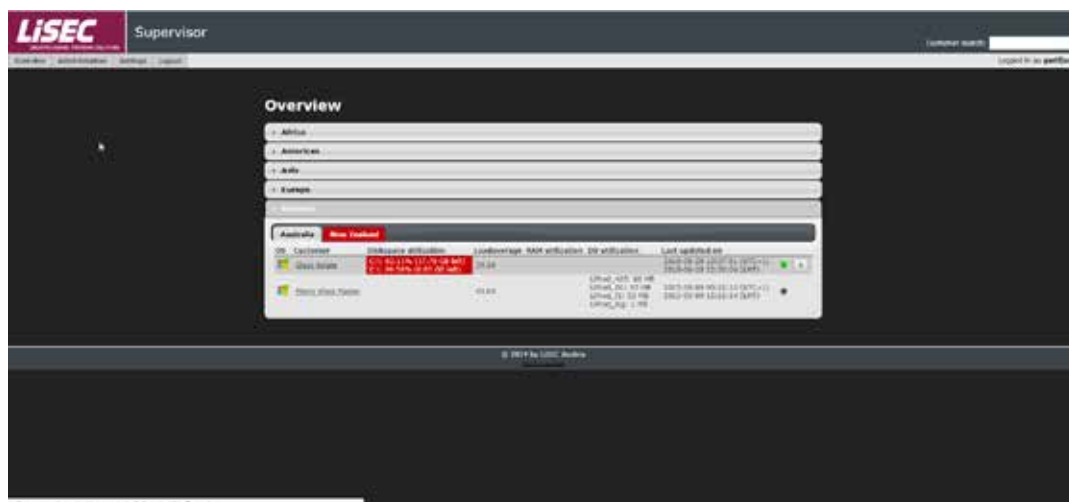
# LiSEC Supervisor

Within the scope of the maintenance contract, we offer monitoring of your ERP and productive servers. The LiSEC supervisor monitors all system-critical processes of your productive server, such as:

- LiSEC product-critical processes & services
- Usage of the individual databases
- Operating system-critical processes
- Hard disk capacity
- CPU usage
- Memory / RAM utilization

## Advantages

- Reduction of downtimes
- 24 x 7 automatic monitoring
- Proactive information of our customers in case of alarms
- Alarm analysis and resolution
- Re-adjustment of system parameters
- Ongoing product development to improve diagnoses, analysis, proactivity and prevention



Sample of an alarm message if the hard drive capacity is underrun

# Project management

## COMPETENT.

Time planning, cost and risk management, communication – a competent project manager is the key to project success. The LiSEC project management team supports you with highly qualified specialists, who are able to draw on years of experience and expertise in the flat glass industry.

LiSEC project management begins during the run-up to the project. The project scope and environment are defined using tried and tested tools and methods. In this way, we enable you to achieve the greatest possible benefit with your resources and our products.

A detailed project schedule forms the basis for the systematic realisation of the project goals. Problems are identified at an early point in time and individual solutions are formulated through continuous risk management.

## RELIABLE.

As a central point of contact, the project manager coordinates and controls the project, and intervenes quickly and effectively if deviations from planning arise.

Well-considered documentation and information planning together with regular progress reports ensure that all relevant project details are fully available to all parties involved without delay, thereby forming the basis for efficient cooperation.

## We use proven tools for project realisation:

- LiSEC CRM for management of the work packages, and for your traceable and transparent progress controlling
- Microsoft® Project for project and resource planning, including milestone management
- Group-wide SAP® project management for project controlling
- Microsoft® SharePoint for internal project coordination and version management
- Comprehensive library of standardised document templates

## INNOVATIVE.

Our goal is to use technologically leading machinery and systems to realise an optimum economic solution for you, as efficiently and effectively as possible. Following successful completion of the project, LiSEC Aftersales/Service supports the seamless operation of your systems.

Our sales team is constantly available to you for the development of new solutions through which to utilise the growth potential resulting from changes in requirements and framework conditions.





# GLASTECH

Competence Center for research, production and training in the field of flat glass processing

## Facts and figures:

- Opened October 2015
- Latest LiSEC technologies
- 70 employees
- Investment: 9 million € since 2015
- 15 million Euros turnover
- Approx. 100 customer visits per year
- Glass storage with 96 rack positions
- 2 insulating glass lines
- 3 cutting lines for float, laminated and special glass
- 1 glass processing line „SplitFin“
- 1 edge processing machine KSD
- 1 laminated glass line
- One AEROFLAT tempering furnaces
- Automatic sorting/shuttle logistics
- Planned ahead maintenance schedule
- Automatic production planning and machine addressing





The new LiSEC Competence Center for research, production and training in the field of flat glass processing was opened in Hausmening at the end of 2015. It aligns completely with the LiSEC claim „all.in.one:solutions“. The Competence Center „GLASTECH“ makes LiSEC the only machine manufacturer on the market who profitably processes flat glass. This operator know-how allows LiSEC to share and therefore fully understand their customers' problems and challenges.

The „GLASTECH“, a LiSEC investment of approximately nine million Euros, accommodates the latest LiSEC technologies for each step of glass processing – from cutting and edge processing to a sophisticated sheet logistics system to the production of insulating glass units and laminated safety glass including tempering. In the GLASTECH, flat glass is processed under real life production conditions. The state-of-the-art plants and software applications are also used for research, testing and training.



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