

# Mek SpectorBOX Bottom Up and Top Down Modular AOI System

√	Optimized for THT Components- and Post Wave and Selective Soldering Inspections	AOI Solution For Wave & Selective Soldering Of THT & SMT Components
	Bottom-up and/or Top-down Inspection	Inspects PCB's From Below a Conveyer Belt or Chain
	Solder Frame Compatible	Designed to Inspect PCB's Inside Solder Frames Directly From The Conveyer
	Ultra Slim Design Inspects Down To 280mm Above Factory Floor	Save Production Space! Fits Below Existing Return and/or Feed Conveyers
	Modular Inspection Possibilities: Bottom, Top or Top + Bottom	Possibility to Combine Two SpectorBOX Systems For Simultaneous Top+Bottom AOI
$\checkmark$	Main Frame Compatibility	Multiple 3rd Party Turn Key Solutions Readily Available. Spector-BOX Systems Fit Conveniently Inside these Main Frames
	Up to 18 Cameras	Choose between 1 or 9 camera's per inspection side (up to 18 cameras in Top+Bottom configuration)
	In Z-Axis Moving Optical Head(s)	Focus and Position Optimally For Varying PCB Distances Or Warpage (Applicable To Certain Models With Z-Axis)
	General Purpose I/O	Configurable I/O to Be Controlled By Existing PCB Handling Sys-

tems

Later Whenever Convenient

Inspect your PCB's Automatically Now, Classify/Report Defects



Scenarios

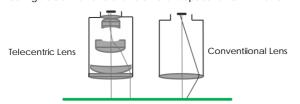
√ Post Defect Classification and Reporting



## 1. Bottom Up Features:

The Mek SpectorBOX bottom up modular AOI is optimized for the inspection of THT solder joints and detection of solder bridges and solder balls. It is designed to inspect PCB's inside solder frames directly from the conveyor system. With it's totally newly developed mechanical platform, it is the only modular AOI in the market that can be equipped with 9 cameras: 1 top and 8 side cameras. The bottom up SpectorBOX is configurable with one of two different optical units: FDLz and FDAz.

	Angular Camera's	Z-Axis
FDLz	NO	YES
FDAz	YES	YES



#### High grade Telecentric Lens

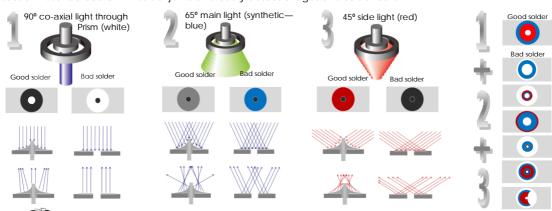
Parallel image over the whole sensor/lens Field of View — No parallax effect

#### Large pixel image capturing sensor

18,8µ² pixel size — smooth and detailed image with great dynamic range — Japanese built

#### Omnidirectional multi angle, multi color LED lighting

3D color profile of solder meniscus — accurate defect decision by the software algorithms — Detect all visual defects of THT solder joints and easily detect bridges and solder balls



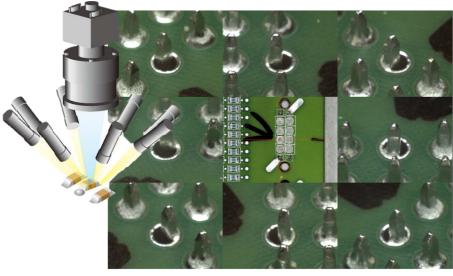


#### In Height Adjustable Optical Head

In Z-Axis moving Top Camera, Light and Side View cameras — Adaption to any PCB Thickness PCB Warp Compensation — Inspection of "Sandwich" assemblies without need of jigs and multiple inspections

#### 8x Angular Side Sensors (Only available for FDA and FDAz models)

Simultaneously operating, multiplexed side view sensors with CameraLink interface — 45/45 arrangement — Triple use: Active automatic inspection, classification and repair — clear 9 angles defect review — high magnification 50x (10µm/pixel) — Full Color — Auto highlight — Large sensor pixels — 9 view images also in backup database



#### Powerful algorithms for

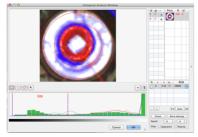




Dedicated algorithms for solder balls detection

#### Histogram Analysis algorithms

Condition based decision — Tolerances can be set tightly - Close to zero false alarms







## 2. Top Down Features:

The Mek SpectorBOX Top Down modular AOI is optimized for the inspection of THT components to find any visual defect like prsence/absence, wrong polarity, colour, type, bent pins etc. It has a top clearance of 130mm (5.12") so inspection can be done even when the tallest components are placed. It is designed to inspect PCB's inside solder frames directly from the conveyor system. The SpectorBOX Top Down module can be equipped with one top camera and 8 wide field of view side camera's. Available optical units are FWz and FWAz.

	Angular Camera's	Z-Axis
FWz	NO	YES
FWAz	YES	YES

#### Large pixel image capturing sensor

18,8µ² pixel size — smooth and detailed image with great dynamic range — Japanese built



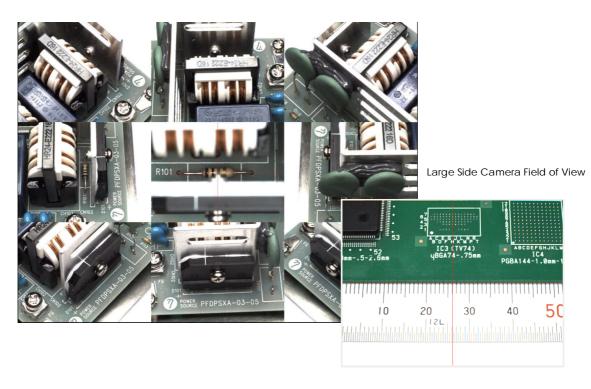


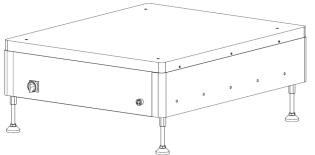
#### In Height Adjustable Optical Head

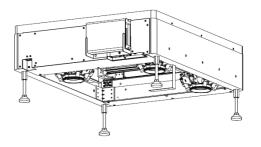
In Z-Axis moving Top Camera, Light and Side View cameras — Adaption to any PCB Thickness — PCB Warp Compensation — Reliable text and/or polarity inspection on tall components — Inspection of "Sandwich" assemblies without need of jigs and multiple inspections

#### 8x Angular Side Sensors (Only available for the FWAz model)

Simultaneously operating, multiplexed side view sensors with CameraLink interface — 45/45 arrangement — Triple use: Active automatic inspection, classification and repair — clear 9 angles defect review — Full Color — Auto highlight — Large sensor pixels — 9 view images also in backup database











## **Bottom Up**

## **FDL**

Lighting system (Coaxial))  Minimum inspection object size  Positioning accuracy  Component clearance  +40mm (1.57")  Side Cameras  Z-Axis movement range  Movement speed  1500cps/min  Mains  Interfacing  Control PC type  Control interface  Data interface  Communication  General  (Coaxial))  80µ (3.15 mils)  Pixel related Feedback Loop  Pixel related Feedback Loop  140mm (1.57")  No side cameras  30mm (2.4")  720mm/s  1500cps/min  Mains  100-240 Vac / 150W  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  CameraLink  Communication  General Purpose I/O, RS232		SpectorBOX	FDLz 550
Product type  Camera movement  Camera movement  PCB movement  Parts inspection  Soldering, Bridges, Solder Bails  Imaging principle  Synthetic Imaging, Spectral Analysis, Greyscale limits  Imaging parameters  Specifications  Main Camera type  Main Camera Field Of View/ Resolution  Lens  Digital with CameraLink  Main Camera Field Of View/ Resolution  Lens  Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Minimum inspection object size  Positioning accuracy  Component clearance  1-2-Axis movement range  Movement speed  Tommy/S  Inspection capacity typical  Mains  Interfacing  Control PC type  Control PC type  Communication  General  General  Automatic Optical Inspection  Stationary  Stationary  Soldering, Bridges, Solder Bails  Brightness, Hue, Saturation via Filters  Brightness, Hee, Saturation via Filters  Brightness, Hue, Saturat	Maximum PCB Size	550x520mm (2	21.7" x 20.5")
Camera movement  PCB movement  PCB movement  Parts inspection  Soldering, Bridges, Solder Balls  Imaging principle  Synthetic Imaging, Spectral Analysis, Greyscale limits  Imaging parameters  Specifications  Main Camera type  Main Camera Field Of View/ Resolution  Lens  Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  (Coaxiall)  Minimum inspection object size  80µ (3.15 mils)  Pixel related Feedback Loop  40mm (1.57")  Side Cameras  2-Axis movement range  30mm (2.4")  Movement speed  720mm/s  Inspection capacity typical  1500cps/min  Mains  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface  Control interface  CameraLink  Communication  General Purpose I/O, RS232	Characteristics		
PCB movement Parts inspection Soldering, Bridges, Solder Balls Imaging principle Synthetic Imaging, Spectral Analysis, Greyscale limits Imaging parameters Brightness, Hue, Saturation via Filters Specifications Main Camera type Digital with CameraLink Main Camera Field Of View/ Resolution Lens Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lig (Coaxial)) Minimum inspection object size 80µ (3.15 mils) Positioning accuracy Pixel related Feedback Loop Component clearance 140mm (1.57°) Side Cameras No side cameras Z-Axis movement range 30mm (2.4°) Movement speed 1720mm/s Inspection capacity typical 1500cps/min Mains Interfacing Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface Communication General Purpose I/O, R\$232	Product type	Automatic Opti	cal Inspector
Parts inspection Imaging principle Imaging principle Imaging parameters Specifications  Main Camera type Digital with CameraLink  Main Camera Field Of View/ Resolution Lens Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system (Coaxial))  Minimum inspection object size Positioning accuracy Prixel related Feedback Loop  Component clearance Side Cameras  Z-Axis movement range Movement speed Inspection capacity typical Interfacing Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface Communication General Purpose I/O, R\$232 General	Camera movement	X+Y Dire	ection
Imaging principle Imaging parameters Specifications Main Camera type Main Camera Field Of View/ Resolution Lens Telecentric lens with built in prism for DOAL Lighting Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lig (Coaxial)) Minimum inspection object size Positioning accuracy Component clearance Side Cameras Z-Axis movement range Movement speed Inspection capacity typical Mains Interfacing Control PC type Component Cetype Component Cetype Control interface Communication General Purpose I/O, RS232 General	PCB movement	Station	nary
Imaging parameters Specifications  Main Camera type Main Camera Field Of View/ Resolution  Lens Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting accuracy  Pixel related Feedback Loop  Component clearance  H40mm (1.57")  Side Cameras  Z-Axis movement range  No side cameras  Z-Axis movement speed  Inspection capacity typical  Mains  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Communication  General  General  General	Parts inspection	Soldering, Bridge	es, Solder Balls
Specifications           Main Camera type         Digital with CameraLink           Main Camera Field Of View/Resolution         36x20mm/18.75μm or 19.2x10.8mm/10μ           Lens         Telecentric lens with built in prism for DOAL Lighting           Ughting system         Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system (Coaxial))           Minimum inspection object size         80μ (3.15 mils)           Positioning accuracy         Pixel related Feedback Loop           Component clearance         +40mm (1.57")           Side Cameras         No side cameras           Z-Axis movement range         30mm (2.4")           Movement speed         720mm/s           Inspection capacity typical         1500cps/min           Mains         100-240 Vac / 150W           Interfacing         Apple MacMini (or higher) with Mac OSX and Thunderbolt interface           Control PC type         Apple MacMini (or higher) with Mac OSX and Thunderbolt interface           Control interface         CameraLink           Communication         General Purpose I/O, RS232	Imaging principle	Synthetic Imaging, Spectral	Analysis, Greyscale limits
Main Camera type Main Camera Field Of View/ Resolution  Lens Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system (Coaxial))  Minimum inspection object size Rop (3.15 mils)  Positioning accuracy Pixel related Feedback Loop  Component clearance Pixel related Feedback Loop  Component range No side cameras  Z-Axis movement range Novement speed T20mm/s Inspection capacity typical Mains Interfacing Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface Control interface Communication General General General General	Imaging parameters	Brightness, Hue, Sa	turation via Filters
Main Camera Field Of View/ Resolution  Telecentric lens with built in prism for DOAL Lighting  Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting system  (Coaxial))  Minimum inspection object size  Positioning accuracy  Pixel related Feedback Loop  Component clearance  140mm (1.57")  Side Cameras  No side cameras  Z-Axis movement range  30mm (2.4")  Movement speed  1500cps/min  Mains  100-240 Vac / 150W  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface  Cameral Purpose I/O, RS232  General  General	Specifications		
Resolution36x20mm/18.75μm or 19.2x10.8mm/10μLensTelecentric lens with built in prism for DOAL LightingLighting systemOmnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lighting systemMinimum inspection object size80μ (3.15 mils)Positioning accuracyPixel related Feedback LoopComponent clearance+40mm (1.57°)Side CamerasNo side camerasZ-Axis movement range30mm (2.4°)Movement speed720mm/sInspection capacity typical1500cps/minMains100-240 Vac / 150WInterfacingApple MacMini (or higher) with Mac OSX and Thunderbolt interfaceControl PC typeApple MacMini (or higher) with Mac OSX and Thunderbolt interfaceControl interfaceUSBData interfaceCameraLinkCommunicationGeneral Purpose I/O, RS232	Main Camera type	Digital with C	ameraLink
Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lig (Coaxial))  Minimum inspection object size 80µ (3.15 mils)  Positioning accuracy Pixel related Feedback Loop  Component clearance +40mm (1.57")  Side Cameras No side cameras  Z-Axis movement range 30mm (2.4")  Movement speed 720mm/s  Inspection capacity typical 1500cps/min  Mains 100-240 Vac / 150W  Interfacing  Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface USB  Data interface Cameral Purpose I/O, RS232  General		36x20mm/18.75µm о	r 19.2x10.8mm/10µ
Lighting system (Coaxial))  Minimum inspection object size  Positioning accuracy  Component clearance  +40mm (1.57")  Side Cameras  Z-Axis movement range  Movement speed  Inspection capacity typical  Mains  Interfacing  Control PC type  Control interface  Data interface  Communication  General  (Coaxial))  80µ (3.15 mils)  Pixel related Feedback Loop  140mm (1.57")  No side cameras  30mm (2.4")  720mm/s  1500cps/min  Mains  100-240 Vac / 150W  Line facing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  CameraLink  Communication  General Purpose I/O, RS232	Lens	Telecentric lens with built in	n prism for DOAL Lighting
Positioning accuracy Component clearance +40mm (1.57")  Side Cameras No side cameras  Z-Axis movement range 30mm (2.4")  Movement speed 720mm/s Inspection capacity typical 1500cps/min  Mains 100-240 Vac / 150W  Interfacing Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface Control interface USB Data interface Communication General General	Lighting system	Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Lightir (Coaxial))	
Component clearance +40mm (1.57")  Side Cameras No side cameras  Z-Axis movement range 30mm (2.4")  Movement speed 720mm/s  Inspection capacity typical 1500cps/min  Mains 100-240 Vac / 150W  Interfacing  Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface USB  Data interface CameraLink  Communication General Purpose I/O, RS232	Minimum inspection object size	80μ (3.15 mils)	
Side Cameras  Z-Axis movement range  30mm (2.4")  Movement speed  720mm/s  Inspection capacity typical  1500cps/min  Mains  100-240 Vac / 150W  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface  USB  Data interface  CameraLink  Communication  General  General	Positioning accuracy	Pixel related Feedback Loop	
Z-Axis movement range  30mm (2.4")  Movement speed 720mm/s  Inspection capacity typical 1500cps/min  Mains 100-240 Vac / 150W  Interfacing  Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface USB  Data interface Communication General Purpose I/O, RS232  General	Component clearance	+40mm (1.57")	
Movement speed Inspection capacity typical Inspection capacity typical Interfacing Control PC type Control interface Control interface Data interface Communication  General  T20mm/s  1500cps/min 100-240 Vac / 150W  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface USB  CameraLink Communication General Purpose I/O, RS232	Side Cameras	No side cameras	
Inspection capacity typical  Mains  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  Control interface  USB  Data interface  Communication  General  General	Z-Axis movement range	30mm (2.4")	
Mains  Interfacing  Control PC type  Apple MacMini (or higher) with Mac OSX and Thunderbolt interface  USB  Data interface  Communication  General  General	Movement speed	720m	m/s
Interfacing  Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface Control interface USB  Data interface CameraLink Communication General Purpose I/O, RS232 General	Inspection capacity typical	1500cp	s/min
Control PC type Apple MacMini (or higher) with Mac OSX and Thunderbolt interface USB Data interface Communication General Purpose I/O, RS232 General	Mains	100-240 Va	c / 150W
Control interface  Data interface  CameraLink  Communication  General Purpose I/O, RS232  General	Interfacing		
Data interface CameraLink  Communication General Purpose I/O, RS232  General		Apple MacMini (or higher) with Ma	c OSX and Thunderbolt interface
Communication General Purpose I/O, RS232  General	Control interface	USB	
General	_ = = = = = = = = = = = = = = = = = = =	CameraLink	
23.00	Communication	General Purpose I/O, RS232	
Operating temperature 15.30 door C (50.96 door E)	General		
15-30 degi C (55-60 degi F)	Operating temperature	15-30 degr C (59-86 degr F)	
Operating humidity 15-80 % RH	Operating humidity	15-80 % RH	
W750 x D842 x H256 W900 x D1056 x H251 <b>External size</b> (29.5" x 33.2" x 10.1") (35.5" x 41.6" x 9.9")	External size		
Weight 50kg (110lbs) 100kg (220lbs)			, , , , , , , , , , , , , , , , , , ,

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## **Bottom Up**

## **FDA**

	SpectorBOX FDAz 550		
Maximum PCB Size	550x520mm (21.7" x 20.5")		
Characteristics			
Product type	Automatic Opt	ical Inspector	
Camera movement	X+Y Dire	ection	
PCB movement	Statio	nary	
Parts inspection	Soldering, Bridge	es, Solder Balls	
Imaging principle	Synthetic Imaging, Spectral	Analysis, Greyscale limits	
Imaging parameters	Brightness, Hue, Sa	turation via Filters	
Specifications			
Main Camera type	Digital with C	CameraLink	
Main Camera Field Of View/ Resolution	36x20mm/18.75µm о	r 19.2x10.8mm/10µ	
Lens	Telecentric lens with built in	n prism for DOAL Lighting	
Lighting system	Omnidirectional Triple LED rings: Side, Main, Line Sourced DOAL Diffused On Axis Light (Coaxial))		
Minimum inspection object size	80μ (3.15 mils)		
Positioning accuracy	Pixel related Fe	edback Loop	
Component clearance	+30mm	(1.2")	
Side Cameras	8x Digital with CameraLink in 45/45 orientation		
Z-Axis movement range	30mm (2.4")		
Movement speed	720mm/s		
Inspection capacity typical	1500cp	s/min	
Mains	100-240 Va	c / 150W	
Interfacing			
Control PC type	Apple MacMini (or higher) with Ma	c OSX and Thunderbolt interface	
Control interface	USI	3	
Data interface	CameraLink		
Communication	General Purpose I/O, RS232		
General			
Operating temperature	15-30 degr C (59-86 degr F)		
Operating humidity	15-80 % RH		
External size	W750 x D842 x H256 W900 x D1056 x H251 (29.5" x 33.2" x 10.1") (35.5" x 41.6" x 9.9")		
Weight	50kg (110lbs)	100kg (220lbs)	

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## **Top Down**

## **FWz**

	SpectorBO:	X FDLz 550
Maximum PCB Size	550x520mm (	21.7" x 20.5")
Characteristics		
Product type	Automatic Opt	tical Inspector
Camera movement	X+Y Dir	ection
PCB movement	Statio	nary
Parts inspection	Presence/Absence, Type, P	olarity, Colour, Text, Offset
Imaging principle	Synthetic Imaging, Spectra	Analysis, Greyscale limits
Imaging parameters	Brightness, Hue, Sa	turation via Filters
Specifications		
Main Camera type	Digital with (	CameraLink
Main Camera Field Of View/ Resolution	36x20mm/18.75µm с	or 19.2x10.8mm/10µ
Lighting system	Omnidirectional Singl	e Source White Light
Minimum inspection object size	80µ (3.15 mils)	
Positioning accuracy	Pixel related Feedback Loop	
Component clearance	+130mm (5.12")	
Side Cameras	No side cameras	
Side Cameras Field of View	N/A	
Z-Axis movement range	30mm (2.4")	
Movement speed	720m	nm/s
Inspection capacity typical	1500cp	os/min
Mains	100-240 Va	ac / 150W
Interfacing		
Control PC type	Apple MacMini (or higher) with Ma	ac OSX and Thunderbolt interface
Control interface	US	В
Data interface	Came	raLink
Communication	General Purpose I/O, RS232	
General		
Operating temperature	15-30 degr C (59-86 degr F)	
Operating humidity	15-80 % RH	
External size	W750 x D842 x H256 W900 x D1056 x H251 (29.5" x 33.2" x 10.1") (35.5" x 41.6" x 9.9")	
Weight	50kg (110lbs) 100kg (220lbs)	

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# **Top Down**

## **FWA**

	SpectorBOX	FDAz 550
Maximum PCB Size	550x520mm (21.7" x 20.5")	
Characteristics		
Product type	Automatic Opti	ical Inspector
Camera movement	X+Y Dire	ection
PCB movement	Station	nary
Parts inspection	Presence/Absence, Type, Pr	olarity, Colour, Text, Offset
Imaging principle	Synthetic Imaging, Spectral	Analysis, Greyscale limits
Imaging parameters	Brightness, Hue, Sa	turation via Filters
Specifications		
Main Camera type	Digital with C	CameraLink
Main Camera Field Of View/ Resolution	36x20mm/18.75µm о	r 19.2x10.8mm/10µ
Lighting system	Omnidirectional Single Source White Light	
Minimum inspection object size	80μ (3.15 mils)	
Positioning accuracy	Pixel related Feedback Loop	
Component clearance	+130mm (5.12")	
Side Cameras	8x Digital with CameraLi	nk in 45/45 orientation
Side Cameras Field of View	50x39mm (1	.96x1.54")
Z-Axis movement range	30mm (2.4")	
Movement speed	720mm/s	
Inspection capacity typical	1500cp	s/min
Mains	100-240 Va	c / 150W
Interfacing		
Control PC type	Apple MacMini (or higher) with Ma	c OSX and Thunderbolt interface
Control interface	USF	3
Data interface	CameraLink	
Communication	General Purpose I/O, RS232	
General		
Operating temperature	15-30 degr C (59-86 degr F)	
Operating humidity	15-80 % RH	
External size	W750 x D842 x H256 (29.5" x 33.2" x 10.1")	W900 x D1056 x H251 (35.5" x 41.6" x 9.9")
Weight	50kg (110lbs) 100kg (220lbs)	

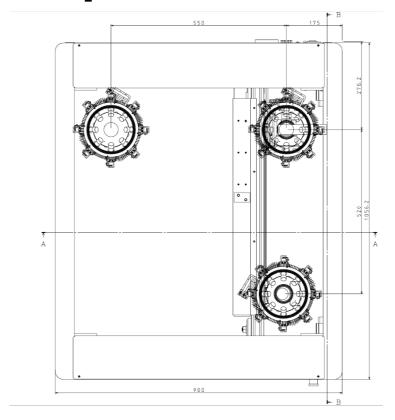
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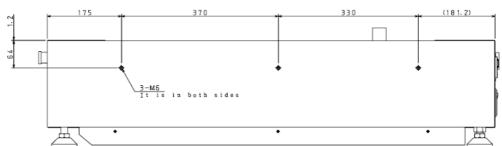


# Spector AUX

# **Bottom Up**

## FDLz/FDAz







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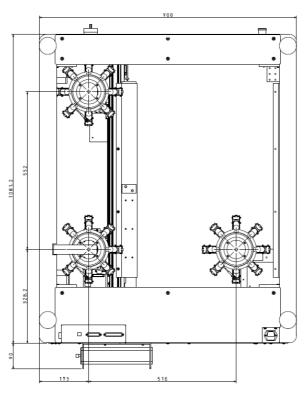


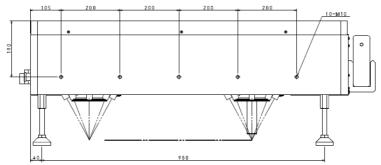
4F North Square I, Yokohama Business Park, 134 Goudo-cho, Hodogayaku, Yokohama, Kanagawa Japan 240-0005 T+81-45-340-5566 Info@marantz-mek.co.jp,

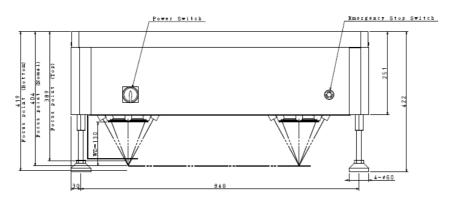
info@marantz-mek.c www.model22x.com Mek Europe BV Polluxstraat 2b 5047 RB Tilburg, Netherlands T+31 40 7114111 info@mek-europe.com www.mek-europe.com

# *Spector-BIIX*Top Down F

## FWz/FWAz







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4F North Square I, Yokohama Business Park, 134 Goudo-cho, Hodogayaku, Yokohama, Kanagawa Japan 240-0005 T +81-45-340-5566 info@marantz-mek.co.jp,