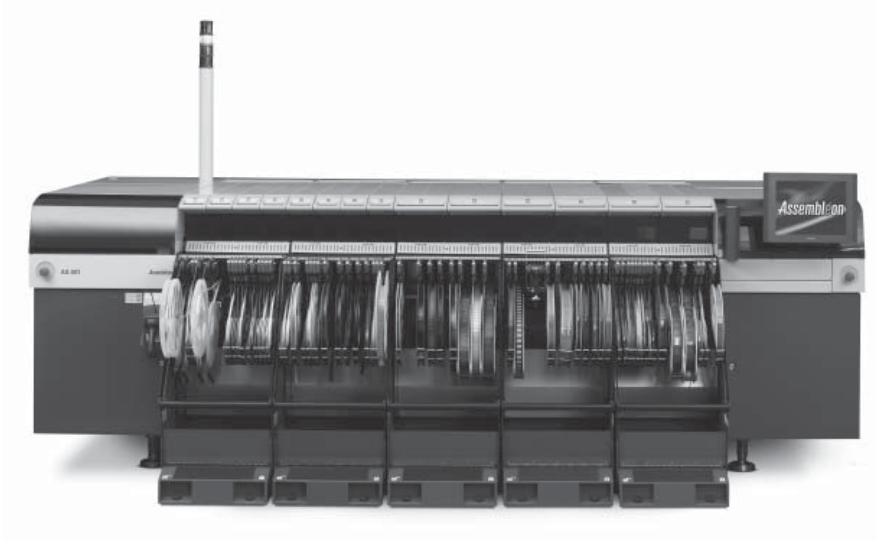
SPECIFICATIONS

Assembléon



# AX-301/501

March
2011

© Assembléon 2011
All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.
The information presented in this document does not form part of any quotation or contract, is to believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use.
Publication thereof does not convey nor imply license under patent or other industrial or intellectual property rights.
“Values are valid at specified conditions”.
Date of release: March 2011
9498 389 0063.1

**Contents**


**1 Introducing the AX-501 and AX-301** 3

**2 General specifications** 5

2.1 Main differences AX-501 and AX-301 6

**3 Base and transport** 7

3.1 AX-Base 7

3.2 Board transport 10

3.2.1 AX transport key right to left 11

3.2.2 Board size 11

3.2.2.1 Wide board size W=457mm 11

3.2.2.2 Long board size L=800mm 11

3.2.3 Board support 12

3.2.3.1 Support strip 12

3.2.3.2 Support pins 12

3.2.3.3 OEM flexible support kits 12

**4 Placement robots** 13

4.1 Compact Placement Robot (CPR) 13

4.2 Standard Placement Robot (SPR) 14

4.3 Twin Placement Robot (TPR) 14

**5 Placement heads** 15

5.1 Placement Head Laser Vision (PH-LV) 15

5.2 Placement Head Single Vision (PH-SV) 16

5.3 Board alignment camera 16

**6 Component alignment** 17

6.1 Laser alignment 17

6.2 Component vision camera 18

6.3 Extra Small Field of View (XSFOV) camera 19

**7 Toolbits and toolbit exchange unit** 20

7.1 Toolbits 20

7.1.1 Nozzle cleaning kit 21

7.2 Toolbit exchange units (TEU) 21

**8 Trolleys** 22

8.1 Feeder trolleys 22

8.2 Auxiliary feeder trolley 23

8.3 No trolleys: AX trolleys lift cover 25

**9 AX User Interfaces and software** 26

10.1 Multi-language 27

**10 Feeding** 28
10.1 Tape feeding 28
10.2 Stick feeding 29
10.2.1 Single lane stickfeeder 30
10.3 Jedec tray stacking 31
10.4 Re-use feeder 32
10.5 OEM feeders 32
10.5.1 Pre-printed label feeders 32
**11 Options** 33
11.1 Offline feeder storage cart 33
11.2 Tape loading units 33
11.3 Tape splicing tools 34
11.4 Service tooling 34
**12 Installation requirements** 35
**13 Factory Integration - New Product Introduction (NPI)** 36
13.1 Assembléon optimizers 36
13.2 Front ends vPlan-Lite 36
13.2.1 Input and reverse gerber engineering 37
13.2.2 CAD importer package 37
13.2.3 Virtual sticky tape 38
13.3 Product Library Manager (PLM) 38
**14 Factory Integration - Manufacturing Execution Systems (MES)** 39
14.1 Setup assistant 39
14.1.1 Setup assistant (SA) online 39
14.1.2 Setup assistant (SA) offline 39
14.1.3 Setup assistant extension 40
14.1.4 Moist Sensitive Device (MSD) control 40
14.2 Traceability 40
14.2.1 Work order traceability and reporting 41
14.2.2 PCB traceability and reporting 41
14.2.3 Performance monitoring 41
14.3 Feeder maintenance monitroing 42
14.4 Board indentification 42
14.5 Data interfaces 43
**Appendix A** 44

## 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 ensure a seamless fit when combined in a line.

The AX-301 and AX-501 are fully modular, enabling scaleable output:
- up to 121,000 components/hour (IPC9850) for the AX-501 with up to 260 feeding inputs
- up to 77,000 components/hour (IPC9850) for the AX-301 with up to 156 feeding inputs

Even with such high placement rates, accuracy is an excellent 25µm, 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 trolleys, fast changeovers are guaranteed.

With the addition of the Twin Placement Robot (TPR) the capabilities of the AX-501 and AX-301 are expanded with high output IC placement rates (up to 16,600 cph) and front side tray feeding, by means of a maximum of 2 Jedec Tray Stacker. This combination makes it ideal for applications with low unique tray part types (such as DRAM) or high IC count in tape.

With the TPR the accuracy of the AX is enhanced to 25 µm @ CpK>1.0, ideal for applications with BGA's or CSP's having high ball count. With the renowned placement process of the A-Series equipment, the TPR is a perfect fit for stacking, PoP or bare die product applications.

This specification book presents the in depth technical specifications, features, options as well as the installation requirements. The information is transparantly 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
- Three robot types are availble to configure the required output or application fit:
    a) Compact Placement Robot (CPR): Occupies 1/4th of a trolley section
    b) Standard Placement Robot (SPR): Occupies ½ of a trolley section
    c) Twin Placement Robot (TPR): Occupies one trolley section.
- 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 45mm
- Just 1 placement heads need to be used for accurate component placement of the full range of components
- Laser alignment for component sizes up to 17.5 x 17.5mm at the highest speed and accuracy

Accuracy
The AX-501/301 has the following component placement accuracies at CpK > 1.00
- 40 µm when aligned by laser on CPR, SPR and TPR robot
- 35 µm when aligned by camera on a SPR robot
- 25 µm when aligned by camera on a TPR robot

Placement heads
- Two heads available for optimal pick and place performance for the complete component range
- Programmable placement force 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 continuous 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
- Left-to-right or right-to-left transport direction support
- SMEMA or Japanese height

Feeding platform
- Trolleys allow fast exchange of feeders
- Adaptive pick correction assures maximum pick performance
- Intelligent feeding for traceability, warehousing 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
- Warehousing and parts control

## 2 General specifications

| Item | AX-501 | AX-301 |
|---|---|---|
| Max. ouput (cph) | 165,000 | 99,000 |
| IPC output (cph) | 121,000 | 77,000 |
| Highest accuracy class:<br>Laser<br>Camera (TPR) | <br>40µm, Cpk>1.00<br>25µm, Cpk>1.00 | <br>40µm, Cpk>1.00<br>25µm, Cpk>1.00 |
| Pick performance | 99.95%* | 99.95%* |
| Placement Defect Rate | <10 PPM* | <10 PPM* |
| Technical availability | >99.97%* | >99.97%* |
| Lifetime toolbits | 20 Million placements*<br>(CPL toolbits) | 20 Million placements*<br>(CPL toolbits) |
| Component Size (LxW)<br>Minimum (LxW)<br>Maximum (LxW) | <br>0.4 x 0.2mm<br>45 x 45mm | <br>0.4 x 0.2mm<br>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 |
| Tape feeding positions | 260 (Twin tape feeder)<br>130 (Single tape feeder) | 156 (Twin tape feeder)<br>78 (Single tape feeder) |
| Feeding types: | tape, tray stacker, stick<br>Note: Other feeders on request | tape, tray stacker, stick<br>Note: Other feeders on request |
| Board range minimum<br>Standard:<br>Optional: | <br>50 x 50mm<br>25 x 25mm | <br>50 x 50mm<br>25 x 25mm |
| Board range maximum<br>Standard:<br>Optional board width:<br>Optional board length: | <br>515 x 390mm<br>457mm<br>800mm | <br>475 x 390mm<br>457mm<br>800mm |
| Transport direction | Left to right<br>Optional: right to left | Left to right<br>Optional: right to left |
| Power supply | 400V 3phase<br>47-63Hz | 400V 3phase<br>47-63Hz |
| Optional transformer | 208, 230, 400, 480V 3phase | 208, 230, 400, 480V 3phase |
| Power rating<br>Avg. power consumption | 7kVA<br>3kVA | 5kVA<br>3kVA |
| Air supply | 6-8 bar, 10Nl/robot, max 200Nl | 6-8 bar, 10Nl/robot, max 120Nl |

*Table 1*

* Lab conditions

| Item | AX-501 | AX-301 |
|---|---|---|
| Dimensions (incl. trolley) | 3,720 x 2,285 x 1,290mm<br>Total 8.5m$^2$ | 2,760 x 2,285 x 1,290mm<br>Total 6.3m$^2$ |
| Weight (excl. trolleys) | < 3200 kg | < 2500 kg |
| Noise | < 72 db(A) at 1m | < 72 db(A) at 1m |
| Applicable standards | **CE**<br>- 2006/42EC Machine Directive<br>- 2004/108/EEC EMC Directive<br>- 2006/121/EC REACH Directive<br>- 73/23/EEC CE Low voltage Directive<br>**CSA/UL**<br>- CSA-C22.2<br>**IPC**<br>- 9850 Equipment Characterization<br>- 9851 SMEMA<br>- 2541/2546/2551 CAMX<br>**SEMI**<br>- S2 Safety standard<br>- S8 Ergonomics standard<br>- E10 RAM<br>- F47 Voltage Sag Immunity<br>- E58 ARAM<br>- E95 Human Interfaces Standard | |
| Acceptance protocol | Assembléon factory acceptance protocol | |

*Table 2*

## 2.1 Main differences AX-501 and AX-301

| Item | AX-501 | AX-301 |
|---|---|---|
| Base Length | 3,720mm | 2,760mm |
| 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 cph | 99,000 cph |
| Maximum IPC output | 121,000 cph | 77,000 cph |
| Maximum board length<br>Optional board length | 515mm<br>800mm | 475mm<br>800mm |

*Table 3*

# 3 Base and transport

## 3.1 AX Base

The machine base contains all mechanical interfaces for connection of the placement robots, feeder 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. The bases are height adjustable to meet the standard production height requirements (Smema or Japanese).

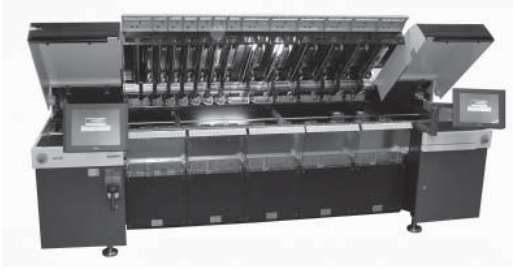


*Figure 1* *AX-501 machine base*

| Base specifications | |
|---|---|
| Maximum height (incl. light tower) | Smema: 1,905mm (+25/-0)<br>Japanese: 1,850mm (+30/-0) |
| Topside placement robot | Smema: 1,290mm (+25/-0)<br>Japanese: 1,235mm (+30/-0) |
| Transport | Smema: 940mm (+25/-0)<br>Japanese: 885mm (+30/-0) |
| Base length AX-501<br>Base length AX-301 | 2,760mm<br>3,720mm |
| Width (including feeders) | 2,285mm |

*Table 4*

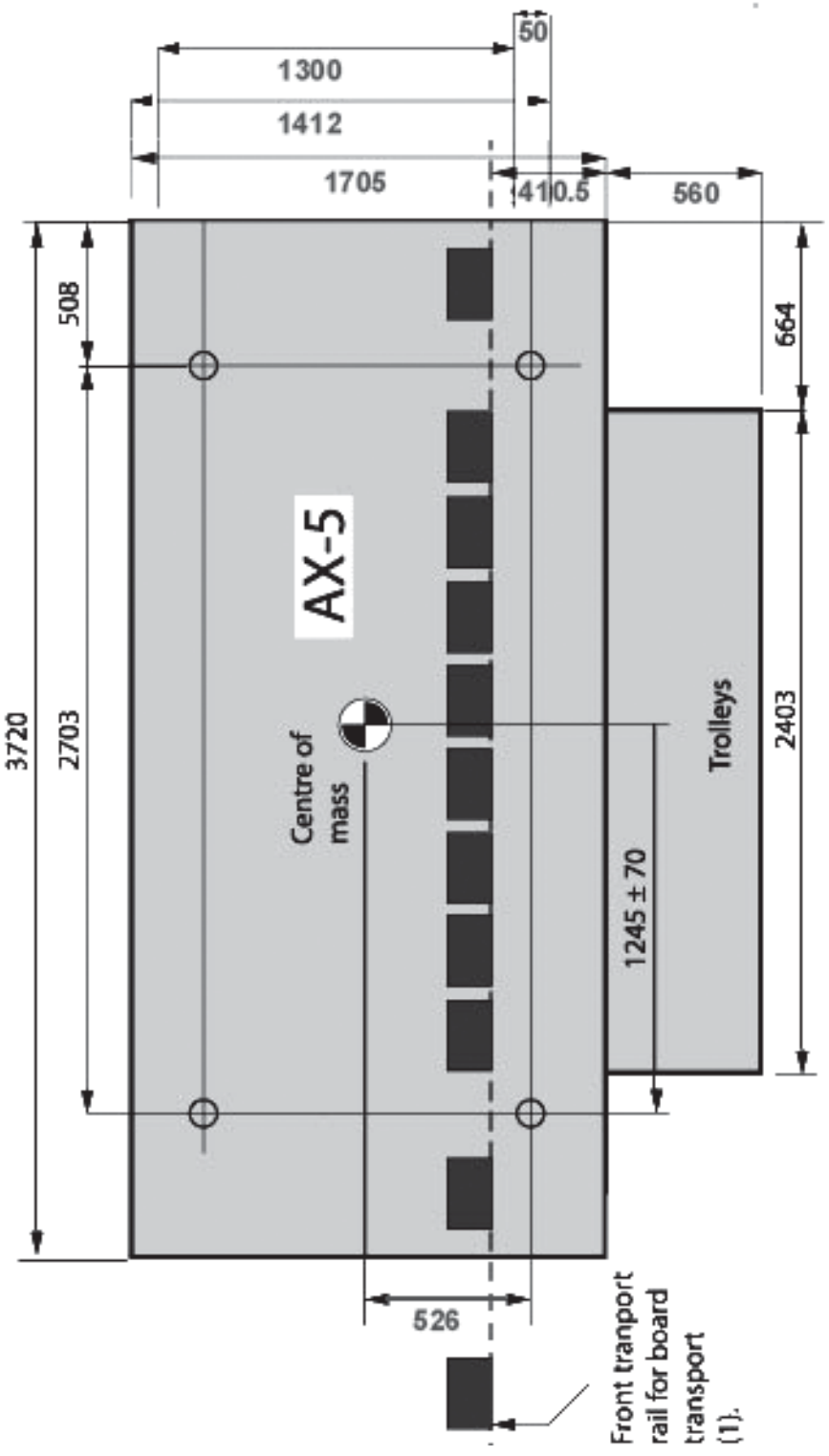



*Figure 2 AX-501 floorspace*

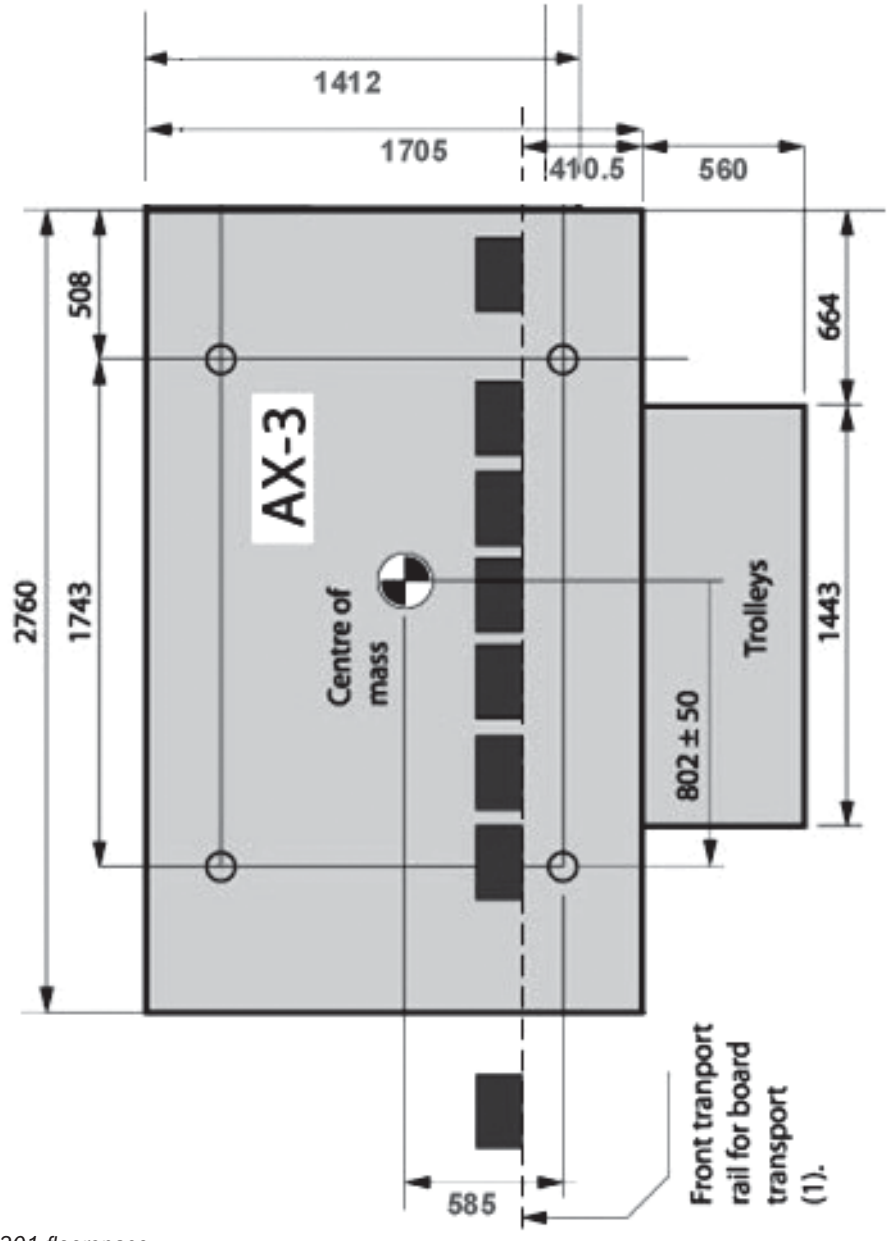



*Figure 3 AX-301 floorspace*

## 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,<br>Optional: right to left | Standard left to right,<br>Optional: right to left |
| Transport mechanism | Indexing<br>(walking beam) | Indexing<br>(walking beam) |
| Board transport height | SMEMA (940-965mm) and<br>Japanese (885-915mm) | SMEMA (940-965mm) and<br>Japanese (885-915mm) |
| **Board specification** | | |
| Max. height pre-mounted components<br>Bottomside:<br>Top side:<br>(Optional top side; restrictions apply) | <br>20mm<br>10.5mm<br>12mm | <br>20mm<br>10.5mm<br>12mm |
| Y/X ratio | < 2.5 | < 2.5 |
| Board material | • Phenolic/paper (FR2)<br>• Glass-Epoxy (FR4)<br>• Composite materials<br>• IPC 9850 Glass verification panel<br><br>Optional:<br>• Ceramics<br>• Carriers | |
| Board artwork material/surface finish | • Hot Air Solder Leverled (HASL)<br>• Bare copper with Organic Surface Protectant (OSP)<br>• Electroless Ni / Immersion AU | |

*Table 5*

### 3.2.1 AX Transport key right to left

This option is to integrate the AX-501/301 into existing production lines that run from right to left, additionally it is used when AX systems are placed front-to-front and back-to-back while keeping the PCB flow in the same direction.

### 3.2.2 Board size

| Board size specifications | | |
|---|---|---|
| | **AX-501** | **AX-301** |
| Minimum board dimensions (L x W) | 50 x 50mm, 50 x 25mm optional | 50 x 50mm, 50 x 25mm optional |
| Maximum board dimensions:<br>Optional board dimensions #1 (LxW):<br>Optional board dimensions #2 (LxW):<br>Optional board dimensions #3 (LxW): | 515 x 390mm<br>515 x 457mm<br>800 x 390mm<br>800 x 457mm | 475 x 390mm<br>475 x 457mm<br>800 x 390mm (on request)<br>800 x 457mm (on request) |
| Board thickness | 0.3mm - 6mm<br>Optional other transport systems are available like flexfoil or 10mm for carriers | 0.3mm - 6mm<br>Optional other transport systems are available like flexfoil or 10mm for carriers |

*Table 6*

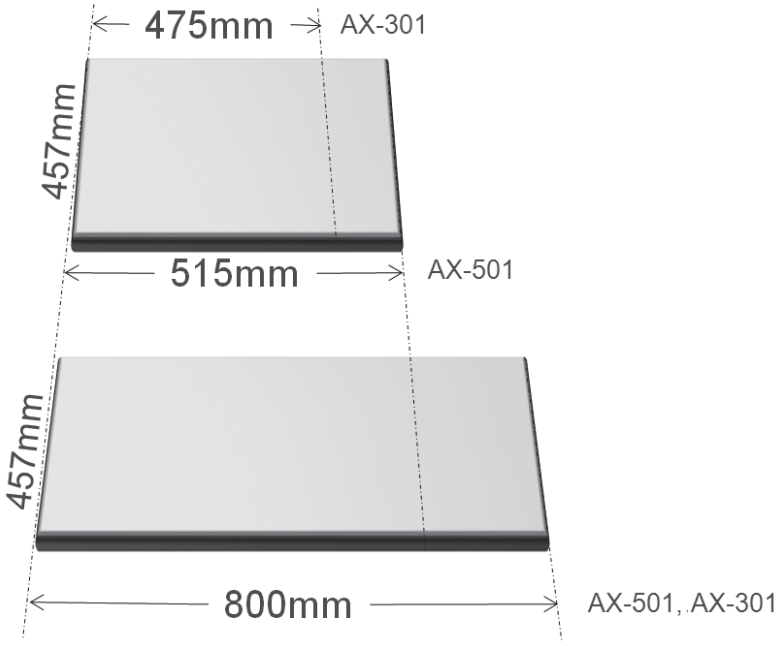



*Figure 4* *AX board size*

#### 3.2.2.1 Wide board size W=457mm

To expand the board width from 390mm to 457mm a wide board option is available for both the AX-301 and AX-501. This option requires new toolbit exchange units, where the identification markers are re-located for the board alignment camera is able to detect them.
The wide board size option can be combined with the long board option (see next section).

**3.2.2.2 Long board size L= 800mm**

To expand the board length from 515mm to 800mm, a long board option for the AX-501 is available (for AX-301 on special request only). This option comes in a left to right and right to left version.
The long board option can be combined with the wide board option (see previous section).

**3.2.3 Board support**

There are multiple methods of supporting a board within the AX. Depending on the warpage behavior, bottom side components, required change-over time or any other variable, it determines the board support type that fits best.

**3.2.3.1 Support strip**

The board support strip is a flat surfaced strip that can support a board over its 'full' length. Held by a magnet it is easily positioned and is best used when no components are mounted on the bottom side of the PCB

**3.2.3.2 Support pins**

When subpanels are used support pins can be used to prevent downward board warpage. The top-surface of the support plate has a visible grid in X and Y direction (10 mm) as an aid to place support pins on the required position, for more accurate positioning and fast change-over the off-line set-up tool can be used. The support pins can be placed with a minimum interspacing of 32mm.

**3.2.3.3 OEM flexible support kits**

In an enviroment with frequent changeovers and where board support preparation can be reduced to zero, OEM supplier(s) offer flexible support systems. These systems, at each index of the AX, will settle its pins underneath the PCB and will lock itself. This is independent whether there are components located on this position or not. Its low force takes care that no component damage can occur.

Tested OEM Products are: Grid-lok. Contact the OEM supplier for further information.

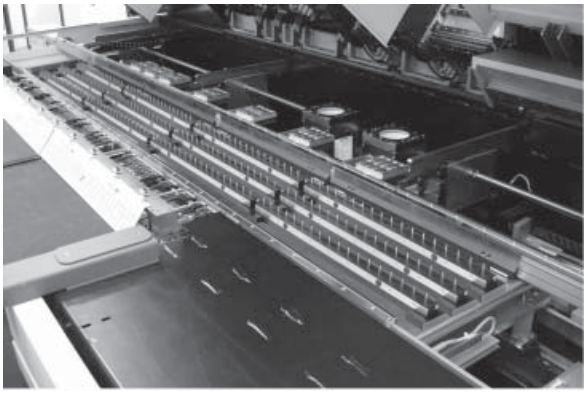


*Figure 5 AX Grid lok*

## 4 Placement robots

There are three types of placement robots. The machine base and the output requirement of the customer determines the amount of robot types that will be configured.
The three robot types are the following:

1. Compact Placement Robot (CPR): Each trolley segment holds up to 4 CPR's.
2. Standard Placement Robot (SPR): This robot is twice the width of a CPR. Each trolley segment holds up to 2 SPRs.
3. Twin Placement Robot (TPR): This is a two axes linear robot that occupies 1 trolley segment. In contrast to the CPR and SPR, only one (1) TPR can be placed on an AX base.

CPR: fits all robot positions
SPR: fits all odd robot positions
TPR: Most right trolley section (other positions on request)

For safety reasons, any section that is not equipped with a robot will be covered by a dummy hood. This dummy hood is called an AX Safety cap and is of the same width as one CPR.

## 4.1 Compact Placement Robot (CPR)

A total of 4 compact placement robots fit one trolley segement, meaning that an AX-501 can hold a maximum of 20 robots while an AX-301 can hold a maximum of 12 robots.
2 CPRs fit on the same location as 1 SPR robot and therefore effectively double the output on the same footprint.

| CPR specifications | |
|---|---|
| Dimensions (LxWxH) | 1,625 x 120 x 250mm |
| Weight | 32 kg |
| Component alignment possibilities | Laser |
| Component range | 0.4 x 0.2mm up to 17.5 x 17.5mm |
| Component height | 10.5mm |
| Accuracy | 40µ, CpK > 1.0 |

*Table 7*

*Figure 6 CPR and SPR*

## 4.2 Standard Placement Robot (SPR)

A total of 2 standard placement robots fit one trolley segment, meaning that an AX-501 can hold a maximum of 10 robots while an AX-301 can hold a maximum of 6 robots.

| SPR specifications | |
|---|---|
| Dimensions (LxWxH) | 1,625 x 240 x 250mm |
| Weight | 52 kg |
| Component alignment possibilities | Laser and camera alignment |
| Component range | 0.4 x 0.2mm up to 45 x 45mm |
| Component height | 10.5mm |
| Accuracy | 40µ, CpK > 1.0 for laser alignment<br>35µ, CpK > 1.0 for camera alignment |

*Table 8*

## 4.3 Twin Placement Robot (TPR)

Currently, only one (1) TPR can fit on an AX-501 or AX-301 base. It occupies exactly one trolley position and expands the capabilities of the AX with high speed IC placement and increased accuracy for IC/BGA/CSP and Flip chip placement. Additionally it adds front side tray capability.

| TPR specifications | |
|---|---|
| Dimensions (LxWxH) | 1,820 x 480 x 407mm |
| Weight | 120 kg |
| Component alignment possibilities | Laser and camera |
| Component range | 0.4 x 0.2mm up to 45 x 45mm |
| Component height | 10.5mm |
| Accuracy | 40µ, CpK > 1.0 for laser alignment<br>25µ, CpK > 1.0 for camera alignment |
| Output TPR (IPC9850):<br>IC from tape, aligned by laser<br>IC from tape, aligned by camera<br>IC from tray, aligned by laser<br>IC from tray, aligned by camera | <br>16,000 cph<br>6,600 cph<br>13,000 cph<br>6,000 cph |

*Table 9*

## 5 Placement heads

For the CPR only one placement head is available (PH-LV) while the SPR and TPR can be equipped with two different placement heads (PH-LV, PH-SV).

The placement heads execute the following tasks:
- Align component
- Pick and place components
- Z-Movement
- Rz Movement
- Force sensing control
- Board and component thickness variation correction
- Component presence check
- Board alignment

The placement heads are supported by the following robots:
PH-LV: CPR, SPR, TPR
PH-SV: SPR, TPR

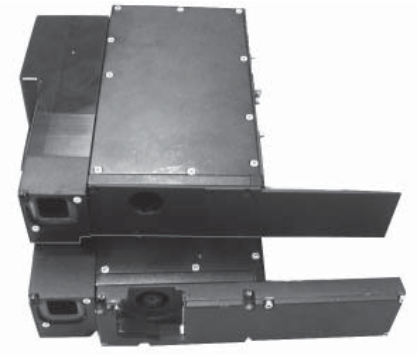


*Figure 7 PH SV (top) and LV (bottom)*

## 5.1 Placement Head Laser Vision (PH-LV)

A compact placement robot can only be equipped with a PH-LV and can perform laser alignment only. A standard, compact and twin placement robot can be equipped with a PH-LV and can perform both laser and camera alignment.

| PH-LV specifications | |
|---|---|
| Closed loop placement force feedback | Programmable between 1.5 ~ 8N in steps of 0.1N* |
| Component pick orientation | 0°, 90°, 180°, 270°, 360° |
| Maximum component weight | <12gr |
| Maximum component dimensions:<br>Laser alignment (LxWxH)<br>Camera alignment (LxWxH) | <br>17.5 x 17.5 x 10.5mm<br>24 x 24 x 6.3mm (component size ≤ 24 x 24mm)<br>45 x 45 x 4.3mm (component size > 24 x 24mm) |
| Minimum component thickness | 0.12mm |

*Table 10*

* Dependent on nozzle type

## 5.2 Placement Head Single Vision (PH-SV)

A standard placement robot and twin placement robot can be equipped with a PH-SV and perform camera alignment only.

| PH-SV specification | |
|---|---|
| Closed loop placement force feedback | Programmable between 1.5 ~ 8N in steps of 0.1N* |
| Component pick orientations | 0°, 90°, 180°, 270°, 360° |
| Maximum component weight | < 12 gr |
| Maximum component dimensions: Camera alignment (LxWxH) | 45 x 45 x 10.5mm |

*Table 11*

* Dependent on nozzle type

## 5.3 Board alignment camera

Board align camera's are mounted at the front side of each placement head. Besides the main purpose of board alignment, the downward looking camera has a multiple of additional functions:

- Badmark sensing
- Feeder trolley position detection
- Toolbit exchange unit location detection and toolbit presence check
- Dump bin location detection
- Alignment camera location detection
- Diagnostics or teaching viewing purposes with live image on GUI
- Snapshot camera of feeder position pickup location for fault tracing (default set off)

| Board alignment camera | |
|---|---|
| Camera field of view | 8.6 x 6.8mm |
| Camera pixels | 1024 x 768 |
| Camera pixel resolution | 8.4 µm |
| 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 |
| Maximum number of fiducials | 2048 |

*Table 12*

*Figure 8* *Example of typical fiducials*

## 6 Component alignment

For the standard SMD range, the AX makes use of only 1 camera type that is capable of aligning most known SMD components. For bare die product handling, of sizes up to a maximum of 6mm, an additional high resolution camera is available.

### 6.1 Laser alignment

Laser alignment performs the following functions:

- Alignment of the component
- Component presence check
- Toolbit identification (verified against toolbit file dimensions) and tip (Z-position) calibration

Component alginment and continuous monitoring are performed by measuring the component shadow projections. Measuring toolbits is performed in the exact same manners. By moving the toolbit upwards, the tip z-position is where the component leaves the laser curtain. This position is used to determine the alignment height that is executed per each individual component (which is not necessarily the same).

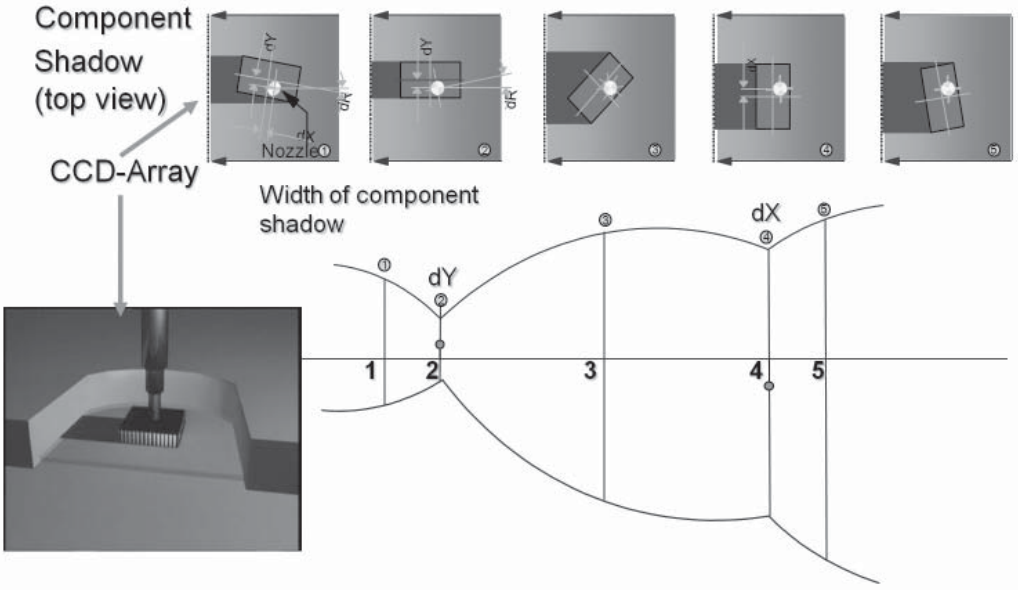



*Figure 9 Laser alignment principle*

## 6.2 Component vision camera

The component vision camera (CV) is the standard camera to align components up to 45 x 45mm. It is used by the SPR as well as the TPR robot.

Components are always aligned with the z-stroke of the placement head on an Z=0 position as well as in the placement angle. This takes out any possible perpendicular offset that might be present.

| CV specifications | |
|---|---|
| Maximum component size (LxW) | 45 x 45mm |
| Accuracy SPR<br>Accuracy TPR | 35µ, CpK > 1.0<br>25µ, CpK > 1.0 |
| Leaded components up to 35 x 35mm:<br>Minimum lead width<br>Minimum lead pitch<br>Leaded components from 35 x 35mm to 45 x 45mm:<br>Minimum lead width<br>Minimum lead pitch | <br>0.150mm<br>0.300mm<br><br>0.175mm<br>0.350mm |
| Bumped components up to 18 x 18mm:<br>Minimum bump size<br>Mimimum bump pitch<br>Leaded components from 18 x 18mm to 45 x 45mm:<br>Minimum lead size<br>Minimum lead pitch | <br>0.150mm<br>0.300mm<br><br>0.270mm<br>0.540mm |
| Number of bumps | 2 to 3,500 |

*Table 13*

*Figure 10* *AX Component Vision Camera*

## 6.3 Extra Small Field of View (XSFOV) camera

The XSFOV camera is especially meant for applications such as modules that handle bare die product placements (flip chips) with small bump sizes.

| XSFOV specifications | |
|---|---|
| Maximum component size (LxW) | 6 x 6mm |
| Accuracy SPR<br>Accuracy TPR | 35µ, CpK > 1.0<br>25µ, CpK > 1.0 |
| Minimum bump size<br>Minimum bump pitch | 0.030mm<br>0.060mm |
| Number of bumps | 2 to 3,500 |

*Table 14*

*Figure 11 XSFOV camera*

# 7 Toolbits and toolbit exchange unit

## 7.1 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, while providing robust and delicate component handling. The toolbits are connected to the placement head by a magnetic connection. Please refer to the compatibility matrix in Appendix A for an overview of the toolbit and placement head relationship as well as the toolbit and component relationship. For the PH-SV, the vision nozzles are equipped with a dot code, which are used for type identification (inner-ring according fig 12) and rotational information (outer ring according fig 12).

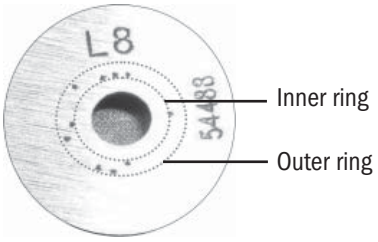



*Figure 12* *Nozzle dot codes*

| Nozzle specifications | |
|---|---|
| Nozzle range | See table in Appendix A |
| Placement force range<br>(programmable in steps of 0.1N) | 1.5N to 2N for CPL Nozzles<br>1.5N to 8N for all other nozzles |
| Nozzle life time at normal use | 20 million pick for CPL nozzles |

*Table 15*

*Figure 13* *Toolbits*

### 7.1.1 Nozzle cleaning kit

To be able to clean and repair the CPL toolbits (CROS), an AX nozzle cleaning kit is required. This kit contains the required tooling and can also be used to store spare parts. One kit per production floor is sufficient to support the cleaning and repairing process

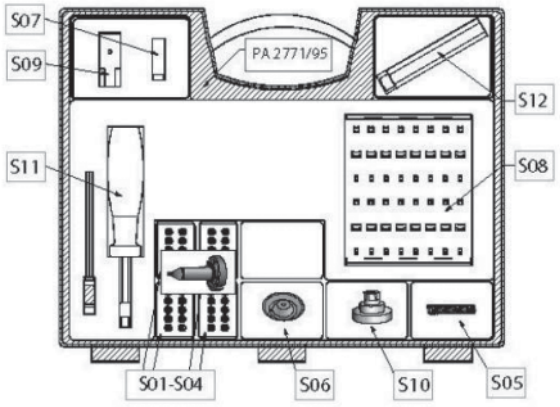



*Figure 14 Nozzle cleaning kit*

## 7.2 Toolbit exchange units (TEU)

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

The toolbit exchange unit has the following functions:

- Storage of nozzles. Maximum of 8 storage positions
- Component dump tray
- Vacuum calibration pad for calibrating vacuum level of the placement head

*Figure 15 Toolbit exchange unit*

# 8 Trolleys

## 8.1 Feeder trolleys

The standard feeder trolleys are mainly used to hold tape- and reel feeders. However, the trolley fits many other types (see feeding section).

Standard feeder trolleys come in two types:
- Including a tape cutter
- Without tape cutter

It is possible to upgrade a feeder trolley without tape cutter in the field with a tape cutter. Tape cutters help the ease of use of operators by reducing the cutting frequency drastically. Additionally it reduces the waste volume significantly.

| Feeder | # of feeding positions | |
|---|---|---|
| | AX-501 | AX-301 |
| TTF | 220 ~ 260 | 132 ~ 156 |
| ITF3 4mm | 100 ~ 130 | 60 ~ 78 |
| 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 |
| ITF44 | 40 | 24 |
| ITF56 | 25 ~ 30 | 15 ~ 18 |
| ITF72* | 10 | 6 |
| ITF88* | 10 | 6 |

*Table 16*

**Note:** * Component size must match AX-501/301 alignment capabilities. One per SPR.

**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.

*Figure 16* *Feeder trolley*

| Tape cutting specifications | |
|---|---|
| Maximum pocket depth for cutting | 18mm |
| Cuts carrier Tape | Yes |
| Cuts cover Tape | No |
| Cut frequency | per 10 seconds when feeder pick are detected |
| Waste bin volume | 24 liters |

*Table 17*

## 8.2 Auxiliary feeder trolley

The auxiliary feeder trolley has the capability to communicatie via I/O to the AX. Therefore it can hold feeders from third party vendors. Currently, the AX supports the following feeder:

- Jedec Tray Stacker

The auxiliary feeder trolley is compatible to the TPR only and is meant to fit the Jedec Tray Stacker underneath any of the two axes of the TPR.

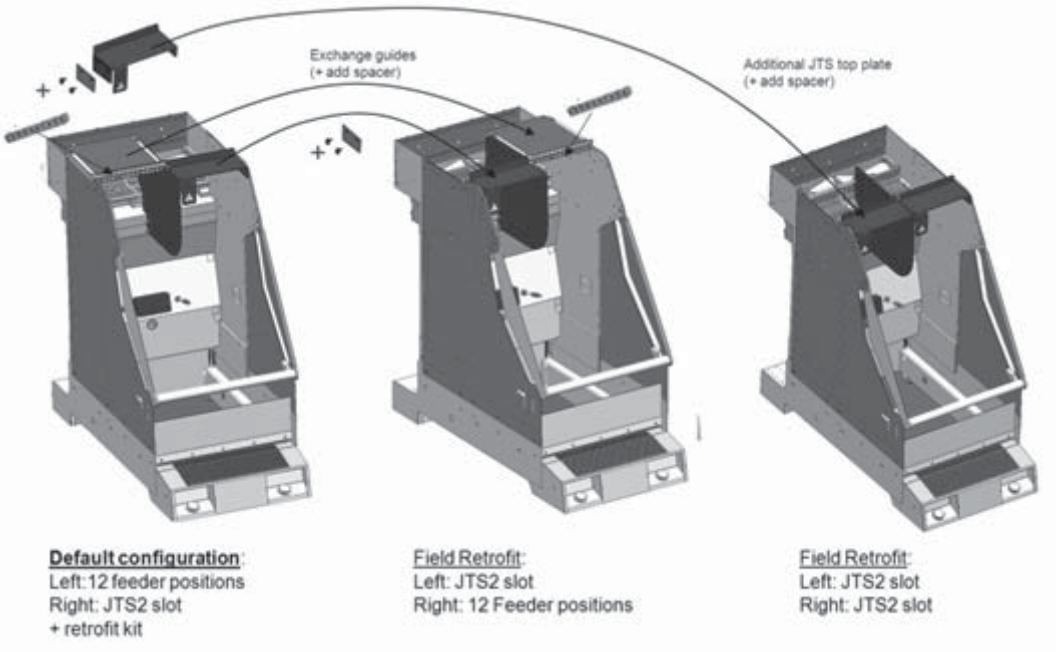



*Figure 17 Auxiliary feeder trolley configurations*

As shown in figure 13. The Auxiliary Feeder Trolley can be reconfigured (from factory or in the field). All parts are delivered with the trolley to perform this reconfiguration. The following configurations are possible:

| | | |
|---|---|---|
| Default: | Left axis of TPR and left side of trolley: | Tape Feeders |
| | Right axis of TPR and right side of trolley: | Jedec Tray Stacker and Re-use feeder |
| Reconfigure 1: | Left axis of TPR and left side of trolley: | Jedec Tray Stacker and Re-use feeder |
| | Right axis of TPR and right side of Trolley: | Tape Feeders |
| Reconfigure 2: | Left axis of TPR and left side of trolley: | Jedec Tray Stacker and Re-use feeder |
| | Right axis of TPR and right side of Trolley: | Jedec Tray Stacker and Re-use feeder |

It is not possible to reconfigure the trolley for tape feeders only. For this purpose the standard feeder trolley is available. Additionally, tape feeders cannot be on the same side of the trolley as the Jedec Tray Stacker, the upper guides of the tape feeders obstruct the path of the placement head, towards the tray. For this reason only a reuse feeder will fit directly alongside a Jedec tray stacker

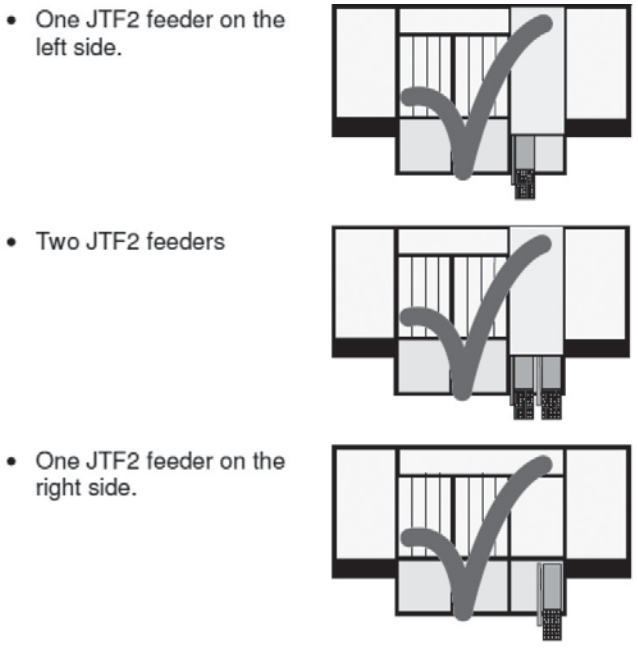



*Figure 18* *Allowed auxiliary feeder trolley configurations*

## 8.3 No trolleys: AX trolleys lift cover

A trolley section that is unused during production must be occupied by a trolley itself or, when no trolley is available and the section uses safety caps (dummy robots), then, for safety, the lift must be covered by a AX trolley lift cover.

*Figure 19* *AX trolley lift cover*

## 9 AX User Interfaces and software

The A-Series is operated via a touch screen 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.A wide range of languages is standard available, please check with the local Assembléon representative for more details.

The software supports:

- All configuration models of the AX-501/301 base
- Any mix of CPR/SPR/TPR robots
    - CPR on all positions
    - SPR on all odd positions
    - TPR on most right trolley section
- Features activated by software licences (main items, but not limited to)
    - Speed packs
    - Multi-language
    - Program editing with an editing wizard
    - Barcode Triggered Changeovers
    - Transport direction
    - Splice detection
- Standard features are (main items, but not limited to)
    - Program editing
    - Automatic pitch programming of feeders
    - Automatic view of pick position after errors for quick feeder analysis
    - Connection to Product Library Management
    - Program to offline program authorizing lists
    - Diagnostics toolboxes to reduce unscheduled downtime
    - Documentation
    - Illustrated Help screens and clear messaging
    - Teaching screens
    - Information on feeder setup, family setups
    - Information on parts consumption
    - Information on first upcoming 15 splice events
    - Application software, such as Package on Package
    - Performance monitoring screen (MIS data)
- Databases
    - Component outline (shape) databases
    - Component process parameters
    - Component databases, including feeder index distanes
    - Toolbit descriptions
    - Feeder descriptions

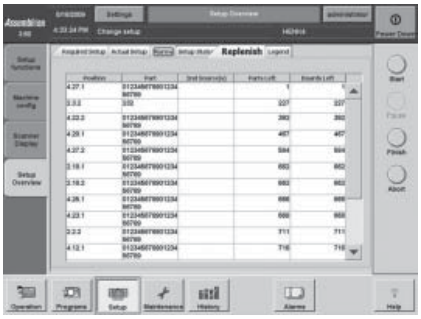


*Figure 20 Graphical User Interfaces*

## 9.1 Multi-language

This option (license) takes care that all menu options, control screen and help screens are translated in the selected language. Default language is English.

Languages that are available are added and updated upon request.

Main multilanguage support is available in the following languages (can by multilizer support, where new features are only available in english):

Default:

- English

Optional languages:

- Chinese simplified
- Chinese traditional
- German
- Italian
- Korean
- Spanish (Mexican)
- Swedish
- Turkish
- Polish
- Japanese

Other languages on request.

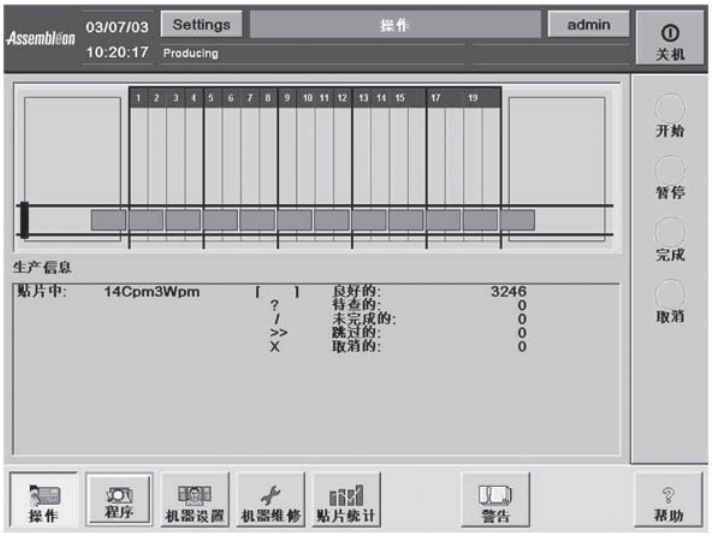



*Figure 21 Example chinese human interface*

# 10 Feeding

## 10.1 Tape feeding

The AX supports two generations of tape feeders:

- The first generation: ITF2 and TTF
- New generation: ITF3

The first generation feeders are self indexing when the nozzle interrupts the light beam above the pick position. A component that will be picked must always be available. The pitch of these feeders can manually be set on the feeder by means of a switch, or, when set to 'remote' it retrieves the pitch from the AX.

The new generation of feeders - the '3-Series' feeders (ITF3) - are superior in handling and performance. They have no indexing sensor and no manual adjustable pitch setting. All feeders are automatically programmed with the correct pitch when being inserted onto the system. Additionally, the '3-series' feeders will not bring a component to the pick position unless asked for by the AX. Components will then always be preserved in their tape compartment when they are not used.

To benefit on existing equipment from the new generation ITF3 feeders, the AX firmware must be of level 3.62 or higher. It might be that some hardware changes are required on older equipment. Contact Assembléon first to enquire about these changes.

Current '3-Series' feeders, which are RFI capable only, are:

- ITF3 4mm (W4P1 tapes)
- ITF3 8mm

Other ITF3 feeders will become available in 2011.

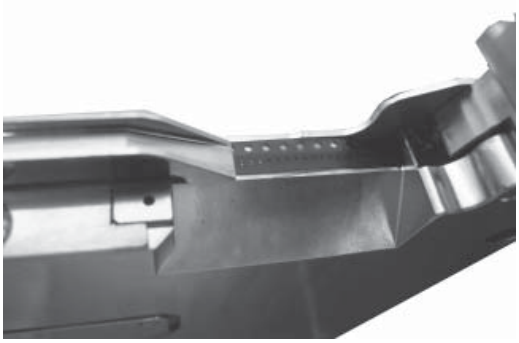


*Figure 22 ITF3 4mm tape feeder*

| Feeder | Tape width | Pocket depth | Reels | Pitch support |
|---|---|---|---|---|
| TTF (2 lanes) | 2 x 8mm | 3.5mm | 2x7” or 2x7”-13” | 2, 4mm |
| ITF 4mm | 4mm | 3.5mm | 5” - 7” | 1, 2mm |
| ITF 8mm | 8mm | 12mm | 7” - 13”<br>15” optional | 2 ~ 56mm |
| ITF 12mm SV | 12mm | 12mm | 15” | 2 ~ 56mm |
| ITF 12mm | 12mm | 12mm | 7” - 13”<br>15” optional | 2 ~ 56mm |
| ITF 16mm | 16mm | 12mm,<br>15.4mm optional | 7” - 13”<br>15” optional | 2 ~ 56mm |
| ITF 24mm | 24mm | 12mm,<br>16.5mm optional | 7” - 13”<br>15” and 22”<br>optional | 2 ~ 56mm |
| ITF 32mm | 32mm | 16.5mm* | 7” - 15”<br>22” optional | 2 ~ 56mm |
| ITF 44mm | 44mm | 16.5mm* | 7” - 15”<br>22” optional | 2 ~ 56mm |
| ITF 56mm | 56mm | 16.5mm* | 7” - 15”<br>22” optional | 2 ~ 56mm |
| ITF 72mm | 72mm | 16.5mm* | 7” - 15” | 2 ~ 56mm |
| ITF 88mm | 88mm | 16.5mm* | 7” - 15” | 2 ~ 56mm |

*Table 18*

***Note:** Deeper pocket depths on request

## 10.2 Stick feeding

Where many sticks are utilized in production, the stick feeders provide the optimum solution. Presenting multiple lanes of components allows less refill actions and virtually no downtime creating therefore a care free stick feeding environment. One stick base can handle a large range of easy exhangeable top plates providing operational flexibility during batch changes and reducing inventory storage of additional stick feeder bases.

- Standard top plate for most used components
- Easy replaceable top plates
- Generic top plate support for quick use in operations of non-supported component ranges
- Custom top plate support for long term use in operations of non-supported component ranges
- Depending on the size of components, 2 up to 6 lanes of components on one top plate
- Easy lane filling

The stick feeder occupies 6 feeding slots and is commonly used on a SPR and TPR.

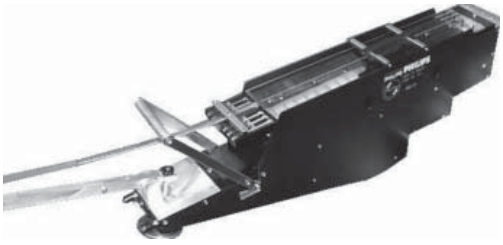


*Figure 23* *Stick feeder*

The stick feeder has the following available top plates:

| Description | Lanes | Lane width | Lane depth | Front stop | Max. comp length |
|---|---|---|---|---|---|
| Top plate SO IC 14/16 | 6 | 6.5mm | 2.4mm | Adjustable | 9-11mm |
| Top plate SOL IC 16/20/28 | 4 | 10.8mm | 3.0mm | Adjustable | 11-20mm |
| Top plate SOM IC 14/16/20 | 4 | 8.2mm | 2.4mm | fixed | 16mm |
| Top plate SOJ 20/26 | 4 | 9.1mm | 4.1mm | fixed | 19mm |
| Top plate SOJ 28/32 | 4 | 9.1mm | 4.1mm | fixed | 23mm |
| Top plate SOJ 24/32 | 3 | 11.6mm | 4.1mm | fixed | 23mm |
| Top plate SOJ 36/44 | 3 | 11.6mm | 4.1mm | fixed | 30mm |
| Top plate PLCC 18 | 4 | 8.6mm | 4.1mm | fixed | 13mm |
| Top plate PLCC 20 | 4 | 10.2mm | 4.95mm | fixed | 12mm |
| Top plate PLCC 28/32 | 4 | 12.8mm | 4.95mm | fixed | 16mm |
| Top plate PLCC 44 | 3 | 18.0mm | 4.9mm | fixed | 20mm |
| Top plate PLCC 52 | 2 | 20.4mm | 5.0mm | fixed | 22mm |
| Top plate PLCC 68 | 2 | 25.5mm | 5.1mm | fixed | 26mm |
| Top plate PLCC 84 | 2 | 30.4mm | 5.1mm | fixed | 31mm |
| Top plate PLCC 100 | 1 | 35.7mm | 5.0mm | fixed | 36mm |
| Top plate Generic | n.a. | 68.0mm | 5.0mm | fixed | 70mm |

*Table 19*

To meet the component demands of tomorrow the generic top plates provide the quickest solution. The generic top plate can also handle all components that cannot be processed by the standard range of available top plates. Specifications of the generic top plate can be found in table 20.

| Generic top plate specifications | |
|---|---|
| Maximum tube width | 68mm |
| Maximum tube height | 6.3mm (~height of regular PLCC tube) |
| Maximum tube length | 430mm (Jedec Default. Longer is possible, but is outside tested Jedec range) |

*Table 20*

### 10.2.1 Single lane stickfeeders

Single lane stickfeeders are available upon request.

## 10.3 Jedec tray stacking

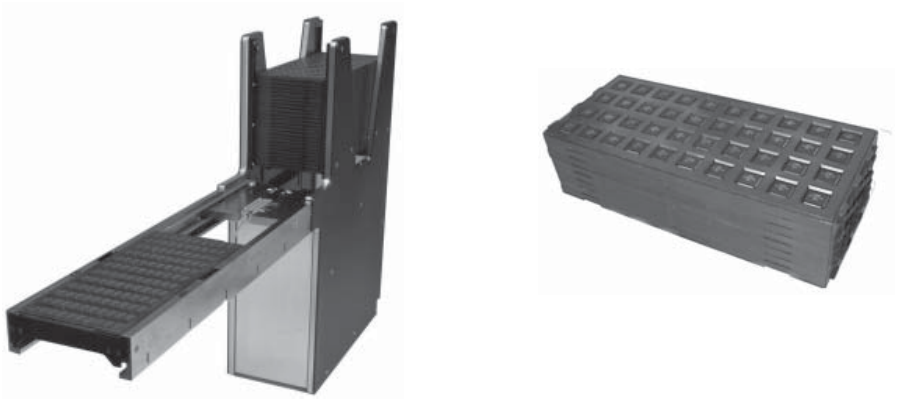


*Figure 24* *Jedec tray stacker and a stack of Jedec trays*

The Jedec Tray stacker will only fit:
a) on the Auxiliary Feeder Trolley
b) on a TPR

The Jedec Tray Stacker is an excellent solution for high volume feeding of 1 and/or 2 tray parts and makes it therefore and excellent solution for high volume placement of IC's for DRAM or shields (when supplied in tray).
The stacking mechanism of the feeders virtually eliminate tray setup and replenishment. As the Jedec Trays can be stacked, up to 30 trays can be placed in the feeder within 30 seconds. Meaning a setup time of 1 second per tray. Due to the high volume nature of the parts from tray the (visible) stacking mechanism takes care that replenishment is only performed once in a while (depends on the number of components per tray).
Example: If a tray holds average 100 components, a tray stacker can hold up to 30 of these trays = 3000 tray components. If camera aligned on the TPR (6,000 cph), a tray replenish action only takes place every 30 minutes (for about 30 seconds).

Benefits:
- Clear operator visibility on stack
- No pallet setup times
- Replenishment on the fly
- Ideal for high volume IC shooting

| Jedec tray stacker specifications | |
|---|---|
| Number of unique code numbers | 1 |
| Maximum number of trays | 30 thin Jedec trays<br>20 thick Jedec trays |
| Maximum number of Jedec tray stackers on TPR | 2 |

*Table 21*

## 10.4 Re-use feeder

Re-use feeders take care that rejected components can be transported out of the AX working area without interrupting the AX production. The main purpose for transporting components out of the working area is to be able to fetch the rejected component, correct it and re-use it by:

a) Using it at a re-work station
b) Placing it back in its packaging (usually tray).

Re-use feeders can be used in combination with tape feeders and is recommended in combination with a Jedec Tray Stacker.

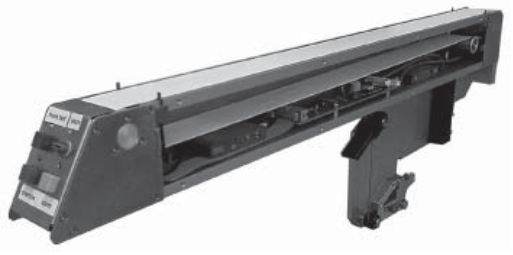


*Figure 25* *Re-use feeder*

## 10.5 OEM feeders

The following OEM feeders are tested on form, fit and function on the A-Series equipment, but restrictions may apply.

### 10.5.1 Pre-printed label feeders

These feeders are Hover Davis design and can only be purchased at HD agents. The label feeder will only fit an SPR and TPR, with no restriction on the TPR. Most labels will require a special nozzle and require camera alginment.

SPR restriction: The pick reach of the AX is limited. The label feeder is equiped with a custom made presentation module (will fit the label and its liner). The longer the label becomes, the longer this unit becomes and the pick position of the label will move backwards (possibly out of the system pick reach).

Please contact Assembléon first before using this feeder on a default SPR robot.

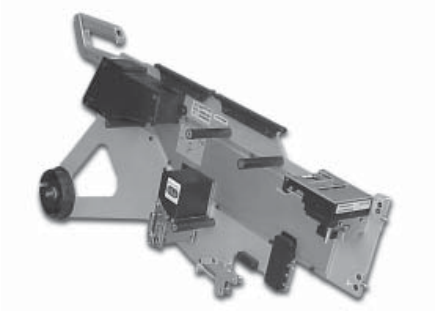


*Figure 26* *Pre-printed label feeder*

# 11 Feeding options

## 11.1 Offline feeder storage cart

*Figure 27* *Offline feeder storage cart*

The offline feeder storage cart takes care of safe storage of ITF2/3 interface type feeders. The cart also hosts storage for reels as well as splice materials and the tape loading unit.

| Specifications feeder storage cart | |
|---|---|
| Standard feeder storage cart | |
| - Number of 8mm storage slot | 50 |
| - Number of 8mm reel storage slots | 100 |

*Table 22*

## 11.3 Tape loading units

The offline tape loading unit is an electrical powered unit that fits one feeder. It contains mounting holes that fit the feeder storage cart or to be mounted onto any flat surface.
The inline loading unit is a handy inline feeding loading station that can be mounted on any empty feeder slot on a system. The unit fits one feeder of any width and reels can be loaded/unloaded and can be programmed at the machine.

*Figure 28* *Tape loading units (offline and inline)*

## 11.4 Tape slicing tools

Two tape splicing tools are available within Assembléon. One for tape sizes 8 to 24mm, which contains also tape scissors, and one splice tool holder, specifically for 8mm tapes.
Splice tape should be ordererd locally.

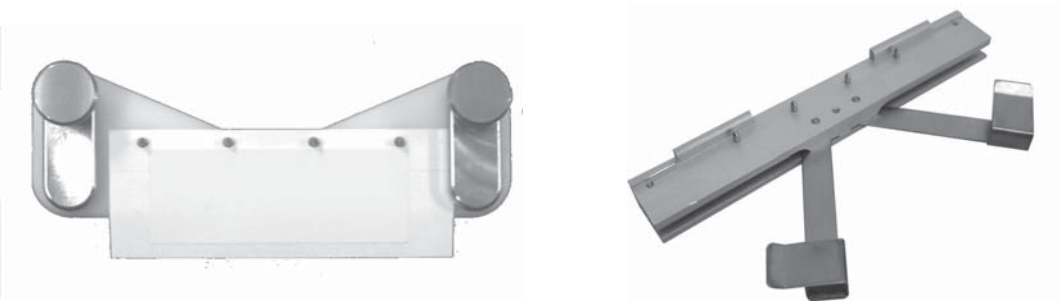


*Figure 29* *Tape splice tools*

## 11.5 Feeder service tooling

Feeder service tooling allows quick and easy offline analysis, repair and verification with fast return of modules to operation.

| Feeder service ooling | | Serviceable articles |
|---|---|---|
| ITF-TTF Analysis Tool | | ITF2 Tape feeders,<br>ITF3 Tape feeders,<br>TTF Tape feeders |
| ITF-TTF Calibration Tool | | |

*Table 23*

## 12 Installation requirements

| | AX-501 | AX-301 |
|---|---|---|
| Maximum height (incl. light tower) | 1,905mm (+25/-0 SMEMA) | 1,905mm (+25/-0 SMEMA) |
| Topside standard placement robot | 1,290mm (+25/-0 SMEMA) | 1,290mm (+25/-0 SMEMA) |
| Board transport | 940mm (+25/-0 SMEMA)<br>885mm (+30/-0 Japanese height) | 940mm (+25/-0 SMEMA)<br>885mm (+30/-0 Japanese height) |
| Ambient temperature | 15-35°C functions guaranteed<br>20-28°C specifications guaranteed | 15-35°C functions guaranteed<br>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 supply without transformer:<br>Voltage configuration<br>Nominal mains voltage ± 10 %<br>Correspondending full load current<br>Corresponding external fuse<br>External fuse type<br>Frequency<br>Inrush current | <br>3-phased, neutral and ground<br>400 Volt<br>10 Amp.<br>16 Amp.<br>Slow-blow “D-type”<br>47-63 Hz<br>≤ 150 Amp. (5 msec) | <br>3-phased, neutral and ground<br>400 Volt<br>7 Amp.<br>16 Amp.<br>Slow-blow “D-type”<br>47-63 Hz<br>≤ 150 Amp. (5 msec) |
| Power supply with transformer:<br>Voltage configuration<br>Nominal mains voltage ± 10 %<br>Correspondending full load current<br>Corresponding external fuse<br>External fuse type<br>Frequency<br>Inrush current | <br>3-phased and ground<br>208, 230, 400, 480 Volt<br>19, 18, 10, 8 Amp.<br>20, 20, 16, 16 Amp.<br>Slow-blow “D-type”<br>47-63 Hz<br>≤ 150 Amp. (5 msec) | <br>3-phased and ground<br>208, 230, 400, 480 Volt<br>14, 13, 7, 6 Amp.<br>16, 16, 16, 16 Amp.<br>Slow-blow “D-type”<br>47-63 Hz<br>≤ 150 Amp. (5 msec) |
| Power rating | 7 kVA | 5 kVA |
| Air supply | 6-8 bar, 200 Nl/min | 6-8 bar, 120 Nl/min |
| Width including trolleys | 2,285mm | 2,285mm |
| Length | 3,720mm | 2,760mm |
| Weight (excl. trolleys) | <3,200 kg | <2,500 kg |

*Table 24*

## 13 New Product Introduction (NPI)

New Product Introduction (NPI) tools ensure the successful transfer of new products or introduction of new products. NPI software ensures the reduction of time between receiving BOM and CAD data and running actual production.

Assembléon's partners together with Mentor and Tecnomatix for front-end data preparation tools. These tools take care that the route from receiving BOM data towards the generation of a program is done error free in the most efficient manner. Supported by Assembléon optimizers the outcome of the programs are always within 5% accuracy of reality, providing you with extreme high production predictability. To manage all exisiting programs and parts within the factory and avoiding existing items to be created twice, a product library manager is available that seamlessly works together with our partners data preparation tools.

### 13.1 Assembléon optimizers

The Assembléon optimizer takes care that all programs are calculated within 5% accuracy. The optimizer is always updated with latest products and improved processes of the AX pick and place systems. The optimizer supports A-Series lines.

### 13.2 Front end: vPlan-Lite

Assembléon Data Preparation and Programming vPlan-Lite:
This stand-alone front-end application supports A-Series production lines, and A-Series lines combined with other Assembléon end of line solutions. Additionally it is capable of importing Assembléon PP's, MG-YGX files, Centroid files and BOM. It has an extensive shape library, including system process data which it can synchronize with the Assembléon Product Library Manager. vPlan-Lite is a light and cost effective version of the upsell possibility towards the full vPlan.

vPlan-Lite optimizes in:
- Best output single setup
- Single family setup

Additionally, vPlan lite supports the following options (see also next sections)
- Input and reverse gerber engineering
- CAD importer packages
- Virtual Sticky tape

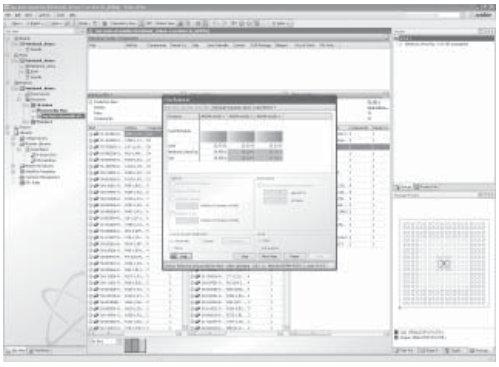


*Figure 30* *vPlan-Lite*

### 13.2.1 Input and reverse gerber engineering

This tool guides the user in the fastest possible way from gerber data to centroid data (coordinates). When shapes are known, this tool can automatically map the right shape to the right location. Also, when the gerber data has a electrical reference indicator layer, it can automatically link the correct component (from BOM data) to this location so that programs are created in the fastest possible way.

*Figure 31* *Input and reverse gerber engineering*

### 13.2.2 CAD importer package

This package contains the worlds most leading CAD format converters. For information on converting any other format, please contact Assembléon. This CAD importer package contains the following converters:
Altium designer, Altium P-CAD, Allegro, OrCAD Designer, OrCAD Layout, Mentor Board Station, Mentor Power PCB, PADS Perform, PDIF, Zuken Cadif, Zuken PWS, Zuken BD.

*Figure 32* *CAD importer package*

### 13.2.3 Virtual sticky tape

In order to create zero defect programs, the virtual sticky tape option guides you through a virtual 'real' production run. An image of the PCB can be displayed as background to check the shape of the component as portrait onto the PCB. Virtual stick tape checks on X and Y offset, rotation, polarity and pin-1 location.

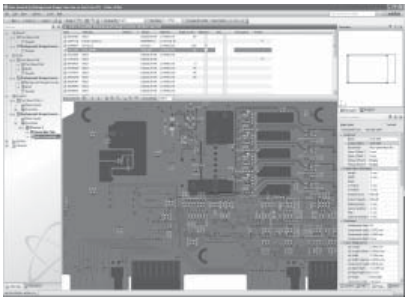


*Figure 33 Virtual sticky tape*

## 13.3 Product Library Manager (PLM)

PLM is a central management system that deals with versioning and authorization. It makes sure that programs and process data is defined only once and managed centrally. PLM helps in:

- Define programs and parts only once
- Central parts management
- Central program management
- Central Product Validation & Authorization
- Releasing of products and parts on line and factory level
- Central Line Definitions
- Faster ramp-up and repeatability
- Synchronization of parts, tray and process data to vPlan Lite
- Synchronization of parts and tray data to PPS-Pro+
- Downloading of Programs by offline editors and Setup Assistant

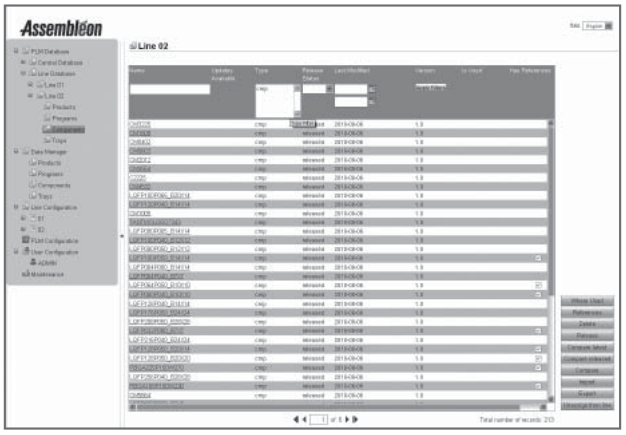



*Figure 34 Product Library Manager (PLM)*

## 14 Manufacturing Execution Systems (MES)

A manufacturing execution system (MES) is a control system for managing and monitoring work-in-process on a factory floor. An MES keeps track of all manufacturing information in real time, receiving real-time data from machine and employees. Manufacturing execution systems are increasingly being integrated with enterprise resource planning (ERP) software suites. The goal of a manufacturing execution system is to improve productivity and reduce cycle-time, the total time to produce an order. By integrating an MES with ERP software, factory managers can be proactive about ensuring the delivery of quality products in a timely, cost-effective manner.

## 14.1 Setup assistant

### 14.1.1 Setup assistant (SA) online

Setup Assistant online is the basis for zero defect setups and setup monitoring during production. It contains a variety of fail save mechanisms to ensure always a correct setup.

Features of SA are:

- Error free setups
- Own GUI with Setup Information and Feeder replenishment information
- Provides the data set for traceability data
- Contains a material database for component consumption and interface to external systems
- Assists in fast, operator guided, setups and change-overs
- Contains a second source list for alternate suppliers – at line level
- Monitors Reel Expiration date
- Wide range of forced rescan options for fail safe setups during production

*Figure 35 Setup assistant (SA) online*

### 14.1.2 Setup assistant (SA) offline

Setup assistant offline supports fast trolley changeovers to reduce the changeover time inbetween (family) programs. It aides in preparing trolleys offline. Except for monitoring production (as it is offline) it holds the same benefits as Setup Assistant online. The Setup Assistant Offline contains a loading unit station where tapes and trolleys can be connected to for offline preparation. Feeders can also be unloaded where a label with remaining quantities can be placed back onto the reel.

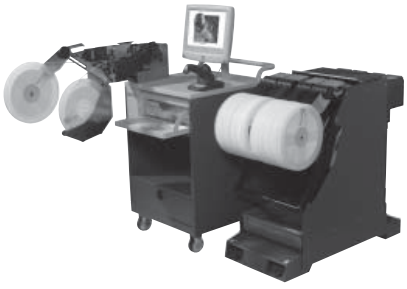


*Figure 36 Setup assistant (SA) offline*

### 14.1.3 Setup assistant extension

The Setup Assistant Extension extends the possibilities of the standard Setup Assistant. It contains a incoming material database which provides incoming reels with an Unique Reel-ID. This Unique reel-ID is a basis for fail save traceability data. The material database is connected to Setup Assistant and monitors and registers the component consumption of each reel. This database can be connected to an ERP for warehousing.

Setup Assistant Extension has the following features:
- Incoming parts registration
- Unique reel-ID Labelling (required for warehousing, recommended, but not required for traceability)
- RoHs, Approved Vendor List (AVL) compliency and component blocking control
- Component consumption registering

Setup Assistant Extension requires the following set of products in order to connect and function:
- Setup Assistant Online
- Performance Data Interface or Traceability Data Interface (both license per machine)
- Material Site License (only once per site)
- Assembléon MES adapter (to connect to the central Shopfloor manager). License per machine

**Note:** for parts warehousing, unique reel-ID is required

*Figure 37* *Setup assistant extension*

### 14.1.4 Moist Sensitive Device (MSD) control

MSD control is an extension to the Setup Assistant Extension package. Components are monitored on how long they are exposed on the line. By clear color code indications, the MSD screen shows when action is required.

## 14.2 Traceability

*Figure 38* *Traceability*

### 14.2.1 Work order traceability and reporting

Work order traceabiltiy traces data linked to work order numbers and contains a reporting function.

Traceability requires the following set of products in order to connect and function:
- Setup Assistant Online
- BI scanner (to be purchased locally)
- Traceability Data Interface (license per machine)
- Assembléon MES adapter (to connect to the central shopfloor manager). License per machine

**Note:** traceability does not require unique reel-ID

### 14.2.2 PCB traceability and reporting

PCB traceabilitiy extends the trace data from work order to reference designator level and contains a reporting function.

- PCB traceability requires Work Order Traceability in order to function.

### 14.2.3 Performance monitoring

Improve machine, line and changeover performance by identifying the bottleneck equipment/ process in the line for the operators and identifying where productivity is wasted caused by machine errors. It contains a line monitor and changeover dashboard.

Monitoring Dashboard Facts:
- Improve machine and line performance by identifying the bottleneck equipment in the line for the operators and identifying where productivity is wasted caused by machine errors.
- Follow up and remove reasons for performance drops.
  Minimize material waste and scrap

Changeover Dashboard Facts:
- Identifies deviations from your changeover targets and investigates reasons for drops in change-over performance.
- Initiates follow-ups on change-over improvements

Performance Monitoring requires the following set of products in order to connect and function:
- Performance Data Interface (license per machine)
- Performance Monitor web service license (only once per site)
- Assembléon MES adapter (to connect to the central Shopfloor manager). License per machine

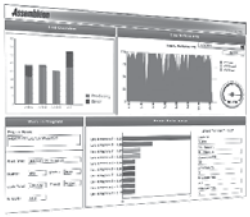


*Figure 39 Performance monitoring*

## 14.3 Feeder maintenance monitoring

Feeder maintenance monitoring allows feeders to stay in top shape and therefor in top performance. By defining a fixed maintenance interval that suites your production environmental conditions, feeders are identified on the system or offline loading unit that their maintenance is due. The web-based feeder maintenance software can also be connected to the feeder service tools.

*Figure 40* *Feeder maintenance monitoring*

## 14.4 Board identification

Feeder maintenance monitoring requires the one of the following products in order to function:

- Offline setup assistant 5.2 or higher
- Inline setup assistant 5.2 or higher

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<br>2D: to ISO/IEC 16022 |
| Codes | • CODE39<br>• 2/5 Interleaved<br>• CODE128<br>• Data matrix ECC200 |

*Table 25*

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

*Table 26*

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

## 14.5 Data interfaces

Assembléon's data interfaces integrate fully with Valor's MES.
However, Assembléon provides an 'Assembleon Interface Document' describing the protocol of the Performance, Traceability and Material data interfaces. This allows the AX systems to be able to connect to any other external MES environment or application.
Assembléon's data interfaces are structured CAM-X files/messages according IPC standards 2541, 2545 and 2551.

## Appendix A

| 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)<br>Placement force > 2N |
| L4 | | • | Length=1.6-3.2mm, width=0.8-2.5mm (e.g. 0603-1206)<br>Placement force > 2N |
| L5 | | • | Length=3.2-10.0mm, width=1.6-6.6mm (e.g. 1206-2516, SO14-SO16) |
| 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<br>(e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, TANT) |
| L8 | • | • | Length=10-17.5mm, width=10-17.5mm<br>Max. component height 10.5mm<br>(e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC) |
| V1 | • | • | Length=-5-10mm, width=5-10mm (e.g. SO8-SO16L, SSOP20-SSOP28) |
| V2 | • | • | Length=6-14mm, width=6-14mm<br>(e.g. SO16-SO16L, SO20-SO28L, VSO40-VSO56, SOP20-SOP56) |
| V3 | • | • | Length=3.0-5.0mm, width=3.0-8.0mm<br>(e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC) |
| V4 | | • | Length=8.0-24.0mm, width=4.0-10.0mm<br>(Connectors, maximum height 6.3mm) |
| V5 | | • | Length=10.0-24.0mm, width=10.0-24.0mm<br>Max. component height 6.3mm (e.g. black, medium L8) |
| V6 | | • | Length=10-45mm, width=10-45mm<br>Max. component heigth 4.3mm (e.g. black, long L8) |
| V7 | • | • | Length=5.2-17.5mm, width=3.2-17.5mm<br>(e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC) |
| V8 | • | • | Length=8.0-17.5mm, width=4.0-10.0mm<br>(Connectors, maximum height 10.5mm) |
| V9 | • | • | Length=3.0-5.0mm, width=3.0-8.0mm<br>(e.g. BGA, SO, SOJ, SSOP, TSSOP, VSO, QFP, PLCC) |

*Table 27*

Special nozzles are available on request.