



COMMITTED TO QUALITY



TWO-WAY RADIO IS THE COMMUNICATIONS LIFELINE FOR MANY BUSINESSES

BY OFFERING FAST, HIGH-QUALITY COMMUNICATION, YOUR TEAM ARE INFORMED AT ALL TIMES, IMPROVING EFFICIENCY IN EVERY TASK



KEEPING YOUR TEAM'S COMMUNICATION CHANNEL UP AND WORKING IS CRITICAL TO THE SUCCESS OF THE JOB WHICH IS WHY WE AT MOTOROLA SOLUTIONS PUT QUALITY AT THE HEART OF EVERYTHING WE DO.

Motorola Solutions history of quality is unparalleled, especially when you consider that we were trusted to keep communications flowing during the Apollo moon landings, transmitting Neil Armstrong's infamous words as he stepped onto another celestial body. We continue our history of mission-critical communications today by providing equipment and support to emergency services, government organisations and companies all around the world.

All Motorola Solutions products are designed to withstand the knocks, bumps, and drops they will experience during their lifetime, but we go further. With Accelerated Life Testing (ALT), destructive testing, and feedback from the field. All these sources of information are analysed and integrated into our design and improvement process, making Motorola Solutions products better with every iteration.

In addition to our internal quality standards, Motorola Solutions design and test to all relevant

standards for the markets we operate in. We perform additional testing to the United States military standards (MIL-STD-810) and international Ingress Protection standards to ensure our radios will survive real-world daily use.

With over 90 years of communications experience, Motorola Solutions know what makes a robust and high-quality radio product. Quality is built into everything we do; every process, every component, and every product we ship to our customers.



QUALITY DESIGNED IN

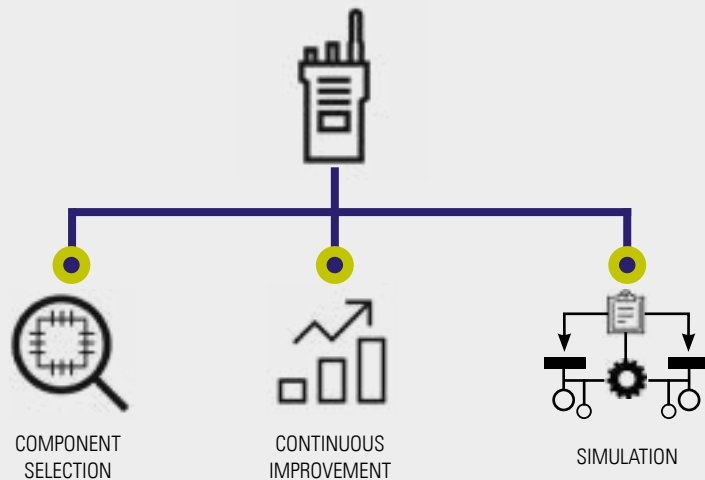
At Motorola Solutions, we are proud of the products we make, which is why from the moment we start developing a product we are already considering the quality of the final article. Every choice we make is made with quality in mind, from the selection of electrical components to the plastics chosen for the casing. Every single part contributes to the durability and reliability of our portfolio.



ELECTRICAL DESIGN

Motorola Solutions engineers always perform a detailed analysis of our circuit designs, performing our unique Accelerated Life Testing, and querying our database of failures on previous products to continuously improve the lifetime of your radio.

Design decisions such as purchasing more expensive chips to replace multiple other components can lower the failure rate of devices by simplifying circuits while choosing parts with lower failure rates can drastically improve the lifetime of the whole device. We even simulate the operating temperature of the components within our radios to ensure they stay within tolerance and have the longest lifetime possible.



COMPONENT
SELECTION

CONTINUOUS
IMPROVEMENT

SIMULATION

As devices age the characteristics of components within them can change, especially when subjected to changing temperature and humidity; by simulating the circuitry of our radios and performing tests with varying values of each component we can ensure that these changes do not mount up in a way that could cause an early failure of the electronics.

Finally, we consider the supply chain of every component so that we can support the devices for as long as possible. We ask how long a manufacturer expects to make a component, if there will be replacements that can easily be designed into the device, and even how reliable the deliveries of the components will be to avoid breaks in the supply of new and replacement radios.

**MOTOROLA
SOLUTIONS CAN
DELIVER THE RIGHT
SOLUTION FOR YOUR
CIRCUMSTANCES, NO
MATTER WHAT YOUR
REQUIREMENTS ARE**

**OUR OBSESSION WITH
QUALITY KEEPS YOU SAFE IN
THE MOMENTS THAT MATTER**



DROP TESTING

The casing of every radio Motorola Solutions manufactures will need to withstand all manner of knocks, bumps, drops and scrapes as it accompanies you through your daily life.

Our heavy-duty casings are subjected to drop tests from 120cm (4ft) onto concrete 42 times as well as receiving repeated blows from steel balls dropped directly onto the screen and speakers.

THE FINAL MECHANICAL TESTS SUBJECT THE RADIOS TO MULTIPLE-G FORCES IN ALL DIRECTIONS FOR OVER 3 HOURS



EXTREME TEMPERATURE TESTING

With the mechanical tests completed, Motorola Solutions radios are submitted to thermal shock testing where they are heated and cooled between -35°C and $+75^{\circ}\text{C}$ multiple times ensuring the equipment you buy will work even in the harshest temperature.



SOLAR RADIATION TESTS

Extended exposure to sunlight can break down plastic and cause degradation such as discolouration and flaking. Motorola Solutions radios and accessories are placed into a solar radiation chamber that simulates the sun's rays using UV light at a much higher level that would be encountered in the field. With high-intensity light, many years of exposure can be simulated within weeks proving that our devices will withstand operational use in bright sunlight.



CORROSION TESTING

Whether on land, at sea, inside or outdoors, the environments we operate in can be corrosive to electronics and metals causing rust and weakness. To test our protective coatings, our accelerated lifecycle testing includes salt fog testing. This standardised test ensures that the metals used in Motorola Solutions radios won't quickly corrode no matter what job you take them on.



VIBRATION TESTING

Imagine the scenario where your radio stops working while you are walking or driving due to the vibration; you may lose communications and waste precious seconds in a critical situation. To avoid this sort of failure, all Motorola Solutions devices are subjected to vibration testing designed to prove that all connections inside and outside every radio are firmly connected and will not detach as you go about your day.



ENVIRONMENTAL PROTECTION TESTING









Electronics are susceptible to damage caused by dust and water entering the housing. This is why the protection provided by the casings of our radios is so important. This protection is measured using the Ingress Protection (IP) rating, but we also submit our radios to MIL-STD-810 testing including blowing rain which better simulates outdoor conditions.

IP (INGRESS PROTECTION) RATINGS GUIDE

SOLIDS

1.  Protected against a solid object greater than 50 mm such as a hand.
2.  Protected against a solid object greater than 12.5 mm such as a finger.
3.  Protected against a solid object greater than 2.5 mm such as a screwdriver.
4.  Protected against a solid object greater than 1 mm such as a wire.
5.  Dust Protected. Limited ingress of dust permitted. Will not interfere with operation of the equipment.
6.  Dust tight. No ingress of dust.

WATER

1.  Protected against vertically falling drops of water. Limited ingress protected.
2.  Protected against vertically falling drops of water with enclosure tilted up to 15 degrees from the vertical. Limited ingress protected.
3.  Protected against sprays of water up to 60 degrees from the vertical.
4.  Protected against water splashed from all directions. Limited ingress permitted.
5.  Protected against jets of water. Limited ingress permitted.
6.  Shall experience no harmful effects from high-pressure water being sprayed against the device from any direction.
7.  Protection against the effects of immersion in water between 15 cm and 1 m for 30 minutes.
8.  Protection against the effects of immersion in water under pressure for long periods.

IP 67
RATING EXAMPLE



ACCELERATED LIFE TESTING

Accelerated Life Testing (ALT) allows Motorola Solutions to test how all aspects of our radios will handle many years of use in your organisation. By placing our radios into specially designed test equipment, years of heavy usage can be simulated in days or weeks, allowing us to improve designs quickly and build quality into every part we make. Some of the tests we do are mentioned below:



BUTTON PRESSES

We test the design of the keys on our radios, with the PTT button being tested with over 1 million presses to verify that your radio will work as well on its last day in service as it did on its first



PLUGGING CYCLES

The last thing you want is to pick up a radio you thought was charging to find that it has no charge. We make sure our radios and chargers can take a lifetime of being plugged in by simulating 100,000 aggressive insertions on our designs. We even add dust to recreate the everyday circumstances of the radio and charger in the field.





MIL STANDARDS

MIL-STD-810 is a standard developed by the United States military which defines a number of test processes that can be performed on a product to verify its suitability for use in particular environments. MIL-STD-810 was first released in 1962 and has been updated many times over the years, with the latest version (MIL-STD-810H) released in 2019.

MIL-STD-810 ENVIRONMENTAL CONSIDERATIONS

When designing a new radio, our first consideration is to pick the type of customer who the radio is aimed at. What will you, as the user, require from the radio and its accessories? What sort of life will the radio have by your side?

Part of the process when designing a new device is to choose the environment that the radio will find itself in. At Motorola Solutions, we make a decision about the harshest environments the devices are likely to experience at the beginning of the design process using our years of experience to guide us. By correctly choosing the right environments, we can be certain we choose the relevant tests from MIL-STD-810 and ensure that the radios we produce won't let you down.

MIL-STD-810 can be broken down in three ways; method, procedure, and parameter levels:

METHOD

Methods are the name given to each of the tests within MIL-STD-810. There are methods for low-temperature tests, high-temperature tests, vibration, and immersion to name some of the 29 different methods that exist in the standard. It is not mandatory to test all methods within the standard, so you should always check that the device you are purchasing has passed the individual methods your use case requires.

PROCEDURE

Procedures are the individual tests that can be performed to claim compliance with a specific method. The low-temperature method (502.5) defines three procedures; storage at low temperature (1), operation

at low temperature (2), and usability while wearing cold-weather clothing (3). A device could be tested for use in cold-weather clothing only and still claim low-temperature compliance. This is why it is important to check what procedures were tested as well as what methods.

PARAMETER LEVEL

Within each procedure are parameter levels which allow devices to be tested for the environment in which it will be used. For instance, when testing the effects of high temperature, either a parameter level of "Basic hot" (A2) or "Hot dry" (A1) can be chosen, the latter having a wider range of temperatures over which it must be tested.

OUR TESTING

Motorola Solutions uses the MIL-STD-810 standard as well as our specific Accelerated Life Testing to verify the durability and suitability of our equipment, ensuring we perform all the procedures required from the methods which we choose. Through years of design and testing, Motorola Solutions understands what is needed to make a radio tough, giving you confidence that whatever the circumstances, your radio will perform perfectly.

FOR PEACE OF MIND, WE PUBLISH ALL METHODS, PROCEDURES, AND PARAMETERS USED IN OUR DATASHEETS





To learn more about the Motorola Solutions portfolio,
visit www.motorolasolutions.com

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