SPECIAL LAB - The heart of control and innovation

SPECIALCAVI
WE BRIDGE PEOPLE

Summary

Who we are

Special Lab was born from the company's commitment to placing quality at the core of its operations. It serves as a key facility for incoming material inspection and continuous verification of finished products, ensuring that every cable complies with safety, performance, and conformity standards set by both Italian and international regulations.

Thanks to specialized technical expertise and cutting-edge equipment, our team conducts thorough testing on hundreds of cables each week. Each batch, sampled at high frequency, is inspected prior to delivery to guarantee that the production process consistently maintains high quality standards and that the final product meets the minimum requirements for reliability and performance.

Overall, the laboratory and testing department carry out **57 different tests**, covering every aspect of cable behavior and resistance.

The types of test

In Special Lab the tests are classified according to three complementary criteria:

Based on their purpose, we distinguish between:

- **type tests:** these are standardized tests, conducted according to product and compound standards, aimed at verifying the quality, safety, and performance of cables. They are performed as part of product quality control to ensure long-term cable performance and are carried out on incoming materials, semi-finished products, and finished cables. These are in-depth tests and include electrical, mechanical, thermal, chemical, and aging tests to certify the cable in accordance with Italian and international standards.
- **routine tests:** these are regularly performed on each reel or production lot to ensure the immediate functionality of the cable. They verify that the finished product meets the minimum safety and performance requirements before delivery to the customer.

Based on the stage of the production process, we distinguish between:

- **tests on incoming material:** these are aimed at verifying that incoming materials comply with the technical specifications defined by the compound standards and the supplier's technical data sheet.
- **tests on semi-finished product:** these are carried out on components that will form the finished cable, in order to monitor the quality of the production process and prevent defects in the final stage.
- **tests on finished product:** before delivery, the finished cable is tested to ensure that it complies with the specifications set by applicable regulations and meets customer requirements.

Based on the technical nature of the tests, they are divided into 11 macro-categories:

- **Tests on cable construction:** these are aimed at verifying compliance with the specific product standard and include checks on diameters, thicknesses, concentricity, marking, and verification of materials and conductors.
- **Electrical tests:** the purpose is to assess the cable's fundamental electrical performance, ensuring safety, reliability, and regulatory compliance.
- **Chemical-physical tests:** these are designed to analyze the properties of materials and establish structure/property correlations. The materials tested are used in cable construction as insulators, sheaths, conductors, and fillers. These tests also verify the quality, compliance, and suitability of the materials for their intended use.

The types of test

- **Aging tests:** these are simulations designed to assess the cable's lifespan and its behavior over time when exposed to various environmental stresses. All aging tests are linked to mechanical tests, as they evaluate changes in the material's mechanical properties before and after exposure to different aging conditions.
- **Resistance tests to mechanical stress:** these specific tests verify that cables can withstand physical stress during installation and use, without compromising their electrical functionality or safety throughout their lifecycle.
- **Thermal tests**: these assess the cable's performance at high or low temperatures.
- **Thermo-mechanical tests:** combined tests that evaluate the cable's behavior when subjected simultaneously to thermal and mechanical stresses.
- **Reaction to fire tests:** these aim to evaluate how the cable behaves in the presence of a flame, specifically whether it contributes to fire propagation.
- **Fire resistance tests:** these verify that the cable maintains electrical functionality during a fire, even when directly exposed to flames.
- **Combustion resistance tests:** these assess the cable's ability to resist fueling combustion and to self-extinguish once the heat source is removed.
- **Rheological tests:** these analyze the behavior of polymeric materials (such as insulators and sheaths) during processing and use, particularly in relation to temperature.

Each test may fall into one or more of the categories described and can be performed either as a type test or a routine test, depending on the production context, regulatory requirements, and customer needs.

In this brochure, the tests will be presented according to their technical nature, to provide a clear and structured overview of the laboratory activities and the equipment available at Special Lab.

Research and Development Area (R&D)

In a constantly evolving industrial context—characterized by increasingly stringent regulations, complex market demands, and growing attention to quality and sustainability—a laboratory cannot be limited to quality control activities alone.
It is within this scenario that Specialcavi recognized the need to establish an internal area within Special LAB dedicated to **Research and Development (R&D).**

The R&D area functions as a dynamic and multidisciplinary center, where high-value activities are carried out, including:

- *Optimization of production processes* to improve efficiency and quality
- *Validation and approval of new raw materials* to ensure reliability and compliance
- *Statistical analysis of test data* to support evidence-based technical decisions
- *Development of new products* in response to specific application or regulatory requirements
- *Simulation of flame resistance performance* to anticipate official test results
- *Continuous training for employees, interns, and students* to promote knowledge and skill development
- *In-depth study of cross-linking processes* (air or forced) of polyolefin materials to determine the optimal timing for semi-finished product coating
- *Advanced characterization of polymeric materials* to thoroughly understand their chemical, physical, and mechanical behavior

These activities allow the laboratory to evolve from a specialized testing entity into a true technological partner, capable of supporting customers throughout all stages of product development, validation, and industrialization.

CLASSIFICATION OF THE TESTS BASED ON THEIR TECHNICAL NATURE

Tests on cable construction

- **Measurement of insulation thickness**
  CEI EN 60811-201
- **Measurement of non-metallic sheath thickness**
  CEI EN 60811-202
- **Measurement of external dimensions (outer diameter)**
  CEI EN 60811-203
- **Measurement of ovality**
  CEI EN 50396 + norme CEI di prodotto

These tests aim to verify—using precision instruments—that the actual dimensions of the cable comply with the minimum values specified by the relevant standards (particularly the CEI product standards). Measurements are carried out on non-metallic components such as insulators and sheaths.

- **Measurement of the diameter of the conductor capillary (incoming copper + semi-finished products + finished cables)**
  CEI EN 50396 + CEI EN 60228 + CEI product standard

This test consists of measuring the diameter of each conductor strand using a precision micrometer, in order to verify that each wire has the correct dimensions according to the cable construction specifications (flexibility class). This ensures good electrical conductivity and checks the strand's resistance to breakage or deformation.

Tests on cable construction

Verification of core and outer sheath coloring and marking

CEI product standards

These are visual inspections, carried out both at the beginning and end of the examined reel, aimed at verifying that:

- The cable cores are colored according to the specifications defined by CEI standards for the specific cable type. If the cable has numbered cores, the quality of the number printing is also checked to ensure readability and durability.
- The outer sheath has a color that complies with the cable type, as required by current regulations.
- The marking on the outer sheath matches the cable type, and the print quality—meaning readability, durability, and continuity—is appropriate.

Cable construction inspection and verification

CEI product standards

The cable construction is checked to ensure it matches the specifications for its type, in compliance with applicable CEI standards.
The inspection is carried out both at the beginning and at the end of the examined reel section.
During the verification process, if applicable, sheath removal is also checked.

Test/verification of the cores nominal cross-section and/or of the shield

CEI EN 60228 + CEI product standards

This test is performed on cable sections (reels or coils).
By measuring the electrical resistance—using a milliohmmeter—the actual cross-section of the conductor (and sometimes the shield) is verified against the values specified by the applicable standard.

Electrical tests

Measurement of conductor electrical resistance at 20°C (incoming copper + semi-finished products + finished cables) using wire tension bar, and measurement of conductor electrical resistance at 20°C (finished products) on reel/coil

CEI EN 60228

These tests are essential to verify:

- For incoming materials, that the conductor complies with the specifications declared by the supplier
- For semi-finished products, that the manufacturing process has not altered the electrical characteristics
- For finished products, that the cable meets the required specifications

LCR Bridge – Measurement of capacitance and inductance

CEI EN 50289-1-5 + CEI EN 50289-1-8

The LCR bridge test measures transmission parameters. The parameters assessed include:

- capacitance: Represents the cable's ability to store electrical charge between conductors.
- inductance: Refers to the cable's property of opposing changes in current by generating a magnetic field.

Determining the values of these transmission parameters is essential to ensure signal quality and system safety.

Electrical tests

Insulation resistance test and constant insulation verification
CEI EN 50395 + CEI product standards

This test is performed on cable sections (reels or coils) or segments of at least 20 meters after the voltage test.
Insulation resistance is measured using a teraohmmeter between each core and the other cores and any shielding/armoring.
The measured value is then compared with the minimum value required by the applicable standard.

Long-Term DC insulation resistance test
CEI EN 50395 + CEI product standards

This test allows for the evaluation of the long-term insulation performance, as the cable is placed in a temperature-controlled tank and subjected to high-voltage direct current using a DC generator.

Surface resistance of the sheath
CEI EN 50395 + CEI product standards

This test is used to measure the electrical surface resistance of the cable's outer sheath under specific humidity and temperature conditions.

Voltage test on finished cable
CEI EN 50395 + norme CEI di prodotto

This test is performed on cable sections (reels or coils) or segments of at least 20 meters.
The voltage test is an electrical test that allows us to verify that there are no faults in the insulated cores of the cable that could lead to a short circuit.

Electrical tests

Non-contamination test – electrical decay test
CEI EN 60811-401 + CEI product standards

This test aims to verify, after aging in a hot air oven – through insulation resistance measurement – any possible incompatibilities between the insulation compounds and the intermediate and/or outer sheath compounds.
The measured values are compared with the minimum values specified by the standard.

Test/verification of electrical continuity of conductors, shielding and/or armoring (when present)
CEI product standard

This test aims to verify the absence of interruptions in the core conductors, shielding, or cable armoring when the electrical resistance test is not performed (starting from the sixth core of the cables). It is carried out using a simple acoustic signaling device (buzzer), which allows for the quick detection of any discontinuities in the electrical path.

Chemical-physical tests

Water absorption test using the gravimetric method
CEI EN 60811-402

This is a fundamental test to assess the water absorption resistance—after prolonged immersion—of insulating and sheath materials.
It simulates humid or submerged environmental conditions and is particularly important because it aims to ensure the cable's durability and reliability over time.

Compound density
CEI EN 60811-606

This acceptance test aims to determine the density of the compound, verifying that the measured value matches the one declared by the supplier.
The result allows confirmation of the consistency of the incoming material with the required technical specifications.

Chemical-physical tests

Hydrolysis resistance test

CEI EN 50396

This test aims to evaluate the ability of the insulating material and sheath to maintain their mechanical and physical properties after being subjected to water treatment at a specific temperature and for a specific period of time. These conditions can cause chemical degradation (hydrolysis) in polymers.

OIT tests

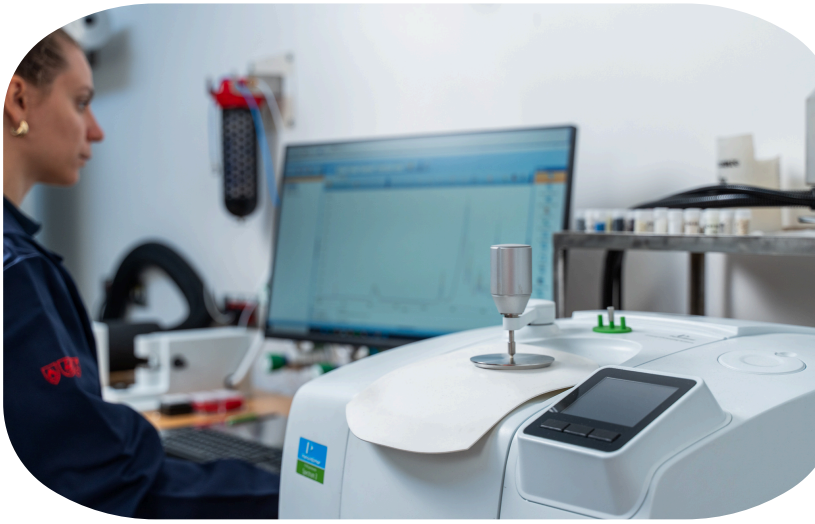
ASTM D3895-03

The OIT (Oxidative Induction Time) test is used to evaluate the oxidative stability of a polymeric material. By measuring the oxidation induction time, it is possible to estimate the compound's resistance to prolonged exposure to oxygen and high temperatures, as well as to verify the correct dosage of the catalytic component in cross-linked materials.

FTIR test – ATR Infrared Spectroscopy

ASTM E1252-98 (2021)/Internal method

ATR-FTIR infrared analysis is a spectroscopic technique used to identify and characterize the chemical compounds present in a material. A spectrum is generated that highlights specific absorptions related to the chemical nature of the compound, which is then compared to a reference spectrum. This method can be used both as an acceptance test, to verify the quality of the incoming compound, and as a type test on semi-finished or finished cables.



Chemical-physical tests

TGA-FTIR Transfer line

Internal method

This technique combines thermogravimetric analysis (TGA) with infrared spectroscopy (FTIR). It allows the identification of gases released during degradation for each mass loss, helping to determine the chemical nature of the loss itself.

Gel content for cross-linked materials

ASTM D2765

This test determines the percentage of cross-linked material (gel) present in a polymer sample. It is essential for:

- Evaluating the effectiveness of the cross-linking process
- Ensuring the thermal and mechanical stability of the material
- Verifying compliance with technical specifications for XLPE-insulated or similar cables

A high gel content indicates a good degree of cross-linking. A low gel content may suggest an incomplete or defective cross-linking process.

Tinning

UNI EN 13603 + CEI product standards

This standard specifies the methods for evaluating the tin coating on drawn round wires intended for the manufacture of electrical conductors or shields. Specifically, it defines:

- Test procedures to verify the continuity and adhesion of the tin coating
- Methods to determine the mass of deposited tin
- Test conditions (e.g., temperature, reagents, immersion times)
- Acceptance criteria for hot-dip or electroplated tinned wires

Aging tests

Accelerated thermal ageing treatments – Air oven ageing
CEI EN 60811-401

This test aims to evaluate the thermal stability of polymeric materials used in electrical cables by simulating long-term ageing under accelerated conditions.

Oil immersion tests for cable sheaths
CEI EN 60811-404

These tests are used to verify the chemical resistance of the cable sheath to the action of mineral oils.
The purpose is to simulate operating conditions in industrial environments where the cable may come into contact with oils.

Thermal stability test for PVC insulation and PVC sheaths
CEI EN 60811-405

This test is performed exclusively on PVC, as it releases HCl when exposed to heat. The purpose is to assess the material's degradation time by monitoring pH changes.

Thermal duration test (long-term ageing)
CEI EN 60216-1 + CEI EN 60216-2

This test uses the relationship between temperature and the rate of chemical reaction (thermo-oxidative degradation), described by the Arrhenius equation.
The purpose of this test is to obtain the so-called "temperature index," a parameter that indicates the maximum temperature at which an insulating material can operate for an extended period without losing its fundamental properties, thus assessing the material's service life.

Aging tests

Accelerated thermal ageing treatments – air pressure vessel ageing
CEI EN 60811-412

This test aims to evaluate the thermal and oxidative stability of materials under extreme conditions, specifically in the presence of oxygen at high temperature and pressure.

Damp Heat Test
CEI EN 60068-2-78

The purpose is to verify resistance to humidity under high temperature conditions in order to assess the mechanical integrity of the sample.

Non-contamination test – Mechanical degradation test
CEI EN 60811-401 + CEI product standards

The purpose is to verify that the material does not undergo mechanical degradation due to external contaminants or chemical incompatibility between components.

UV Resistance Test + Spray – Variation in mechanical properties of compound
ISO 4892-2

The objective is to evaluate the resistance to UV radiation combined with water spray, in order to simulate prolonged exposure to outdoor environments.

Cable immersion test (AD8)
CEI EN 50525-2-21 (Annexes D e E)

This test is used to verify the cable's resistance to permanent immersion in water, demonstrating that the cable maintains its electrical and mechanical properties even when submerged. This test does not simulate installation conditions where biological agents may be in direct contact with the cable and could attack or compromise the plastic components of the material.

Resistance tests to mechanical stress

Measurement of breaking load and elongation of the conductor capillary (incoming copper + semi-finished products + finished products)
CEI EN 60228 + CEI product standards

This mechanical test is performed to evaluate the strength and ductility of copper, both during material acceptance and on semi-finished and finished products. It applies to both stranded copper and single conductors.

Test on cables for explosion-proof installations
CEI EN 60079-14 (Annex E)

This test verifies the passage of air under well-defined conditions inside an electrical cable. The greater the cable's resistance to air passage, the better its performance. This test is typical for electrical cables used in potentially explosive atmospheres (classified Ex zones).

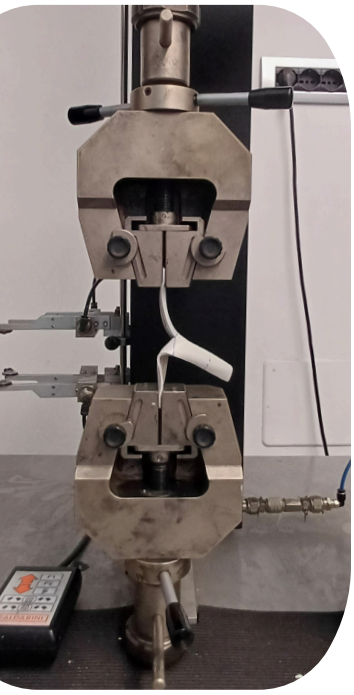
Test for the determination of mechanical properties of insulations and sheaths
CEI EN 60811-501 + CEI product standard

This test evaluates the fundamental mechanical properties of insulating and sheath materials, specifically elongation at break and breaking load. These parameters are essential to ensure that the material is sufficiently elastic to withstand bending and tension and has adequate mechanical strength during installation and operation.

Dynamic penetration test
CEI EN 50618 (Annex D)

This is a specific test for photovoltaic cables aimed at verifying the finished cable's resistance to penetration by a blade in a mechanical compression test.

Resistance tests to mechanical stress



Tear/laceration resistance test
CEI EN 50396

The purpose of this test is to verify the ability of the plastic material to resist the propagation of a tear following accidental cuts, abrasion, or mechanical stresses.

Shore A – D hardness
ASTM 2240 + ISO 868

This measures the surface hardness of polymeric materials by evaluating their resistance to penetration and deformation when indented with a defined force using a specific indenter. Shore A is used for soft materials, while Shore D is for harder materials.

Alternate bending test with two pulleys
CEI EN 50396

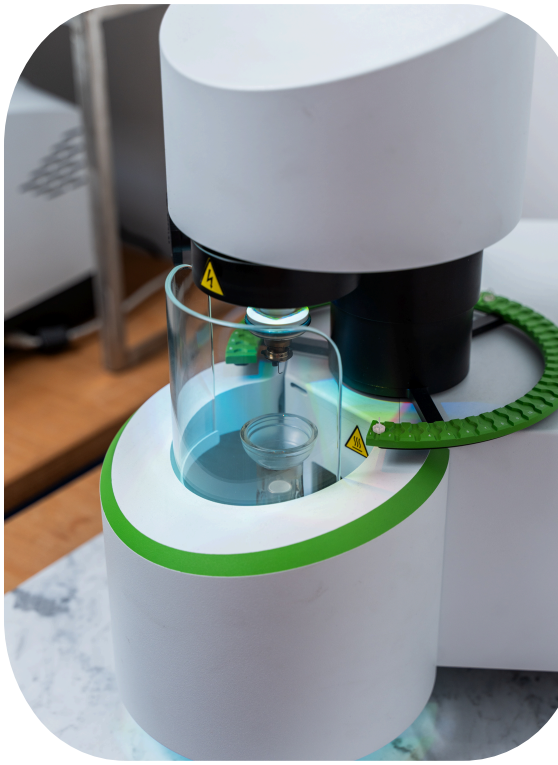
This test is used to verify the resistance of cables to repeated bending. It is performed on the finished cable, which is mounted on two pulleys and subjected to a horizontal "back-and-forth" movement (alternate bending) for a number of cycles specified by the standard. During the bending test, the cable is under tension, and it is checked that each conductor core maintains electrical continuity and that no short circuits occur between the cores or between the cores and the test equipment frame. If required by the standard, after the bending test, the cable cores must be extracted and subjected to a tension test in water; even in this case, no short circuits should occur between each individual core and the water.

DSC Test (Scan)
Internal method

DSC (Differential Scanning Calorimetry) allows the identification and quantification of first- and second-order thermal transitions, which are essential for material characterization and for understanding the structure–property relationship.

TGA Test (Scan)
Internal method

TGA (Thermogravimetric Analysis) is an analytical technique used to study the thermal stability and related mass changes of a material as a function of temperature or time under a controlled atmosphere. Specifically, it measures how much weight a sample loses when heated or held at a constant temperature.



Thermo-mechanical tests

Hot shrinkage test for insulations
CEI EN 60811-502

This test is used to evaluate whether the cable insulation maintains its shape and dimensions under heat conditions. Excessive shrinkage can compromise the electrical and mechanical integrity of the cable.

Hot shrinkage test for sheaths
CEI EN 60811-503

This test assesses whether the cable sheath maintains its length and integrity under heat conditions, such as during installation in hot environments or prolonged operation. Excessive shrinkage can cause exposure of the internal insulation or loss of mechanical protection.

Low-temperature bending test for insulations and sheaths
CEI EN 60811-504

This test aims to evaluate the material's resistance to cracking when subjected to low temperatures. It is performed on sheath or insulation samples, which are cooled and then bent according to the standard's specifications.

Low-temperature stretch test for insulations and sheaths
CEI EN 60811-505

This test verifies the mechanical properties of insulating and sheath materials when exposed to low temperatures. The sample is cooled and then subjected to tensile stress to measure its elastic capacity.

Thermo-mechanical tests

Low-temperature impact resistance test for insulations and sheaths
CEI EN 60811-506

This test is designed to evaluate the material's ability to withstand impacts at low temperatures. The sample is cooled and subjected to controlled impacts, simulating mechanical stresses that may occur during installation or use.

Hot stretch test for cross-linked materials – HST
CEI EN 60811-507

Also known as the hot set test (HST), this test evaluates the degree of cross-linking of the material. It assesses the resistance to deformation under load of cross-linked materials when exposed to high temperatures. The sample is heated and subjected to a constant load to measure hot elongation and cold elastic recovery. This test complements the gel content test to verify proper cross-linking of halogen-free cross-linked materials.

High-temperature pressure test for insulations and sheaths
CEI EN 60811-508

Also known as the thermopressure test, this test evaluates the material's resistance when exposed to the pressure of a blade under high-temperature conditions.

Crack resistance test for insulations and sheaths
CEI EN 60811-509

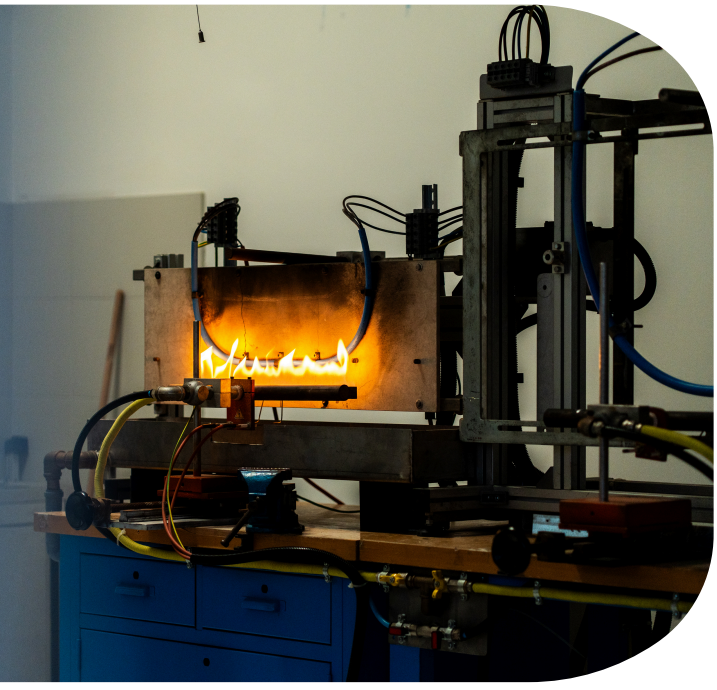
Also known as the heat shock test, this test evaluates the resistance of thermoplastic material to cracking when exposed to high temperatures and bent around a mandrel. It is used to assess the proper extrusion of the cable.

Reaction to fire tests

Flame retardant test
CEI EN 60332-1-2

This test is used to evaluate the ability of a single cable to self-extinguish in the event of a fire. The test consists of exposing the cable to a direct flame for a defined period, observing whether the combustion stops spontaneously once the heat source is removed.
Passing this test allows the product to achieve at least class Eca, demonstrating a minimum level of reaction to fire according to European regulations.

Fire resistance tests



Fire Resistance test for cables with diameter ≤ 20,0 mm and diameter > 20,0 mm
CEI EN 50200 (for cables ≤ 20 mm) and CEI EN 60331-1 (for cables > 20 mm)

The fire resistance test evaluates, in addition to resistance to thermal shock, also resistance to mechanical shock.
The purpose of this test is to ensure that the cable continues to carry the applied voltage without short circuits or conductor interruptions during the burning period, thus guaranteeing the operation of equipment even under fire conditions.

Combustion resistance tests

Compound Oxygen Index

CEI 20-22/4 + UNI EN ISO 4589-2

This acceptance test determines the relative flammability of the compound by evaluating its self-extinguishing capability. The oxygen index represents the minimum concentration of oxygen required to sustain the combustion of the material: the higher the value, the greater the flame resistance (self-extinguishing).

The test can be performed on extruded material (sheath or insulation) or directly on the incoming material (granules).

Compound temperature index

CEI 20-22/5 + UNI EN ISO 4589-3

This acceptance test determines the relative flammability of the compound by evaluating its self-extinguishing capability. This test is similar to the oxygen index test: the oxygen concentration affecting the sample is kept constant at 21%, while the temperature of the oxygen/nitrogen mixture flow is varied.

Therefore, the temperature index represents the minimum temperature required to sustain the combustion of the material: the higher the value, the greater the flame resistance (self-extinguishing).

The test can be performed on extruded material (sheath or insulation) or directly on the incoming material (granules).

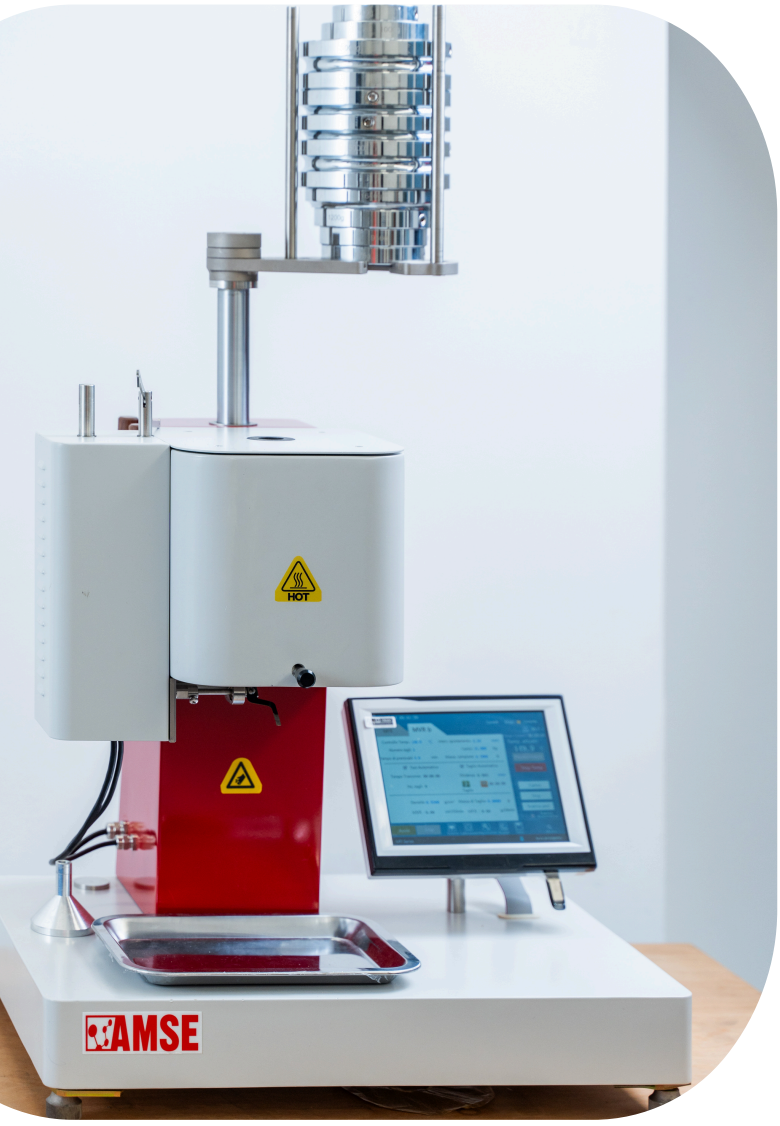
Rheological tests

MFI – MFR – MVR (Compound Flowability)

ASTM D1238

MFI stands for Melt Flow Index; MFR stands for Melt Flow Rate; MVR stands for Melt Volume Rate. The purpose of this test is to determine the flowability of a melted thermoplastic material, a fundamental parameter for:

- evaluating the processability of the compound during extrusion or molding;
- controlling quality consistency between different supply batches;
- comparing different materials in terms of rheological behavior, useful for raw material approval.



Summary tables of the tests

Test name	Tests based on technical nature	Tests based on purpose	Tests based on production process phase	Reference Standard
Measurement of insulation thickness	TESTS ON CABLE CONSTRUCTION	Routine	Semi-finished product	CEI EN 60811-201
Measurement of non-metallic sheath thickness	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI EN 60811-202
Measurement of external dimensions (outer diameter)	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI EN 60811-203
Measurement of ovality	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI EN 50396 + CEI product standards
Measurement of the diameter of the conductor capillary (incoming copper + semi-finished products + finished cables)	TESTS ON CABLE CONSTRUCTION	Tipo	Incoming material - Semi-finished product - Finished product	CEI EN 50396 + CEI EN 60228 + CEI product standards
Verification of core and outer sheath coloring and marking	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI product standards
Cable construction inspection and verification	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI product standards
Test/verification of the cores nominal cross-section and/or of the shield	TESTS ON CABLE CONSTRUCTION	Routine	Finished product	CEI EN 60228 + CEI product standards
Measurement of conductor electrical resistance at 20°C (incoming copper + semi-finished products + finished cables) using wire tension bar, and measurement of conductor electrical resistance at 20°C (finished products) on reel/coil	ELECTRICAL TESTS	Tipo/Routine	Incoming material - Semi-finished product - Finished product	CEI EN 60228
Voltage test on finished cable	ELECTRICAL TESTS	Tipo	Semi-finished product	CEI EN 50289-1-5 + CEI EN 50289-1-8
Insulation resistance test and constant insulation verification	ELECTRICAL TESTS	Tipo/Routine	Semi-finished product	CEI EN 50395 + CEI product standards
Long-term DC insulation resistance test	ELECTRICAL TESTS	Tipo	Semi-finished product - Finished product	CEI EN 50395 + CEI product standards
Surface resistance of the sheath	ELECTRICAL TESTS	Tipo	Finished product	CEI EN 50395 + CEI product standards
LCR Bridge – Measurement of capacitance and inductance	ELECTRICAL TESTS	Routine	Finished product	CEI EN 50395 + CEI product standards
Non-contamination test – electrical decay test	ELECTRICAL TESTS	Tipo	Semi-finished product - Finished product	CEI EN 60811-401 + CEI product standards
Test/verification of electrical continuity of conductors, shielding and/or armoring (when present)	ELECTRICAL TESTS	Routine	Finished product	CEI product standards

Summary tables of the tests

Test name	Tests based on technical nature	Tests based on purpose	Tests based on production process phase	Reference Standard
Water absorption test using the gravimetric method	CHEMICAL-PHYSICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-402
Compound density	CHEMICAL-PHYSICAL TESTS	Type	Incoming material	CEI EN 60811-606
Hydrolysis resistance test	CHEMICAL-PHYSICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 50396
OIT tests	CHEMICAL-PHYSICAL TESTS	Type	Semi-finished product - Finished product	ASTM D3895-03
FTIR test	CHEMICAL-PHYSICAL TESTS	Type	Incoming material - Semi-finished product - Finished product	ASTM E1252-98(2021)/Internal method
TGA-FTIR Transfer line	CHEMICAL-PHYSICAL TESTS	Type	Incoming material - Semi-finished product - Finished product	Internal method
Gel content for cross-linked materials	CHEMICAL-PHYSICAL TESTS	Type	Semi-finished product - Finished product	ASTM D2765
Tinning	CHEMICAL-PHYSICAL TESTS	Type	Incoming material	UNI EN 13603 + CEI product standard
Accelerated thermal ageing treatments – Air oven ageing	AGING TEST	Type	Semi-finished product - Finished product	CEI EN 60811-401
Oil immersion tests for cable sheaths	AGING TEST	Type	Finished product	CEI EN 60811-404
Thermal stability test for PVC insulation and PVC sheaths	AGING TEST	Type	Incoming material - Semi-finished product - Finished product	CEI EN 60811-405
Accelerated thermal ageing treatments – air pressure vessel ageing	AGING TEST	Type	Semi-finished product - Finished product	CEI EN 60811-412
Thermal duration test (long-term ageing)	AGING TEST	Type	Semi-finished product - Finished product	CEI EN 60216-1 + CEI EN 60216-2
Damp Heat Test	AGING TEST	Type	Finished product	CEI EN 60068-2-78
Non-contamination test – Mechanical degradation test	AGING TEST	Type	Semi-finished product - Finished product	CEI EN 60811-401 + CEI product standard
UV Resistance Test + Spray – Variation in mechanical properties of compound	AGING TEST	Type	Finished product	ISO 4892-2
Cable immersion test (AD8)	AGING TEST	Type	Finished product	CEI EN 50525-2-21 (Annex D and E)

Summary tables of the tests

Test name	Tests based on technical nature	Tests based on purpose	Tests based on production process phase	Reference Standard
Measurement of breaking load and elongation of the conductor capillary (incoming copper + semi-finished products + finished products)	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Incoming material	CEI EN 60228 + CEI product standards
Test on cables for explosion-proof installations	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Finished product	CEI EN 60079-14 (Annex E)
Test for the determination of mechanical properties of insulations and sheaths	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Semi-finished product - Finished product	CEI EN 60811-501 + CEI product standards
Dynamic penetration test	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Finished product	CEI EN 50618 (Annex D)
Tear/laceration resistance test	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Finished product	CEI EN 50396
Shore A – D hardness	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Incoming material - Finished product	ASTM 2240 + ISO 868
Alternate bending test with two pulleys	RESISTANCE TESTS TO MECHANICAL STRESS	Type	Finished product	CEI EN 50396
TGA Test (Scan)	THERMAL TESTS	Type	Incoming material - Semi-finished product - Finished product	Internal method
DSC Test (Scan)	THERMAL TESTS	Type	Incoming material - Semi-finished product - Finished product	Internal method
Hot shrinkage test for insulations	THERMO-MECHANICAL TESTS	Type	Semilavorati	CEI EN 60811-502
Hot shrinkage test for sheaths	THERMO-MECHANICAL TESTS	Type	Finished product	CEI EN 60811-503
Low-temperature bending test for insulations and sheaths	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-504
Low-temperature stretch test for insulations and sheaths	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-505
Low-temperature impact resistance test for insulations and sheaths	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-506
Hot stretch test for cross-linked materials – HST	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-507
High-temperature pressure test for insulations and sheaths	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-508
Crack resistance test for insulations and sheaths	THERMO-MECHANICAL TESTS	Type	Semi-finished product - Finished product	CEI EN 60811-509

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Test name	Tests based on technical nature	Tests based on purpose	Tests based on production process phase	Reference Standard
Flame retardant test	REACTION TO FIRE TESTS	Type	Finished product	CEI EN 60332-1-2
Fire Resistance test for cables with diameter ≤ 20,0 mm and diameter > 20,0 mm	FIRE RESISTANCE TESTS	Type	Finished product	CEI EN 50200 for cables ≤ 20 mm and CEI EN 60331-1 for cables > 20 mm
Compound oxygen index	COMBUSTION RESISTANCE TESTS	Type	Incoming material - Finished product	CEI 20-22/4 + UNI EN ISO 4589-2
Compound temperature index	COMBUSTION RESISTANCE TESTS	Type	Incoming material - Finished product	CEI 20-22/5 + UNI EN ISO 4589-3
MFI – MFR – MVR (Compound Flowability)	RHEOLOGICAL TESTS	Type	Incoming material	ASTM D1238

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