

SPECIFICATIONS AND TESTING

SPECIFICATIONS:

elmex Terminal Blocks comply with the International Specifications IEC-60947-7-1: Low voltage switchgear and controlgear, Part 7 - ancillary equipment, section 1 - Terminal Blocks for copper conductors.

For the purpose of product-approvals as required by **elmex** customers, various types of terminal-blocks have further undergone comprehensive testing and verification for compliance with other International standards:-

1. UL1059 : Terminal Blocks (USA - Standard)
2. CSA C22-2 No. 158-1987 (Canadian standard)
3. ATEX: 94/9/EC Directive

In addition, **elmex** carries out other special tests also, such as, Salt Mist Test, Environmental Cycle test, Insulation Resistance Test, Capacitance Measurement and so on.

TESTING:

Testing & Evaluation is the backbone of product development and continuous quality improvement. **elmex's** major strength derives from the top priority it has always given to establishing **testing facilities on the shop floor and in the laboratory.**

Two kinds of testing are done here - one is where product testing is conducted as part of the manufacturing process to ensure quality, and the second is at R&D where new products undergo **extensive in-house testing** before they are cleared for regular manufacturing.

The following tests are conducted on standard products during manufacturing:

- ✓ **Curing Test**
- ✓ **Insulation Inflammability Test**
- ✓ **Insulation Resistance & HV Test**
- ✓ **Torque Test and Pull-out Test**
- ✓ **Voltage Drop Tests**
- ✓ **Plating Thickness Test**
- ✓ **Solderability Test**

The tests conducted at the R&D level are much more rigorous than type tests. Our Test Laboratory set-up conforms to Testing and Calibration Standards and all tests are conducted by technically qualified and experienced staff.

Type tests are conducted as per **IEC, VDE, UL** and **Canadian standards (CSA)**. These include:

- ✓ **Temperature Rise Test**
- ✓ **Pull Out Test**
- ✓ **Mechanical Strength Test (Clamping Units)**
- ✓ **Flexion Test**

- ✓ **Vibration Test**
- ✓ **Voltage Drop Test**
- ✓ **Mechanical Endurance Test (for custom-made switches as Reliability Test)**
- ✓ **Dielectric Test (power frequency)**
- ✓ **Verification of thermal characteristics**
- ✓ **Thermal Aging Test**

We also get tests conducted at Nationally Accredited Laboratories. The main ones include:

- ✓ **Impulse Voltage Withstand Test**
- ✓ **Short-time Current Withstand Test**
- ✓ **Salt Mist Spray Test**
- ✓ **Environmental Tests**

Some of the tests, required by the standards, are described here as technical information.

Salt Mist Test :

The **Salt Mist Test** is defined and described in **Part XI** of the Indian Standards **IS-9000** on **Environmental Testing Procedures**. Its detailed description covers Test Chamber Design, Pre-conditioning, Test Procedures, Salt Solutions for Tests, Actual Testing, Recovery and Performance Assessment.

The Test Chamber details are basically meant for Test Laboratories. Pre-conditioning involves cleaning of specimens just before the test. The standard defines **three Test procedures : No. 1 for components and Nos. 2 & 3 for equipment**. Procedure No. 2 is applicable where there is severe salt contamination, while No. 3 is applicable where salt laden atmosphere is occasional.

For terminal blocks, procedure No.1 is applicable. The salt solution for this procedure is normally **5% sodium chloride solution**. Components are exposed to salt mist spray in test chamber for **48 or 96 hours (elmex has tested for 96 hours)**. After the Test, salt deposits are cleaned gently, leaving the specimen for 2 to 4 hours in normal atmosphere ("recovery" procedure). The criteria for passing the Test successfully is visual examination. However, **elmex** carries out **voltage drop test** and **insulation resistance test** both before and after Salt Mist Test on terminal blocks.

Procedures 2 & 3 have salt solutions containing various chlorides, bromides, sulphates, etc. which **raises severity of the test**. After exposing the equipment to the Salt Mist spray for **2 hours** in the Test chamber, it is subjected to **damp heat for 22 hours (procedure-3)** and **7 days (procedure-2)**. Finally the equipment is checked if it has passed the test successfully as per the **criteria laid down by the relevant equipment standard**.

Insulation Inflammability Test

IEC 60947-7-1 specifies that "the insulation materials of terminal blocks shall not be adversely affected by abnormal heat and fire", (clause 7.1.5). To verify compliance with this requirement, **the Needle Flame Test is specified in clause 8.5** ("Verification of thermal characteristics").

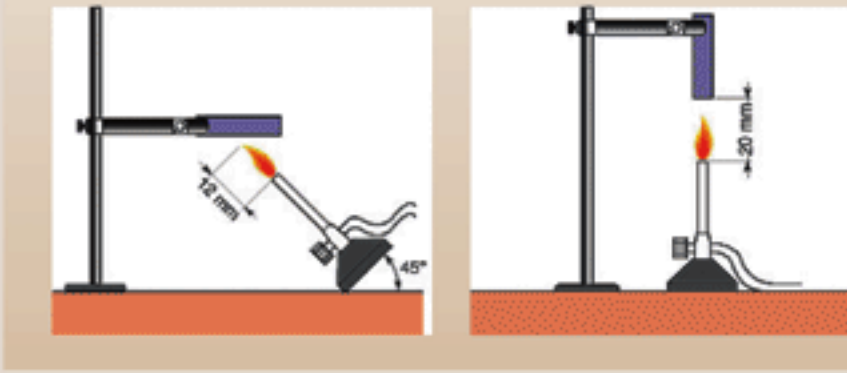


Illustration showing testing according to IEC and UL standards.

As its name suggests, a flame of the **size of a needle**, as defined in **IEC 60695-2-2 (on fire hazard testing)**, is used to perform the test. Three Terminal Blocks, one at a time, are tested **after pre-conditioning** for 24 hours in an atmosphere with temperatures between 15 °C and 35 °C and relative humidity between 45% and 75%.

The Terminal Block being tested is mounted in the specified manner and a well-defined single layer tissue paper, placed on a pine wood board, is kept below the insulation face of the Terminal Block at a distance of (200 ± 5) mm. The **test flame is directed at the specific area** of the insulation wall at an **angle of 45°**. If the thickness of insulation wall is less than 1 mm and/or the area is less than 100 sq mm, the flame is applied for 5 seconds. Otherwise it is applied for 10 seconds. In case the insulation ignites, the **duration for the ignition is recorded**, which is the time between removal of flame and extinction of glowing (or the flame) from the terminal block.

The tip of test flame has to be directed at the insulation wall in the area of conductor clamping unit, which is the source of internal heating of the Terminal Block in service.

Terminal Blocks are considered to have passed the test if the insulation does not ignite, or if it ignites, the duration of burning is **less than 30**

seconds, and in addition, the tissue paper does not ignite due to burning particles falling from the insulation wall.

To verify the thermal characteristics, **UL standards specify test for insulation materials**. These are carried out as type tests by the manufacturer of the materials on test specimens. **The IEC test**, on the other hand, is carried out on the final product by its manufacturer and hence it **verifies both the basic material as well as its application** in the construction of the Terminal Block.

CORROSION CRACKING TEST ON BRASS PARTS

Brass parts used in Terminal Blocks and containing **less than 80% copper** are required to withstand the **Corrosion Cracking Test**, according to Canadian Standard **CSA : C22.2 No. 158**.

A phenomenon called "Stress - corrosion cracking" or "Season - Cracking" occurs in brass parts, due to combined action of residual stresses in the brass parts and the effect of certain chemical pollutants in working atmosphere. The residual stresses can be due to cold working, or even due to assembly stresses. The problem of stress-corrosion-cracking is solved by proper selection of the composition of the Copper alloy with addition of certain elements, which prevent cracking and by proper annealing to remove stresses due to cold working.

The test according to the above CSA standard consists of immersion of Brass Parts for **30 minutes** in an aqueous solution of **mercurous nitrate** and **10 ml of nitric acid**, as specified in the CSA standard. After the test the Brass part is checked for cracking visually/after magnification.

APPROVALS

	UL Recognition for USA		CE Mark Conforming to IEC Specification
	c-UL Recognition for Canada		CE Mark for explosion-proof Approval as per ATEX directive
	D mark Certification for Denmark		For compliance of products with RoHS directive.
	S Mark Certification for Sweden	Quality System ISO 9001-2000	
	FI mark Certification for Finland		
	N Mark Certification for Norway		