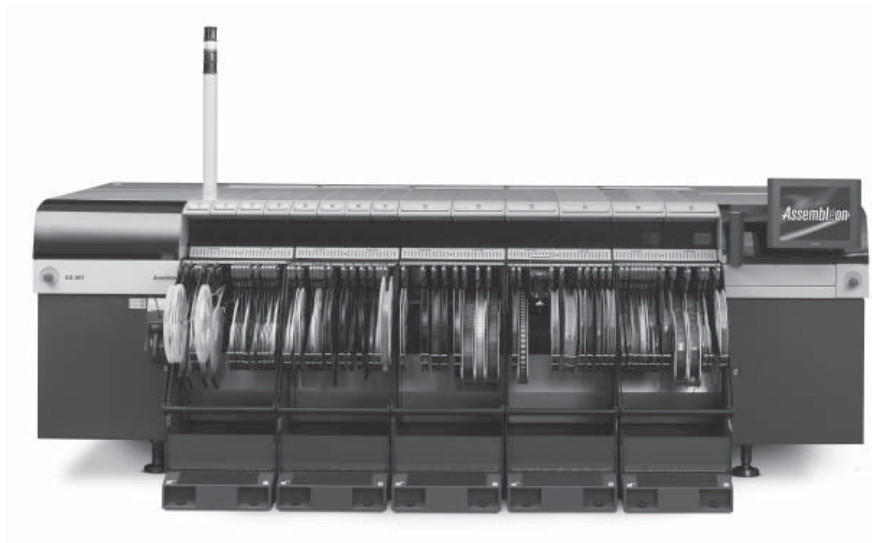


# Assembléon



## AX-301/501

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**1**      **Introducing the  
AX-501 and  
AX-301**

Assembléon's AX-501 and 301 are part of the A-Series platform solutions that consists of three types of machines, the AX-501, AX-301 and the AX-201. These machines are fully modular and ensure a seamless fit when combined in a line.

The AX-301 and AX-501 are fully modular, enabling scalable output:

- up to 121,000 components/hour (IPC9850) for the AX-501 with up to 260 feeding lanes
- up to 77,000 components/hour (IPC9850) for the AX-301 with up to 156 feeding lanes

Even with such high placement rates, accuracy is an excellent  $40\mu\text{m}$  @  $\text{CpK} > 1.0$ . The equipment places components varying from 01005 at full speed, right up to those measuring 45mm square. With easy to use feeder and tray trolleys, fast changeovers are guaranteed.

With a base extension, a tray trolley can be added to the system, enabling an additional 47 tray positions.

This specification book presents the in depth technical specifications, features, options as well as the installation requirements. The information is transparently and clearly presented in text, tables, pictures and drawings. This book assures a complete and detailed overview of the technical facts of the revolutionary pick and placement platform.

### **The AX Platform has the following features**

#### Modular platform

- Allows the platform to be configured for the required output while maintaining full feeder availability
- Configurable output from 30K to 121K components per hour (IPC 9850)
- Enables product changeovers in minutes for known boards
- No accuracy calibration required

#### Component capability

- 0.4mm x 0.2mm (01005) up to 45 x 45
- Only a few placement heads and component alignment methods need to be used for optimized component placement for the full range of components.
- Laser alignment can be used for small components at the highest speed and accuracy delivers placement accuracy down to 40 micron (CpK>1.00)

#### Placement heads

- Two heads available for optimal pick and place performance
- Programmable placement force available from 1.5 to 8 N
- Automatic correction for component thickness variation
- Automatic correction for board height variation (e.g warpage)
- Placement quality is assured by component sensing from pick to place

#### Board transport

- Features automated width and thickness adjustment of edge clamped boards
- Integrated run-in and run-out section
- Is left-to-right or right-to-left
- SMD or Japanese height

#### Feeding platform

- Trolleys allow fast exchange of feeders
- Stationary feeders allow tape replenishment during production
- Adaptive pick correction assures maximum pick performance
- Intelligent feeding for traceability, index counters and zero setup failures and maintenance scheduling

#### Software

- CAD import and best in class program generation for (balanced) lines
- Zero Defect setup system
- Traceability data generation for component tracking
- Performance data generation for machine performance monitoring

## 2

## General specifications

Item	AX-501	AX-301
Max. output (cph)	165,000	99,000
IPC output (cph)	121,000	77,000
Highest accuracy class		
Laser	40µm, Cpk>1.00	40µm, Cpk>1.00
Camera	35µm, Cpk>1.00	35µm, Cpk>1.00
Pick performance	99.95%*	99.95%*
Placement Defect Rate	<10 PPM	<10 PPM
Technical availability	>99.969%	>99.984%
Lifetime toolbits	10 Million placements (CPL toolbits)	10 Million placements (CPL toolbits)
Component Size (LxW)		
Minimum (LxW)	0.4 x 0.2mm	0.4 x 0.2mm
Maximum (LxW)	45 x 45mm	45 x 45mm
Max. component height	10.5mm, higher upon request	10.5mm, higher upon request
Programmable placement force	1.5 to 8N	1.5 to 8N
Alignment types	Laser, CCD	Laser, CCD
Max. number of components	1500 per robot	1500 per robot
Tape feeding positions	260 (Twin tape feeder) 130 (Single tape feeder)	156 (Twin tape feeder) 78 (Single tape feeder)
Tray feeding positions	47	47
Feeding types:		
Standard:	tape, bulk, tray, stick	tape, bulk, tray, stick
Special applications:	tray stacking, bowl, direct die feeding, inline memory programming, tupe feeding Others on request	tray stacking, direct die feeding, inline memory device programming Others on request
Board range minimum		
Standard:	50 x 50mm	50 x 50mm
Optional:	25 x 25mm	25 x 25mm
Board range maximum		
Standard:	515 x 390mm	475 x 390mm
Optional:	515 x 457mm	475 x 457mm
Optional board length:	800mm <sup>*2</sup>	
Transport direction	Left to right (Optional: right to left)	Left to right (Optional: right to left)
Power supply	200-480V 3phase 47-63Hz	200-480V 3phase 47-63Hz
Power rating	7kVA	5kVA
Avg. power consumption	3kVA	3kVA
Air supply	6-8 bar, 10NI/robot, max 200NI	6-8 bar, 10NI/robot, max 120NI

\* Best conditions, tapes up to 24mm

\*<sup>2</sup> Available from Q3-2009

Item	AX-501	AX-301
Dimensions (incl. trolley, excl. extension module)	3720 x 2285 x 1290mm Total 8.5m <sup>2</sup>	2760 x 2285 x 1290mm Total 6.3m <sup>2</sup>
Weight (excl. trolleys and extension module)	< 3200 kg	< 2500 kg
Noise	< 72 db(A) at 1m	< 72 db(A) at 1m
Applicable standard	<b>CE</b> - 2006/42EC Machine Directive - 2004/108/EEC EMC Directive - 2006/121/EC REACH Directive - 73/23/EEC CE Low voltage Directive <b>CSA/UL</b> - CSA-C22.2 <b>IPC</b> - SMEMA Standard - IPC 9850 Equipment Characterization - 9851 SMEMA - 2541/2546/2551 CAMX <b>SEMI</b> - S2 Safety standard - S8 Ergonomics standard - E10 RAM - F47 Voltage Sag Immunity - E58 ARAM - E95 Human Interfaces Standard	
Acceptance protocol	Assembléon factory acceptance protocol	

Both equipment are fully compatible for its pick and place process and differ only in length. The difference therefore is only where machine length has impact. Some main characteristic differences are listed below:

Item	AX-501	AX-301
Base Length	3720mm	2760mm
Number of trolley segments	5	3
Maximum feeding capacity	260 8mm lanes	156 8mm lanes
Maximum number of robots	20	12
Maximum output	165,000	99,000
IPC output	121,000	77,000
Maximum board length	515mm	475mm



### 3 Features

#### 3.1 AX Base

The machine base contains all mechanical interfaces for connection of the placement robots, feeder and tray trolleys and board transport units. It also holds the controls and supply systems as well as safety covers and doors to provide safe working conditions for the operator. Two bases are available: AX-501 holding five trolley positions, AX-301 holding three trolley positions.

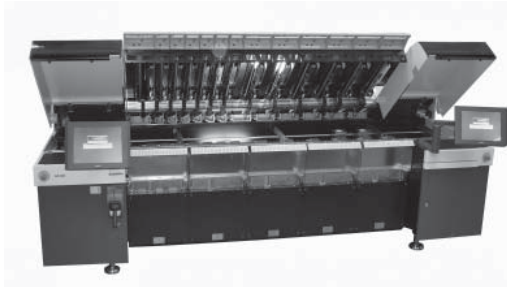


Figure 1 AX-501 machine base

#### 3.2 Board transport

Each board transport unit contains a run-in section, where boards from the previous machine are received, and a run-out section, where boards are transferred to the next machine. In between the run-in and run-out section is the working area of the machine where the components are placed on the board. The automated transport unit adjusts to the correct width and thickness of the board and all boards in the working area are clamped on the side. Boards in the working area can be supported using pins or strips with magnetic interface or third party support system.

Board transport		
	AX-501	AX-301
Board transport direction	Standard left to right, optional right to left	Standard left to right, optional right to left
Transport mechanism	Indexing (walking beam)	Indexing (walking beam)
Board transport height	SMEMA (940-965mm) and Japanese (885-915mm)	SMEMA (940-965mm) and Japanese (885-915mm)
Board specification		
Board material	<ul style="list-style-type: none"> <li>Phenolic/paper (FR2)</li> <li>Glass-Epoxy (FR4)</li> <li>Composite materials</li> <li>IPC 9850 Glass verification panel</li> </ul>	Optional: <ul style="list-style-type: none"> <li>Ceramics</li> <li>Carriers</li> <li>Flex foil</li> </ul>
Board artwork material/surface finish	<ul style="list-style-type: none"> <li>Hot Air Solder Leverled (HASL)</li> <li>Bare copper with Organic Surface Protectant (OSP)</li> <li>Electroless Ni / Immersion AU</li> </ul>	
Minimum board dimensions (L x W)	50 x 50mm, 50 x 25mm optional	50 x 50mm, 50 x 25mm optional
Maximum board dimensions (L x W)	515 x 390mm, 515 x 457mm optional, L=800mm optional *2	475 x 390mm, 475 x 457mm optional
Y/X ratio	< 2.5	< 2.5
Board thickness	0.3mm - 6mm Optional other transport systems are available like flexfoil or 10mm for carriers	0.3mm - 6mm Optional other transport systems are available like flexfoil or 10mm for carriers

\*2 Available from Q3-2009

Board specification		
Item	AX-501	AX-301
Pre-mounted comp. Max. bottomside Max. topside	20mm 10.5mm	20mm 10.5mm
Warpage (Flatness)	Topside: Max. 0.6% of diagonal to max +2mm Bottomside: Max. -2mm	
Edge clearance	3mm from front and rear edge of board	
Board weight	Max. 2 kg	Max. 2 kg.

### 3.3 Placement modules

Depending on the base, the machine can be equipped with different types of placement robots; there are two available; the standard placement robot and the compact placement robot.

#### 3.3.1 AX-501 & AX-301 Placement robots

A compact placement robot is half the width of a standard placement robot. This allows scaling the machine in output while maintaining the available feeding positions, and achieving same specifications.

Standard and compact robot specifics:

- Direct drive Y spindle using high-resolution rotary encoders
- Linear X motor and encoder
- Placement head interface
- Safety interlocks
- Quick exchange connection cables to placement controller
- Air controller and local vacuum system (venturi)



Figure 2 Placement robots

	Standard placement robot	Compact placement robot
Weight	52 kg	32 kg
Dimensions (L x W x H)	1625 x 240 x 250mm	1625 x 120 x 250mm
Max. partnumbers	26	11

### 3.3.2 Placement head

Each placement robot is fitted with one placement head, which is equipped with Z-height, phi-rotation and real time force control. With every component placement, the placement head measures the impact position and calculates the appropriate Z-height to correct for any applicable board warpage. This adaptive Z-height feature (Board- and component thickness variation correction) enables that the appropriate placement dwell time and force is well within the tolerance of process requirements. All placement heads can use vacuum toolbits for component pick-up, detection and placement.



Figure 3 Placement head

Two types of placement heads are available:

1. Placement Head Single Vision (PH-SV)
2. Placement Head Laser Vision (PH-LV)

They execute the following tasks:

- Align components
- Pick and place components
- Z-movement
- Rz-movement
- Force sensing and control
- Board- and component thickness variation correction
- Component presence check

The Placement Head Single Vision uses a Z-stroke linear motor. This linear motor controls the pick force, placement Z-speed, dwell time and force. On top of these control functions, the Placement Head Laser Vision has the capability to perform 'on the fly' laser alignment for components down to 01005.

	Placement head Single Vision	Placement Head Laser Vision
Placement force	Programmable between 1.5 - 8N in 0.1N steps *1	Programmable between 1.5 - 8N in 0.1N steps *1
Component pick orientation	Multiples of 90 degrees	
Comp. weight	< 12g	< 12g
Comp. height	10.5mm for L x W >3 x 3mm and < 45 x 45mm	10.5mm for L x W < 17.5 x 17.5mm 6.3mm for L x W > 17.5 x 17.5mm and < 24 x 24mm 4.3mm for L x W > 24 x 24mm and < 45 x 45mm
Variable through hole check	Not applicable	Not applicable
Configured in set of:	One	One
Toolbits	Nozzles	Nozzles

Note: \*1 Depending on nozzle type

### 3.4 Board alignment

The board alignment camera is used for fiducial and artwork alignment, and is also used for badmark sensing, position detection of feeder trolleys, toolbit exchange unit, dump bin and the component vision camera.

Board alignment camera	
Camera field of view	8.6 x 6.8mm
Camera pixels	1024 x 768
Camera pixel resolution	8.4 $\mu$ m
Illumination	Bright field & dark field
Fiducial types	All regular types with a contrast level of > 30%
Fiducial shape size	Fiducial shape size > 0.3mm, < 3.0mm (smaller on request)
Free zone around fiducial	No features allowed within 0.1mm, no look-a-likes within 2.6mm from fiducial

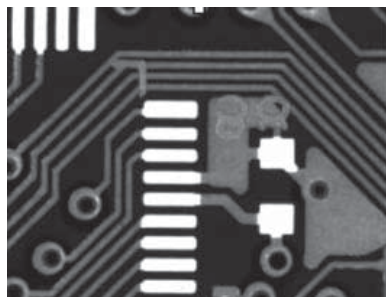


Figure 4 Examples of artwork and typical fiducials

Badmark sensing	
Bad mark type	Black or white dot, or fiducial shape
Size	> $\phi$ 1mm
Color	Bad marks can be dark in a light background or light in a dark background
Contrast	At least 30%
Badmark levels	3
Number of bad marks	< 2048 per board

### 3.5 Component alignment

Component alignment is used for the alignment of components on leads, edges or bumps, prior to placement on the board. Depending on the configuration of the machine there are four alignment options available.

#### 3.5.1 Laser alignment

The component laser module is part of the Placement Head Laser Vision. The component laser module is used for component presence check, component alignment, toolbit type identification and toolbit verification.

Laser alignment	
Component size	0.4 x 0.2mm (01005) to 17.5 x 17.5mm (max. diagonal 24.75mm) Length & dwidth including leads
Component thickness	0.130mm to 10.5mm (higher with restrictions)

#### 3.5.2 Vision alignment

The Component Vision (CV) system is used for the alignment of components on leads, edges or bumps. Component Alignment is achieved by moving the component above the lens of an upward-facing digital camera. A combination of multiple light sources (dark-, mid-, and bright field illumination ensure sufficient contrast between the component (leads) and the background. Utilizing these light sources the A-Series are capable of aligning a large range of components. The illumination intensity is automatically chosen based upon the reflectivity of the respective components. The CV camera determines the position of the component with respect to a reference plate. The deviations, together with the fiducial alignment values, will be used to determine the correct placement position.

There are two component vision modules available for the AX-501 and AX-301.

##### 3.5.2.1 Component vision alignment

The Component Vision Camera holds one upward looking camera and can inspect a single component up to 45 x 45mm in one view. Components with bumps down to 150 micron with a 300 micron pitch can be measured.



Figure 5 AX Component Vision Camera

Camera	Maximum component size		Lead		Bump	
	X-axis	Y-axis	Width	Pitch	Size	Pitch
CV camera	45	45	0.150 <sup>*1</sup>	0.300 <sup>*1</sup>	0.150 <sup>*2</sup>	0.300 <sup>*2</sup>
No. of bumps					2-3500	

Notes: <sup>\*1</sup>: For components larger than 35x35mm, minimum lead size is 0.175 mm, the minimum lead pitch is 0.350 mm

<sup>\*2</sup>: For components larger than 18x18mm, minimum bump size is 0.270 mm, the minimum bump pitch is 0.540 mm

**3.5.2.2 Components Extra Small Field of View Camera**

The Extra Small Field of View is a single upward looking camera, especially designed to be used for small components and ultra fine pitch components such as 01005, 0201, 0402, uBGA and Flip Chips.

Camera	Maximum component size		Lead		Bump	
	X-axis	Y-axis	Width	Pitch	Size	Interspacing
XS FOV	6	6	N.a.	N.a.	≥ 0.030	≥ 0.060
No. of bumps					2 - 3500	



Figure 6 Extra small field of view camera

**3.6 Toolbit exchange unit**

Each placement robot requires a toolbit exchange unit to exchange toolbits automatically. In less than one second a toolbit is exchanged, while production continues. Holding multiple positions a maximum flexibility for component range and family setup is ensured



Figure 7 AX Toolbit exchange unit

### 3.7 User interface

The A-Series is operated via a touch screen and a full graphical user interface. The user interface complies to SEMI E95 to maximize ergonomics, ease of use and minimize learning time. The interface can be set to different language modes. This can be done while the production is running and is therefore, suited to multi-lingual environments. A wide range of languages is standard available, please check with the local Assembléon representative for more details.



Figure 8 Graphical User Interface

### 3.8 Board Identification

Board Identification (BI) can be used to provide barcode -ID and traceability information. It features:

- A check of the board ID versus the running placement program. On error the system will prevent the board from entering the machine.
- Board identification for traceability (see paragraph on traceability).

Barcode specifications	
Types	1D and 2D
Length	1D: max. 1024 2D: to ISO/IEC 16022
Codes	<ul style="list-style-type: none"> <li>• CODE39</li> <li>• 2/5 Interleaved</li> <li>• CODE128</li> <li>• Data matrix ECC200</li> </ul>

Scanner specifications	
Connection	RS-232
Baudrate	9600 kb/s
Number of bits	7
Stopbit	1
Parity bit	none
X-on/X-off	off

**Note:** There are no scanners provided with the system.

## 4 Options

### 4.1 Toolbits



Figure 9 Toolbits

The AX-301/501 uses a variety of toolbits to handle the wide range of components. Each toolbit is designed to ensure durability, minimal wear, whilst providing robust and delicate component handling. The toolbits are connected to the placement head by a magnetic connection or mechanical clamping.

Please refer to the Compatibility matrix on page 20 for an overview of the toolbit and placement head relationship as well as the toolbit and component relationship.

### 4.2 Feeding

#### 4.2.1 Intelligent tape feeders & Twin tape feeders



figure 10 Twin tape feeder, intelligent tape feeder and twin bulk feeder

Feeder	Tape width	Pocket depth	Reels	Pitch support
TTF 2 lanes	8mm (2x)	3.5mm	2x7" or 2x7"-13"	2 ~ 4mm
ITF	8mm	12mm	7" - 13" 15" optional	2 ~ 56mm
ITF 12mm SV	12mm	12mm	15"	2 ~ 56mm
ITF2 12mm	12mm	12mm	7" - 13" 15" optional	2 ~ 56mm
ITF2 16mm	16mm	12mm, 15.4mm optional	7" - 13" 15" optional	2 ~ 56mm
ITF2 24mm	24mm	12mm, 16.5mm optional	7" - 13" 15" and 22" optional	2 ~ 56mm
ITF2 32mm	32mm	16.5mm	7" - 15" 15" and 22" optional	2 ~ 56mm
ITF2 44mm	44mm	16.5mm	7" - 15" 22" optional	2 ~ 56mm
ITF2 56mm	56mm	16.5mm	7" - 15" 22" optional	2 ~ 56mm
ITF 72mm	72mm	16.5mm	7" - 15"	2 ~ 56mm
ITF 88mm	88mm	16.5mm	7" - 15"	2 ~ 56mm



#### 4.2.2 Bulk feeders

Component EIA description	Lanes	EIA Component Lengths (mm)	specifications Width (mm)	Thickness
C0201	2	0.57 ~ 0.63	0.27 ~ 0.33	0.27 ~ 0.33
C0402	2	0.95 ~ 1.05	0.45 ~ 0.55	0.45 ~ 0.55
R0402	2	0.95 ~ 1.05	0.45 ~ 0.55	0.30 ~ 0.40
C0603	2	1.53 ~ 1.67	0.73 ~ 0.87	0.73 ~ 0.87
R0603	2	1.50 ~ 1.70	0.70 ~ 0.90	0.35 ~ 0.55
MELF R0604	2	1.50 ~ 1.70	Ø 0.90 ~ Ø 1.10	
C0805T0.6	2	1.90 ~ 2.10	1.15 ~ 1.35	0.50 ~ 0.70
C0805T1.25	1	1.90 ~ 2.10	1.15 ~ 1.35	1.15 ~ 1.35
R0805	2	1.90 ~ 2.10	1.15 ~ 1.35	0.50 ~ 0.70
MELF R0805	1	1.90 ~ 2.10	Ø 1.15 - Ø 1.35	

#### 4.2.3 Feeder trolleys & banks



Figure 11 A-Series feeder trolley

Feeder	# of feeding positions	
	AX-501	AX-301
TBF	200 ~ 260	120 ~ 156
TTF	220 ~ 260	132 ~ 156
ITF08	100 ~ 130	60 ~ 78
ITF12SV	100 ~ 130	60 ~ 78
ITF12	80 ~ 90	48 ~ 54
ITF16	80 ~ 90	48 ~ 54
ITF 24	60	36
ITF32	40 ~ 50	24 ~ 30
ITF	40	24
ITF56	25 ~ 30	15 ~ 18
ITF72*	12	12
ITF88*	8	8

Note: \* Component size must match AX-501/301 alignment capabilities.

**Note:** Maximum quantity of feeders depend on the robot configurations. The largest number is for a full standard robot configuration whilst the smallest number represents a full compact robot configuration.

#### 4.2.3.1 Tape cutting

A-Series trolleys can be delivered with or without the option of tape cutters. Tape cutters help the ease of use of operators by reducing the cutting frequency drastically. Additionally it reduces the waste volume significantly.

Specifications	
Pocket depth	18mm
Cuts carrier Tape	Yes
Cuts cover Tape	No
Cut frequency	per 10 seconds when feeder pick are detected
Waste bin volume	24 liters
Weight	21.9 kg

#### 4.2.4 Tray trolley



Figure 12 A-Series tray trolley and AX Extension Module

Tray trolley	
Supported tray type	JEDEC-95-1. IEC 60286-5 or 327 x 274mm or 338 x 240mm
Number of tray carriers for tray height up to 8mm	47
Maximum tray load	0.6 kg
Number of occupied tape feeding positions	0

**Note:** AX Extension Module is required for tray feeding



#### 4.2.5 Other feeding options



Figure 13 The following feeder options support the TTF and all ITF2 feeders. Tape Loading Unit and Feeder storage card

Description	
ITF Tape loading unit	For off-line loading of tapes. Capacity of one (1) tape feeder
Feeder storage cart	50 x 8mm feeders (or equivalent) 100 reels 8mm size
Small feeder storage cart	20 x 8mm feeders (or equivalent) 40 reels 8mm size

- 4.3 2<sup>nd</sup> User Interface** Each machine is supplied with one user interface at the front-right-hand side. For AX-501 a 2nd user interface can be optionally mounted at the front-left-hand side.
- 4.4 Re-use feeder** The re-use feeder is available for components, which have failed inspection because of pick-up errors or vision alignment. These components are placed on the re-use belt and transferred out of the system for connection and re-use. The system is not interrupted.
- 4.5 Online machine setup controller** When a trolley is docked, the machine specific part of SVS Pro will start its continuous checking of the feeder set-up. If mistakes, at any time, are detected, it will be impossible to start production or if the machines was running, production will stop. Error messages will be provided on the Graphical User Interface as well as on the wireless barcode scanner.
- Feeder set-up errors can be resolved by (re-) programming the feeder on the machine (online feeder programming).
- 4.6 Barcode Triggered Changeover (BTCO)** Barcode Triggered Change Over provides:
1. Automatic placement program changeover if a new type of PCB is offered to the machine (indicated with barcodes).
  2. Optimal use of production with combined set-ups (e.g. family board)
  3. An easy to use production scheme especially if you are running small batches
- Notes:
1. Board Identification is required for this option reference to 3.7
  2. Rolling change-over can only be done if the new board has the same board width, board thickness and index scheme (the same pitch) as the previous board.
- 4.7 Service Tooling** Service tooling allows quick and easy offline analysis, repair and verification with fast return of modules to operation.

Service Tool	Serviceable articles	
ITF-TTF Analysis Tool		ITF2 Tape Feeders, TTF Tape Feeders
ITF-TTF Calibration Tool		
AX Nozzle cleaning kit		For nozzle cleaning and low level parts exchange

\* Via local customized repair Assembléon also offers low level part repair for AX Placement Heads, placement controllers and placement robots.

## 5 Installation requirements

	<b>AX-501</b>	<b>AX-301</b>
Maximum height (incl. light tower)	1905mm (+25/-0 SMEMA)	1905mm (+25/-0 SMEMA)
Topside standard placement robot	1290mm (+25/-0 SMEMA)	1290mm (+25/-0 SMEMA)
Board transport	940mm (+25/-0 SMEMA) 885mm (+30/-0 Japanese height)	940mm (+25/-0 SMEMA) 885mm (+30/-0 Japanese height)
Ambient temperature	15-35°C functions guaranteed 20-28°C specifications guaranteed	15-35°C functions guaranteed 20-28°C specifications guaranteed
Humidity	20-90%, no dew	20-90%, no dew
Floor flatness	< 1%	< 1%
power supply	200-480V 3-phase, 47-63Hz	200-480V 3-phase, 47-63Hz
Power rating	7 kVA	5 kVA
Air supply	6-8 bar, 200 NI/min (Tape feeding only) 6-8 bar, 260 NI/min (Tape & Bulk feeding)	6-8 bar, 120 NI/min (Tape feeding only) 6-8 bar, 180 NI/min (Tape & Bulk feeding)
Width including trolleys	2285mm (excl. Ext. Module) 2305 (incl. Ext. Module)	2285mm (excl. Ext. Module) 2305 (incl. Ext. Module)
Length	3720mm (excl. Ext. Module) 4570mm (incl. Ext. Module)	2760mm (excl. Ext. Module) 3610mm (incl. Ext. Module)
Weight (excl. trolleys)	<3200 kg	<2500 kg

## 6 Options overview

Subsystem	Article	AX-501	AX-301
Placement robot	Standard placement robot	•	•
	Compact placement robot	•	•
Placement head	PH-SV	•	•
	PH-LV	•	•
Camera	Component vision camera	•	•
	Component vision XSFOV camera	•	•
<b>Feeding interfaces</b>			
	Feeder trolley	•	•
	Feeder bank	•	•
	Tray trolley	•	•
<b>Feeding</b>			
Tapefeeding	TTF 8mm, 2 lanes, 13" Reels or 7" Reels	•	•
	ITF2 8mm, 13" Reel	•	•
	ITF 12mm SV, 15" Reel	•	•
	ITF2 12mm, 13" Reel	•	•
	ITF2 16mm, 13" Reel	•	•
	ITF2 24mm, 13" Reel	•	•
	ITF2 32mm, 15" Reel	•	•
	ITF2 44mm, 15" Reel	•	•
	ITF2 56mm, 15" Reel	•	•
Bulkfeeding	C0201, 2 Lanes	•	•
	C0402, 2 Lanes	•	•
	R0402, 2 Lanes	•	•
	C0603, 2 Lanes	•	•
	R0603, 2 Lanes	•	•
	MELF R0604, 2 Lanes	•	•
	C0805T0.6, 2 Lanes	•	•
	C0805T1.25, 1 Lane	•	•
	R0805, 2 Lanes	•	•
	MELF R0805, 1 Lane	•	•
Stick feeding		•	•
Surftape feeding		•	•
Direct Die Feeder Ultra		•	•
Label feeding		•	•
Re-use feeder		•	•
Device programming feeding (Data IO)		•	•

**7** **Nozzle compatibility matrix**

NOZZLE COMPATIBILITY FOR AX-301 and AX-501			
NOZZLE	PH-SV	PH-LV	COMPONENT RANGE
CPL1		•	Length=0.4mm, width=0.2mm (e.g. 01005)
CPL2		•	Length=0.6-1.0mm, width=0.3-0.5mm (e.g. 0201-0402)
CPL3		•	Length=1.0-2.1mm, width=0.5-2.0mm (e.g. 0402-0603)
CPL4		•	Length=1.6-3.2mm, width=0.8-2.5mm (e.g. 0603-1206)
L3		•	Length=1.0-2.1mm, width=0.5-2.0mm (e.g. 0402-0603) Placement force > 2N
L4		•	Length=1.6-3.2mm, width=0.8-2.5mm (e.g. 0603-1206) Placement force > 2N
L5		•	Length=3.2-10.0mm, width=1.6-6.6mm (e.g. 1206-2516, S014-S016)
L6		•	Length=1.6-5.9mm, width=1.0-2.7mm (e.g. MELF >Ø 1.0 <Ø 2.7mm)
L7		•	Length=5.2-17.5mm, width=3.2-17.5mm (e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, TANT)
L8	•	•	Length=10-17.5mm, width=10-17.5mm Max. component height 10.5mm (e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC)
V1	•	•	Length=-5-10mm, width=5-10mm (e.g. S08-S016L, SSOP20-SSOP28)
V2	•	•	Length=6-14mm, width=6-14mm (e.g. S016-S016L, S020-S028L, VSO40-VSO56, SOP20-SOP56)
V3	•	•	Length=3.0-5.0mm, width=3.0-8.0mm (e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC)
V4		•	Length=8.0-24.0mm, width=4.0-10.0mm (Connectors, maximum height 6.3mm)
V5		•	Length=10.0-24.0mm, width=10.0-24.0mm Max. component height 6.3mm (e.g. black, medium L8)
V6		•	Length=10-45mm, width=10-45mm Max. component height 4.3mm (e.g. black, long L8)
V7	•	•	Length=5.2-17.5mm, width=3.2-17.5mm (e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC)
V8	•	•	Length=8.0-17.5mm, width=4.0-10.0mm (Connectors, maximum height 10.5mm)
V9	•	•	Length=3.0-5.0mm, width=3.0-8.0mm (e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC)