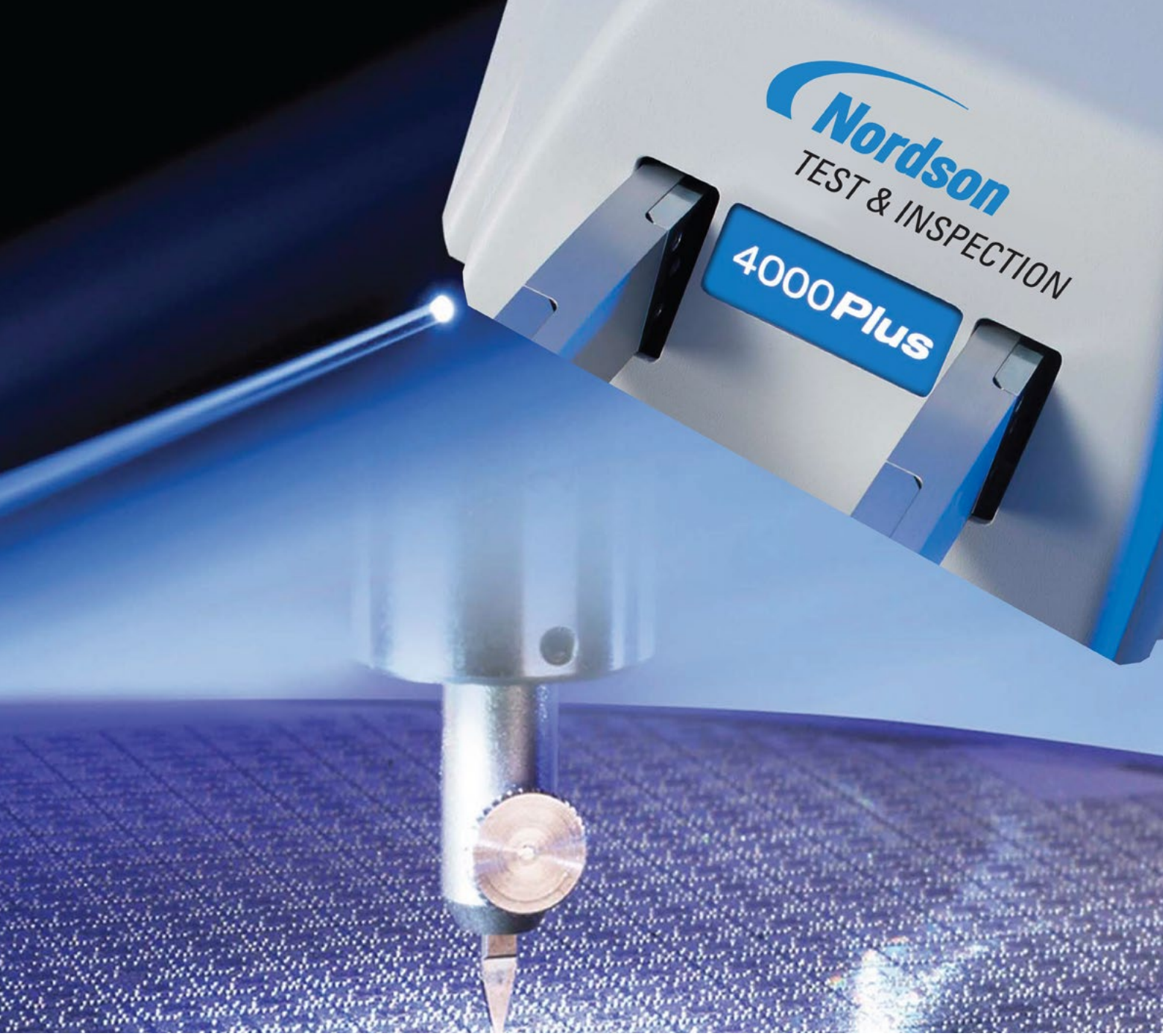


4000*Plus* Bondtester

Engineered for Excellence

www.nordson.com/TestInspect

Nordson
TEST & INSPECTION

The 4000Plus is the most advanced bondtester on the market, offering unsurpassed accuracy and repeatability. Developed by the world leader in bond testing technology, the 4000Plus represents the industry standard in bond testing.

Irrespective of the industry: semiconductors, or the various microelectronics sectors of automotive, power, hybrid, or high reliability, the 4000Plus has the versatility and accuracy that gives its users total confidence in the quality of its products. It features the latest patented bond testing technology, for example the anti-backlash system. The 4000Plus is capable of testing from 250 milligrams right through to 500kg, catering for both standard and specialized applications. Remember too, that the 4000Plus builds on the success of the 4000, so data correlation between the machines is assured.

Highly Configurable

The 4000Plus provides ultimate versatility. Choose from a range of XY stages up to 300mm of travel in one axis, and a unique range of load cartridges including push cartridges up to 50kg, pull cartridges up to 100kg and shear cartridges up to 200kg (500kg capable using special fixtures for shear). An extensive range of load tools provides for standard and specialized applications. A wide choice of optics is available to suit every application. The standard mainframe vertical working envelope of 120mm will meet most applications. However please consult factory for any special requirements.

Pull/Push Test	Shear Tests
Wire	Ball
Ribbon	Solder ball
Hot bump/pin pull	Standard die shear
Cold bump pull	Cavity
Copper wire bonds, studs and pillars	Passivation layer
Stud bump	Low profile zone shear
Vector	Wafer bump
Fatigue	Fatigue
Push	Low profile die shear
Tweezer peel	High force die shear
High force pull (up to 100kg)	Horizontal stud pull
Vertical stud pull	Cu pillar shear
Die pull/flip chip pull	Micro bump shear

Leading The Way In Bond Testing

Repeatable results

- Ribbon pull – With an extensive range of load tools including hooks and tweezer jaws, all sizes and types of ribbons can be tested.
- Hot bump/pin pull – A new load cartridge makes this ground breaking test even better, especially for evaluating PCB substrate materials and low profile solder bumps.
- First bond ball pull of copper wires and pull of studs, bumps and pillars – For the first time custom pull jaws enable tensile tests on these important interconnects.
- Fatigue pull and shear – Fatigue analysis is emerging as an increasingly important method in evaluating solder joint reliability. A mix of software control and hardware enables fatigue testing in both pull and shear modes.
- Passivation layer shear – A combination of software and a special load tool provides a solution to ball shear where access is limited by the passivation layer.

Extensive Testing Capability

Current and emerging applications are fully catered for with load cartridges combined with standard and specialized fixtures to perform shear tests up to 500kg, pull tests up to 100kg and push tests up to 50kg.

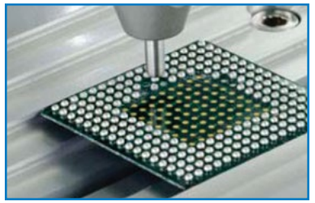
Image Capture System

Quick and simple to set-up, located in close proximity to the test head to aid faster testing. Improves test automation.

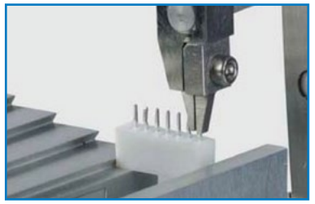
XY Stage

A range of XY stages are available from 160mm x 160mm right through to 300mm x 210mm. Including high precision, higher speed and zone shear options.
In addition to this there is even the option of a heated work stage up to 400 degrees C at 200kg max, complete with adjustable temperature control.

Flexural Testing



Fatigue Testing



Torsion Testing

Brittle Fracture Testing

Confidence In Your Results

Data Correlation

Nordson recognizes that data correlation is fundamental for cross referencing test results between old and new platforms. Existing users of Nordson bondtesters (4000 Optima and 4000) can confidently compare data between old and new machines. Further, we know that many users collect data on the same product from multiple machines, either on the same site or even different sites, and need to be sure that the data will correlate with ultimate integrity given identical configurations and test parameters.

Nordson have carried out exhaustive internal GR&R studies to prove correlation between old and new machines. The 4000Plus plays a critical role in data correlation but equally important is Paragon™, our bond testing software. Import and export protocols and database management tools also ensure data streams from new, old or multiple machines can be compared.

Data Integrity

The 4000Plus offers exceptional repeatability and reproducibility of results, with a total system accuracy of +/-0.1% of the load range selected (see detailed specifications).

Ultimate Step Back Accuracy

Control of shear height (step back) is critical to consistent test results in shear applications. Nordson has developed a unique patented anti-backlash system that aids setting and control of step back. Shear height can be set and maintained to single micron accuracy across the range of load cartridges. Additionally, on the S25G load cartridge the step back accuracy is a superlative +/- 0.25 microns. The accuracy is qualified through laser measurement.

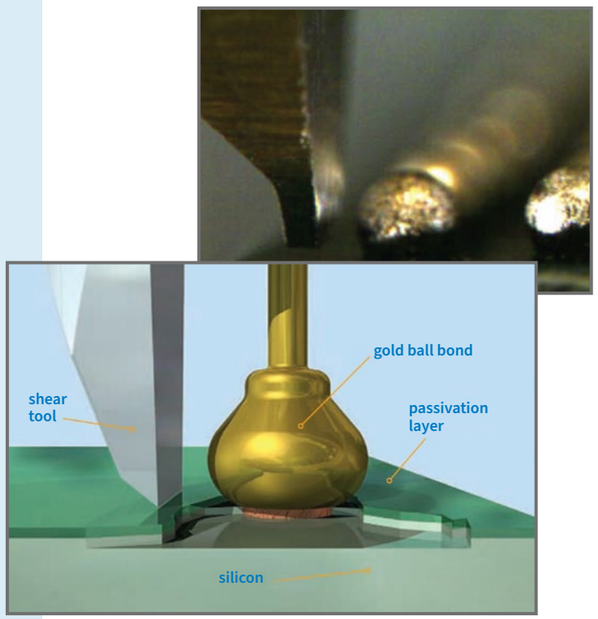
Data Traceability

The 4000Plus is calibrated in accordance with International standards, providing full traceability and integrity in product testing. Calibration is performed using O.I.M.L class M1 tolerance weights directly traceable to National Standards; UKAS or optional NIST Class 1 weights.

Automatic Load Tool Alignment

The optional self-aligning shear tool sleeves ensure that the correct load is applied by compensating for misaligned die attach.

Ultimate step back accuracy



Increased Efficiency

The 4000Plus test platform offers a wide range of optical solutions for bond testing and materials testing, featuring imaging systems for failure mode analysis, alignment and live recording of tests.

Image Capture Camera

The image capture system provides high resolution images for failure mode analysis and fiducial alignment. Its close proximity to the tool maximizes throughput, particularly for automated tests. The camera has a built-in light source to provide optimal illumination and fine focus is achieved using the precise movement capabilities of the 4000Plus test platform. A wide range of objective lenses ensure that the optimal resolution and depth of field can be achieved with magnifications up to 1500x.

Borescope Imaging System

The borescope provides high magnification imaging, ideal for precise tool alignment. Based on medical endoscope technology, it is perfect for ultra fine pitch devices such as fine wire bonds or very small geometries such as micro bumps and copper pillars. The borescope contains its own light source and can be positioned in and out of the viewing position using its precision slide with constant focus on the test sample.

Trinocular Camera

The trinocular camera can be attached to any stereo zoom microscope with a C-mount. With an appropriate microscope, the field of view can be adjusted from wide to close up and is ideally suited for macro positioning. Used in conjunction with the side alignment camera, the two views (front and side) enable precise tool alignment, particularly for small, delicate or difficult samples.

Side Alignment Camera

The side view camera is ideal for testing micro features such as copper pillars, micro bumps and TSVs. The system enables a secondary view point of feature to be tested, providing accurate and repeatable tests. The side alignment camera is attached to the cartridge mount, giving ultra stable, vibration free, imaging with constant focus on the tool tip.

All camera systems use a USB connection and can be field retrofitted.

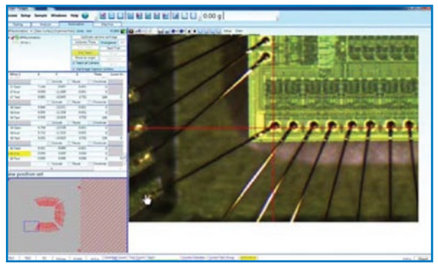
Image Capture System

Borescope Imaging System

Trinocular Camera

Slide Alignment Camera System

Image capture camera can be utilized as a fiducial alignment camera for automation.



Paragon™ software's virtual map for programming a pattern

You can test faster with the unique vector controls, utilizing the newly styled key-pad featuring programmable nudge buttons for precise positional alignment.

Reduced Cost of Ownership

Downtime Minimized

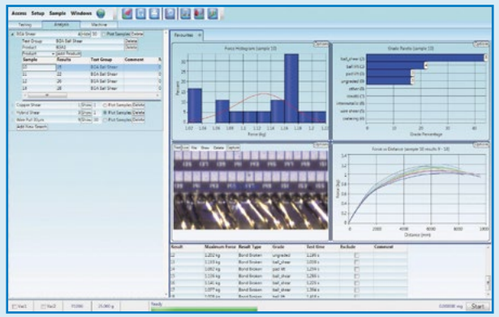
Every aspect of the 4000Plus' robust design has been thoroughly tested to ensure superb reliability. A new ergonomic design for load cartridges significantly improves handling when changing them on the machine and reduces the risk of damage. In addition, the 4000Plus is manufactured in accordance with ISO 9001: 2008, meeting the Machinery Safety Directive, Low Voltage Directive, EMC Compliance, SEMI Safety Guideline (S2 ESH) and RoHS as well as designed to comply with UL requirements.

Compatibility

The 4000Plus has been designed with continuity in mind. Some accessories from the Nordson 4000 are forwardly compatible with the 4000Plus, so you can use your existing stock of equipment and upgrade at your own pace.

Intelligent Software

The 4000Plus utilizes Nordson next generation Paragon™ software. Paragon boasts a highly configurable and intuitive interface as well as a wide variety of advanced functionality, such as automatic GR&R calculation, built-in diagnostics, a range of charts and a unique database search engine wizard. The superior reporting capability enables the creation of personalized reports and provides the ability to easily manipulate data using interactive graphs.



Nordson Paragon™ bond tesing software

Switch Applications in Just Seconds

The industry-unique multi-function cartridges (MFC's) are designed for use with automatic test routines on the 4000Plus bondtester enabling multi-surface test patterns for complex hybrid packages and ultra-quick application changeover.

Unique Features of the Industry Leading Multi-Function Cartridges*

- Guaranteed correlation with both 4000 and 4000Plus cartridges
- Operators can easily identify which transducer is active when not in use, via the cartridge window
- 'Park Position' protects the transducers inside the cartridge rather than leaving one of them exposed and susceptible to damage
- Quick and easy to interchange with single load cartridges
- Frictionless pull to record true load
- Patented air bearing technology for shear testing
- Minimum off-axis tool deflection
- Automatic electromagnetic damping at low loads
- Dual application calibration jigs
- Majority of control electronics and rotation mechanism are inside the cartridge, ensuring zero machine downtime and easy serviceability
- Unique damping system for wire pull

Unique multi-function cartridges

Standards

The Nordson 4000Plus conforms to, and in many cases exceeds, the following industry standards:

Cold bump pull/Hot bump pull	JEITA EIAJ ET-7407/IPC-9708
BGA bump shear	JEDEC JESD22-B117A
Cold bump pull	JEDEC JESD22-B115
au ball shear	JEDEC JESD22-B116
Ball bond shear	ASTM F1269
Wire pull	DT/NDT MIL STD 883
Die shear	MIL STD 883
Stud pull	MIL STD 883
Flip chip pull	JEDEC JESD22-B109

*Patent pending

4000Plus Load Cartridges, XY Tables and Z-axis

Pull - Wire	Long Ranges	Shear – Ball/Wedge	Long Ranges
P25	25g, 10g, 5g	S25	25g, 10g, 5g, 2g
P100	100g, 50g, 25g, 10g	S250	250g, 100g, 50g, 25g
P500	500g, 250g, 100g, 50g	S250R	250g, 100g, 50g, 25g
P1KG	1kg, 500g, 250g, 100g	S2.5KG	2.5kg, 1kg, 500g, 200g
P10KG	10kg, 5kg, 2.5kg, 1kg	S5KG	5kg, 2kg, 1kg, 400g
P50KG	50kg, 20kg, 10kg	S5KGR	5kg, 2kg, 1kg, 400g
P100KG	100kg, 50kg, 20kg, 10kg		
Pull – Tweezers/CBP/HBP		**Shear – Die/Zone/Stud Pull**	
T100	100g, 50g, 25g, 10g	S50KG	50kg, 20kg, 10kg, 5kg
T1KG	1kg, 500g, 250g, 100g	S200KG	200kg, 100kg, 50kg, 20kg
T5KG	5kg, 2.5kg, 1kg, 500g	ZS50KG	50kg, 20kg, 10kg, 5kg
HBP2.5KG	2.5kg, 1kg, 500g		
HBP10KG	10kg, 5kg, 2.5kg, 1kg		
Pull – Vector			
VP250	250g, 100g, 50g, 25g		
VP5KG	5kg, 2kg, 1kg, 400g		
Push/Pull			
PP500g	500g, 250g, 100g		
PP5KG	5kg, 2.5kg, 1kg		
PP50KG	50kg, 40kg, 20kg, 10kg		

Nordson provides a comprehensive range of load cartridges supporting both standard and custom bond testing applications. A 500kg high force shear jig is available - Please consult factory for further details. The list above should not be considered exclusive – our experienced engineers can provide advice on every application. Detailed specifications on individual load cells are available in a separate publication.

Multi-Function Cartridges

Semiconductor	Long Ranges
S250	250g, 100g, 50g, 25g
S5KG	5kg, 2kg, 1kg, 400g
P100	100g, 50g, 25g, 10g
Hybrid	
S20KG	20kg, 10kg, 5kg, 2kg
P1KG	1kg, 500g, 250g, 100g
P10KG	10kg, 5kg, 2.5kg, 1kg

XY Tables

Standard 160mm x 160mm	Forces up to 200kg
160mm x 160mm	Forces up to 20kg at 20mm/s
160mm x 160mm	High precision up to 5kg
300mm x 210mm	Large area XY stage
160mm x 160mm for high speed zone shear	Zone shear: 20kg max at 50mm/s test speed
160mm x 160mm for high force zone shear	Zone shear: 40kg max at 5mm/s test speed

A variety of XY tables are available according to your test needs. This list is not exclusive and you should consult the factory for special applications.

Z-Axis and Working Envelope

4000Plus-Mainframe	75mm Z-axis travel; 120mm working envelope range (see detailed load cell specifications)

Specifications

Footprint	W= 630mm (including left and right joysticks), D=600mm, H=830mm
Weight	90kg including XY table
Power Supply	90-264VAC single phase
Pneumatic Supply	4 bar minimum, 6mm OD plastic pipe. Note some specialized applications may require increased pressure, clean dry air
Vacuum Supply	500mm Hg (67kPa) minimum, 6mm OD plastic pipe

Accuracy

Total system accuracy using load cartridges	+/- 0.1% full scale deflection for selected load range (see detailed load cell specifications)
Shear (ball and die) load cartridge step back accuracy (excl. S25)	+/- 1µm over 2mm of travel in Z-axis
S25 step back accuracy	+/- 0.25µm over 2mm of travel in Z-axis

A Partner You Can Trust

Nordson Test & Inspection is the market leading provider of award winning test and inspection systems for destructive and non-destructive mechanicaltesting of electronic components, taking pride in delivering support to both local and international organizations alike. Founded in 1961, with global headquarters in Aylesbury, UK, Nordson is part of the Nordson Corporation, which has direct operations and sales support offices in more than 30 countries.

Nordson continues to invest significantly in research and development to remain at the cutting edge of bond testing technology Nordson has a truly global presence and is recognized as the industry standard.

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Nordson Test & Inspection products are patent protected and covered by the patent listed at www.nordson.com

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