TEOGEN



CPR Cable Fire Performance & Test System

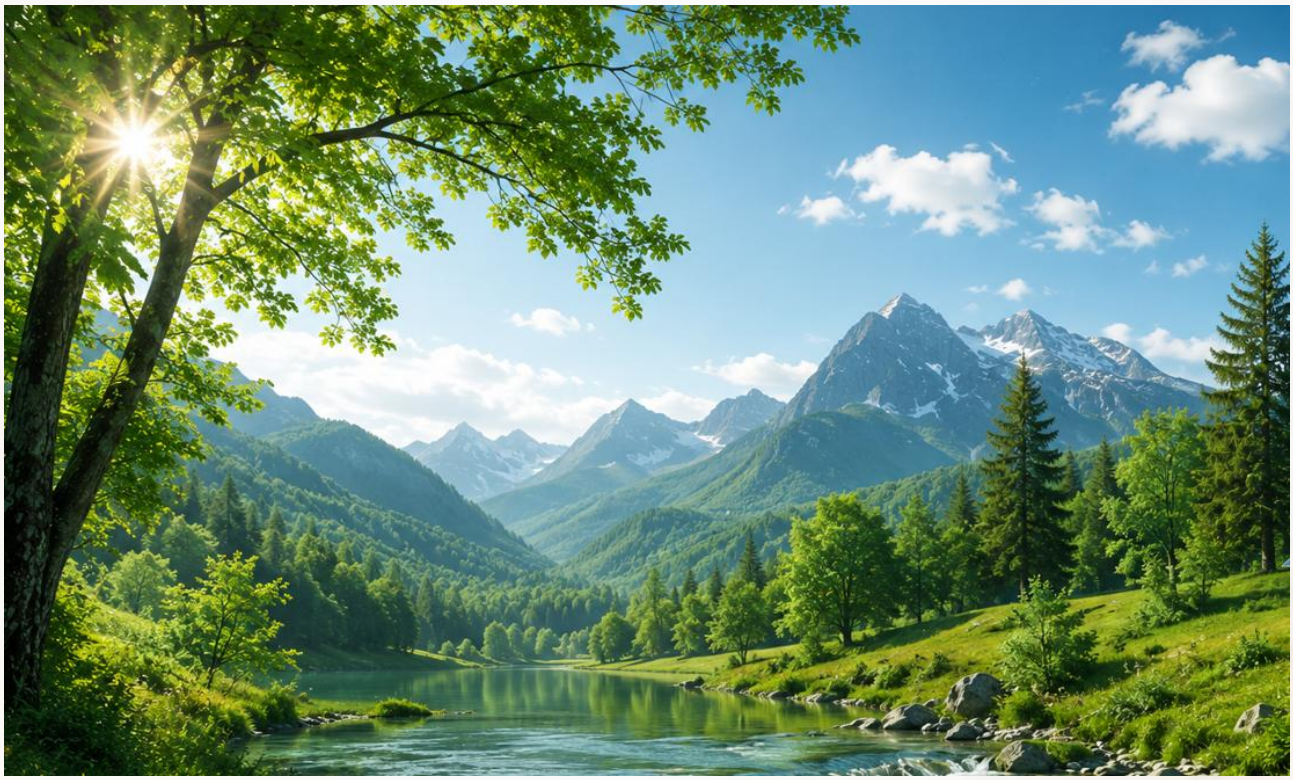
EN 50399, EN 60332-3-10

Technology and Industrial Software Solutions

Testing with **TEOGEN**

Advanced Testing Solutions for Cable, Material and Product Evaluations

Fire safety is a fundamental requirement for the protection of people, infrastructure and the environment. As fire safety regulations and standards continue to evolve worldwide, the need for accurate and reliable fire testing systems is becoming increasingly important for manufacturers, testing laboratories, certification bodies and research institutions.



At **TEOGEN**, we operate in the development and manufacture of advanced fire testing equipment, drawing in particular on our expertise in cable fire performance testing. Our systems enable cables, polymers, construction products, electrical components and a wide range of industrial materials to be evaluated in accordance with international standards.

In addition to standard fire testing systems, we also develop and manufacture custom-designed testing equipment to address our customers' specific needs, R&D projects and non-standard testing applications. By combining our engineering experience, automation technologies and hands-on laboratory expertise, we provide reliable and innovative solutions for the most demanding testing requirements.

Our experience covers both **Reaction-to-Fire** and **Fire Resistance testing** of cables and construction materials. We offer testing systems developed for flame spread, heat release, smoke production, corrosive gas analysis, electrical circuit integrity and other related fire performance evaluations.

- Fire performance testing of cables and cable systems
- Reaction-to-Fire and Fire Resistance testing equipment
- Testing systems compliant with international fire safety standards
- Custom-designed research and development testing systems and laboratory solutions
- Automation and data acquisition systems
- Turnkey laboratory projects
- Fire behavior analyses of materials and products

CPR Cable Fire Performance Test System

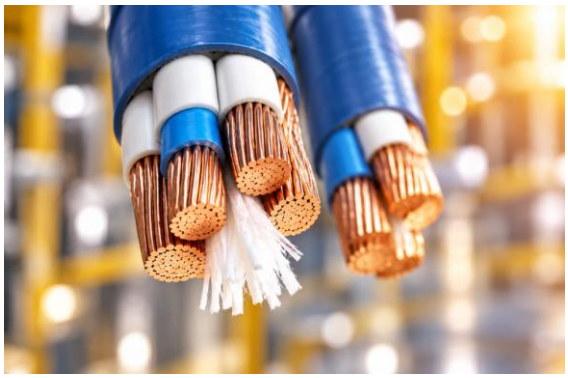
EN 50399, EN 60332-3-10

Evaluation of Flame Spread, Heat Release and Smoke Production in Vertically Mounted Cable Bundles

The TEOGEN Cable Bundle Reaction-to-Fire and Vertical Flame Spread Test System is a laboratory testing system used to evaluate the behavior of vertically mounted bundles of electrical and fiber-optic cables under controlled fire conditions.

The common testing platform can be configured for the vertical flame spread tests specified in the EN IEC 60332-3 series and for the evaluation of heat release, smoke production and flaming droplets/particles under EN 50399. The supported methods must be specified according to the equipment configuration, including the burner, air supply, specimen mounting, measurement hardware and software.

Results obtained under EN 50399 provide data for the reaction-to-fire classification of cables. The system can be used by cable manufacturers for product development, quality control and performance evaluation, and, with appropriate equipment and verification, by testing and certification laboratories. The scope of EN 50399 includes power, control, communication, fibre-optic and hybrid cable.



Standards

EN 50399
Vertical flame spread, heat release, smoke production and the occurrence of flaming droplets/particles in cable bundles.

EN IEC 60332-3-10
Apparatus, arrangement and calibration setup for vertical flame spread tests on cable bundles.

EN IEC 60332-3-21,22,23,24,25
Test procedures for Categories A F/R, A, B, C and D .

EN 13501-6
Reaction-to-fire classification of cables.

Test Principles

The test is based on evaluating the fire behavior of vertically mounted cable bundles exposed to a controlled flame source.

Cable specimens are secured to the test ladder according to the specimen quantity and mounting arrangement specified by the relevant standard. The ladder is placed inside the combustion chamber, and a flame is applied to the lower portion of the cable bundle using a propane burner for the specified duration. Throughout the test, the airflow supplied to the chamber and the burner supply conditions are kept under control.

According to EN IEC 60332-3:
The specimen quantity is determined according to the volume of non-metallic material in the cables and the selected test category. Following flame application, the extent of damage propagation along the cable specimens is measured to evaluate the bundle's performance in limiting vertical flame spread.



According to EN 50399:
Flame spread and the occurrence of flaming droplets or particles are observed during the test. Combustion gases are collected by means of a hood and directed to the exhaust duct containing the measurement equipment. The heat release rate is calculated using gas flow, temperature, oxygen and carbon dioxide measurements. Smoke production is determined by measuring the attenuation of light passing through the exhaust duct due to smoke.

The measurement data are processed by the software to obtain the following results:
- Heat Release Rate (HRR)
- Total Heat Release (THR)
- Fire Growth Rate Index (FIGRA)
- Smoke Production Rate (SPR)
- Total Smoke Production (TSP)

These results, together with observations of flame spread and flaming droplets/particles, are used to assess the reaction-to-fire performance of cables and in the relevant classification studies.

Key Features;

- Common equipment platform for EN 50399 and EN IEC 60332-3 tests
- Test management for Categories A F/R, A, B, C and D
- Equipment construction suitable for industrial use
- Vertical combustion chamber with controlled air supply
- Propane burner and Venturi mixer
- Digital propane and air mass flow controllers
- Automatic ignition and flame monitoring system
- Integrated oxygen and carbon dioxide analysis system
- White-light optical smoke measurement system
- Combustion gas sampling, cooling and filtration system
- Airflow, differential pressure and temperature measurement
- PC- and PLC-based T-UCT test control platform
- Automatic calculation of specimen quantity and mounting tiers
- Automatic data acquisition, archiving and customizable reporting
- Camera-based test monitoring and archiving of specimen photographs
- Lifting hoist for the specimen ladder
- Suitability for use in certification testing, quality control and R&D laboratories

Main Components

Test Chamber and Specimen System:
- Vertical combustion chamber with controlled air inlet
- Standard cable specimen ladder
- Ladder lifting and positioning hoist
- Test monitoring camera system
- In-chamber fire extinguishing arrangement

Burner and Gas Supply System:
- Propane burner
- Venturi gas-air mixer
- Automatic ignition and flame monitoring system
- Digital propane and air mass flow controllers
- Gas distribution and filtration unit

Air Supply System:
- Air supply fan and variable-speed drive
- Air inlet ducts
- Flow-straightening elements
- Flow rate measurement system using an orifice and differential pressure
- Air inlet temperature sensor

Combustion Gas Collection and Exhaust System:
- Hood and gas collection box
- Exhaust duct equipped with measuring instruments
- In-duct flow-straightening elements
- Exhaust fan and stack connection
- Combustion gas filtration unit

Gas Analysis and Sample Conditioning System:
- Oxygen and carbon dioxide analyzer
- Gas sampling probe
- Particulate filtration system
- Sample gas cooling unit
- Gas sampling pump

Smoke and Flow Measurement System:
- White-light optical smoke measurement unit
- Bidirectional flow probe
- Differential pressure sensors
- Exhaust duct temperature sensors

Control and Data Acquisition System:
- PLC-based system control panel
- Test computer and monitor
- T-UCT test management software
- Data acquisition and signal processing hardware
- Sensors for chamber temperature and ambient pressure, temperature and humidity



Automatic Functions

- Loading of test parameters in accordance with the selected standard
- Calculation of specimen quantity and mounting tiers
- Test initiation and management of flame application time
- Ignition and gas/air flow control
- Real-time monitoring of measurement data
- Calculation of HRR, THR, FIGRA, SPR and TSP values under EN 50399
- Automatic report generation
- Archiving of test records and specimen photographs

T-UCT Intelligent Test Control Platform

The equipment is managed by **TEOGEN** Universal Control Technology (T-UCT). This PLC- and PC-based laboratory automation platform integrates test control, measurement data acquisition, evaluation of results and reporting within a single software environment.

Automatic Test Management:
- Automatic determination of test parameters in accordance with the selected standard
- Reduction of operator-induced errors through checks for missing or incorrect data entries
- Test procedures that guide the user step by step
- Automatic execution of the test process
- Real-time monitoring of critical test parameters
- Automatic calculation of specimen quantity and mounting tiers in cable bundle tests

Reporting and Traceability:
- Reporting in Turkish, English, Russian, Arabic and other languages
- Archiving of test data and access to historical records
- Comparison of historical results and trend analysis
- Traceability through the association of specimen, operator, batch and test information
- Automatic generation of test reports
- Archiving of specimen photographs taken before and after testing

Flexible Report Design:
- Customer-specific report templates
- Product- and test-method-specific report formats
- Laboratory-specific documentation
- Customizable report fields and page layouts
- Creation of report templates in different languages

ERP and Laboratory Integration:
T-UCT supports data exchange with software used by the organization. The scope of integration is configured according to the interfaces of the relevant system and project requirements.
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Supported Applications and Systems:
Microsoft Office applications, SAP and SAP S/4HANA, IFS, Canias ERP, Logo ERP, Sistrade, Freedom ERP, Prometrik, SenkronERP, and other project-specific ERP, MES and Laboratory Information Management Systems (LIMS).

Product and specimen information can be associated with test records using barcodes generated by ERP systems.

Data Management:

The system enables the following information to be recorded, archived and reported:
- Customer information
- Product information and technical specifications
- Order and production work order information
- Batch and lot numbers
- Operator records
- Quality control information
- Historical test results
- Laboratory performance records

Records may be used for real-time or periodic reports.

Data storage capacity depends on the computer and server infrastructure used.

Technical Specifications

Parameter	Value / Description
Test standards	EN 50399 and EN IEC 60332-3-10
Category coverage	A F/R, A, B, C and D under EN IEC 60332-3-21, -22, -23, -24 and -25
Specimen mounting	Cable bundles mounted vertically on a ladder
Burner	AGF 10L11-55 propane burner
Gas-air mixer	AGF 14-18 Venturi mixer
Ignition system	Automatic ignition and monitoring
Gas control	Digital propane and air mass flow controllers
Propane flow controller	1,300 mg/s
Air flow controller	4,700 mg/s
Chamber air supply	5,000 ± 500 L/min for IEC tests
Air supply fan capacity	10,000 L/min
Gas analysis	Oxygen and carbon dioxide meas.
Smoke measurement	White-light optical attenuation
Air supply flow measurement	Orifice and differential pressure
Exhaust flow measurement	Bidirectional probe and diff.pressure
Temperature measurement	Type K sensors at the air inlet and inside the chamber; temperature measurement in the exhaust duct
Control platform	T-UCT, PC- and PLC-based manage.
Specimen handling	Ladder lifting hoist
Test monitoring	Camera system



Dimensions

Width × Depth × Height
Chamber internal dimensions: 1,000 × 2,000 × 4,000 mm ±10 mm
Chamber external dimensions: 1,150 × 2,160 × 4,230 mm ±20 mm
EN 50399 exhaust duct diameter: 400 mm

The overall system layout is determined according to the arrangement of the hood, measurement duct, supporting platform, exhaust fan and exhaust stack.



Infrastructure Requirements

Electrical Supply:
- Electrical supply for the control panel, computer, analyzers, fans and lifting hoist
- Voltage, phases, frequency and total installed power: specified according to the approved electrical design

Gas Supply:
- Propane gas
- Supply pressure and consumption: specified according to the selected burner operating conditions

Air Supply:
- Suitable air source for the burner air line
- Suitable air inlet conditions for the chamber air supply fan
- Air quality, supply pressure and consumption: specified according to the system configuration

Extinguishing System:
- Water or CO_2 supply according to the selected extinguishing arrangement
- Suitable drainage connection for configurations using water

Requirements to Be Provided by the Customer:

Installation Area:
- Sufficient space to accommodate the chamber, exhaust system and control equipment
- Working clearance for transporting and positioning the specimen ladder
- Access for maintenance and servicing
- Ceiling height suitable for hood and duct installation

Ventilation and Exhaust:
- Sufficient fresh air supply to the laboratory
- Outdoor exhaust connection compliant with the system design
- Suitable penetration and installation space for the exhaust stack
- Connections required for the selected filtration system

The definitive infrastructure and layout requirements are specified in the project-specific installation plan.

Scope of Delivery

Test Chamber and Specimen System:
- Vertical cable bundle combustion test chamber
- Hood and combustion gas collection unit
- Standard specimen ladder
- Ladder lifting hoist
- Test monitoring camera system
- In-chamber fire extinguishing arrangement

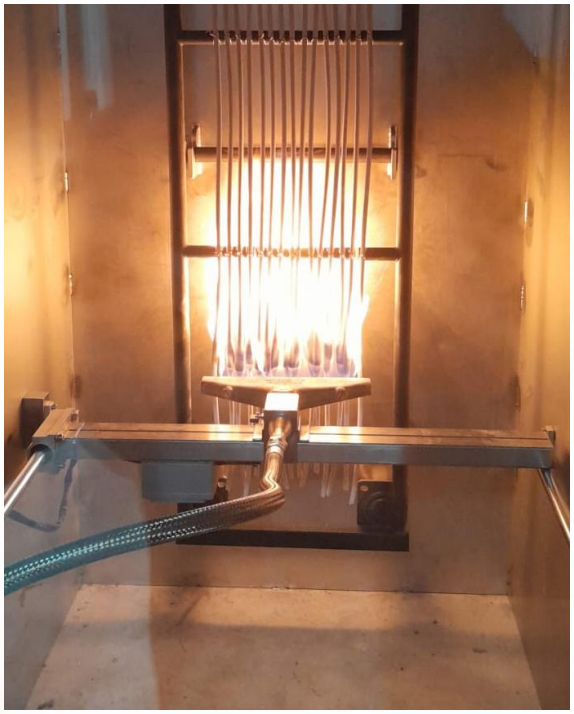
Burner and Gas Control System:
- Propane burner and Venturi mixer
- Automatic ignition and flame monitoring system
- Digital propane and air mass flow controllers
- Gas distribution and filtration system

Air Supply and Exhaust System:
- Air supply fan and variable-speed drive
- Air supply ducts and flow straighteners
- Exhaust duct and exhaust fan
- Combustion gas filtration system

EN 50399 Measurement Equipment:
- Oxygen and carbon dioxide analyzer
- Gas sampling probe
- Sample gas cooling, filtration and suction system
- White-light optical smoke measurement system
- Bidirectional flow probe
- Differential pressure measurement system
- Temperature sensors

Control System and Software:
- System control panel
- PC- and PLC-based T-UCT test management system
- Test computer and monitor
- Data acquisition, archiving and reporting software

The scope of supply is determined according to the selected test standards, equipment configuration and contents of the approved quotation.



Documentation

- Operation and maintenance manual
- User training attendance certificates
- Electrical diagrams and wiring documentation
- Factory Acceptance Test (FAT) documentation
- Manufacturer's calibration certificates
- Calibration certificates from an accredited body (optional)

Advantages

✓ Domestic manufacturing, locally developed solutions and rapid support backed by TEOGEN expertise
✓ Ability to perform EN 50399 and EN IEC 60332-3 tests on a common equipment platform
✓ Combined evaluation of flame spread, heat release and smoke production
✓ Controlled test conditions through digital gas and air flow control
✓ Automatic test management using the PC- and PLC-based T-UCT platform
✓ Reduction of operator-induced procedural errors through automatic selection of test parameters
✓ Automatic calculation of specimen quantity and mounting tiers
✓ Traceability through archiving of test data and specimen photographs
✓ Ability to create customer-, product- and language-specific report formats
✓ Data exchange with ERP and office applications
✓ Easier specimen positioning using the ladder lifting hoist
✓ Support for cable development, quality control and reaction-to-fire classification studies

Specimens Can Be Tested

- Power and energy cables
- Control and command cables
- Instrumentation cables
- Communication and data transmission cables
- Fiber-optic cables
- Hybrid power and communication cables
- PVC-insulated and sheathed cables
- Halogen-free and low-smoke-emission cables
- Flame-retardant cables
- Single-core and multicore cables

The specimen quantity, mounting arrangement and test conditions are determined according to the relevant standard and selected test category.

Color options may be modified according to customer requirements.

Teogen Teknoloji
Custom Testing Equipment • Laboratory Solutions • Turnkey Projects

** The manufacturer reserves the right to make technical and design changes without prior notice. Product photographs and illustrations in this publication may not reflect the latest version of the equipment.*



TEOGEN Objectives;

- Supporting compliance with national and international standards
- Contributing to manufacturers' development of safer products
- Evaluating fire behavior under realistic conditions
- Supporting efforts to reduce flame spread, heat release and smoke generation
- Ensuring reliable, repeatable and accurate test results
- Providing innovative and customer-specific testing solutions

Through continuous innovation and engineering expertise, **TEOGEN** provides advanced testing technologies that help its customers improve product safety, achieve compliance with regulations and standards, and develop next-generation fire-resistant materials and cable systems.

TEOGEN Teknoloji ve Endüstriyel Yazılım Sistemleri

+90 212 706 98 04
+90 544 783 22 31

www.teogen.com.tr
info@teogen.com.tr

Selimpaşa Mah. 6093. Sok. No.18 Silivri
İstanbul TÜRKİYE

TEOGEN, *Your Solution Partner*.

