Bond Testing
Find Every Failure

www.nordsondage.com

Nordson
DAGE
Complete Integration

For over fifty years Nordson DAGE has been the market leading provider of award winning Bond Test Systems.

Produced at our state of the art production facility in Aylesbury, UK and engineered for excellence to ensure ultimate accuracy and repeatability, Nordson DAGE Bondtesters are at the forefront of technology to meet the wide range of applications required by our customers.

Pioneers of Bond Testing

DAGE established
First dedicated Bondtesters introduced
BST12 pull system launched with pull capability up to 100g
Introduction of Bondtesters with selectable destruct and non-destruct modes
Adjustable load rate introduced
MCT20/22 introduces microprocessor control
First intelligent tool landing and ball shear
BT22A increases load range to 20kg
First PC controlled Bondtester, the PC2400
Hot bump pull load cartridge invented by DAGE
Industry standard 4000 Bondtester launched
Series 5000 launched pioneering 25µm ultra-fine pitch
Cold bump pull test patented by DAGE
Patents granted on DAGE load cartridge
Rotating shear load cartridge introduced
4000Plus Bondtester launched, industry first dual Bondtester and Micro-materials tester
Paragon™ software introduces camera assist automation
4800 INTEGRA™ with EFEM integration and SECS/GEM
The Right Product for the Right Application

Production
- 4000 OPTIMA
  - The Gold Standard Bondtester
- 4000 PLUS
  - Advanced Bondtester
- 4000 OPTIMA
  - Production Bondtester

Operator-Free
- 4600
  - Automated Bondtester
- 4600-W, LF
  - Automated Parts Handler

R&D
- 4800 INTEGRA™
  - Clean Room
- 4000 HS
  - High Strain Rate Tester
- 4000 PLUS MATEIRALS
  - Micro-Materials Tester

Bond Testing
Automated Bond Testing
Materials Testing
Gold Standard Bondtester - Series 4000

Fast set-up, easy to learn, maximum comfort.

I spend a lot of time manually testing. I chose the 4000 as it is the most ergonomic and easy-to-use system.

Advanced Bondtester - 4000Plus

Superior accuracy for complex samples and advanced test types.

My samples are complex with a wide variety of components. The 4000Plus gives me the accuracy and flexibility I need.
Automated Testing - 4600 Series

Maximum repeatability for the most demanding applications.

Highest complexity products

Maximum repeatability and accountability

Ultimate precision

"My interconnects are extremely small and it is crucial to remove operator influence. The 4600 ensures each test is 100% reproducible."

Automated Applications

Automatic parts handling with the 4600-W and 4600-LF.

Remove handling errors and operator influence with automated benchtop product handling. Applicable for lead frames and wafers up to 200mm.

Automatic battery cell inspection and testing - 4600 Battery.

Test every connection before your batteries leave the factory. The 4600 Battery non-destructively tests 100% of welds.
Dedicated Wafer Tester - 4800

High density interconnect quality control

Micro-bumps, micro pillars
50mm - 450mm wafers

Ultimate precision

"I perform front end testing on bumps and pillars for a range of wafer sizes. The 4800 even handles my extremely warped wafers."

Semiconductor Wafer Tester - 4800 INTEGRA™

Integrated wafer handling that's clean room compatible.

Micro-bumps, micro pillars

Island of automation

Light curtain version

Extreme precision

"I test a high volume of wafers and achieve the highest throughput with the 4800 INTEGRA."
High Strain Rate Tester – 4000HS

Characterize lead free solder and replicate board drop testing using high strain rate tests.

Find Every Failure – Materials Tester

Bend, fatigue, creep testing and more with the advanced micro-materials tester.

I need to qualify the performance of new solder. I can only achieve this with high strain rate testing.

I qualify new devices and materials before they are transferred to production. Now I can characterize every component and even do lifetime testing.
Find Every Failure

Test Components

- Wirebond
- Solder Ball
- Ribbon
- Tab
- Die
- Surface Mount Device
- Surface Pad
- Micro-pillar

Standard Pull Tests

- Wirebond Pull
- Ribbon Pull
- Cold Bump Pull

Standard Shear Tests

- Wirebond Shear
- Ribbon Shear
- Ball Shear

Advanced Tests

Variable heights and dimensions.

- Cavity Shear
- Passivation Shear
- Micro-pillar Shear (base)
- Micro-pillar Shear (cap)

For difficult to grip or small dimensions.

- Stud Pull
- Hot Bump Pull
- Micro-pillar CBP

Larger components and higher forces.

- Surface Mount Device Shear
- Die Shear
- High Force Shear
- Vector Pull
Micro-Materials Testing

Component dimensions vary significantly for micro-materials testing (mm – µm).

Defining the test geometry and sample dimensions enables measurement of underlying materials properties.

Knowing the sample shape and size is critical for data analysis.

Micro-Materials Test Types

- Material Properties
- Component Lifetime
- Load and Displacement Control
- Stress and Strain
- Statistical Analysis
Bond Test Failure Modes

Solder Ball Shear Testing

<table>
<thead>
<tr>
<th>Failure Mode</th>
<th>Description</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ductile</td>
<td>Solder ball fracture at or above the surface of the solder mask within the bulk solder material.</td>
<td></td>
</tr>
<tr>
<td>Pad Lift</td>
<td>Solder pad lifts with solder ball; lifted pad may include ruptured base material.</td>
<td></td>
</tr>
<tr>
<td>Ball Lift</td>
<td>Solder ball lifts from pad; pad is not completely covered by solder/intermetallic and the top surface of the pad plating is exposed.</td>
<td></td>
</tr>
<tr>
<td>Interfacial Break</td>
<td>The break is at the solder/intermetallic interface or intermetallic/base metal interface. The interfacial fracture may extend across the entire pad or be the dominant failure mode at the tool contact region.</td>
<td></td>
</tr>
</tbody>
</table>

Solder Ball Pull Testing

<table>
<thead>
<tr>
<th>Failure Mode</th>
<th>Description</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A: Ductile</td>
<td>A – Ductile: Solder ball fracture at or above the surface of the solder mask within the bulk solder material.</td>
<td></td>
</tr>
<tr>
<td>Type B: Quasi-Ductile</td>
<td>B – Quasi-Ductile: Mixed ductile/brittle fracture with the dominant failure mode (&gt;50% area) being ductile.</td>
<td></td>
</tr>
<tr>
<td>Type A: Pad Lift</td>
<td>A – Pad Lift: Solder pad lifts with solder ball.</td>
<td></td>
</tr>
<tr>
<td>Or Type B: Pad Crater</td>
<td>B – Pad Crater: Lifted pad includes ruptured base material.</td>
<td></td>
</tr>
<tr>
<td>Non-wet</td>
<td>Solder ball lifts from pad and any portion of the pad top-surface plating is exposed.</td>
<td></td>
</tr>
<tr>
<td>Type A: Brittle</td>
<td>A – Brittle: The break is at the solder/intermetallic interface or intermetallic/base metal interface.</td>
<td></td>
</tr>
<tr>
<td>Type B: Quasi-Brittle</td>
<td>B – Quasi-Brittle: Mixed brittle/ductile fracture with the dominant failure mode (&gt;50% area) being brittle.</td>
<td></td>
</tr>
<tr>
<td>Ball Extrusion</td>
<td>Solder ball is stretched but not fractured. Invalid failure – repeat test with replacement solder ball samples after appropriate adjustments.</td>
<td></td>
</tr>
</tbody>
</table>