Navigate robotics compliance standards and regulations

UL Solutions

Safety. Science. Transformation.™

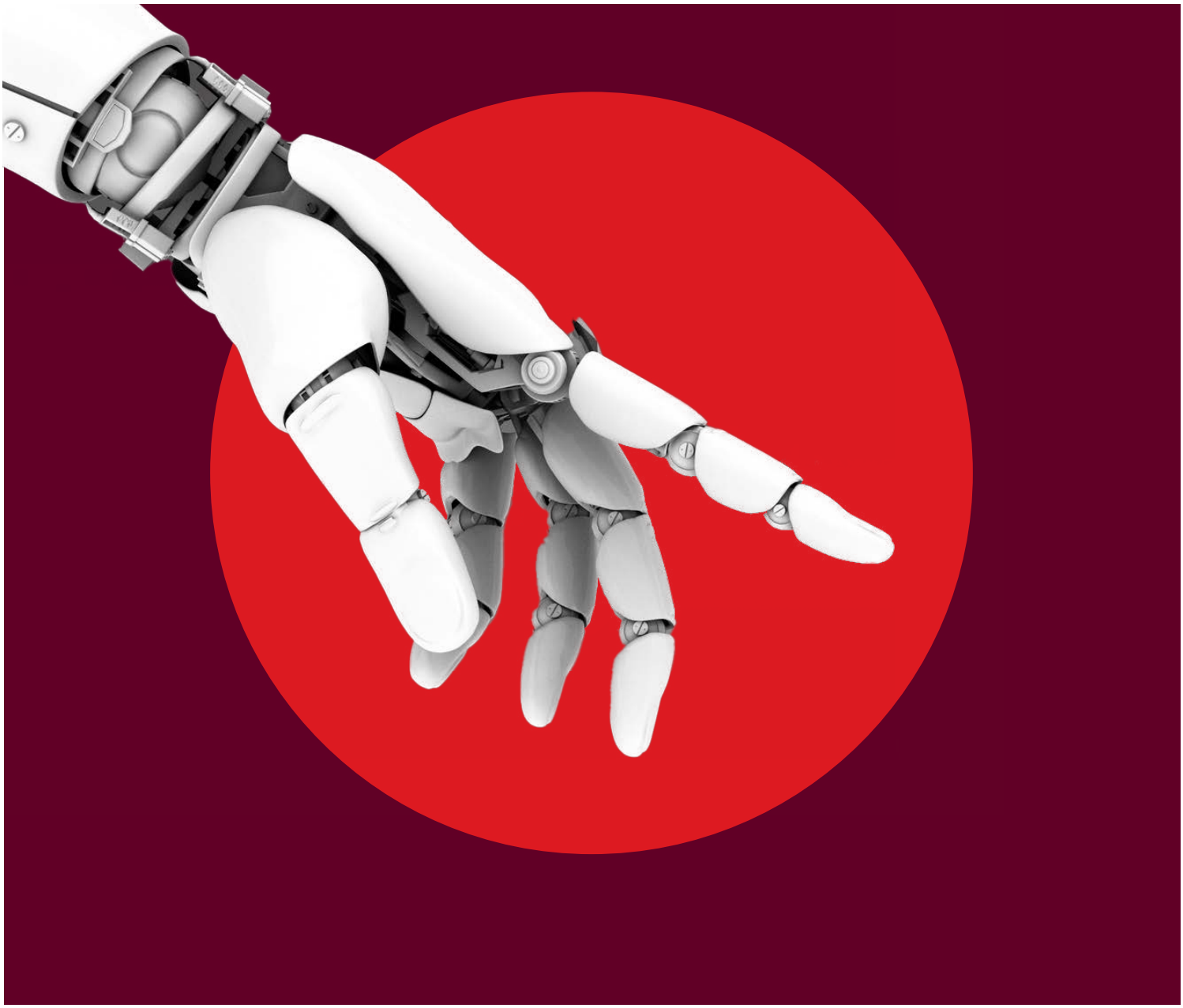
Consumer and commercial robots continue to find purpose in an ever-growing range of applications. UL Solutions offers a suite of robotics -related conformity assessment offerings that can help you navigate standards to enhance the safety of robotics in various environments.

The functionality of robots in the 21st century has evolved and become much more complex than the first robots, which were bolted to the floor or operated on a fixed track. In many newer applications, robots can even travel and interact freely with people in many different ways. Robots now apply advanced technologies, including functional safety features, sensor fusion, artificial intelligence, and machine learning, which help increase robots' functional safely in various environments.

Today, while workers are familiar with the use of robotics in an industrial manufacturing environment, robots can be found in many other sectors, such as private households, commercial locations, and medical settings. For example, robotic servers in restaurants are becoming more common, traveling and interacting with restaurant staff and customers autonomously. Delivery robot operations, which started trending up during the pandemic, can now be seen operating on city sidewalks and streets, navigating among pedestrians and automobiles. Many people also encounter robots in medical settings, such as doctors' offices and hospitals.

But what challenges and risks do consumer and commercial robots bring to humans and the environment? In addition to functional safety concerns that arise when a machine interacts with its environment, including with people, businesses may risk brand harm if a robot becomes unsafe and noncompliant with safety standards.

UL Solutions offers a range of robotic-related conformity assessment offerings designed to help you identify and navigate the various standards, including electrical and battery safety, charging systems, robot mobility, collaboration, and human interaction. We are a trusted resource for robot manufacturers, system integrators, and asset owners. We can help you evaluate robotic systems for compliance with safety and performance requirements.



To help you with these many other standards and regulations, we provide testing and certification services for robotic equipment and systems, including:

- Communication, information robots
- Companion robots
- Delivery robots
- Education and STEM robots
- Entertainment robots
- Exoskeletons
- Guide robots
- Hobby robots
- Household, domestic and home functional robots
- Humanoid robots
- Mobile servant robots
- Person carrier robots
- Physical assistant robots
- Restaurant robots
- Retail robots
- Security robots
- Service and personal care robots
- Telepresence robots

Enhancing consumer and commercial robot safety

Consumer and commercial robots generally operate in public places, in commercial environments and in homes near humans, so increasing the safety of robots operating in environments where people are present is important. Robot technology and applications are quickly expanding from the industrial and manufacturing segment to public and commercial spaces, as well as within homes, to assist and improve the quality of life for people. As this trend accelerates, additional safety concerns, including those associated with robot and human interactions, need to be identified and addressed.

Several different standards apply to the development, manufacture and marketing of robots throughout the world in the areas of safety, functional safety, interoperability, components and electromagnetic compatibility (EMC):

Safety

- UL 3300, Outline of Investigation for Service, Communication, Information, Education and Entertainment Robots
- EN ISO 13482 – Safety requirements for personal care robots

Functional Safety

- UL 60730-1 Annex H, the Standard for Automatic Electrical Controls
- ISO 13849 -1, Safety Of Machinery - Safety-Related Parts Of Control Systems - Part 1: General Principles For Design
- ISO 12100, Safety Of Machinery - General Principles For Design - Risk Assessment And Risk Reduction
- UL 5500, the Standard for Safety for Remote Software Updates

Components

- Battery safety testing
  - UL 2271, the Standard for Batteries for Use In Light Electric Vehicle (LEV) Applications
  - UL 2580, the Standard for Batteries for Use In Electric Vehicles
  - UL 62133-2, the Standard for Safety for Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from Them, for Use in Portable Applications - Part 2: Lithium Systems
- Charger safety testing (UL/IEC 62368-1)

Additional relevant services

- Cybersecurity (IoT device security rating)
- EMC (Electromagnetic compatibility) testing (EN/ IEC 61000-x)
- Wireless device testing and certification
- Interoperability testing
- Global Market Access (Compliance marks in different countries/ regions)
- Laser optical radiation testing (IEC 60825-1 and CDRH)
- Energy efficiency testing and certification
- UL Marketing Claim Verification (Robot Performance)

Related robot standards

- IEC 63327 Automatic floor treatment machines for commercial use
- UL 1017, the Standard for Vacuum Cleaners, Blower Cleaners, and Household Floor Finishing Machines
- UL 3100, the Standard for Automated Mobile Platforms
- UL 60335-2-2019, Outline for Robotic Germicidal Equipment

How can we help?

Starting with the right choice of components, safe daily operations, effective market access, and cybersecurity-by-design, we can help you demonstrate compliance with strict safety standards and navigate barriers to entry for markets around the world. Our services include a full range of offerings.

We can provide certification for UL 3300 and ISO 13482, safety requirements for personal care robots, as well as functional safety services, evaluation and certification of components used, EMC testing, and interoperability testing. With our deep technical expertise, we can:

- **Help with a preliminary investigation at the design stage of your products to assist you in building a safety framework/ road map for your innovative products.**
- **Evaluate products for compliance with standards and regulations for your target markets (market access) and help you bring innovative robot technologies to market faster.**
- **Help you increase confidence in the quality, performance, and reliability of your products, differentiating them against their competitors.**
- **Verify interoperability, i.e., that products work as expected with all other relevant devices and conform to all appropriate standards and technology platforms.**

Our preliminary services can provide an early assessment of your design against robotic, electrical, and functional safety requirements. This can help you avoid rework and changes in later development phases and identify potential schedule risks early to aid in effective project management, bringing time and cost savings.

Our experts can work with your teams to evaluate designs, conduct interviews, and look at all of your safety critical construction, components, Operational Design Domain (ODD), and Risk Assessment. We also offer specific robotic training and advisory on robotic safety, electrical safety, or functional safety requirements. Additionally, we provide expert functional safety testing and certification, including personnel qualification (such as UL-CFSP and UL-CFSX), as well as testing for specific robotic applications and their corresponding standards. The preliminary services can provide a detailed gap analysis report along with a test plan. The full evaluation will be based on it to carry out required tests and evaluation. The testing may be conducted either in a UL Solutions laboratory or at your facility, witnessed by the UL Solutions engineer.

For component sourcing, the UL Product iQ® database can help you source safety-compliant, pre-certified components.

EMC, radio performance, radio frequency (RF) exposure and safety requirements are mandatory in most markets. However, regulations vary from country to country. Our EMC and wireless testing can help ensure that your robots meet the requirements that are mandatory in the targeted environments.

The UL Cybersecurity Assurance Program (UL CAP) aims to minimize risks by creating standardized, testable criteria for assessing software vulnerabilities and weaknesses in embedded products and systems. This helps reduce exploitation, address known malware, enhance security controls, and expand security awareness.

UL CAP offers trusted third-party support with the ability to evaluate the security of network-connectable products and systems, as well as vendor processes for developing and maintaining products and systems with a security focus. The program allows manufacturers to concentrate on product innovation with emerging technologies and capabilities to meet the ongoing needs of the marketplace.

Based on the UL 2900 Series of Standards, UL CAP's full suite of solutions is designed to help organizations manage their cybersecurity risks and validate their cybersecurity capabilities to the marketplace.

Finally, we perform UL Solutions Follow-Up Services to verify that products continue to comply with the standards under which they were certified. Throughout the lifetime of certification, products undergo regular inspections at the manufacturing facility. This increases the confidence of the robot brand owners and operators that the manufacturing of the product has not been changed or altered in a way that may impact its safety.

Next Step

Find out how our robotics offerings can help with consumer robotic system compliance at www.UL.com/SCIEE.

Contact us today at www.UL.com/contact-us.

UL.com/Solutions

CS707546_0323