DAGE 4000HS



4000HS | Specifications

General	Size (W x D x H)	1100mm (excluding PC) x 850mm x 670mm
	Weight (unpacked)	100kg
	Power supply	100/110V, 220/240V AC, 50/60Hz switchable
	Pneumatic supply (machine)	4 bar, 6mm OD/4mm ID plastic pipe
	Interfaces	RS232, optional network card, centronics
	Vacuum supply (workholders)	Min 500mm Hg plastic pipe
Workholder	Adapter	Application specific (please consult factory)
Loadcartridges	Shear in Y	Ball shear 3kg (+/- 2% FSD) and 5kg (+/- 1% FSD)
	Ball pull in Z	CBP 5kg (+/- 1% FSD)
	Higher forces available on request	Please consult factory for further details
Test Speed	Shear	Adjustable up to 4m/sec
	Pull	Adjustable up to 1.3m/sec
Test Parameters	Programmable	Shear speed, stepback height, landing speed, fallback, overtravel, grade list and product group fields
Operator Interfaces	PC	Please consult factory
	Monitor	17 inch LCD
Compliance	General	European CE regulations-EMC directive, low voltage directive and mechanical safety directive
	Quality	Manufactured and tested in accordance with ISO 9001
Analysis Features	Statistics	Force or energy results, min, max, mean, range, standard deviation, m-3s, CpK, Cp
	Charts / SPC	Histogram, Trend, Pareto
	Z (Stepback)	Total stepback accuracy +/- 1 micron
	Force vs Distance	Force vs Distance or time graphs, Energy results: total, pre-peak and post-peak load. Test velocity report

LATEST JEDEC STANDARDS

Fully compliant to JEDEC standards for high speed shear and cold bump pull.
Please contact Dage for further details on these standards.

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4000HS

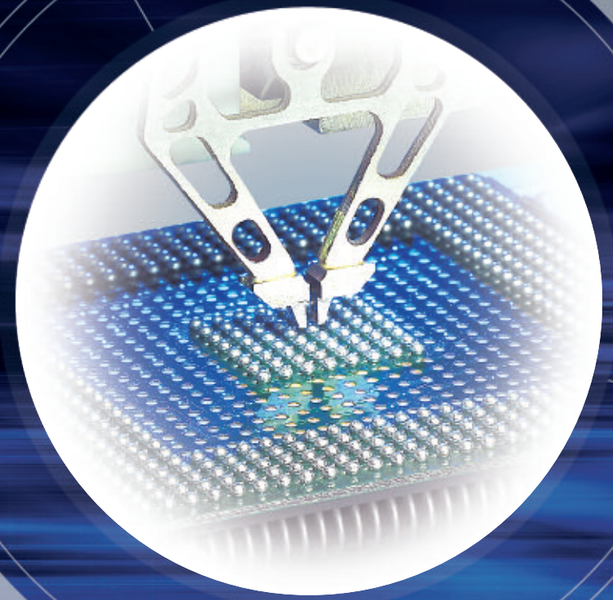
High Speed Bondtesting

Brittle fracture joint analysis

Alternative to drop testing

Interfacial testing

Impact testing applications



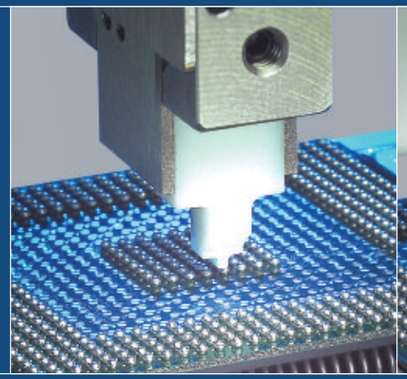
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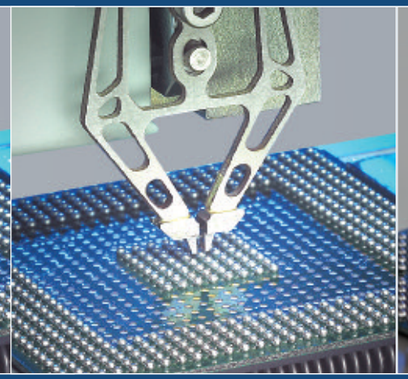
DAGE 4000HS



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High Speed Bondtesting







SUITABLE FOR:

Brittle fracture joint analysis

Alternative to drop testing

Interfacial testing

Lead-free solder joint evaluation

BGA, CSP, PiP, PoP, SiP solder joint testing

Pad finish and substrate evaluation

Impact testing applications

Zone shear – testing multiple ball bonds simultaneously

4000HS features:

- Shear testing to 4m/s
- Cold bump pull to 1.3m/s
- Ultra high bandwidth force measurement technology
- Dage patented frictionless air bearing bump shear technology
- Cold bump pull testing using patented Dage jaw technology
- Force-displacement graphs with test time or distance
- Fracture energy (pre- and post-peak load plus total)
- Velocity log
- Single adjust optics mounting keeping region of interest with changing operator eye line
- Servo power control
- Built-in automatic safety guards with CE/UL compliant interlocks
- Home position load/unload

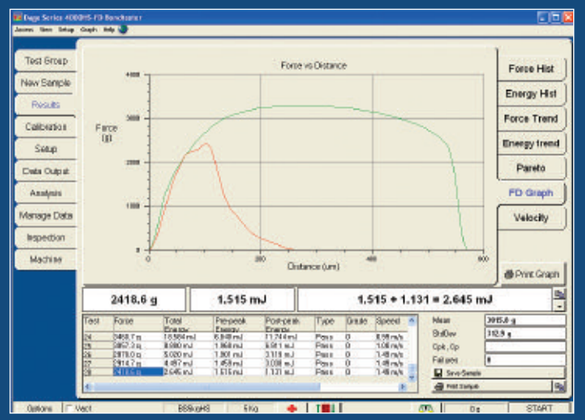
Traditional bondtesting is carried out at relatively low speeds (less than a 1mm/sec for shear and 5mm/sec for pull) and the principal failure mode is rupture of the solder itself. Thus there is little information available on the strength of the bond. With the enforced introduction of Pb-free solder and the accompanying higher risk of interfacial brittle fracture failures, there is an urgent need to find quick and accurate methods for testing the bond interface. High speed bondtesting offers a viable alternative to cumbersome and expensive board level drop testing. Essentially, high speed bondtesting reproduces the configuration of drop testing by applying high strain rates to the solder bump, thereby hardening the solder and largely transferring the load to the bond interface. Studies have shown that the DAGE 4000HS can be used to examine the influence of different materials on bond strength, the effects of thermal aging, and monitor process improvements in device bumping. Furthermore, many reports show a strong correlation of high speed bondtesting with drop testing.

Tens of bonds per hour can be assayed with detailed information on fracture force, energy and failure mode.

High Speed Shear

The high speed test regime requires an area in which the tool (in reality, the test ball) can accelerate before contacting the ball. This is achieved by retracting the sample holder to an automatically calculated distance according to the speed chosen. Thus, non-test balls must be cleared prior to the test. DAGE provides a ball clearance jig which will readily clear a wide variety of devices. (DAGE-4000HS-CLEAR-JIG; also see technical informer).

Shear tools are provided in industry standard sizes with smaller face widths available on request.



High Speed Cold Bump Pull

This technique is a DAGE invention and offers some advantages over shear with simpler, symmetrical loading, similar to the 70° to the horizontal load experienced by corner balls in drop tested devices. Indeed, a body of data is accumulating showing a strong correlation of high speed pull and drop testing.

Similarly to high speed shear, the conventional pull test has been reconfigured to achieve the high test speeds. With the jaws attached to the bump, the sample holder is driven upwards to the test speed by a combination of the Z-drive and an air-driven rising table.

Data analysis

The use of digital data capture for both shear and pull offers the possibility of detailed information on the bond failure. Force-displacement curves provide signature shapes for different types of bond failures. In addition, fracture energy values (which can be subdivided into pre- and post-peak load energies) give the means to further characterise the bond and differentiate between different failure types. For example, the total fracture energy for a brittle failure is generally much less than that for a solder failure. See screen shot below.

High Power Zone Shear

This is an optional alternative to high speed shear testing. One or more rows of balls are sheared simultaneously in a single pass of the tool. Typically this is done at a speed of 600mm/s. Evaluation is semi-quantitative through an assessment of remaining solder area for each sheared bond.

Note: zone shear requires a separate main frame and XY stage to the standard 4000HS.