marantz Business electronics

Model 22XDL Desktop AOI System

M22XDL

- Automatic Optical Inspection of PCB's
- Inspects: – SMT & THT Components (presence, type, polarity, offset, text etc)
  – Reflow and Wave Solder Joints (including meniscus)
  – Solder Paste (2 dimensional)
- High Speed Digital XGA Colour Camera (CameraLink Interface)
- DOAL (Coaxial lighting using prism), Side and Main lighting using PWM LED's
- Telecentric lens for parallax reduction
- Analysis via Synthetic Imaging (colour), Greyscale and Histogram
- Imports PnP data and Gerber files
- Programmable with library or Golden Board
- Prototype mode for quick setup
- Automatic custom library generation
- Choose from different Resolution/Field of View combinations (resolution vs. speed)
- Available for medium and large PCB sizes
- 22X software for **Desk-top** and **In-Line** versions fully compatible

MODEL 22X DL

because inspection matters

Automatic Optical Inspection (AOI) system for electronics production

Marantz, well known from high quality Audio/ Video products, developed its first AOI system in 1994 for its own use, to inspect PCB assemblies for correct component placement and soldering. The AOI system prove to be a cost effective solution to replace the traditional visual human inspection while at the same time reducing the need for expensive electrical tests.

After successful use in Marantz' own factories, Marantz started sales of its 1st generation system in 1996. With a steady growing installed base, the current level reaches well over 2500 units worldwide.

The latest generation 22XDL systems combine the speed and accuracy of the CL systems with a totally new lighting concept. 3 Pulse Wave Modulated (PWM) LED light sources (Main, Side and DOAL), can lighten inspection points from 3 different angles. Up to 6 different lighting combinations are selectable to obtain best failure detection for each individual inspection point. The possibility to choose between different telecentric lenses allow the possibility to balance the system between resolution and speed.

For Statistical Process Control management, Rc22X software collects inspection data of any 22X AOI machine in the network on a logging base. Watch22X monitors the inspection process in real time and REP22X software visualises collected data: per PCB for repair purposes, or totalised for process statistics and analysis.

To minimize machine occupation for programming purposes, OLT22X Off-Line programming software allows preparation of new inspection programs, while the machine runs an existing inspection job.

The DL series. Unsurpassed vision and lighting in Desktop and In-line AOI

The XGA (1280x960) high speed-high resolution colour camera of the DL series forms the base of the image capturing system. Besides the camera, optics and lighting are of utmost importance when it comes to capturing highest quality images to be used for qualification of the objects inspected. The better the final picture quality, the better differences can be visualised and the better the failure detection performance will be. Lenses are specially selected for best contrast and sharpness, while using Telecentric technology to achieve a completely flat image, without the typical parallax distortion of a normal lens, for more accurate and faster inspection.

Different lenses available for the machine, offer the possibility to optimise between inspection resolution and Field of View. When choosing the largest Field of View (32x24mm), a 4 times bigger "working surface" than the smallest FoV, result in speed improvements up till more than 200%, due to fewer necessary camera movements. A higher resolution lens, displays objects up till 2 times larger (more pixels per object inspected) and it is useful when the system is mainly used for inspecting very small items such as 01005 components.

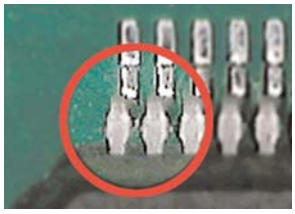


Image Normal lens

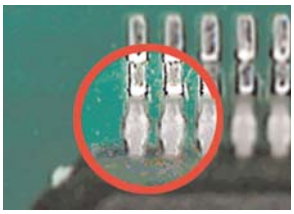
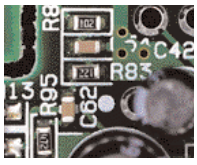


Image Telecentric lens

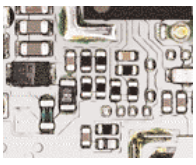
The DL system uses a completely new lighting system compared to previous generations. The possibility to lighten an object with different lighting angles/colours per inspection point, creates the possibility to optimise lighting for each specific inspection task. To inspect laser engraved text for example, it requires another lighting type than inspecting body positioning. In the same way, QFP reflow solder joints require different lighting from THT wave solder joints for best inspection. The DL incorporates 3 omni directional (360°) LED light sources with 3 different angles and 2 different colours. Besides the Side Light and the Main Light located around the lens, the DOAL (Diffused On Axis Lighting) system provides light *through* the lens via a built-in prism. This coaxial lighting system with its exactly 90° light beam, offers possibilities that cannot be met by any other lighting system. Shading from tall components nearby is completely absent and the contrast between flat surfaces and angled surfaces becomes highly emphasized. This is especially useful for checking presence and absence of solder menisci.

The 3 self calibrating PWM controlled LED's offer 6 different light settings that can be mixed freely to obtain best lighting for each inspection point.

The unique combination of colour inspection, 3 fold omnidirectional lighting system (including DOAL) and a Telecentric lens, offer a very high detection performance without the need for using multiple angled cameras. Programming efforts can be kept consequently low, while keeping inspection speed high.



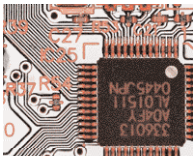
Main light



Main + DOAL light

DOAL light

Side light



Side + Doal light

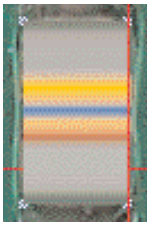
Inspection by Synthetic Imaging and Histogram analysis

The images captured by the camera, are converted, by graphics processing, to a synthetic image using an algorithmic filter. After conversion they are compared with its synthetic reference in the program or library. Because of the use of Synthetic Imaging the machine does not have to "learn" many images to compensate for small component tolerances. This because the tolerances are already incorporated in the synthetic image by the filters. The quality and stability of the inspection process does therefore not de-generate over time when more PCB's are passed. The filter parameters determine the way of distinction and permitted tolerances. The filter can be tuned for each component individually.

The comparison between the target and the reference image is based on Brightness (B&W), Hue (= colour value) and Saturation (= colour intensity) levels of the synthetic image (or a subset of these). Depending on the object to be inspected, the normal colour measurement can easily be limited to greyscale only if, for example, the inspection task does not require colour measurement (e.g. text inspection).

Some typical inspection tasks like IC leads, solder joint menisci and solder paste, require and have different inspection algorithms (e.g. histograms) for best inspection results. These algorithms have been incorporated in the system and are integrated with the standard library for easy user access.

Normal image Minimelf



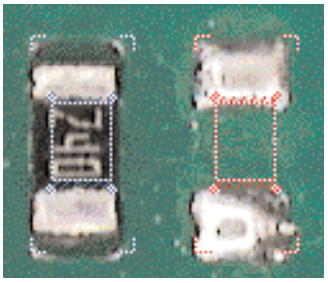
Synthetic image Minimelf

Normal image with text

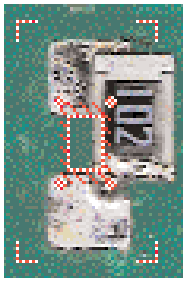
Synthetic image with text

Inspection of parts

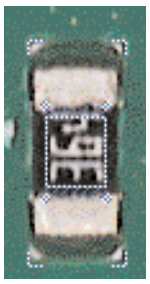
Parts can be inspected for presence, positional offset, polarity and type by colour or text. By means of filter parameters, a synthetic image is generated and the tolerance levels can be adjusted. The red side light eases extraction of laser inscripted text if the text is poorly visible due to lack of contrast.



Missing component



Offset



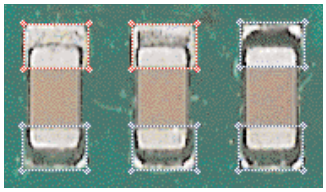
Correct type

Wrong type

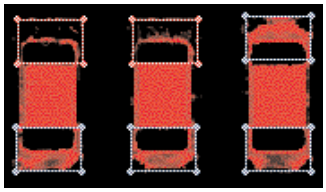
Inspection of solder joints

There are 4 possibilities to inspect solder joints:

-Traditional B&W judgement for presence/absence of solder
- Side lighting and Synthetic Imaging for accurate analysis of the highlighted meniscus
- Side lighting and Histogram Analysis for full flexible analysis of different joint types
- DOAL and Synthetic Imaging
- DOAL and Greyscale analysis

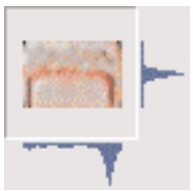


Solder joints normal light

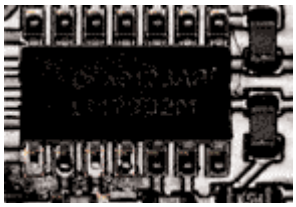


Solder joints side light

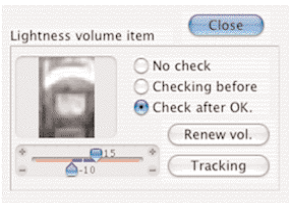
Histogram normal joint



Histogram thin joint



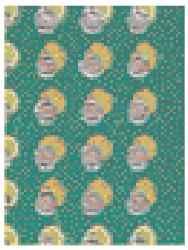
Solder joints DOAL light



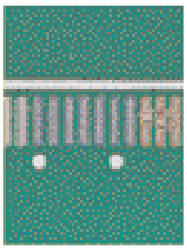
Greyscale analysis

Inspection of solder paste

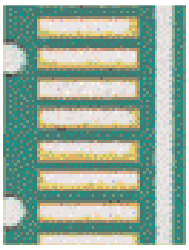
Special filters take care of the inspection of solder paste. Solder paste can be checked for offset, coverage, uniformity and smearing. The red sidelight can be used to compensate for unevenness in case of HAL (Hot Air Level) pre-tinned PCB's.



Offset



Smearing

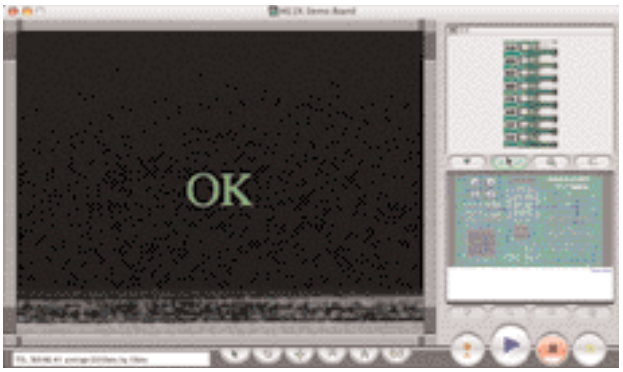


Coverage and uniformity

Defects classification, Information and SPC

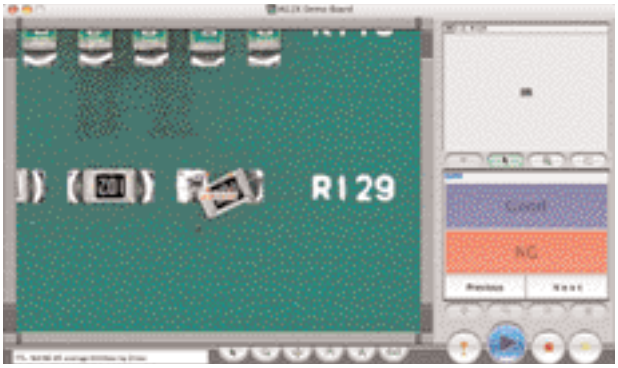
After inspection of the PCB, the found defects can be directly displayed on the monitor using the PCB Map View or via the dedicated Classification Mode. Classification can also be performed while inspecting the next PCB. Eventually post classification can be done using the Repair Desk Software RC/REP22X.

After classification of the found defects, the system displays the result which can additionally be directed to a Mini-Printer, to a NotGood Marking Unit, to a File or to the Rc/Rep22X Statistics & Repair Desk software (option). On the system the image of the complete PCB is shown with defect-locations and their detailed images. The same colour screen output is provided via the Repair Desk software to another PC in the network for efficient and effective repair or for post-classification of defects.

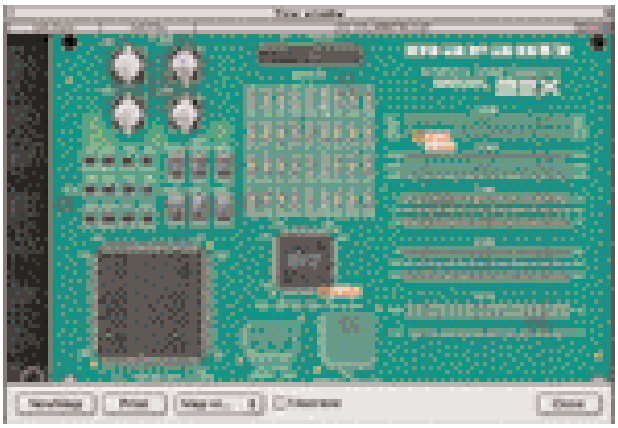


Inspection result OK

Inspection result NG



Classification Mode



PCB Map

Library & programming

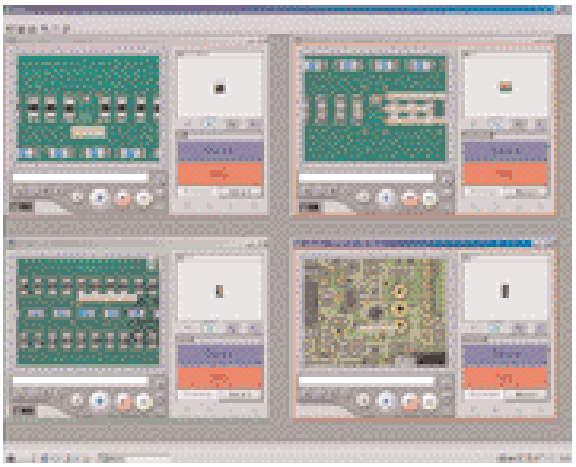
The system uses a full component library, which can be customised per project. For new projects, existing libraries can easily be re-used for efficient programming of new projects.
For fast programming of component locations, the system imports XY data files from, for example, PnP machines. Imported data can be linked easily with an existing library, bringing the required programming effort to a minimum. Creation of a new library can be done fully automated, starting from an existing library or the Marantz standard library.
If both sides of the PCB's have to be inspected, the side detection is automatic.

For programming Solder Paste inspection, original Gerber plotting files can be used to create a program quickly. Alternatively, the automatic solder paste detection facility can be used for faster programming using a good sample PCB.

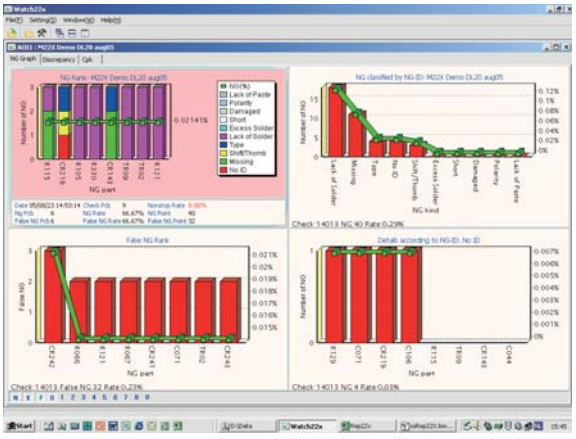
Options

- **OLT22X Off Line Programming software**
  Maximizes machine efficiency. Develop inspection programs and component libraries on a separate work-station. By capturing high resolution images of the PCB in advance (using the machine), the files can be transferred to the off-line work-station for programming purposes.

- **RC22X and Watch22X Network software**
  Integrates multiple 22X inspection systems into a Windows™ network via an Ethernet connection. Collects and organises inspection data on a network server.
  In addition, the RC22X software allows centralised (remote) control of multiple inspection machines by one operator.
  Watch22X monitors the inspection processes in real time and flags an alarm if consecutive process errors appear.

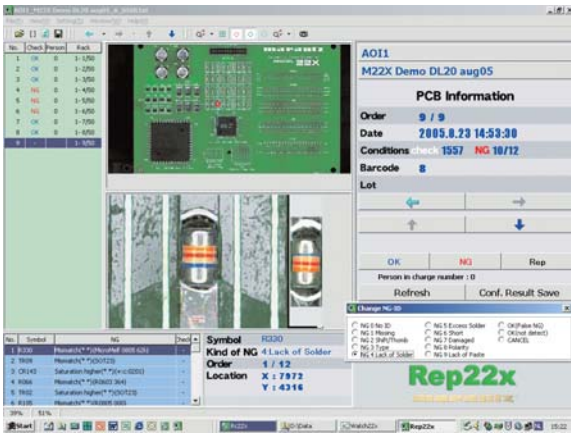


RC22X screen



Watch22X Process monitoring screen

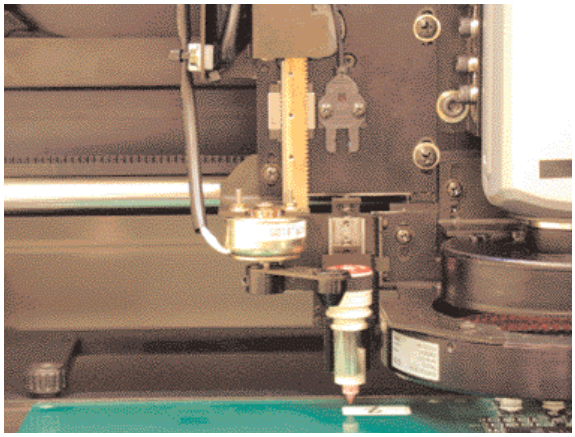
- **Rep22X Statistics & Repair Desk software**
  Rep22X displays and analyses the inspection data as collected by RC22X on the network. For the repair technician, an image of the complete PCB is displayed in combination with detailed images of detected defects. The bright and full colour presentation to the repair technician, provides easy location and judgement of the items to be reworked. For statistics, Rep22X generates time and LOT graphs, pareto analysis and defect statistics with numerous filters to extract relevant data.
  Using the RC22X network and its data storage, the Rep22X Repair Desk software can run on a different physical location using another PC within a Windows™ based Ethernet network.



Rep22X Repair desk screen

- **Bar Code reader**
  An external 1D Bar Code Reader can be connected to read serial numbers of PCB's after inspection. When the repair technician, using Rep22X, scans the Bar Code afterwards, detailed defect data, including photos, become visible automatically.
  2D matrix bar codes can be easily read using the machine camera, avoiding the need for a separate reader in the machine.
  A part of the bar code can also be used for automatic loading of the correct inspection programs to reduce or avoid machine intervention when the production line changes to another PCB.

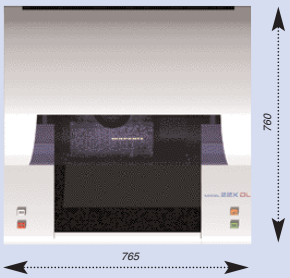
- **NG marking unit (not for in-line models)**
  Marks defective spots on the PCB or on components itself, but can also be used as "Good" marker to mark tested PCB's OK.



NG Marking unit

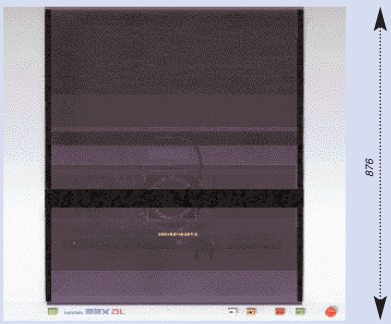
M22XDL-350

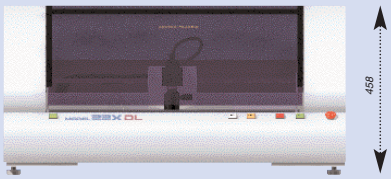
External size W765 x D760 x H398
Maximum PCB Size 350x250mm



M22XDL-460

External size W946 x D876 x H458
Maximum PCB Size 460x360mm





		M22XDL-350	M22XDL-460
Characteristics	Product type	Automatic Optical Inspector	
	In-line/Off line	Off-Line	
	Camera movement	X Direction	X + Y Direction
	PCB movement	Y Direction	Stationary
	Parts inspection	Presence, Polarity, Offset, Correctness, Soldering	
	Printing/paste inspection	Offset, Smearing, Bridges, Uniformity	
	Distinction principle	Synthetic Imaging, Histogram analysis, Greyscale limits	
	Distinction parameters	Brightness, Hue, Saturation via Filters	
	Camera type	XGA CCD digital with Camera Link	
	Camera Field Of View/Resolution	32x24mm/25um or 25.6x19.2/20um or 16x12mm/12.5um	
	Lens	Telecentric lens with built in prism for DOAL Lighting	
	Lighting system	Omnidirectional Triple LED: Side, Main, DOAL (Diffused On Axis Lighting (Coaxial))	
Specifications	Minimum inspection component size	01005" (0.4x0.2mm) (12.5um resolution)	
	Positioning accuracy	Pixel related feedback loop	
	Component clearance (top)	40mm	40mm
	Component clearance (bottom)	35mm	70mm
	Maximum PCB Size	350x250mm	460x360mm
	Movement speed	600mm/s	
	Inspection capacity	160 000 components/hr (typical excl board handling)	
	Master pictures per library component	Up to 24 variations per library component	
	Mains	100-240 Vac / 300W	
Interfacing	Control PC type	Apple PowerMac Dual G5 with Mac OSX (not included)	
	Control interface	USB	
	Data interface	Camera Link	
General	Operating temperature	15-30 degr C	
	Operating humidity	15-80 % RH	
	Weight	51kg	89kg

Marantz Business Electronics
A division of Marantz Europe BV
PO Box 8744, 5605 LS Eindhoven, Netherlands
T +31 40 2507870 / F +31 40 2507840
info@marantzeurope.com
www.marantz.com/bus/eu

Representative