06 Reference Laser Response by Materials

◎ Excellent / ○ Good / △ Pair / X Impossible

	Materials	FAYb Laser	CO2 Laser
Resin	PE (polyethylene)	○	○
	PC (polycarbonate)	○	○
	PP (polypropylene)	○	○
	POM (Polyacetal)	◎	○
	PBT (polybutylene terephthalate)	◎	○
	PET (polyethylene terephthalate)	X	○
	ABS (acrylonitrile butadiene styrene)	◎	○
	EP (epoxy)	◎	◎
	PF (phenol)	◎	◎
	UF (Urea)	◎	◎
	PVC (polyvinyl chloride)	◎	◎
	PA (polyamide)	◎	○
	SI (silicone)	○	X
Metal	Iron	◎	X
	Aluminium	◎	X
	Nickel	◎	X
	Stainless	◎	X
	Copper	○	X
	Gold	○	X
Others	Ceramic	○	○
	Lumber	△	◎
	Paper	△	◎
	Glass	X	◎
	Rubber	◎	◎

Marking Examples


Metal tray


Printed circuit boards


IC Package


Transistors


Product package


PET bottle

Printed September, 2017

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Laser Series

laser marking machine

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Laser Marking Machine

Laser Marking Machine engraves 1D/2D barcodes, logos, and characters on the surface of a PCB or an object without physical or chemical damage. The laser head performs it's marking by adjusting its own height in the Z axis according to the height of the object.

Model	ALMC-100	ALMC-200	ALMC-300	ALMC-400
System Movement	X-Y Axes Stage Moving	X-Y Axes Stage Moving	X-Y Axes Head Moving	X Axis Laser Moving Y Axis Stage Moving
				
Laser Type	CO2 10W Marking Area 110x110 PANASONIC Head	FAYb 12W Marking Area 90x90 PANASONIC Head	CO2 10W Marking Area 110x110 PANASONIC Head	CO2 10W Marking Area 110x110 PANASONIC Head
	Gas Laser	Solid Laser	Gas Laser	Gas Laser
Feature	· Entry level product · Suitable for FR4 grade PCB	· Able to mark on metal · Better color formation for resin · Head moving type is inapplicable.	· Compact size · Faster cycle time · Suitable for FR4 grade PCB	· Compact size · Faster cycle time · Suitable for FR4 grade PCB · Full optional - Double-sided Marking - Fiducial Recognition - Marking Grade - Marking Power Detector - UPS
Laser Wavelength	10.6㎛	1.06㎛	10.6㎛	10.6㎛
Spot	182㎚	60㎚	182㎚	182㎚
Marking Material	Resin(Plastic), Ceramic, Paper, Glass	Metal, Resin(Plastic), Ceramic	Resin(Plastic), Ceramic, Paper, Glass	Resin(Plastic), Ceramic, Paper, Glass

*Depending on the material of the PCB or the marking material, the laser head may be changed. Pre-test is recommended.

1D code	Code39, Code128, ITF, NW-7, JAN/UPC, RSS-14, RSS
2D code	QR, Micro QR, Data Matrix, GS1 Data Matrix
Logo	BMP, DXF, HPGL, JPEG, AI, EPS
Laser Grade	Grade 4 (It is extremely dangerous to expose the laser light to skin or eyes even if it is temporary. And the diffuse reflected light is also dangerous to skin or eyes. Lastly, it can cause fire as well if not used properly)

ALMC-100	ALMC-200	ALMC-300	ALMC-400
Common Standard Specification			
Items	Contents		
Basler Vision Camera 	· Key Mark Function(Prevent wrong PCBs from coming in) » An operator registers the unique pattern(Barcode/Image) only on the PCB. When a new PCB comes in, the machine compares the pattern of the new PCB with the registered pattern to decide whether it is a correct board to engrave.  Key Mark: ◉ Image ○ barcode ○ Non Fiducial point: 50 Tolerance: 0.5 **Fiducial Point |** The machine starts marking even if a newly scanned pattern doesn't match 100% with the registered one as Key Mark but matches over 50%.  **Tolerance |** Error range can be set in 'mm' * When using key mark, if any of 'Fiducial Point' and 'Tolerance' can not be matched, an error occurs. · Teaching Marking Position » Marking position preview(Indicator)		
Scanner 	· Barcode Reading » Honeywell 3310g		
BOFA Fume Collector 	· External Type - Structure: Primary Pre-Filter / Secondary HEPA Filter - ON/OFF control by the host(ALMC) - Check error status via Laser Marking Machine » Filter exchange / Operating Error		
DUCLEAN Fume Collector 	· Internal Type - Cartridge type(Periodic cleaning is needed.) » Changing filter after certain amount of time. * Brand changes may occur depending on Laser Machine specifications.		
Ionizer 	· Minimize PCB damage by keeping ion balance below ±10V · Bar type · Brand : KEYENCE or PANASONIC		
· Saving data in a log file			
· Adopted internal motion controller(Industrial LAN Interface)			

ALMC-100	ALMC-200	ALMC-300	ALMC-400
Optional Specifications			Standard Specifications
Double-sided Marking	Double-sided Marking	Double-sided Marking	Double-sided Marking
· Adopting the internal inverter to engrave on both top/bottom sides of PCBs			
Fiducial Recognition	Fiducial Recognition	Fiducial Recognition	Fiducial Recognition
· Position compensation up to 0.1mm by recognizing Fiducial before marking » The tact time is increased by 2 ~ 3 seconds. If marking on both sides, the tact time will be increased by 4 ~ 6 seconds. » The equipment width will be longer by (W)150mm.			
Marking Grade	Marking Grade	Marking Grade	Marking Grade
· Measuring the barcode grade marked on PCB » Able to provide the results to a PDF			
Marking Power Detector	Marking Power Detector	Marking Power Detector	Marking Power Detector
· Checking whether the set laser value is output after the set number of marking » When a certain set value 'n' (For example, n=1,000: Every time after producing 1,000 PCBs) is input, the laser automatically moves to the laser power detector and measures the laser power so that the user can know the current state of the laser. » Since the detector and the Laser PC are connected by a USB cable, it can be directly controlled on the Laser Machine program. » If the marking power is different from the set value, it is necessary to re-adjust the set value in the program.			
UPS	UPS	UPS	UPS
· The standard is a battery capacity that can last about 10 minutes			
Optional Specifications			
Laser 30W	Laser 25W	Laser 30W	Laser 30W
· Other specifications require discussion in advance.			
Marking Area 300x300	Marking Area 330x330	None	None
3 color LED(R, B, W)	3 color LED(R, B, W)	3 color LED(R, B, W)	3 color LED(R, B, W)
· It is necessary to set the LED color on machine program according to the PCB color. · LED color can be decided according to the customer's PCB color. Ex. 2 color LED(Red, White)			

· MES SYSTEM(Manufacturing Execution System)

· Communication Method: LAN(TCP or UDP) / RS-232

» LAN communication is a method using the Ethernet cable that we often use to connect to the Internet. Technically, you can use sockets and others for LAN communication. Also, it is fast.

» RS-232 is one of the serial communication methods, and it was used mostly in the past industry. Also, it is mainly used when the amount of communication data is small and the communication speed is much slower than LAN.

* MES protocols and flow charts should be provided from customer.

ALMC-100 / ALMC-200 / ALMC-300 / ALMC-400 General Spec.

No.	Items	Y	X
1	PCB Min. Size Width(mm) x Length(mm)	50x80	
2	PCB Max. Size Width(mm) x Length(mm)	330x440	460x530
3	PCB Thickness (mm)	0.5 ~ 4.0	
4	PCB Edge (mm)	3.0	
5	PCB Top/Bottom Clearance (mm)	25 / 25	
6	Loading Weight (kg)	2	
7	Conveyor Speed (mm/sec)	200	
8	Conveyor Belt	Antistatic $10^{9\sim11}$ Tem: 70°	
9	Transport Height (mm)	950±20	
10	Flow Direction	Left to Right / Right to Left	
11	Fixed Rail	Front / Rear	
12	Air Supply (Mpa)	0.5(5bar)	
13	Air Usage (ℓ/min)	33	48
14	Electricity Consumption (kw) - Laser	1.4(Normal) / 2.2(Internal inverter)	
15	Electricity Consumption (kw) - Extractor	1.1(External Type) / 0.9(Internal Type)	
16	Power	220~230V/50~60Hz, 1Phase	
17	Color	EX8816(S)-SR-WH020 (KCC)	

Dimension (L)mm x (W)mm x (H)mm

Model	Type	Y	X
ALMC-100	Normal	1090x1520x1540	1190x1670x1540
	Internal Inverter	1150x1840x1540	1390x1990x1540
ALMC-200	Normal	1090x1520x1540	1190x1670x1540
	Internal Inverter	1150x1840x1540	1390x1990x1540
ALMC-300	Normal	950x1650x1540	1050x1600x1540
	Internal Inverter	950x2000x1540	1050x2100x1540
ALMC-400	Internal Inverter	950x2000x1540	1050x2100x1540

*Normal : Single sided marking
* Internal inverter : Double sided marking

01 YJ's own Program

02 CPK

ITEM NUMBER	1	2
ITEM NAME	X	Y
AVERAGE	3.046	37.716
STANDARD DEVIATION	0.039	0.032
MAX. DATA	3.108	37.755
MIN. DATA	2.991	37.634
MAX. DEVIATION	0.117	0.121
CP	4.24	5.286
CPK	3.852	4.059

03 Certificate

Inverter Stage Repeat Precision Measurement

Stage Repeat Precision Measurement

Fiducial Repeat Precision Measurement

Built-In Inverter Performance Testing

- Inverting time
- Stage transfer response time

Noise and Vibration Measurements

- Noise level of 65db
- No misaligned marking position caused by vibration.

Laser Marking Depth Measurement

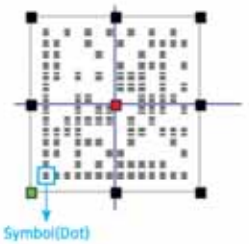
- No damage to the PCB caused by engraving. (The shallowest measurement depth: 15.6μs)

*Marking depth depends on laser power, marking speed or PCB material.

04 Reference Symbol Size and Data Capacity-Data matrix

Symbol size	Numeric (Single-byte)	Alphanumeric (Single-byte)
10 x 10	6	3
12 x 12	10	6
14 x 14	16	10
16 x 16	24	16
18 x 18	36	25
20 x 20	44	31
22 x 22	60	43
24 x 24	72	52
26 x 26	88	64
32 x 32	124	91
40 x 40	172	127
44 x 44	228	169
48 x 48	288	214
52 x 52	-	259
64 x 64	-	-
72 x 72	-	-
80 x 80	-	-
88 x 88		-
8 x 18	10	6
8 x 32	20	13
12 x 26	32	22
12 x 36	44	31
16 x 36	64	46
16 x 48	98	72

※ "Alphanumeric" includes blank characters, numerical characters and capitals.



- The table represents the amount of data that can be included in barcodes, depending on the number of width- and lengthwise dots of the data matrix(symbol size).
- The recommended symbol size for manufacturing purposes is 0.2~0.25mm
- Amount of Markable data by barcode size

Barcode size	Numeric	Alphanumeric
2.8mmX2.8mm	16	10
3.2mmX3.2mm	24	16
3.6mmX3.6mm	36	25
4.0mmX4.0mm	44	31

- The above table is an example and may vary depending on laser type and PCB characteristics.
- Higher-resolution scanners should be used to read larger amounts of data in barcodes of the same size.
- The read rates of the scanner vary depending on the barcode size

05 Reference Marking Quality

BEST Example - barcode on Green PCB

It has a bright pattern with dark background, so it has good contrast ratio and good scan rate. The marking quality is excellent because the size of the marking DOT and the margin are the same(equidistant interval).

Bad Contrast Example - barcode on Red PCB

Most scanners use red LEDs for lighting. At this time, the red PCB strongly reflects the red LED, so the brightness difference between the barcode and the PCB color is reduced, resulting in a lower scan rate.

- If you are marking on a red PCB, the reading rate can be improved by using white illumination. However the reading rate may drop if other colors are going to be used under the same illumination. Therefore it is very important to check the colors of the boards that are going to be used at customer's site in advance.