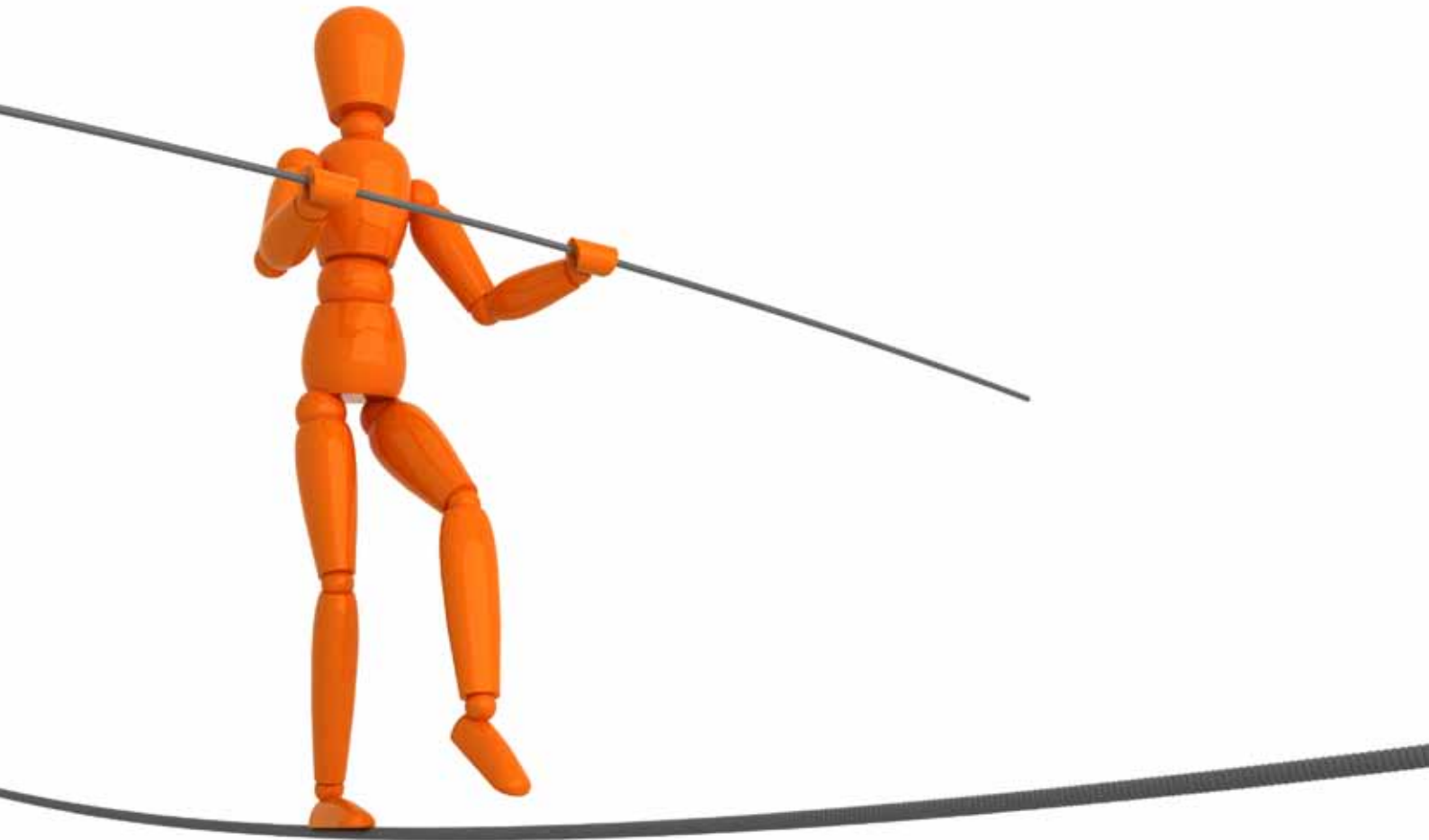


BEFORE YOU PUT IT ALL ON THE LINE



PERFORMANCE & RELIABILITY SERVICES

LOCALLY AVAILABLE WORLD-WIDE



| WHO IS SGS?

Founded in 1878, SGS is recognized as the global benchmark for quality and integrity. With over **59,000 employees**, we operate a network of over **1,000 offices** and **laboratories in over 140 countries** around the world.

As a result, our expertise provides a single consolidated source to reduce your risk, improve efficiency and quality, and ensure compliance.

>> The SGS Group is the global leader and innovator in INSPECTION, VERIFICATION, TESTING and CERTIFICATION services. <<

| SGS ELECTRICAL & ELECTRONICS

Beside product inspection, verification, testing and certification services, our comprehensive service portfolio also includes **technical assistance**, **process assessment** and **consulting**.

Our services cover the following fields:

- Chemicals (RoHS)
- Product Safety & EMC
- Product Inspection
- Wireless Telecommunications
- Performance/Reliability
- Micro- & Nanotechnology
- Solar
- Sustainability (EuP, Ecodesign, WEEE)

For the following Industries:

- Household Appliances
- Information Technology
- Machinery
- Telecommunications
- Automotive
- Luminaries
- Audio/Video
- Renewable Energies
- Medical Devices and more

PERFORMANCE & RELIABILITY



>> Is your product as good as you promise? Find out through performance & reliability testing. You will reduce product recall risks and cut costs before entering the market. <<

| WHAT IS P&R TESTING?

Performance & Reliability tests verify the ability of a product to function at required parameters under various conditions throughout its lifetime. Intensive testing of specific samples will ensure that failures first occur in the lab and not in your customer's hands.

Reliability testing ensures a product works as expected in normal and unusual situations. Such tests enable producers and retailers to estimate a product's life span and identify the causes of failures.

Performance testing is not related to any directives and in most cases is carried out at the end of the product development stage, after all other tests have successfully passed. It is a comprehensive survey, which entails verifying all relevant test protocols and certificates and creating the required Technical Construction File (TCF).

| YOUR BENEFITS

SGS can carry out performance and reliability measurements against standards and regulations applicable in a specific market. Furthermore, our performance & reliability services can be adapted to perform testing to manufacturer or retailer-specific performance requirements.

Other performance & reliability advantages:

- lower costs associated with in-warranty and after sale product failures
- higher brand recognition and increased consumer trust in your product
- you get a quality mark from SGS
- you get benchmark information to compare with your competitors
- you find out the real capacity of your product

| WHY SGS E&E?

SGS looks beyond a client's needs. When it comes to consumer electronics manufacturers and retailers should only place safe products on the market.

Through our testing we help you make your product go the extra mile:

- Manufacturers can improve their products based on test results data
- Poorly performing products can be redesigned or removed from the market

Our global network, extensive resources and knowledge of the **retail industry** allow us to provide reliable performance services to large and small retailers. Retailers acquiring large amounts of electronics, need to be sure all products in a lot meet both their quality and durability expectations and those of consumers.

PRODUCT

>> Multiple SGS performance & reliability centres offer testing packages for specific product groups. <<

RELIABILITY TESTS FOR LEAD-FREE E&E PRODUCTS

Through various types of tests, SGS can help manufacturers check the reliability of components made of nonhazardous substances:

- Surface Insulation Resistance Test
- C-SAM Analysis for Package De-Lamination
- Solder Joint Evaluation Considering Reliability & Durability
- Moisture / Reflow Sensitivity & Heat Resistance Tests for Devices
- Solder Ability Test
- Micro Section Observation
- X-Ray Analysis for Solder Joints
- Terminal / Pad Solder Ability Tests
- Tin Whisker Observation
- BGA Dye & Pry Test
- SEM / EDS Analyses

AIR CONDITIONING PRODUCTS

The testing performed includes the verification of various technical characteristics, fundamentally those related to the cooling power of air conditioners.

Standards used for Performance testing:

- EN 14511-1:2004
- EN 14511-2:2004
- EN 14511-3:2004
- EN 14511-4:2004

Secondary parameters verified during Performance testing:

- Outward appearance
- General condition of equipment before test
- Plates of characteristics

HOUSEHOLD APPLIANCES TESTING

Labelling and MEPS (regulated minimum energy efficiency levels) requirements are currently mandatory in most global markets. The following electrical products offered for sale need to carry an approved energy label:

- Refrigerators and Freezers
- Clothes Washers/Dryers
- Dishwashers
- Air Conditioners
- External Power Supplies
- Set Top Boxes
- Televisions
- Home Entertainment Products (Audio and Video Equipment)
- Boiling and Chilled Water Dispensers
- Vending Machines
- Commercial Ice Makers
- A range of Lamp types
- and more

POWER TOOLS

Our test capabilities are dedicated (but not limited) to the following types of power tools:

- Cordless Drilling Machines
- Cordless Screwdrivers
- Percussion Drilling Machines
- Grinders
- Sanders
- Jig Saws & Circular Saws
- Mini Drills
- and more



SPECIFIC

| LIGHT SOURCES-PHOTOMETRIC TESTING

Photometric measurements investigate characteristics (performance and ergonomic aspects) of light sources and lighting installations. These parameters are very important for engineers and architects creating illumination designs for products or spaces.

Performance variables measured:

- luminous intensity distribution
- luminous flux (lumen)
- utilization factor (h)
- service luminance (lux)
- optical power (Watt)
- color rendering power index (Ra-index)
- color temperature (Kelvin)
- chromaticity coordinates (x and y)
- spectrum distribution wave of visual light
- luminance distribution of lamps, luminaries, displays, background-lit symbols (cd/m²)

SGS carries out measurements on luminaries for normal use, safety luminaries, incandescent, fluorescent and discharge lamps, control gear for lighting fittings (i.e. electronic terminals, and flat screens). Photometric measurements can be carried out in a week, as follows:

- In combination with Safety, EMC and RoHS testing
- In combination with a certification (Safety, EMC and RoHS marks)
- As benchmarking and product development and quality control tests

| PORTABLE ELECTRONICS-BATTERY & ACCUMULATOR

SGS has over 25 years of experience in Energy Storage System Design. We have played a leading role in the development of IEEE 1725 standard and the CTIA battery certification working group.

Beside testing to IEEE 1725 SGS provides testing and consultancy on various other national and international battery standards:

- United Nations ST/SG/AC.10/11/Rev.4/Amend.2 – Transport of Li Cells and Batteries
- UL 1642 – Applicable to Li-Ion “Cells”
- UL 2054 – Applicable for “Batteries” Li-Ion & others (NiMH, NiCad)
- IEC 62133 – Safety Requirements
- IEC 61960 – Performance
- IEC 61959 – Mechanical Tests
- GB/T 18287 – China’s Standard for Safety & Performance



TEST

>> SGS performance & reliability testing labs are able to carry out a wide range of tests related to environmental, mechanical or electrical characteristics. <<



| ACOUSTIC AND THERMAL PERFORMANCE

Acoustic Noise Measurement - Sound Pressure and Sound Power tests

Thermal Profile Measurement for Systems and Components

- Thermal Performance for IT Products
- Heat Pipe Thermal Performance
- Temperature Rise / Gradient

| MECHANICAL / PHYSICAL PROPERTIES TESTING

To ensure the proper functioning of various components in a product, SGS performs a comprehensive series of tests:

- Keypad/Switch Durability
- Bending & Twisting on PC Card & Memory Modules
- Insertion / Extraction Durability Test for Connectors
- Mating / Unmating / Normal Force Tests for Connectors
- Terminal Retention Force Testing
- Flexibility Tests for Cords
- Evaluation of Solder Joint Reliability

| ENVIRONMENTAL SIMULATIONS

SGS helps manufacturers and retailers to establish the impact of environmental conditions on the functioning of consumer electronics through various types of tests:

Environmental Simulations for Temperature / Humidity / Weather:

- Cold/Heat Testing
- Temperature Cycling Testing
- Salt Spray Test
- Thermal Shock Test
- Ozone Testing
- Altitude / Low Pressure Testing
- Temperature / Humidity Cycling Test
- Water / Rain / Dust Proofing Test
- High Temperature Gradient Cycling Testing
- Mixed Flow Gas Corrosion Test
- Steady State Temperature / Humidity Testing
- Solar & UV Irradiation Testing
- PCT (Pressure Cooker Testing)

Environmental Simulations for Mechanical Stress:

- Sine Wave / Random Vibration Testing
- Bump testing
- Mechanical Shock Test
- Drop Testing
- Bouncing & Loose Cargo / Swinging Testing
- Package & Transportation Testing

SPECIFIC

ENERGY EFFICIENCY TESTING & CERTIFICATION

Energy Rating labels, which evolve from the test results, enable consumers to compare the energy efficiency of E&E products on a fair and equitable basis. Energy efficiency is measured against specific standards which are periodically updated, prescribing higher levels of energy efficiency.

SGS can perform various tests to provide valuable information on the energy efficiency of consumer electronics:

- PCB Surface Insulation Resistance Test
- Ion Migration Test
- Contact and Insulation Resistance Measurement
- Dielectric Withstanding Voltage Test
- Capacitance and Inductance Measurement

HIGHLY ACCELERATED LIFE/STRESS TESTING/SCREENING (HALT/HASS)

Manufacturers can better prepare their products for consumer use by submitting it to extreme tests that mimic extreme scenarios that might happen during the product's usage:

- Hot/Cold Temperature Step Stress Test
- Rapid Thermal Transitions Stress Test
- Combined Environment Stress Test
- Vibration Step Stress Test
- Highly Accelerated Stress Screen

HIGH-DEFINITION MULTIMEDIA INTERFACE (HDMI)

SGS undertakes HDMI Connector Testing in several performance areas, such as mechanical, electrical, environmental characteristics.

We support your business by conducting the necessary connector testing and by registering the connector with the HDMI authorities.



MORE PERFORMANCE MORE RELIABILITY



| CONSULTANCY SERVICES

Product reliability is together with safety and costs, a factor that needs to be always taken into consideration in all production stages.

SGS supports companies in achieving this through the following services:

- Reliability Program Assessment
- Reliability Models and Predictions
- Education for Reliability Engineering
- Failure Modes and Effects Analysis – FMEA
- Reliability Demonstration Test
- Failure Analysis
- HALT – Highly Accelerated Life Test
- ESS / HASS Profile development
- RoHS Reliability Transition Program
- and more

A SECURE SOLUTION

| GET IN TOUCH WITH OUR PERFORMANCE & RELIABILITY EXPERTS WORLD-WIDE



EUROPE

Finland
ee.finland@sgs.com
t +358 9 6963 278

France
ee.france@sgs.com
t +33 442 977 235

Germany
ee.germany@sgs.com
t +49 231 98 22 95 45

Spain
ee.spain@sgs.com
t +34 933 203 600

ASIA

China-Guangzhou
ee.guangzhou@sgs.com
t +86 208 215 5432

Korea
ee.asia@sgs.com
t +82 314 285 700

Taiwan
ee.taiwan@sgs.com
t +886 222 993 279 ext 1520

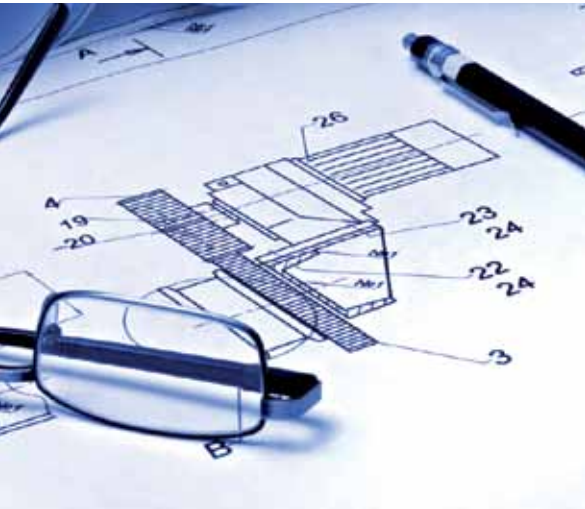
Thailand
ee.thailand@sgs.com
t +66 229 474 859

NORTH-AMERICA

ee.northamerica@sgs.com
t +1 973 575 5252

AUSTRALIA

ee.australia@sgs.com
t +61 398 759 023



>> SGS's portfolio includes various other testing & certification services that can ensure faster market access and increase your product's competitiveness. <<

RELATED

EMC SERVICES

Electrical products must be disturbance free and therefore electromagnetically compatible (EMC) with other E&E goods. This means a piece of equipment does not introduce intolerable electromagnetic disturbances into its environment and is not affected by such disturbances. (e.g. mobile phones often create interferences with electro-medical equipment used in medical practices).



SGS EMC



CE Marking



Product Safety



SGS GS



SGS Solar



SGS North America



IEC CB Scheme



FCC



SGS Bauart



SGS Fimko



SGS CEBEC



China CCC

PRODUCT SAFETY

SGS E&E offers certifications that help you gain a competitive advantage in the various markets in which you are interested. The SGS Safety marks allow you to demonstrate that your product fulfils all relevant and applicable product safety requirements. Our capabilities in product safety testing and certification, combined with our world-wide accreditations allow us to offer you the following safety marks

MARKET YOUR MARK

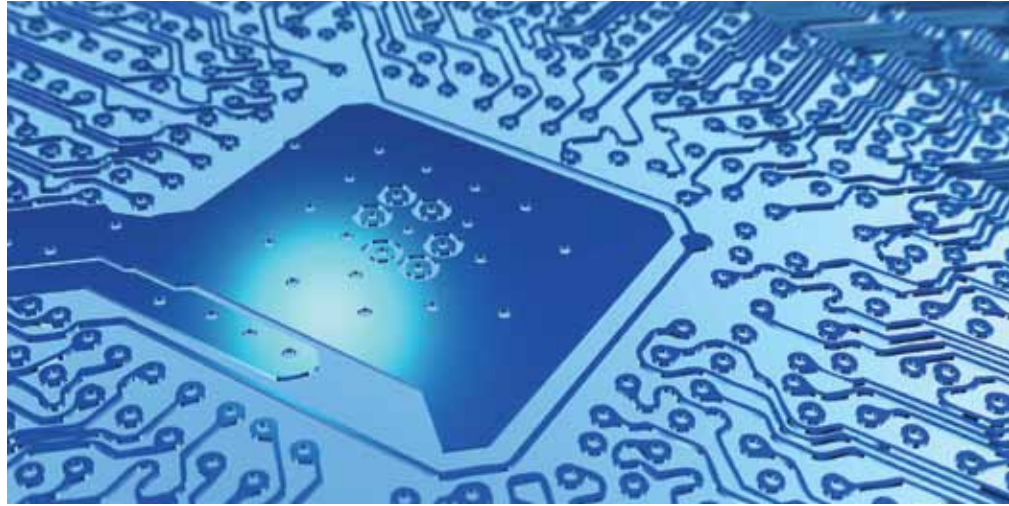
To help maximize the benefits of newly-awarded certifications, SGS offers to all its **certified customers** the MARKET YOUR MARK client package - **an easy to implement set of marketing tools** to help them promote the proven qualities of their product to existing and future clients.

Other **EMC-related marks** offered:

- China CCC
- Korea MIC
- Australia C-tick
- Taiwan BSMI
- Russia Ghost-R

Other **safety-related marks** offered:

- HAR
- ENEC
- Japan PSE
- Korea eK
- Australian Safety Approval



SERVICES

| IT&T TESTING SERVICES

We are your **independent, experienced global partner** in testing & certification for the IT & T and Mobile industry. We are **active members** and **contributors** to:

- GCF – Global Certification Forum
- PTCRB – PCS Type Certification Review Board
- PVG – PCS Validation Group
- OMA – Open Mobile Alliance
- CTIA – Cellular, Telecom and Internet Association

| MICROELECTRONICS

The CTS Microelectronics division of SGS Institut Fresenius is the leading provider of analytical services for the semi-conductor industry and its components suppliers. The microelectronics division focuses especially on areas that use Micro- and Nanostructures or thin film technologies.

Our key knowledge with materials, surfaces and layers enables us to support our customers through individualized chemical, biological and physical analyses.

| EU RoHS DIRECTIVE & LAW

The RoHS (Restriction of Hazardous Substances) legislation covers the restriction of six hazardous substances used in E&E equipment.

SGS has over 24 accredited RoHS laboratories worldwide and 1,000 specialists in this field, providing E&E

industries with the requisite, independent data to achieve RoHS compliance.

SGS helps clients monitor their supply chains and self-declare compliance with confidence.



SGS RoHS Mark

Other **related green services** offered:

- RoHS Certificate of Conformity
- REACH/SVHC
- WEEE Services
- Verification Services
- Green inspection
- Related Chemical Tests
- IECEE HS Reporting Services
- Sustainability Services (EuP, Ecodesign, etc.)

| WORLD-WIDE PRODUCT INSPECTION

We are capable of providing a wide range of quality inspection services that ensure products comply with regulations, standards and contractual specifications:

- The **Quality Assurance Program (QAP)** focuses on retailers and importers
- The **Quality Improvement Program (QIP)** is aimed at suppliers and manufacturers.
- In addition to QIP and QAP, we also provide comprehensive **individual customer modules**, to ensure your needs are met for all inspection steps.

WWW.SGS.COM

WHEN YOU NEED TO BE SURE

