Is Your Manufacturing Facility

READY TO MEET THE EMERGING DEMAND

FOR AUTOMATED ELECTRIC VEHICLE PRODUCTION?

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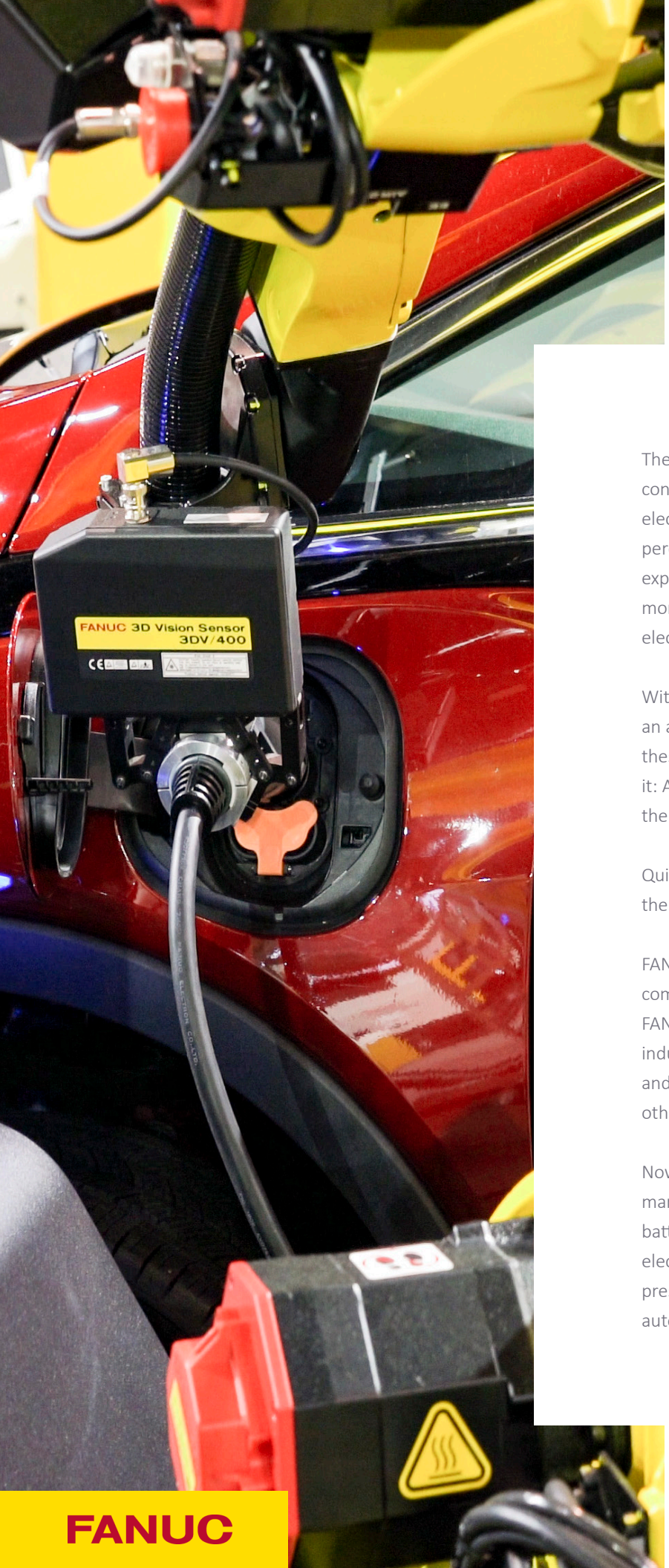

The demand for electric vehicles is climbing, with consumers worldwide purchasing more than 2 million electric vehicles in 2018. These sales represented a 64 percent leap over the previous year. Global sales are expected to reach 10 million by 2025. And come 2040, more than half of all new car sales globally will be for electric vehicles.

With the ballooning demand for electric vehicles comes an accelerating demand for automated production of these vehicles and their batteries. Make no mistake about it: Automated production of electric vehicles represents the future for leading-edge automotive manufacturers.

Quite simply, the race is on for auto companies to meet the soaring demand for electric vehicles.

FANUC America is the company most automotive companies turn to for the best in automated production. FANUC has a strong and proven track record in this industry, automating more processes in vehicle assembly and internal combustion engine production than any other automation company.

Now FANUC is leading the way in the electric vehicle market. FANUC has automated the production process of battery cells, a top priority for automakers. Furthermore, electric drivetrains and smart manufacturing systems present infinite potential for FANUC to continue automating vehicle production.

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Battery Demand Is Increasing with Electric Vehicle Demand, Creating Heightened Needs As Material Supply Questions Loom

Electric vehicle batteries are lithium-ion batteries that power everything in automobiles, from the engine to doors to windows. These batteries are made up of cells, modules and a pack. Cells are grouped into modules, and module clusters comprise packs. These battery packs are installed in electric vehicles.

Commonly known as li-ion batteries, lithium-ion batteries boast high energy density and charge retention capacity while calling for low maintenance. All this has made lithium-ion batteries the battery of choice for electric vehicles, overtaking nickel metal hydride, or NiMH, batteries.

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Coupled with the surging demand for electric vehicles and the batteries that power them is the escalating need for charging stations. With only a quarter of the public chargers needed to support growth in the electric vehicle market operational, the charger infrastructure will have to increase 20 percent a year, according to the International Council on Clean Transportations.

With wireless technologies taking over consumer electronics, could wireless charging help provide solutions to meet the demand for electric vehicle battery charging stations? The U.S. Department of Energy's Vehicle Technologies Office has teamed up with Oak Ridge National Laboratory to build the world's first 20-kilowatt wireless charging system for automobiles. Electric current is transferred by creating a magnetic field between a ground-based transmitting pad and a receiving pad placed under a car. Tests have shown this system charges at three times the power rating of a conventional electric vehicle battery charger but at 90 percent energy efficiency.

The explosive growth of the markets for electric vehicles and their batteries and charging stations has created tremendous opportunities for agile, forward-thinking automotive manufacturers to get ahead of the pack in ensuring their manufacturing, assembly and production lines for electric vehicles and the lithium-ion batteries that drive them are fully automated.

Why Automate Production for Electric Vehicles?

Automotive manufacturers have known for decades that vehicle manufacturing, assembly and production robots provide competitive advantages that are impossible for human beings to match.

These high-powered and tireless solutions enhance quality, expedite production, amplify capacity and eliminate bottlenecks that can be caused by human error. Robots can also reduce warranty costs by ensuring better results and protect workers from engaging in dirty, difficult and even dangerous occupations.

The use of robots helps significantly reduce part variability, leading to quality gains. Robots can handle repetitive tasks without distraction or physical compromise such as fatigue or sickness. They can also eliminate waste linked to human error such as dropping or improperly handling parts. Robots' vision systems can also detect part variation and make adjustments accordingly.

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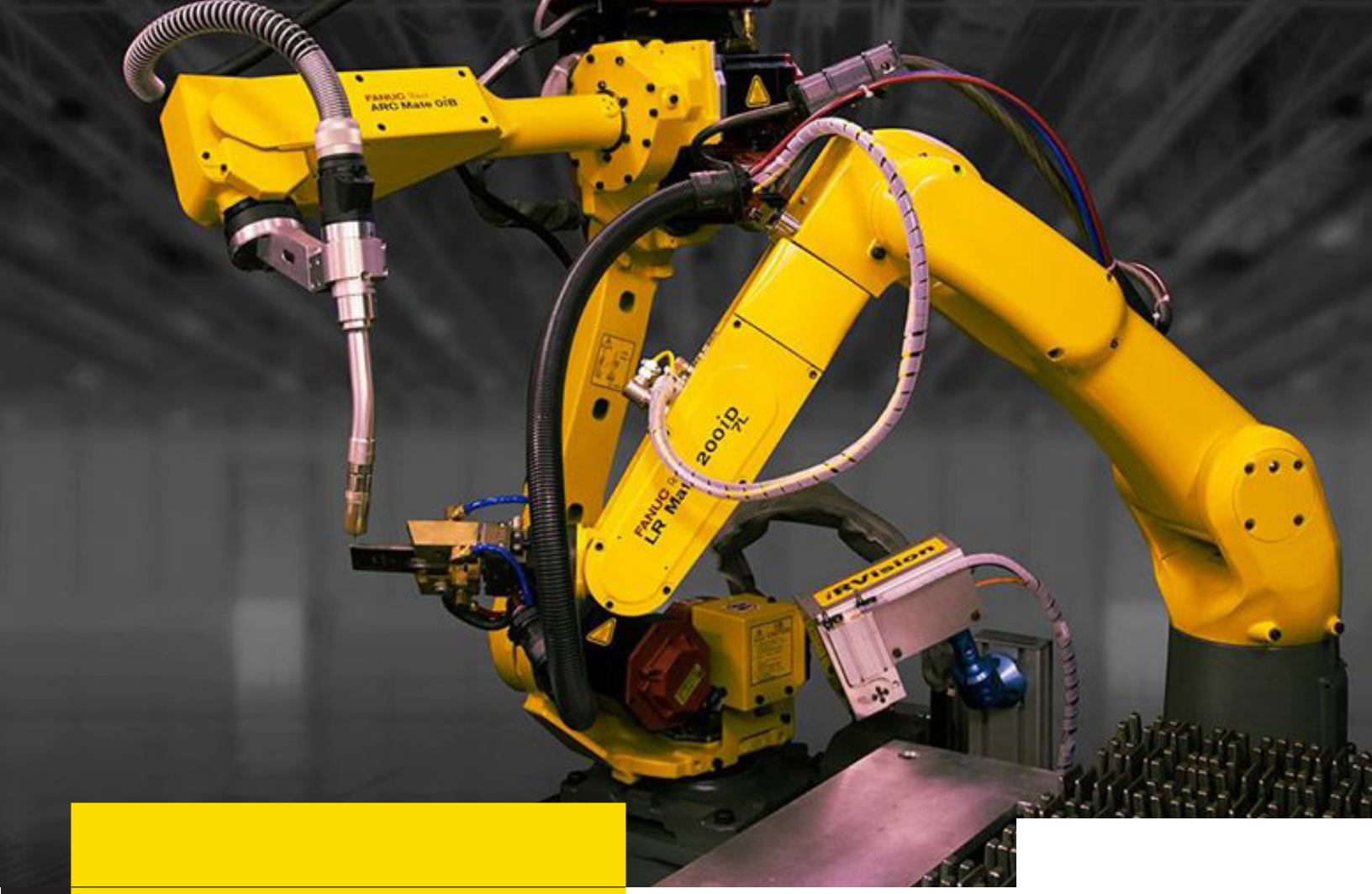
Robots are designed to take on the dirty and dangerous tasks, preventing workers from getting injured, sick or disabled.

Because robots can deliver pinpointed results, automakers stand to benefit from measurable gains in manufacturing capacity. Cycle times are consistent throughout the day, with robots and other automation tools running at peak rates minute by minute, hour by hour, day by day.

A longtime challenge auto companies faced with manufacturing employees beyond the limitations of the human body is safety concerns. Many of these manufacturing jobs are hazardous, resulting in injuries from accidents, sickness from fume and paint exposure or even disabilities from musculoskeletal conditions caused by repeatedly lifting and twisting their bodies. Robots are designed to take on the dirty and dangerous tasks, preventing workers from getting injured, sick or disabled.

The rise of electric vehicles presents opportunities and challenges for automakers. These vehicles are constructed using fewer and different parts compared with gas-powered vehicles. Vehicles run by internal combustion engines require a crankshaft, flywheel, DC motor, alternator, cooling system and several other parts nowhere to be found in electric vehicles, whose construction is dramatically streamlined.

Automotive companies looking to scale up production to meet the rapidly mushrooming demand for electric vehicles are faced with automation investment decisions that must be answered quickly.



Benefits of Partnering with FANUC for Automated Electric Vehicle Production

Automotive manufacturers worldwide have partnered with FANUC in outfitting their assembly line floors. FANUC is recognized as the industry leader in the manufacturing automation space. With more than 24 million products installed worldwide, FANUC is the top brand in manufacturing automation, helping raise companies' bottom lines by providing extraordinary production efficiencies.

The manufacturing, assembly and production of electric vehicles and lithium-ion batteries involves many automation steps to create finished cars, trucks and other vehicles. ***FANUC's 200-plus*** robots and related products are equipped to revolutionize any factory by heightening production, efficiency and optimization.

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Battery Pack Assembly Automation

With payloads from 0.05 kilograms to 2,300 kilograms, FANUC's robots can handle flat and cylindrical tasks such as those involved in electric battery manufacturing. FANUC's flat battery pack automation solutions excel in high-speed material handling and precision dispense and assembly. With cylindrical battery pack automation, FANUC's robots are designed for high-speed pick and place, intelligent screwdriving and precision dispense and assembly.

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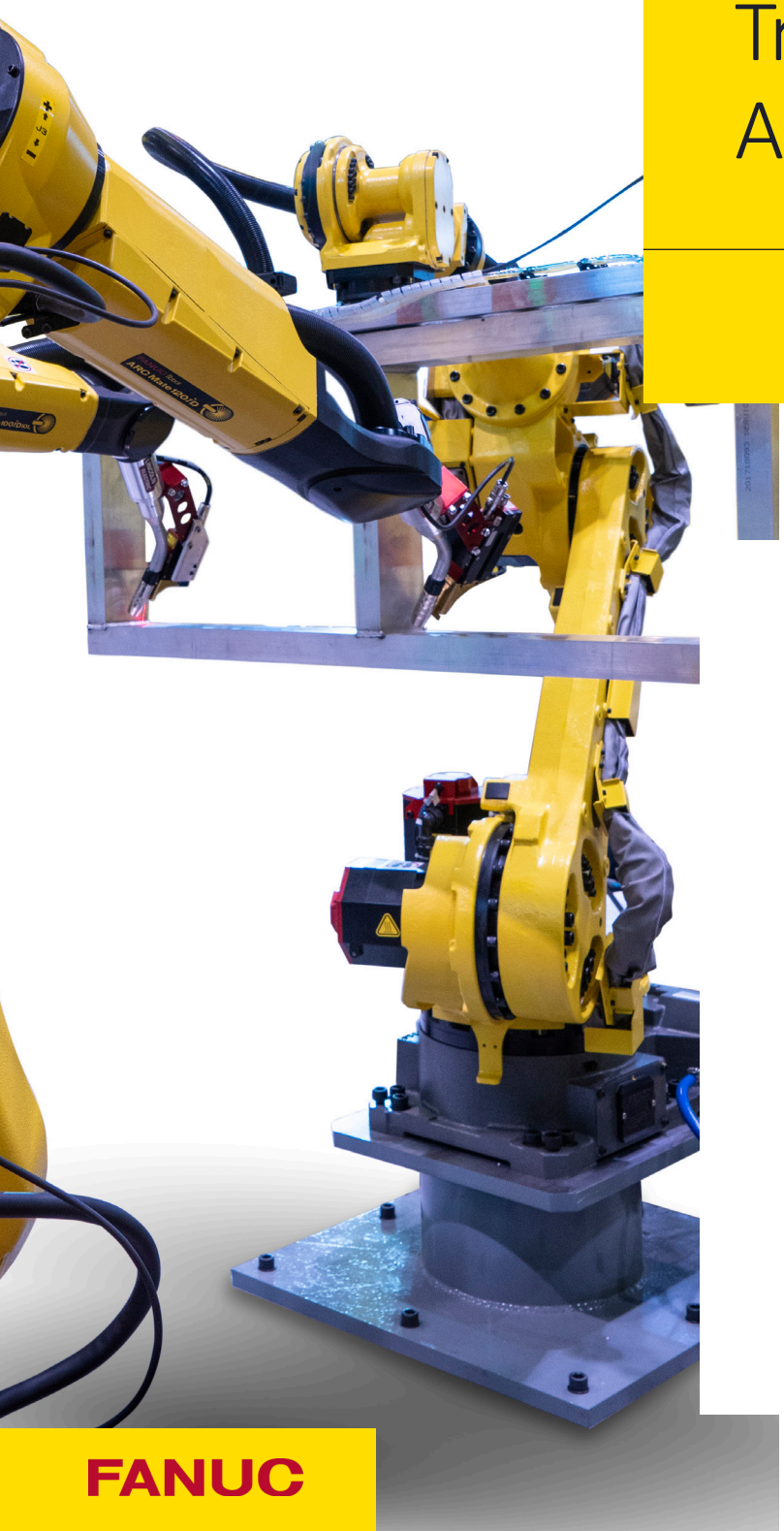
Battery Frame and Tray Assembly Automation



FANUC’s robots are engineered to provide peak battery frame and battery tray assembly, encompassing mig welding, friction stir welding and riveting. Tasks involved with cooling tray installation—including high-speed pick and place, heatsink dispense and battery pack load—are amply met by FANUC’s robotic solutions. Cooling tray installation also calls for a visual inspection, and FANUC’s innovative iRVision helps your robots “see,” providing for greater accuracy and speed.

Competing robot suppliers tap third-party companies for vision solutions that fall well short of FANUC’s robust robotic vision technologies, developed in-house by our engineering team. ***FANUC’s iRVision*** is unrivaled in performance, reliability and cost effectiveness for 2D and 3D part recognition, regardless of size, shape or position. FANUC’s robotic solutions can manage cooling tray installation, from high-speed pick and place to heatsink dispense, iRVision inspection and battery pack load.

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Cooling Hose Assembly Automation

With cooling hose assembly, electric vehicle manufacturers need an automation solution capable of force sensing and visual inspection. FANUC's robots are up to the task, with its powerful ***iRVision*** technology putting "eyes" on the work to ensure standards are met. This technology also comes into play with automation of nut running for cover plates.

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Final Frame and Tray Assembly Automation

FANUC's groundbreaking technology can automate the assembly of final frame and trays, handling battery enclosure assembly and nut running. These processes are followed by a visual inspection, with ***FANUC's iRVision*** powering through the task with razor-sharp accuracy and unequaled speed.

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Powertrain, Motor and Crankcase Assembly Automation

With powertrain and motor assembly, FANUC's robots and automation integrate quickly and easily because they share a common control platform. FANUC's CNCs and motion-control products power machine tools and equipment for stator and armature production. FANUC's solutions are able to manage machine tending and visual inspection for motor assembly, with iRVision technology utilized. FANUC's tools can also automate crankcase assembly, providing machine tending and iRVision inspection.

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FANUC Can Provide the Ultimate Automation Solution for Electric Vehicle Production

Automotive manufacturers have looked to FANUC for world-class, top-of-the-line automation solutions for decades, since the company jump-started the production of the internal combustion engine. As production of electric vehicles gets into the fast lane to meet booming consumer demand, manufacturers need proven solutions from companies they can depend on to level up and fully automate their assembly and production processes.

FANUC possesses unmatched experience and is the only automation supplier with a globally dedicated propulsion group, tested engineering expertise and sound solutions to support every electric vehicle application. FANUC boasts expansive regional facilities in North and South America and the industry's largest network of line builders and authorized system integrators. As your company builds out its vision to meet consumer demand for electric vehicle production, know that FANUC is the only automation company you can trust to deliver unparalleled results.

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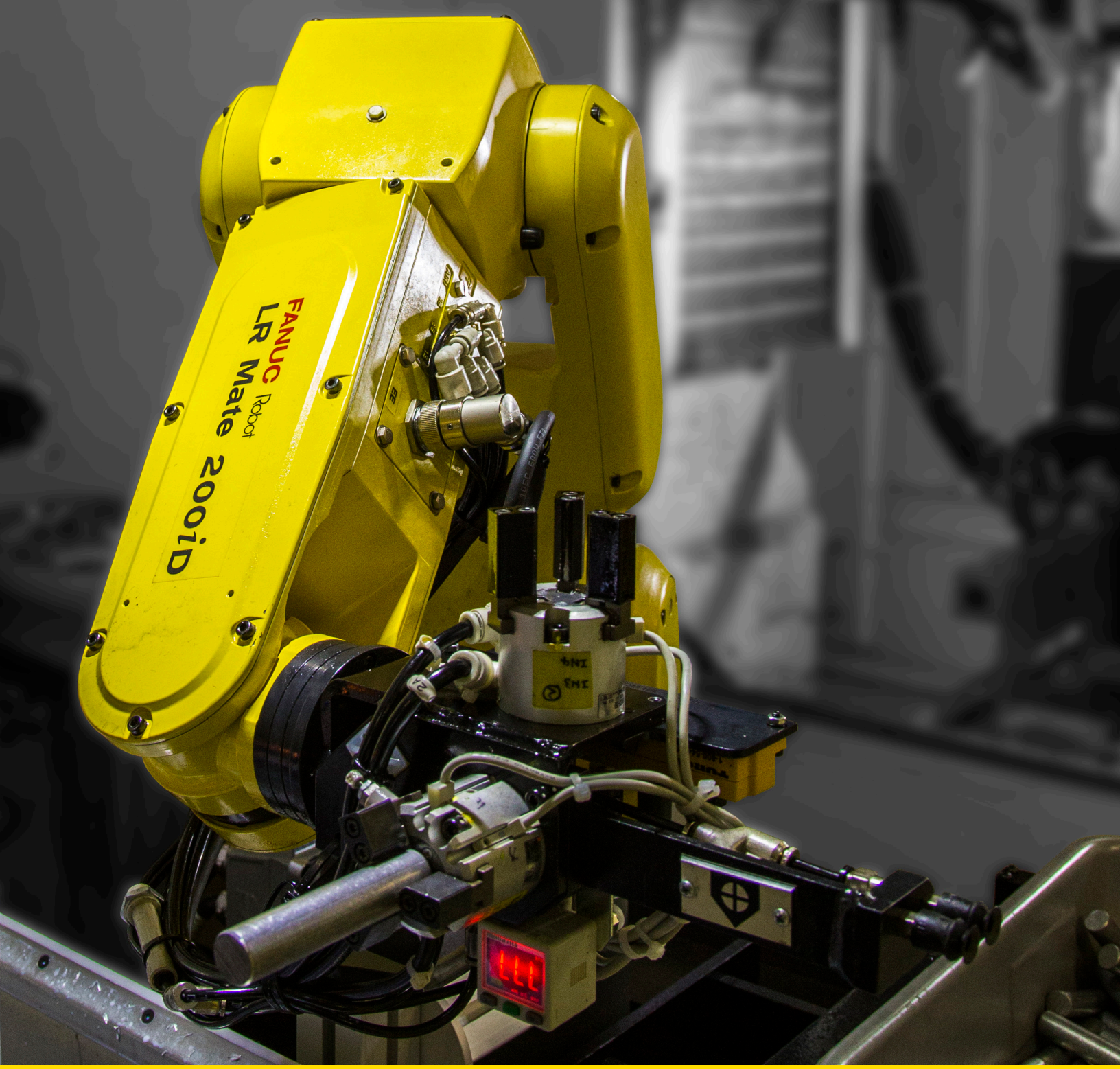

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