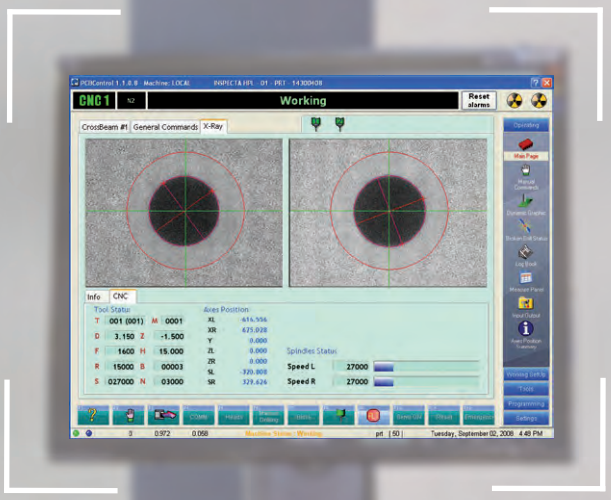
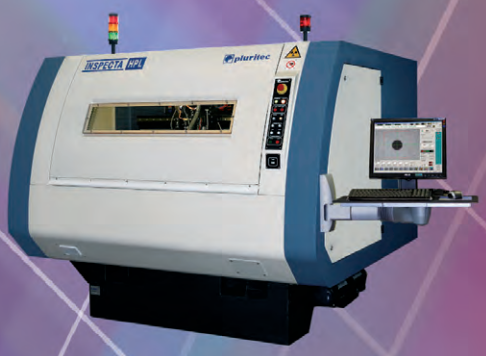
pluritec®



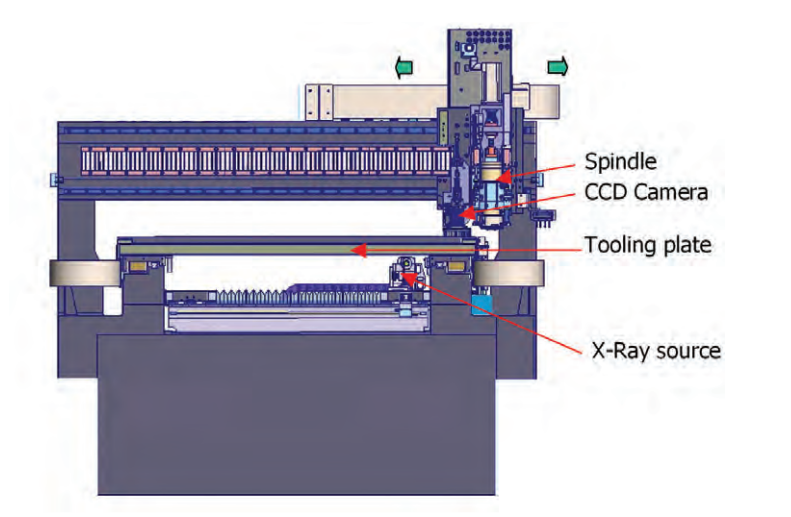

# INSPECTA X-RAY SERIES




**AUTOMATIC X-RAY REFERENCE HOLE OPTIMIZER**
**X-RAY INSPECTION SYSTEM**
**“ONE STEP®” X-RAY DRILLER - ROUTER**
**POST ETCH X-RAY DRILLER**

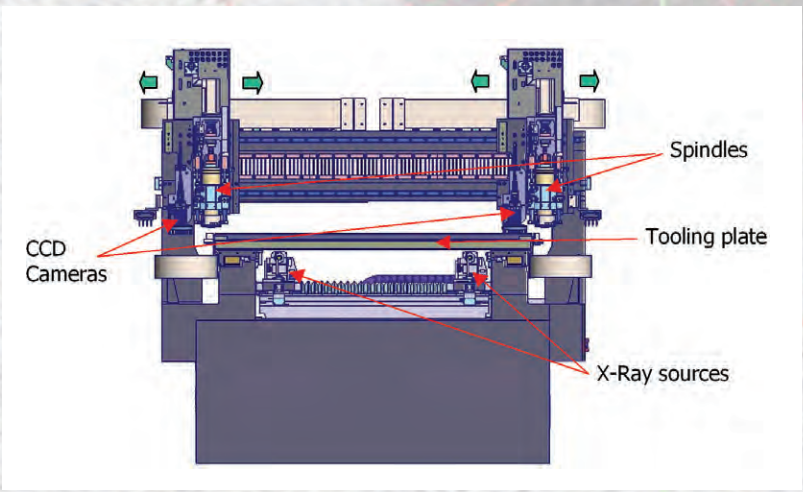
# ALL AXES WITH

## INSPECTA L





## INSPECTA HPL




## THE X-RAY SERIES

**INSPECTA L or HPL**
X-Ray inspection machine for optimized reference hole drilling

# INSPECTA X-RAY SERIES

### X-RAY SERIES

### ALL AXES WITH LINEAR MOTORS

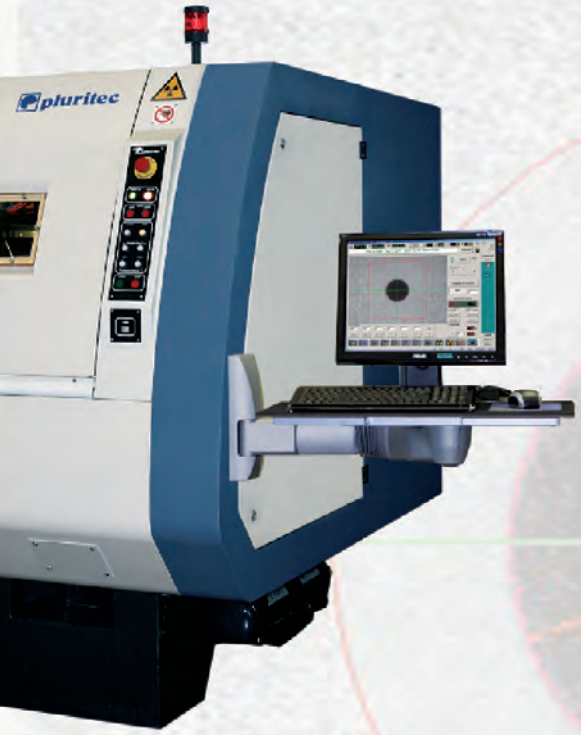
INSPECTA is the new Pluritec® X-Ray drilling/routing machine.

The wide range of configurations allows to have not only an X-Ray optimizer but also a real drilling machine assisted by X-Ray.

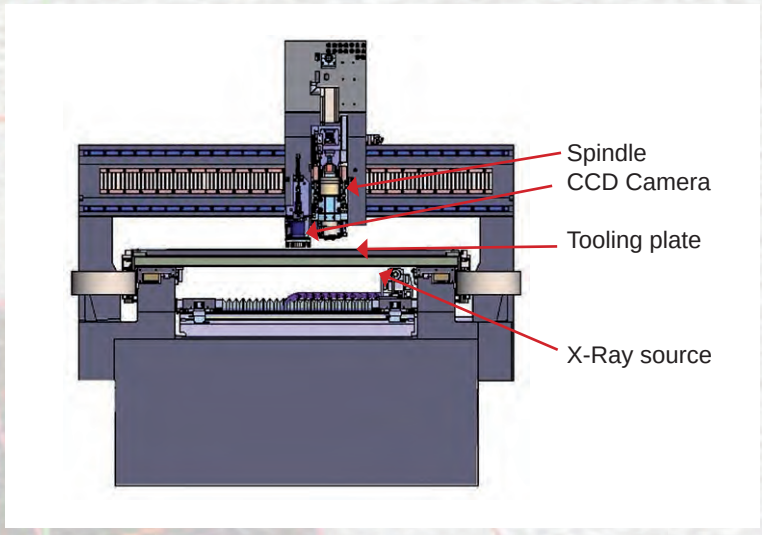
This means maximum versatility and flexibility that, in combination with a large working area, make INSPECTA the perfect tool to process multilayers boards.

INSPECTA is designed to grant high accuracy and productivity (up to 5 panels/min).
The machine can be equipped with 1 or 2 spindles.

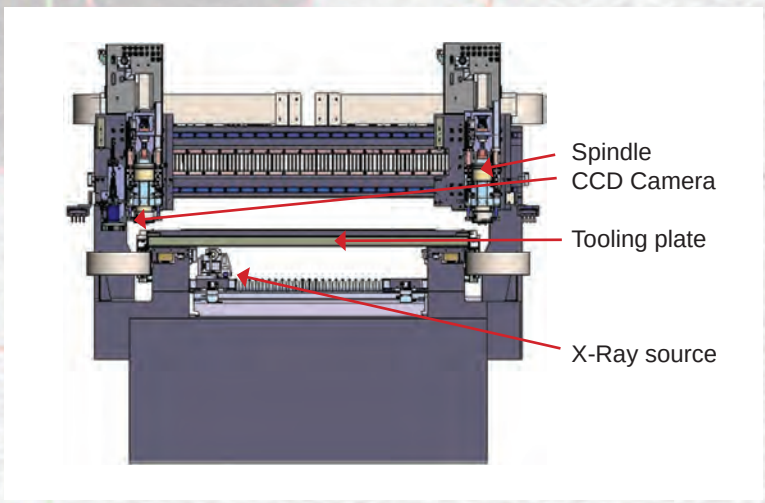
# LINEAR MOTORS




## COMBO L




## COMBO HPL




## MAIN VERSIONS:

**INSPECTA COMBO L or HPL**
X-Ray inspection system with **"ONE STEP®"** drilling - routing package

INSPECTA (COMBO), thanks to the **ONE STEP®** system in combination with the independent heads and the versatility of the Pluritec CNC control it's not only an X-Ray optimizer but also a driller and/or router.
Very large panels can be processed by parking one head and using the other to cover the larger working area.
Different spindles types are available.

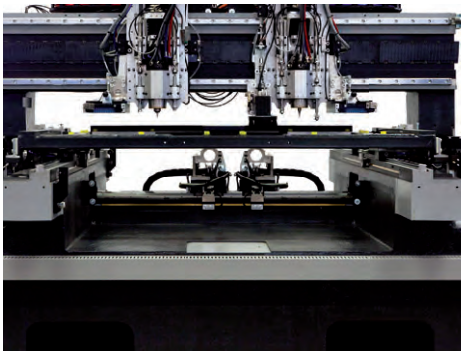
### The main available configurations are:

- INSPECTA L
- INSPECTA HPL
- INSPECTA COMBO L
- INSPECTA COMBO HPL

**INSPECTA can be also used as a Post Etch Drilling machine**

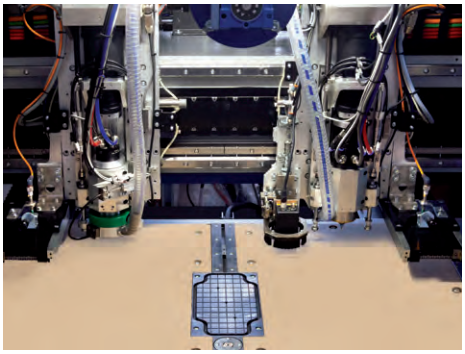
## Basement

A cast structure machine basement assures high stability to the X,Y, Z and X-Ray sources axes movement on linear motors.
The Y axis movement is based on a Gantry system, thus allowing the **X-Ray sources to cover the entire working area under the tooling plate.**



## Independent heads

Two high speed air bearing spindles (drilling and/ or routing) and two CCD Cameras provide a nearly simultaneous pads detection, to ensure an high productivity.



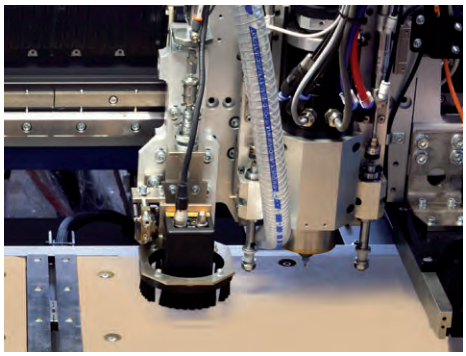
Each spindle is housed on a structure that moves on two linear guides with four sliding blocks. This solution assures the highest Z axis movement accuracy.

## X-Ray Camera

A high sensitive resolution X-Ray camera, with an integrated scintillator and a controller is able to:

- Perform CCD over-exposure (for very thick panels).
- Reduce the noise effect by averaging the process.

All parameters are controlled by software.

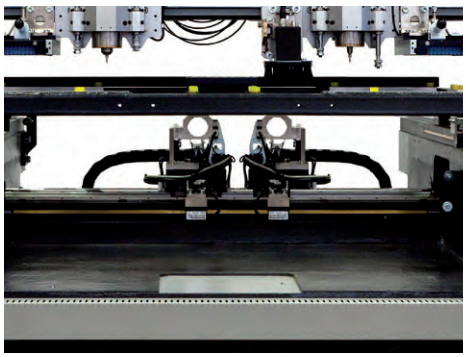


A special soft brushes pressure foot around the Camera has the important function to press the panel flat against the tooling plate avoiding planarity problems that might affect the vision accuracy.

## X-Ray sources

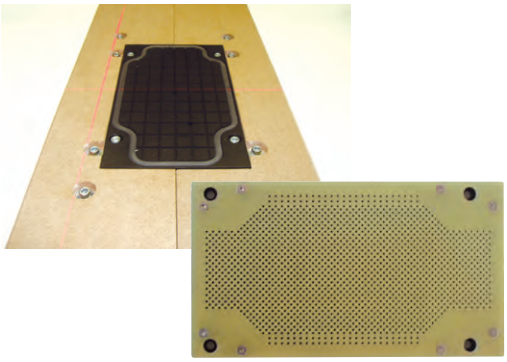
X-Ray microfocus sources are driven by linear motors.

Thin and thick panels can be processed setting the parameters programmable inside the part-program.

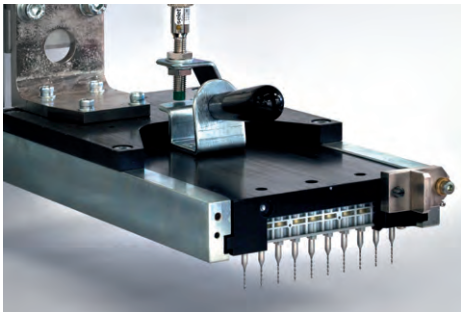


## Vacuum device for panel locking

The panel is locked using of a vacuum device (Venturi system) that operates in the centre of the working area.
Two laser beams, guide the operator to position the panel on machine table.



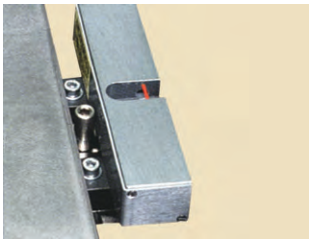
In case of **thin panels or inner layers** a special vacuum system is available in order to keep the panel flat and uniform on the tooling plate before processing it.



## Tool magazine

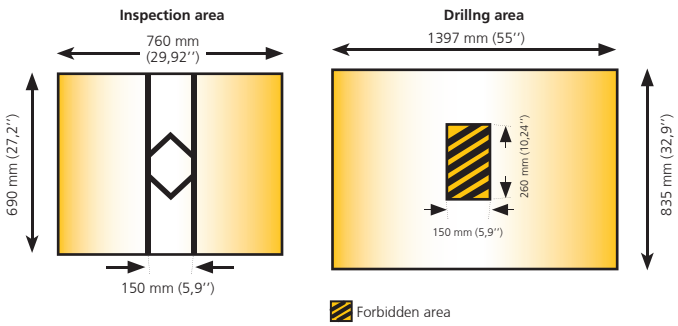
A cassette (one for each spindle) holds 140 tools.

Drill bit height, diameter and run-out are measured by a laser station during every tool change operation.



## Working area

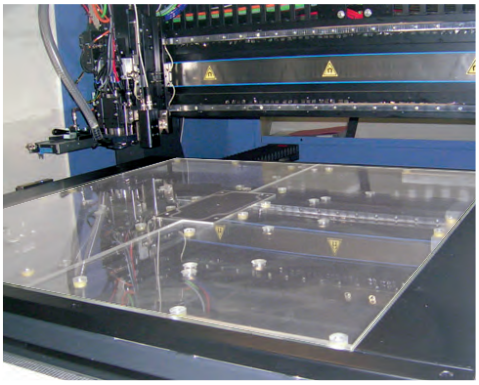
The maximum **inspection area** is 760 mm x 690 mm (29.92" x 27.2") excluded a central area of 150 mm (5.9").
The **drilling area** is up to 1397 mm x 835 mm (55'' x 32,9'') excluded a central area of 150 mm x 260 mm (5.9" x 10.24").




**Customized "dead zone area"**
According to the customer needs the "dead zone area" can be customized in order to process any kind of panel on any internal area, i.e. when using multiple reference pads for the optimization of all internal patterns.

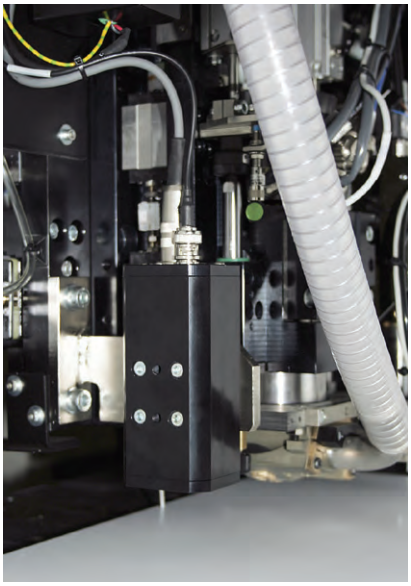
## COMBO with “ONE STEP®” drilling-routung package

The **COMBO** version is equipped with “ONE STEP®” the drilling - routing package (ONE STEP software, dedicated tooling plate, air bearing spindle, contact drilling system, surface CCD camera).



**Drilling/routing spindle**
According to the relevant configuration, the machine can be equipped with a microdrilling spindle on one head and a routing spindle on the other head.
The machine can also be use as regular two head drilling - routing machine.

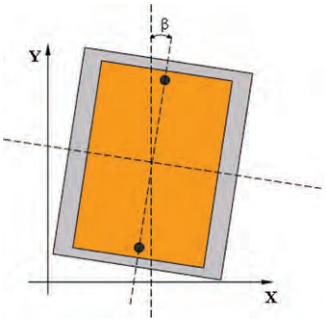
**Contact drilling**
This system allows both, broken bit detection and controlled depth drilling.
Any breakage/chipping of small diameter drill bits can be detected in real time.



**Pressure foot**
The spindle can be equipped with automatic bush exchange pressure foot.

**Surface Camera**
System for automatic alignment of single stack after the loading on the table. This provides the “ultimate” in perfect drilling of multilayer stacks, so eliminating any error due to the tooling plate.

Moreover, the vision system allows the processing of particular applications, such as the drilling of holes related to the position of specified targets (i.e. BGA products) and the routing of patterns related to the position of specified references.




## Machine configurations

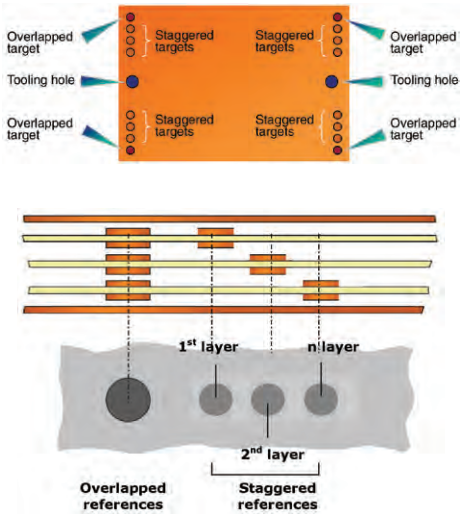
| INSPECTA MACHINE TYPE | HEADS | SPINDLE TYPE Spindle1 \| Spindle2 | | X-RAY SOURCE |
|---|---|---|---|---|
| L | 1 | 180 krpm | - | 1 |
| HPL | **2 Independent** | **180 krpm** | - | **2** |
| COMBO L | **1 drilling and/or routing** | **Drilling:** 180 or 200 or 250 krpm **Routing:** 80 or 125 krpm | | **1** |
| COMBO HPL | **2 Independent drilling and/or routing** | **Drilling:** 180 or 200 or 250 krpm **Routing:** 80 or 125 krpm | | **1** |

## Inspection methods

The inspection methods available in the machine standard configuration are:

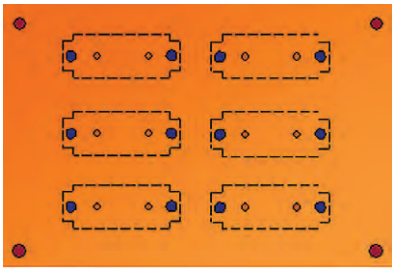
- Two symmetrical overlapped and staggered targets
- More than two symmetrical or asymmetrical overlapped targets
- More than two symmetrical or asymmetrical overlapped and staggered targets
- Anti-rotation target

Overlapped method is the most commonly adopted, while the staggered one is normally used to generate feed-back data either to the lamination process in case the machine inspects the Multilayer panels, or to the etching process in case the machine inspects the innerlayer in the post-etch drilling.




## Multiple inspection

New software capability for the inspection of multiple targets which allows the drilling of multiple reference optimized holes or, in case of the "one step X-Ray drilling/ routing" application, directly compensate (offset + rotation + scaling) the drilling/routing program on every single pattern of the circuit.

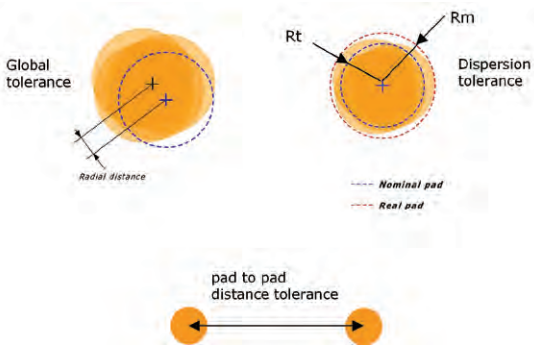


## Rejection criteria

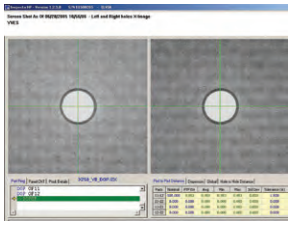
During the inspection step (before drilling), INSPECTA cheks if the panel geometry is within the tolerances set by the operator.

The causes of panel rejection can be as follows:

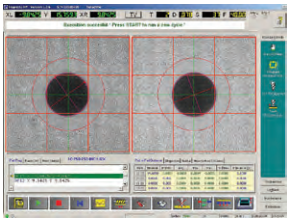
- Dispersion tolerance
- Pad to pad distance tolerance
- Global tolerance



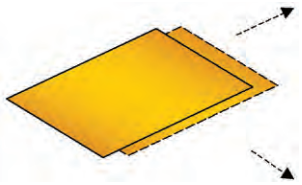
## Main features



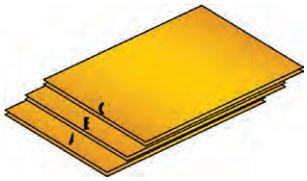
**Drill on pad with/without offset**
In addition to the standard holes (drilled in the reference system based on the acquired targets) it is possible to drill exactly in the middle of target or with a given offset from it. This function is useful to drill the laser-via reference holes.



**Extended zone target search**
The extended zone search allows to process panels positioned on the working table with high misalignments (for instance panels with “flashes”). This function allows to search in surrounding areas when no pad is detected in the initial position with the standard field of view.



**Panel shifting**
This is a very useful function that avoids the drilling burr on the bottom side of the panel (due to the repeated drilling in the same area which creates the absence of “backup material” under the panel to be drilled).
The “panel shifting” automatically guides the placement of the panels and makes each time different their position on the working table equipped with backup panel.

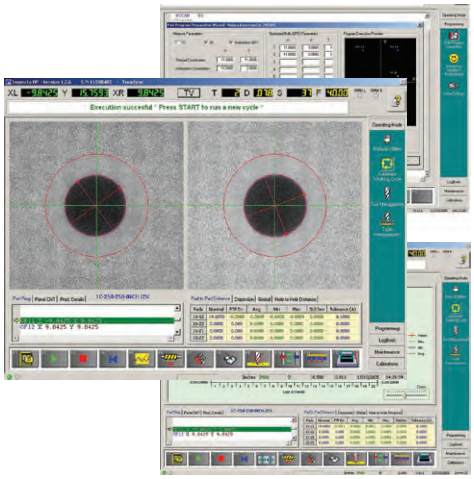


**Classified panels**
This useful function allows processed panels to be classified according to three or more classes of user-defined tolerance.
Example:
Class A = ± 0.025 mm (1 mil)
Class B = ± 0.050 mm (2 mils)
Class C = ± 0.075 mm (3 mils)

The panel classification is made by drilling the processed panels with one or more dedicated holes according to the measured errors.

## Control unit

Very powerful Pluritec® PCB Control CNC, with customized working cycles, integrated vision system, interactive graphic programming and online statistical analysis.

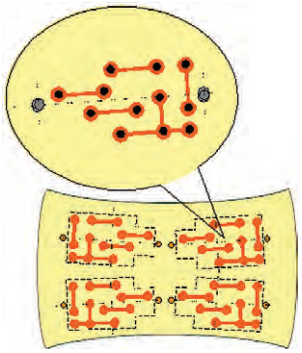


# APPLICATIONS

## One step X-Ray drilling/routing

The unique and sophisticated software package allows processing a multilayer panel in one step only.
The panel is fixed on the machine table via two pins and before running the drilling or routing program (like on a standard drilling or routing machine) the machine will detect and measure (via the X-Ray system) the reference targets in order to directly compensate (rotation, offset and possible scaling) the measured deformation.

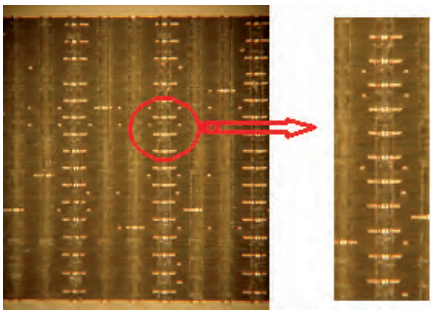
This new and unique capability allows to use the machine like a very accurate one spindle drilling/routing machine equipped with CCD camera; the big advantage is the very high drilling/routing accuracy that could not be achieved with the standard processes.



## Flip Drilling

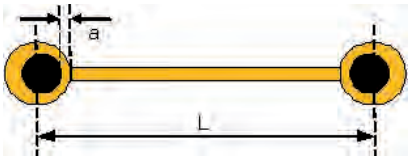
The “Flip drilling” system is applied in presence of very small trough holes and thick multilayer panels. The drill bit flute length of small tools, in fact, does not allow the drilling of trough holes .

Two or more references are measured by the X-ray vision system before starting the drilling of the top side and before the drilling of the bottom side of the panel.



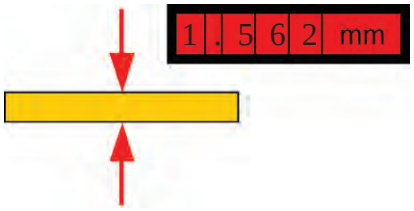
## Manual measuring

By means of a dedicated joy stick it is possible to execute manual X-ray measurements on multilayer panel, such as minimum annular ring (automatic calculation of the error), distances between holes, pads and others.




## Panel thickness measuring

A special measuring device, available with the automatic Loading/Unloading system only, measures the thickness of the panel during panel pick-up operation; if the measured value is out of tolerance the panel is marked for its identification.



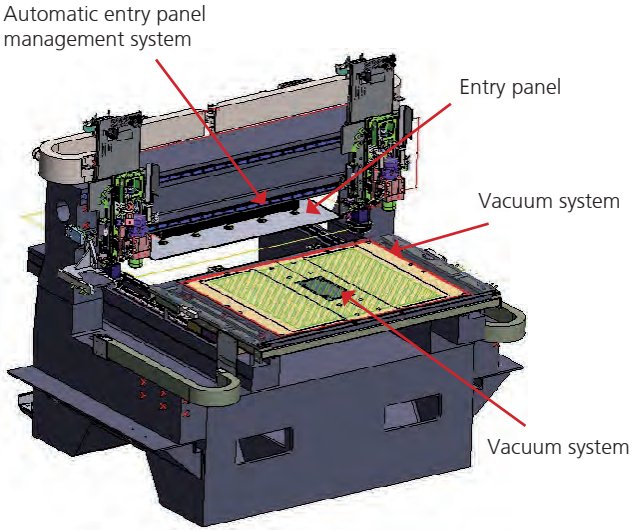
## Post Etch Drilling

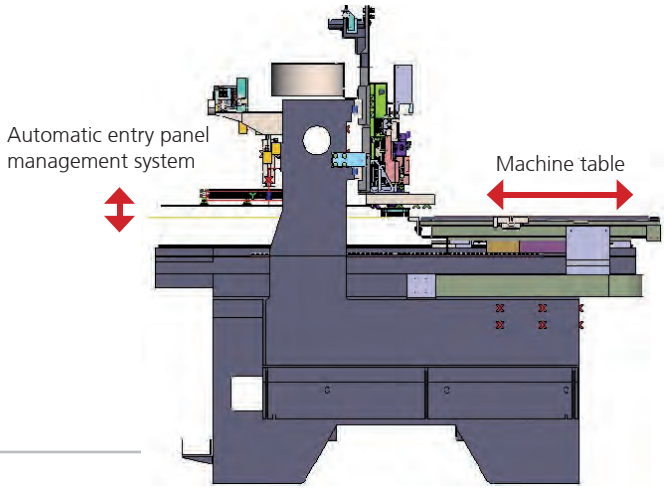
Inspecta can be used also as a Post Etch Drilling machine.
Compared to others post etch drilling machines available in the market Inspecta has a big advantage: the x-ray system.
When processing a multilayer core, the possible mis-alignment between the top and bottom layers is compensated and the reference holes for the multilayer build-up are extremely accurate.

In addition, a dedicated thin panel management system allows to place and remove an "entry panel" in order to grant:

1) Flatness uniformity on the machine tooling plate for a very good drilling accuracy.
2) Rigidity during the drilling for a very good hole quality.

The entry panel is automatically placed on the innerlayer before drilling and automatically removed after the end of cycle.




## Automation

Inspecta L or HPL can be equipped with an automatic Loading/Unloading system that makes the machine very productive.
The automation system in composed by:

- Loading station where the panels to be processed are positioned on a moveable trolley.
- Unloading station with a moveable trolley where the processed panels are positioned.
- Rejection station where the rejected panels (out of tolerance) are positioned.

INSPECTA X-RAY SERIES

# TECHNICAL SPECIFICATIONS

| TECHNICAL FEATURES | INSPECTA L/COMBO L | INSPECTA HPL/COMBO HPL |
|---|---|---|
| Inspection methods | - Two symmetrical overlapped and staggered targets<br>- More than two symmetrical or asymmetrical overlapped targets<br>- More than two symmetrical or asymmetrical overlapped and staggered targets<br>- Anti-rotation target<br>- Multiple targets (multiple patterns) for independent drilling optimization | |
| Reference pad shape and diameter | Circular 0.5 to 3.5 mm (0.0196" to 0.1378") | |
| Panel rejection criteria | Pad to pad, dispersion, global and overall tolerances | |
| Panel thickness | From 0.1 mm** (0.00393") up to 10 mm (0.4") | |
| XL, XR and Y axes positioning speed | 60 m/min (2362 in/min) with linear motors | |
| XL, XR and Y axes acceleration | 1.5 g | |
| X-Y axes positioning accuracy | 0.005 mm (0.196 mils) * | |
| X-Y axes positioning repeatability | 0.004 mm (0.157 mils) * | |
| Z axis positioning speed | 35 m/min (1378 in/min) | |
| Z axis acceleration | 3 g | |

| DRILLING UNITS | | |
|---|---|---|
| Air bearing drilling spindle | 180 krpm (standard) - 200 krpm - 250 krpm (option) | |
| Number of spindles | 1 | 2 |
| Routing spindle (option) | 80 krpm - 125 krpm - HCT 60 Krpm synchronous | |
| Broken bit detection | Contact drill (STD) | |
| Drilling diameters | 0.1 ~ 6.35 mm (0.004" ~ 0.250") | |

| TOOL CHANGE | |
|---|---|
| Number of tools available | 140 drill bits on cassette (standard) 280 drill bits on cassette per spindle (option) |
| Laser station | For drill bit height, diameter and dynamic run-out measuring |

| CCD CAMERA AND X-RAY SYSTEM | | |
|---|---|---|
| CCD Camera | High resolution CCD Camera with integrated high resolution scintillator and controller<br>Active area: 9.6 x 12.8 mm (0.3779" x 0.5039") - Resolution: 15LP/mm, 33um | |
| Number of CCD Camera | 1 | 2 (Inspecta HPL) - 1 or 2 (COMBO HPL) |
| X-Ray system | X-Ray micro-focus sources driven by linear motors<br>Focal spot size, optical: 50 m x 50 m (1.97 x 1.97 mils) - Wave angle: 20° | |
| Number of X-Ray sources | 1 | 2 (Inspecta HPL) - 1 or 2 (COMBO HPL) |

| CONTROL UNIT | |
|---|---|
| CNC type | Pluritec® PCB Control |
| Operatng system | Windows 7 professional based O.S. and proprietary platform for integrated machine/axis/vision management |
| Monitor | 17" LCD colour monitor |
| CPU | Intel Pentium Dual Core 1.8 GHZ |

| GENERAL SPECIFICATIONS | | |
|---|---|---|
| Electrical power supply | 400 V - 50 Hz - 3 phase - different power supply on request | |
| Power requirements | 6.5 kVA (manual machine)<br>8 kVA (with automation) | 8 kVA (manual machine)<br>9.5 kVA (with automation) |
| Compressed air pressure | 7 bar (102 PSI) | |
| Air consumption | 450 Nl/min (15.9 CFM) manual machine<br>1250 Nl/min (44.1 CFM) with automation | 600 Nl/min (21.2 CFM) manual machine<br>1400 Nl/min (49.4 CFM) with automation |
| Machine dimensions | 2820 x 2140 x 2300 mm (111" x 84.3" x 90.6") | |
| Noise level | < 75 dB | |
| Total weight (base machine) | 3100 kg (6800 lb) | 3200 kg (7000 lb) |
| Total weight with L/U system | 5600 kg (12330 lb) | 5700 kg (12550 lb) |

*(*) According to ISO 230/2*
Data is not binding. Pluritec® reserves the right to change the present information without notice.

pluritec®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