Nordson SIP Solution

Dispensing – Conformal Coating – X-Ray – Bond Tester - Plasma Treatment - AOI
Nordson Corporation

• Nordson: A Premier Industrial Technology Company
• Focused On Precision Dispensing, Fluid Control, And Related Processes
• Founded: 1954
• FY2017 Sales: $2.1 Billion
• Direct Presence: 35+ Countries
• Employees: 7500
• Customers: 25,000+
• Headquartered In Cleveland, OH
• NASDAQ Symbol: NDSN
• CEO: Michael F. Hilton
Global Capability
Expertise in serving multi-national customers

EUROPE/AFRICA
Austria: Vienna
Belgium: Brussels
Czech Republic: Brno, Prague
Denmark: Copenhagen
Finland: Helsinki
France: Bugival, Ligny Sur Marne
Germany: Erkrath, Kirchheim unter Tech, Luneburg, Munich
Italy: Segrate
Netherlands: Maastricht, Duerne
Norway: Rud
Poland: Warsaw
Portugal: Nogueira da Mala, Porto
Russia: Moscow, St. Petersburg
South Africa: Cape Town, Durban, Johannesburg
Spain: Valencia
Sweden: Malmo
Switzerland: Munchenstein
United Kingdom: Aylesbury, Colchester, Dunstable, Milton Keynes, Stockport

USA
California: Carlsbad, Concord, Vista
Florida: St. Petersburg
Georgia: Dawsonville, Duluth, Norcross, Swainsboro
Michigan: Rochester Hills
New Jersey: Robbinsville
Ohio: Amherst, Westlake
Pennsylvania: Easton
Rhode Island: East Providence

AMERICAS
Brazil: Sao Paulo
Canada: Laval, Toronto
Colombia: Envigado
Mexico: Guadalajara, Mexico City, Monterrey, Queretaro

ASIA
Australia: Brisbane, Melbourne, Perth, Sydney
China: Beijing, Dongguan, Guangzhou, Shanghai, Suzhou, Hong Kong
India: Bangalore, Chennai, New Delhi, Pune
Japan: Chiba, Hiroshima, Kyushu, Nagoya, North-Kanto, Osaka, Shizuoka, Takamatsu, Tohoku, Tokyo
Malaysia: Penang, Pulau Pinang, Selangor
New Zealand: Auckland, Christchurch, Wellington
Singapore
South Korea: Seongnam, Gwangju-City
Nordson Markets
Every Day You Experience the Value We Bring

Adhesive Dispensing Systems
Consumer Non-Durable Goods Focus

Advanced Technology Systems
Electronics, Medical and General Industrial Focus

Industrial Coating Systems
Durable Goods and Industrial Focus
Nordson
Advanced Technology – Electronic Systems (AT-ES)

PROCESS SYSTEMS
Build in Quality

TEST & INSPECTION
Verify Quality

Dispensing Systems
Plasma Cleaning
Selective Soldering
X-Ray MXI
Bond Test
Optical AOI
X-Ray AXI
Acoustic AMI
**Heterogeneous Packaging and Nordson Solution**

<table>
<thead>
<tr>
<th>NordsonASYMTEK</th>
<th>NordsonDAGE BT</th>
<th>NordsonDAGE XR</th>
<th>NordsonYESTech</th>
<th>NordsonMARCH</th>
<th>NordsonMATRIX</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D Package CUF</td>
<td>uCU pillar Pull</td>
<td>40 um Copper pillar</td>
<td>Epoxy on Die Detect, UV Inspection</td>
<td>Plasma clean for stacked die wire bonding,</td>
<td>Inspection of cascade wire bonds</td>
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<tr>
<td>Stacked die UF</td>
<td>Wire bond test</td>
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<td>EMI Shilding</td>
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<tr>
<td>Solder Dispensing, Camera module etc.</td>
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Support all Advance Packages - WLCSP, Flip Chip, SIP, BGA etc.
Nordson AT Wafer Level Packaging Capabilities

- NordsonASYMTEK
- NordsonDAGE BT
- NordsonDAGE XR
- Nordson SONOSCAN
- NordsonMARCH

- Wafer Level Stacked Die UF
- Cu Pillar Bump Shear/Pull Test
- Virtual Cross-Section Through A 3D X-Ray Model Of TSVs Containing Voids
- X-Ray Image Of 10um X 100um TSVs
- Post-lithography Plasma Descum
- Polymer Ashing for TSV
- Photoresist Ashing

Nordson AT Wafer Level Packaging Capabilities
TOTAL SOLUTION：Process Synergy 工艺协同

Without Plasma Treatment
- Non-uniform underfill fluid flow
- Uneven fillet height and distribution

With Plasma Treatment

Fillet Width Verification

Treatment ➔ Dispense ➔ Cure ➔ Inspect/Test
Asymtek sets the standard for a wide variety of dispensing applications in SIP

- Flip Chip & CSP Underfill
- Spray Flux
- EMI Spray Shielding
- PCBA Conformal Coating
- Surface Mount Adhesive
- FPD Cell Assembly
- Silver Epoxy - Die Attach
- Solder Paste Dispensing
- High Brightness LEDs
- Wafer-Level Packaging
- Life Science - Reagent Dispense
- Hard Disk Drive Assembly
## Spray Coating for EMI Shielding

Nordson Asymtek

**Before**

**After**

### Thickness & Surface Resistance

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Ag type</th>
<th>Ag-Coated Cu type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top (um)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Side (um)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Surface Resistivity (mΩ)</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>
March Plasma - Semiconductor Segment

- Plasma Processes
  - Surface Activation
  - Contamination Removal
  - Etch
  - Crosslinking

- Semiconductor Packaging
  - Wirebond
  - Mold
  - Flip Chip Underfill

- Wafer Level Packaging
  - Dielectric Etch
  - Photoresist Descum
  - Wafer Bumping

- Product
  - Leadframe
  - SIP
  - CIS
  - Substrate
  - PCB
  - Etc.
Contamination Removal:
Wire Bonding; Molding; Underfill; Coating

- Plasma Processing Removes Trace Contamination and Oxidation From Substrates
  - Metal
  - Ceramic
  - Plastic
- Wire Bond Strength Significantly Increased
- Throughput Increased: Lower Pressure Required
NordsonMARCH MesoSPHERE

De-Scum

Oxide Removal

Photo Resist Ashing Process

Round or square wafer/substrate up to 480mm
Nordson Test and Inspection 诺信检测设备

NDT

AMI

X-ray

Optical

Nordson SONOSCAN

Nordson DAGE

Nordson MATRIX

Nordson YESTECH

C-SAM  Automated C-SAM  SonoLab  Wafer X-ray Metrology  Manual X-ray inspection  Bond tester  Automated X-ray  AOI Automated Optical Inspection  UV Automated Conformal Coating
Industry Leading Nordson for Semiconductor Test & Inspection

Automated X-Ray Wafer Metrology
XM-8000
High-throughput In-line X-Ray wafer measurement of voiding and fill levels, overlay, critical dimensions X-ray metrology and defect review system for both optically hidden and visible features of TSVs, 2.5D and 3D IC packages, MEMS and wafer bumps.

4000W Wafer Handling System
This wafer handling system provides automatic loading from the cassette, bump testing (shear or pull), and then unloading of the six or eight inch wafers.

Wafer Testing
4800
Provides the ultimate flexibility for wafer map creation allowing for quick and precise set-up of test patterns; with virtual images for each test pattern.

4000W Bond Testing Platforms
4000 Series
Camera assist automation system ideally suited for applications such as pull and shear testing of wafer interconnections, lead frames, hybrid microcircuits or automotive electronic packages.

Automated Optical Inspection
M1M
High-speed microelectronic device inspection with exceptional defect coverage. With 5 micron pixel resolution and telecentric optics, the M1M provides complete inspection, all within a footprint less than 1 sq. meter.

Off-Line Advanced Failure Analysis X-Ray Inspection
Quadra Series
Ultra-high resolution, off-line X-ray system offering the highest feature recognition at full power. Oblique Viewing, 3D Inspection Planes and micro CT capable all in one package.

In-Line or Cell Based Automated X-Ray Wire Bond Inspection
X2.5#
Automatic X-ray inspection solutions for semiconductor application on substrate-level (component backend) capable to allow a 100% all wires on substrate inspection based on CAD input and chip model library.

Front End Process
Nordson Tools
Bond Test on Wafer, Die Crush, Bump Pull, TSV, Wafer Bump Voiding, Fill Level, Taper

Back End Process
Nordson Tools
Wirebond, DieBond, Die Attach, Wire, Ball, Die Shear, Pull, Wiresweep, Underfill, Die Placement, Cracks.

Bond Test on Wafer, Die Crush, Bump Pull, TSV, Wafer Bump Voiding, Fill Level, Taper

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NordsonYESTech 全自动光学在线检测

- Automated Inspection for:
  - Bond Wire and Small SMT Part Defects
  - Die Inspection
  - Lead Defects
  - Bump Inspection
  - Bond Wires
  - Paste
  - Underfill run out inspection
  - Dispensed Materials
  - Contamination

sub-micron resolution
Yestech M1m Application
- Die Bonding Inspection

- Wire Bonding Inspection
NordsonMATRIX 全自动 X-RAY 在线检测

- Wire-Bond Test for Semi-Backend Applications
  - In line or off-line w/ magazine loader/unloader
  - CAD input or “Teach & Go”
  - Inspect for:
    - Missing Wire
    - Disturbed Wire
    - Broken Wire
    - Missing Bond Balls
    - Missing Wedge Bond
  - Up to 100 wires per second!
  - Bar Code scan
  - Defect Marking / Part Sorting
  - SecsGem – Full Traceability

Hi-Resolution AXI-System: X2.5#

Any Vertical Angle, Any Lateral Rotation with NO Limitation.
To Deliver Best Possible 2.5D Inspection.
Matrix Application in Micro Electronics

- Wire Bonding Inspection
- IGBT Void Inspection
NordsonDAGE X-RAY

Better Clarity
Up to 6.7 MP images provides incredible brightness, contrast, spatial resolution, depth of field and grey scale for clearer images and easier analysis.

Stay Sharp
The QuadraNT X-ray tube provides unbeatable images with high resolution at high magnification. With up to 10 W target power at 0.1 μm feature recognition or up to 20 W target power at 0.3 μm feature recognition the QuadraNT delivers sharp clear images.

Easy to use
The ergonomically designed cabinet is tailored to optimize how a user interacts with the system. The intuitive Gensys inspection software enables operators to be up and running in seconds.

Inspect Quicker
Live enhanced inspection technology up to 30 fps means real-time image processing giving the best images quickly to maximize throughput.
The Right Product for the Right Application

**Production**
- **4000**
  - 3800/3800+
  - Standard Bond Tester
  - The Gold Standard Bond Tester
- **OPTIMA**
  - 4000 HS
  - Brittle Fracture Tester

**R&D**
- **PLUS**
  - Materials Tester
  - Automated Tester
- **4600**
  - Automated Parts Handler
  - Semiconductor Wafer Tester

**Operator-free**
- **4600-LFM**
  - Clean room

**Automation**
- **4800 INTEGRA**
  - Semiconductor Wafer Tester
**Key product capabilities**

### Bond Testing

**Production testing**
- Solder ball
- Wirebonds

**Technology**
1. Industry standard data correlation
2. Calibration traceable to national standards
3. Step back accuracy +/- 0.25 µm

### Materials Testing

**Complex device testing**
- Automotive
- BGA’s

**Technology**
1. Shear speeds to 4m/s (Pull 1.3m/s)
2. Pneumatic anti backlash (system accuracy +/- 0.1% FSD)
3. High force shear 300kg

### Automation

**Automatic handling and testing**
- Wafers 150-450mm
- Leadframes

**Technology**
1. Linear encoded stages (0.1 µm)
2. Camera assisted automation (fiducial)
3. Advanced optics (5 vision systems)
New Product Update – Sonoscan

SAM – Scanning Acoustic Microscope

- Wafer Level
- 粘结晶圆
- MEMS–晶圆键合
- MEMS–晶片密封腔分析
- LED–晶圆

A1) Bonded Wafer inspection:
A2) MEMS–Bonded Wafer
A3) MEMS–Wafer Cavity Seal Analysis
A4) LED–Wafers

- A1) Flip chip devices 倒装芯片
- A2) PEM Plastic Encapsulated Microcircuit 塑封微电路板
- A3) BGA Ball Grid Array
- A4) Stacked Die 堆叠芯片
- A5) IGBTs
Acoustic Inspection Portfolio
Screen for voids, delamination and product defects using acoustic microscopy

D9600™
- Offline component inspection

Gen6™
- Offline lab and high resolution inspection

P300™
- Semi automatic component inspection

J610™
- Semi automatic inspection of large boards

AW300™
- Inline wafer inspection

DF2400™
- Inline component inspection

Offline
Semi automatic
Automated inline
Questions?

desmond.hor@nordson.com