

Improving battery production at every stage

Precision technology solutions that power
global battery manufacturing from start to finish





From the smallest cell to the largest battery pack, **we have the capacity to help improve battery production at every stage.**

With every element of component manufacturing, cell and module manufacturing and final pack assembly covered, Nordson is better connected to improve quality, efficiency and output.

Whether it's our comprehensive portfolio of extrusion and coating technologies, or the innovative measurement and control solutions that ensure the optimum quality electrodes and separator films, or our world-leading knowledge of dispensing thermally conductive adhesive for electric vehicle batteries, we lead the way in technology and expertise.

Additionally, our systems provide fluid management, polymer processing and test and inspection technologies, integral to the end-to-end manufacturing process.

All supported with unrivalled expertise and direct global sales and service available in more than 35 countries.

Our innovative products are used by everyone, from R&D start-ups to the world's biggest manufacturers, for the accurate and efficient measurement and dispensing of adhesives, coatings, sealants and thermal interface materials.



Any material

Conformal coatings, one component and two component adhesives, sealants, and thermal management materials? Or micro-jetting applications and high-volume encapsulation? Whatever your requirement, our solutions are designed to deliver optimal precision, accuracy and machine life, with equipment that dispenses exactly the right amount every time; even with highly abrasive materials.



Application expertise

We provide industry-leading, field proven solutions for end-to-end battery manufacturing. Our customers rely on us to deliver improvements, efficiencies and solutions for everything from dies for separator manufacturing to anode and cathode bonding to applying abrasive thermal management materials. This expertise extends beyond battery manufacturers to include research centers, material suppliers and integrators.

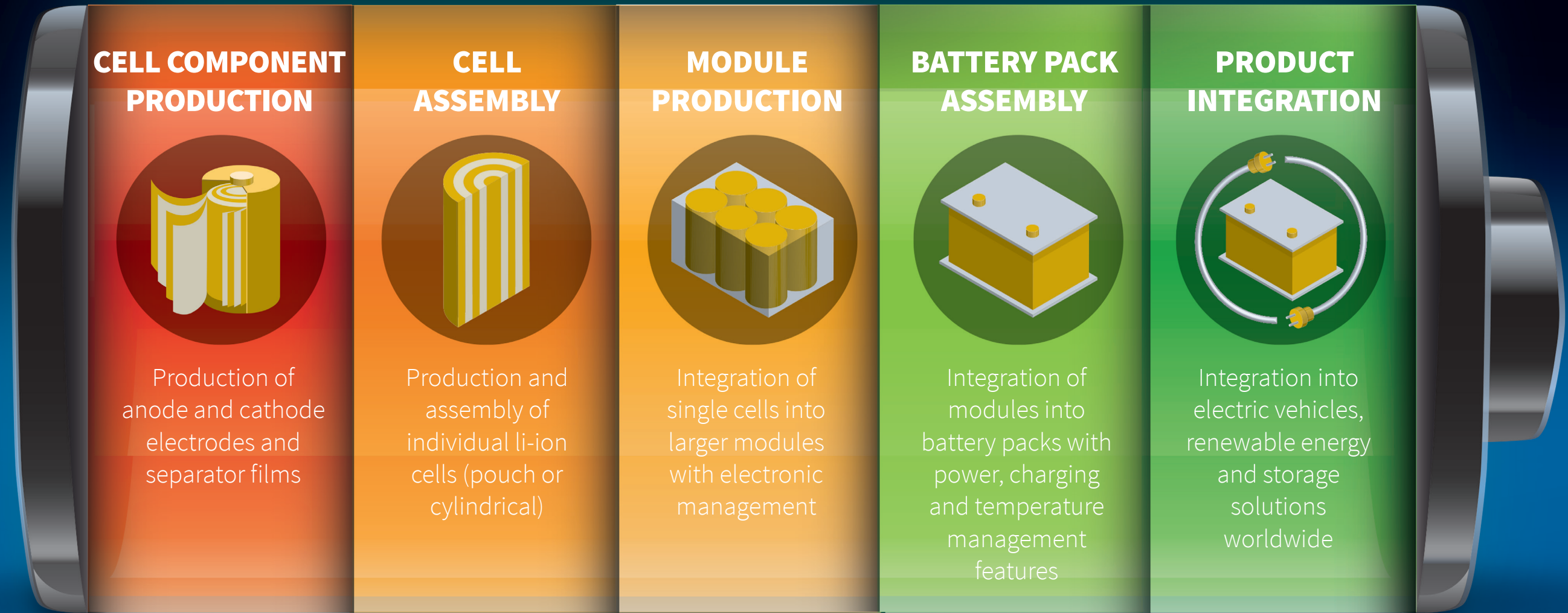


Complete solutions

In addition to a full line of dispensing products, we also support robotic automation, test and inspection equipment; combining them into complete scalable systems designed to optimize production throughput, deliver superior quality, and easily integrate into your factory. All engineered to be easy to use and maintain, to minimize labor required and reduce the total cost of ownership.

Nordson. Improving battery production at every stage

From the smallest components to the largest energy storage solutions, Nordson technology plays a crucial part in every stage of the battery manufacturing process.



How we help:

	Cell Component Production	Cell Assembly	Module Production	Battery Pack Assembly	Product Integration
Asymtek		X	X		
Dage		X			
EFD		X	X		
Matrix		X			
ICS Cold Materials		X	X	X	X
PA		X	X	X	X
PPS	X				
NDC	X				



Cell Component Production

A battery is only as good as its weakest component. We help make sure that every element is manufactured to pack more power.



OVER 5000 SYSTEMS GLOBALLY

Polymer Processing & Fluid Coating Systems

As global leaders in polymer processing solutions, our technology is used worldwide to melt, filter, and pelletize polymers.

Our extrusion and slot die systems are used to support battery customers and OEMs in the production of key components used in cell manufacturing. This includes the manufacturing of separators and soft-pack external casings, as well as the application of anode, cathode, and insulation coatings.

We also provide ancillary equipment for added safety and reduced maintenance downtime and enhanced product quality through customized manifolds.

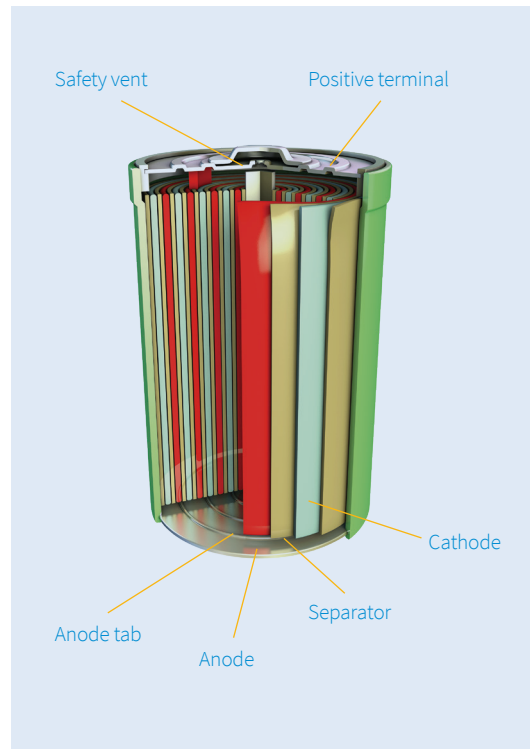
This technical know-how is backed by years of experience in the field of die design and manufacturing, providing you with superbly reliable equipment that will not just refine your final product, but maximize the overall efficiency of your production process.

Innovative hot melt gluing solutions contribute to next-gen z-fold or separator stacking battery and solid-state battery.

Measurement and Process Control

Production processes for high-performance lithium ion batteries (LiB) used in mobile devices, electric (EV/ HV) vehicles, and stationary energy storage systems must adhere to very high-quality standards to ensure maximum performance, the utmost safety, and the longest battery lifespan.

Our measurement solutions for battery electrode cell production stand apart from conventional gauging methods by offering a complete end-to-end system solution from basis weight measurement of anode



and cathode coatings to final product thickness measurement in the roll press line.

You benefit from greater process visibility and control, so you exceed the market demand for outstanding quality and performance... while realizing bottom-line advantages.



Cell Assembly

Fluid dispensing that's so reliable and accurate, over 70% of the world's battery manufacturers rely on it every day.

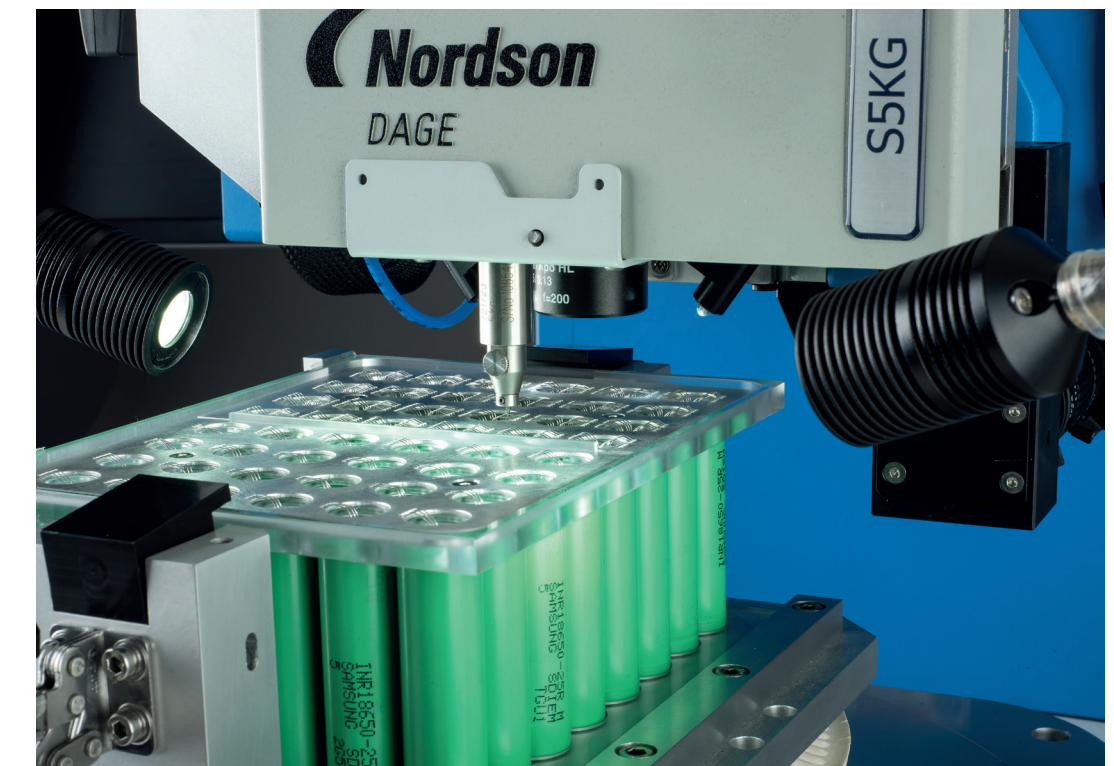


25 YEARS INDUSTRY EXPERIENCE

When it comes to cell manufacturing, we deliver precise, reliable fluid dispensing systems to help the world's battery manufacturers meet their efficiency needs. Our technologies deliver highly repeatable, consistent fluid deposition while reducing material waste, rejects and rework.

Our products dispense materials for anode and cathode coating and bonding, electrolyte filling, electrode cell bonding, winding friction prevention, cell edge protection, and separator fixing. This broad range of precision solutions includes benchtop dispensers, dispense and spray valves, innovative jetting technologies, and automated dispensing robots.

In addition to a full line of dispensing solutions, we also support quality assurance through x-ray testing and other inspection technologies. From overhang measurement and layer count verification, to weld and bond destructive testing or pull and shear testing, our proven technology ensures the highest quality standards and consistency from cell to cell.



Our range for Cell Component Production and Cell Assembly includes:



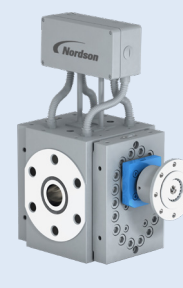
EFD - xQR41 MicroDot™ needle valve for potting and sealing of electrical battery components



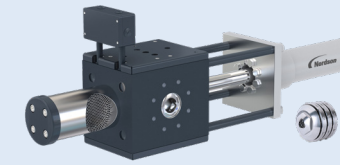
EFD - 702 Mini-diaphragm valve for electrolyte cell filling



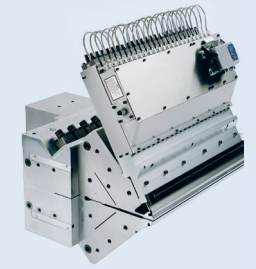
EFD - PICO® Nexµs™ controller



PPS - BKG® melt pumps



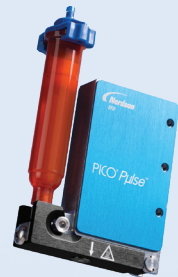
PPS - BKG® screen changers with BKG® FlexDisc™



PPS - EDI® Autoflex™ extrusion die systems



EFD - OptiSure Automated Optical Inspection (AOI)



EFD - PICO® Pµlse™ XP jetting valve for anode and cathode bonding



EFD - 797PCP-2K pump for dispensing small amounts of TIM



PPS - EDI® Premier™ slot die systems



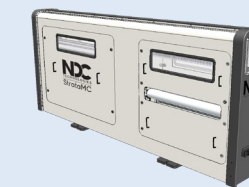
Matrix - XCT high-power offline AXI platform with CT technology



Dage - 4600 Bond tester



ICS - Micro-Meter D2K



NDC - StrataMC electrode thickness measurement system



NDC - FilmPro infrared sensor for separator film basis weight measurement

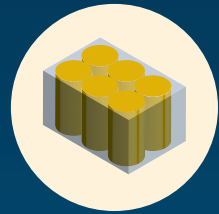


NDC - Photon X-Ray sensor for anode/cathode coat weight measurement



NDC - Beta sensor for anode/cathode basis weight measurement





Module Production

With the right technology on board, assembling cells into modules is quicker, and more accurate with less chance of error.

Our module production solutions are flexible enough for any size and speed of manufacturing process, from manual applications to fully automated production. Whether cylindrical, prismatic or soft-pack, we have a solution to bond, secure, or apply thermal management materials for the assembly of cells into modules.

We can also dramatically improve speed and accuracy of module assembly, cell stacking, component bonding, battery cell bonding, solder paste dispensing, module cover sealing, module structural bonding, and encapsulation.

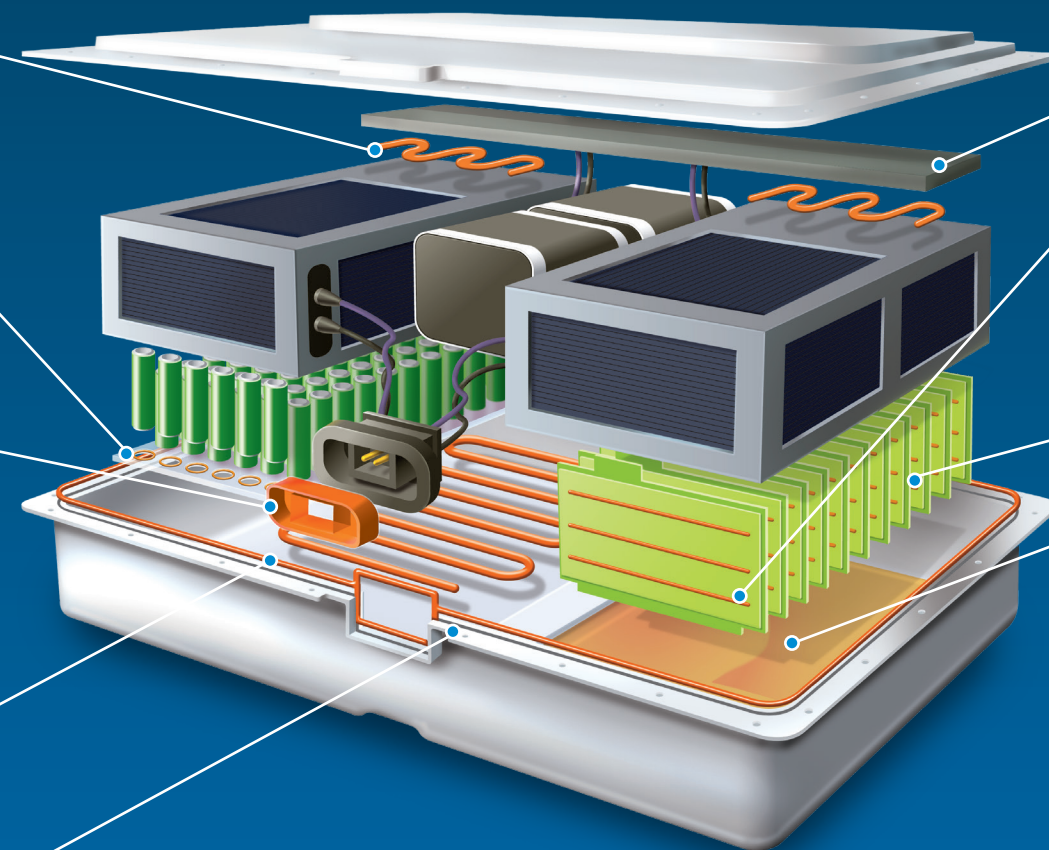
Thermal management materials are dispensed to draw heat away from sensitive components, and toward outer casings or heat sinks.

Cylindrical cell bonding provides structural rigidity and manufacturing ease.

Potting / sealing electrical components helps prevent moisture or other foreign matter from entering the battery case and causing malfunctions, essential in automotive, recreational, and general use battery markets.

Case bonding and gasketing completes the full battery assembly, adding final structural rigidity and protection. Typically, epoxy or silicone materials are used, both offering fast curing times.

IK foaming gasket makes the battery pack water proof, reopenable and serviceable.

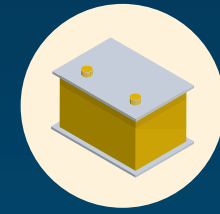


Current collector bonding.

Pouch cells are bonded together in rows to create a compact layout and provide additional strength and rigidity when the battery is in operation. Single component or two component epoxy materials are typically used.

Hot melt PSA Solution can save up to 90% of the cost.

Pack filling / encapsulation ensures components remain in place, and repel moisture and heat in a structurally sound battery case. Materials dispensed for this purpose can also offer some thermal management properties, which are found in epoxies, urethanes, and TIMs, either one or two component.



Battery Pack Assembly

Minimized overflow and cleaner pack assembly means less waste and reduced rejects. A powerful argument for Nordson expertise.

Ensuring a battery cell module provides enough power with the correct form and fit for the end product is no simple task. Precisely why we offer a variety of solutions that allow materials to be dispensed accurately into difficult to access channels and locations, preventing material overflow and ensuring clean pack assembly.

With years of experience in this field, we can call on the expertise required to provide precision potting and gap filling solutions to support power distribution and thermal management throughout the battery pack. In fact, we've developed applications for everything from cars to buses to aircraft and energy storage including pack lid bonding, pack cover gasketing, power distribution potting, battery pack encapsulation, thermal management and materials dispensing.

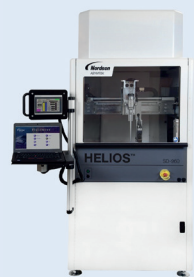
Our range includes:



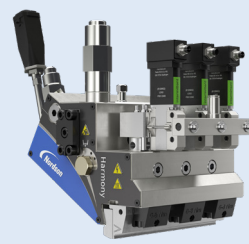
ICS - Micro-Meter 2K series



ICS - 2K dispensing valves & EFD mixers



Asymtek - Helios™ SD-960 series automated dispense platform



Product Assembly - Harmony applicators



EFD - GV Series gantry automated dispensing system with CCD smart vision



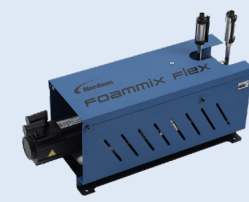
ICS - Pro-Meter 2K series



Product Assembly - Pro-Meter VDK dispensing system



ICS - Rhino pumps



Product Assembly - FoamMix Flex dispensing system



From car to wind and energy storage, Nordson has a solution



**POWERING
OVER 500,000
ELECTRIC
CARS**

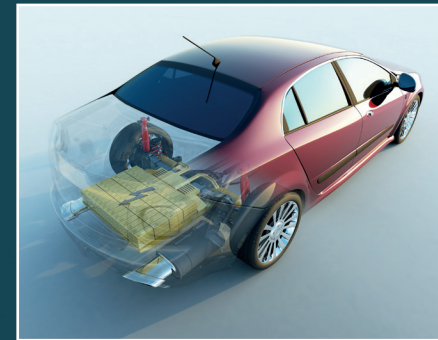
Our expertise in production solutions is powered by a dedication to innovation.

Nordson's automated systems have been revolutionizing automotive production lines for decades. And now we're doing the same for the battery manufacturing industry, by accelerating production with zero compromise on quality.

The systems we deploy are purpose built to meet and exceed the demanding standards of the battery industry. With the most comprehensive range of dispense valves and meter mix solutions, our technology can be configured to meet the most demanding production specifications, however stringent.

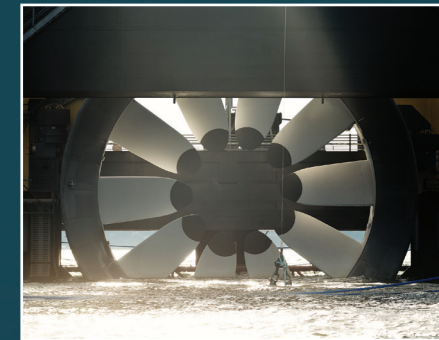
From electric vehicles to energy storage, our specialists design a custom process from the ground up, to help make your production more predictable and controllable than ever. So you can rely on the same product, finished to exactly the same standard, with minimum material waste or inconsistency.

We think it's the kind of technological advance that is precisely what battery manufacturers have been waiting for.



Electric vehicle solutions

- Supporting manufacturers to keep pace with vehicle battery demand
- Wide range of precision solutions for cylindrical, prismatic and soft pack production
- Dispense thermally conductive adhesives and interface materials with more precision



Renewable energy

- Streamline production for solar, wind and hydroelectric battery manufacturing
- Precision dispensing solutions for solar panel and wind turbine assembly



Storage

- Residential, commercial, and industrial storage assembly solutions
- Low and high volume dispensing systems sized to support the smallest residential systems to the largest industrial solutions
- Dispensing of chemical barriers or membranes used in larger non-solid state batteries.
- Ability to integrate with large automation equipment that enables efficient dispensing process on larger scale battery systems.





Why choose Nordson?

Precision technology that touches your life every day everywhere

Nordson delivers precision technology solutions to help more customers succeed worldwide. Founded in 1954 and headquartered in Westlake, Ohio, USA, we now operate in more than 30 countries.

We're world leaders in precision dispensing, fluid management and related technologies. We engineer, manufacture and market differentiated products used for dispensing adhesives, coatings, sealants, biomaterials and other materials; for fluid management; for test and inspection; and for UV curing and plasma surface treatment.

Our products can also be found hard at work in a wide range of consumer non-durable, durable and technology end markets including packaging, nonwovens, electronics, medical, appliances, energy, transportation, construction, and general product assembly and finishing.

This technology is supported with application expertise and direct world sales and service that brings our production precision and innovation to every corner of the globe.

Advanced Technology Solutions:

- Nordson Electronics Solutions
- Nordson EFD*
- Nordson Medical
- Nordson Test & Inspection

Industrial Precision Solutions:

- Nonwovens
- Packaging
- Product Assembly*
- Industrial Coasting Systems*
- Polymer Processing Systems*
- Measurement and Control Solutions*

* Supporting battery markets

Nordson

Worldwide Service and Support

Nordson helps protect your investment with exceptional people, programs and service to keep your equipment in peak operating condition. For your satisfaction, Nordson solutions are backed by a Package of Values® that includes:

- Locally-available service network
- TrueBlue™ service & preventive maintenance plans
- Global service and distribution centers
- Repair and exchange programs

For more information, speak with your Nordson representative or contact your Nordson regional office.

United States

Duluth, Georgia
(800) 683-2314 **Phone**
(866) 667-3329 **Fax**

Canada

Markham, Ontario
(800) 463-3200 **Phone**
(905) 475-8821 **Fax**

Europe

Erkrath, Germany
(49) 211-9205-0 **Phone**
(49) 211-254658 **Fax**

Japan

Tokyo, Japan
(81) 3-5762-2700 **Phone**
(81) 3-5762-2701 **Fax**

Asia/Australia/Latin America

Amherst, Ohio
(440) 985-4797 **Phone**
(440) 985-1096 **Fax**



Discover more at: www.nordson.com/battery

Nordson Corporation Westlake, Ohio, USA

