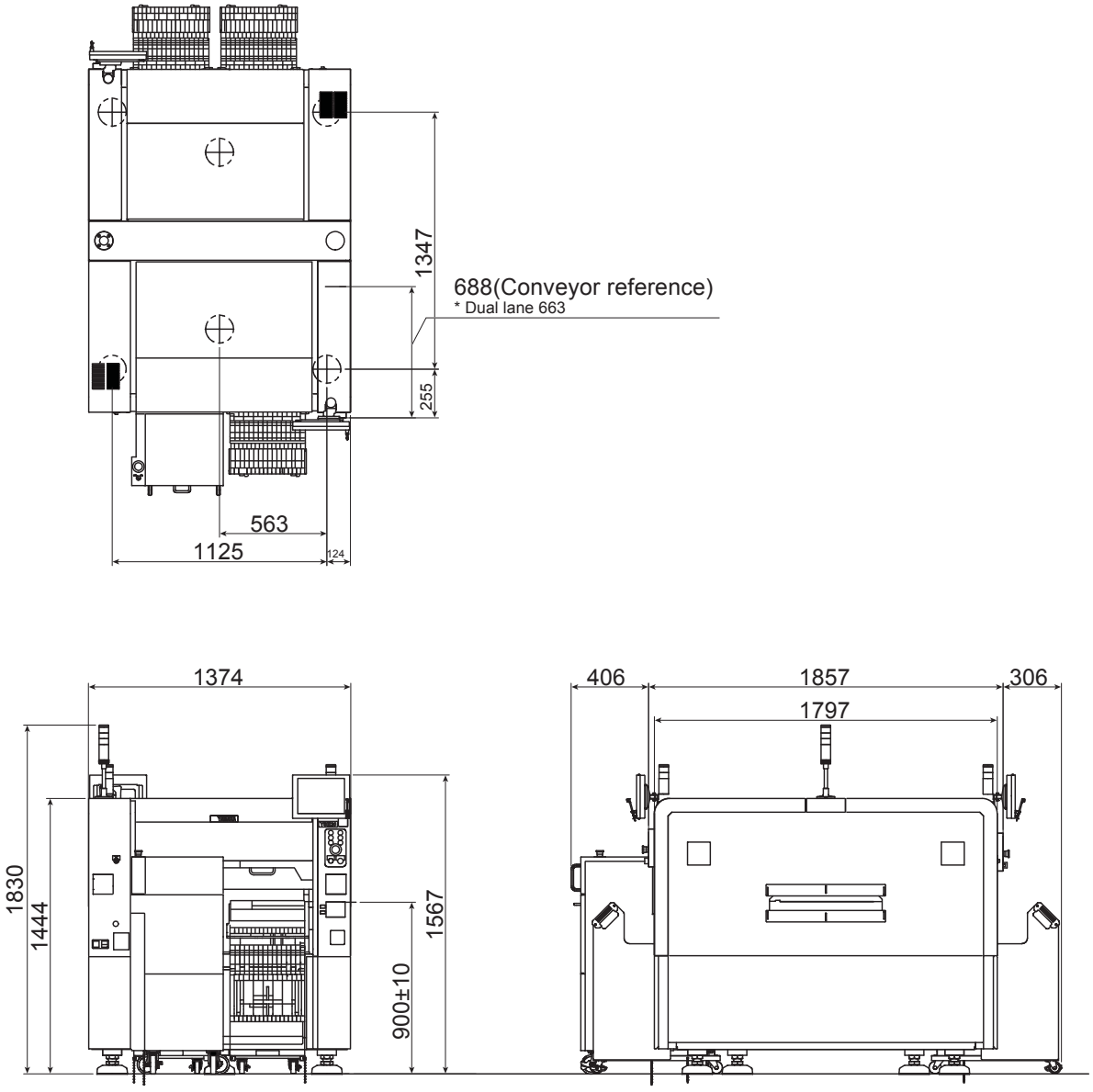
General Contents

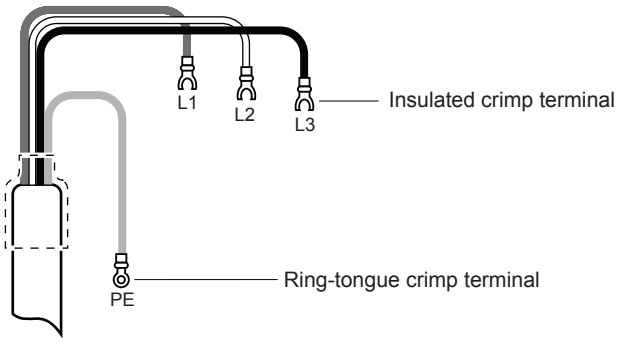
11. Specifications

11.1 Major specifications

Outside dimensions	L 1,374x W1,857 x H1445 mm (Main unit only)
Weight	Approx. 2,100kg （Main unit only） Approx. 70kg (32-feeder exchange carriage) Approx. 160kg （cATS10)
Noise to be generated	78dB (A) or less

* The dimensions exclude any removable projecting parts.
* For detailed dimensions or dimensions with various options installed, see the figure below.
* The following figure shows the machine with various options installed, such as feeder exchange carriage.



Air supply source	0.45 MPa or more (4.5 kgf/cm^2 or more), clean and dry air * To maintain a sufficient air flow rate, prepare a supply air hose with an inside diameter of 8mm or more. * Supply the air with excellent quality that has passed through the air dryer and air filter on the line side of the air supply source. (The air filter built-into this machine is intended to protect the machine. To maintain the function and performance of this machine at their optimal levels for an extended period of time, the air must be kept clean and dry on the line side of the customer's air supply source.)
Power supply	Power requirement: 3-phase AC power, 200/208/220/240/380/400/416 V ±10% Frequency: 50Hz/60Hz Power capacity: 13.9kVA Average power consumption: 1.79kW (under standard operating conditions)
Power supply connection	Power cable conductor cross-section area: 10mm ^{2} or more.  * To prevent electric shock accidents, make sure that the power source is shut down securely before connecting the power cable. * Connect the main body grounding cable securely. * L1, L2, and L3 show the 3-phase AC power cables and PE shows the grounding cable.

Environmental conditions	Temperature	Function assurance: 15 to 35°C Accuracy assurance: 20 to 28°C
	Humidity	Allowable range: 20 to 80% (No condensation) Optimal range: 50 to 60% * Keep a humidity of approx. 40% or more as static electricity prevention measures. * When using an industrial humidifier, use water equivalent to DI water.
	Transient voltage category	category III
	Pollution degree	degree 2
	Atmosphere	There shall be no dirt and dust. There shall be no organic solvent vapor, sulfurous acid gas, chlorine gas, and flammable gas.
	Altitude	1,000 m or less above sea level * This avoids that the air pressure or cosmic ray adversely affects the insulation performance.
	Installation floor conditions	The floor withstanding load capacity shall be approx. 850kg/m^2. * For the floor withstanding load capacity, consult the specialists who know the installation place well with the information on equipment weight, floor sharing area, and adjuster foot positions. * The floor shall be flat and have sufficient strength so that it does not vibrate during operation. The floor shall have the concrete strength or its equivalent. In particular, wooden floor, office floor, and grating are not allowed to use. * If the floor is not concrete, consult the specialists who know the installation place well and construct the reinforcement work for the portions where the equipment adjuster feet are placed. * When the feeder exchange carriages are used on the front right and left and the rear right and left, a flatness of 10mm or less is required for the floor including the portion immediately below this equipment.
	Ambient noise	There shall be no significant noise. Equipment warning beep should be heard without fail.
	Ambient light	Strong light such as sunlight does not enter the vision system (optical image processing system).
	Noise immunity	See “10.7 CE marking”.
	Noise emission	See “10.7 CE marking”.
Board transport height	900mm ±10mm (From the floor surface to the upper surface of the conveyor belt)	
Input data	Number of mounting points	12,800 points (Note that the number of mounting points decreases depending on the number of boards, the number of blocks, or the number of fiducial marks.)
	Component types	255 types / board
	Board data	100 MB / unit
	Number of fiducial marks	128 sets / board
	Data entry method	Data entry unit supplied with the machine main unit
Positioning resolution	X-axis / Y-axis / Z-axis	0.001mm
	R-axis	0.001°
External interface	LAN*, 1 port (See “7.8 Network” and “7.9 Anti-virus measures”.)	
Internal memory	Built-in 4GB flash card *, 1 pc. * For storage of files, such as OS, mounter application software, board data, component data, vision data, machine information, and production history information, etc.	
External memory	USB flash memory with a capacity of 8GB or more *, 1 pc. (Supplied as standard accessory: For data backup)	

11.2 Mounting capability

90kCPH (0.040 sec/CHIP) *YAMAHA optimal conditions

The mounting capability when using the customer's boards and components can be estimated (calculated) by using the following tools. Consult with YAMAHA for details.
-1- Simple tact simulation program
-2- YAMAHA SMT line support software Y.FacT / P-Tool

11.3 Mounting accuracy

When using YAMAHA standard components for evaluation, test board, and two-faced adhesive tape.

CHIP components	±0.035mm	(±0.025mm)	Cpk ≧ 1.0 (3σ)
QFP components	±0.035mm	(±0.025mm)	Cpk ≧ 1.0 (3σ)

11.4 Compatible components

Components for which normal mounting can be expected when all conditions are good

The mounting capability of this machine is significantly affected not only by the machine performance, but also by various conditions such as the components and boards. Determining whether or not a given component can be mounted requires a test operation with an actual sample of the component in question. Some guidelines for compatible components are given in the table below.
(Factors which determine whether or not a component can be used include the following: electrode lead's bend, lift and optical surface condition, ball electrode's deformation and height variations, background color, glossiness condition, component's weight, pickup nozzle's contact surface condition, and board warp, etc.)

Component type	Typical component size	Remarks
Square chip components Cylindrical chip components Mini-mold transistors Power transistors Aluminum electrolytic capacitors, etc.	0.3 x 0.15mm to 8 x 8mm	
Lead electrode components (SOP, SOJ, QFP, etc.)	5 x 4.5mm to 20 x 20mm	Minimum lead pitch: 0.4mm or less (0.22mm gap for a reference lead width of 0.18mm)
	20 x 20mm to 32 x 32mm	Minimum lead pitch: 0.5mm or less (0.28mm gap for a reference lead width of 0.22mm)
	32 x 32mm ～ 45 x 45mm (45mm to 55mm when custom FM head is used)	Minimum lead pitch: 0.65mm or less (0.35mm gap for a reference lead width of 0.30mm)
Ball electrode components (BGA, etc.) * Consult us for CSP with micro-ball electrodes.	Up to 20 x 20mm	Reference: Minimum ball diameter is 0.18mm or larger Reference: Minimum ball pitch is 0.3mm or larger
	20 x 20mm to 32 x 32mm	Reference: Minimum ball diameter is 0.22mm or larger Reference: Minimum ball pitch is 0.37mm or larger
	32 x 32mm to 45 x 45mm (45mm to 55mm when custom FM head is used)	Reference: Minimum ball diameter is 0.30mm or larger Reference: Minimum ball pitch is 0.5mm or larger
Odd-form components such as connectors, etc.	Up to 45 x 100mm	Consult us for each component.

* When handling components with a size up to 8 x 8mm and a thickness up to 6.5mm, the HM head can be used with a scan recognition camera (with coaxial lighting).
* When handling components with a size exceeding 8 x 8mm and a thickness exceeding 6.5mm, the HM head requires a multi-view camera (option).
* The FM head can be used with a multi-view camera (standard).

11.5 Component height & mounting restrictions

11.5.1 Height of mountable components

The following describes the height of the components that can be mounted (on the upper side of the board).
High-seed multi (HM) head: 15mm or less
Flexible multi (FM) head: 28mm or less

* If different heads are installed on the YSM20-2, the height of the mountable components will be the minimum value among the maximum component thicknesses of each mounting head.

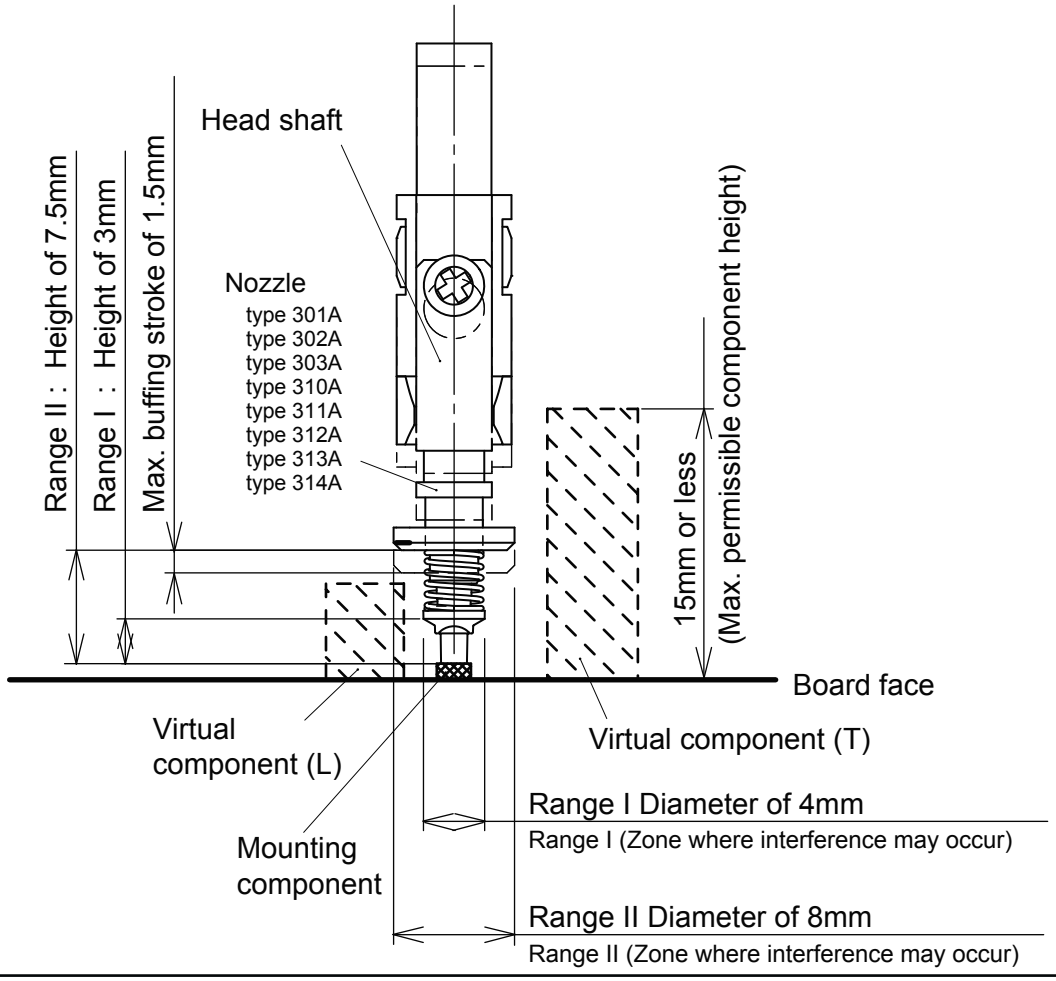
11.5.2 Mounting restrictions

The correct mounting may not be established according to the relationship between the component size/ height and the nozzle shape.

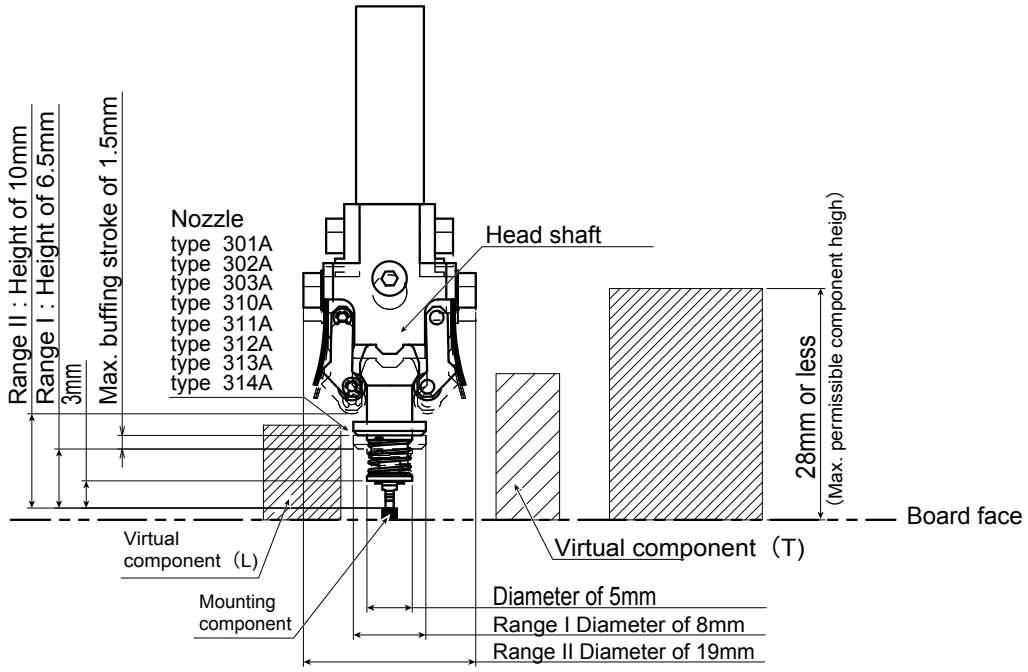
* In the figure below, since the virtual component (L) is located on the outside of the range I, the correct mounting is established. If this component is located on the inside of the range, interference may occur.
* In the figure below, since the virtual component (T) is located on the outside of the range II, the correct mounting is established. If this component is located on the inside of the range, interference may occur.
* An area where any component cannot be mounted may arise around the components that have already been mounted before carrying into this machine in the same manner as described in the figure below.
* The component presence is not permitted in an area of 3mm from both ends in the transport direction.

support system, programming tool "P-Tool", is prepared to take measures against restrictions on mounting, such as possibility of interference as described above. Please order this tool. See “3. Arrangements/ -4- Support systems”.

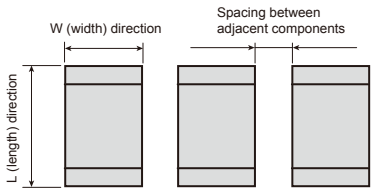
HM Head



FM Head



11.6 Component mounting restrictions



Mountable components ("mm" size)	Spacing between adjacent components			
	Standard 30X nozzles		Standard 31X nozzles	
0603 square chips (L0.6 x W0.3mm)	301A nozzle	0.35mm or more	311A nozzles	W-direction 0.15mm or more
1005 square chips (L1.0 x W0.5mm)			312A nozzles	W-direction 0.15mm or more

* The above values apply under YAMAHA standard conditions (when using YAMAHA standard evaluation test board, standard components, and two-faced adhesive tape).
* The above values may not be obtained depending on the shapes and dimensions of tape reels and components.
* A mounting space smaller than those shown above requires a custom nozzle (consult us).

11.7 Compatible board dimensions

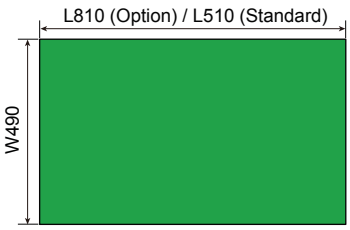
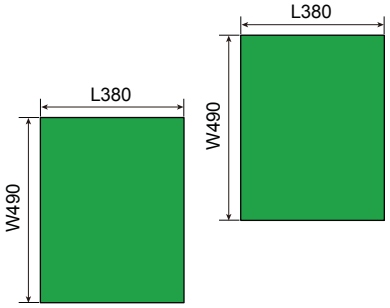
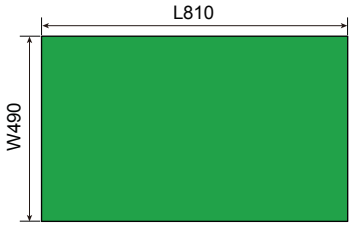
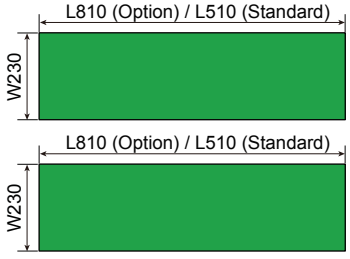
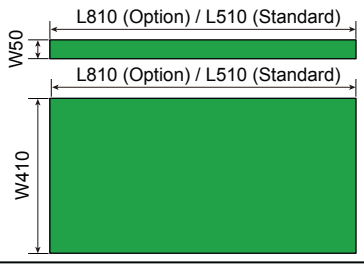
YSM40-2

L50 x W50 (min.) to L810 x W 490 (max.) [dual-stage and single lane model]
When a “YAMAHA dual-lane system” is installed, the above maximum dimensions change as follows:
(A) W230mm (max.) for two same boards
(B) Or, W410mm (max.) + W50mm (min.) [tradeoff relationship] for two different boards

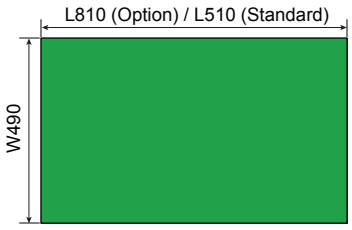
YSM40-1

L50 x W50 (min.) to L810 x W 490 (max.) [single lane model]
* "L" is a direction along the transport direction while "W" is a direction perpendicular to the transport.
* Maximum dimensions are illustrated below.

YSM20-2

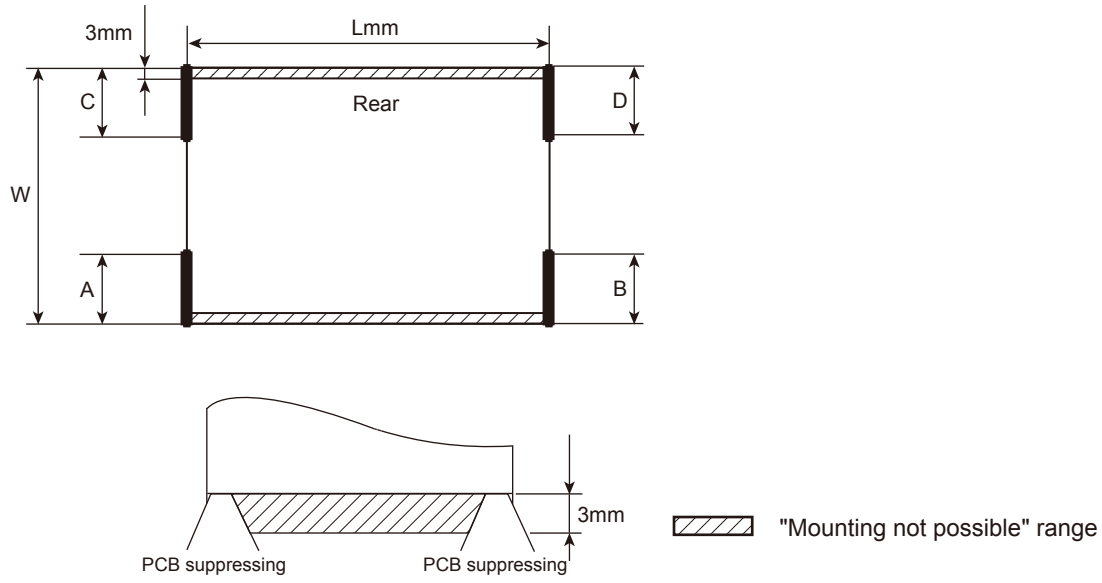
<table>
<tr><td colspan="3">Single lane model ====> [SL]</td></tr>
<tr><td colspan="2">Machine layout type
(See “14. References and details” B0001.)</td><td>Maximum L & W dimensions</td></tr>
<tr><td>#001
#002
#003
#004
#005
#006
#007
#008</td><td>#011
#012
#013
#014
#015
#016
#017
#018</td><td> 
</td></tr>
<tr><td colspan="3">Dual-stage model ====> [DS]</td></tr>
<tr><td colspan="2">Machine layout type
(See “14. References and details” B0001.)</td><td>Maximum L & W dimensions for dual-stage transport</td><td>Maximum L & W dimensions for single-stage transport</td></tr>
<tr><td>#009
#00A
#00B
#00C
#00D
#00E
#00F
#00G</td><td>#019
#01A
#01B
#01C
#01D
#01E
#01F
#01G</td><td> 
</td><td> 
</td></tr>
<tr><td colspan="4">YAMAHA dual-lane system (dual-stage model) ====> [DL]</td></tr>
<tr><td colspan="2">Machine layout type
(See “14. References and details” B0001.)</td><td>Maximum L & W dimensions when transporting two same boards</td><td>Maximum L & W dimensions (PCB on one side) when transporting two different boards</td></tr>
<tr><td>#00H
#00J
#00K
#00L
#00M
#00N
#00P
#00R</td><td>#01H
#01J
#01K
#01L
#01M
#01N
#01P
#01R</td><td> 
</td><td> 
</td></tr>
</table>

YSM20-1

Single lane model ====> [SL]		
Machine layout type (See “14. References and details” B0001.)		Maximum L & W dimensions
#001	#011	
#002	#012	
#003	#013	
#004	#014	
#005	#015	
#006	#016	
#007	#017	
#008	#018	

11.8 Unmountable areas on board

As illustrated below, the board includes areas where no components can be mounted due to the interference with the conveyor rail, particularly with the board clamp claws.
Additionally, 30mm-straight zones expressed by “A” to “D” are required for the board edge to halt against the stopper. The stopper is installed at a position of "A" to "D" depending on the machine configuration determined by the conveyor type, board transport direction, and conveyor reference.



Dual-line & single-lane model

A : Right-to-left transport and front conveyor reference
B : Left-to-right transport and front conveyor reference
C : Right-to-left transport and rear conveyor reference
D : Left-to-right transport and rear conveyor reference

* Rear conveyor reference is a special order item.

Dual-line model

A : Right-to-left transport for front conveyor
B : Left-to-right transport for front conveyor
C : Right-to-left transport for rear conveyor
D : Left-to-right transport for rear conveyor

* Rear conveyor reference is a special order item.

11.9 Compatible board thickness

0.4 to 3.0mm

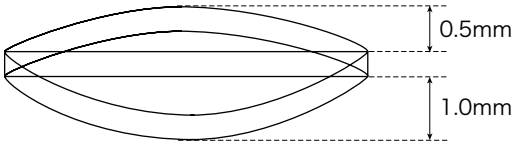
11.10 Compatible board weight

0.65kg or less per sheet
* Consult us for board weights exceeding 0.65kg.

11.11 Recommended board material

Glass fiber reinforced epoxy resin
* Consult us for other materials.

11.12 Allowable board warp



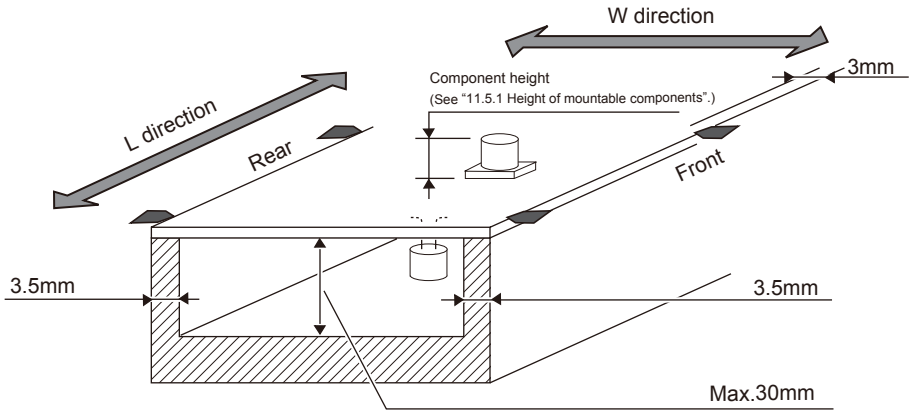
Upward warp: 0.5mm or less
Downward warp: 1.0mm or less

* Warps which exceed the above values (particularly the upward warp) may significantly reduce the component mounting accuracy. An excessive warp may cause interference with the head, nozzle, or camera, so use caution.

11.13 Board slits and holes

The conveyor is equipped with sensors (light transmission type) to check the position of boards being conveyed. The position of the boards may not be detected correctly if they have slits and holes. Consult us when using such boards.

11.14 Restrictions on mounting components on boards



Upper side of board: See “11.5.1 Height of mountable components”.

* No components can be placed in areas of 3mm from both ends in the board transport direction.
  See also the figure in “11.8 Unmountable areas on board”.

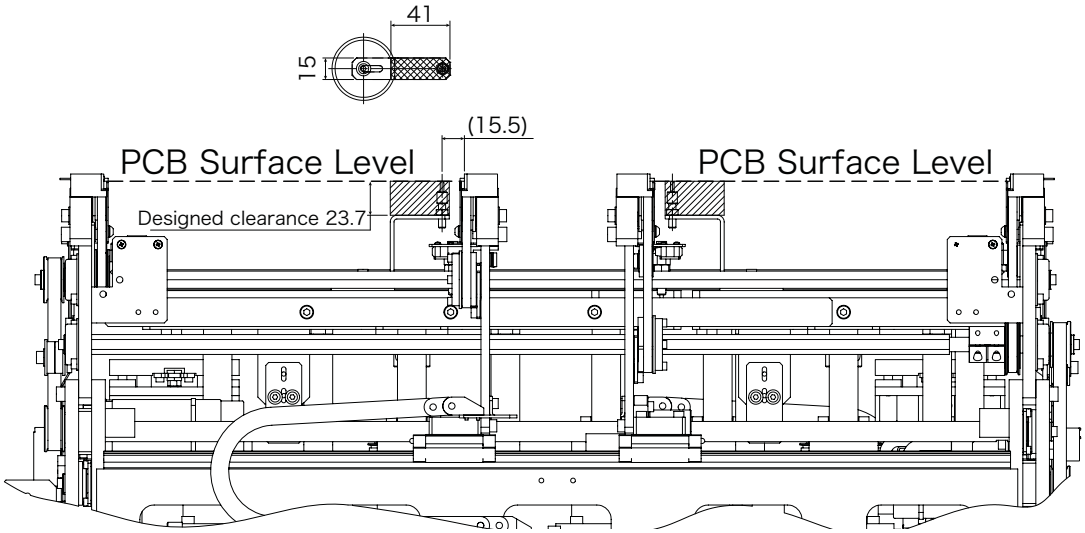
Back side of board: 30mm or less

* No components can be placed in areas of 3.5mm from both ends in the board transport direction.
  No components can be mounted in the shaded areas in the above figure.

Additional restrictions on dual-lane conveyor

-1- The height of mountable components (on back side of the board) must be 20mm or less in an area near the push-up pin stay (shaded area shown in the figure below).

-2- The push-up pin assembly must be changed to match the dual-lane conveyor.



11.15 Board transport speed

50 to 500mm/sec (Speed setting can be changed.)

* The transport speed may vary depending on the board weight.