“We make Professional Technology”

PROTEC

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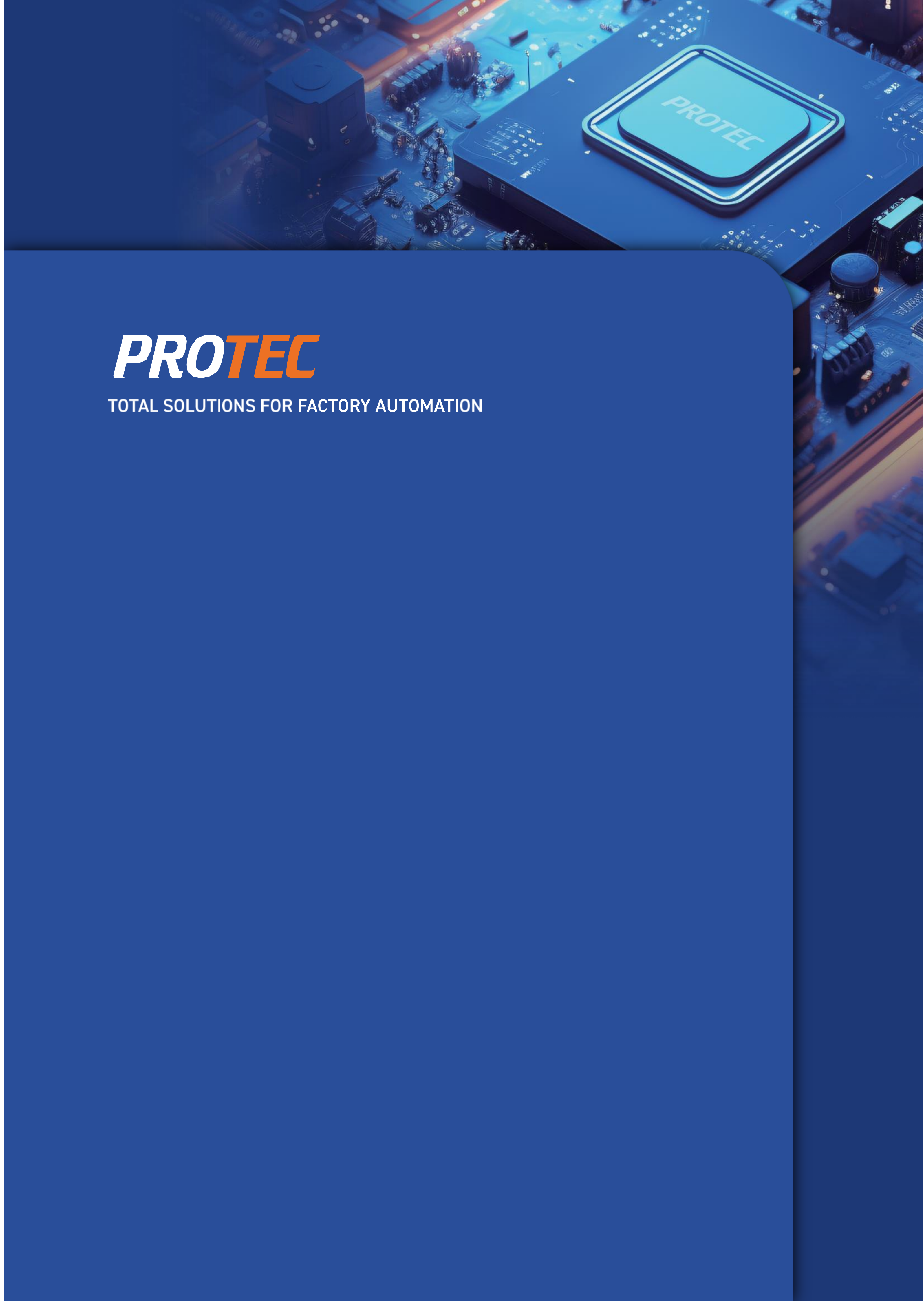


PROTEC

TOTAL SOLUTIONS FOR FACTORY AUTOMATION

Company Introduce

Confidently Global with PROTEC

PROTEC creates the highest value based on the best talents and technological prowess.

CEO's Message

PROTEC is a semiconductor packaging equipment manufacturer established in 1993. Since its inception, PROTEC has been dedicated to continuous research and development, aiming to become the world's premier semiconductor equipment manufacturing company in the high-precision dispensing and packaging sectors of semiconductors, LEDs, and SMTA.

Thanks to the dedication and support of our valued customers, PROTEC continues to turn challenges into reality, even today.

Thank you.

FOUNDED	EMPLOYEES	TOTAL ASSETS	PATENTS	CUSTOMERS	SALES AMOUNT
1993	**286**	**348B**	**272**	**55+**	**19.9K+**

Product

PROTEC

04 Dispenser
APOLLO

08 Attach
PCA-200

11 **Automated Guided Vehicle**

09 Laser Assisted Bonder
PLA-400RT

10 Micro SBM
BP-5000

Company History

1993

-2010
FDS-1000
INNOVATION
PRO-500
PRO-2020NT

2011

2012
FPA-300

2013
ZEUS
FSA-20D

2014
SPR-200
WDS-300
FWA-200
CAC-400
AGV

2015

2016
FPA-20
PLA-100

2017
FWA-500

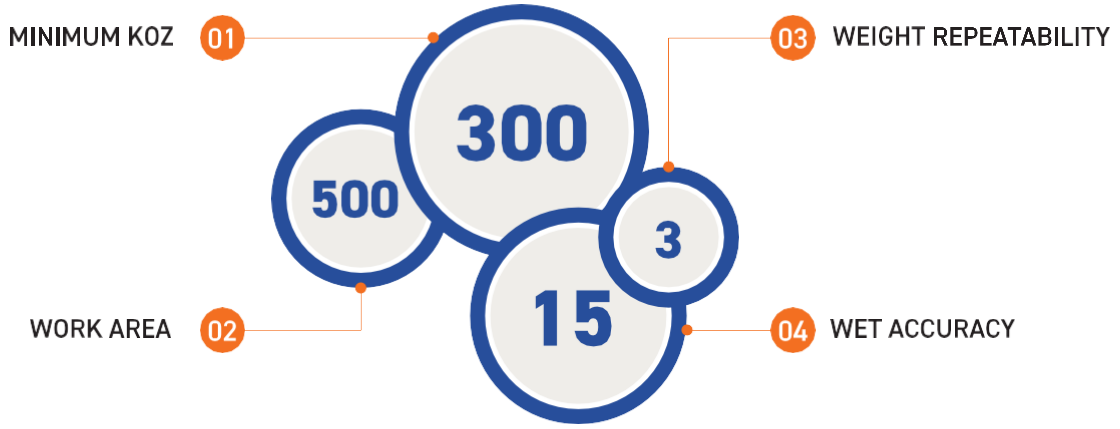
2018
BP-5000

2019
PLA-400
FCA-200
CAC-200
MK-D100

2020+
BP-5000IR
APOLLO
LB-300

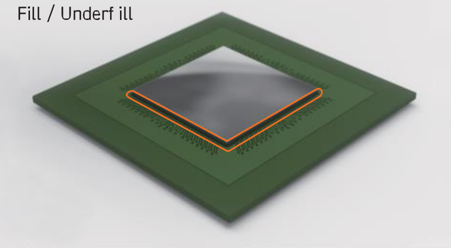
Dispenser
APOLLO

- HIGH RELIABILITY FOR HIGH SPEED AND ACCURACY
- HIGH FLEXIBILITY FOR VARIETY LINEUPS
- DUAL ACTING PUMP SYSTEM(INDIVIDUALLY CONTROLLED)
- DUAL LANE SYSTEM FOR HIGH EFFICIENCY
- FLYING VISION AND MULTICHIP RECOGNITION FUNCTION
- NON STOP DISPENSING MOTION CONTROLL FOR HIGH UPH

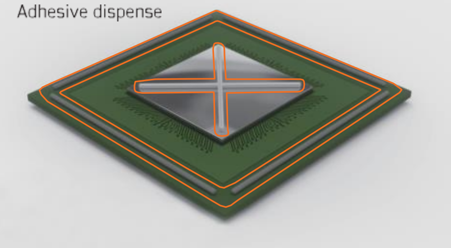


Items	Specification
Jetting Frequency	600Hz(MAX)
Minimum KOZ	300㎛
Wet Accuracy	±15㎛(Single Head)
Minimum Flow Rate	0.0013㎎
WEIGHT REPEATABILITY	±3% at 10㎎ Dispensing
WORK AREA	Single Lane : 500x480㎜
	Dual Lane : 310x200㎜
Stage Temperature	Max. 150 ±5℃ (Pre-heat, Bond zone)

Fill / Underf ill



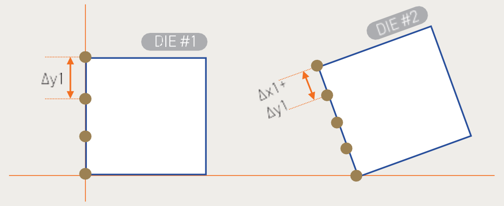
Adhesive dispense



DUAL ACTING PUMP SYSTEM

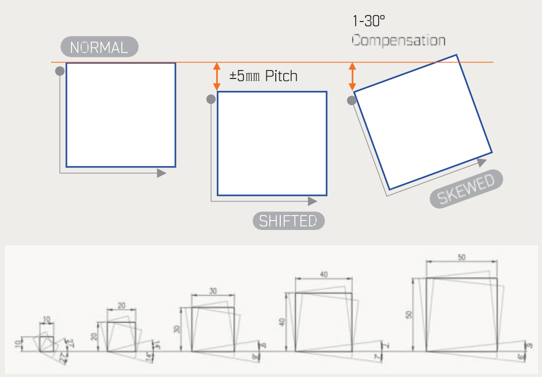
- Technology to Overcome Position and Discharge Discrepancies When Using 2 Heads
- Individual Control of Position and Discharge Volume for the 2nd Head

WEIGHT COMPENSATION



	FLOW RATE	DOT #	COMPENSATION
HEAD 1	0.01㎎	100	By Main Robot
HEAD 2	0.009㎎	111	Real Time Relative Position

POSITION COMPENSATION

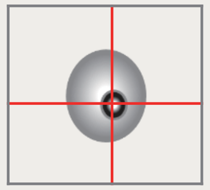


AUTOMATIC AND PROGRAMMED POSITION CALIBRATION

- Advanced Automation Features Developed for Establishing a Smart Factory
- Minimizing operator involvement to enhance productivity and quality

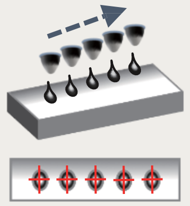
BEFORE

① Dotting on a Touch Probe

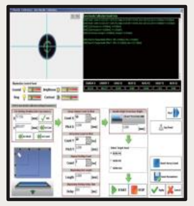


② Calibration with the Eye

APOLLO



① Dotting on a Calibration Pad

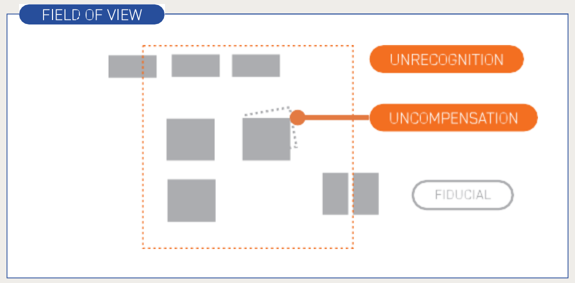


② Calibrated by Software

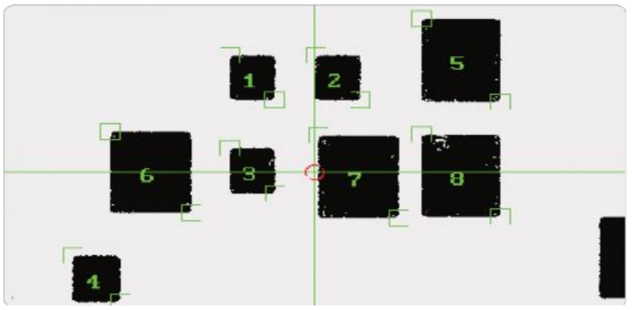
MULTICHIP RECOGNITION FUNCTION

- Advanced Functionality for Product Recognition in Cases of Irregularly Arranged Multiple Chips
- Enhanced Chip Recognition and Operational Convenience Using Gerber Files

UNRECOGNIZED ZONE

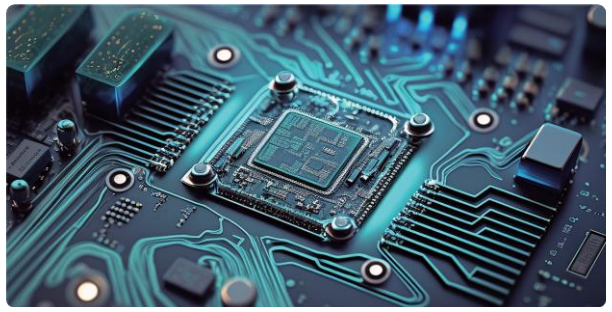


CHIPS RECONGNITION

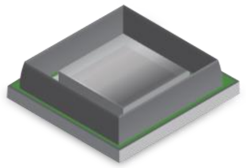


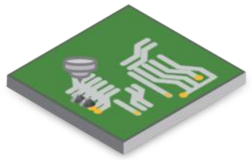
Dispensing Pump

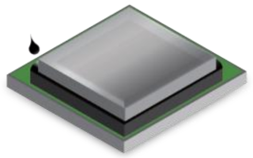
- Various pumps developed to accommodate diverse processes
- Part customization for the optimal process condition
- Multiple pump system for increased productivity
- Automatic weight compensation for consistent volume quantity

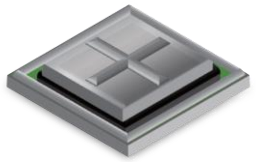


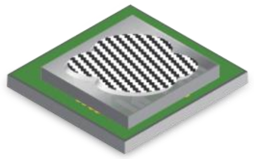
Application Range


DAM

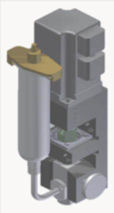
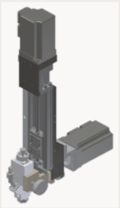
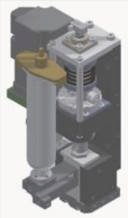
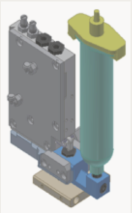
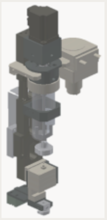

Solder Dispensing


Fill / Underfill

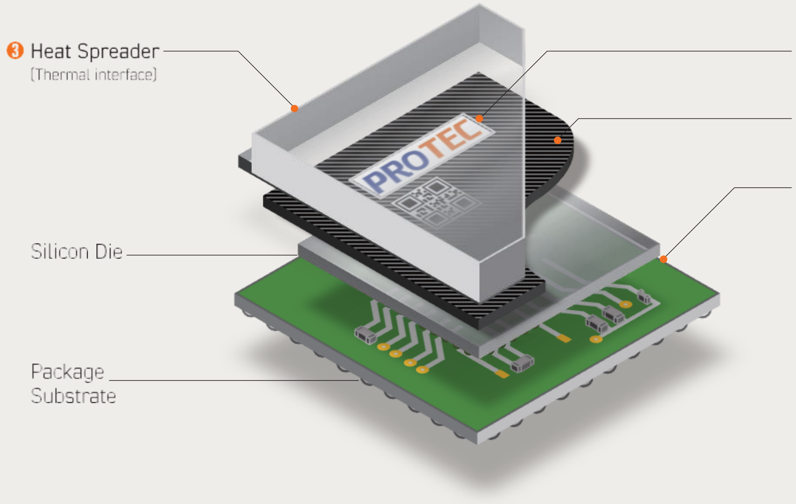

Adhesive dispense


Coating

Dispensing pump line up

					
Pump type	Auger pump	Linear pump	Impact pump	Piezo pump	Spray pump
Dispensing	Dot & Line	Dot & Line	Dot & Line	Dot & Line	Line
Driving control	Servo motor	Servo motor	Servo motor	Piezo actuator	Air pressure
Viscosity range (cps)	5,000 ~ 1,500,000	1 ~ 50,000	1 ~ 150,000	1 ~ 150,000	1 ~ 500
Min. DP weight (mg)	0.01	0.05	0.03	0.0015	1
Application	Dam, Solder paste, Silver paste, Hot melting	Epoxy filling, Dust trap	Underfill, Flux Jet Coating	FC underfill, Coating	EMI shield, LED phosphor coating
Remark	Screw Rotation	Piston Up-Down	Jetting	Jetting	Spray

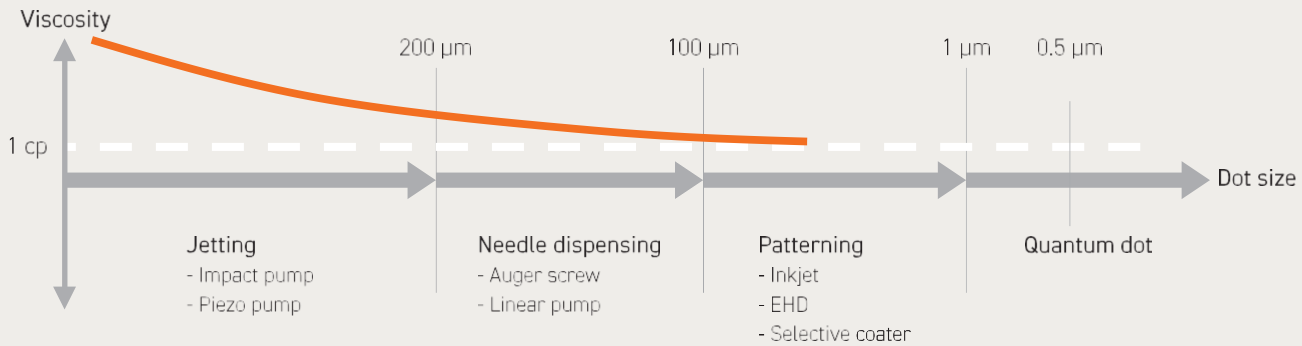
Advanced Packaging Solutions



PROTEC Contents

❶ Labeling Solution : Inkjet Printing
❷ EMI Shield Solution : Selective Coating
❸ Thermal Spreading Solution : TIM, Liquid Metal
❹ Jetting Solution : Underfill, Cornerfill

- Conventional
  - Contact
    - AUGER PUMP
    - LINEAR PUMP
    - SOL-EX PUMP
    - PROGRESSIVE PUMP
  - Non Contact
    - IMPACT PUMP
    - PIEZO JETTING
- Coating Solution
  - Spray
    - FLUX COATING
    - EMI SHIELDING
    - LED COATING
  - Sub-Micro
    - ELECTROHYDRODYNAMIC SPRAY
    - SELECTIVE COATER



Jetting
- Impact pump
- Piezo pump

Needle dispensing
- Auger screw
- Linear pump

Patterning
- Inkjet
- EHD
- Selective coater

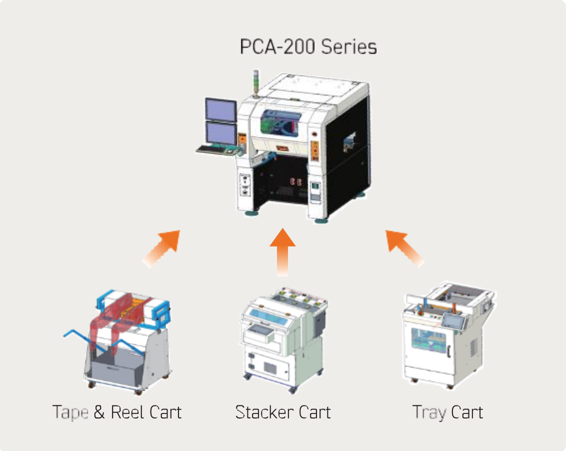
Quantum dot

Attach

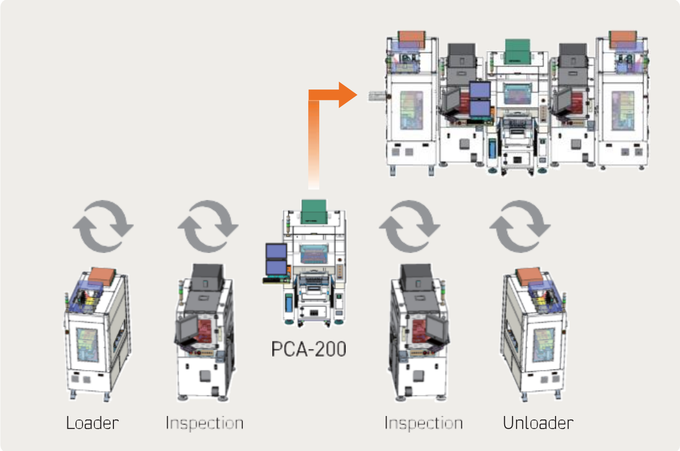
PCA-200

- DESIGNED TO EASILY PERFORM PRECISION ATTACHMENT TASKS UNDER VARIOUS CONDITIONS
- OFFERS FLEXIBILITY IN ADAPTING TO MATERIAL SUPPLY CONDITIONS AND LINE CONFIGURATIONS BASED ON PROCESS CHANGES
- EQUIPPED WITH VARIOUS TYPES OF PICK AND PLACE HEADS, ALLOWING CUSTOMIZATION TO SUIT SPECIFIC USAGE

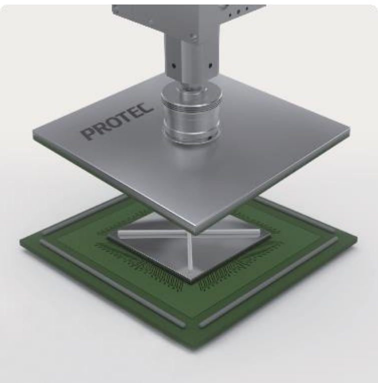
Easily adaptable to changes in raw material supply conditions



Facilitates quick adjustments to line configuration based on process changes

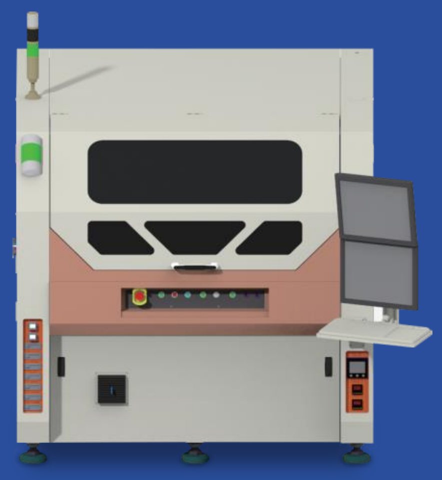


Item			Specification
System Performance	UPH		5K
	Attachment Accuracy	X-Y	± 7.0 µm @ 3σ
		Rotation, Tilt	± 0.1° @ 3σ
	Bonding Force	Standard	0.5Kgf ~ 4Kgf
		High Pressure	1Kgf ~ 20Kgf
	Head Heating	Constant Heat & Cool	~ 150°C ~ 400°C
System Flexibility	Applicable Component Size		1~60mm
	Applicable Substrate Size		300x200mm
System Reliability	MTBA (Mean time between assists)		< 1hrs
	MTTR (Mean time to repair)		< 3 minute



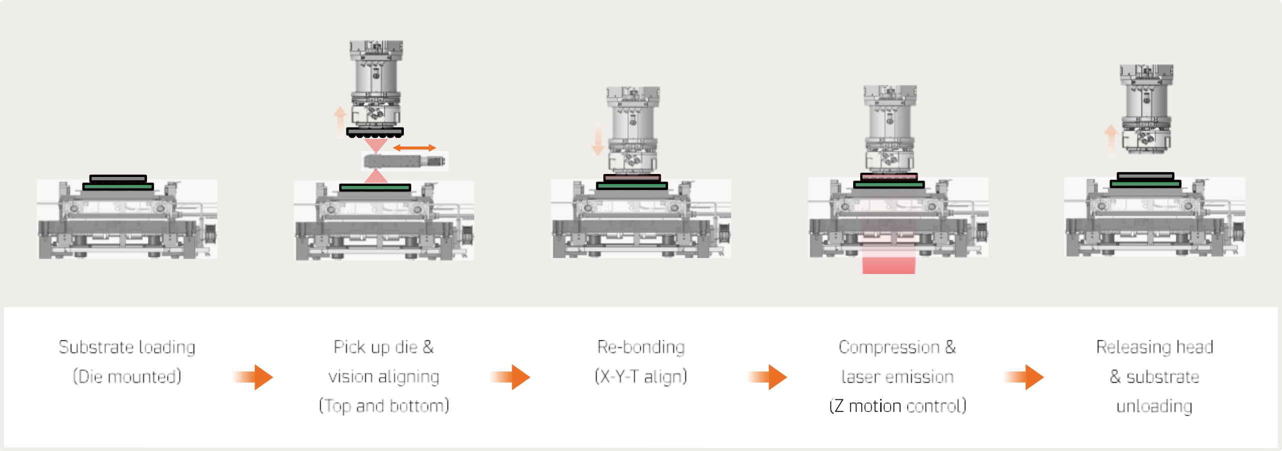
Laser Assisted Bonder

PLA-400RT



- LOW THERMAL STRESS AND LESS WARPAGE BONDING TECHNOLOGY
- EFFECTIVE FOR THIN SUBSTRATES DUE TO SELECTIVE HEATING CAPABILITY
- STABLE INTERCONNECTION QUALITY WITH VARIOUS PACKAGE TYPES
- EXCELLENT FOR DOWNSIZING PRODUCTION SPACE AND COST SAVINGS

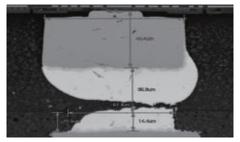
Comparison with Reflow



Items	Specification
Laser Type	IR Laser
Wavelength	980nm (Near Infrared)
Output Power	4000W
Homogenizer beam size	25x25 ~ 65x65mm
Gantry Resolution	1um
Beam center position accuracy	500µm
Beam width	Within 2.5mm
Flatness of stage	Bonding stage ≤ 25um
Stage Temperature	Max. 150 ±5℃ (Pre-heat)
Max working zone	310x160x4.5mm
Machine Foot Print	1,500x1,500x1,900 (W x L x H)

REFLOW

Interconnection quality



Bump tearing after reflow due to high thermal budget

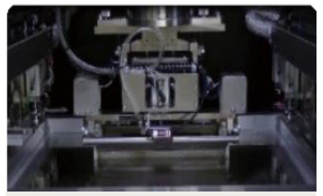
PLA-400RT

Heater & vacuum for warpage control

Stable joint height

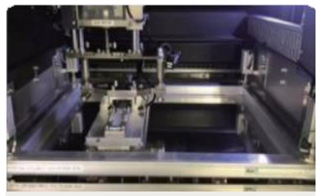
Micro SBM
BP-5000

- NON CONTACT AERO DROP HEAD
- AUTO BALL SUPPLY SYSTEM
  - NON STOP AUTOMATIC BALL SUPPLY
  - BARCODE VERIFYING SYSTEM
- DUAL SHUTTLE SYSTEM AT MAX 250 x 250mm
- DUAL REWORK HEAD
  - INDEPENDENT FLUX, ATTACH, REMOVE HEAD
- CU PIN ATTACHMENT SOLUTION



❶ Flux Printing

- Homogenous printing solution with rotary squeegee

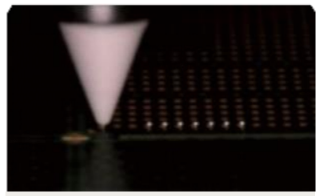


❷ Ball attachment

- Linear move Aero Drop Head for high-speed ball attachment

❸ Inspection System

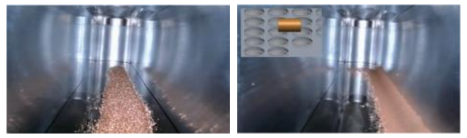
- High speed & accuracy inspection with PROTEC Vision system



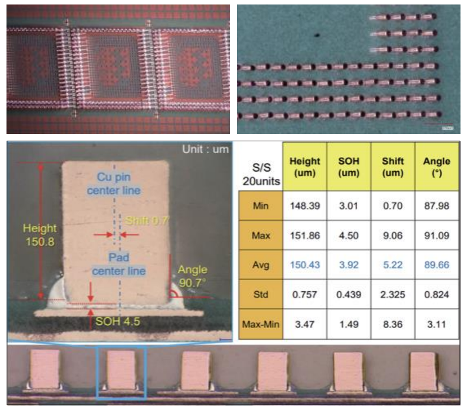
❹ Rework System

- Rework min. 45um ball
- Rework missing ball, Double ball, Misalignment available

Item	Spec.
Cycle Time	70 Sec/PCB (250x250mm / 65um Ball)
Repeatability Accuracy	±10μm @3S
Ball Size[um]	Φ45 ~ Φ600
Supply Substrate	PCB etc.
Substrate Handling Size[mm]	Dual Lane: 250x250x2.5mm
Substrate Handling	PCB Transfer Loading/Unloading
Footprint	3070x1800x2000mm
Weight	2,700Kg
Electric Power	220VAC, 3-Phase, 50/60Hz, 30A



Inside Aero Drop Head

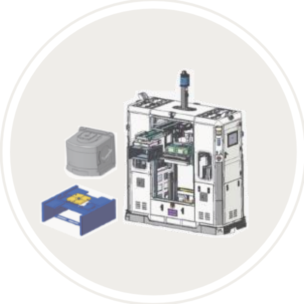


S/S 20units	Height (um)	SOH (um)	Shift (um)	Angle (°)
Min	148.39	3.01	0.70	87.98
Max	151.86	4.50	9.06	91.09
Avg	150.43	3.92	5.22	89.66
Std	0.757	0.439	2.325	0.824
Max-Min	3.47	1.49	8.36	3.11

Cu pin attach solution

Automated Guided Vehicle

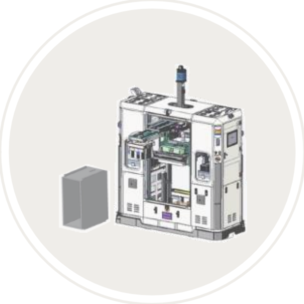
- FOCUSING ON CORE AREAS IN THE INDIVIDUAL VALUE CHAIN
- REDUCTION OF REDUNDANCIES IN PROCESSES
- MINIMIZING QUALITY LOSSES
- MAKING PROCESSES MORE FLEXIBLE AND COHERENT



CST & FOSB Ttansfer

Cassette & FOSB AGV

Payload : 10 kg (Max 15 kg)
Cassette Size : 394 X 393 X 169.5
AGV Size : 700mm X 1,800mm X 2,500mm



Magazine Transfer

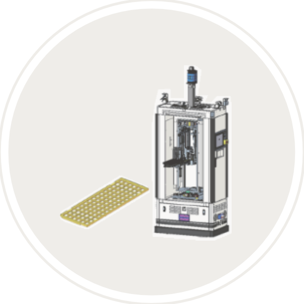
Magazine AGV

Magazine Size : 247 X 104 X 174
Payload : 10 kg (Max 15 kg)
AGV Size : 700mm X 1,800mm X 2,500mm

Rack Transfer

Rack AGV

Payload : 250 kg X 2 EA (Total 500 kg)
Rack Size : 491 X 570 X 551
AGV Size : 700mm X 1,800mm X 2,500mm



Tray Transfer

Tray AGV

Payload : 15 kg (Max 20kg)
Tray Size : 322.6 X 135.9 X 7.62
AGV Size : 700mm X 1,800mm X 2,500mm

Item	Specification
Payload (Arm)	250Kg x 2EA
Maximum Driving Speed Straight / Rotation	Maximum : 0.8m/sec Maximum : 0.2m/sec
Stopping Accuracy	±10mm
Guidance System	Optical Guide / 2D LiDAR (Reflector)
Work Area (Center to Center)	Avg : 1,055mm, Max 1,380mm
Driving Method	2 Steering Wheels
AGV Size / Weight	964x2180x1780mm / 1,300Kg
Power	48V, 160Ah
Battery Charge Method	External Battery Charge Station Frequent Recharging
Safety System	- Wide range optical sensors - Bumper contact sensors - E.M.O Switches - Warning Lamps - Sound Alarm

ACS Smart Functions