Glass Inspector

Products catalog

Artificial Vision System for
Glass Quality Control

Artificial Vision System for Glass Quality Control

玻璃质量控制-人工视觉系统

What is Glass Inspector® and how does it work?什么是Glass Inspector®，它是如何工作的？

Defects in flat glass, whether they are origin defects (such as bubbles or inclusions) or production defects (such as scratches, spots or coating defects, are a problem that is usually detected too late during the manufacturing process.平面玻璃中的缺陷，无论是原始缺陷(如气泡或夹杂物)还是生产缺陷(如划痕、斑点或涂层缺陷)，在制造过程中发现得太晚的问题。

Glass Inspector® with proper lighting and processing, performs an **online inspection of glass pieces**, detecting defects without interrupting manufacturing. With this information, we ensure that defective glass does not continue in the production process and thus the costs derived from these defects are minimized.

Glass Inspector®在适当的照明和加工条件下，**对玻璃片进行在线检测**，在不中断生产的情况下检测缺陷。有了这些技术，我们可以确保有缺陷的玻璃不会继续在生产过程中出现，从而最大限度地降低这些缺陷带来的成本

Glass Inspector® points out the defect directly onto the glass, this helps the operator to make a quick decision: correct the defect or remove the defective piece of glass.**Glass Inspector®直接在玻璃上指出缺陷**，这有助于操作人员快速做出决定:纠正缺陷或移除有缺陷的玻璃

Technical characteristics技术特征:

- Maximum line speed最大线速度: **40 m/min (131 ft/min)**
- Maximum resolution最高分辨率: **0.04 mm²/pixel** 像素(0.000062 in²/pixel)(*)
- Maximum glass dimensions: no limit 最大玻璃尺寸：没有限制.
- Detectable defects: **bubles, inclusions, scratches, stains, layer defects, fingerprints, water drops,** etc. 可检测的缺陷:气泡、夹杂物、划痕、污点、层缺陷、指纹、水滴等。

(*) The minimum detectable defects depend on the type of defect, the minimum resolution and the type of lighting applied
最小可检测缺陷取决于缺陷类型、最小分辨率和所用照明类型

Ease of integration易于集成:

Glass Inspector® integrates easily into any horizontal or vertical manufacturing line. You do not need to modify any element and it does not occupy any space at the back of the manufacturing lines.**Glass Inspector®**可轻松集成到任何卧式或立式生产线中。您不需要修改任何部件，也不会占用生产线后部的任何空间。

Complete solution: Detection and signaling directly on the glass
完整解决方案:直接在玻璃上检测和发送信号

Glass Inspector® is a complete solution for detecting and signaling of defects. Thanks to the patented Smart Pointer System **(Patent P201030605)**, the operator quickly and easily locates the defect and decides whether to intervene to correct it or dispose the defective piece. **Glass Inspector®**是检测和提示缺陷的完整解决方案。凭借获得专利的智能指针系统（**专利**P201030605），操作人员可以快速轻松地找到缺陷，并决定是否进行干预以纠正缺陷或处理缺陷产品。

Glass Inspector® includes a **traceability system** that can be linked to a bar-code reader.
Glass Inspector®包括一个可追溯系统，可以链接到条形码阅读器。

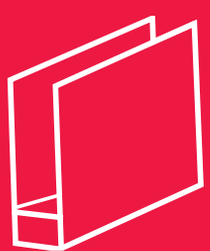
Personalized service:个性化服务

Glass Inspector® is configured according to the requirements and specifications of each installation, each manufacturing line and each client.**Glass Inspector®**是根据每个安装、每个生产线和每个客户的要求和规格配置的。

Please contact the technical and commercial team of Glass Inspector for a personalized project.
如需个性化项目，请联系Glass Inspector 的技术和商务团队。

PRODUCTS

Glass Inspector® is intended for use in the manufacture of double glazing, tempered glass, laminated glass and glass for photovoltaic applications.
玻璃检测器用于制造双层玻璃、钢化玻璃、夹层玻璃和光伏应用玻璃。



VERTICAL Glass Inspector
立式玻璃检测

Due to its ease of installation, it can be placed in any existing insulating glass production line or in a new one. The **Vertical Glass Inspector®** can also be installed on any vertical line of flat glass manufacturing such as CNC edgers and drills.由于易于安装，它可以放置在任何现有的绝缘玻璃生产线或内。垂直玻璃检测器也可以安装在平板玻璃制造的任何垂直生产线上，例如CNC磨边机和钻孔机。

HORIZONTAL Glass Inspector
卧式玻璃检测

Horizontal Glass Inspector® has been designed to be installed on laminated glass manufacturing lines. After the detection of a defect, the Horizontal Glass Inspector makes it easier for the operators to identify it and to decide the type of intervention to be carried out. The system records the images of 100% of the pieces.卧式玻璃检测机设计安装在夹层玻璃生产线上。检测到缺陷后，水平玻璃检测器使操作人员更容易识别缺陷并决定要进行的干预类型。系统记录100%作品的图像。

Glass Inspector 4D
4D玻璃检测

Due to its ease of installation, it can be installed in any existing tempered glass oven or in a new one.
The **Glass Inspector 4D®** analyzes and measures: optical distortion, anisotropy, flatness and the presence of white haze.由于易于安装，它可以安装在任何现有的钢化玻璃炉或新的钢化玻璃炉中。
玻璃检查员4D分析和测量:光学变形、风斑、平整度和白雾的存在。

VERTICAL GLASS INSPECTOR®

Vertical Glass Inspector® is designed to be integrated into:
立式玻璃检测可以安装到:

- Double glazing manufacturing lines.双层玻璃生产线。
- Vertical glass machining lines.立式玻璃加工线

100% Quality Control: The main function of the Vertical Glass Inspector is the real-time quality control of all processed glass, including both inspection (passed/failed) and interface with the operator to facilitate the making decision: correct the defect or remove the defective piece of glass.
100%质量控制:立式玻璃检测的主要功能是对所有加工玻璃进行实时质量控制，包括检查（通过/未通过）以及与操作人员进行交流，以帮助做出决定:纠正缺陷或移除有缺陷的玻璃。

Essential complement for automation: The manufacturing lines in a glass processing plant are becoming more automatic and faster. Therefore, it is necessary to incorporate artificial vision equipment that enables manufacturing not to stop except for the strict necessary time when the Glass Inspector detects a possible problem. System reliability and future access to pieces of glass images for traceability depend on the Glass Inspector.
自动化的重要补充:玻璃加工厂的生产线越来越自动化，速度越来越快。因此，除了玻璃检查员检测到可能的问题的严格必要时间之外，有必要结合人工视觉设备，使制造不停止。系统可靠性和未来获取玻璃图像的可追溯性取决于玻璃检查员。

Smart Pointer Patent: Glass Inspector has patented the defect position signaling system since 2010 (Patent ES2388631). With the help of two arrays of polychromatic LEDs, it is very simple and intuitive to check the defects detected and thus make the most appropriate decision.
智能指针专利:自2010年以来，玻璃检查员已获得缺陷位置信号系统的专利（专利ES2388631）。在两个多色led阵列的帮助下，可以非常简单直观地检查检测到的缺陷，从而做出最合适的决定。

Interface and warning: Glass Inspector artificial vision systems incorporate an user interface where it is very quick to identify the magnitude of a defect. The three main magnitudes are: contrast, dimension and area. These magnitudes are presented in the user interface, as well as an image of the defect found, with the lighting with which it was detected.界面和警告:玻璃检查员人工视觉系统包含一个用户界面，可以非常快速地识别缺陷的大小。三个主要的量值是:对比度、维度和面积。这些数值将显示在用户界面上，同时还会显示所发现缺陷的图像，以及检测缺陷时使用的照明设备。

TYPES OF ILLUMINATIONS：照明类型：

Glass Inspector Master detects defects using two types of lighting:
玻璃检测大师使用两种类型的照明检测缺陷:

- Dark-field lighting 暗场光
- Diffused back-light lighting 漫反射

With these two illuminations, all the most common types of defects are detected: stains, scratches, bubbles, inclusions, fingerprints, dust, other adhesives, etc.
通过这两种照明方式，可以检测出所有最常见的缺陷类型:污渍、划痕、气泡、夹杂物、指纹、灰尘、其他粘合剂等。

Glass Inspector Master is designed to be integrated into manufacturing lines of double glazing, tempered glass, laminated glass and glass for photovoltaic applications.Glass Inspector Master
可以安装到双层玻璃、钢化玻璃、夹胶玻璃和光伏应用玻璃的生产线中。

Glass Inspector Premium incorporates a third lighting：
玻璃检测的三种照明方式:

- Reflex lighting反射照明

With reflex lighting we can detect layer defects in low emissive glass and low emissive glass with solar control.
利用反射照明，我们可以检测低辐射玻璃和带太阳能控制的低辐射玻璃中的层缺陷。

DIMENSIONS, RESOLUTION AND SPEED
尺寸、分辨率和速度

Necessary space: 3 cm (1.18 in)
必要空间:3厘米（1.18英寸）

Maximum dimension: 3.21 m (10,53 ft)
最大尺寸:3.21米（10.53英尺）

Resolution: 0.04 mm2/pixel (0.000062 in2/pixel)

(*)
分辨率:0.04平方毫米/像素（0.000062平方英寸/

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HORIZONTAL
GLASS INSPECTOR®

Horizontal Glass Inspector is designed to be integrated into:
卧式玻璃检测可以安装到:

- Laminated glass manufacturing lines.-**夹胶玻璃生产线**
- Glass screen printing lines.**玻璃丝网印刷线**

100% Quality Control: The main function of the Vertical Glass Inspector is the real-time quality control of all processed glass, including both inspection (passed/failed) and interface with the operator to facilitate the making decision: correct the defect or remove the defective piece of glass.
100%质量控制:立式玻璃检测的主要功能是对所有加工玻璃进行实时质量控制，包括检查（通过/未通过）以及与操作人员进行交流，以帮助做出决定:纠正缺陷或移除有缺陷的玻璃。

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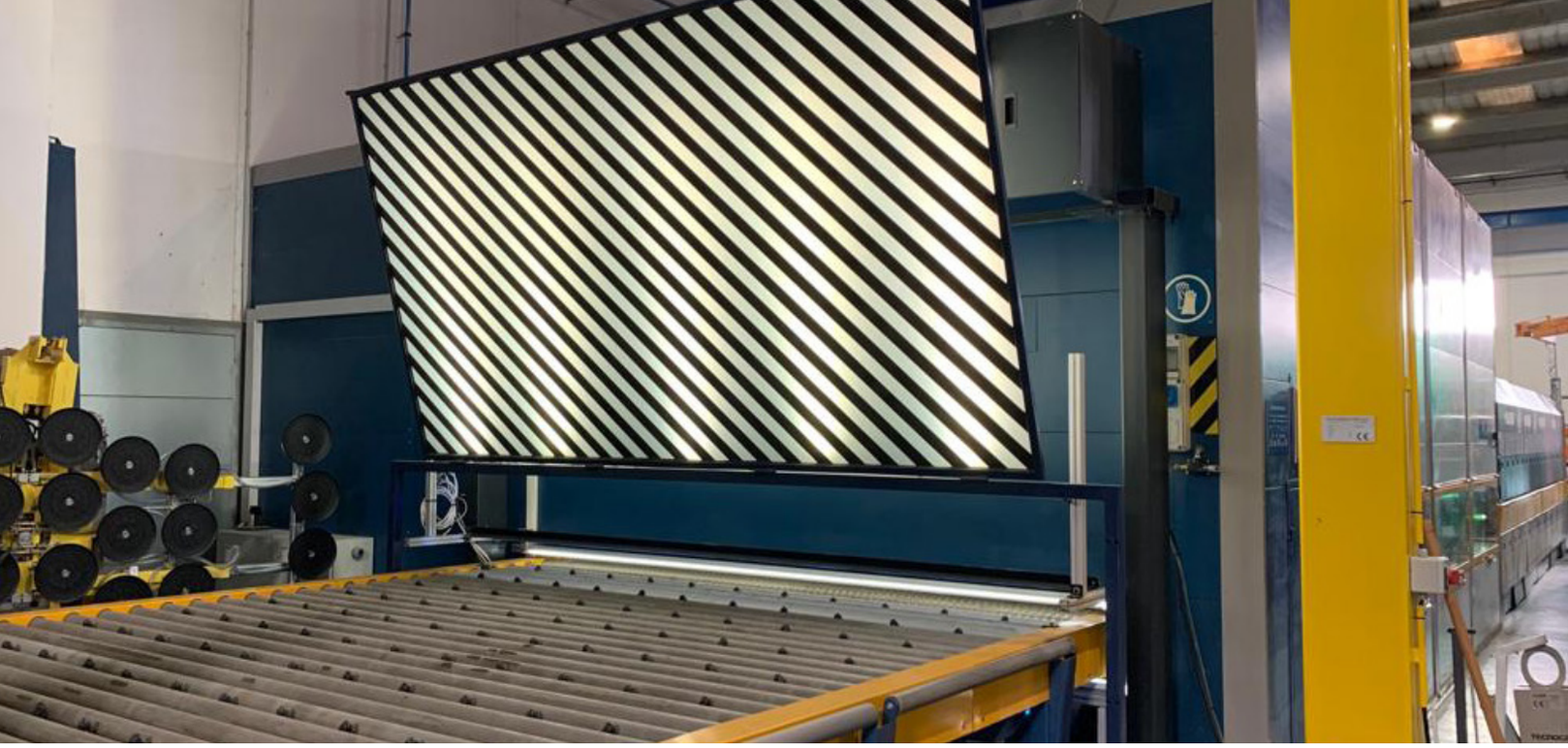


GLASS INSPECTOR 4D®

Glass Inspector 4D detects and measures the following 4 defects that occur during glass tempering process:检测和测量4D玻璃在钢化过程中可能会出现的以下4种问题:

White haze:**白色薄雾**:

When certain parts of the glass lean against the rollers more than others while it is being tempered, microcracks appear in the glass. These microcracks look like a diffuse shadow called "White haze".在钢化过程中，当玻璃的某些部分比其他部分更靠在辊子上时，玻璃中就会出现微裂纹。这些微裂纹看起来像一种被称为"白雾"的弥漫阴影。

With a darkfield lighting it is possible to highlight those defects that are seen with a dark background when they are illuminated intensely. The image is shown on the screen with increased contrast so that the operator can easily see both the dirt and the "white haze".
通过暗场照明，可以突出那些在黑暗背景下被强烈照亮的缺陷。图像以增强的对比度显示在屏幕上，以便操作员可以轻松看到污垢和"白雾"。

Iridescence/Anisotropy:**彩虹色/风斑**:

Iridescence or "leopard spots" occur due to the anisotropy of the glass.
由于玻璃的风斑，会出现彩虹色或"豹纹"。

Through the appropriate combination of polarizing and retarding filters, an image of the glass is taken where each level of anisotropy is represented by a color. The unit of measurement is nanometer and the system is designed taking compliance with the C1901-21 standard as a criterion.通过偏振滤光器和延迟滤光器的适当组合，拍摄玻璃的图像，其中每一级别的各向异性由一种颜色表示。测量单位为纳米，系统的设计以符合C1901-21标准为标准。

The system is calibrated using standards of known anisotropy.
使用的标准来校准系统。

Optical distortion:
光学失真：

By comparison with patterns of the reflected image, the optical distortion produced by lack of flatness in the glass is measured. The result is given in diopters (a diopter is the distortion created by a radius of curvature of one meter). The resolution of the system is 0.002 diopters.通过与反射图像的图案进行比较，可以测量玻璃因不平整而产生的光学畸变。结果以屈光度给出（屈光度是一米曲率半径产生的变形）。系统的分辨率为0.002屈光度。

Flatness：
平整度：

Glass Inspector 4D makes a 3D reconstruction of the glass. The result is the depth of the valleys generated in the rollers ("rollerwave"). The precision in short sections is 0.1 mm.
4D玻璃检测是对玻璃进行了三维重建。结果是在滚轮中产生的谷的深度(“ 滚轮波 ”)。短截面的精度为0.1毫米。

Adaptation to the Standard:**适应标准**:

Glass Inspector 4D has the flexibility to adapt tolerances to existing or future standards.玻璃检验员4D能够根据现有或未来的标准灵活调整公差

Report generation:**报告生成**:

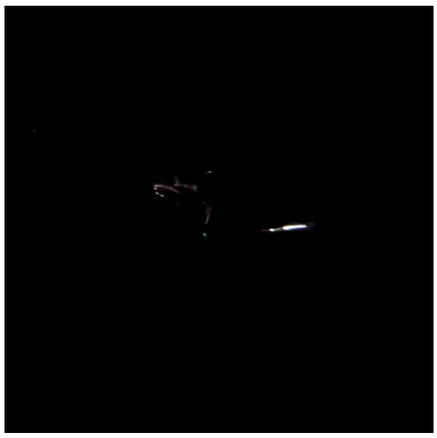
Reports are automatically generated and saved on disk. They can be integrated with manufacturing software directly by date and by manufacturing time or enter the unique barcode identifier of each piece of glass. 报告会自动生成并保存在磁盘上。它们可以通过日期和制造时间直接与制造软件集成，或者输入每块玻璃的唯一条形码标识符。

Detectable defects
at working speed

工作速度下可检测的缺陷

Glass surface contamination 玻璃表面污染

Defects on the glass surface can be removed by proper cleaning.玻璃表面的缺陷可以通过适当的清洁来去除。

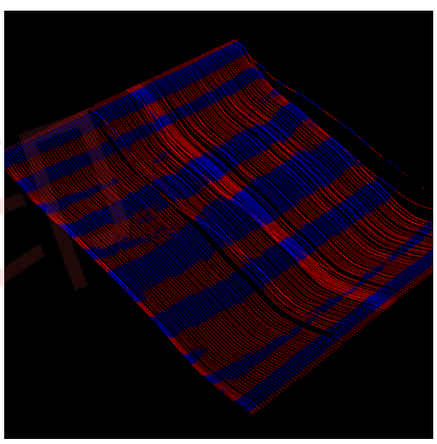


Damaged glass surface 受损的玻璃表面

Physical damage on the glass surface is mainly caused by its handling in the factory (cutting tables, edgers, etc.).玻璃表面的物理损坏主要是由工厂中的搬运造成的（切割台、磨边机等）

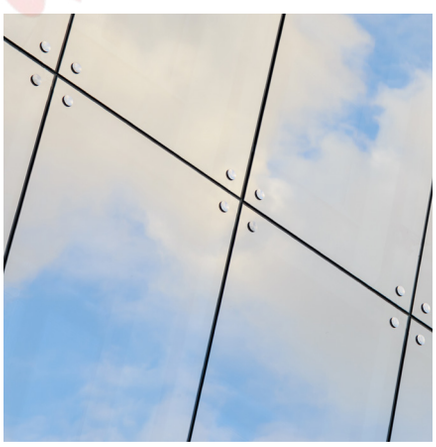
Interior glass defects 玻璃内部缺陷

The defects found inside the glass have not been caused by handling (bubbles, inclusions, etc.) 玻璃内部发现的缺陷不是由处理引起的（气泡、夹杂物等）



Layer glass defects 玻璃缺陷

Damage or defects in the glass layers are difficult to detect without the help of artificial vision equipment. 如果没有人工视觉设备的帮助，很难检测到玻璃层中的损坏或缺陷。



Anisotropy, Distortion, Planimetry, White haze各向异性、失真、平面测量、白雾

The tempering process produces observable and measurable optical effects under certain conditions.回火过程在某些条件下产生可观察和可测量的光学效果。

GLASS INSPECTOR CLOUD: We have designed a service for traceability of the analyzed glass. Glass Inspector Cloud is a web service in the cloud that allows you to store, query and process images and data captured by Glass Inspector in the different lines that each company has.

云玻璃检测：我们设计了一项服务，用于对分析过的玻璃进行追溯。Glass Inspector Cloud是云中的一项web服务，允许您存储、查询和处理Glass Inspector在每个公司的不同生产线上捕获的图像和数据。

Glass Inspector

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v1 / 2022 - EN