Ultrasonic Laserbonder M17

F & K DELVOTEC – Partner for Tomorrow's Interconnection Technology.

Developed in close co-operation with Fraunhofer Institute for Laser Technology in Aachen, the combination of ultrasonic bonding and laser welding offers the best of both worlds. It is ideal for package interconnects in power modules and for battery pack assembly. Aluminium, copper or nickel ribbons are welded by laser energy at low bond forces. The process offers a larger range of choice in very diverse joining materials, compared to ultrasonic bonding. As a further advantage, it is very easy to automate.

ULTRASONIC
LASERBONDER

Advantages

- **The best of both worlds: Combination of laser welding and wire bonding**
- Higher current carrying capability with larger connector cross sections compared to ultrasonic wire bonding
- Lowers manufacturing costs through reduced demands on the surface quality of the parts to be connected
- Allows XYZ positional tolerance compared to laser welding through use of touch down sensor and pattern recognition
- No damage to parts because of lower clamping forces in the work holder
- Integrated process technology and automation from a single source
- Combines three processes in a single machine without modification:
  - Laser bonding of ribbon
  - Laser-tab-bonding of connections
  - LIMBO

NOT JUST MACHINES.
BUT BONDING SOLUTIONS.

Bitte kürzen

F&K DELVOTEC

MADE FOR YOU – YOUR ADVANTAGES AT A GLANCE

M17 LSB

500 W

- CW infrared
- Power modulation
- PCB connections
- Al/Cu ribbon thickness 100 µm

M17 LSB

600 W

- CW infrared
- Power modulation
- DCB connections
- Terminal connections
- Al/Cu ribbon thickness 200 µm

M17 LSB

700 W

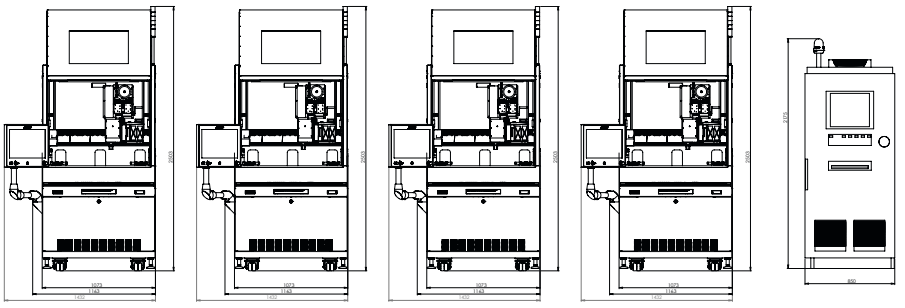
- CW infrared
- Power modulation
- DCB, steel, die-cast Al
- Terminal connections
- Al/Cu/Ni ribbon thickness up to 400 µm

M17 LSB

1,000 W

- CW infrared
- Power modulation
- TAB Bonding up to 800 µm thickness
- Suitable for battery pack connections
- Al/Cu/Ni ribbon thickness up to 500 µm

ULTRASONIC LASERBONDER MACHINE MODEL



M17	500 W	600 W	700 W	1,000 W	Laser Unit
X-axis	652 mm (25″)	652 mm (25″)	652 mm (25″)	652 mm (25″)	
Y-axis	350 mm (14″)	350 mm (14″)	350 mm (14″)	350 mm (14″)	
Z-axis	100 mm (4″)	100 mm (4″)	100 mm (4″)	100 mm (4″)	
Width	1,073 mm	1,073 mm	1,073 mm	1,073 mm	850 mm
Height with/without signal lamp	2,501 / 1,975 mm	2,501 / 1,975 mm	2,501 / 1,975 mm	2,501 / 1,975 mm	2,175 mm / -
Depth	1,565 mm	1,565 mm	1,565 mm	1,565 mm	1,200 mm
Weight	1,100 kg	1,100 kg	1,100 kg	1,100 kg	510 kg
Working height	SMEMA compliant 850-1,050 mm				
Power supply	3P / 200 V / 208 V / 230 V / 400 V / PE; 50 Hz / 60 Hz				
Compressed air	4-8 bar				
Vacuum connection	< -0.8 bar				
Optional	Supply for water-water cooler, purging gas for N2				

The technical information provided reflects our current knowledge. The details shown do not take any particular considerations of unique cases into account.

LASER UNIT

- **Ribbon materials**
  Al, Au, Ag, PtIr, Pt, Cu, Ni
- **Ribbon dimensions**
  - Max. cross sections up to 5,000 µm x 500 µm
  - Min. cross sections down to 500 µm x 100 µm
  - Customer specific dimensions on request
- **Joining materials**
  - Al, die-cast Al, Cu, Ni, brass, bronze, steel
  - Other metals on request
- **Ribbon spool**
  - Spool diameter 3", 3,5", 4"
  - Larger diameters optional
  - Automatic ribbon feed
  - Detection of ribbon end by CCD sensor
- **Cutting process**
  Active, programmable cut depth, front cut
- **Bond tool**
  Special tools of length 50 mm, 60 mm, 70 mm, 90 mm, 100 mm & 110 mm
- **Touchdown sensor**
  - Inductive sensor with linear working range
  - Anti-crash hardware sensor
- **Laser power**
  500 W, 600 W, 700 W, 1,000 W (each freely adjustable between 10 and 100 %)
- **Optics variants**
  - Optics for tools 50 to 70 mm
  - Optics for tools 90 to 110 mm for extreme cavity depth
- **Adaptation to tool lengths**
  Tracking of laser focus position for different tool lengths and varying touchdown speeds
- **Focus spot diameter**
  < 50 µm for tool length 60 mm and 100 mm, resp.
- **Beam quality M^2**
  ≤ 1.5
- **Laser beam source**
  CW fibre laser with fundamental mode radiation
- **Speed**
  - Speed up to 1 wire/sec (depending on application)
  - Welding time depending on ribbon width and the desired connection area
  - Simple scale-up of connection area possible

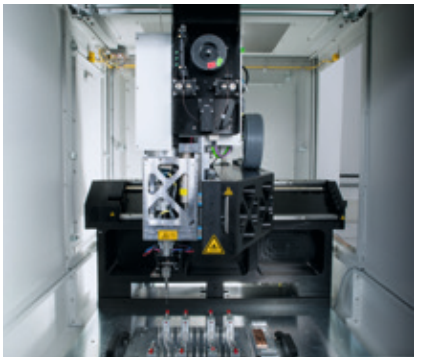
ULTRASONIC LASERBONDER MACHINE MODEL

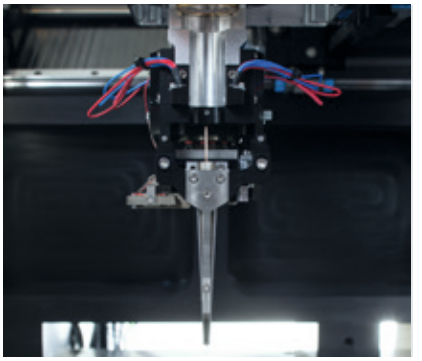
M17 LSB

MACHINE SPECIFICATION

MACHINE BASE

X-Y-axes	Linear encoder resolution better than 0.1 µm
P-axis	+/- 180° AC servomotor with absolute encoder, resolution 0.0035°
Z-axis	Up to 100 mm, AC servomotor with absolute encoder, resolution 0.5 µm
Positional accuracy	< +/-5 µm @ 3 sigma, incl. PRU/Wire/Tool/Application
Repeatability on the product	< +/-3 µm @ 3 sigma, incl. PRU/Wire/Tool/Application
Working height	According to SMEMA 850-1,050 mm
Monitor	21" flat screen
Certification	SEMI S2, CE, Laser Unit Class 1 according to EN 60825-1:2014
Connections	SMEMA, USB, RJ 45, Digital I/O
Operating system	Real-time, Unix®-based multi-tasking OS
Pattern recognition unit	Cognex® PatMax® System
Recognition time	Up to 2 ms per pattern recognition
Alignment correction	NEW Flexsearch, single point recognition incl. phase angle, two point recognition, phase angle correction +/- 5 %
Precision	Sub-pixel resolution down to 0.1 pixel
Camera	Moving CCD-camera, 640 x 480 pixel
Resolution	Standard approx. 30 µm per pixel, adjustable using different optics
Image size	Standard 19.2 x 14.4 mm, adjustable using different optics
Illumination	Ring light, red, blue, white
Manual work stations	From standard size for PCB 4" x 4", 6" x 6", 8" x 6", 10" x 6", 10" x 8" up to 650 mm x 350 mm (25" x 14"), vacuum and / or mechanical clamping
Automatic parts handling	Belt indexer for flat substrates, e. g. ceramic substrates, PCB or workpiece carriers, substrate length: flexible, according to requirements; substrate width up to 350 mm
Network connectivity	TCP/IP/FTP data exchange, SMEMA for in-line connections to other machines, SEMI communication standard SECS/GEM, MES host connectivity





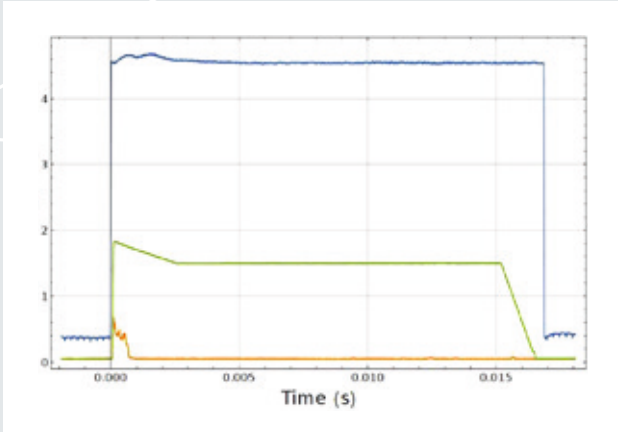
NOT JUST MACHINES. BUT BONDING SOLUTIONS.

QUALITY TOOLS

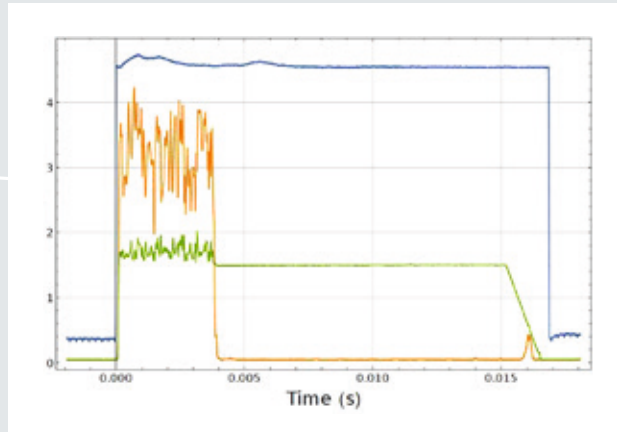
Laser quality monitoring

The laserbonder can be equipped with a process control system which permits real-time monitoring of standard welding processes. It supplies quality data on every single bond by detecting deviations from the programmed welding parameters as well as process fluctuations. The welding process is compared to characteristic references which are a composite of various signals, automatically supporting the user when deciding about OK or NOK classifications for the joint.

Part OK



Part Not OK



Further information about the system is available upon request.

Laser adjustment kit
- Camera system and PRU for easy adjustment and checking the bond tool
- Software based adjustment of laser beam relative to the bond tool and tuning of the focus position
- Graphical display of the target position of bond tool and cutter
- Minimal adjustment time when changing bond tool and cutter
- Detection of tool contamination and prevention of faults

Traceability
- Connection of standard F & K or customized MES
- Connection to existing host system
- Storing, retrieving and transferring process settings per wire
- Parts traceability by barcode or RFID
- SECS/GEM state monitoring

Barcode & DMC-Reader
- Fully automatic part recognition, recipe and process data assignment
- Available as flexible hand-held DMC-reader or fixed-position integrated unit

Expanding process limits by
- Combination of CW micro and oscillation welding
- Excellent beam quality and high dynamic range of beam motion for improved weld seam strength
- Optimal adaptation of connection area between ribbon and substrate
- Welding depth and seam width independently adjustable
- Flexible laser power modulation for varying requirements in amplitude and frequency
- Optimal quality monitoring

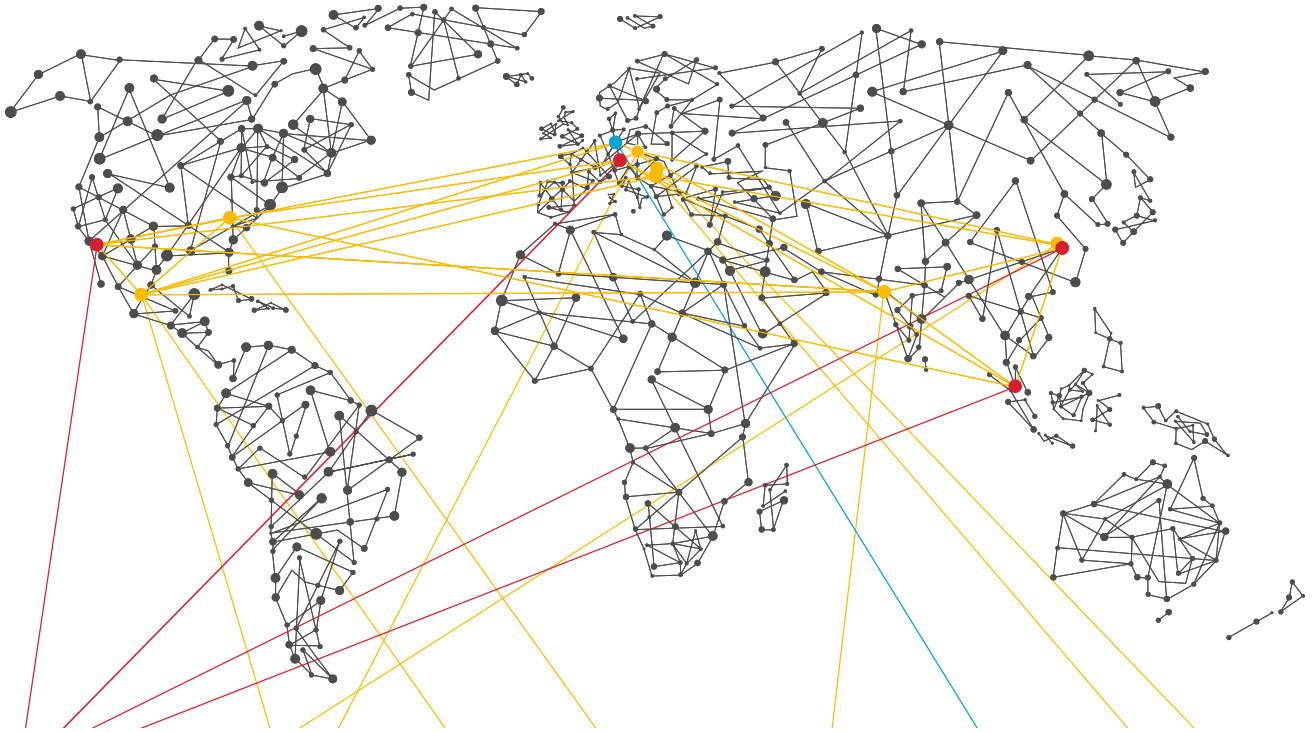
BOND ACADEMY: your advantages?
Our support for implementing your requirements and optimising your processes:

- Competent advice
- Determining the correct transducer frequency for the application
- Rapid prototyping
- Validation of product design
- Sample bond tests and pilot series manufacture
- Training your service technicians
- Ramp-up-support

BOND ACADEMY

POWERFUL SYNERGIES AS „MEMBER OF STRAMA GROUP“

Together with our parent company, Strama-MPS, we integrate our wirebonders into complete assembly lines with other joining, assembling and testing stations. Our customers profit from the combination of our bonding and automotive expertise, „One-stop-shopping“, and the interface free quality of the complete package.



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