

**JUKI®**

HIGH-SPEED FLEXIBLE SMT PLACEMENT SYSTEMS

**KE-2050R/2055R/2060R**

**PRODUCT SPECIFICATIONS**



Inquiry contact regarding the product:

**JUKI CORPORATION**

ELECTRONIC ASSEMBLY & TEST SYSTEMS DIVISION  
INTERNATIONAL SALES & MARKETING DEPT.

8-2-1, KOKURYO-CHO, CHOFU-SHI, TOKYO 182-8655, JAPAN

TEL: 03-(3480) 3371

FAX: 03-(3488) 1971

<b>Revision</b>	<b>Date</b>	<b>Revised locations</b>
00	2004. 11	
01	2005. 09	
02	2006. 04	
03	2006. 07	Contents P2, 6, 7, 8, 26, 27, 32 to 36
04	2006. 12	Contents P25, P26, P28 to33
04a	2007. 02	P32

- Specifications are subject to be changed without notice.

**JUKI®**

**JUKI CORPORATION**

**ELECTRONIC ASSEMBLY & TEST SYSTEMS DIVISION  
SALES & MARKETING DEPT.**  
8-2-1, KOKURYO-CHO, CHOFU-SHI, TOKYO 182-8655, JAPAN  
PHONE: 81-3-3480-3371 FAX: 81-3-3488-1971

<http://www.juki.co.jp/>

●The specification and appearance may be changed without notice.

Copyright © 2007 JUKI CORPORATION  
All rights reserved throughout the world.

# Table of contents

<b>1. GENERAL</b> .....	<b>1</b>
<b>2. FEATURES</b> .....	<b>2</b>
<b>3. SYSTEM CONFIGURATION</b> .....	<b>6</b>
3.1 KE-2050R System Configuration .....	6
3.2 KE-2055R System Configuration .....	7
3.3 KE-2060R System Configuration .....	8
<b>4. SPECIFICATIONS</b> .....	<b>9</b>
4.1 Mechanical/Electrical Specifications .....	9
4.2 Mounting cycle time (a number of components to be mounted per hour).....	9
4.3 Nozzles .....	10
4.4 Applicable Component.....	11
4.4.1 Applicable component sizes .....	11
4.5 Mounting accuracy at X, Y and ( $\theta$ ).....	12
4.6 Applicable PWBs .....	13
<b>5. STANDARD FUNCTIONS AND OPTIONAL FUNCTIONS</b> .....	<b>19</b>
5.1 Bad Mark Reader (Factory-Set Option) .....	19
5.2 Height Measurement System (HMS) (Standard)) .....	19
5.3 Feeder Changeover Function (Factory-Set Option).....	19
5.4 Feeder Float Detecting Sensor (Standard).....	19
5.5 IC Collection Belt (Optional).....	20
5.6 Rear Side operation unit (Factory-Set Option).....	20
5.7 Components verification (CVS, factory-Set Option).....	20
5.8 Feeder Indicator Function (FPI , factory-Set Option) .....	20
5.9 SOT Direction Check Function (Factory-Set Option).....	21
5.10 Automatic Tape Cutter (Optional) .....	21
5.11 Coplanarity (KE-2055R/2060R, factory-Set Option) .....	21
5.12 High resolution camera (KE-2055R/2060R, factory-set option).....	22
5.13 MNVC (KE-2055R: Standard, KE-2060R: factory-set option).....	23
5.14 FCS (Option).....	23
5.15 SCS (Option).....	24
5.16 Function for supporting 0402 components (Factory-Set Option).....	25
5.17 Non-Stop Operation (Factory-Set Option) .....	25
<b>6. OPTIONAL FEEDERS</b> .....	<b>26</b>
6.1 Maximum number of types.....	26
6.2 A list of feeders and options.....	27

6.3	Tape Feeder .....	28
6.3.1	CTF .....	28
6.3.2	ATF .....	29
6.3.3	FTF/FTFR .....	31
6.3.4	Adjustment jig for the feeder with a monitor .....	33
6.4	Tray Holder .....	34
6.5	TR Series .....	34
6.5.1	Overview .....	34
6.5.2	Specifications .....	35
6.5.3	Options to be mounted at the factory (Only for a TR6S/TR6D) .....	36
6.6	Stick Feeder .....	37
6.7	Stack Stick Feeder .....	38
<b>7.</b>	<b>CONTROL SYSTEM SPECIFICATIONS .....</b>	<b>39</b>
7.1	Program Selection .....	39
7.2	Production Methods .....	39
7.3	Production Management Information .....	39
7.4	Edition of a Program .....	39
7.5	Number of Data Records Which Can Be Handled by a Production Program .....	40
7.6	Host Line Computer (HLC) (Optional) .....	40
<b>8.</b>	<b>SAFETY SPECIFICATIONS .....</b>	<b>41</b>
8.1	Standards specifications .....	41
8.2	CE marks specifications (For a CE-specifications Machine Only) .....	41
<b>9.</b>	<b>RELIABILITY SPECIFICATIONS .....</b>	<b>42</b>
9.1	Lifetime of devices .....	42
<b>10.</b>	<b>OTHER SPECIFICATIONS .....</b>	<b>43</b>
10.1	Dimensions of Each Model .....	43
10.2	Specifications for connections between the front and rear devices .....	44
10.3	Electrical interfaces .....	44

# 1. GENERAL

The new series mounter models of one-by-one systems, KE-2050R/KE-2055R/KE-2060R (called "KE-2000R series" hereinafter), inherit the flexibility performance under the concepts that have been built up since the KE-700 series as the successors of the KE-2000 series, and the economy, versatility, extensibility, reliability, serviceability and safety are further improved with comparing with those of these conventional mounters. In addition, a new model, a high-speed chip general-purpose machine "KE-2055R," has been designed so that it could balance a production line consisting of our best-seller machine, a general-purpose machine equipped with the visual centering system (VCS), and is appropriate for manufacturing of small boards.

The KE-2000R series can control the production lines not only among the KE-2000R series products but also among KE-2000 series, KE-700 series and JUKI adhesive dispensers (KD-775 and/or KD-770) via a host line computer (HLC), and can built up a production line suitable for every application.

This series allows you to build up a production line according to the board production application and/or production quantities, representing the feature of a modular type of mounters, and to re-divide production programs according to the production line via the host line computer (HLC).

## **Features of each model**

A KE-2050R is suitable mainly for high-speed mounting of small chips, thus, be able to perform high-speed mounting of a thin chip-shaped components, SOPs, small connectors and so on.

Although a KE-2055R is a high-speed chip mounter, it can mount small type components such as QFP, BGA and CSP by recognizing them with the VCS also.

A KE-2060R not only has the capabilities of a KE-2050R but also can mount large ICs such as QFPs, FBGAs and BGAs by recognizing them with the VCS.

The relationship among the model names, recognition devices and heads is shown below.

Model name	KE-2050	KE-2055R	KE-2060
MNLA head	○	○	○
FMLA high-precision IC head	-	-	○
VCS (for image recognition)	-	○	○

**Note :** VCS = Vision Centering System

## **Board specifications**

	KE-2050R	KE-2055R	KE-2060R
Applicable component height	6mm (SC)	12mm (NC)	12mm (NC), 20mm (HC), 25mm (EC) <b>*See Note 1.</b>
Board dimensions	Medium size (330 × 250 mm) Large size (410 × 360 mm) Extra Large size (510 × 460 mm)		
Board transport direction	Right direction or left direction		
Board transport reference position	Front side or rear side	<b>* See Note 2.</b>	
Board transport height	900mm, 950mm		
CE specifications	Applicable for an extra large size board only.		

**\* Note 1:** Only a KE-2060E can handle a board whose height is 25 mm (EC).

**\* Note 2:** An extra large board can be produced with the front reference side only.

## 2. FEATURES

---

### **High Precision and High Speed Placement of Components**

- ① Employing a technology of highly running the X/Y axis, heads and the like, resulted in increasing the mounting TACT by 20% on an maximum, as compared with those of KE-2010/2020.
- ② A high-speed mounting can be operated via the multi-laser heads (MNLA) making it possible to recognize the four (4) nozzles simultaneously.  
KE-2050R/2055R : Composed of one (1) MNLA head and four (4) nozzles  
KE-2060R : Composed of one (1) MNLA head and four (4) nozzles + one (1) FMLA and one (1) nozzle, each with a highly accurate IC head.
- ③ The independent AC servo motor is used to move up/down (Z axis) or rotate (theta axis) each nozzle: this feature enables high-speed and high precision placement of components regardless of the used placement pattern
- ④ The twin motors drive synchronically both X and Y axis so that the high-speed control for a shorter distance can effectively be operated.
- ⑤ The Flexible Calibration System (FCS), which allows a mounter itself to recognize a component placement position error and correct it, can maintain the component placement accuracy that is realized at the factory or control the component placement accuracy after the line configuration is changed.  
(Option)

### **Improvement of the Effective Cycle Time**

- ① KE-2060R was engineered for a pitch among the nozzles each with a highly accurate IC head, to double 17 mm in the pitch among the MNLA head 4-axial cores and a number of pairings absorbable simultaneously with an 8 mm tape feeder was increased.
- ② A matrix arrangement auto tool change unit (ATC) resulted also in making it possible to replace the 5 heads nozzles simultaneously.

### **Space Savings**

- ① These series achieved a maximum of space saving of all series as a mounter of one-by-one system, likewise of the conventional KE-2000 series.
- ② A height up to the top of machine covers was lowered by 110 mm (900 mm in carryout height) to increase see-through the production lines, as compared with that of the conventional KE-2000 series.

### **Improvement of Availability**

- ① If you use the option "Non-stop function", it allows this series of products to automatically pick up components from the rear side when the stocked components run out at the front side during production to prevent PWB production from stopping and to replenish the feeder where the stocked components run out
- ② For the tray components whose components-run-out frequency is high, this series model can, as a model corresponding to the trays, use the DTS, TR-5S and TR-5D as they are now, that all have been used for the conventional KE-2000 series. This series can use a TR-6S and TR-6D in which a few minor changes are introduced.

- ③ Fixing was made with Dial screws in order to make it possible to adjust the arrangement of carryout sensors for carrying in-and-out the PWBs, with no use of any tool.
- ④ It resulted in making possible to move the PWBs (at the driven side), without use of any tool.
- ⑤ The time required for changeover is shortened and the number of component placement errors is reduced thanks to the automatic teaching function of a component (supplied with a paper tape whose component type is from 0402 to 3216) pick-up position.
- ⑥ Simultaneous Component Pick-Up Priority mode allows you to restrict the productivity decrease caused by a simultaneous pick-up failure to the minimum.
- ⑦ The HMS equipped as the standard device allows you to check the component pick-up height and to perform a teaching operation easily to prevent the operation rate from being lowered by a component pick-up error.

#### **Low Frequency of Failure Occurrence**

- ① Since the laser heads monitor, via laser sensors, all the conditions of absorbing the components, until right before the completion of mounting.
- ② The function of self-calibrating the timing of releasing the vacuum pressure prevented the components at a mounting moment from being brought back.
- ③ Driving the motor at the PWBs supports (backups) resulted not only in preventing the components from being vibrated at unclamping the PWBs to avoid their derailing out of the production lines after mounted, but also curtailing the times of clamping and unclamping the PWBs.
- ④ When you select Pick-up Range Setting mode, the mounter can pick up the center of a component correctly to prevent the tip of a nozzle from being in contact with the adjacent component when components are already placed in the limited area.

#### **Low Component Lost Rate**

- ① Combination of a new tape feeder (CTF/ATF) and bank improves the pick position accuracy and component pick-up rate.
- ② For the components fed by a shuttle-type tray feeder, such defective components as crooked legs and the like can also be collected automatically into the original trays
- ③ As process of component measurement operation performed while Component data is being created, components are returned to the feeder from which they were picked up after measurement.
- ④ To prevent a component placement error from occurring due to a feeder-setting mistake, the Setup Control System (SCS) is provided that prevents a component from being placed at a wrong position. In addition, as the SCS advanced options, the following functions are provided also: check of changeover of an external feeder, and traceability.  
(Option)

### **Curtailling the set-up time**

Having made it possible to adjust the adjuster bolts with removing no cover, resulted also in making it possible to change the layout within the factory and to curtail the set-up/-down times at transferring the installation. Since the floor conditions influence the installation stability at installing all the equipment, also, the adjustment feet (Super feet) were provided as options, thus, resulted in the installation hard to be influenced by the floor conditions.

### **Improvement of Versatility**

- ① Mounting the 0603 components via the multi-laser heads (MNLA) corresponds to standard.
- ② A 0402 component can be mounted on a board. (Option to be mounted at the factory)
- ③ For KE-2060R, vision recognition enabled by the multi-laser heads greatly improves the placement cycle time of a component that is centered based on its vision. (Optional)
- ④ KE-2060R : Switchover between the reflection and pass-through  
The new component recognition system which has the illuminance control, waveform (color) switching and coaxial light functions improves the QFP, BGA and CSP recognition capability and the handling capability of irregularly-shaped components such as a connector
- ⑤ For KE-2060R, a high-resolution camera can be added thereto as an option, in addition to the recognition camera of a standard component (maximum component size = 50 x 50 mm).
- ⑥ For KE-2060R, a model differing in the head height above the top of PWBs was provided, using the different types of components.  
Corresponding to 12 mm in the component height = NC specifications (Factory-set options)  
Corresponding to 20 mm in the component height = HC specifications  
Corresponding to 25 mm in the component height = EC specifications (only KE-2060RE)
- ⑦ Employing a new type of lighting system resulted in enhancing both recognizing the marks on the flexible PWBs and the same via the pattern matching function. The function of recognizing the area fiducial marks also made it possible to mount a multiple number of components upon a set of mark corrections.
- ⑧ The PWB sizes were made available to correspond to all of the M-PWBs (330 x 250 mm), L-PWBs (410 x 360 mm) , L-wide specification PWBs (510 x 360 mm) and E-PWBs (510 x 460 mm).
- ⑨ Mounting a maximum of 1,200 circuits per Matrix PWB became available.
- ⑩ An option of MTS(TR5S/TR5D) unit resulted in making it possible to arrange the same components onto a multiple number of trays on the same tray base.
- ⑪ A bad mark indicating a defective circuit can be detected with an OCC camera.

### **High Flexibility**

- ① All the program data of the current KE series can be read.
- ② An idle carryout can be operated at a state of freeing the servo motors for heads and X/Y axis.

### **Improvement of Operability**

- ① Windows XP is adopted as the Operating System to enable operations similar to those of a personal computer.
- ② Displaying the graphics in rich facilitated an ease of operating the data inputs
- ③ The touch panel resulted in making it possible to simplify the key-in operations. (Option)
- ④ Provided with an option of feeder position indicator (FPI), the stocked components run out or warns that the number of the remaining components is below the regulated number with lighting the corresponding LED. This feature indicates which feeder is to be replaced. (Option)
- ⑤ In addition to the languages (Japanese and Chinese) in the destinations for where the products are to be shipped, selecting the displays in English was also made possible.

### **High Serviceability**

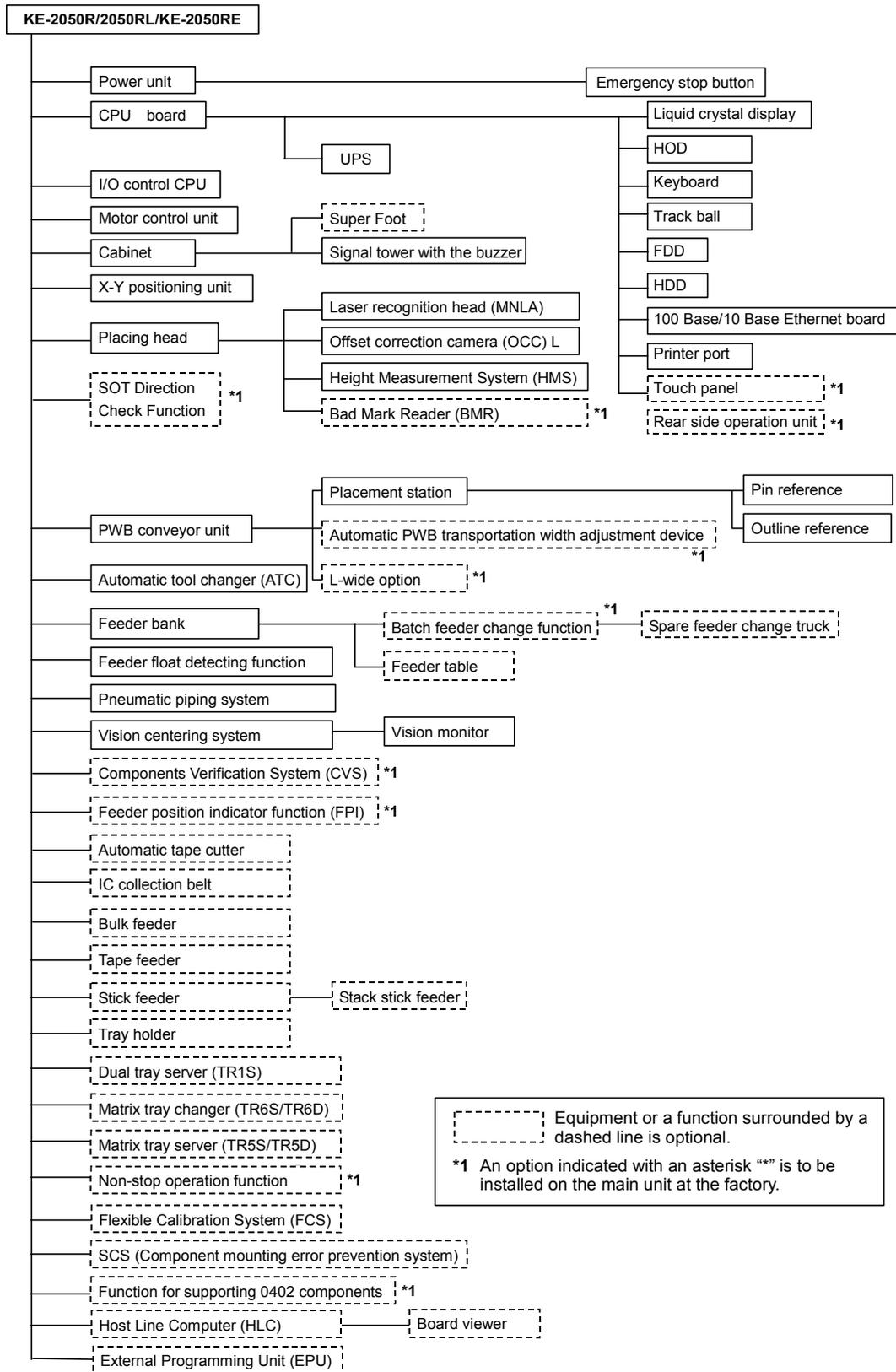
- ① The serviceability has been enhanced by displaying the screens of absorption frequencies per nozzle and of X/Y axis traveling distances to call a checking time, in addition to the hour meter (energized hours).
- ② Protecting the passwords has hierarchically stratified the maintenance levels to increase a degree of freedom in setting the machines.
- ③ For the troubleshooting by operators, the HELP functions were fulfilled.

### **Corresponding to the safety standards**

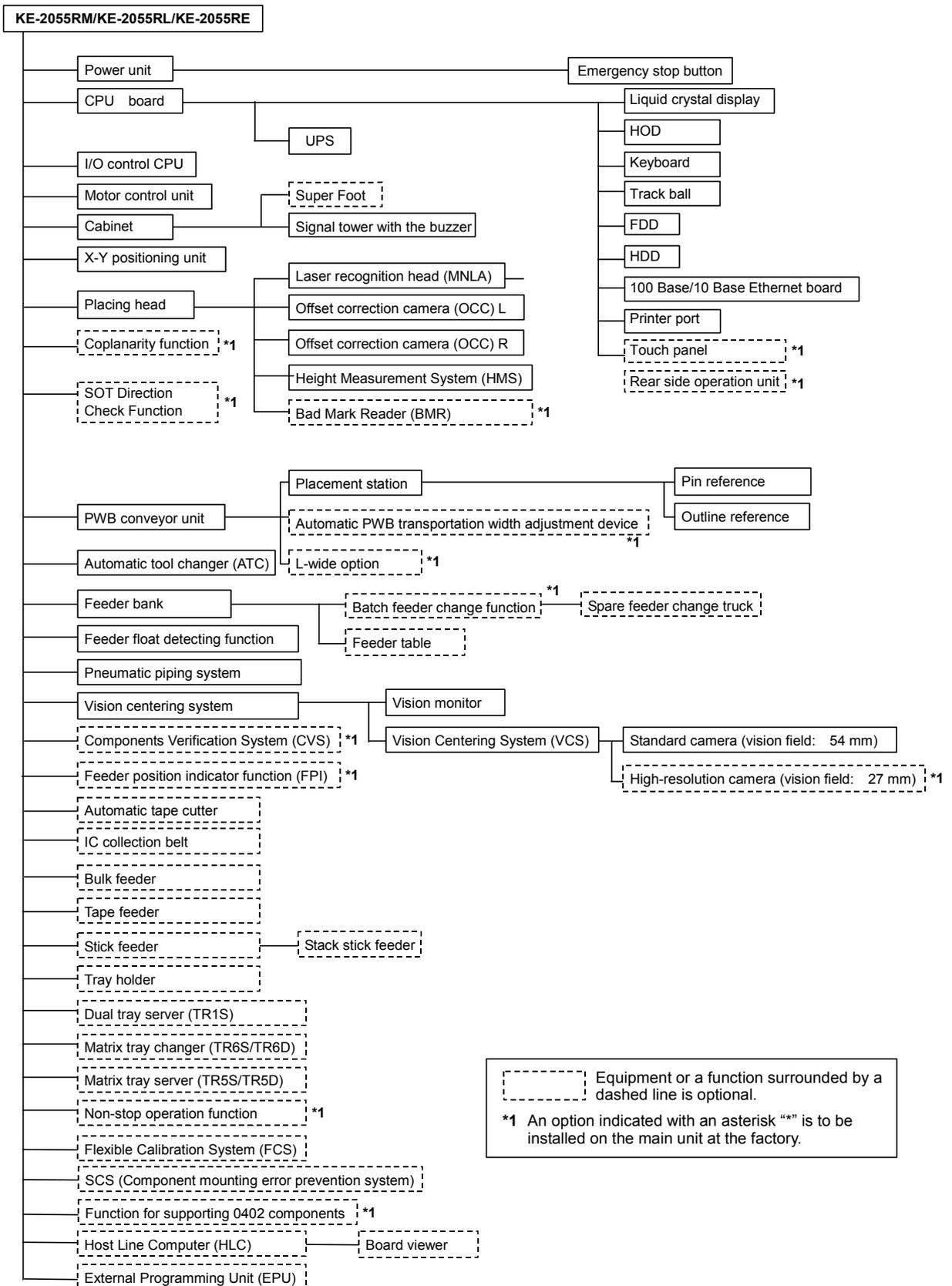
- ① The machine marked with Europe CE is added to the line-up.

# 3. SYSTEM CONFIGURATION

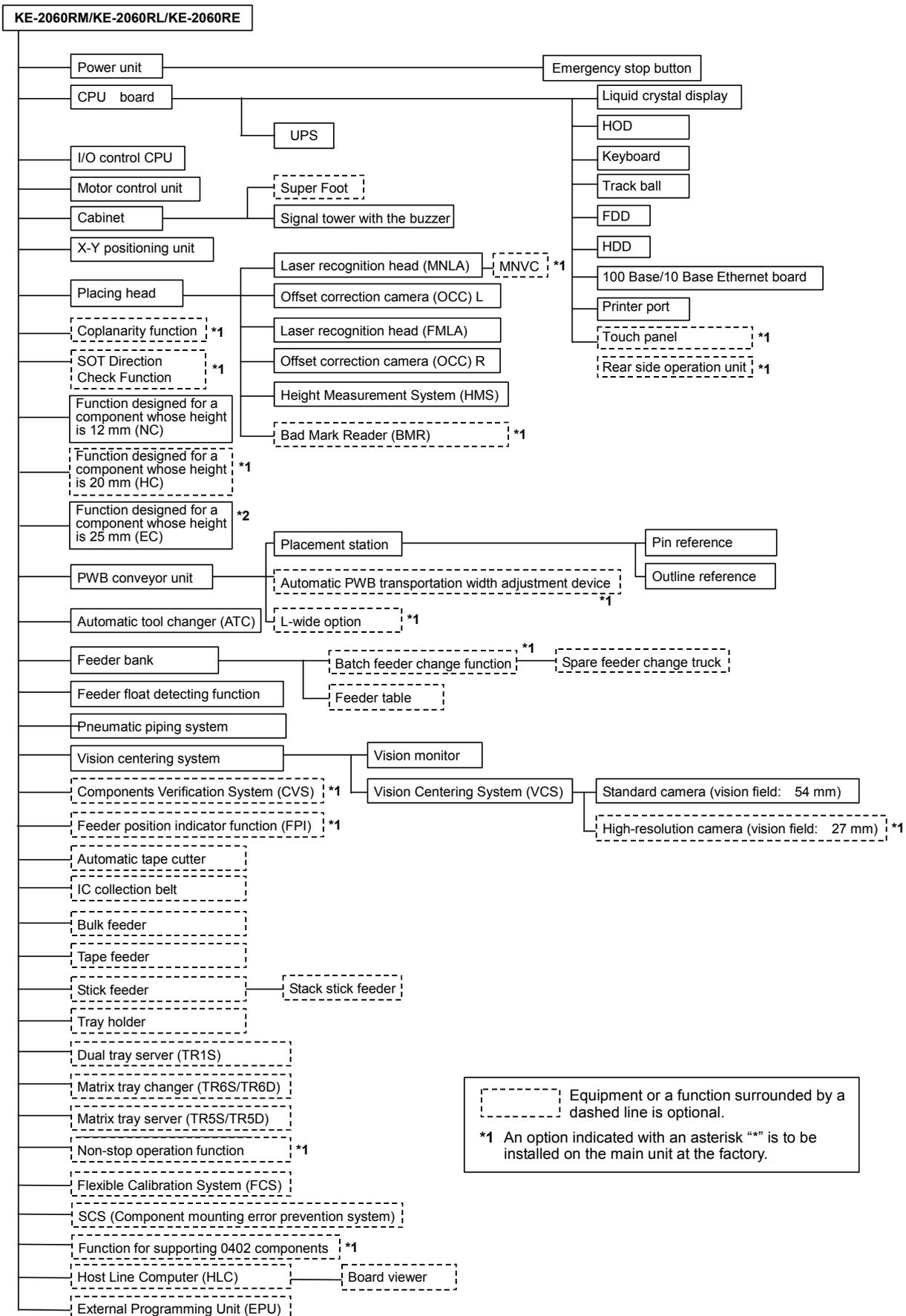
## 3.1 KE-2050R System Configuration



### 3.2 KE-2055R System Configuration



### 3.3 KE-2060R System Configuration



Equipment or a function surrounded by a dashed line is optional.  
 \*1 An option indicated with an asterisk "\*" is to be installed on the main unit at the factory.

## 4. SPECIFICATIONS

### 4.1 Mechanical/Electrical Specifications

		KE-2050R/2055R	KE-2060R
Power supply	Voltage	Three-phase 200 V, 220 V, 240V, 380 V, 400 V, 415 V AC	
	Frequency	50/60 Hz	
	Rated apparent power	3 kVA (rated apparent power at installing each option)	
Air supply	Air pressure	0.49 ± 0.05 MPa dry air	
	Consumption	230 L/min (Normal)	280 L/min (Normal)
Environment requirements	During operation		
	Ambient temperature	+ 20 to + 25 °C	
	Relative humidity	50 % or less (at 35 °C)	
	During transportation or storage		
	Ambient temperature	- 15°C to + 70°C	
	Relative humidity	20 % to 95% (No condensation)	
Noise	80 dB (A) or less (see <b>Note 3</b> )		

**Note 1:** No power supply cable at the primary side is attached thereto.

**Note 2:** We make NO WARRANTIES against any accident of the primary side wiring caused by such as short-circuit of the power cable. Select a breaker and a power cable responsibly. Please use a 6mm<sup>2</sup> or more (5.5 m<sup>2</sup> or more if the length of the power cable is 10 m or less) diameter power of cable for each phase.

**Note 3:** The numerical value is measured at a position 1 meter far from the front and rear side of the machine, and at a height of 1.5 meters. The cover is closed at this time.

**Note 4:** Peak current (at AC200V 3phase power) : 35A (KE-2050R, KE-2055R), 40A (KE-2060R)

### 4.2 Mounting cycle time (a number of components to be mounted per hour)

① Laser recognition

(CPH)

Head height specification	KE-2050R (SC) /KE2055R (NC)					KE2060R				
	Front side			Rear side		Front side			Rear side	
	M-PWB	L-PWB	E-PWB	M-PWB	L-PWB	M-PWB	L-PWB	E-PWB	M-PWB	L-PWB
SC specification	13200	13200	13200	13200	11200	–	–	–	–	–
NC specification	12500	12500	12500	12500	11000	12500	12500	–	12500	11000
HC specification	–	–	–	–	–	12000	12000	–	12000	11000
EC specification	–	–	–	–	–	–	–	11000	–	–

**Condition \*1 :** A number of components available to be mounted per hour, when the mounting device, i.e. 400 of 1608 condensers are mounted onto the M-size PWBs (330 x 250 mm).

**\*2 :** Since the conditions such as the Z-axis speed are changed when a mounter places a 0603 component, the cycle time is degraded by approximately 5 %.

② Image recognition (For a KE-2055R/2060R only)

(CPH)

Model	KE-2060R	KE—2055R	KE-2060R + MNVC option
Cycle time	1850	3290 *1	3400 *2

\*1 Cycle time to be applied when components are placed from a rear feeder (simultaneous pick-up of components from four points)

\*2 Cycle time to be applied when components are placed from a rear feeder (simultaneous pick-up of components from five points)

\*3 Common requirements: NC specifications, front reference, and medium size of boards  
Excluding time for ATC replacement, board transport and BOC mark recognition.

\*4 Delayed by approximately 3 % when an optional camera and HC specifications are used.

\*5 Component conditions: 0.5-mm pitch 100-pin QFP or 256-pin BGA and QFP/BGA whose dimensions are 10 mm x 10 mm or less

### 4.3 Nozzles

Various types of nozzles have been designed to increase the reliability of placement of each type of components as shown in the table below. Nozzles whose number is from 500 to 508 are used for both laser recognition of components and vision

You can select one of the nozzle sets shown in Table 4.3.1: A, B, D, E, F, G and D as the standard nozzles supplied with the KE-2000R series products.

**Table 4.3.1 Nozzles supplied as the standard devices**

NO.	Nozzle		Nozzle assembly							Applicable components (reference) and remarks
	Internal diameter of a nozzle	External diameter of a nozzle	A	B	D	E	F	G	H	
500	2-φ0.4	0.5x1.0	–	4	–	–	–	–	–	1005, 1608, 2012, SOT (Molding: 1.6 x 0.8)
501	2-φ0.2	0.4x0.7	–	–	4	–	–	–	–	0603
502	φ0.4	φ0.7	4	–	4	2	–	–	2	1005
503	φ0.6	φ1.0	4	–	2	4	2	4	2	1608, 2012, SOT (Molding: 1.6 x 0.8), SOT (Molding: 2.0 x 1.25)
504	φ1.0	φ1.5	–	1	1	2	4	4	2	2012, 3216, SOT23, SOT (Molding: 2.0 x 1.25)
505	φ1.7	φ3.5	1	1	–	2	2	1	2	Aluminum electrolytic capacitor (small), tantalum electrolytic capacitor, trimmer
506	φ3.2	φ5.0	1	1	–	1	2	1	2	Aluminum electrolytic capacitor (medium), SOP (narrow type), SOJ, Connector
507	φ5.0	φ8.5	1	1	–	–	1	1	1	Aluminum electrolytic capacitor (large), SOP (wide type), TSOP, QFP, PLCC, Connector
508	φ8.0	φ9.5	1	1	1	1	1	1	1	QFP, PLCC, BGA
509	φ0.1	0.2 x 0.4	–	–	–	–	–	–	–	0402 only *See <b>Note 1</b>
Total number of nozzles			12	9	12	12	12	12	12	

\* Nozzles other than the supplied ones are optional.

\* Total number of nozzles that can be installed onto an ATC station:

- KE-2050R/KE-2055R: 29

- KE-2060R: 29 + Large types 2

**Note 1** To mount a 0402 component on a board, software for supporting a 0402 component (option to be installed at the factory) and the dedicated tape feeder are required in addition to a No. 509 nozzle.

## 4.4 Applicable Component

### 4.4.1 Applicable component sizes

				KE-2050R	KE-2055R	KE-2060R	
Length x Width	Laser recognition	MNLA <b>See Note 1.</b> (□10.0 mm or more for 2-heads absorption only)		0.6 x 0.3 mm minimum, <b>See Note 2.</b> Length of a diagonal line: 30.7 mm maximum Square component : □20.0 mm maximum, Rectangular component = 26.5 x 11 mm maximum			
		FMLA		— 1.0 mm x 0.5 mm minimum, Length of a diagonal line: 47.0 mm maximum Square component = □33.5 mm maximum			
	Vision recognition	Standard camera (field of vision = 54.0 mm)	Reflection	—	Minimum: □ 3mm Maximum: Length of a diagonal line 30.7 mm Square: Maximum □ 20.0 mm Rectangle: Maximum 26.5 mm × 11 mm	□3.0mm – □50.0mm	
			Pass-through	—	□ 3.0 mm to □ 6.0 mm		
		Option: highly accurate camera (field of vision = 27.0 mm)	Reflection	—	Minimum: 1.0 mm × 0.5 mm Maximum Square: Maximum □ 20.0 mm Rectangle: Maximum 24 mm × 11 mm	1.0mm x 0.5 mm – □24.0mm	
			Pass-through	—	□ 3.0 mm to □ 6.0 mm	□3.0mm – □24.0mm	
		Optional MNVC	Standard camera	Reflection	—	□ 3 mm minimum, Length of a diagonal line: 30.7 mm maximum Square component : □20.0 mm maximum, Rectangular component = 26.5 x 11 mm maximum	
				Pass-through	—	□ 3.0 mm – □ 6.0 mm	
			Option: camera	Reflection	—	1.0 mm x 0.5 mm minimum, Square component : □20.0 mm maximum, Rectangular component = 24 x 11 mm maximum	
				Pass-through	—	□ 3.0 mm – □ 6.0 mm	
		Divided-image recognition	Standard camera (field of vision = 54.0 mm)	Reflection	—	Maximum 50.0 x 150.0 mm (at 1 x 3 division); Maximum □74.0 mm (at 2 x 2 division)	
				Pass-through	—	Maximum 50.0 x 120.0 mm (at 1 x 3 division)	
	Option: highly accurate camera (field of vision = 27.0 mm)		Reflection	—	Maximum 24.0 x 72.0 mm (at 1 x 3 division); Maximum □48.0 mm (at 2 x 2 division)		
	Component height	HC specification (NC maximum 12.0 mm) (EC maximum 25.0 mm)	MNLA		0.2 mm (0.4 mm or at 0603) – 6 mm	0.2 mm (for □ 0.4 mm or a 0603) to 12.0 mm	0.2 mm (0.4 mm or at 0603) – 20.0 mm
			FMLA		— 0.3 – 20.0 mm		
Collective image recognition			— 0.1 – 20.0 mm				
Divided-image recognition			— 0.1 – 20.0 mm				
Lead pitch	Vision recognition	Standard camera (field of camera vision = 54.0 mm)	—	0.38mm – 2.54mm			
		Option: highly accurate camera (field of vision = 27.0 mm)	—	0.2 mm – 2.54mm			
Ball pitch	Vision recognition	Standard camera (field of camera vision = 54.0 mm)	—	1.0mm – 3.0mm			
		Option: highly accurate camera (field of vision = 27.0 mm)	—	0.25mm – 2.0mm			
Ball diameter	Vision recognition	Standard camera (field of camera vision = 54.0 mm)	—	φ0.4mm – φ1.0mm			
		Option: highly accurate camera (field of vision = 27.0 mm)	—	φ0.1mm – φ0.63mm			

**Note 1** "MNLA": A maximum size of components that can be used simultaneously with 4 nozzles is □10.0mm.

**Note 2** When you use the 0402 component support function (option to be installed on the machine at the factory), the minimum component size becomes 0.4 mm x 0.2 mm.

## 4.5 Mounting accuracy at X, Y and ( $\theta$ )

### Mounted positions (X, Y) (except for the profile recognition)

	Laser	Vision (VCS)	
	MNLA/FMLA recognition	MNLA head (MNVC option)	FMLA head
Square chip	<ul style="list-style-type: none"> <li>• <math>3\sigma</math> : <math>\pm 0.05\text{mm}</math></li> <li>• <math>Cpk \geq 1</math> : <math>\pm 0.07\text{mm}</math></li> </ul>	—	—
QFP (Pitch: 0.5,0.4,0.3)		$\pm 0.04$ mm (when a component positioning mark is used)	$\pm 0.03$ mm (when a component positioning mark is used)

**Note 1:** The accuracy in correcting the laser recognition shall, as its standard value, fall within  $\pm 3\sigma$  in dispersion in all mounted areas, whose dispersion average, within 40% in the logic coordinates  $\pm$  standard value.

**Note 2:** The accuracy in correcting the image recognition shall be an absolute value from the component reference marks or the PWBs reference marks.

### Mounted posture ( $\theta$ )

(Unit:°)

	Laser	Vision (VCS)	
	MNLA/FMLA recognition	MNLA head (MNVC option)	FMLA head
Square chip	<ul style="list-style-type: none"> <li>• <math>3\sigma</math> : <math>\pm 3.0</math></li> <li>• <math>Cpk \geq 1</math> : <math>\pm 4.2</math></li> </ul>	—	—
QFP (Pitch: 0.5,0.4,0.3)		Component size 20.0 mm or larger but smaller than 30.0 mm: $\pm 0.12$ 10.0 mm or larger but smaller than 20.0 mm: $\pm 0.22$ Smaller than 10.0 mm: $\pm 0.33$	Component size 50.0 mm : $\pm 0.04$ 40.0 mm or larger but smaller than 50.0 mm: $\pm 0.05$ 30.0 mm or larger but smaller than 40.0 mm : $\pm 0.07$ 20.0 mm or larger but smaller than 30.0 mm : $\pm 0.1$ 10.0 mm or larger but smaller than 20.0 mm : $\pm 0.2$ 10 mm or less : $\pm 0.3$

**Note 1:** The accuracy in correcting the laser recognition shall, as its standard value, fall within  $\pm 3\sigma$  in dispersion in all mounted areas, whose dispersion average, within 40% in the logic coordinates  $\pm$  standard value.

**Note 2:** The accuracy in correcting the image recognition shall be an absolute value from the components reference marks or the PWBs reference marks.

## 4.6 Applicable PWBs

### 4.6.1 PWBs carry-out direction

Rightward flow (carrying from left to right, looking from the front side)

Leftward flow (carrying from right to left, looking from the front side)

**Note :** Corresponding to a time of shipments from the factory

### 4.6.2 PWB sizes and Mass

#### 1) PWB sizes

	Minimum size (L <sub>1</sub> x W <sub>1</sub> )	Maximum size (L <sub>2</sub> x W <sub>2</sub> )	Minimum thickness T <sub>1</sub>	Maximum thickness T <sub>2</sub>
M-PWB specification	50.0 x 30.0 mm (With function of automatically adjusting the PWB width : 50.0 x 50.0 mm)	330.0mm x 250.0mm	0.4mm	4.0mm
L-PWB specification		410.0mm x 360.0mm		
E-PWB specification (KE-2060RE) * <b>Note3</b>		510.0mm x 460.0mm		
L-wide PWB specification (option)		510.0mm x 360.0mm		

**Note 1 :** Where, L = Carry-directional size and W = Direction perpendicular with L. The maximum allowance for the PWB mass shall be shown in the following table.

**Note 2 :** Contact us for a notched board or board whose shape is irregular.

**Note 3 :** KE-2060RE supports only 25 mm in the component height.

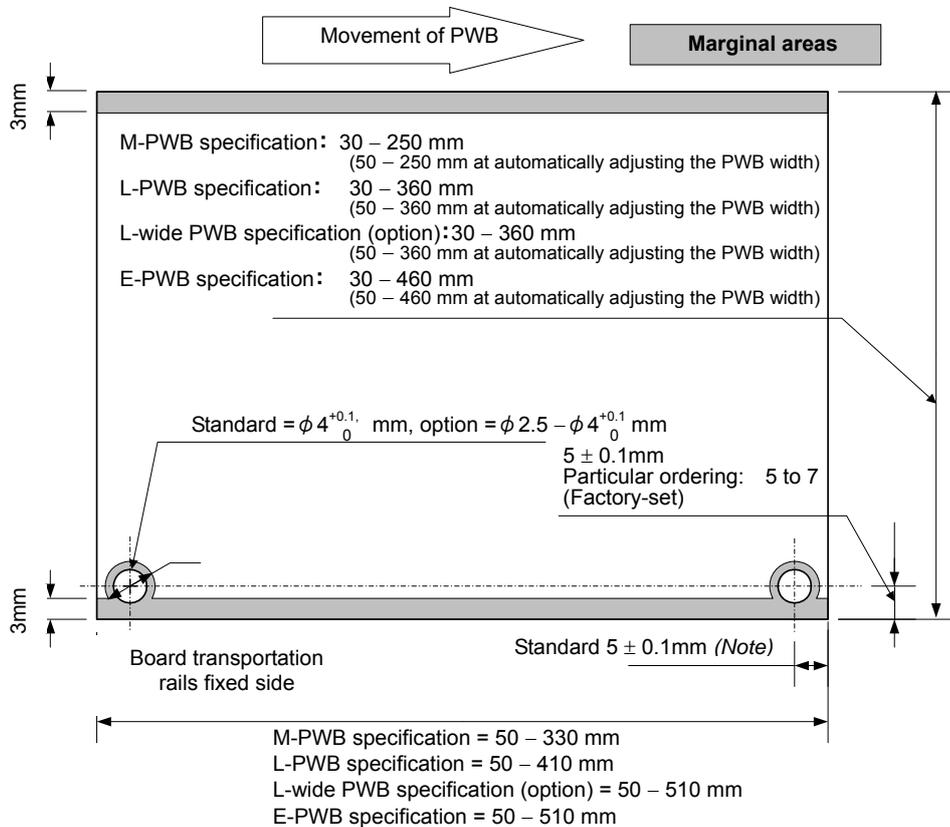
#### 2) Maximum allowance of PWB mass

2000g

### 4.6.3 PWBs carryout dead space (a range impossible to mount the components)

PWB Top View :

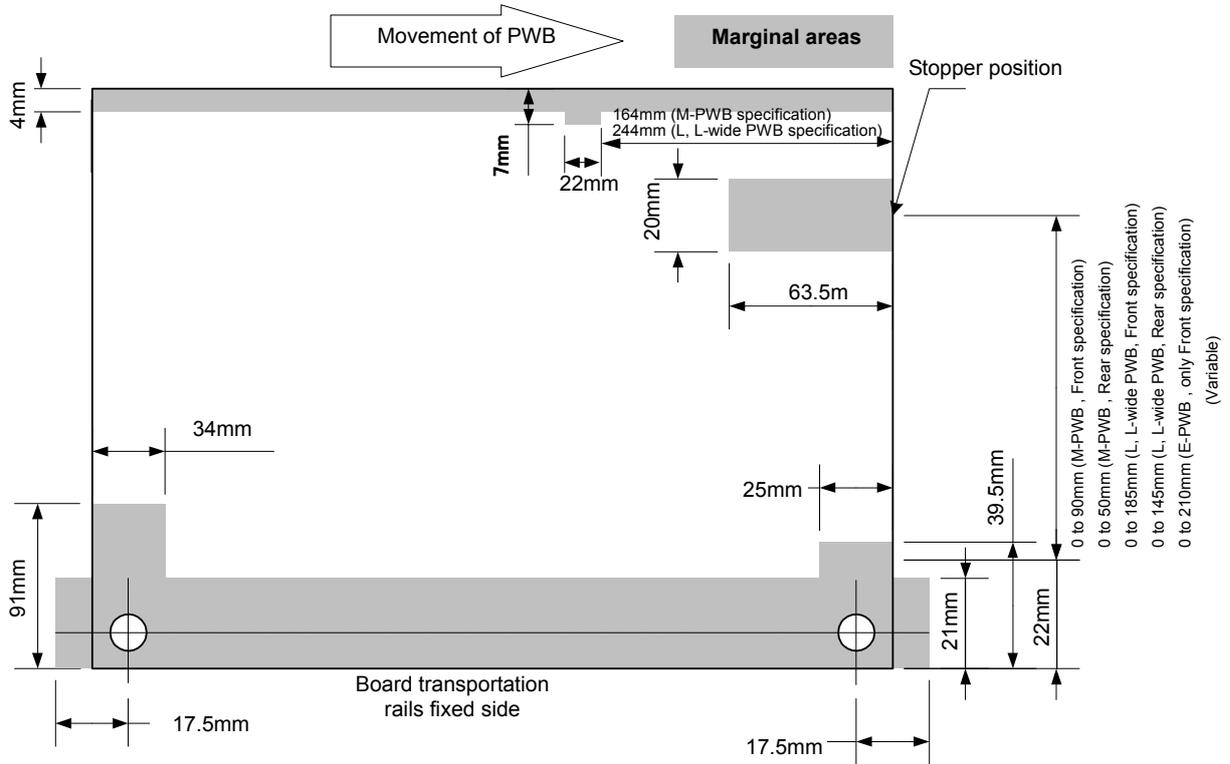
#### PWB top dead space (a range impossible to mount the components)



**Note :** This is a size at shipments from the factory.

#### 4.6.4 A range not available to set up the backup pins

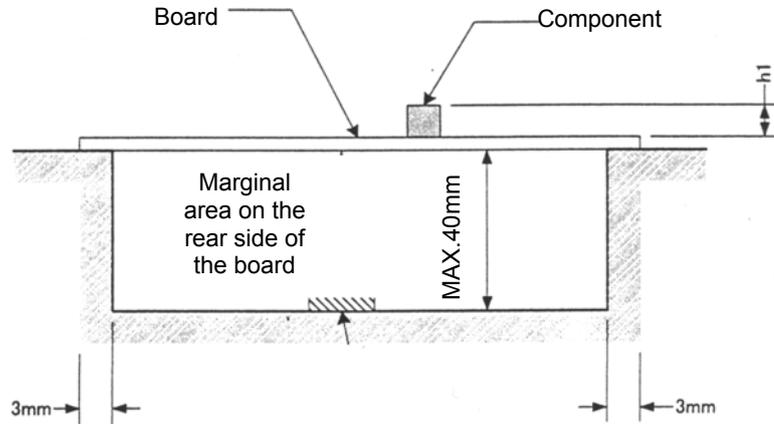
PWB Bottom View :



**Note :** When the PWB carryout direction is reversed (leftward flow), the range not available to set up the backup pins results in the symmetry of the left and right in the view above.

#### 4.6.5 Ranges available to mount the components on the PWB front and back surfaces

##### Height-directional dead space



The size  $h_1$  results in figures as shown in the following table :

Model	Specification for heights of components	$h_1$ (mm)
KE-2050R	SC specification	6
KE-2055R	NC specification	12
KE-2060R	NC specification	12
	HC specification	20
	EC specification	25

##### ***PWB transportation specifications***

M PWB specifications : Front specification, Rear specification (factory-set)

L PWB specifications : Front specification, Rear specification (factory-set)

L-wide PWB specifications : Front specification, Rear specification (factory-set)  
(Option)

E PWB specifications (only KE-2060RE) : Front specification (factory-set)

##### ***PWBs clamping method***

This is a method to use the PWB top surface as a reference to have both the PWB front and rear ends each at the fixed and movable sides supported to the carryout rails, then, to clamp the PWBs.

##### ***PWB width adjusting methods***

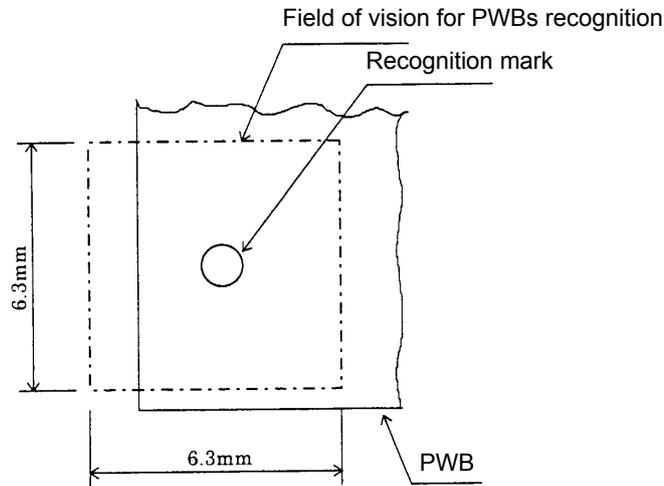
\* Standard : Manually adjusting method with your hand

\* Option : Automatic PWB width adjusting method via a motor  
(Minimum board size: 50.0 mm × 50.0 mm)

## 4.6.6 Function correcting the PWB positions

### **Field of vision for recognizing the PWB reference marks**

□6.3 mm (camera's field of vision for recognition).



**Field of vision for PWB recognition**

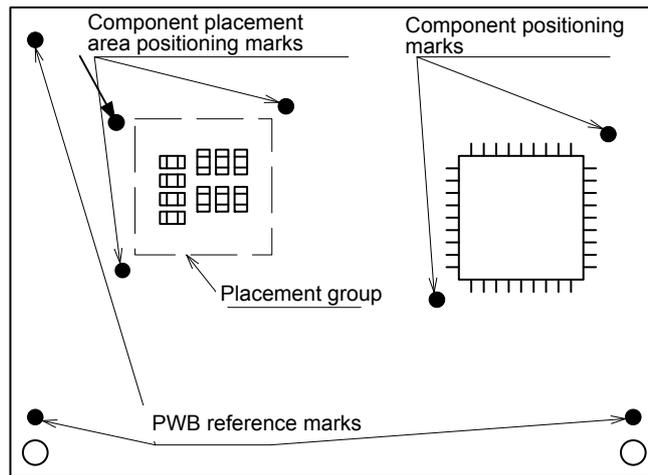
### **Window size for recognizing the PWB reference marks**

This size can be changed within a maximum of 6.3 mm, subject to securing a clearance between the recognition mark and its surrounding area.

### **Kinds of recognition marks and corrective method**

- PWB reference mark  
Two or three marks are located on a PWB to correct the entire PWB.  
When a machine detects two PWB reference marks, it corrects the positioning, angle and expansion/contraction of the entire PWB. When detecting three PWB reference marks, it corrects the perpendicularity in the X and Y direction also.
- Component positioning marks  
If a component such as an IC (QFP) needs to be placed on a board very precisely, two marks set on a component itself are used to correct the component placement position.
- Marks used to position the component area  
Two marks (their positions can be set as you like) are to be provided to a group of components placement positions, and they are used to correct each component placement position in the group.

**Note :** *The position is arbitrary, subject to not aligning three (3) reference makes, if this is the case, on one (1) straight line. (It is recommended that the reference marks should be made at the four (4) corners of the PWBs.*



**Reference marks and components positioning marks**

**Basic quality of recognition marks**

- Copper not coated or coated
- It needs to have a clear contrast between the recognition mark surface and the print wiring quality.
- It needs to have neither oxidation nor quality deterioration of the recognition marks.

**Coating the recognition marks**

The recognition mark surfaces shall all be coated as follows :

- Transparent antioxidant coating
- Nickel plating
- Tin plating
- Solder plating
- Gold plating
- Hot air repeller solder coating

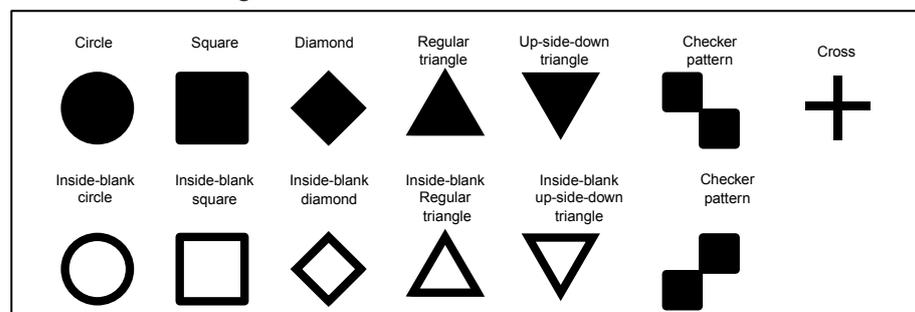
**Marking forms**

- The standard marks represent the thirteen (13) forms as shown in the following block, "forms of recognition marks."
- For any mark other than those shown in the said block, customers shall make templates to allow for recognition through a pattern matching.

**Note 1:** Limited to the standard marks only ; and any area fiducial mark is excluded from the subjects.

**Note 2:** Within a field of vision, there should be no similar form pattern other than the subjected form patterns.

- For regular triangles, checker patterns and users' templates, the 90° up-side-down marks can also be recognized.



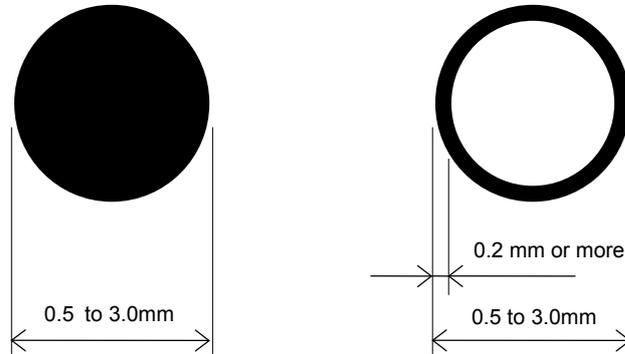
**Forms of Recognition Marks**

The recognition marks shall all comply with EIAJ ET-7302 "Recognition marks for on-surface mounted PWBs."

**Dimensions and tolerances**

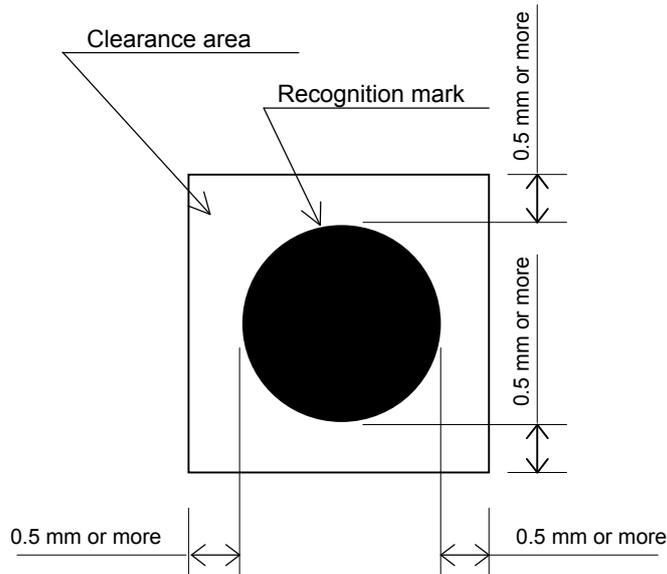
The outside dimensions shall range from 0.5 mm up to 3.0mm, whose tolerance, less than 10%.

For all the inside-blank forms, the edging line width shall be more than 0.2 mm.



**Dimensions and tolerances of recognition marks.**

It is desirable that there is, around each recognition mark, a space having nothing of such other marks as conductor pattern, solder resist, marking and the like, and that this space dimensions is a larger square than the mark by 0.5 mm or more from the outer circumference of the recognition marks.



**Clearances of recognition marks**

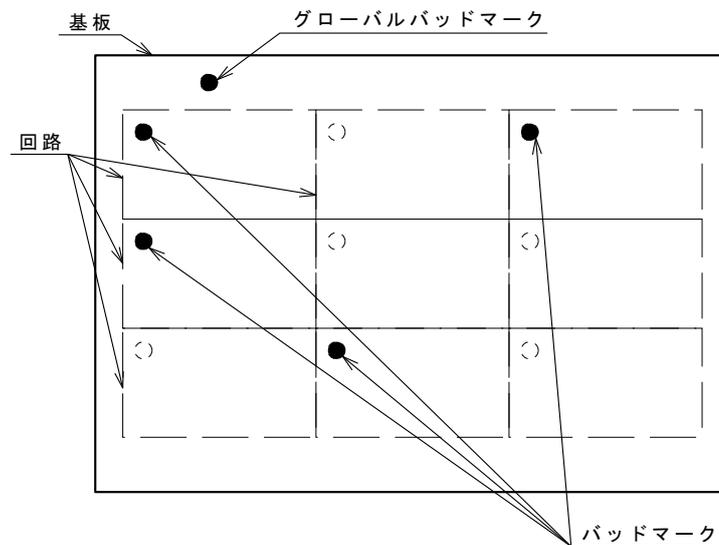
## 5. STANDARD FUNCTIONS AND OPTIONAL FUNCTIONS

### 5.1 Bad Mark Reader (Factory-Set Option)

A bad mark is given to a circuit on a multi-circuit PWB to prevent any component from being placed on the circuit.

The minimum diameter of a bad mark is 2.5 mm or more and the color of a mark should be highly contrasted with the color of a board. The brightness can be switched when the color of a board is bright (looks white).

When you use an optional bad mark reader, the time for recognizing one bad mark can be shortened by approximately 0.09 seconds with comparing with the time taken with the standard OCC camera.



### 5.2 Height Measurement System (HMS) (Standard)

When preparing the pick data, the component pick position and height shall all be measured via the laser sensors. The components, whose pick surface is transparent (LEDs and the like), such as glass and the like and in a mirror state, from where the light is fully reflected, shall all be excluded from the subjects.

### 5.3 Feeder Changeover Function (Factory-Set Option)

This function allows a group of feeders to be mounted or demounted onto/from the main unit at a time. Since this function enables changeover from the current feeders to the next feeders even during production of PWBs, it shortens the time required for changeover.

### 5.4 Feeder Float Detecting Sensor (Standard)

This function is provided to prevent mechanical troubles caused by improper installation of tape or stick feeders. When this sensor detects an improperly-installed feeder, it stops the X-Y axes, and warns an operator.

## 5.5 IC Collection Belt (Optional)

This belt collects IC components whose lead is found to be bent or float with the VCS by separating them one by one.

The feed pitch setting can be changed just by your entering a new value.

- Applicable component size : 10 x 10 mm to 50 x 50 mm,  
Height: 1 mm or higher
- Belt feeding pitch : 15 mm to 55 mm  
(in increments of 5 mm)
- Number of components which  
can be collected : 5 to 19
- Number of occupied positions : 9

## 5.6 Rear Side operation unit (Factory-Set Option)

The liquid crystal display monitor, keyboard and track ball are attached on the rear of the main unit to secure the same efficiency as that of the front operation unit (this operation unit is equipped with the front/rear operation switch).

## 5.7 Components verification (CVS, factory- Set Option)

This function is provided to inspect components to be placed before production and at the restart after components run out, and detect errors such as component, polarity, feeder setting position and other errors in advance.

Applicable components:

- Components which have two electrodes at opposite sides.
- Maximum component size: 10 mm x 10 mm or smaller
- Minimum component size: 1.0 mm x 0.5 mm
- Component type: resistor, capacitor, and 2-pin diode
- Component package: tape feeder
- Nozzle: Material of the nozzle designed for the verification  
function is different from that of the standard nozzle.

## 5.8 Feeder Indicator Function (FPI , factory-Set Option)

This function uses LEDs to notify an operator of the feeder position to be checked if the stocked components run out or an feeder error occurs during production of PWBs.

This feature shortens the time spent for replacing a feeder and facilitates the operation of the KE-2000 series of products.

## 5.9 SOT Direction Check Function (Factory-Set Option)

This function uses the left OCC to find the component supply angle error in advance by placing a 3-terminal SOT component on the SOT direction check table before production or the restart after components run out.

Applicable components:

- Component dimensions: 1.6 mm to 4.0 mm x 4.0 mm
- Electrode dimensions: Length 0.2 mm to 1.0 mm  
Width 0.1 mm to 1.0 mm

## 5.10 Automatic Tape Cutter (Optional)

This tape cutter automatically cuts empty tapes to dispose of them in a lump.

It can be combined with a floorstanding type of machine or a machine to be integrated into an overall feeder exchange trolley.

Power is supplied from the connector of the KE-2000R series of chip placer/shooter main unit to this option.

## 5.11 Coplanarity (KE-2055R/2060R, factory-Set Option)

This device performs coplanarity check for electronic components with its scanning type laser displacement gauge.

A scanning type laser displacement gauge emits a laser beam to a certain spot of an object, and uses the light receptive lens to gather lights reflected or scattered from the spot. Next, it generates an image of the spot over the position sensor to measure a displacement without touching the object.

This device measures the height of each lead to judge its coplanarity.

What to check with this device

- Colinearity check  
The colinearity check inspects how much a side on which leads are located is bent in the up/down directions.
- Coplanarity check  
Two methods are provided to obtain a coplanarity value: the method regulated by EIAJ and the least squares method.

Method regulated by EIAJ:

This method generates a virtual geometric plane passing three lowest leads on each side, and measures distances between this virtual plane and all leads to check how much each lead is bent.

Least squares method:

This method measures distances between the plane obtained by the least square method and all leads to check how much each lead is bent.

Applicable components:

- Only components that can be recognized by VCS
- BGAs, FBGAs, connectors and lead components (SOPs and QFPs) having the same pitch and lead width shall all be subjected.

### Component dimensions:

Item		Standard mode	High-precision mode
Pitch		0.4 mm or more	0.3 mm or more
Lead width		0.18 mm or more	0.12 mm or more
Lead length		0.3 mm or more	0.3 mm or more
Component size	Batch measurement	MNLA	20 mm × 20mm or less, or 26 mm × 11.0 mm or less
		FMLA	26 mm x 100 mm or less      26 mm x 50 mm or less
	Division measurement	MNLA	–
		FMLA	50 mm x 100 mm or less      50 mm x 50 mm or less

In Standard mode, this device scans a component over its sensor at 80 mm/s, while in High-precision mode, it scans a component at 20 mm/s.

In Standard mode, the X-Y direction resolution becomes 0.02 mm to measure a component. In High-precision mode, it becomes 0.01 mm.

It takes approximately 3 seconds to switch the mode between Standard mode and High-precision mode.

## 5.12 High resolution camera (KE-2055R/2060R, factory-set option)

This is a new components recognition system capable of switching over between the reflection and pass-through, among wavelengths (red, blue and green), and controlling the illumination intensity.

### Dimensions of applicable components

(Unit: mm)

Collective VCS recognition		Divided-VCS recognition (for an FMLA only)
Reflected-light recognition component	Pass-through-light recognition component	Reflected-light recognition component
KE-2055R: 1.0 × 0.5 to □ 20.0 KE-2060R: 1.0 × 0.5 to □ 24.0	KE-2055R: □ 3.0 to □ 6.0 KE-2060R: □ 3.0 to □ 24.0	Maximum : 24.0 x 72.0 (at 1x3 division) □48.0 (at 2x2 division)

Lead pitch	Component height	Ball pitch	Ball diameter
0.2~2.54	- NC specification 1.0 – 12.0 - HC specification 1.0 – 20.0 - EC specification 1.0 – 25.0	0.25 – 2.0	φ 0.10 – φ 0.63

### Lighting

Lead components reflection lighting	Coaxial, downward and sideward lighting via red LEDs
Area array components sideward lighting	Ball sideward lighting via blue LEDs
Pass-through lighting	Profile pass-through lighting via green LEDs

\* Adjusting the lighting intensity can be made per component.

### 5.13 MNVC (KE-2055R: Standard, KE-2060R: factory-set option)

This is a function that uses the VCS to recognize a component that is picked up by an L head and places it.

Use of the MNVC greatly improves the productivity of a PWB on which many small vision-centered components are to be placed.

#### Applicable component dimensions

(Unit: mm)

			VCS recognition with the R head	VCS recognition with the L head <b>See Notes 1 and 2.</b>	
Length × Width	VCS simultaneous recognition	Standard VCS (Field of view: 54 mm)	Reflection	□3 – □50	□3 – □20 <b>See Note 3.</b>
			Pass-through	□3 – □50	□3 – □6
		Optional high-resolution VCS (Field of view: 27 mm)	Reflection	1.0 × 0.5 – □24	1.0 × 0.5 – □20 <b>See Note 3.</b>
			Pass-through	□3 – □24	□3 – □6

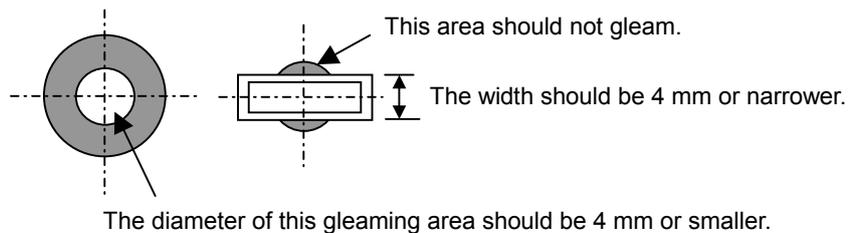
**Note 1:** Any L head cannot be used to recognize a component by dividing its image.

**Note 2:** The component height, lead pitch, ball pitch and ball diameter that can be recognized by the L head are same as those that can be recognized by the R head.

**Note 3:** Even though a dimension of a component exceeds 20 mm, the component can be used if its longer side length is 26.5 mm or shorter, its shorter side length is 20 mm or shorter, and the length of the diagonal line is 30.7 mm or shorter.

#### Applicable nozzles

- Standard nozzles: The No. 500 to 508 nozzles are applicable. Be sure to use the No. 505, 506, 507 or 508 nozzle that is modified so that they cannot gleam when they are shot with a VCS.
- Customized nozzles: The section of any customized nozzle that is used to pick up a component should not gleam when it is shot with a VCS except the area ± 2.0 mm from the center of the nozzle.



### 5.14 FCS (Option)

After a jig component that is recognized with the VCS or laser is placed on a glass jig board, the Flexible Calibration System (FCS) uses a camera to automatically measure the difference between a value set with the program and the position at which the component is placed, and calculates the offset value to be used for placing the component.

This series of operations are automatically performed with your setting of a board and loading of a program into the system.

When you use the FCS, you can check whether the precision is maintained at relocation or routine maintenance.

The system software is included as standard software, and if you purchase the jig parts set, you can use this option for two or more mounters.

## 5.15 SCS (Option)

The Setup Control System (SCS) uses a bar code and a wireless LAN system to prevent a component from being mounted accidentally.

In addition, the SCS is equipped with the function for controlling the number of remaining components as a standard function also.

This option can be expanded with the external changeover check function and the traceability function.

- ① Prevention of a component from being placed accidentally (standard function of the SCS)  
By recognizing a bar code when an attached feeder is replaced with another one (feeder changeover) or when components are replaced because components run out, start of production is prohibited until the component placement position is checked completely. This system prevents a defective board from being produced due to a component placement mistake.
- ② Number of the remaining components management subsystem (standard function of the SCS)  
This function manages the component location according to the serial number of the components reel, and the number of remaining components (stock).
- ③ External changeover check subsystem (SCS option)  
This is the function for checking components when only one feeder change trolley is used to set an external feeder for the next production. The subsystem loads the ID of this feeder exchange trolley to the system when you set it onto the main unit. Then, the components check is completed and production becomes available.
- ④ Traceability subsystem (SCS option)  
When a board is loaded to a mounter, this subsystem allows a mounter to read the serial number pasted on a board, and records all serial numbers (lot numbers) of a reel of each component placed on the board. This allows you to search the lot numbers of all components placed on the board.

The serial number of a board corresponds with the one-dimension or two-dimension bar code.

Serial number type	How to read
One-dimension bar code See Notes 1 and 2.	Reads a bar code with a dedicated bar code reader set on the entrance of the conveyor.
Two-dimension bar code See Note 3.	Reads a bar code with the OCC.

- **Note 1:** *When the main unit handles a medium-sized board or a large-sized board, an optional conveyor extension belt is required to use one-dimension bar codes.*
- **Note 2:** *About a CE machine*
  1. *Machine handling a medium-sized board: your conveyor has to be extended optionally (in case of 150 mm only), and the conveyor cover has to be replaced with the corresponding one.*
  2. *Machine handling a large-sized board: Not available.*
  3. *Machine handling a large and wide type board (L-Wide type) and/or extra large board: the conveyor cover has to be replaced with the corresponding one.*
- **Note 3:** *The maximum readable two-dimension code size is □5.5 mm.*

## 5.16 Function for supporting 0402 components (Factory-Set Option)

This is an optional function (\* See **Note 1.**) to be installed at the factory, and it is used to place a component of 0402 size on a board.

To place a 0402 component on a board, the dedicated nozzle (No. 509) and the dedicated tape feeder (AQ02HP) are required.

**Note 1:** The models already sold do not support this function.

**Note 2:** This nozzle is applicable only to MNLA.

### - Component placement speed

Component height specifications	SC (6mm)	NC (12mm)	HC (20mm)	EC (25mm)
Component placement speed (CPH)	6,200	6,050	5,800	5,550

### - Specifications

Placement accuracy (Cpk ≥ 1)	Pitch between adjacent components	Height of an adjacent component
- X,Y : ±50 μm - θ : ±5° or less	0.15 mm or more	Maximum 0.5 mm

\* The specifications above are applicable to sequential pick-up operation only, and are not applicable to simultaneous pick-up operation.

\* The component pick-up position automatic correction (Auto Correct) function is set to OFF.

### - Applicable components

Resistor: HOKURIKU ELECTRICAL CONSTRUCTION, Panasonic, KAMAYA

Capacitor: muRata, TDK, ROHM

## 5.17 Non-Stop Operation (Factory-Set Option)

This is the function for continuing PWB production without interrupting it although components run out on the reference side when the same type of components are set on the front side and the rear side.

PWB production is normally performed with using components set on the reference side bank (front side or rear side) only. When components run out on the reference side, the machine picks up components from only the opposite side bank to continue the current PWB production. Therefore, you can replenish the machine with components even during PWB production.

When you select the rear reference, the cycle time of production is a little longer in comparison with that in case of the front reference. (This varies depending on a production program used.)

## 6. OPTIONAL FEEDERS

### 6.1 Maximum number of types

Feeder name	A number of available mounts at the front side	A number of available mounts at the rear side	Total number of mounts available	A number of slots occupied	Remarks
8 mm tape feeder	40	40	80	2	
12 mm tape feeder	26	26	52	3	
16 mm tape feeder	26	26	52	3	
24 mm tape feeder	20	20	40	4	
32 mm tape feeder	16	16	32	5	
32 mm adhesive tape feeder	16	16	32	5	
44 mm tape feeder	10	10	20	8	
56 mm tape feeder	10	10	20	8	
72 mm tape feeder	8	8	16	10	
Stick feeder type N	26	26	52	3	
Stick feeder type W	13	13	26	6	
Stack stick feeder	5	—	5	8	
Bulk feeder	40	40	80	2	
DTS	—	1 (2-sheets)	1 (2-sheets)	48	
MTS (TR-5S)	—	1 (40-stages)	1 (40-stages)	80	
MTS (TR-5D)	—	1 (40-stages) (Note 1)	1 (40-stages) (Note1)	80	
MTC (TR-6S) (Note 3)	—	—	20-stages	—	
MTC (TR-6D) (Note 3)	—	—	30-stages (Note 2)	—	

**Note 1 :** 40 sheets of 20 types in the nonstop mode

**Note 2 :** 30 sheets of 15 types in the nonstop mode

**Note 3 :** TR-6S and TR-6D, both of which have partly been machined in the components, can only be mounted onto the conventional KE-2000 series. To all the customers who are already using such, please consult with us.

## 6.2 A list of feeders and options

	Option	Model name		
		KE-2050R	2055R	KE-2060R
1	8 mm tape feeder	○	○	○
2	12 mm tape feeder	○	○	○
3	16 mm tape feeder	○	○	○
4	24 mm tape feeder	○	○	○
5	32 mm tape feeder	○	○	○
6	32 mm adhesive tape feeder	○	○	○
7	44 mm tape feeder	○	○	○
8	56 mm tape feeder	○	○	○
9	72 mm tape feeder	○	○	○
10	Stick feeder type 1~9	○	○	○
11	Stick feeder type N	○	○	○
12	Stick feeder type W	○	○	○
13	Stack stick feeder	○	○	○
14	Comtra belt stick feeder (Note 1)	○	○	○
15	Bulk feeder	○	○	○
16	DTS	○	○	○
17	MTS (TR-5S)	○	○	○
18	MTS (TR-5D)	○	○	○
19	MTC (TR-6S)	○	○	○
20	MTC (TR-6D)	○	○	○
21	Tray holder type	○	○	○
22	Bad mark reader	○	○	○
23	Highly accurate camera for image recognition	—	○	○
24	Coplanarity check	—	○	○
25	Components verification	○	○	○
26	IC collection belt	○	○	○
27	Rear side operation unit	○	○	○
28	Touch panel	○	○	○
29	Feeder position indicator	○	○	○
30	PWB width automatic adjustment	○	○	○
31	Super foot	○	○	○
32	Batch feeder change function	○	○	○
33	Nonstop operation	○	○	○
34	Mini-signal light (indicating a component-run-out)	○	○	○
35	SOT direction check	○	○	○
36	Optional nozzle	○	○	○
37	Component height 20 mm (HC)	—	—	○
38	Component height 20 mm (EC)	—	—	○
39	SCS	○	○	○
40	FCS	○	○	○
41	MNVC	—	—	○
42	Support of 0402 components	○	○	○

**Note 1 :** This product is being soled only in Europe and the U.S.A.

## 6.3 Tape Feeder

### 6.3.1 CTF

#### 1) List of specifications

Product code	Tape type		Feeding pitch	Number of pins at the edge	Diameter of a reel	Typical component type
	Paper	Embossed				
CF03HP	○	—	2mm	Two	180mm	0603
CF05HP	○	—				1005
CF08HE	—	○	Two-terminal diode			
CF081P	○	—	1608, 2012, 3216			
CF081E	—	○	4mm		180 – 380mm	SOT
CF8L1P	○	—				1608, 2012, 3216
CF8L1E	—	○			SOT	
CN05HP	○	—			2mm	One
CN08HE	—	○	Two-terminal diode			
CN081P	○	—	1608, 2012, 3216			
CN081E	—	○	SOT			
CN081C	○	○	4mm	180 – 380mm	1608, 2012, 3216	
CN8L1P	○	—			1608, 2012, 3216	
CN8L1E	—	○		SOT		
CN8L1C	○	○		1608, 2012, 3216		

**Note:** For a tape feeder designed for both paper and embossed paper, contact our sales person.

#### 2) Common specifications

1	Power supply/air supply	None	
2	Dimensions	C*0***	L=602mm, W=16.2mm, H=205mm
		C*8L1*	L=683mm, W=16.5mm, H=431mm
3	Mass	C*0***	1.5kg (Excluding a reel)
		C*8L1*	1.9kg (Excluding a reel)
4	Component transport method	Ratchet drive system	

#### 3) Options

##### ① Bar code tag

This tag is used to paste a bar code mark onto the rear edge of a tape feeder. Even after you install a tape feeder on the feeder bank, the pasted bar code can be read easily.

##### ② Embossed tape spacer

This spacer is to be attached on the bottom side of a carrier tape to improve the feeding capability and component pick-up stability of a carrier tape for embossed components whose materials is soft and inelastic.

##### ③ Support stay

This is an optional component for preventing a tape feeder from falling down due to miss operation when you attach or remove it onto/from a feeder bank.

## 6.3.2 ATF

For splicing of component feed tape (tape splicing), this tape feeder permits a component feed during production.

### 1) Specifications

#### ① 8mm

Product code	Tape type		Feeding pitch	Number of pins at the edge	Diameter of a reel	Typical component type
	Paper	Embossed				
AQ02HP See <b>Note 1</b>	○	—	2mm	Two	180mm	0402 only
AF05HP	○	—	2mm			1005
AF08HE	—	○	4mm			Two-terminal diode
AF081P	○	—				1608, 2012, 3216
AF081E	—	○	2mm	SOT		
AN05HP	○	—		1005		
AN08HE	—	○	4mm	One		Two-terminal diode
AN081P	○	—		1608, 2012, 3216		
AN081E	—	○		SOT		

**Note 1:** This tape feeder does not support splicing.

**Note 2:** For a tape feeder designed for both paper and embossed paper, contact our sales person.

#### ② 12mm to 24mm

Product code	Feed pitch	Pick position (Y direction)	Applicable component emboss width
AF121S	4mm	132mm	8.3 mm or less
AF122S	8mm		
AF123S	12mm		
AF12FS	4/8/12mm		
AF12NS	4/8/12mm		12.2 mm or less
AF161S	4mm		
AF162S	8mm		
AF163S	12mm		
AF16FS	4/8/12/16mm		20.2 mm or less
AF16NS	4/8/12mm		
AF242S	8mm		
AF243S	12mm		
AF244S	16mm		
AF245S	20mm		
AF246S	24mm		
AF24FS	8/12/16/20/24mm		
AF24NS	8/12mm	114 mm ( <b>Note 1</b> )	
AF24FS (option)	8/12/16/20/24mm		

**Note 1:** In the FC-1/1R of the KE-730/740/750 and KE2010/20/30/40 series, only the rear side can be used.

**Note 2:** The applicable component emboss depth is 17 mm or less. (Depending on the component size)

### 2) Common specifications

		8mm	12mm/16mm	24mm
1	Power supply/air supply	None		
2	Dimensions	L=645mm, W=16.8mm H=213mm	L=693mm, W=31.5mm H=472mm	L=693mm, W=40mm H=472mm
3	Mass (Excluding a reel)	1.8 kg or less	2.45kg or less	2.6kg or less
4	Component transport method	Ratchet drive system		

### 3) Options

① Bar code tag (8mm only)

This tag is used to paste a bar code mark onto the rear edge of a tape feeder. Even after you install a tape feeder on the feeder bank, the pasted bar code can be read easily.

② Embossed tape spacer

To improve the feed and pickup stability of the carrier tape for the emboss component made of a soft and fragile material, this spacer is installed in the emboss groove of the feeder to support the bottom surface of the carrier tape.

A type for 8 mm feeder, type for both 12 mm and 16 mm feeders, and type for 24 mm feeder are available.

③ Tape reel mounting platform

This is a platform that allows you to set a tape onto a tape feeder. Since you can set a tape while holding a tape feeder correctly, this option improves the tape setting capability and prevents a tape feeder from falling down.

Type	Application
Tape reel mounting platform (no foot)	A user is supposed to fix this option onto a table or similar device with screws.
Tape reel mounting platform (with foot)	This option is equipped with foot, so you can install this option as desired.

④ Joint tape splicing jig (8mm only)

When you use a JUKI designated joint tape, this jig allows you to paste a joint tape with glue easily.

⑤ Joint tape

This is a tape that splices an old tape reel and a new tape reel.

A dedicated type for each tape width is available.

⑥ Scissors (8mm only)

A positional adjustment between the tape feeder under production and the tape feeder to be connected can be accurately and quickly made by cutting the tape with dedicated scissors at connection of an 8 mm tape.

\* **Note:** *The scissors are not applicable to tapes with a less pitch than 2 mm.*

### 6.3.3 FTF/FTFR

#### 1) Specification table

① FTF (12 mm, 16 mm, 24 mm, and 72 mm)

Product code	Feed pitch	Pick position (Y direction)	Applicable component emboss width
FF121S	4mm	132mm	8.3mm or less
FF122S	8mm		
FF123S	12mm		
FF12FS	4/8/12mm		
FF12NS	4/8/12mm		
FF161S	4mm		12.2mm or less
FF162S	8mm		
FF163S	12mm		
FF16FS	4/8/12/16mm		
FF16NS	4/8/12mm		
FF242S	8mm		20.2mm or less
FF243S	12mm		
FF244S	16mm		
FF245S	20mm		
FF246S	24mm		
FF24FS	8/12/16/20/24mm		
FF24NS	8/12mm		
FF724S	12/16mm		62mm or less
FF728S	12/16/20/24/28/32mm		
Power supply/air	None		
Dimensions	FF12**	L =693mm , W=31.5mm , H =472mm	
	FF16**	L =693mm , W=31.5mm , H =472mm	
	FF24**	L =693mm , W=40.0mm , H =472mm	
	FF72**	L =693mm , W=89.2mm , H =472mm	
Mass (Excluding a reel)	FF12**: 2.45kg , FF16**: 2.45kg , FF24**: 2.6kg, FF72**: 5.1kg		
Component transport method	Ratchet drive system		

**Note:** The applicable component emboss depth is 17 mm or less.  
(Depending on the component size)

② FTFR (32 mm, 44 mm, and 56 mm)

Product code	Feed pitch	Pick position (Y direction)	Applicable component emboss width
FF323R	12mm	132mm	23.5mm or less
FF324R	16mm		
FF32FR	8/12/16/20/24mm		
FF32FR (Optional)	8/12/16/20/24/28/32mm	114mm ( <b>Note 1</b> )	
FF443R	12mm	128mm	33.8mm or less
FF444R	16mm		
FF44FR	8/12/16/20/24mm		
FF44FR (Optional)	8/12/16/20/24/28/32/36/40/44mm	114mm ( <b>Note 1</b> )	
FF564R	12/16mm	128mm	46.0mm or less
FF568R	12/16/20/24/28/32mm	114mm ( <b>Note 1</b> )	
FF56FR	8/12/16/20/24mm	128mm	
FF56FR (Optional)	8/12/16/20/24mm	114mm ( <b>Note 1</b> )	
Power supply/air	None		
Dimensions	L =693mm , H =472mm W= FTFR32**:47.7mm , FTFR44**:61.6mm , FTFR56**:66.0mm		
Mass (Excluding a reel)	FTFR32**:3.2kg , FTFR44**:3.5kg , FTFR56**:3.8kg		
Component transport method	Ratchet drive system		

**Note 1:** In the FC-1/1R of the KE-730/740/750 and KE2010/20/30/40 series, only the rear side can be used.

**Note 2:** The applicable component emboss depth is 25 mm or less.  
(Depending on the component size)

## 2) Options

### ① Emboss spacer (FTFR only)

When the component width and length are large and the tape depth is small, the posture stability at component pickup can be improved by placing the spacer at the component pickup position of the tape feeder.

The usable emboss depth is 1.0 mm to 8.0 mm.

### ② Tape reel mounting platform

This is a platform that allows you to set a tape onto a tape feeder. Since you can set a tape while holding a tape feeder correctly, this option improves the tape setting capability and prevents a tape feeder from falling down.

Type	Application
Tape reel mounting platform (no foot)	A user is supposed to fix this option onto a table or similar device with screws.
Tape reel mounting platform (with foot)	This option is equipped with foot, so you can install this option as desired.

### 6.3.4 Adjustment jig for the feeder with a monitor

This is a jig for checking a component pick position with a CCD camera to adjust it. If you check and adjust the pick position on a regular basis, you can maintain the stable pick-up capability.

#### 1) Specifications

1	Power supply	Select 100 V - 120 V or 200 V - 240 V.
2	Outer dimension	L=290mm, W=157mm, H=480mm
3	Mass	- Adjustment jig main unit: 12 kg or less (including the CCD camera and lens section) - Master feeder: 12 kg - Monitor: 4 kg

#### 2) Environment

##### ① Operation environment

Temperature: 10 to 35°C  
Humidity: 50 % or less  
No condensation.

##### ② Precision guaranteed range

Temperature: 20 to 25°C  
Humidity: 50 % or less  
No condensation.

##### ③ Transport/Storage environment

Temperature: - 15 to + 70°C  
Humidity: 20 % to 95 %  
No condensation.

#### 3) Configuration

- Adjustment jig main unit
- Master feeder
- CCD camera (including a lens)
- Light
- Power supply
- Monitor
- Jig tape
- Adjustment tool

#### 4) Applicable feeders

- ATF: 8 mm
- CTF: 8 mm
- FTF: 8 mm to 72 mm
- NTF: 8 mm to 56 mm \* See **Note**
- BF: BF10AS, BF11AS, BF12BS, BF12CS, BF25CS, BF28CS and BF28RS

\* **Note:** The NTF can be adjusted only in the Y direction except some models.

## 6.4 Tray Holder

This tray holder is equipped with one tray, and can be installed on the rear bank so that the head of the main unit can pick up a component directly from this holder.

When the tray size is small, several trays can be attached on the holder to allow this holder to function as a multi-tray holder.

	Full type	Half type
Longitudinal direction	65mm to 322mm	65mm to 160mm
Horizontal direction	65mm to 270mm	65mm to 270mm
Thickness	5 mm to 11 mm (from the bottom of a tray to the top of an IC) (see Note 1.)	
Number of occupied positions	42 (see Note 2.)	21 (see Note 2.)

**Note 1:** *Unless you use a feeder float detection sensor for a KE-2060R HC-specifications or EC-specifications mounter, the mounter can handle a component whose thickness is a value specified in the section "Specifications" + 9 mm.*

**Note 2:** *A number of available mounts at the rear side.*

- Full type: 2 tray holders,

- Half type: 4 tray holders

## 6.5 TR Series

A TR series device supplies a mounter with a tray component.

### 6.5.1 Overview

#### 1) TR1S (DTS: Dual Tray Server)

This is a tray server on which two trays can be set, and is to be installed on the rear bank so that the head of the mounter can pick up components directly from this tray server. When you use this server in Stop mode, which supplies the same type of components by alternately changing a tray, you can replace trays without stopping the main unit even though the stocked components run out.

Since the head of the mounter directly picks up components from this tray server, even irregularly-shaped components can be supplied easily.

#### 2) TR5S (MTS: Matrix Tray Server)

This matrix tray server is to be installed on the rear bank of a mounter, and pulls out all trays at a time so that the head of the mounter can pick up components directly from the trays. Since the head of the mounter directly picks up components, even irregularly-shaped components can be supplied easily.

#### 3) TR5D (MTS: Matrix Tray Server, Non-Stop Type)

This matrix tray server is to be installed on the rear bank of a mounter, and pulls out all trays at a time so that the head of the mounter can pick up components directly from the trays. Two tray stackers that control axes independently allow you to replace components without stopping PWB production even though the stocked components run out.

Since the head of the mounter directly picks up components, even irregularly-shaped components can be supplied easily.

#### 4) TR6S (MTC: Matrix Tray Changer, Transverse-Mounted Type)

This is a tray changer equipped with a shuttle type conveyor that supplies various types of tray components.

#### 5) TR6D (MTC: Matrix Tray Changer, Transverse-Mounted and Non-Stop Type)

This is a tray changer equipped with a shuttle type conveyor that supplies various types of tray components. Two tray stackers that control axes independently allow you to replace components without stopping PWB production even though the stocked components run out.

### 6.5.2 Specifications

Specifications		TR1S	TR5S	TR5D	TR6S	TR6D
1	Method for supplying a moulder with components	Pulling out of all trays at a time			Supplying components by a shuttle	
2	Tray unit (*1)					
	Number of units	2	40	40	20	30
	Minimum size of a tray that can be supplied (*2)	Width: 150 mm Length: 90 mm Thickness: 5 mm				
	Maximum size of a tray that can be supplied (*3) (*4)	Width: 340 mm Length: 230 mm Thickness: 27 mm	Width: 340 mm Length: 230 mm Thickness: 23 mm		Width: 340 mm Length: 230 mm Thickness: 15 mm	
	Mass	500 g or less/tray (total of the mass of a tray and that of a component(s))				
3	Component size	Maximum □ 50 mm			□ 5 mm to □ 50 mm (*5)	
4	Mass (kg)	16	217 (standard) 220 (EN) (*6)	218 (standard) 290 (EN) (*6)	225 (standard) 230 (EN) (*6)	324 (standard) 330 (EN) (*6)
5	Occupied position	48	—	—	—	—
6	Pick-up pad	—	—	—	Two types: ø 11-mm and ø 4.8-mm	
7	Length of the transportation rails	—	—	—	740mm	840mm (M,L) 740mm (E,Lwide)
8	Voltage of the power supply	—	The 3-phase power supply of the main unit is used as a single-phase power supply. (200, 220, 240, 380, 400 or 415 V AC)			
9	Apparent power	—	800VA	600VA	900VA	1kVA
10	Air consumption	—	3 L/min	5 L/min	50 L/min	50 L/min

(\*1) The following types of tray units on which trays can be set are provided:

	Type of a tray unit	Description	
TR1S	Top plate (ST) assembly	Top plate on which one tray can be set (standard)	
	Top plate (MTX) assembly	Top plate on which two or more trays can be set (optional)	
TR5S/ TR5D/ TR6S/ TR6D	Tray unit (ST)	One-touch style of unit that pushes down a tray with its spring pressure. A tray can be replaced with another one easily.	Select a tray unit (ST) or a tray unit (A) according to the material of trays to be used.
	Tray unit (A)	Unit that fixes a tray with screws. It is appropriate for a tray whose material is soft.	

(\*2) When you use a TR1S and a tope plate (MTX) assembly, the minimum size is 65 mm (W) × 65 mm (L).

When you use a TR5S/5D/6S/6D and an optional waffle tray holder, the minimum size is 50 mm (W) × 50 mm (L).

(\*3) The thickness is a dimension from the bottom of a tray to the top of the tray or a component, which is higher.

When you use a tray whose thickness is more than 11 mm with a TR1S/TR5S/TR5D, you have to set the feeder float sensor of the moulder so that it cannot be used.

- (\*4) When you use a tray whose thickness is more than 9 mm with a TR5S/TR5D/TR6D, you cannot set any tray immediately above that tray.
- (\*5) The area of a component that can be picked up should be  $\square$  5 mm or more. For a mechanically centered component such as a BGA, this area should be  $\square$  17 mm to  $\square$  50 mm.
- (\*6) This is the mass when the device is equipped with full options.

### 6.5.3 Options to be mounted at the factory (Only for a TR6S/TR6D)

- ① **Conveyor board transportation check specifications:** This is a function that stops a board on the conveyor to allow you to check it with your eyes.
- ② **Automatic board width adjustment function:** This function automatically adjusts the width of a board to be transported in conjunction with the automatic board width adjustment function of the mounter.
- ③ **Seesaw nozzle:** This is a unit that makes the pick-up pad seesaw to prevent a component from interfering with the pick-up pad if the surface of a component such as a socket component to be picked up is uneven and it comes in contact with the adjacent pick-up pad.
- ④ **Chuck for the CSP:** This is a mechanical chuck that supports components such as an FBGA whose dimensions are from  $\square$  9 mm to  $\square$  43 mm.

## 6.6 Stick Feeder

A stick feeder is driven by the belt without requiring any power supply nor air supply. It feeds an ordinary SOP, SOJ and PLCC which are packed in a stick.

Call the JUKI head office or local distributor for special components packed in a stick.

Feeder section type (Manufacturer code)	Lane width (mm) (Number of lanes per feeder)	SOP			SOJ			PLCC (QFJ)			Number of occupied positions (see Note 1)
		Nominal size	Component width (mm)	Component height (mm)	Nominal size	Component width (mm)	Component height (mm)	Nominal size	Component width (mm)	Component height (mm)	
N0 (SFN0AS)	Factory setting: 6.9 (1)	225 mil	5.72 to 6.99	to 1.5	-	-	-	-	-	-	3
	Adjustable range: 6.6 to 9.1	300 mil	7.62 to 8.89	2.0	-	-	-	-	-	-	
N1 (SFN1AS)	7.2mm (1)	225 mil	5.72 to 6.99	1.5	-	-	-	-	-	-	
N2 (SFN2AS)	9.2mm (1)	300 mil	7.62 to 8.89	2.0	300 mil	8.38 to 8.76	3.25~ 3.76	285 × 425 mil	8.05 to 8.31	4.20 to 4.57	
								290 × 490 mil	8.13 to 8.51		
N3 (SFN3AS)	11.2mm (1)	375 mil	9.53 to 10.8	2.5	350 mil	9.65 to 10.03		350 mil	9.78 to 10.03		
								350 × 550 mil			
N4 (SFN4AS)	13mm (1)	450 mil	11.43 to 12.7	3.0	400 mil	10.92 to 11.30		450 mil	12.32 to 12.57		
					450 mil	12.19 to 12.57		450 × 550 mil			
W1 (SFW1AS)	15mm (1)	525 mil	13.34 to 14.61	3.5	-	-	-	-	-	-	6
W2 (SFW2AS)	18.2mm (1)	600 mil	15.24 to 16.51	4.0	-	-	-	650 mil	17.40 to 17.65	4.20 to 4.57	
W3 (SFW3AS)	20.8mm (1)	-	-	-	-	-	-	750 mil	19.94 to 20.19	4.20 to 5.08	
W4 (SFW4AS)	26mm (1)	-	-	-	-	-	-	950 mil	25.02 to 25.27		
W5 (SFW5AS)	31.2mm (1)	-	-	-	-	-	-	1150 mil	30.10 to 30.55		

- The optional spacer kit, which allows a stick feeder to be changed to another type, is provided for the Types N1 to N4 and W1 to W5.
- You can make the gap of the Type N0 narrower to secure the lane width most appropriate to SOP 8-pin or 10-pin components.

## 6.7 Stack Stick Feeder

A stack stick feeder feeds an ordinary SOP, SOJ or PLCC packed in a stick to its pick-up position, then automatically ejects an empty stick to produce PWBs continually.

### *SOP component list*

Type	Feeder section type (Manufacturer code)	Lane width (mm)	SOP		
			Nominal size (mil)	Component width (mm)	Component height (mm)
1	SC1SES	7.0	225	5.72 to 6.99	~1.5
2	SC2SES	9.0	300	7.62 to 8.89	2.0
3	SC3SES	10.8	375	9.53~to 10.8	2.5
4	SC4SES	12.8	450	11.43 to 12.7	3.0
5	SC5SES	14.8	525	13.34 to 14.61	3.5
6	SC6SES	18.0	600	15.24 to 16.51	4.0

### *QFJ (PLCC) component list*

Type	Feeder section type (Manufacturer code)	Lane width (mm)	QFJ (PLCC)		
			Nominal size (mil)	Component width (mm)	Component height (mm)
3 L	SC3LES	10.8	350	9.78 to 10.03	4.20 to 4.57
4 L	SC4LES	12.8	450	12.32 to 12.57	
6 L	SC6LES	18.0	650	17.40 to 17.65	
7 L	SC7LES	20.4	750	19.94 to 20.19	4.20 to 5.08
8 L	SC8LES	25.4	950	25.02 to 25.27	
9 L	SC9LES	30.8	1150	30.10 to 30.35	

### *SOJ component list*

Type	Feeder section type (Manufacturer code)	Lane width (mm)	SOJ		
			Nominal size (mil)	Component width (mm)	Component height (mm)
2J	SC2JES	9.0	300	8.38 to 8.76	3.25 to 3.76
3J	SC3JES	10.8	350	9.65 to 10.03	
4J	SC4JES	12.8	400	10.92 to 11.30	
			450	12.19 to 12.57	

## 7. CONTROL SYSTEM SPECIFICATIONS

---

The KE-2000R series of products adopt Windows-XP as its Operating System. This allows you to operate these products as if you operate a personal computer.

### 7.1 Program Selection

Since the KE-2000R series of products are equipped with hard disk units as its internal device, they can store production programs. They are equipped with a floppy disk drive also, and this drive allows you to save production programs on a 3.5-inch floppy disk.

You can select a hard disk or floppy disk to store a program easily.

### 7.2 Production Methods

#### *Continuous production*

- The number of PWBs which have been produced completely is displayed on the screen during continuous PWB production. The number of not-produced PWBs can be displayed also with subtracting the number of produced PWBs from the planned number of PWBs to be produced.

#### *Pilot run function*

- You can correct the coordinates of a component: by tracing its position with a camera after temporarily placing a component (for pilot running).

#### *Blank run function*

- You can check the production operation without placing any component on a board actually.

### 7.3 Production Management Information

The KE-2050/KE-2060 series of products collect and display the following production management information:

- Number of PWBs which have been produced completely
- Production start time
- Running time (Operating time)
- Halt time
- PWB transportation waiting time
- Number of components picked up successfully
- Number of components placed successfully
- Number of bad marks detected
- Number of pick-ups and placements successfully executed per feeder, and so on

### 7.4 Edition of a Program

A production program consists of the following five types of data:

- PWB data
- Placement data
- Component data
- Pick data
- Vision data (only KE-2055R/2060R)

## 7.5 Number of Data Records Which Can Be Handled by a Production Program

Number of placement steps	:	3000 steps (maximum)
Number of circuits	:	Matrix circuits 1200 (Total of 10000 steps.)
		Non-matrix circuits 200 (Total of 10000 steps.)

## 7.6 Host Line Computer (HLC) (Optional)

System environment

- HLC system software
- Protect

Communication with a KE-2000/200R series of product: via Ethernet

- (1) Ethernet I/F board

**Note:** Any personal computer which has an Ethernet port is not required.

- (2) 100 Base/10 Base T HUB
- (3) 100 Base/10 Base T cable

Communication with a KE-700 series of product: via ARCNET

- (1) ARCNET I/F board

**Note:** Since there are two (2) types corresponded to either ISA\_\_BUS or PCI slot, please select either one to meet your computers

- (2) ARCNET cable

Function specifications

- MSL setup
- Program editing
- Database (Component library)
- Placement simulation
- Production planning
- Production
- Result summarization
- Program relator

### 7.6.1 Board viewer (an option for HLC)

This is a software capable of displaying the mounting data graphically onto the PWB image and confirming both the mounting coordinates and angles, based on the production programs prepared by editing the HLC programs. This also made it possible to overlay the PWB image taken thereunto by scanning, onto the mounting data to check for the image much more identical to the actual mounting.

**Note 1 :** HLC Ver. 5.3 or later version needs to have been installed.

**Note 2 :** The applicable OS is Windows ME/98/95/2000.

## 8. SAFETY SPECIFICATIONS

---

### 8.1 Standards specifications

#### *Emergency stop*

By the two (2) emergency stop buttons, each at the front and rear sides : i.e. depressing these emergency stop buttons immediately stops each axis to cut off the power supply for driving the motors.

#### *Safety covers*

The machine is provided with covers, each at the front and rear sides, for both of which the cover open switch detects either status of opening or closing to suspend the continuous operation temporarily upon opening either cover or both. Starting the operation as either cover or both remains at opened, results in a status of low speed operation. Keeping either cover or both opened results in nullifying both the START and SERVO FREE keys on the operation panel at the opposite side.

### 8.2 CE marks specifications (For a CE-specifications Machine Only)

This shall comply with the following EC (European committee) instructions

- EC mechanical instructions : 89/392/EEC + 91/368/EEC + 93/44/EEC
- EC low-voltage instructions : 72/23/EEC + 93/68/EEC
- EC EMC instructions : 89/336/EEC + 92/31/EEC + 93/68/EEC

## 9. RELIABILITY SPECIFICATIONS

---

### 9.1 Lifetime of devices

For five (5) years : Excluding either the consumable components or the following regularly replaceable components.

Refer to the Instruction Manual for the details of consumable components.

- Regularly replaceable components: you have to replace such a component approximately two years after starting using it. (This time period varies depending on the use condition of the component.)
  - Plastic rail
  - Board positioning pin
  - Sensor
  - Camera
  - Electromagnetic valve
  - Air cylinder
  - Vacuum generator
  - Liquid crystal back light
  - HDD

#### ***Criteria for calculating the lifetime :***

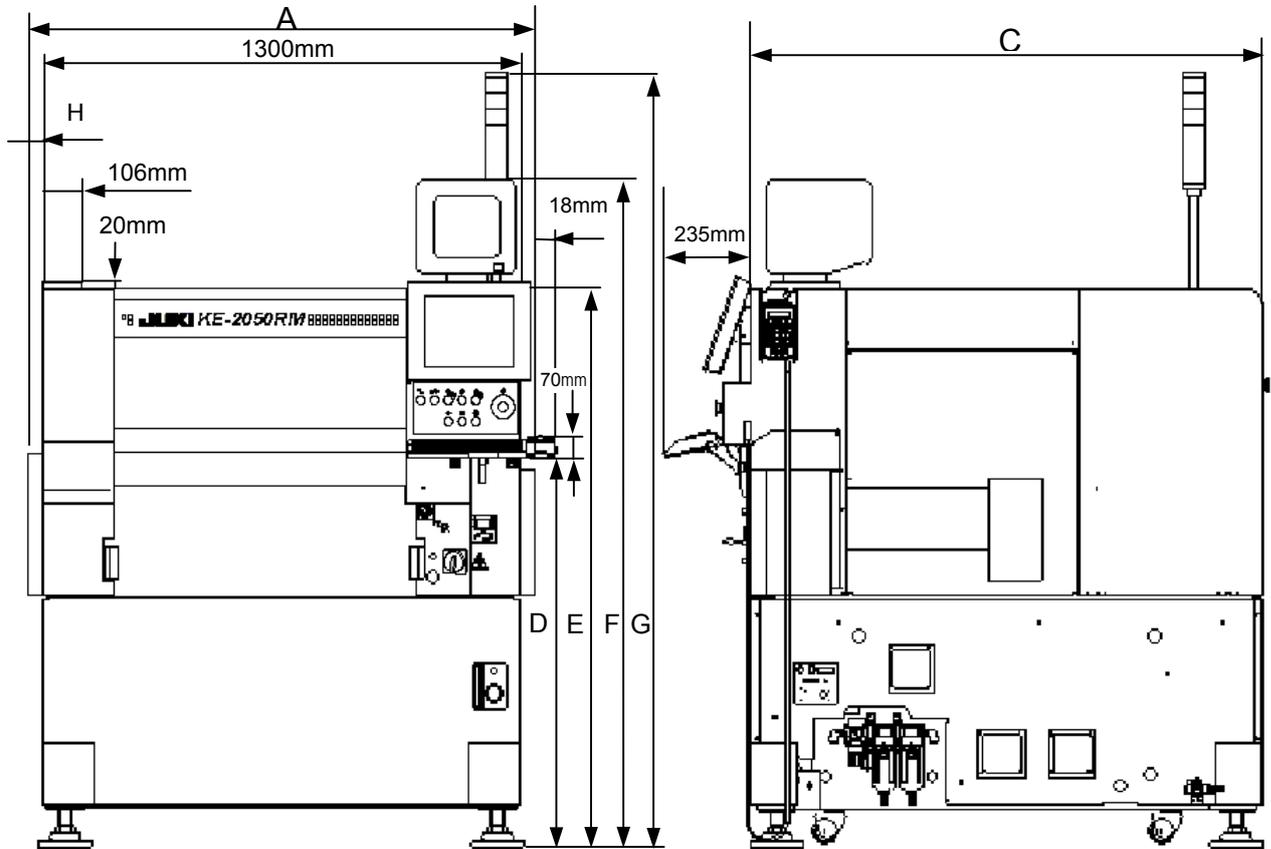
22 hours per day

300 days per year

Therefore,  $22 \times 300 \times 5 = 33,000$  hours/5-years

# 10. OTHER SPECIFICATIONS

## 10.1 Dimensions of Each Model



**Outside dimensions** (except for the largest projections)

(Unit : mm)

Size	M-PWB specification	L-PWB specification	L-wide PWB specification	E-PWB specification
A	1400	1500	1730	1730
C	1393	1500	1500	1600
H	50	125	240	240

(Unit : mm)

Size	Carryout height 900mm	Carryout height 950mm
D	1005	1055
E	1440	1490
F	1725	1775
G	2000	2050

\* The M-PWB, L-PWB and L-wide PWB specifications shall all result in being common for all the D~G dimensions.

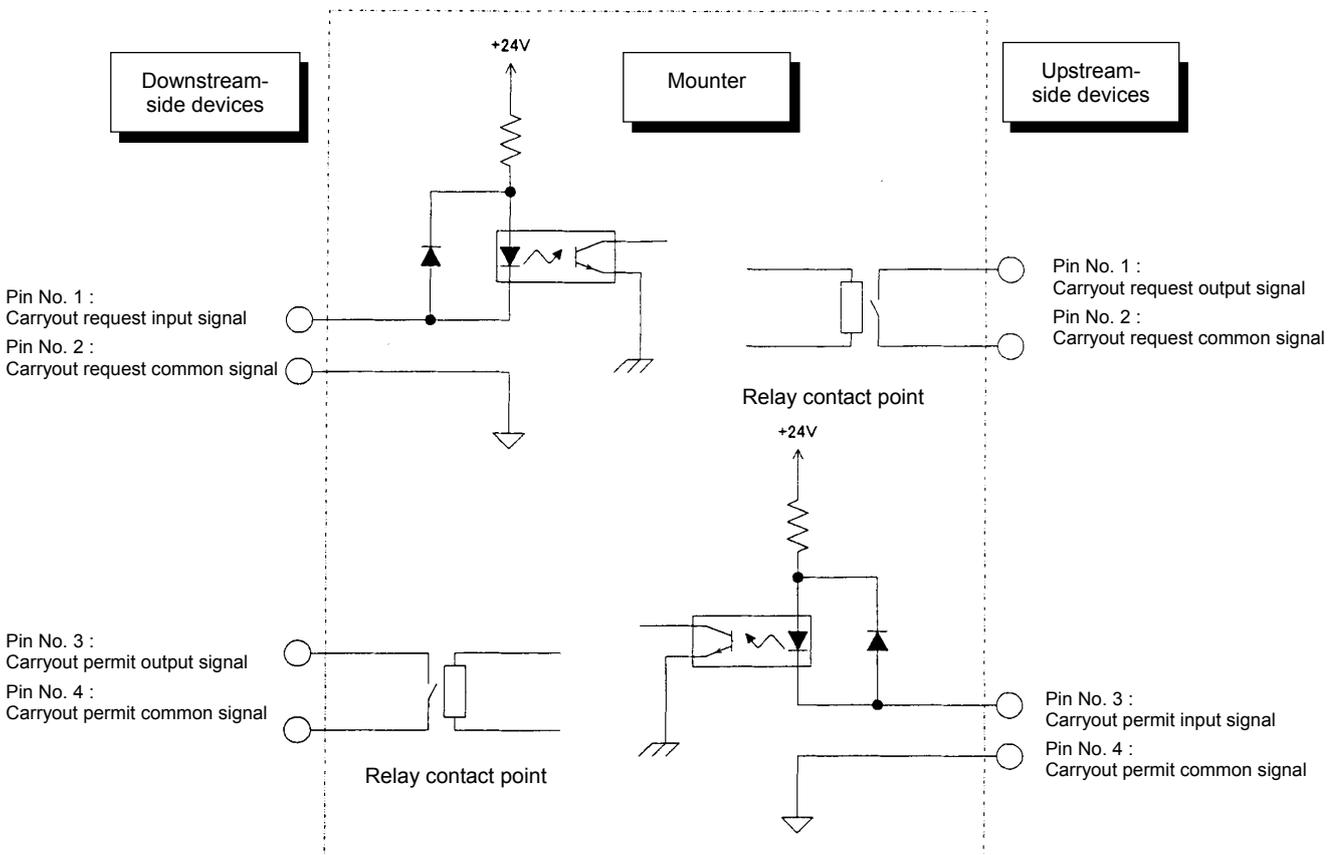
**Net weight**

(Unit : kg)

Model	M-PWB specification	L-PWB specification	L-wide PWB specification	E-PWB specification
KE-2050R	Approx. 1400	Approx. 1460	Approx. 1460	-
KE-2055R/2060R	Approx. 1410	Approx. 1470	Approx. 1470	Approx. 1530

## 10.2 Specifications for connections between the front and rear devices

### Signal interfaces and connection terminals

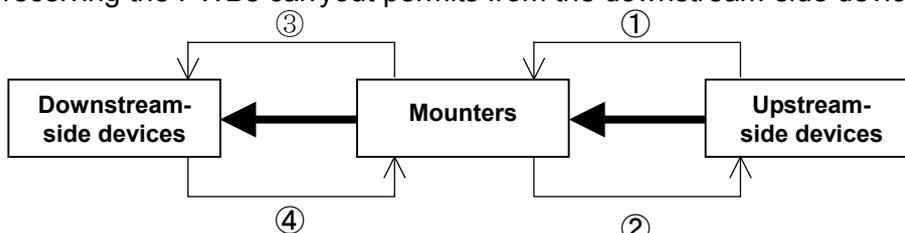


## 10.3 Electrical interfaces

### *Kinds and meanings of electrical signals*

The conceptual diagram of the electrical signals both on the mounters and the other side machines is shown, as follows : The electrical signals between the mounters and upstream-side devices (1), (2) and between the mounters and downstream-side devices (3), (4) is shown in the following diagram.

- The electrical signal (1) is called the “carryout request input signal (or PWBs available-in),” receiving the PWBs carryout requests from the upstream-side devices.
- The electrical signal (2) is called the “carryout permit output signal (or ready-out),” having the PWBs carried out to the upstream-side devices.
- The electrical signal (3) is call the “carryout request output signal (or PWBs available-out),” requesting the PWBs carryout to the downstream-side devices.
- The electrical signal (4) is called the “carryout permit input signal (or ready-in),” receiving the PWBs carryout permits from the downstream-side devices.



Conceptual diagram connecting the electrical signal