

# 4000*Plus* Bondtester

**Engineered for Excellence**

The Nordson DAGE 4000Plus is the most advanced bondtester on the market, offering unsurpassed accuracy and repeatability.

Developed by the world leader in bond testing technology, the Nordson DAGE 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 Nordson DAGE 4000Plus has the versatility and accuracy which gives its users total confidence in the quality of their products. It features the latest patented bond testing technology, for example the anti-backlash system. The Nordson DAGE 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 Nordson DAGE 4000; data correlation between the machines is assured. The new Paragon™ software will also run on the Nordson DAGE 4000 bondtester.

# Leading The Way In Bond Testing

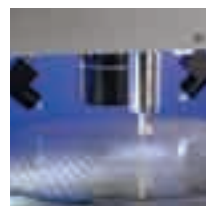
## Featured Applications

- 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 groundbreaking 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 with a 160mm XY stage as standard to meet a wide range of requirements. Custom XY stages are also available

## Highly Configurable

The Nordson DAGE 4000Plus provides ultimate versatility. Choose from a choice 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. For the majority the standard mainframe with a vertical working envelope of 120mm will meet all your application needs, but the Nordson DAGE 4000Plus LE with an extended working envelope of 200mm is available for testing oversize parts.

### Pull Tests

Wire
Ribbon
Hot bump/pin pull
Cold bump pull
Copper wire bonds, studs and pillars
Stud bump
Vector
Fatigue
Push
Tweezer peel
High force pull (up to 100kg)
Vertical stud pull

### Shear Tests

Ball
Solder ball
Standard die shear
Cavity
Passivation layer
Low profile zone shear
Wafer bump
Fatigue
Low profile die shear
High force die shear
Horizontal stud pull



# Confidence In Your Results

## Data Correlation

Nordson DAGE recognizes that data correlation is fundamental for cross referencing test results between old and new platforms. Existing users of Nordson DAGE bondtesters (4000 and 5000) 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 DAGE 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 new 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 DAGE has developed a unique patented anti-backlash system which 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.

## Servomotors Give Better Test Control

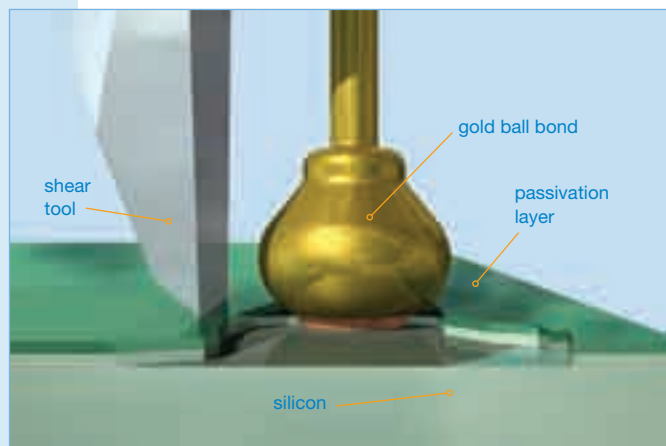
The use of servomotors compared with commonly used stepper motors gives superior test control with maintenance of test speed under load and less interference from vibration.

## 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.

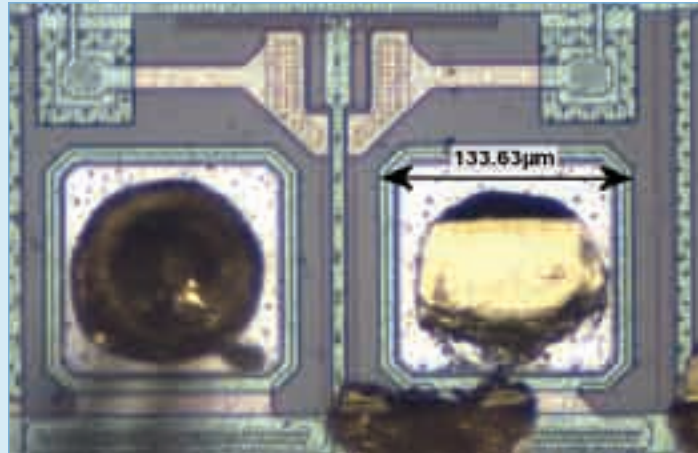


Ultimate step back accuracy

# Increased Efficiency

## Image Capture for Advanced Analysis

For all types of sample, the optional image capture system is positioned directly behind the test point, facilitating failure mode designation and the rapid acquisition of relevant images for further analysis. Zooming is software controlled, increasing ease of use and enabling rapid measurement at different magnifications. The image capture functionality is invaluable in training and test set-up, and image analysis functions such as measurements of dimensions and areas, which are highly useful in many applications.



Field of view as seen through the image capture system

## Easier Load Tool to Bond Alignment and Failure Mode Grading using the Borescope

The optics of the 4000Plus' advanced borescope imaging system (optional) makes these processes significantly easier for small geometry ball shear testing, thereby improving test consistency.



Field of view as seen through the borescope

## Semi-Automatic Testing

Using the Paragon software, it is simple to set-up semi-automatic test routines for a wide range of sample configurations. A step by step wizard guides the user through the test set-up catering for a variety of options.

## Operator Comfort

Great attention has been put into the design of the 4000Plus, especially from an ergonomic perspective, including adjustable working heights and optics eye-lines, as well as fully configurable joysticks. These features ensure that the machine is as operator-friendly as possible, enabling rapid set-up and a comfortable working environment. Consideration has been given to the SEMI S8 guidelines for ergonomics.

## Choice of Computer

The 4000Plus offers a choice of computer options, either a laptop or desktop, both using a standard USB interface, providing operators with a high level of flexibility. The use of a laptop provides significant space saving and allows rapid servicing as a computer can be replaced within minutes, if necessary, avoiding any downtime. Use of an external computer has the advantage of easy repair or upgrade should it be required.

## 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

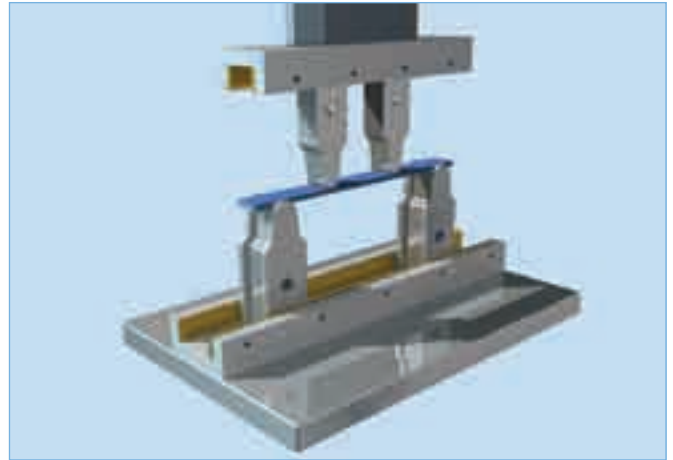
The 4000Plus has been designed with continuity in mind. Some accessories from the Nordson DAGE 4000 are forwardly compatible with the 4000Plus, so you can use your existing stock of equipment and upgrade at your own pace.

## Intelligent Software

The 4000Plus utilizes Nordson DAGE's 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. Paragon will also be available for use on the Nordson DAGE 4000 and 5000 machines with some restrictions.

## Materials Testing

Nordson DAGE understands that many bondtester users have other test requirements, particularly related to materials evaluation. For that reason, with the 4000Plus we offer 3 and 4-point bend testing along with a number of other materials tests.



4-point bend test



Nordson DAGE Paragon bond testing software

## Standards

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

Cold bump pull/Hot bump pull	JEITA EIAJ ET-7407
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

## 4000Plus Load Cartridges, XY Tables and Z-axis

<b>Pull - Wire</b>	<b>Load Ranges</b>	<b>Shear – Ball/Wedge</b>	<b>Load Ranges</b>
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
P100KG	100kg, 50kg, 20kg, 10kg	S5KGR	5kg, 2kg, 1kg, 400g
<b>Pull – Tweezers/CBP</b>		<b>Shear – Die/Zone/Stud Pull</b>	
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
HB10KG	10kg, 5kg, 2.5kg, 1kg		
<b>Pull – Vector</b>			
VP250	250g, 100g, 50g, 25g		
VP5KG	5kg, 2kg, 1kg, 400g		
<b>Push</b>			
PP50KG	50kg, 40kg, 20kg, 10kg		

Nordson DAGE 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.

## XY Tables

Standard 160mm x 160mm	Forces up to 200kg
160mm x 160mm	High precision up to 5kg
300mm x 210mm	XY stage including integral wafer chuck
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
4000Plus-LE-Mainframe	75mm Z-axis travel; 200mm working envelope

The large working envelope provided by the 4000Plus-LE caters for large sections such as solar panels. Specialized fixtures are also available designed to handle large area arrays without damaging them. For the majority the standard mainframe will suit all your applications, but an extended mainframe is available where the size of the parts requires a greater working envelope.

## Specifications

Footprint	W= 630mm (including left and right joysticks), D=600mm, H=830mm
Weight	85kg 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
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. BS25)	+/- 1µm over 2mm of travel in Z-axis
BS25 step back accuracy	+/- 0.25µm over 2mm of travel in Z-axis



## A Partner You Can Trust

Nordson DAGE is the market leading provider of award winning test and inspection systems for destructive and non-destructive mechanical testing 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 DAGE is part of the Nordson Corporation which has direct operations and sales support offices in more than 30 countries.

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

For more information, please contact your Nordson DAGE regional office or speak with your Nordson DAGE representative, all of which are listed on [www.nordsondage.com](http://www.nordsondage.com).

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4000Plus Patent Pending.

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