LARGE AREA AUTOMOTIVE BATTERY TESTING

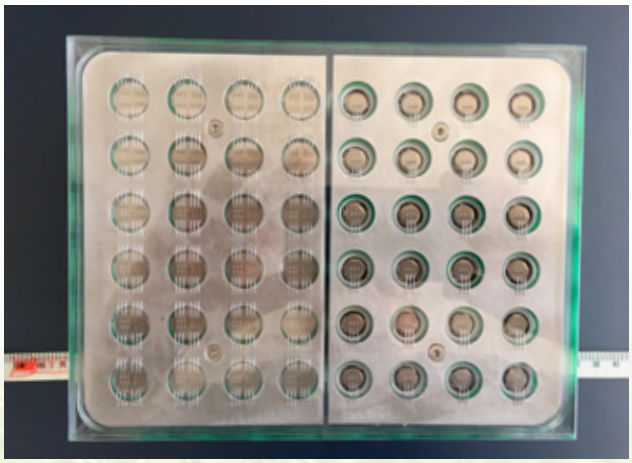
Application Note

Battery lifetime and stability are of key importance for developing the next generation of electric cars. The automotive sector is booming in relation to electric vehicles with some manufacturers already having well-established electric cars on the market today. The reliability of these vehicles depends on overcoming the technical challenges around battery life-time, and ensuring it can match that of the components established in a combustion engine, which is typically around 10 years. Therefore, accurate testing of battery wire bonds is critical to guarantee long component lifetimes.

The Problem

In order to match the power outputs required by highly desirable fully-electric or hybrid supercars, batteries need to be energy-dense with high powered connections that are as reliable as the fuel system in a conventional combustion engine. To repeatedly charge and discharge high currents over time, the formation of multiple heavy gauge wire bonds, laser-welded tabs or capacitive-welded rods between individual cells, need to be carefully controlled to ensure high quality. The physically bonded area (opposed to the contact area) is the source of weakness for high-power connections; these are best characterized using an independent area measurement to regulate a true measure of adhesion and reliability.

This application easily becomes safety-critical so quality control and high supply standards are necessary. Non-destructive inspection techniques are often used for fast problem detection and quality assurance; however, this is not always possible due to the awkward shapes, materials, sizes and weights of battery packs. Destructive mechanical testing of these bonds usually involves peel, shear or pull testing.



A typical Ni cathode Li-ion rechargeable cell with multiple wire bonds, found in an automotive battery pack.

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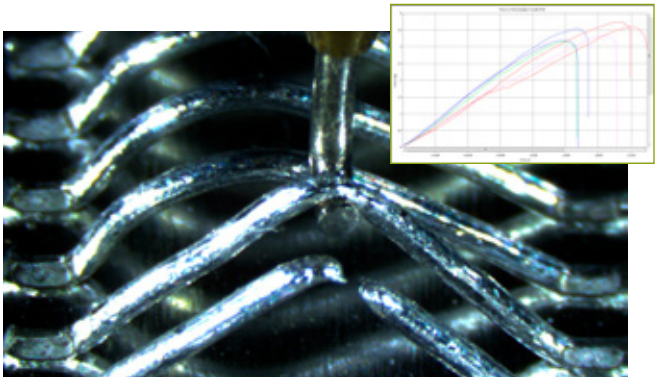
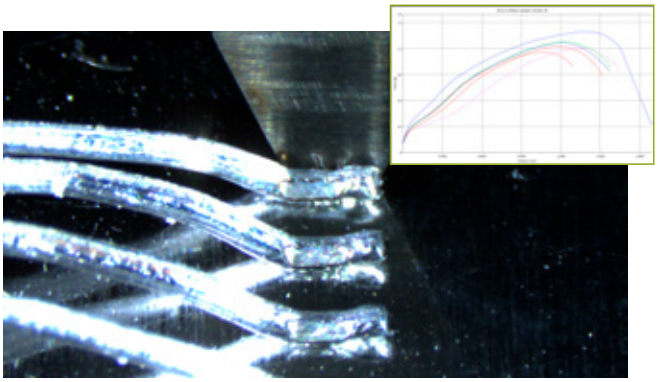
Our Solution

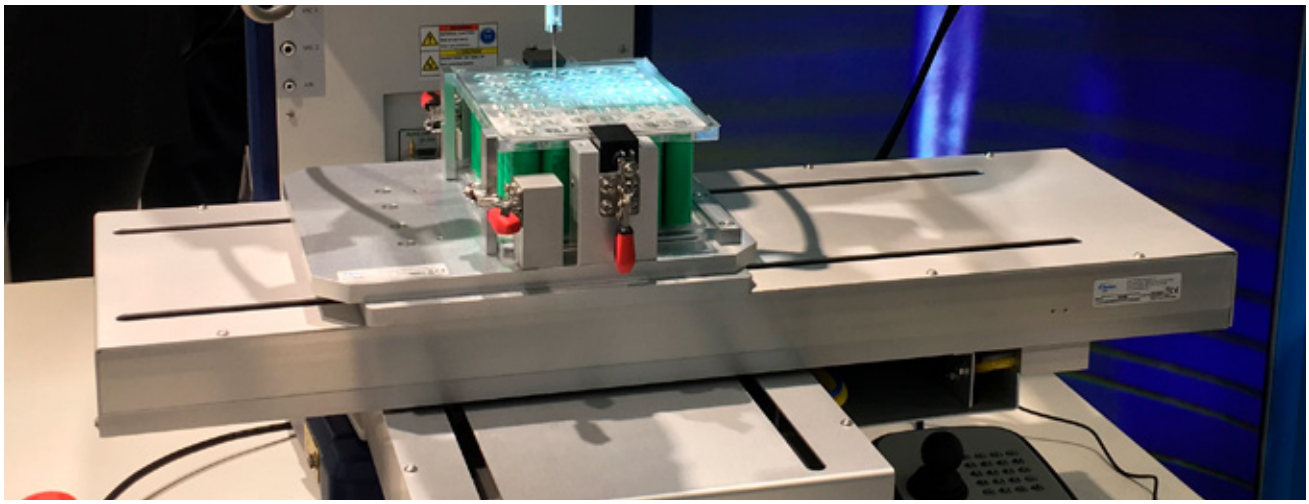
Nordson DAGE's 4000*Plus* can be automatically configured to quantify the strength of these connections using most standard test methods. Heavy gauge wire bonds or battery tab welds typically involve forces of 20-100kg. We offer custom solutions specific to these applications, with shear and pull testing modes of 100kg pull and 200kg shear. We offer the head-extension mainframe which delivers the ideal, large working area, universal battery testing platform. This set up comes complete with advanced software of composite surface imaging as standard and the new option of auto-area calculation, designed for these bond area critical applications. We demonstrated this platform with fully-automated shear/pull capability on our stand at SMT 2017 and Productronica 2017 (Stand A2. 345/445). Please contact your local sales representative with your testing requirements or for more information.



Heavy gauge wire 0.5mm diameter wire bonds prior to shear and pull testing, inset shows typical forces recorded.



The 4000*Plus* large area stage designed for battery testing running a fully-automated heavy gauge wire bond pull on an automotive battery pack. ▼



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