

Extreme Temperature Tester R&S E-Line

Shielded test cell for temperature tests in production

Mobile radio and automotive are two fields where individual components must function properly even at extreme temperatures. As a combined shielded enclosure, climatic chamber and multiplexer that can be program-controlled to test up to 12 DUTs in a wide temperature range, the Extreme Temperature Tester R&S E-Line provides the optimum measurement environment for functional checks of components with a radio interface.



FIG 1 Extreme Temperature Tester R&S E-Line.

Greater test capacity

The Extreme Temperature Tester R&S E-Line (FIG 1) was developed for quality assurance purposes such as random sample tests in the production of mobile communication equipment. The tests can be performed at temperatures ranging from $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$. The tester can be linked to an existing test system, offering significant advantages:

- ◆ If a test system could previously handle only one or two DUTs, being expanded by the R&S E-Line enables it to simultaneously test up to 12 DUTs that may even comply with different standards.
- ◆ Test times are drastically reduced because the time-consuming temperature cycles for the 12 DUTs are performed just once.

The R&S E-Line is used for testing equipment or components wherever the following requirements must be fulfilled:

- ◆ Tests at extreme temperatures
- ◆ Tests in shielded environments (e.g. to exclude external influence when testing the air interface, in particular when measuring maximum input sensitivity)
- ◆ Simultaneous testing of several DUTs
- ◆ Tests with high reproducibility

System concept: a perfect combination

The R&S E-Line primarily consists of a shielded enclosure, climatic chamber and multiplexer. FIG 2 shows the basic interconnection between an external test system and the extreme temperature tester.

Shielding is necessary to exclude any environmental influences on the DUTs. Up to 3 GHz, the R&S E-Line exhibits a minimum shielding effectiveness of 60 dB, allowing communication testing via the air interface, especially for mobile phones.

The climatic chamber features a temperature range of $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$, meeting the requirements in the mobile radio and automotive field.

The multiplexer switches the signal paths of the external test system to the DUTs. Different types of multiplexers are used for RF/AF signals, DC supply or high-speed data lines. The external test system provides all measurement functions; it can be from Rohde&Schwarz or it can be an existing customized test system.

Depending on the test requirements, the Universal Radio Communication Tester R&S CMU 200 and a spectrum analyzer from the R&S FSx family from Rohde & Schwarz are typically used in mobile radio applications.

The controller in the Extreme Temperature Tester R&S E-Line controls the entire test sequence, and thus the test system. It can perform the following tasks:

- ◆ Control of
 - climatic chamber
 - multiplexer
 - pneumatics for the cell door
- ◆ Communication with the external test system
- ◆ Control/monitoring of the DUTs

DUT adaptation across 12 universal interfaces

The extendable DUT platform offers universal interfaces to connect up to 12 fixtures, and is thus configurable for a variety of DUTs. If a DUT must be quickly replaced, two platforms can be used (one for the ongoing test, the second to attach DUTs for the next test).

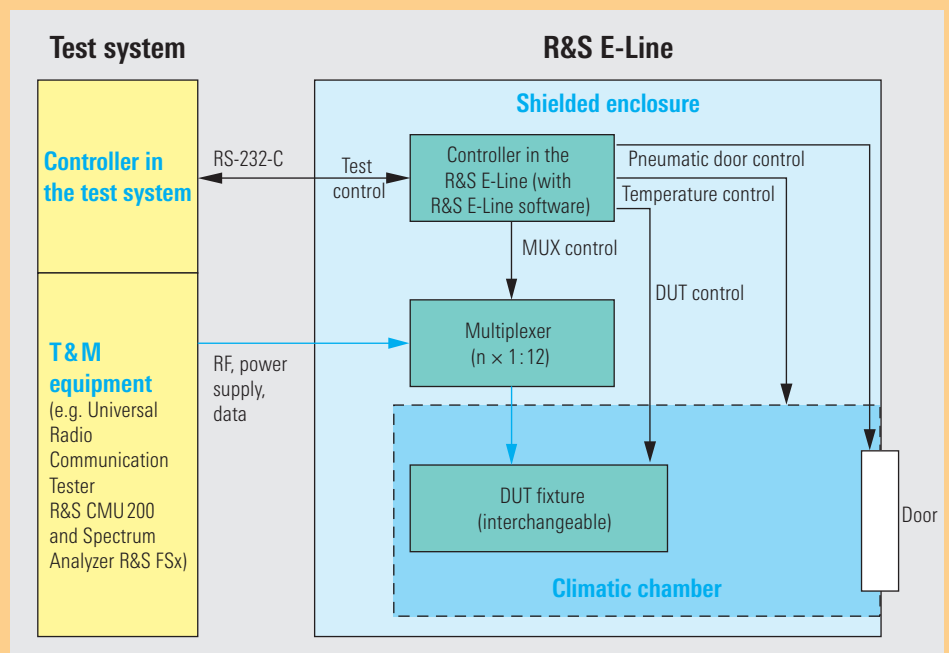
A connecting system links the DUT platform to the instrumentation. When the pneumatically operated door is opened, the DUT platform is disconnected from the connecting system, and is then easy to replace. This connecting system allows fixed laying of the fixture cabling, increasing the test system's reliability.

R&S E-Line control software

The modular R&S E-Line software controls the test sequence. The user interface is implemented as a LabWindows/CVI application and displays the current status of the DUTs, giving an overview of the current system parameters (FIG 3).

The major parameters in the R&S E-Line software are configured via simple text files. The software runs as a sequence under TestStand from National Instruments. FIG 4 shows the software structure.

FIG 2 Block diagram of a test system with the Extreme Temperature Tester R&S E-Line.



► The control software allows test cell operation in the following two configurations:

With an external test system (FIG 2)

The controller in the extreme temperature tester controls the test sequence (master) as well as the controller in the external test system (slave) via a specified interface (trigger “Measurement” or “Read Go/Nogo result”). The customized test program in this case is independent of the R&S E-Line control software.

As an independent test system

Test equipment with IEC/IEEE bus interfaces is operated directly at the test cell controller if the applications are simple. The control software is expanded by a DUT-specific test sequence under TestStand (FIG 4). Basically, all instruments contained in the



Generic Test Software Library GTSL from Rohde & Schwarz can be integrated. This library can be expanded to include other instruments.

Summary

The R&S E-Line is a universal test cell for the simultaneous testing of several DUTs at extreme temperatures in a shielded environment. The open software concept allows integration of an existing test system or configuration of a customized test system.

A variety of DUTs can be adapted via standardized and exchangeable interfaces. Customized versions (e.g. expanded temperature range, different DUT configuration) are available upon request.

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FIG 3 User interface of the R&S E-Line control software.

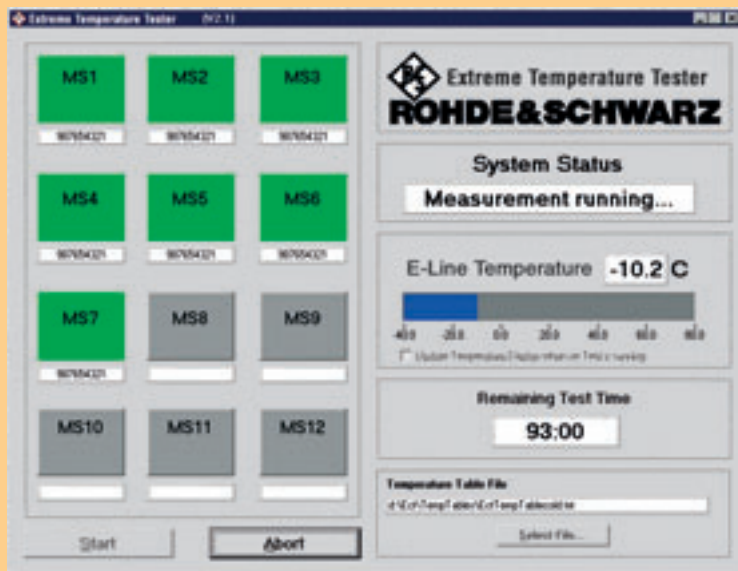


FIG 4 Structure of the R&S E-Line control software.

