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MIL-STD-810 – the ideal tool for demanding environments

Why are military standards so important?

Nowadays, technical devices and systems have to withstand extreme environmental conditions – whether in freezing cold, dusty desert heat or heavy rain.

MIL standards are technical standards that were originally developed by the US Department of Defense (DoD). In recent years, the use of MIL standards, especially MIL-STD-810, has expanded significantly beyond military applications. This is due to the growing importance of robust and durable products, even in the civilian sector. Both manufacturers and consumers are demanding ever-greater reliability from technology, even in adverse conditions.

One of the best-known military standards is MIL-STD-810. This standard comprises a wide range of tests for simulating extreme environmental influences. What makes MIL-STD-810 special is that it is not a rigid standard with fixed limits, but a flexible set of rules. The focus is on realistic test scenarios that can be adapted to the specific environmental conditions of the planned product application.

As a leading supplier of environmental simulation systems, Weiss Technik offers a wide range of test chambers and test sys-tems for temperature change, humidity, vibration tests and many other test methods. These facilities enable companies to test their products under realistic and extreme conditions and ensure that they meet the strict requirements of MIL-STD-810.

Key Facts:

- MIL-STD- 810 originated in the Department of Defense (DoD)
- Its aim is to ensure uniform quality and safety of military equipment.
- It is used for robust and durable products
- Part II of MIL-STD-810 contains 29 specific test methods in the field of environmental simulation.
- Weiss Technik can offer the right solution for a wide range of test methods

Origin and development of MIL-STD-810

MIL-STD-810 was first published in 1962 by the US Department of Defense (DoD). Its purpose was to prepare military equipment for use in extreme climatic and mechanical conditions, such as desert heat, Arctic cold and the intense mechanical stress experienced by military vehicles. The standard has since been revised several times to align with the latest technological advances. The latest version is MIL-STD-810, which was published in 2022. Unlike many other standards, it does not describe test requirements, but instead provides structured test methods and guidelines for environmental testing. The aim is to test products under simulated environmental conditions that could actually occur in real-world use. This makes the standard particularly practical and flexible.

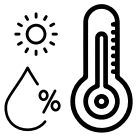
Structure of MIL-STD-810

MIL-STD-810 is a comprehensive document divided into two main sections and comprising a total of over 1,100 pages. It provides both conceptual principles and specific test methods. The modular design allows users to select and adapt the parts that are relevant for their specific application.

Part I - Environmental Engineering Program Guidelines:
This part forms the methodological basis of the standard. It explains how an environmental testing programme should be structured – from analysing environmental conditions to selecting suitable test methods. The chapters cover topics such as: description of a product's life cycle (transport, storage, operation), determination of relevant environmental factors, guidelines for conducting laboratory and field data analyses, creation of environmental profiles and test plans, requirements for test documentation and verification.

Part II - Laboratory Test Methods:
This part describes the specific environmental tests in detail. The standard currently contains over 29 individual test methods (Method Numbers), each of which simulates a specific influencing factor. These include: temperature tests (high/low storage temperature, temperature changes), humidity tests (cyclic humidity, condensation), mechanical tests (vibration, shock, drop, acceleration), particle and liquid influences (dust, sand, rain, freezing rain), corrosion tests (salt spray, fungal attack), radiation and pressure tests (solar radiation, negative pressure).

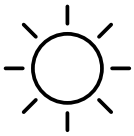
Part III - World Climatic Regions:
This part contains extensive climate data and information on global environmental conditions to develop realistic scenarios for product testing.



Temperature & climate

Water & liquids

Corrosion



Light & radiant exposure

Particles & atmospheric influeces

Altitude

Combination tests & special methods

Mechanical stress

Relevant industries & examples

MIL-STD-810 is now used in a wide range of industries where products are exposed to extreme environmental conditions.

Aerospace
Aircraft, helicopters, drones, satellites and space probes are exposed to extreme conditions: high altitudes, extreme temperature differences, pressure fluctuations and intense vibrations. Tests that comply with MIL-STD-810 check the on-board electronics for pressure changes, vibrations, icing and exposure to UV and solar radiation.

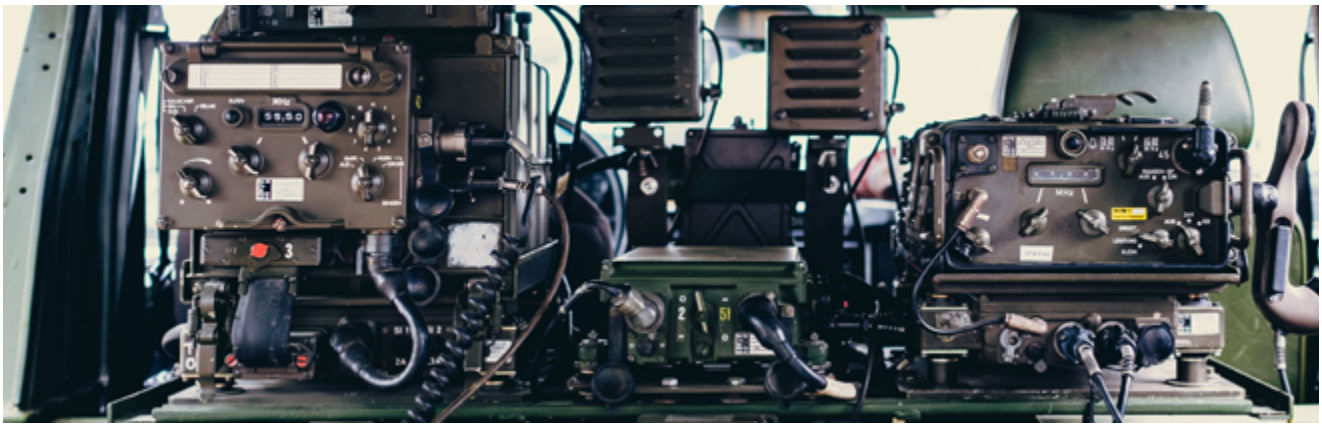
Automotive industry
Vehicles intended for civil and commercial use, including off-road and construction site vehicles, as well as commercial vehicles, must also be protected against environmental influences such as mud, dust, moisture and vibrations. MIL-STD-810 tests are used, for example, to test control units (ECUs) for shock and vibration, to test headlights for dust tightness, and to test on-board cameras for temperature fluctuations in the engine compartment.

Communication and network technology
Radio units, base stations or mobile devices for safety-critical communication must remain operational under all conditions – whether in urban areas or disaster zones: Vibration testing for devices in vehicles, salt fog testing for coastal applications, testing for rain, dust and thermal stress.

Outdoor electronics & consumer products
More and more manufacturers are advertising their products as MIL-STD-810 compliant, especially in the outdoor, sports and adventure sectors: like rugged smartphones, smartwatches and action cameras for mountaineers, hikers or emergency services.

Defence & Security
Of course, the military origin remains relevant. The equipment used by the armed forces, the police and the emergency services is tested in accordance with strict standards. This includes temperature change tests for radio equipment, corrosion tests for maritime operations and stress tests for armoured vehicles.

The wide range of applications demonstrates the versatility of MIL-STD-810 as a tool for ensuring that technical products are fit for demanding environments worldwide, ranging from deserts to the Arctic and from satellites to smartwatches.



Weiss Technik can offer the right solution for a wide range of methods.

- Temperature & climate testing
- Water & fluid tests
- Corrosion tests
- Light and radiation tests
- Particles and atmospheric influences
- Altitude and pressure tests
- Mechanical stress
- Combination tests & special methods

We offer the right solution for every test specimen - from compact bench-top models with a test space volume of 16 liters to reach-in test chambers and drive-in systems for large-volume applications. In addition to our standard products, we also work with our customers to develop customized solutions that are precisely tailored to specific requirements.

MIL-STD-810 Method 500.6
Low pressure (altitude)

Method 500.6 of MIL-STD-810 is used to evaluate the resistance and functionality of materials under conditions of low ambient pressure or rapid pressure changes. It comprises four specific procedures that are adapted to the life cycle of the test object. This method is particularly relevant for materials stored, transported or operated at high altitudes, such as in pressurised or unpressurised areas of aircraft, or for materials that may be exposed to extreme decompression.

Product: Altitude simulation chambers SkyEvent

MIL-STD-810 Method 501.7
High temperature

Test method 501.7 evaluates the effects of high temperature conditions on the reliability, material resistance and serviceability of technical equipment. The test includes constant and cyclic temperature exposures and monitoring for physical or functional changes. High temperatures can lead to material degradation, component failure and performance losses.

Product: Laboratory test chambers LabEvent, Temperature test chambers TempEvent and Climate test chambers ClimeEvent (reach-in, walk-in, drive-in), as well as customised solutions and ammunition temperature control trailers (depending on sample size).

MIL-STD-810 Method 502.7
Low temperature

This MIL-STD-810-Method 502.7 defines how to evaluate devices that are exposed to low temperatures. It comprises three procedures: storage, operation and handling. It is used, for example, to test the hardening and embrittlement of materials, mechanical damage or functional faults.

Product: Laboratory test chambers LabEvent, Temperature test chambers TempEvent and Climate test chambers ClimeEvent (reach-in, walk-in, drive-in), as well as customised solutions and ammunition temperature control trailers (depending on sample size).

MIL-STD-810 Method 503.7
Temperature shock

Method 503.7 (temperature shock) evaluates the ability of a test item to withstand sudden, extreme changes in ambient temperature. It simulates rapid transitions between hot and cold environments to evaluate structural integrity and operational reliability. This enables the identification of failure mechanisms in the event of sudden, extreme temperature fluctuations. For example, mechanical parts may deform or fail due to different thermal expansion.

Product: Temperature shock test chambers ShockEvent, Temperature & Climate test chambers for stress screening tests TempEvent & ClimeEvent with 15...25K/min

MIL-STD-810 Method 505.7
Solar radiation

Method 505.7 of MIL-STD-810 evaluates the effects of solar radiation on the durability, function and safety of equipment used outdoors. The test takes into account both heating from solar energy and light-induced ageing processes triggered by UV radiation. Attention is paid to physical or functional changes. Solar radiation can cause material degradation, malfunctions and mechanical problems such as loosening or jamming of moving parts.

Product: Solar simulation chambers SunEvent

MIL-STD-810 Method 506.6
Rain

Method 506.6 of MIL-STD-810 is used to evaluate the protective effect of covers, enclosures and seals against the ingress of water. It tests the functionality of the material during and after exposure to water, as well as possible physical damage and the efficiency of water drainage systems. This method is relevant for equipment that may be exposed to rain, splashing water or dripping water, and comprises three procedures for realistically simulating typical rain conditions in military scenarios

Product: Climate test chamber ClimeEvent with special equipment, Water Test MIL Spray Event RK/5800/MIL

MIL-STD-810 Method 507.6
Humidity

Method 507.6 simulates warm and humid climatic conditions in two variants: induced and natural cycles. The aim is to evaluate the effects of high humidity on materials and components. Typical risks include corrosion, loss of insulation, material deformation and functional failures. The method enables realistic testing and supports the development of robust products for demanding operating environments with high climatic stress.

Product: Laboratory test chambers LabEvent, Climate test chamber ClimeEvent (reach-in, walk-in, drive-in) as well as customised solutions.

MIL-STD-810 Method 509.8
Salt fog / Corrosive environments

This method is used to evaluate the effectiveness of protective coatings and surface treatments under corrosive conditions such as those found in saline environments. It analyses the effects of salt fog, salt deposits, moisture and temperature fluctuations on the physical and electrical properties of materials. The aim is to identify potential weak points at an early stage – not to predict service life. This method is particularly relevant for marine applications, coastal infrastructure and military equipment in corrosive climates.

Product: Advanced Cyclic corrosion test chambers Atmosar Premium

MIL-STD-810 Method 510.7
Sand and dust

MIL-STD-810 Method 510.7 is used to evaluate the resistance of materials to sand and dust environments tailored to specific environmental conditions and material requirements. This method is relevant for a wide range of mechanical, optical, electrical, electronic, electrochemical and electromechanical devices in industries where such exposures are expected.

Product: Dust testing devices DustEvent ST/600 /MIL

MIL-STD-810 Method 511.7
Explosive atmosphere

Methode 511.5 is used to evaluate equipment and materials in potentially explosive atmospheres. The aim is to ensure that no ignition occurs due to sparks, hot surfaces or electrical components. The method is essential for safety-critical applications in the defence, aerospace and energy industries. Typical applications include aircraft avionics, fuel system components and maintenance tools that are operated in environments with flammable gases or vapours..

Product: Explosion-proof test chamber ExtremeEvent

MIL-STD-810 Method 514.8
Vibration

The aim of this method is to define vibration environments to which materials may be exposed during their life cycle and to carry out laboratory tests to assess their resistance. The tests ensure that the material remains functional under realistic vibration loads, even in combination with other environmental factors. Method 514.8 of MIL-STD-810 provides four specific procedures for simulating typical vibration scenarios that occur during transport, operation or storage of military equipment.

Product: Test Chamber for Vibration Testing ShakeEvent

MIL-STD-810 Method 520.5
Combined environments

Methode 520.5 of MIL-STD-810 evaluates the combined effects of multiple environmental factors – including temperature, altitude, humidity, electrical input power and vibration – on aircraft-qualified electronic and electromechanical equipment during ground and flight operations. The aim is to identify weaknesses that remain undetected in individual tests. The method is specifically tailored to the requirements of the defence industry, particularly for applications in aviation and missile electronics.

Product: Altitude Simulation Cabinet SkyEvent

MIL-STD-810 Method 521.4 Icing/freezing rain

This method is used to assess the effects of icing on the functionality of materials and the effectiveness of de-icing procedures, including field-available means. It applies to equipment that may be exposed to ice formation due to freezing rain, drizzle, fog or spray. The aim is to determine whether the material remains operational after ice accumulation or can be successfully de-iced. Method 521.4 is particularly relevant for military applications in cold, humid operating environments.

Product: Climate test chamber ClimeEvent with special equipment

MIL-STD-810 Method 524.1 Freeze/Thaw

Method 524.1 evaluates the ability of material to withstand repeated freeze-thaw cycles in which moisture in or on the material changes between liquid and solid states. It also investigates the effects of temperature changes between cold and warm environments. The method focuses on physical changes caused by phase changes and is not intended for evaluating low-temperature behaviour, thermal shock, rain or icing. It is particularly relevant for military applications in humid, frost-prone areas of operation.

Product: Climate test chamber ClimeEvent with special equipment, Laboratory test chambers LabEvent with special equipment

MIL-STD-810 Method 528.1 Mechanical vibrations of shipboard equipment

The 'mechanical vibrations of shipboard equipment' method assesses the effects of mechanical vibrations on the operational safety, structural stability and functionality on-board materials and equipment. The test includes environmental and internally induced vibrations, as well as monitoring for physical or functional changes. Vibrations can lead to material deterioration, component failure and performance losses.

Product: Test Chamber for Vibration Testing ShakeEvent

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