



Solarsimulation Systems

khs

K. H. Steuernagel Lichttechnik GmbH

Solarsimulation Systems



Whether in a hot dry desert, warm and humid subtropical climate or in the extreme alpine regions, a car has to function. A car is a distinct representative of products that have to withstand various types of continuously changing environmental conditions. K.H.Steuernagel (KHS) SolarConstant solar simulation systems provides effective solar energy to meet the testing needs of the automotive community.

Within the automotive industry, testing methods based on simulating the most extreme environmental conditions is a very important tool in ensuring automotive system reliability and functionality.

The radiation of the sun, together with the ambient temperature and relative humidity are considered to be the most essential factors. The solar radiation is defined as global or total radiation, which is the sum of direct and diffused (sky radiation) solar energy.

Good correlation to the sun, good reproducibility of test conditions and sufficient acceleration is the main targets for the development, design, fabrication and function of solarsimulation systems.

Regarding correlation, where it is important to achieve a good comparison to the quantitatively (irradiance) and qualitatively (spectral distribution and uniformity) characteristics of natural global radiation, the simulation of effects, that are known by practical experience to be critical in achieving good test results, need to be considered. With decades of solar simulation experience in automotive and other fields, KHS has the experience to help you identify the parameters of concern that play an important role in the design of an effective SolarConstant simulation system.

When making material selection and/or performance related decisions, the automotive engineer depends on repeatable and

reproducible test results regardless of the test site or equipment used. Time also plays an important role. An effective test system and accelerated methods to achieve earliest test results are required to obtain maximum advantage in the development of new products. As a worldwide leader in the field of solar simulation systems KHS can assist with comprehensive test system development and test method design.

While general requirements are similar for most solar simulation applications, whether it is for examining the aging behavior of organic materials; optimizing ventilation and air-conditioning systems; monitoring the thermal stability and interaction of components or emission testing, the resources and experience of KHS will assure that the solar system installed will meet your testing objectives. KHS also has experience in other fields, such as solar energy conversion systems, photovoltaic, agricultural, etc., where KHS SolarConstant technology is proven effective in reliable solar simulation.

The SolarConstant Design

The SolarConstant series is a special design to match the requirements of simulated environmental tests with solar radiation. The spectrum of sunlight (so-called Global Radiation) is accurately reproduced allowing reliable system performance decisions to be made. The basic components of the SolarConstant systems are the Radiation Unit, the Power Supply and the Control System.

Radiation Unit

For the Radiation Source, a special metal halide (MHG) lamp is used. The MHG lamp produces a dense multiline spectrum of the rare earths that is comparable to a continuous spectrum. In combination with special glass filters, MHG

lamp systems provide a spectral distribution very close to natural sunlight (Total Radiation as defined by CIE 85). Filters with different characteristic are available for applications other than the accelerated aging of materials test. The combination of lamp, reflector and filter, all a part of the Radiation Unit, offers high irradiance efficiency and a superior spatial uniformity.

The Power Supply

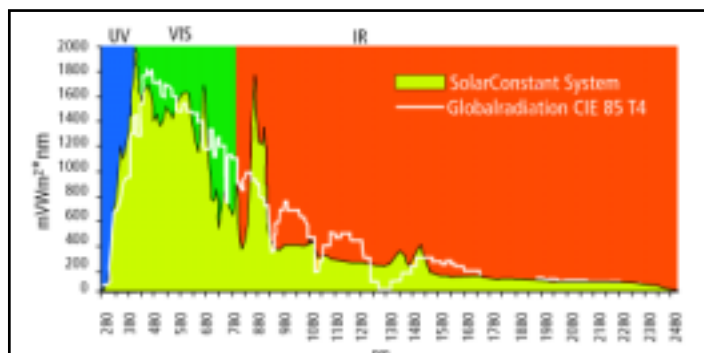
To achieve the best performance, the lamps are powered using electronic power supplies. The electronic power supply or EPS-Modul drives the lamp with square-wave current. This reduces the modulation of the radiation to less than +/-1%, controls the intensity and offers a stabilized power output even when incoming (feed) power varies. In addition, it provides the lamp optimal operation conditions, which results in an extended MHG lamp lifetime.

Control System

The operation of the SolarConstant system is handled by a dedicated computer. SolarSoft is a menu-driven software program designed for the configuration and operation of KHS SolarConstant systems. The profile and output characteristics of the SolarConstant system can be stored as files for later recall. Stored files can be run as a sequences forming part of a complex solar simulation test program. For seamless operator interface, the solar PC using SolarSoft can be linked to the test facility master control computer. SolarSoft provides ease of use and fast test setup allowing maximum utilization of the test facility.

Positioning System

To allow the SolarConstant system to effectively simulate various natural solar





conditions, a mechanical positioning system is often used. This enables motorized movement of the solar array within all axes for easy adaptation to various test configurations or to simulate natural solar day cycles. The control of the positioning can be manual pushbutton or integrated into the SolarSoft program, which will then offer automated control of the radiation, along with effective simulation of various sun positions in the sky. Positioning systems are often unique to the application and test facility. KHS will work with you to define the SolarConstant mounting system that will work best for you.

KHS Solarsimulation systems are custom-made to meet your testing objectives. The

SolarConstant systems are modular in nature and offer a large variety of configurations allowing for system design flexibility. With the use of various size Radiation Units, EPS-Moduls, Radiation Unit mounting systems, and the flexibility of SolarSoft, KHS will design a cost-effective solution to fulfill your solar simulation requirements.

KHS provides SolarConstant systems specifically designed to comply with established test methods, such as the DIN 75220, "Aging of automotive components in solarsimulation units", Society of Automotive Engineers (SAE) methods, MIL-STD-810, EPA or others. As leaders in the solar simulation field, KHS often acts as consultants to test method

organizations and specifying bodies. KHS is ready to offer guidance and support to assist with test method and specification development according to your testing objectives.

Some test specifications call for radiation within spectral ranges that differ from those defined for full spectrum "global" radiation, such as concentrated Ultraviolet or Infrared radiation systems. KHS has experience with many types of power supplies and lamp types and can develop, design and fabricate appropriate radiation systems to meet your requirements.

For detailed information on Solarsimulation systems, please contact either KHS direct or our representative in your area.

As a demonstration of our professional experience here is a partial list of the companies we have had the opportunity to work with (many repeat customers with multiple KHS systems installed):

ACTS, AUDI AG, ARTC, ANTEC, Autoliv, BALZERS AG, Bertrand Ingenieure, Bundesanstalt für Straßenwesen, J. H. Benecke AG, BMW AG, BREED, Canadian National Defense, Chrysler, CIDAUT, DELPHI, Mercedes Benz AG, DELPHI GmbH, Deutsche Fibrit, Daewoo, ETW GmbH, FIAN, FIAT, Fraunhofer Institute, FORD Werke AG, FORD, General Motors, GKSS, HALLA, HAPPICH GmbH, Honda, IDIADA, IFT, Karman, KATRI, KIA Motors, LVM, Marley Foam, Marley Davidson, MBB, Modine, Nedcar, NREL, NUKEM, OPEL AG, PARS, Peguform, PETRI AG, PEUGOT, Porsche AG, Proton, RENAULT, ROVER, Rücker GmbH, SEAT, SKODA, SNCF, SOLTECH, Sommer Allibert, SSANG YONG, Sverdrup Technology, TAKATA, TNO, TRW, TRW-Repa, University Heidelberg, University Gießen, University Stuttgart, University Wisconsin, United States Army Test Command, UTAC, VOLVO, Volkswagen, Webasto.

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