Assembléon

LEADERS IN ELECTRONIC MANUFACTURING TECHNOLOGY

May 2003

GemLine EMERALD-X(i) II series SPECIFICATIONS

PA 1315/01	Emerald-X II (SF)
PA 1315/02	Emerald-X II (FNC)
PA 1315/10	Emerald-Xi II (SF)
PA 1315/11	Emerald-Xi II (FNC)

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Contents

1.0 Introducing the Emerald-X(i) II series

The Emerald-X(i) II series, part of the GemLine (Modular High Speed Production Machines), belongs to the top-of-the-line of Assembléon's SMD pick & place machines. With the Emerald-Xi II a feeder commonality between all Assembléon machines has been introduced which increases the Emerald-X II flexibility. The Emerald-X(i) II is a fine pitch placer that can handle a wide range of components at speeds up to 4,000 QFPs per hour. The machine is built around a very rigid, vibration-free frame for improved accuracy and long-term stability and is perfectly suitable for round-the-clock production.

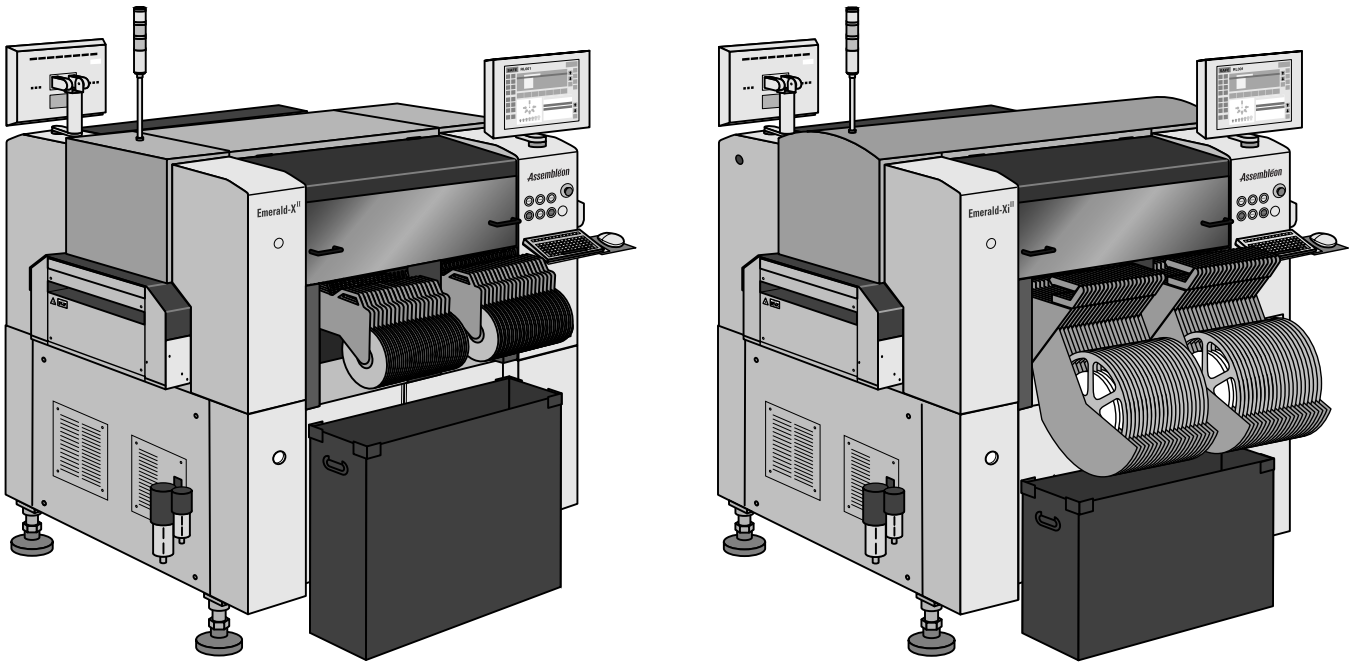


Figure 1 *Front view GEM Emerald-X(i) II.*

The GEM Emerald-X(i) II features a high precision placement beam carrying two independent Flying Nozzle Change heads (each equipped with six nozzles) or two Super Fine heads with automatically exchangeable nozzles. The placement beam moves in X/Y direction with two Z-servo controlled placement heads for stress-free placement of parts up to 20 mm high, while the board and component feeders are stationary. A flexible board transport system enables the Emerald-X(i) II to handle virtually any type of PCB, with or without tooling pins. Board conveyor width is automatically adjustable, allowing board dimensions up to 460 x 440 mm (18.1" x 17.3") to be handled.

The newly designed vision system with Line Array camera allows fast and accurate 'on-the-fly' alignment of a wide range of components from 0201 up to 45mm square 0.5mm (20 mil) pin pitch QFPs. Dark background BGAs, µBGAs and CSPs with ball pitches down to 0.5 mm (20 mil) and ball diameters down to 0.3 mm (12 mil) can be recognized with the use of a new developed illumination unit which allows measurement of ball positions and dimensions. The vision system detects missing, bent or irregular spaced leads or BGA balls; faulty components are rejected.

Optional Single area CCD cameras extend the component range from 32mm square ICs with lead pitches down to 0.3mm (12 mil) to 45 mm square QFPs with lead pitches down to 0.4 mm (16 mil) and 54 mm square QFPs with lead pitches down to 0.5 mm (20 mil). A separate camera system monitors fiducial marks at the board, circuit and component level, using a combination of white-light and IR LEDs with multi-angle diffusers to provide optimal illumination.

Just six nozzle shapes are required to cover the specified SMD range. High output levels are therefore achieved, as the need for nozzle exchanges is minimal. A 24 position nozzle exchange station enables additional special nozzles to be accommodated.

Up to 84 tape feeders can be loaded on the GEM Emerald-X II and 74 on the Emerald-Xi II. The machine supports tape, stick, bulk and tray feeders.

A Windows NT based controller, running a user-friendly Graphical User Interface, allows the GEM Emerald-X(i) II to be used stand-alone or in-line. The controller includes a Management Information System (MIS) that continuously gathers production data for management feedback. The unique bad mark sensing capabilities allow a multi-circuit panel to be run as one large board, thus maximizing placement speed while still using bad mark information. Vision bad mark sensing can also be used as automatic program selection in the production of family boards.

The GEM Emerald-X II is fully compatible with the Topaz X II, which uses the same feeders, feederbars, software and controller. Off-line feeder changeover can be achieved by using a 20 position Feederbar Exchange System (FES). An entire feederbar can be conveniently loaded off-line, minimizing change-over time. A laser-based verification system, which guarantees correct feeder latching, is standard.

A basic program optimization function is also included in the machine as standard. For more advanced machine optimization and/or line balancing, the new Production Preparation System for Gemline allows you to create and optimize SMD machine programs on a PC instead of using the SMD machine. This reduces line change-over time and prevents errors.

2.0 General Specifications

	Emerald-X II (FNC)	Emerald-X II (SF)	
			REMARKS
Tact time:	0.55 sec/chip with line camera		Simultaneous pick with 2 heads
	0.9 sec/QFP with line camera		Simultaneous pick with 2 heads
	2.3 sec/QFP with area CCD camera		In fine mode with 1 head
Optimal placement rate:	6,800 cph		Simultaneous pick with 2 heads (at best conditions)
IPC 9850	5,900 cph		C0603; all heads, all angles
Nominal placement rate:	5,000 cph		
Applicable components:	0201 - SOP, SOJ, PLCC 45mm ⍁ (1.77") 6mm - QFP 20mm ⍁ (0.78") with pin pitch down to 0.3mm (12 mil) 20mm - QFP 31mm ⍁ (1.26") with pin pitch down to 0.4mm (16 mil) 31mm - QFP 45mm ⍁ (1.77") with pin pitch down to 0.5mm (20 mil) Irregularly shaped SMDs, 100 mm long connectors with pin pitch down to 1.27 mm (50 mil) Dark background BGA, µBGA, CSP with regular pitches; 6mm - 45mm: Min. ball pitch down to 0.5mm (20mil); Min. ball diameter down to 0.3mm (12mil)		Line array camera system
	6mm - QFP 32mm ⍁ (1.26") with pin pitch down to 0.3mm (12 mil) Dark background BGA, µBGA, CSP with regular pitches; 6mm - 32mm: Min. ball pitch down to 0.5mm (20mil); Min. ball diameter down to 0.3mm (12mil)		Optional 32mm area CCD camera system with fore and side illumination unit
	6mm - QFP 45mm ⍁ (1.77") with pin pitch down to 0.4mm (16 mil) Dark background BGA, µBGA, CSP with regular pitches; 10mm - 45mm: Min. ball pitch down to 1.00mm (40mil); Min. ball diameter down to 0.6mm (23mil)		Optional 45mm area CCD camera system with fore and side illumination unit
	6mm - QFP 54mm ⍁ (2.1") with pin pitch down to 0.5mm (20 mil)		Optional 54mm area CCD camera system with fore and side illumination unit
Mounting accuracy: (X,Y) 3σ	± 50µ for chips 0201 - 0402 ± 70µ for chips and SOIC ± 35µ for QFPs (6mm - 45mm ⍁ 1.77") with pin pitch down to 0.5mm (20 mil)		Line array camera system (all placement heads and all placement angles)
	± 30µ for QFPs (6mm - 32mm ⍁ 1.26") with pin pitch down to 0.3mm (12 mil)		Optional 32mm area CCD camera system (in fine mode)
	± 35µ for QFPs (6mm - 45mm ⍁ 1.77") with pin pitch down to 0.4mm (16 mil)		Optional 45mm area CCD camera system (in fine mode)
Mounting accuracy: (X,Y) 3σ (continued)	± 40µ for QFPs (6mm - 54mm ⍁ 2.1") with pin pitch down to 0.5mm (20 mil)		Optional 54mm area CCD camera system (in fine mode)

	Emerald-X II (FNC)	Emerald-X II (SF)	
			REMARKS
Mounting accuracy: (φ) 3σ	For Chips and SOIC this is Lead dependent ± 0.12º for QFPs (6mm - 45mm ⍁ 1.77") with pin pitch down to 0.5mm (20 mil)		Line array camera system (all placement heads and all placement angles)
	± 0.08º for QFPs (6mm - 32mm ⍁ 1.26") with pin pitch down to 0.4mm (16 mil)		Optional area 32mm CCD camera system (in fine mode)
	± 0.08º for QFPs (6mm - 45mm ⍁ 1.77") with pin pitch down to 0.4mm (16 mil)		Optional area 45mm CCD camera system (in fine mode)
	± 0.1º for QFPs (6mm - 54mm ⍁ 2.1") with pin pitch down to 0.5mm (20 mil)		Optional area 54mm CCD camera system (in fine mode)
Mounting repeatability: 3σ	X, Y 30µ for QFPs (6mm - 32mm ⍁ 1.26") pitch 0.3 Phi (0.075º)		Optional 32mm area CCD camera
Mounting angle:	0 up to 360 (programmable in steps of 0.01)		
Number of heads:	Two independent flying Nozzle Change heads each equipped with 6 nozzles	Two independent Super Fine heads	For both machine types an optional Nozzle Exchange Station is available
Alignment system:	One line array camera with fore and side illumination system for Vision on the Fly using the VICS 3200 processing system		Standard, second line array camera is optional
	Area CCD camera for QFP 32mm ⍁ (1.26"), for QFP 45mm ⍁ (1.77") and QFP 54mm ⍁ (2.1") components		Optional
	Moving CCD camera for Fiducial alignment		Standard
Type of nozzles for X(i):	Type 61F Type 62F Type 63F Type 64F Type 65F Type 66F (Melf nozzle)	Type 61A Type 62A Type 63A Type 64A Type 65A Type 66A (Melf nozzle)	Standard for the Emerald-X(i) II (FNC) will be delivered: 2×nozzle 61F, 2×nozzle 62F, 2×nozzle 63F, 2×nozzle 64F, 2×nozzle65F, 2×nozzle 66F Standard for the Emerald-X(i) II (SF) will be delivered: 1×nozzle 62A, 1×nozzle 63A, 1×nozzle 64A, 1×nozzle 65A
Nozzle exchange station:	16 nozzle positions Nozzle station can hold: 2× 66A and 14 special nozzles	24 nozzle positions Nozzle station can hold: 2×61, 2×62, 2×63A, 2×64A, 2×65A, 2×66A and 12 special nozzles	Optional for Emerald-X II (FNC) will be delivered: 2×nozzle holders, 2×nozzle 66A. Optional for Emerald-X II (SF) will be delivered: no nozzles.
Component weight:	Max: 20 gr.		With the use of nozzle type 65A
Component height:	Max: 15mm	Max: 20mm	Placing of higher parts is possible if certain conditions are met.
Component mounting interdistance:	Chip: 0.5mm or more SOP: 0.7mm or more		
Placement system:	Two independent heads both with Z axis servo control for optimal component height		

	Emerald-X II (FNC) Emerald-X II (SF)	REMARKS
Placement force:	32 gram/mm (for nozzles with buffer this value is different)	Pre-tension is 500 gr. (spring loaded)
Number of feeders:	Pneumatic Tape Feeders: 8mm: 84 positions 12mm: 41 positions 16mm: 41 positions 24mm: 28 positions 32mm: 20 positions 44mm: 19 positions 56mm: 20 positions Stick feeders: Depends on stick dimensions Bulk feeders: 84 ×8mm positions	For Emerald-X II (FNC) and Emerald-X II (SF) 72mm Tape feeder is available on special request
Number of ITF feeders:	Intelligent Tape Feeders: 8mm: 74 positions 12mm: 36 positions 16mm: 36 positions 24mm: 40 positions 32mm: 24 positions 44mm: 20 positions 56mm: 16 positions Stick feeders: Depends on stick dimensions	For Emerald-Xi II (FNC) and Emerald-Xi II (SF)
Component packaging:	Tape according to IEC/EIA-J/JEDEC: 8-44mm *For larger tape feeders such as 56mm, 72mm please contact your local sales representative.*	Tape reel diameter max: 380mm (15")
	Manual Tray feeder: Max. tray size is board width dependent: Max tray size: 330mm x 300mm (12.8" x 11.7") Max tray size by max board width of 440mm (17.2"): 330mm x 175mm (12.8" x 6.8") Min tray size: 50mm x 50mm (2.0" x 2.0")	Optional: Manual tray feeder (Max. number of 8mm feeders is 59) *Not available for Xi machines*
	ATS 20 Tray Feeder portrait: Max. tray size: 220mm x 350mm (8.6" x 13.7") Min tray size: 50mm x 50mm (2.0" x 2.0")	Optional (factory built in): ATS 20 Tray Feeder portrait (Max. board width 250mm (10"), max. number of 8mm feeders 57, amount of pallets 2 ×20 with 12.5mm pitch)
	Double ATS 20 Tray Feeder portrait: Max. tray size: 220mm x 350mm (8.6" x 13.7") Min tray size: 50mm x 50mm (2.0" x 2.0")	Optional (factory built in): Double ATS 20 Tray Feeder portrait (Max. board width 250mm (10"), max. number of 8mm feeders 37, amount of pallets 2 x 20 with 12.5mm pitch.

	Emerald-X II (FNC)	Emerald-X II (SF)	
			REMARKS
Component packaging (continued):	ATS 20 Tray Feeder landscape: Max. tray size: 350mm x 220mm (13.7" x 8.6") Min tray size: 50mm x 50mm (2.0" x 2.0")		Optional (factory built in): ATS 20 Tray Feeder landscape (Max. board width 380mm (15.0"), max. number of feeders 53, amount of pallets 20 with 12.5mm pitch. *Not possible for Xi machines*
	Double shuttle LCS Tray Feeder: Max. tray size: 350mm x 440mm (13.7" x 17.2") Min tray size: 50mm x 50mm (2.0" x 2.0")		Optional: Double shuttle LCS Tray Feeder (no restrictions) Max: 120 Jedec trays
	Stick and bulk		Many solutions possible
Maximum height pre-mounted components:	6.5mm on placement side (0.26") 18mm on non placement side (0.7")	20mm on placement side (0.8") 18mm on non placement side (0.7")	
PCB Dimensions (x,y):	Min: 50mm x 50mm (2.0" x 2.0") Max: 460 x 440mm (18" x 17.2") *Special applications upon request, 584mm x 610mm (23" x 24")*		Using PCB pin fixation or edge clamping system.
PCB Weight:	Max. 1.2 Kg		Without components
	Max. 2.0 Kg		With components
PCB Thickness:	Min: 0.4mm (0.015") Max: 4.0mm (0.15") *Special applications upon request*		Max.: 3.0mm (0.12") with edge clamping system
Non-mountable area:	Board top side: 3mm (0.12") from rear side board edge 0mm from front side board edge		Component height restrictions apply in the 10mm (0.40") area from front side edge depending on board thickness
	4mm (0.16") around reference holes (locate pins)		Flat edge of 30mm (1.2") is required on bottom right corner for the use of the main stopper, sub and exit stopper
	Board bottom side: 5mm from front and rear side board edge (0.2")		
			For ceramic PCBs (optional) the non-mountable area may be different
PCB Material:	Phenolic/FR4/Composite Materials		Ceramic PCBs require special conveyor sections (optional)

	Emerald-X II (FNC)	Emerald-X II (SF)	
			REMARKS
PCB Positioning:	Locate pin fixation		Adjustable second pin
	Z servo controlled push up system		Software controlled by PCB thickness
	Push up pins		Adjustable positions
	Edge clamping		With adjustable push in
	Board clamping		Optional
	Sub stop (PCB waiting buffer)		Adjustable position
	Exit stop		Fixed position
PCB Transport height:	900mm ± 10mm (35.4" ± 0.4")		Standard
	SMEMA 953mm ± 12.5mm (37.5" ± 0.5")		Standard
PCB Transport direction:	Left to Right		Right to Left is optional
PCB Transport width:	Automatic		Front rail fixed. Rear rail moving
PCB Loading time:	Approximately 3 sec.		PCB loading concurrent to SMD picking and alignment
PCB Ratio width/length:	Max. 1:3		
Control system:	Celeron 566 MHz controller		128 MB internal memory
	Windows NT Operating System		
	256 MB flash disk		Optional 85 MB
	1.44 MB floppy drive 3.5"		
	CD-ROM		
	RS 232 Serial Interface + LAN Interface		
	15" Color User Interface Monitor		12" Flat/touch screen optional
LAN interface:	Based on IEEE802.3u, IEEE802.3		
Communication protocol:	TCP/IP, NetBEUI		
User interface:	VGOS (Visual Graphical Operating System)		
	Maintenance Support Panel (for all functions)		
	Enhanced PC/AT keyboard for data editing functions		
Control system functions:	Max. 127 PCBs		12800 components per PCB
	Backup and restoring data using floppy		
	Data conversion Text↔VIOS		
	MIS data gathering		
	Data teaching		
	Data tracing		
	Component database		3000 Comp. packages; user can define and teach vision files
	Mark database		300 Mark shapes
	SMEMA electrical interface		

	Emerald-X II (FNC)	Emerald-X II (SF)	
			REMARKS
Control system functions (continued):	On line calibration		
	On line help functions		
	Feeder lock verifier		
Machine dimensions and weight:	Length: 1650mm (5.4 ft)		
	Height: 1850mm (6.1 ft)		
	Width: 1408mm (4.5 ft)		Width including feeders: pneumatic feeders 2244mm (7.36 ft), Electrical feeders 2150mm (7.05 ft)
	Weight: 1600 kg (3526 Lbs)		
Safety standards:	EN 292, EN 294, EN 349, EN 614, EN 1050, EN 55011, EN 50082-1, EN 60204-1		CE-safety is part of system design. Safety measurements are tested on each product in the factory.
	Electrical safety according IEC 204		
Warning lights:	White: Emergency stop, safety cover interlock Blue: Error mode, e.g. pick up error, out of components Green: in automatic operation		
Audio warning signal:	Operational errors		
Electric power:	Voltage AC: 200/208/230/240/380/400/416 V ± 10%, 3 Phase		More than 3.5mm^2 cables are needed
	Frequency: 50/60 Hz		
	Consumption: 4.4 kVA max.		
Air supply:	Pressure: > 5.5.10^5 Pa (5.5 bar, 80 PSI)		
	Quality: dust and oil free		
	Consumption: 350 Nl/min.		
Operating temperature:	15-35º C (59º - 95º F)		Specification guaranteed: 20º - 28º C (68º - 82º F)
Humidity:	20 - 90% (no dew)		
Noise:	< 78dBa (X); < 74 dBa (Xi)		
Clean Room:	Class 10,000 (10 K)		

Table 1

3.0 Features, Accessories and Options

3.1 Features

Standard available in the basic GEM Emerald-X(i) II are the following features:

- On the fly alignment using a vision system with a Line Array camera standard equipped with a side illumination unit for BGAs, µBGA, CSP components.
- Simultaneous picking.
- Vision Alignment for QFPs with lead pitches down to 0.3 mm (0.012").
- Two Z-servo controlled Flying Nozzle Change heads each equipped with six nozzles or two Super Fine heads for stress-free placement of parts up to 20 mm high.
- Complete component range can be handled with only six nozzles shapes.
- Automatic nozzle exchange station for up to 24 nozzles.
- Fiducial alignment camera with improved software controlled illumination unit (white + IR Leds), that also can be used as teaching/tracing device and for Bad Mark sensing.
- Automatic width adjustment. The PCB dimension is included in your PCB data.
- PCB pin-positioning. Second pin is easily adjustable for fast changeover.
- PCB edge clamping system, for PCBs without tooling holes.
- PCB push up plate (Z servo controlled) with twelve push up pins, for PCB support. PCB thickness is included in the PCB data.
- Substopper, allowing a second PCB to enter the machine for reducing transport time.
- Exit Substopper, allowing a new PCB to enter the work area of the machine while the downstream machine is still not ready to accept a new PCB.
- Feeder lock verification system to avoid damage to the machine due to incorrectly latched feeders.
- Component dump box.
- 3.5" FDD for backup purposes.
- CD-ROM drive for software installation.
- Operation panel with push buttons.
- Operator manual, available in different languages.
- User manual.
- Service manual.
- Two empty tape bins.
- Toolset.
- First aid spare parts kit.
- CE safety.
- ESD safety.
- Electrical and Mechanical SMEMA.

Standard Software features:

- Multiple Accuracy Compensation System (MACS).
- Variable XY axis speed per component.
- Datum angle functionality (especially for stick components, there is no pick angle necessary to recognize the component which results in higher output).
- User Friendly Human interface VGOS (Visual Graphical Operating System), with touch screen capability.
- An On-line help function allows display of detailed descriptions of operations and functions on screen.
- Management Information System (MIS) to gather production history data.
- 4 point fiducial correction, to maintain accuracy for stretched/distorted boards.
- Template (pattern) matching for PCBs that have no fiducials.
- Different mark shapes for fiducial pair possible.
- Box teaching to recover fiducial recognition error.
- Data editing functions with the use of the fiducial camera (teaching,tracing).
- A Component database, that can hold up to 3000 component packages, with the most frequently used components already predefined.
- A Mark database, that can hold up to 300 mark shapes, with the most frequently used mark shapes already predefined.
- Precede pick-up, allowing to pick up components before the PCB is fixed, reducing cycle time.
- Adaptive pick-up for automatic correction of feeder pick-up position.
- Alternative feeder function, reducing operator intervention (empty feeder switching).
- Automatic program change over for family boards (self production control).
- Automatic rework cycle to improve operator efficiency.
- Product preparation can be done on the machine including basic optimization of the mount program. (nozzle and feeder set-up).
- Multi-section PCBs can either be mounted block-by-block or the block data can be combined to achieve the fastest mounting sequence. In the latter case, block badmarks still remain in effect.
- Retry function.

3.2 Accessories and Options

Accessories and options Emerald-X II (FNC/SF)	
PA 1912/00	CSM/GEM Glass Adjustment Kit
PA 2505/25	Board Clamping Gem X^{II} series
PA 2505/49	Modification kit for FES 20 position (field retro fit, one machine side); no carts included

PA 2505/57	Feederbar exchange system front side, including two FES 20 position cart for FV/GEM II series
PA 2505/58	Feederbar exchange system rear side, including two FES 20 position cart for FV/GEM II series
PA 2505/59	FES (Feederbar exchange system) cart 20 positions for II series
PA 2506/30	Rear side CRT monitor, keyboard and mouse
PA 2506/31	Flat/touch screen monitor front side
PA 2506/32	Flat/touch screen monitor rear side
PA 2506/35	Operation panel rear side
PA 2506/40	Maintenance lamp
PA 2695/12	Manual Tray Feeder Topaz-X/Emerald-X
PA 2696/24	ATS 20 Tray Feeder portrait for GEM
PA 2696/25	Double ATS 20 Tray Feeder portrait for GEM
PA 2696/26	ATS 20 Tray Feeder landscape for GEM
PA 2699/23	Double shuttle Tray Feeder (LCS) for Topaz-X/Emerald-X
PA 2903/27	16mm Tape Feeder, 15 inch reelholder CL
PA 2903/38	24mm Tape Feeder, 15 inch reelholder CL
PA 2903/41	32mm Tape Feeder, 15 inch reelholder FV/GEM PSA
PA 2903/51	44mm Tape Feeder, 15 inch reelholder FV/GEM PSA
PA 2903/77	8mm Tape Feeder for 0201, 2mm pitch, 15 inch reelholder CL
PA 2903/78	8mm Tape Feeder, 2mm pitch, 15 inch reelholder CL
PA 2903/79	8mm Tape Feeder, 4mm pitch, 15 inch reelholder CL
PA 2903/88	12mm Tape Feeder, 15 inch reelholder CL
PA 2904/51	Gem bulk cassette feeder C0603 long
9466 920 10921	Reject belt feeder Gem-X
PA 2923/00	Set of 20 dummy feeders
PA 2962/91	Nozzle Type 61A (0201-0420/0603-1005)
PA 2962/92	Nozzle Type 62A (0603-1206/1608-3216)
PA 2962/93	Nozzle Type 63A (1812-SOP/4532-SOP)
PA 2962/94	Nozzle Type 64A (Middle size QFP)
PA 2962/95	Nozzle Type 65A (Large size QFP)
PA 2962/96	Nozzle Type 66A Cylindrical chip (MELF)

PA 2963/17	Nozzle Exchange System Emerald-X (SF) (24 position no nozzles included, factory built-in only)
PA 2963/21	Nozzle Exchange System Emerald-X (FNC) (16 position no nozzles included, factory built-in only)
PA 2969/59	Second Line Array camera for Emerald-X II (factory built-in only)
PA 2969/85	Area CCD camera 32mm (including fore and side illumination unit) for II series (factory built-in only)
PA 2969/86	Area CCD camera 45mm (including fore and side illumination unit) for Emerald-X II (factory built-in only)
PA 2969/87	Area CCD camera 54mm (including fore and side illumination unit) for Emerald-X II (factory built-in only)
PA 2981/15	Pallet for LCS Tray Feeder FV/GEM (PA 2699/22/23)
PA 2981/35	Pallet for PA 2696/21/24 and PA 2696/22/25 (ATS 20 portrait)
PA 2981/36	Pallet for PA 2696/23/26 (ATS 20 landscape)

Table 2

Accessories and options Emerald-Xi (FNC/SF)	
PA 1912/00	CSM/GEM Glass Adjustment Kit
PA 2505/25	Board Clamping Gem XII series
PA 2505/52	FES (Feederbar exchange system) cart 20 positions for II series
PA 2505/53	Feederbar exchange system front side, including two FES 20 position cart for FV/GEM II series
PA 2505/54	Modification kit for FES 20 position for ITF
PA 2505/56	Feederbar exchange system rear side, including two FES 20 position cart for FV/GEM II series
PA 2506/32	Flat/touch screen monitor rear side
PA 2506/35	Operation panel rear side
PA 2506/40	Maintenance lamp
PA 2601/00	Tape Loading Unit
PA 2602/00	Feeder Storage cart
PA 2654/05	Intelligent Tapefeeder 8mm
PA 2654/15	Intelligent Tapefeeder 12mm
PA 2654/25	Intelligent Tapefeeder 16mm

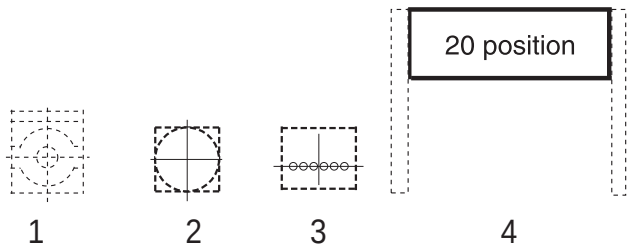
PA 2654/35	Intelligent Tapefeeder 24mm
PA 2654/45	Intelligent Tapefeeder 32mm
PA 2654/55	Intelligent Tapefeeder 44mm
PA 2654/65	Intelligent Tapefeeder 56mm
PA 2696/24	ATS 20 Tray Feeder portrait for GEM
PA 2696/25	Double ATS 20 Tray Feeder portrait for GEM
PA 2699/23	Double shuttle Tray Feeder (LCS) for II series
9466 920 10911	Reject belt feeder Gem X i series
PA 2923/10	Set of 10 ITF dummy feeders
PA 2962/93	Nozzle Type 63A (1812-SOP/4532-SOP)
PA 2962/94	Nozzle Type 64A (Middle size QFP)
PA 2962/95	Nozzle Type 65A (Large size QFP)
PA 2962/96	Nozzle Type 66A Cylindrical chip (MELF)
PA 2962/97	Nozzle Type 61 (0201-0402/0603-1005)
PA 2962/98	Nozzle Type 62 (0603-1206/1608-3216)
PA 2963/17	Nozzle Exchange System Emerald-X (SF) (24 position no nozzles included, factory built-in only)
PA 2963/21	Nozzle Exchange System Emerald-X (FNC) (16 position no nozzles included, factory built-in only)
PA 2969/59	Second Line Array camera for Emerald-X II (factory built-in only)
PA 2969/85	Area CCD camera 32mm (including fore and side illumination unit) for II series (factory built-in)
PA 2969/86	Area CCD camera 45mm (including fore and side illumination unit) for Emerald-X II (factory built-in)
PA 2969/87	Area CCD camera 54mm (including fore and side illumination unit) for Emerald-X II (factory built-in)
PA 2981/15	Pallet for LCS Tray Feeder FV/GEM (PA 2699/22/23)
PA 2981/35	Pallet for PA 2696/21/24 and PA 2696/22/25 (ATS 20 portrait)

Table 3

3.3 Machine configuration examples

On the following pages you can find some machine configuration examples for the Emerald-X(i) II.

Remark 1: In the examples the dotted lines pictures indicate the physical position of the second line array camera, area CCD camera, nozzle exchange station and FES 20. These can be ordered as an option.

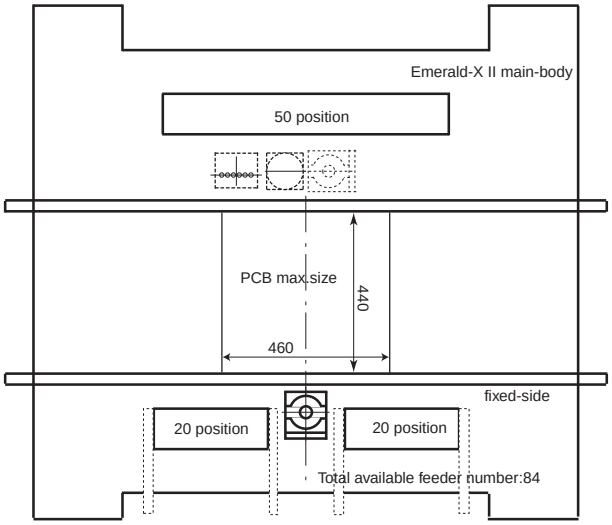


1. Second line array camera.
2. Area CCD camera Emerald-X(i) II.
   This can be the 32mm, 45mm or 54mm camera.
3. Nozzle exchange station for Emerald-X(i) II.
4. Feederbar Exchange System 20 position.

In total two additional cameras can be ordered with the Emerald-X(i) II which means: a second line array camera + an area CCD camera or two area CCD cameras.

Remark 2: By ordering a Feederbar Exchange System for the rear site of the machine, the 50 position feederbar will be replaced by two FES 20 position carts.

EXAMPLE 1: EMERALD-X II FNC/SF



PA 1315/01 Emerald-X II with SF head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

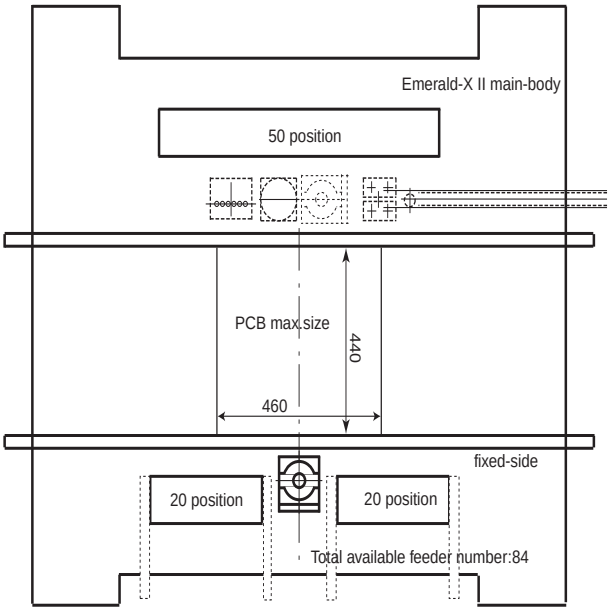
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Or

PA 1315/02 Emerald-X II with FNC head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

EXAMPLE 2: EMERALD-X II FNC/SF WITH DOUBLE SHUTTLE LCS



PA 1315/01 Emerald-X II with SF head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2699/23 Double shuttle LCS
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

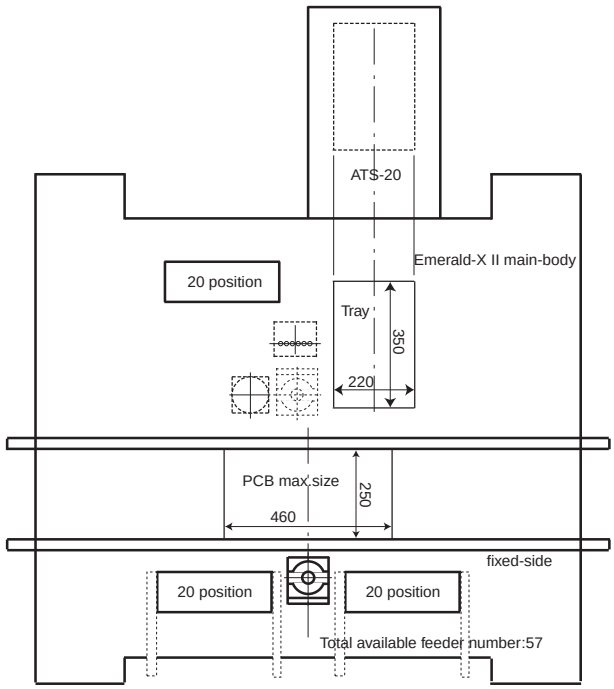
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Or

PA 1315/02 Emerald-X II with FNC head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2699/23 Double shuttle LCS
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

EXAMPLE 3: EMERALD-X II FNC/SF with ATS-20 portrait



PA 1315/01 Emerald-X II with SF head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/24 ATS-20 tray feeder portrait
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

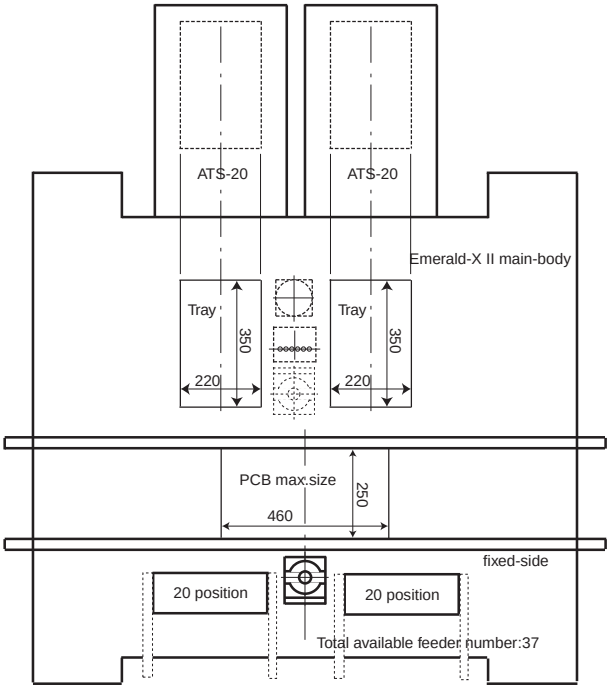
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Or

PA 1315/02 Emerald-X II with FNC head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/24 ATS-20 tray feeder portrait
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

EXAMPLE 4: EMERALD-X II FNC/SF with double ATS-20 portrait



PA 1315/01 Emerald-X II with SF head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/25 Double ATS-20 tray feeder portrait
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

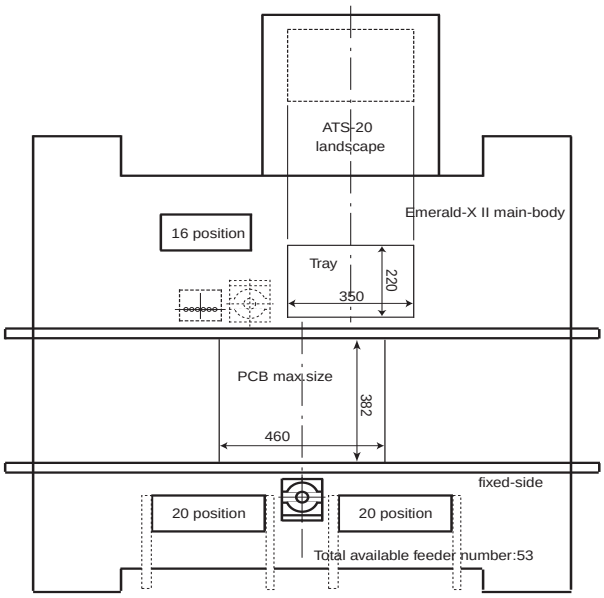
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Or

PA 1315/02 Emerald-X II with FNC head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/25 Double ATS-20 tray feeder portrait
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

EXAMPLE 5: EMERALD-X II FNC/SF with ATS-20 landscape



PA 1315/01 Emerald-X II with SF head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/26 ATS-20 tray feeder landscape
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)

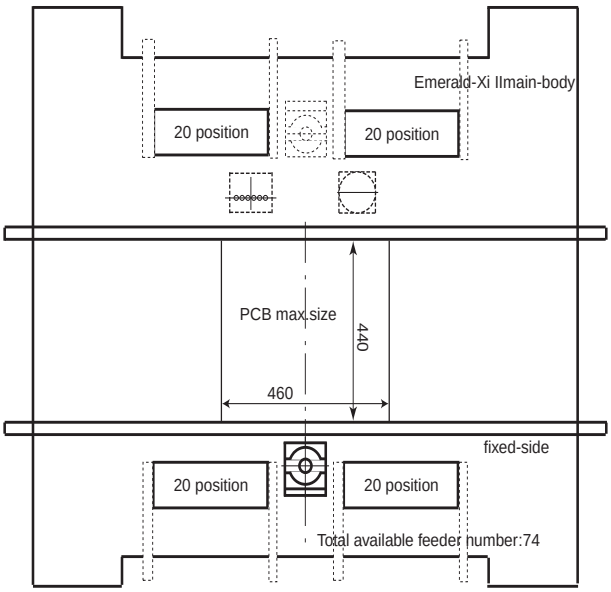
Instead of the second line array camera an area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

Or

PA 1315/02 Emerald-X II with FNC head
PA 2505/47 Feederbar Exchange system front-side, included FES 20 position carts
PA 2696/26 ATS-20 tray feeder landscape
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)

Instead of the second line array camera an area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-X II

EXAMPLE 6: EMERALD-Xi II FNC/SF



PA 1315/10 Emerald-Xi II with SF head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2505/56 Feederbar exchange system rear side, included FES 20 carts
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

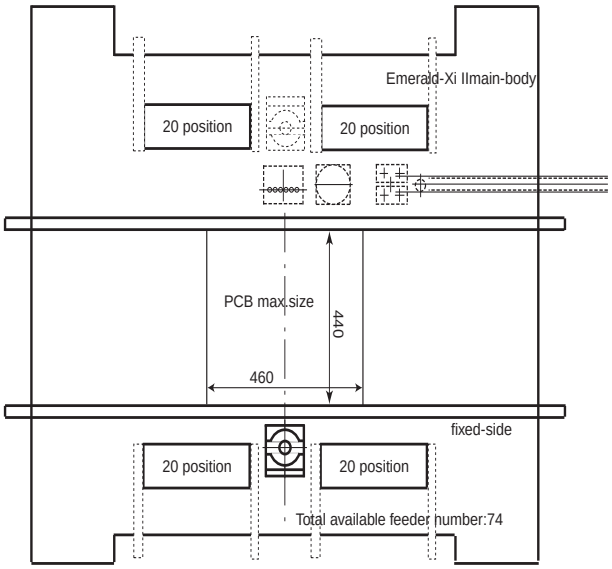
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Or

PA 1315/11 Emerald-Xi II with FNC head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2505/56 Feederbar exchange system rear side, included FES 20 carts
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

EXAMPLE 7: EMERALD-Xi II FNC/SF with double shuttle LCS

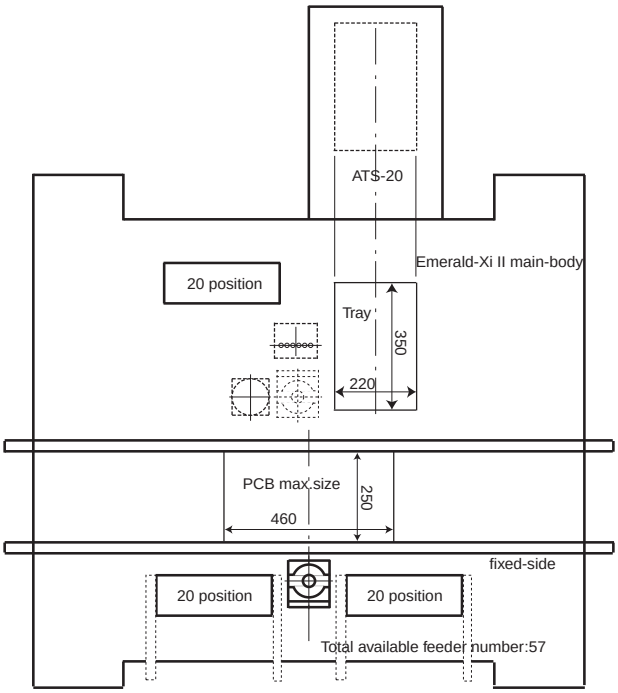


PA 1315/10 Emerald-Xi II with SF head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2505/56 Feederbar exchange system rear side, included FES 20 carts
PA 2699/23 Double shuttle LCS
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Or

PA 1315/11 Emerald-Xi II with FNC head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2505/56 Feederbar exchange system rear side, included FES 20 carts
PA 2699/23 Double shuttle LCS
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

EXAMPLE 8: EMERALD-Xi II FNC/SF with ATS-20 portrait



PA 1315/10 Emerald-Xi II with SF head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2696/24 ATS-20 tray feeder portrait
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

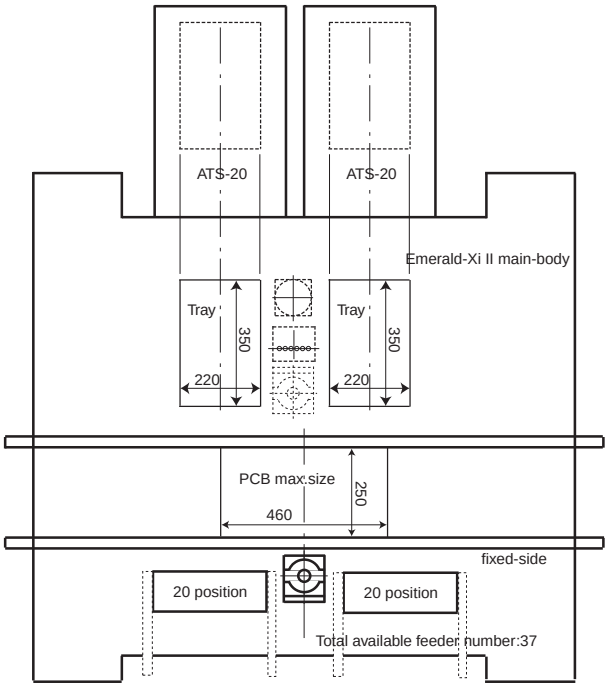
Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Or

PA 1315/11 Emerald-Xi with FNC head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2696/24 ATS-20 tray feeder portrait
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

EXAMPLE 9: EMERALD-Xi II FNC/SF with double ATS-20 portrait



PA 1315/10 Emerald-Xi II with SF head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2696/25 Double ATS-20 tray feeder portrait
PA 2963/17 Nozzle Exchange System Emerald-X (24 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Or

PA 1315/11 Emerald-Xi with FNC head
PA 2505/53 Feederbar exchange system front side, included FES 20 carts
PA 2696/25 Double ATS-20 tray feeder portrait
PA 2963/21 Nozzle Exchange System Emerald-X (16 positions/no nozzles included)
PA 2969/59 Second line array camera Emerald-X II (only factory built-in)
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

Instead of the second line array camera a second area CCD camera can be configured.
You have the choice between :
PA 2969/85, PA 2969/86 or PA 2969/87
Area CCD camera 32mm, 45mm or 54mm (including lighting unit) for Emerald-Xi II

4.0 Mounting Heads Configuration

The GEM Emerald-X(i) II features a newly developed high precision head assembly carrying two Flying Nozzle Change heads (each equipped with six nozzles) or two Super Fine heads with exchangeable nozzles. On both head models (FNC,SF) a separate camera system is attached that monitors fiducial marks at the board, circuit and component level, using white + IR light LEDs and Multi-angle diffusers to provide optimal illumination. Both placement heads have their own servo-controlled rotation- and Z-axis. The Z-axis ensures that every component is picked up and placed without any stress. High placement rates are achieved by simultaneous component picking which reduces head beam travel and thus shortens the mounting cycle.

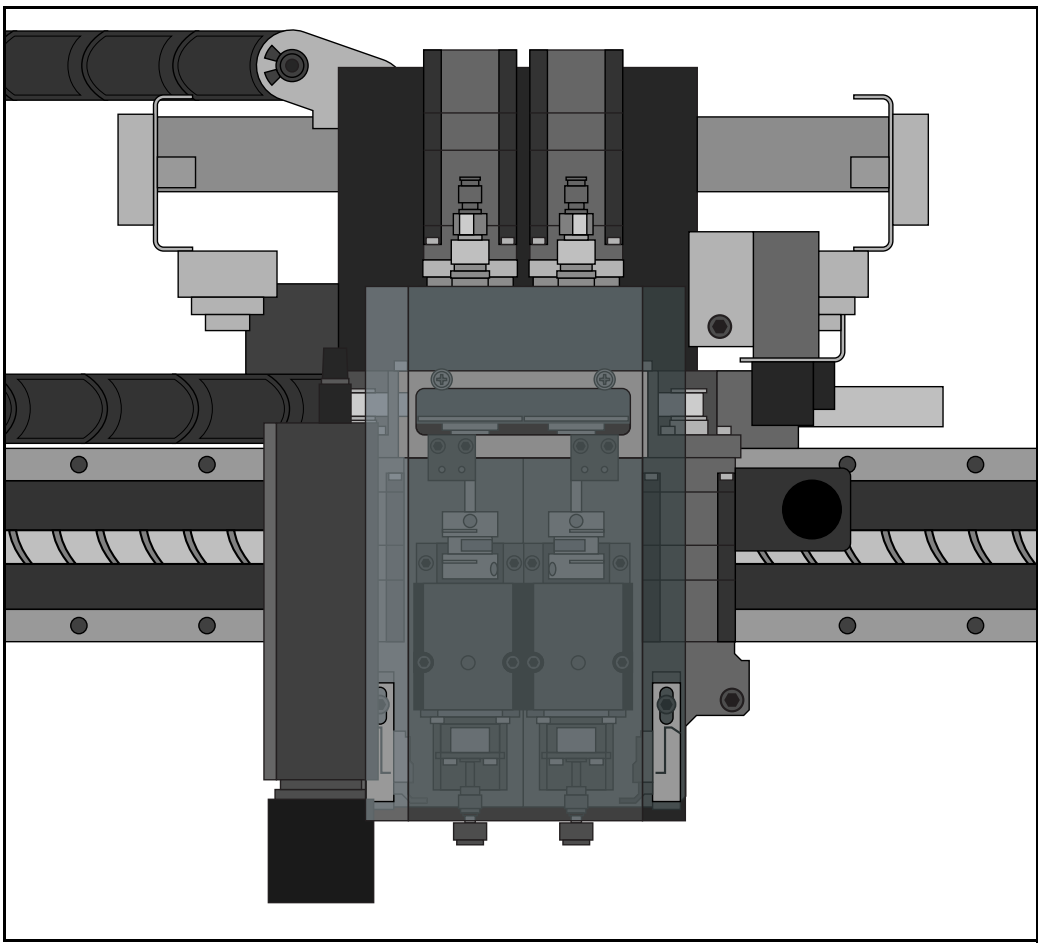


Figure 2 *Configuration of SF head section.*

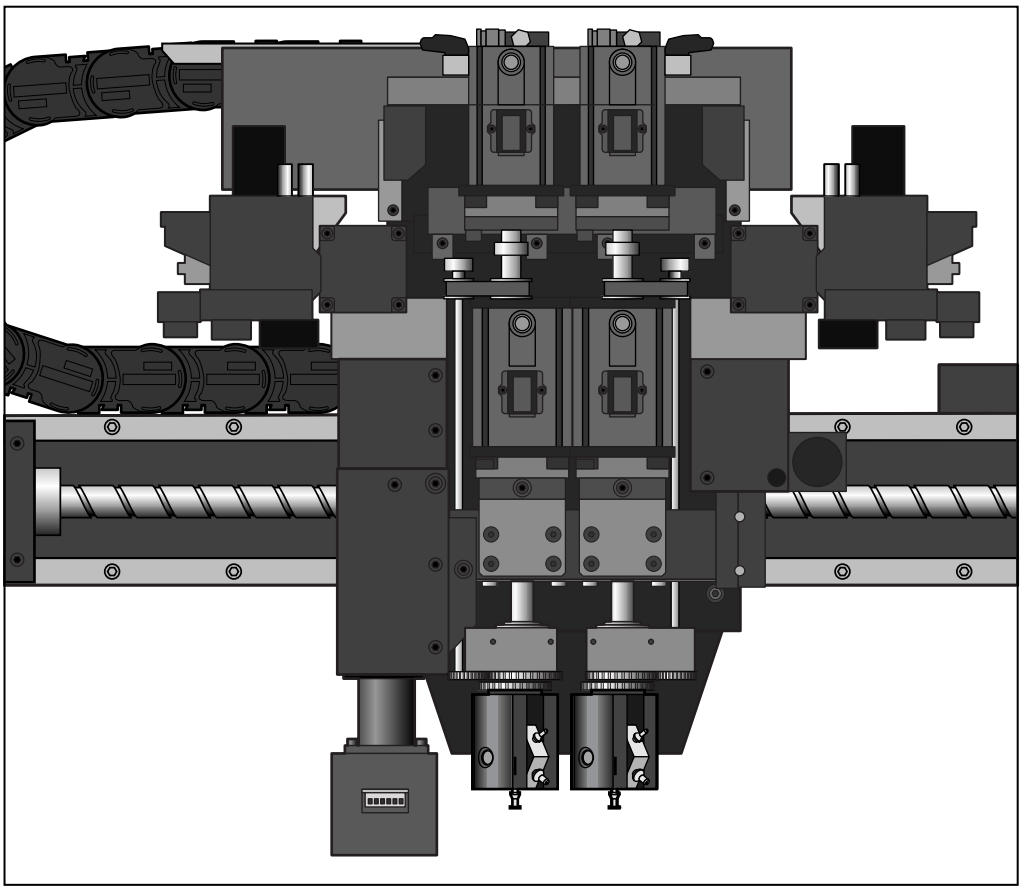


Figure 3 *Configuration of FNC head section*

The high-precision dual Y-drive Emerald-X(i) [II] features four-axis (X, Y, Z, R) servo control for accurate, stress-free component mounting. Direct Drive, brushless AC motors controlling heavy duty lead screws allow optimal accuracy and superb reliability.

Specifications	
Number of axis:	9 for SF, 11 for FNC
Axis configuration:	X axis AC servo Double Y axis AC servo Z (2×), R (2×) axis AC servo W (automatic width) axis AC servo Push up plate AC servo N (2×for nozzle change) axis AC servo (only for FNC)
Z axis sequence:	AC servo motor
R axis sequence:	AC servo motor
Pick-up error detection:	Vacuum check (256 level digital setting)
Mounting angle:	0° - 360° (0.01° step)
Number of mounting head:	2 in-line
Nozzle types:	6 different shapes
Encoder resolution:	X,Y = 0.00122mm/pulse
	Z = 0.00183mm/pulse
	Phi = 0.0030°/pulse
	N = 0.0022°/pulse (only for FNC)
Head position accuracy:	X = 0.010mm
	Y = 0.010mm
Speed:	X = 1500mm/sec
	Y = 1500mm/sec
Acceleration:	X = 36600mm/sec^2
	Y = 27000mm/sec^2

Table 4

5.0 ALIGNMENT

5.1 LINE ARRAY CAMERA ALIGNMENT

The high speed of the GEM Emerald-X(i) II is achieved by fast on-the-fly component alignment using a revolutionary Line Array camera system, equipped with a newly developed multi angle illumination unit, that is four times faster than conventional vision systems. For ultimate speed, the machine can be equipped with a second Line Array camera which reduces head beam travel and thus shortens the mounting cycle.

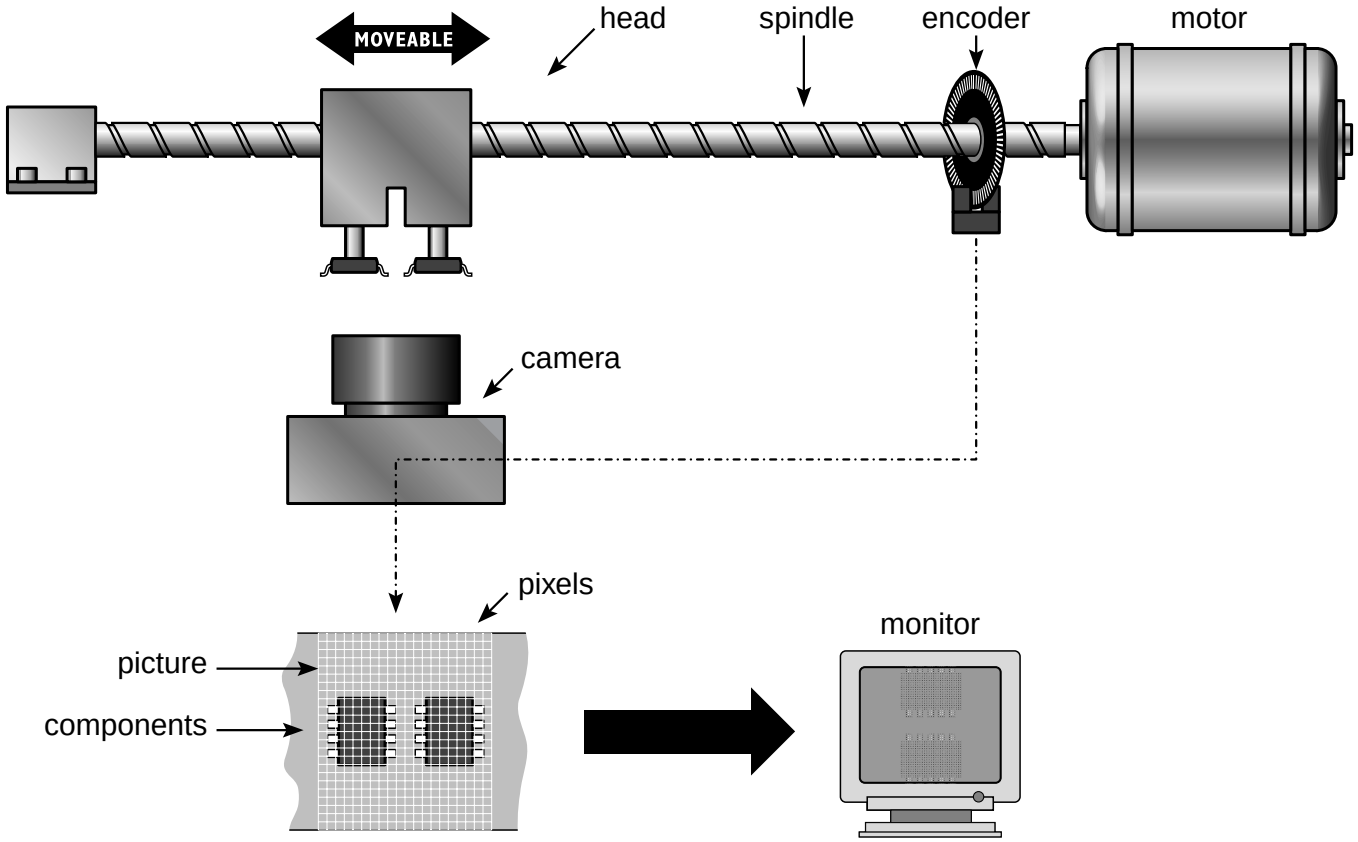


Figure 4 *Line sensor vision principle.*

While moving the beam over the camera, the encoder triggers the camera to capture consecutive lines of pixels. All these lines form the total picture of the components. This picture is processed by a sophisticated vision system. The vision system algorithms inspect the components and calculate position and orientation of the components on the heads.

The SMD components are illuminated by a new developed multi angle side illumination unit which allows high speed recognition of CSPs and µBGAs. The leads of the components are imaged on the line sensor.

Specifications	
Line Array camera:	CCD 1024 x 1 pixels
Max. component size:	45mm ⍁ (1.77")
Min. component size:	0201
Min. lead pitch:	0.5mm (20 mil)
Min. lead width:	0.2mm (0.008")
Grey scale:	256 levels
Lighting:	Multi angle Fore/side illumination; Light intensity is software controlled for each component separately
Recognition:	Reflection. Pattern recognition on all leads
Max. number of lead sides:	4
Max. number of lead groups:	2 per side
Check on:	Lead/ball pitch
	Lead/ball location
	Bent/missing leads/balls
	Total number of leads/balls
	Cumulative lead/ball pitch

Table 5

5.2 Single Area CCD Alignment

An optional single area CCD camera extends the component range for the GEM Emerald-X(i) II.

Component illumination is performed by means of fore/reflective lighting and side illumination. The lighting source reflects the lead of QFP and the balls of BGA components on the CCD camera. The single area CCD camera grabs the image of the component in one frame and presents it to the vision system for recognition and measurements purposes.

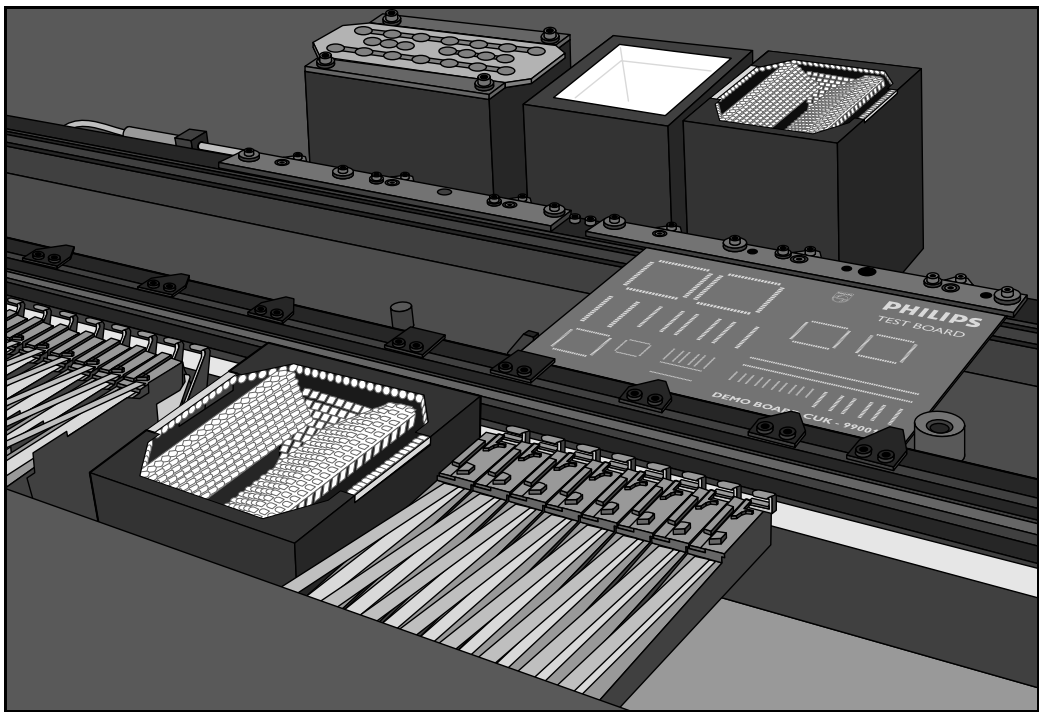


Figure 5 *GEM Emerald-X(i) II working area.*

To increase mounting accuracy for ultra fine pitch components, the Gem Emerald-X(i) II can use the Fine mode/Multi recognition alignment method. In this mode, the calculated offset of the QFP is corrected and re-checked before actual placement is performed.

Specifications	
Optional single area CCD camera 32mm (1.26")	**CCD 512 x 480 pixels**
Max. component size:	32mm ⍁ (1.26")
Min. component size:	6mm ⍁ (0.24")
Min. lead pitch:	0.3mm (0.012")
Min. lead width:	0.1mm (0.004")
Grey scale:	256 levels
Lighting:	Fore/side lighting illumination
Recognition:	Reflection. Pattern recognition on all leads
Max. number of lead sides:	4
Max. number of lead groups:	2 per side
Check on:	Lead/ball pitch
	Lead/ball location
	Bent/missing leads/balls
	Total number of leads/balls
	Cumulative lead/ball pitch
Optional single area CCD camera 45mm (1.77")	**CCD 512 x 480 pixels**
Max. component size:	45mm ⍁ (1.77")
Min. component size:	6mm ⍁ (0.24")
Min. lead pitch:	0.4mm (16 mil)
Min. lead width:	0.2mm (0.008")
Grey scale:	256 levels
Lighting:	Fore/side lighting illumination
Recognition:	Reflection. Pattern recognition on all leads
Max. number of lead sides:	4
Max. number of lead groups:	2 per side

Specifications	
Check on:	Lead/ball pitch
	Lead/ball location
	Bent/missing leads/balls
	Total number of leads/balls
	Cumulative lead/ball pitch
Optional single area CCD camera 54mm (2.1")	**CCD 512 x 480 pixels**
Max. component size:	54mm ⍁ (2.1")
Min. component size:	6mm ⍁ (0.24")
Min. lead pitch:	0.5mm (20 mil)
Min. lead width:	0.2mm (0.008")
Grey scale:	256 levels
Lighting:	Fore/side lighting illumination
Recognition:	Reflection. Pattern recognition on all leads
Max. number of lead sides:	4
Max. number of lead groups:	2 per side
Check on:	Lead pitch
	Lead location
	Bent/missing leads
	Total number of leads
	Cumulative lead pitch

Table 6

5.3 Fiducial Alignment

The GEM Emerald-X(i) II is standard equipped with a fiducial camera. This camera is used to compensate for variations in the position of the circuit pattern relative to the expected position. The fiducial alignment system is an opto-electronic system which performs geometric measurements of fiducial marks on the PCB in order to calculate the deviations from their expected positions. The system can use two or four fiducials per board. Each sub-circuit can also be aligned using two fiducials. For placement of fine-pitch components two local fiducials per component may be used. The individual shapes of a fiducial pair can be different to allow for maximum application flexibility. Also pattern recognition algorithms can be used on traces or pads on the PCB board for cases where fiducials are not available.
The fiducial camera can also be used as a high accurate teaching device for PCB data (if CAD data is not available), automatic calibration and inspection purposes.

Specifications	
Fiducial camera:	CCD
Fiducial camera functionality	Fiducial detection, Bad Mark detection, teaching device (2 or 4 point teaching)
Fiducial illumination:	White + IR LEDs in conjunction with a wide-angle diffuser
Compensation for: (with two fiducials)	Translation Rotation Linear stretch and shrink
Compensation for: (with 3 or 4 fiducials)	Non-linear stretch and shrink
Type of compensation:	PCB, Block, Local
Fiducial size:	Max. 3.0mm (0.12")
	Min. 0.8mm (0.03")
Fiducial material:	Copper Gold Lead-tin
Fiducial clearance area	2 x Fiducial size
PCB warpage at fiducial:	0.5mm (0.02")
Pattern offset:	Max. 1mm (0.04")
Number of different Fiducial pairs per PCB:	128
Number of fiducial shapes in Mark Database:	300
Examples of fiducials:	Solid circle (preferred) Square Triangle Donut Binary cross Bow-tie (connected) Template matching
Fiducial definition:	According CAD data

Table 7

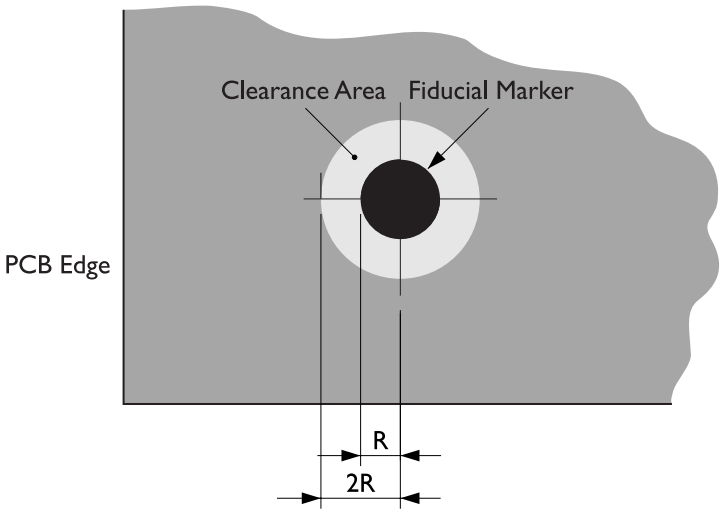


Figure 6 *Fiducial free space.*

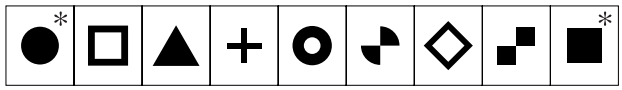


Figure 7 *Fiducials.*

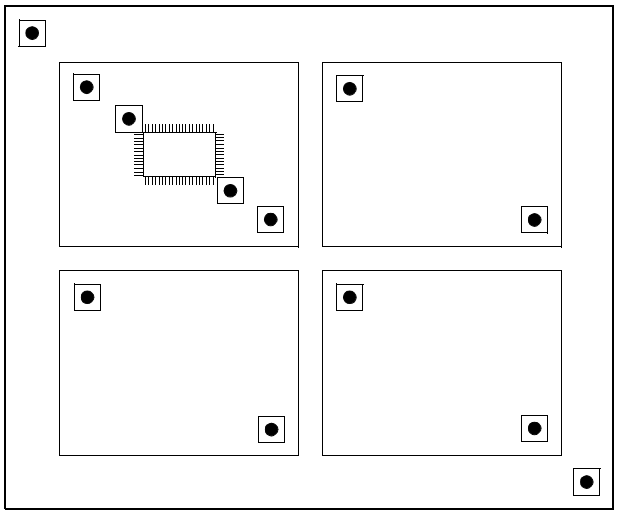


Figure 8 *Examples of PCB, block and local fiducials.*

5.4 Master, Bad Mark Sensing

If the PCB contains subcircuits, one or more of these subcircuits can be skipped for placement by giving them a “Bad Mark” on a designated position on the subcircuit. No parts will be placed on a circuit that has a Bad Mark. Bad Mark sensing, with the use of the fiducial camera, is based on recognition of a difference in contrast in a certain area. This area can be defined in the machine software (position and area-dimensions). This gives maximum freedom in choosing the process or technique to add Bad Marks, for example:

- white or light colored labels of any dimension,
- white paint,

... or any other material that can be fixed as long as it contrasts with the PCB surface.

Before checking the Bad Marks on all circuits, the Master Mark may be checked first. Presence of a Master Mark means that one or more Bad Marks are present on the circuits. This allows the machine to skip the Bad Mark sensing process for all circuits if no Bad Marks are located on the circuits, therefore saving valuable production time.

6.0 BOARD HANDLING

PCB boards can be located in the machine by either tooling pins, edge clamping or board clamping if tooling holes are not available. With pin location, one location pin is fixed on the machine while the other locate pin is easily adjustable when the board length changes. Change over to a different board size is just a matter of seconds by using the automatic adjustment (servo controlled) of the conveyor width and the PCB thickness.

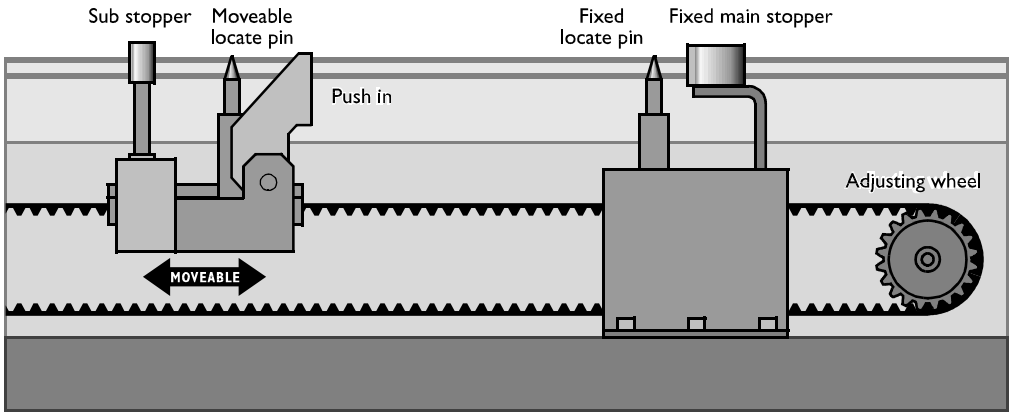


Figure 9 *Pin fixation system.*

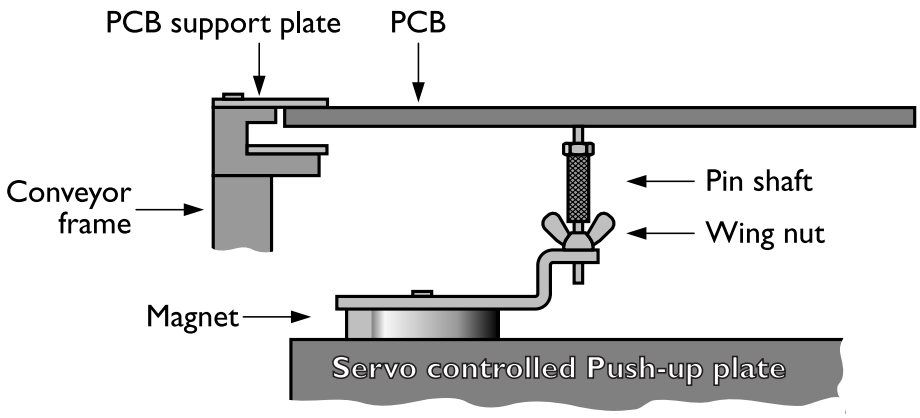


Figure 10 *Push up system.*

The Edge Clamping system is as easy to adjust as the locate pin fixation. Both these systems use Push-up pins to support the PCB.

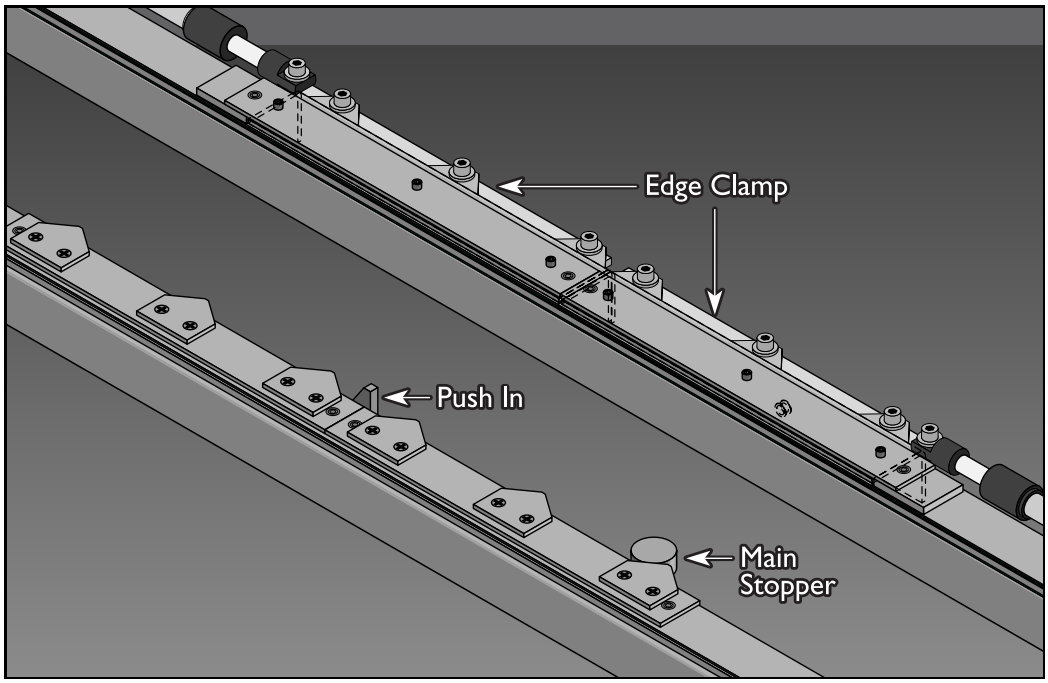


Figure 11 *GEM Emerald-X(i) II Edge Clamping system.*

A sub-stop enables an additional PCB to enter the machine while the current board is being populated. This reduces time loss during transport and is very useful when operating the machine in a flowline. An exit sub-stop, which can be seen as a transport buffer function, links the entrance sub-stop and main stopper, shortening the PCB transport time and reducing loss from inefficient operation.

When using the machine in a flowline, it communicates with the unit upstream and downstream over a SMEMA-connection.

Specifications	
PCB Dimensions (x,y):	Min. 50mm x 50mm (2.0" x 2.0")
	Max. 460mm x 440mm (18" x 17.2") using PCB pin fixation or PCB edge clamping, board clamping system
PCB Thickness:	Min. 0.4mm (0.015")
	Max. 4.0mm (0.15"); max. 3.0mm (0.12") with edge clamping system
Reference hole position:	5mm (0.2") in X and Y from lower right corner
Reference hole diameter:	Ø 2.0mm-Ø 4.0mm (0.08" - 0.157")
PCB Maximum warpage:	0.5mm up (0.02") 1.0mm down (0.04")

Specifications	
Max. height pre-mounted components:	6.5mm on placement side (0.26") with FNC head 20mm (0.79") with SF head 18mm on non placement side (0.7")
Non-Mountable area:	Board Top side: 3mm from rear side board edge (0.12") 0mm from front side board edge (Component height restrictions apply in the 10mm (0.40") area from front side edge depending on board thickness) 4mm around reference holes (0.16") (locate pins)
	Board Bottom side: 5mm from front and rear side board edge (0.2")
PCB Material:	Phenolic/FR4/Composite Materials Ceramic PCB transport is optional
PCB weight:	Max. 1.2 Kg without components Max. 2.0 Kg with components
PCB positioning:	Locate pin fixation (adjustable second pin) Z servo controlled push up system (software controlled by PCB thickness) Push up pins (adjustable positions) Edge clamping (with adjustable push in) Board clamping (optional) Sub stop (PCB waiting buffer) adjustable position Exit stop (fixed position)
PCB Transport height:	900mm ± 10mm (35.4" ± 0.4") SMEMA 953mm ± 12.5mm (37.5" ± 0.5")
PCB Transport direction:	Left to Right standard, optional Right to Left
PCB Transport width:	Automatic
PCB loading time:	Approximately 3 sec.
PCB ratio width/length:	Max. 1:3

Table 8

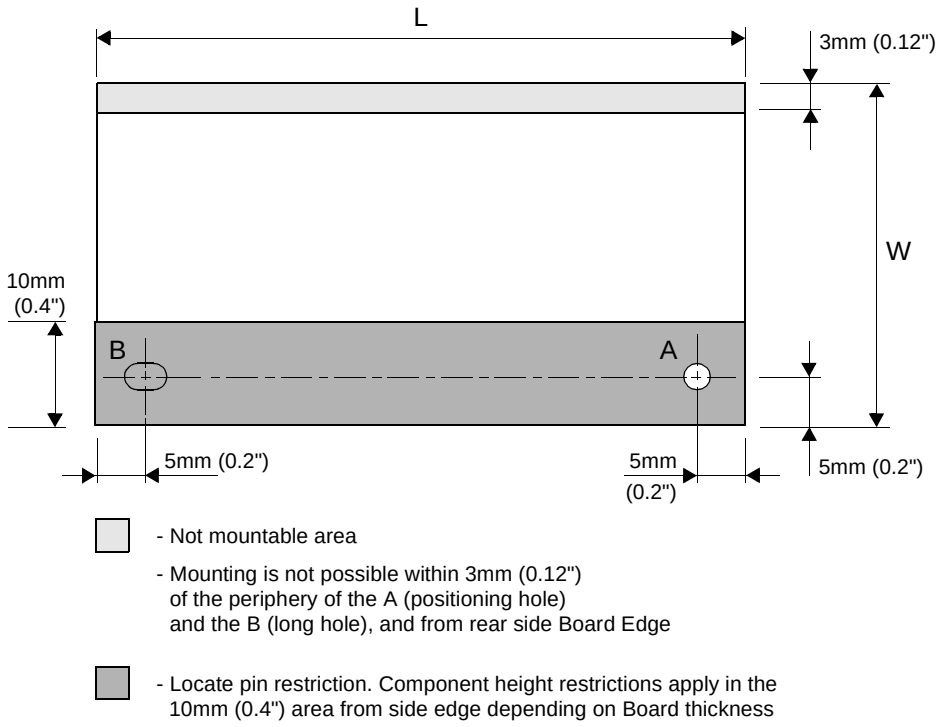


Figure 12 *Mountable area.*

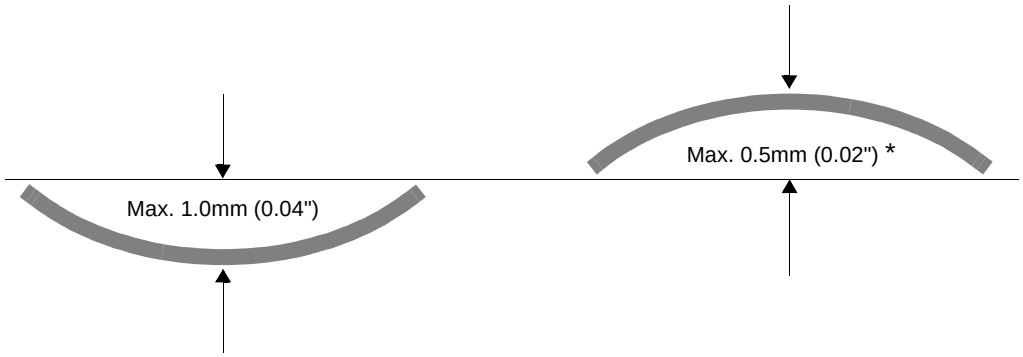


Figure 13 *Warp of fixed PCB.*

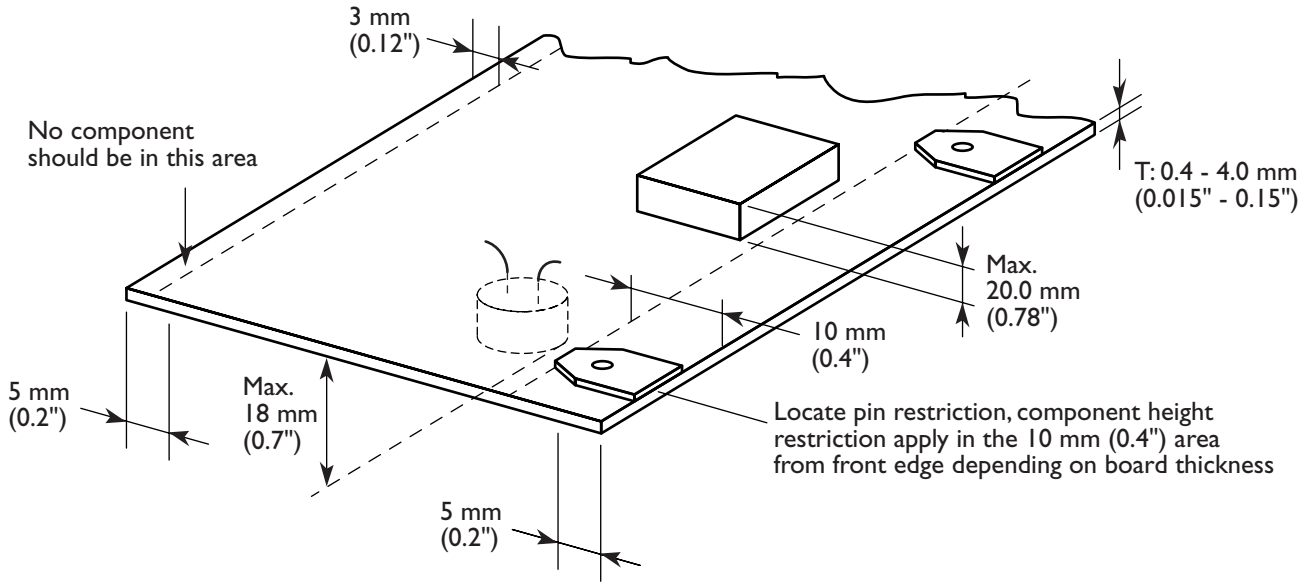


Figure 14 *Mountable area.*

7.0 Feederbar Exchange System

7.1 PA 2505/52

The Feederbar Exchange System (FES) allows fast change-over by switching the complete 20 position feederbar on a GEM Emerald-Xi II.

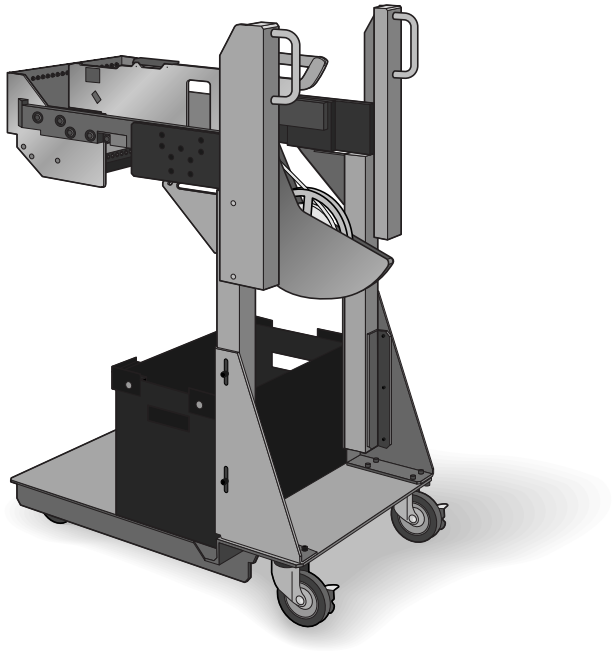


Figure 15 *FES-cart Xi*

Feederbars are mounted on carts to off-line feeder Set-up. These carts are easily moved from set-up area to the mounting machines and back. This option is available for the front (PA 2505/53) and rear side (PA 2505/56) of the machine.

The Emerald-Xi II FES carts are compatible with those of the Topaz-Xi, Emerald-Xi and Topaz-Xi II. An empty tape bin will be delivered with each FES cart.

FES 20 specifications	
	PA 2505/52
FES change-over time:	≤ 60 sec.
FES accuracy from FES cart fiducials to pick position ($\mu + 3\ \sigma$)	X = +/- 0.05mm Y = +/- 0.05mm Z = +/- 0.10
Applicable feeders:	ITF tape feeders ITF stick feeders

Number of feeders on FES carriage:	8 mm: 20 positions 12/16 mm: 9 positions 24 mm: 10 positions 32 mm: 6 positions 44 mm: 5 positions 56mm: 4 positions Stick: depends on stick dimensions
Air and Electrical interface:	Quick coupling (one action)
Electrical power:	Supplied by main system
Air supply:	No air supply to feeders
FES 20 dimensions, stand alone without feeders:	Length: 820 mm (2.7 ft) Width: 470 mm (1.55 ft) Height: 1050 mm (3.44 ft)
Weight without feeders:	55 kg (121 Lbs)
Tape waste bin :	Included
Compatibility:	Topaz-Xi, Emerald-Xi and Topaz-Xi II
Min. component size:	0402 (1.0mm x 0.5mm) Smaller components should be used with pick-up teaching function.

Table 9

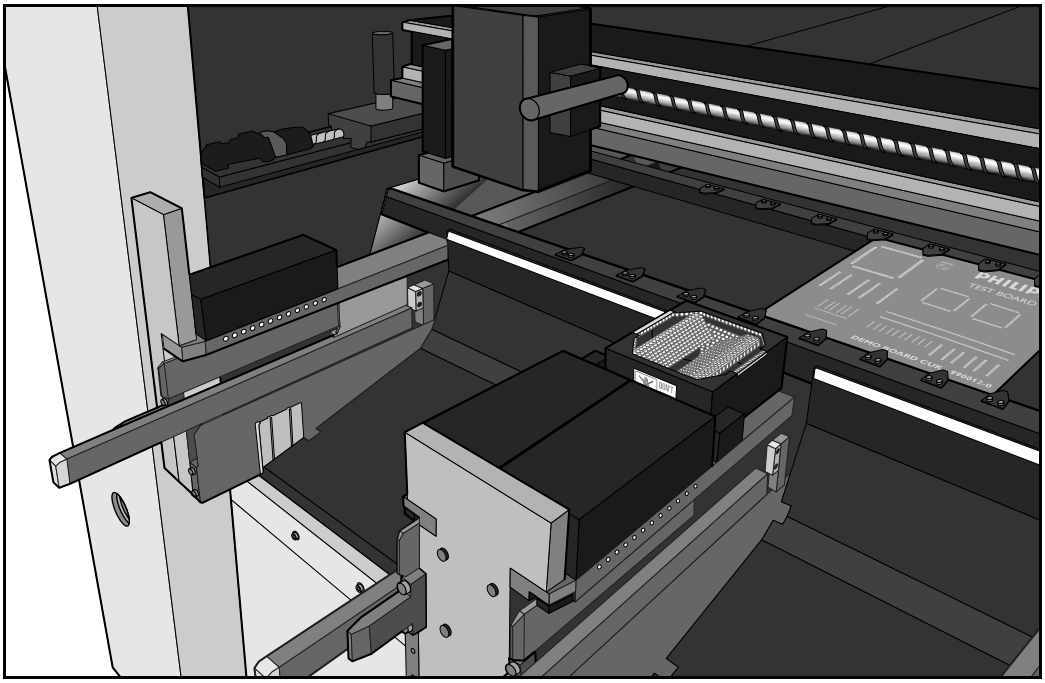


Figure 16 *Clamping System*

7.2 PA 2505/59

The Feederbar Exchange System (FES) allows fast change-over by switching the complete 20 position feederbar on a GEM Emerald-X II.

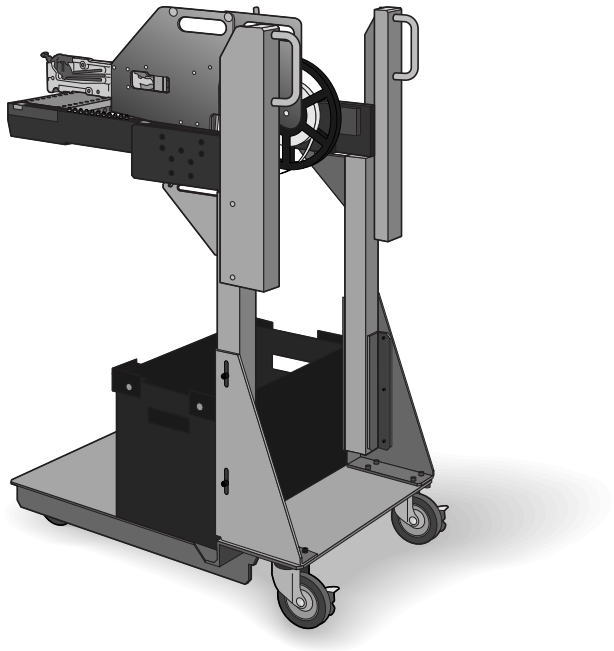


Figure 17 *FES-cart X*

Feederbars are mounted on carts to off-line feeder Set-up. These carts are easily moved from set-up area to the mounting machines and back. This option is available for the front (PA 2505/57) and rear side (PA 2505/58) of the machine. At the rear side of the machine the standard 50 position feederbar will be replaced by two FES 20 position carts.

The Emerald-X II FES carts are compatible with those of the Topaz-X II. An empty tape bin will be delivered with each FES cart.

FES 20 specifications	
	PA 2505/59
FES change-over time:	≤ 60 sec.
FES repeatability (pick position between carts):	Pick position ≤ 0.05mm
Applicable feeders:	Tape, stick, bulk feeders
Number of feeders on FES carriage:	8 mm: 20 positions 12/16 mm: 9 positions 24 mm: 6 positions 32 mm: 6 positions 44 mm: 4 positions 56 mm: 4 positions Stick: depends on stick dimensions
Air and Electrical interface:	Quick coupling (one action)

FES 20 specifications	
	PA 2505/59
Electrical power:	Supplied by main system
Air supply:	Supplied by main system
FES 20 dimensions, stand alone without feeders:	Length: 750 mm (2.5 ft) Width: 460 mm (1.5 ft) Height: 1000 mm (3.3 ft)
Weight without feeders:	65 kg (167 Lbs)
Tape waste bin :	Included
Compatibility:	Topaz-X II
Min. component size:	0402 (1.0mm x 0.5mm) Smaller components should be used with pick-up teaching function.

Table 10

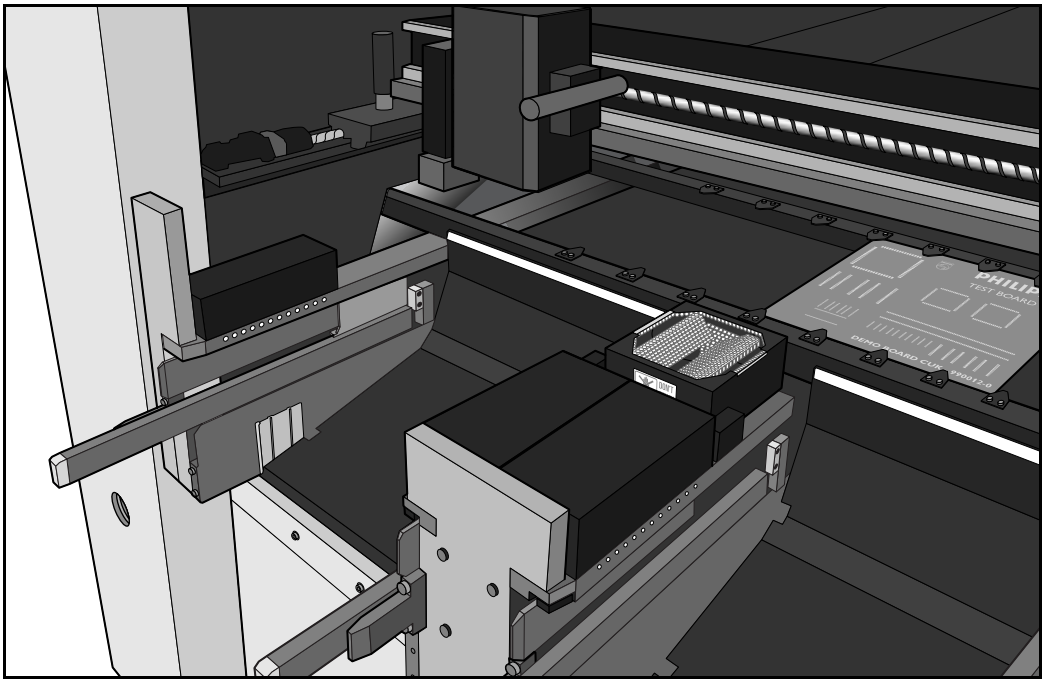


Figure 18 *Clamping System*

8.0 Component Feeding

8.1 Pneumatic Tape feeders

The GEM Emerald-X II has a fully compatible feeder platform with all GemLine machines. Depending on the machine configuration up to 84 tape feeders (8mm) can be loaded. The tape feeder design for the GemLine allows simultaneous picking from any mix of tape feeders ranging from 8 to 44mm. To achieve high speed feeding all feeder types are air driven. To prevent incorrect feeder latching, a laser-based verification system is used.

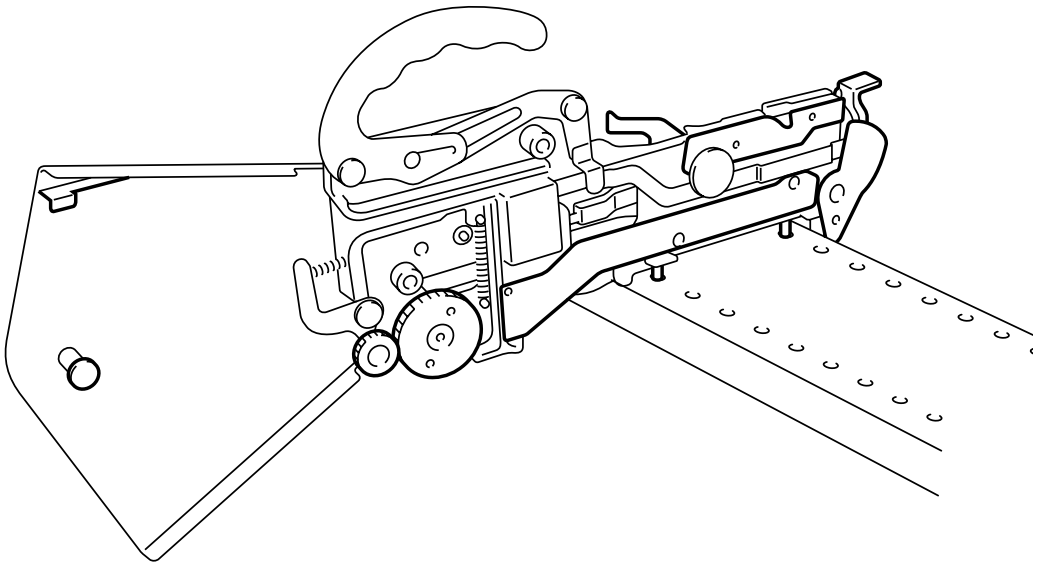


Figure 19 *Pneumatic Tape Feeder*

Available tape feeders		
Tape Feeder	**Feeding pitch (mm)**	**PA#**
Tape Feeder 8mm 15" for 0603 (0201) component CL	2	PA 2903/77
Tape Feeder 8mm 15" for 1005 (0402) CL	2	PA 2903/78
Tape Feeder 8mm 15" CL	4	PA 2903/79
Tape Feeder 12mm 15" CL	4, 8, 12	PA 2903/88
Tape Feeder 16mm 15" CL	4, 8, 12, 16	PA 2903/27
Tape Feeder 24mm 15" CL	4, 8, 12, 16, 20, 24	PA 2903/38
Tape Feeder 32mm 15" (PSA)	8, 12, 16, 24, 28, 32	PA 2903/41
Tape Feeder 44mm 15" (PSA)	8, 12, 16, 24, 28, 32, 36	PA 2903/51
Tape Feeder 56mm 15" CL	4, 8, 12, 16, 20	PA 2903/68
For larger and special tape feeders such as 72mm please contact your local sales representative.		

Table 11 *The feeding pitch can be adjusted on the feeder side.*

Feeder occupation	
Feeder type	**Required feeder position equivalent to tape feeder 8mm**
Tape Feeder 8mm	1
Tape Feeder 12mm, 16mm, 24mm	3
Tape Feeder 32mm	4
Tape Feeder 44mm	5
Tape Feeder 56mm	6

Table 12

The above feeder conversion number may differ according to the installation combination.

8.2 Intelligent Tape feeders

The GEM Emerald-Xi II has a fully compatible feeder platform with the Topaz-Xi, Emerald-Xi, Topaz-Xi II, ACM and FCM Line machines. Depending on the machine configuration up to 74 Intelligent Tape Feeders (8mm) can be loaded.
Intelligent tapefeeders are available for 8 up to 56mm tape widths. The feeders can be loaded with 13 inch tape reels (optional 15" is available).
ITF feeders are indexed by an electrical driven mechanism allowing a highly reliable uninterrupted feeding process.
To prevent incorrect feeder latching, a laser-based verification system is used.
To load the tapes into the ITF feeders a Tape Loading Unit is required. The TLU can be used without main power supply, a battery pack (12V DC) allows 'stand alone' operation for about 8 hours.

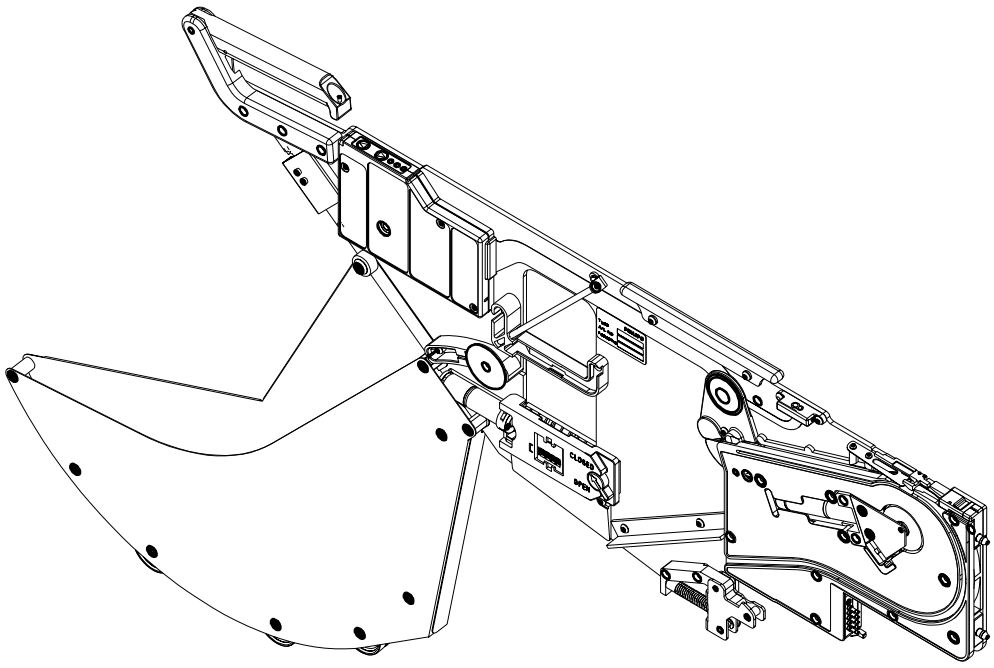


Figure 20 *Intelligent Tape Feeder*

Available tape feeders		
Tape Feeder	**Feeding index (mm)**	**PA#**
Intelligent Tape Feeder 8mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/05
Intelligent Tape Feeder 12mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/15
Intelligent Tape Feeder 16mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/25
Intelligent Tape Feeder 24mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/35
Intelligent Tape Feeder 32mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/45
Intelligent Tape Feeder 44mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/55
Intelligent Tape Feeder 56mm	2, 4, 8, 12, 16, 20, 24, 28, 32, 40, 44, 48, 52, 56	PA 2654/65

Table 13 *The feeding pitch can be adjusted on the feeder side.*

Feeder occupation	
Feeder type	**Required feeder position equivalent to tape feeder 8mm**
Tape Feeder 8mm	1
Tape Feeder 12mm	3
Tape Feeder 16mm	3
Tape Feeder 24mm	2
Tape Feeder 32mm	4
Tape Feeder 44mm	4
Tape Feeder 56mm	5

Table 14 *The above feeder conversion number may differ according to the installation combination.*

8.3 Double Shuttle Tray Feeder (PA 2699/23)

The double shuttle Tray feeder is an additional pallet sequencer feeding parts from a tray. This feeder can be equipped with maximum 40 pallets, each being able to hold different trays.

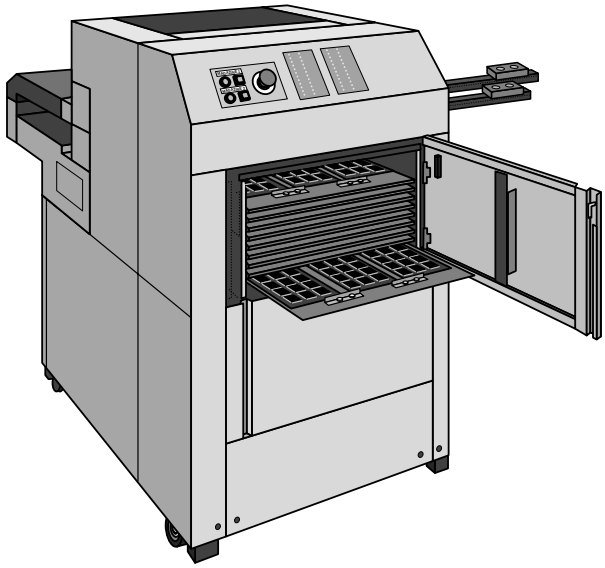


Figure 21 *Double shuttle Tray Feeder.*

Two components are picked up from the tray with a double head, and placed simultaneously on a shuttle. This shuttle then moves into the machine where the components are picked by the placement head. The part is then aligned by vision and placed on the PCB. At the same moment when the components are picked by the placement head a second shuttle will be supplied with the next components which minimize the feeding time.

The component feeding time of the double shuttle Tray feeder is 3.5 seconds for two parts when using the same tray (pallet 1) and 8.5 seconds when changing the tray (pallet 40). However, in practice no time is lost because of the simultaneous operation of Tray

sequencer and Emerald-X(i) II: while the machine is picking from on-board feeders, the shuttle brings in new components. A part that is rejected by vision will be placed back on the reject conveyor which means no loss of expensive parts.

The PCB conveyor on the double shuttle Tray feeder offers the possibility for visual PCB inspection.

- A tray container is fixed and separated into two sections with each 20 pallets. This allows tray replenishment while the machine is running.
- A buffer conveyor is standard equipped, so a reflow oven can be connected without additional conveyors.

LCS Tray Feeder specifications	
GENERAL	
Max. Tray size (L x W):	350mm x 468mm (13.7" x 18.4"); which can hold 3 Jedec trays
Min. Tray size (L x W):	50mm x 50mm (2.0" x 2.0")
Component feeding time	3.5 sec. for 2 parts (picking from pallet 1) 8.5 sec. for 2 parts (picking one from pallet 1 and one from pallet 40)
Power and air supply:	Delivered by Emerald-X(i) II
LCS Tray feeder dimensions:	Length: 826mm (2.8 ft) Height: 1165mm (3.8 ft); with top cover open 1545mm (5.2 ft) Width: 1650mm (5.2 ft); with door open 2292mm (7.6 ft)
Emerald-X(i) II + Tray feeder dimensions:	Length: 2476mm (8.3 ft) Height: 1850mm (6.1 ft) Width: 1842mm (6.1 ft); with LCS door open and feeders on Emerald-X(i) II 2942mm (9.8 ft)
Weight:	± 280 kg (617 Lbs)
Power supply, air supply	Supplied from main machine
APPLICABLE COMPONENTS	
Min. Component dimension:	8mm x 8mm (0.31" x 0.31") Mold size
Max. Component dimension:	45mm x 45mm (1.8" x 1.8")
Max. Tray height included component height:	8.5mm (0.33") from pallets at pitch of 12.5mm (0.5"), total 40 pallets possible
	20mm (0.78") from pallets at pitch of 25mm (0.98"), total 20 pallets possible
FEED CAPACITY	
Number of shuttles:	2

LCS Tray Feeder specifications	
Number of pads on each shuttle:	2 (with a pitch of 48mm)
STANDARD COMPONENT CAPACITY	
Max. number of component types:	120 (3 x 40 Jedec)
Number of pallets:	Standard 30 pallets included (additional pallets available PA 2981/15)

Table 15

8.4 ATS 20 Tray Feeder portrait (PA 2696/24)

The ATS 20 Tray Feeder is a new additional internal pallet sequencer, allowing high-speed feeding of tray components. This feeder can be equipped with a maximum of 20 pallets, each being able to hold different trays.

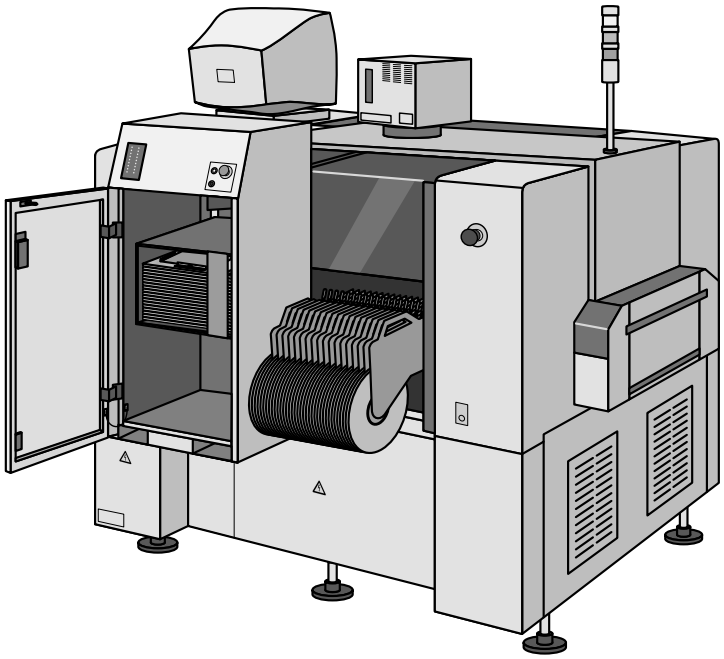


Figure 22 *ATS 20 Tray Feeder portrait.*

The maximum pallet exchange time for the ATS 20 Tray feeder is 5.6 seconds. However, in practice no time is lost because of the simultaneous operation of the ATS 20 Tray feeder and Emerald-X(i) ^{II}; while the machine is picking from on-board feeders, the pallet brings in new components.

A part rejected by vision will be placed back in its original tray position; this means no loss of expensive parts.

ATS 20 Tray Feeder portrait (PA 2696/24) specifications	
GENERAL	
Max. Tray size (L x W):	220mm x 350mm (8.6" x 13.7").
Min. Tray size (L x W):	50mm x 50mm (2.0" x 2.0")
Pallet exchange time:	Changing from pallet 1 to 20; 5.6 seconds
Weight:	± 80 Kg (176 Lbs)
Power and air supply:	Supplied by Emerald-X(i) ^{II}.
Emerald-X(i) ^{II} + ATS 20 Tray feeder dimensions:	Length: 1650mm (5.5 ft) Height: 1850mm (6.2 ft) Width: 1870mm (6.2 ft); with ATS 20 door open: 2220mm (7.4 ft)
Maximum board size Emerald-X(i) ^{II}:	250mm (9.8")
Maximum amount of feeders on Emerald-X(i) ^{II}:	57
APPLICABLE COMPONENTS	
Max. Tray height included component height:	8.5mm (0.33") from pallets at pitch of 12.5mm (0.49"); total 20 pallets possible.
	16mm (0.63") from pallets at pitch of 25mm (0.98"); total 10 pallets possible.
Min. Component dimension:	6mm x 6mm (0.24" x 0.24") mold size
Max. Component dimension:	54mm x 54mm (2.1" x 2.1")
STANDARD COMPONENT CAPACITY	
Max. number of component types:	20 (20 ×1 Jedec tray)
Number of pallets:	Standard 20 pallets included (additional pallets available PA 2981/35)

Table 16

8.5 Double ATS 20 Tray Feeder portrait (PA 2696/25)

The Double ATS 20 Tray Feeder portrait is an additional internal pallet sequencer, allowing high-speed feeding of tray components. This feeder can be equipped with a maximum of 2 x 20 pallets, each being able to hold different trays.

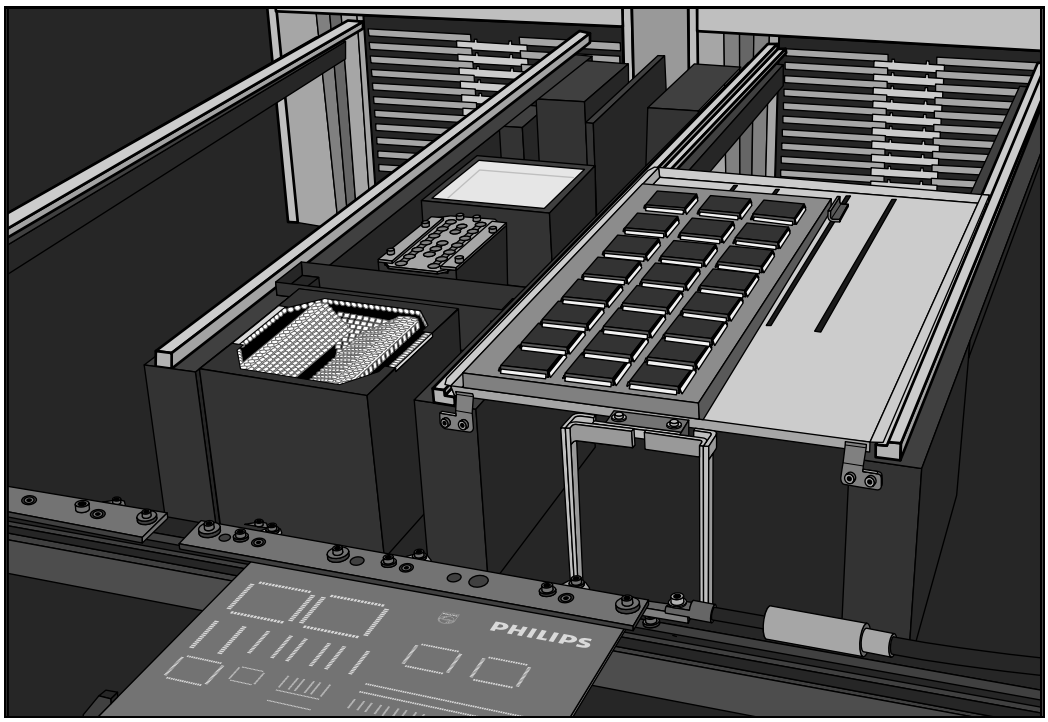


Figure 23 *Double ATS 20 Tray Feeder portrait.*

The maximum pallet exchange time for the Double ATS 20 Tray feeder is 5.6 seconds. However, in practice no time is lost because of the simultaneous operation of the Double ATS 20 Tray feeder and Emerald-X(i) II; while the machine is picking from on-board feeders, the pallet brings in new components.

A part rejected by vision will be placed back in its original tray position; this means no loss of expensive parts.

Double ATS 20 Tray Feeder portrait (PA 2696/25) specifications	
GENERAL	
Max. Tray size (L x W):	220mm x 350mm (8.6" x 13.7").
Min. Tray size (L x W):	50mm x 50mm (2.0" x 2.0")
Pallet exchange time:	Changing from pallet 1 to 20; 5.6 seconds
Power and air supply:	Supplied by Emerald-X(i) II.
Weight:	± 160 Kg (342 Lbs)
Emerald-X(i) II + double ATS 20 Tray feeder dimensions:	Length: 1650mm (5.5 ft) Height: 1850mm (6.2 ft) Width: 1870mm (6.2 ft); with ATS 20 door open: 2220mm (7.4 ft)
Maximum board size Emerald-X(i) II:	250mm (9.8")
Maximum amount of feeders on Emerald-X(i) II:	37
APPLICABLE COMPONENTS	
Max. Tray height included component height:	8.5mm (0.33") from pallets at pitch of 12.5mm (0.49"); total 20 pallets possible.
	16mm (0.63") from pallets at pitch of 25mm (0.98"); total 10 pallets possible.
Min. Component dimension:	6mm x 6mm (0.24" x 0.24") mold size
Max. Component dimension:	54mm x 54mm (2.1" x 2.1")
STANDARD COMPONENT CAPACITY	
Max. number of component types	40 (40 ×1 Jedec tray)
Number of pallets:	Standard 2 x 20 pallets included (additional pallets available PA 2981/35)

Table 17

8.6 ATS 20 Tray Feeder landscape (PA 2696/26)

The ATS 20 Tray Feeder landscape is a new additional internal pallet sequencer, allowing high-speed feeding of tray components. This feeder can be equipped with a maximum of 20 pallets, each being able to hold different trays.

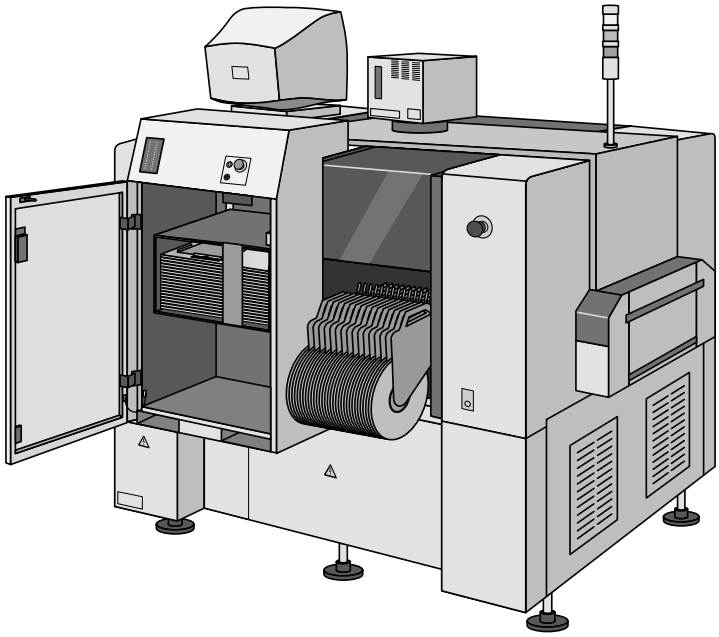


Figure 24 *ATS 20 Tray Feeder landscape.*

The maximum pallet exchange time for the ATS 20 Tray Feeder landscape is 5.6 seconds. However, in practice no time is lost because of the simultaneous operation of the ATS 20 Tray Feeder landscape and Emerald-X ^{II}; while the machine is picking from on-board feeders, the pallet brings in new components.

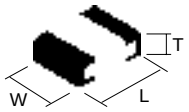
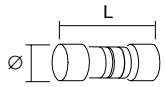
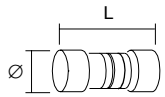
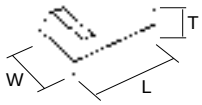
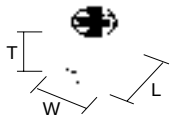
A part rejected by vision will be placed back in its original tray position; this means no loss of expensive parts.

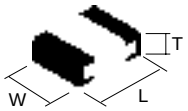
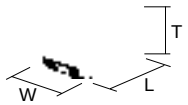
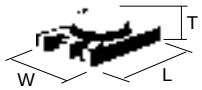
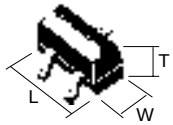
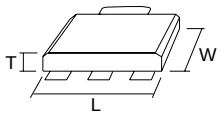
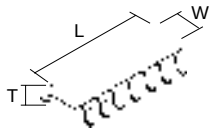
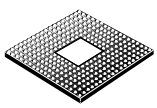
ATS 20 Tray Feeder landscape (PA 2696/26) specifications	
GENERAL	
Max. Tray size (L x W):	350mm x 220mm (13.7" x 8.6").
Min. Tray size (L x W):	50mm x 50mm (2.0" x 2.0")
Pallet exchange time:	Changing from pallet 1 to 20; 5.6 seconds
Power and air supply:	Supplied by Emerald-X ^{II}.
Weight:	± 80 Kg (176 Lbs)
Emerald-X ^{II} + Landscape ATS 20 Tray feeder dimensions:	Length: 1650mm (5.5 ft) Height: 1850mm (6.2 ft) Width: 1783mm (5.9 ft); with ATS 20 door open: 2283mm (7.6 ft)
Maximum board size Emerald-X ^{II}:	380mm (15.0")
Maximum amount of feeders on Emerald-X ^{II}:	53
APPLICABLE COMPONENTS	
Max. Tray height included component height:	8.5mm (0.33") from pallets at pitch of 12.5mm (0.49"); total 20 pallets possible.
	16mm (0.63") from pallets at pitch of 25mm (0.98"); total 10 pallets possible.
Min. Component dimension:	6mm x 6mm (0.24" x 0.24") mold size
Max. Component dimension:	54mm x 54mm (2.1" x 2.1")
STANDARD COMPONENT CAPACITY	
Max. number of component types:	20 (20 ×1 Jedec tray)
Number of pallets:	Standard 2 x 20 pallets included (additional pallets available PA 2981/36)

Table 18

8.7 Mountable Components & Required Nozzles GEM Emerald-X(i) II

Just six nozzle shapes are required to cover the specified SMD range. High output levels are therefore achieved, as the need for nozzle exchanges is minimal. An optional 24 position nozzle exchange station enables additional special nozzles to be accommodated.

Components		Dimension (mm)			Required nozzle type	
		L	W	T	FNC	SF
	Solid resistor	0.60	0.30	0.25	61F	61
		I.00	0.50	0.50	61F	61
		1.60	0.80	0.50	62F	62
		2.00	1.25	0.50	62F	62
		3.20	1.60	0.60	62F	62
	Solid resistor	2.00	ø 1.25		62F	62
		3.45	ø 1.35		62F	62
		5.9	ø 2.2		66F	66A
	Multi-Layered ceramic capacitor	0.6	0.3	0.3	61F	61
		1.0	0.5	0.5	61F	61
		1.50	0.80	0.80	62F	62
		2.00	1.25	1.25	62F	62
		3.20	1.60	1.25	62F	62
		3.20~4.50	2.50~3.20	1.50~1.90	63F	63A
		5.60	5.00	1.90	63F	63A
	MELF ceramic capacitor	3.40	ø 1.50		62F	62
		5.9	ø 2.2		62F	62
	Tantalium electrolytic capacitor	2.90	1.60	1.60	62F	62
		3.80	2.90	1.60	63F	63A
		4.70	2.60	2.10	63F	63A
		6.00	3.20	2.50	63F	63A
		7.30	4.30	2.80	63F	63A
	Aluminium electrolytic capacitor	4.3	4.3	5.7	63F	63A
		6.6	6.6	5.7	63F	63A
		10	10	10.5	64F	64A

Components		Dimension (mm)			Required nozzle type	
		L	W	T	FNC	SF
	Chip film capacitor	7.3	5.3	3.25	63F	63A
	Chip inductor	3.2	2.5	2.0	63F	63A
		4.5	3.2	3.2	63F	63A
	Semi-variable resistor	4.5	3.8	2.4	63F	63A
	Transistor (SOT)	2.90	1.5	1.10	62F	62
		4.0	3	1.8	63F	63A
	Power transistor	4.6	2.6	1.6	63F	63A
	SOP (6 ~ 28 pin)	5.00	4.50	1.50	63F	63A
		7.60	4.50	1.50	63F	63A
		10.10	4.50	1.50	63F	63A
		12.60	5.70	1.50	63F	63A
		15.30	7.50	2.00	64F	64A
		17.80	7.50	2.00	64F	64A
	PLCC	∅ 5~16			63F	63A
		∅ 15~20			64F	64A
		∅ 15~32			64F	64A
	QFP	∅ 5~16			63F	63A
		∅ 15~20			64F	64A
		∅ 15~32			64F	64A
		∅ 20~54			65F	65A
	BGA	∅ 10~26			64F	64A
		∅ 10~30			64F	64A
		∅ 20~54			65F	65A

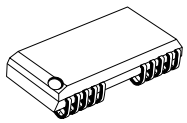
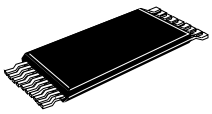
Components		Dimension (mm)			Required nozzle type	
		L	W	T	FNC	SF
	SOJ (20 ~ 42 pin)	max. ⍁ 21 max. ⍁ 32			63F 64F	63A 64A
	TSOP (20 ~ 32 pin)	max. ⍁ 30			63F 64F 64F	63A 64A 64A

Table 19

For information on CSP, µBGA, bare chip and other types of components, please consult your local sales representative.

9.0 EMERALD-X(i) II SUMMARY

	Model	Emerald-X " (SF)	Emerald-X " (FNC)	Emerald-Xi " (SF)	Emerald-Xi " (FNC)
	PA number	**PA 1315/01**	**PA 1315/02**	**PA 1315/10**	**PA 1315/11**
Head	Flying Nozzle Change head (FNC)		•		•
	Super Fine head (SF)	•		•	
	Nozzle Exchange station	o	o	o	o
	Special order nozzles	*	*	*	*
Recognition system	Line Array camera	•	•	•	•
	Second line Array camera	o	o	o	o
	Area CCD camera 32mm including illumination unit	o	o	o	o
	Area CCD camera 45mm including illumination unit	o	o	o	o
	Area CCD camera 54mm including illumination unit	o	o	o	o
	Fiducial camera	•	•	•	•
Feeding	Pneumatic Tape Feeder	•	•		
	Intelligent Tape Feeder			•	•
	Bulk Feeder	o	o		
	Stick Feeder	o	o	o	o
	Double Shuttle Tray Feeder (LCS)	o	o	o	o
	Reject station	o	o	o	o
	ATS 20 Tray Feeder portrait	o	o	o	o
	Double ATS 20 Tray Feeder portrait	o	o	o	o
	ATS 20 Tray Feeder landscape	o	o		
	Manual Tray Feeder	o	o		
	Feeder Exchange System (FES 20)	o	o		
PCB positioning/transport	Main Stopper	•	•	•	•
	Locate Pin	•	•	•	•
	Edge Clamp System	•	•	•	•
	Board Clamp System	o	o	o	o
	Z servo controlled Push Up Plate	•	•	•	•
	Entrance Sub Stopper	•	•	•	•
	Exit Sub Stopper	•	•	•	•
	Automatic Width Adjustment	•	•	•	•
	High Speed soft-stop conveyor	•	•	•	•
	Reverse transfer Right to Left	o	o	o	o
	Ceramic PCBs	o	o	o	o
	Special sized PCBs	*	*	*	*
Safety	Feeder Floating Detection	•	•	•	•
	Conveyor Entrance/Exit covers	•	•	•	•
	Safety cover for feeder exchange	•	•	•	•
	Dummy Feeders	•	•	•	•
	Safety specifications according CE standards	•	•	•	•
	Spare parts kit + tools	•	•	•	•
	SMEMA kit	•	•	•	•
	Front and rear anti-static covers	•	•	•	•
	Signal tower + warning buzzer	•	•	•	•
Software	Windows NT Graphical User Interface	•	•	•	•
	Multiple Accuracy Compensation System	•	•	•	•
	Bad Mark / Master Mark Sensing	•	•	•	•
	Fiducial recovery function	•	•	•	•
	On-line teaching	•	•	•	•
	Alternative Feeder Function	•	•	•	•
	Automatic program change	•	•	•	•
	Variable XY axis speed per component	•	•	•	•
	On-line Help function	•	•	•	•
	Management Information System	•	•	•	•
	Template (pattern matching)	•	•	•	•
	Automatic rework cycle	•	•	•	•
	On-line data generator	•	•	•	•

Table 19

• = Standard
o = Optional
** = Special order*

Assembléon

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