

Simple Sequencing Tool for SCPI Commands

Application Note

Products:

- | R&S®UPV
- | R&S®UPV-K1

This document describes an application program for sending a sequence of logged SCPI commands to the firmware of the R&S® Audio Analyzer UPV.

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Background

SCPI Remote Control Commands

SCPI (Standard Commands for Programmable Instruments) contains syntax and naming conventions for remote control commands for measurement instruments. SCPI is independent of the physical interface used for communication between a controller and an instrument. The specification contains a set of mandatory system and status commands, conventions for generating long form and short form mnemonics for command headers, parameter formatting, status reporting, data interchange format, instrument classes and a command reference list

SCPI Logging on the R&S® Audio Analyzer UPV

Commands for instrument settings can be logged using the item “SCPI Recording” of the “Sequence” menu. For example, setting the frequency of the generator function “Sine” to 1250 Hz produces the logged command

```
SOURce:FREQuency 1250 HZ
```

The logged command can be re-phrased to a query by replacing the parameter by a question mark:

```
SOURce:FREQuency?
```

The lowercase letters are optional for better understanding. The parser for the remote control commands evaluates only the mandatory uppercase letters.

Single commands can be tested in the diagnostic panel (“Utilities” menu). Paste the command to the text field “SCPI Cmnd” and press the “Enter” key to send the command to the firmware of the instrument. Responses to queries entered here appear in the status line on the bottom left above the softkey labels.

The application program described herein is made for executing a sequence of logged remote control commands.

Key presses on the front panel and query commands for result values and curves cannot be logged. For these commands please refer to the UPV manual, chapters “Remote Control – Fundamentals” and “Remote Control - Commands”.

A single measurement (key press “SINGLE”) is started with

```
INITiate:CONTinuous OFF
```

This command stops any potentially ongoing measurement and starts a single measurement without resetting traces and maximum/minimum readings. The main function result of channel 1 is queried with command

SENSe:DATA?

The main function result of channel 2 is queried with command

SENSe:DATA2?

Installing the Application Software

Prerequisites

The use of the application program provided with this application note requires option UPV-K1 (universal sequence controller). For modification of the supplied source code of the application program the VB.Net IDE (integrated development environment) provided with option UPV-K1 must be installed. The VB.NET IDE is not required for installing and running the program from the installer.

Required file

Copy "1GA53.msi" to the UPV hard disk, e.g. to "D:\R&S Software\Application Notes".

Installation

Run installation file "1GA53.msi" from the UPV hard disk and follow the instructions on the screen. The installer creates a shortcut on the desktop and in "Programs" within the start menu.

Using the Application Software

User Interface

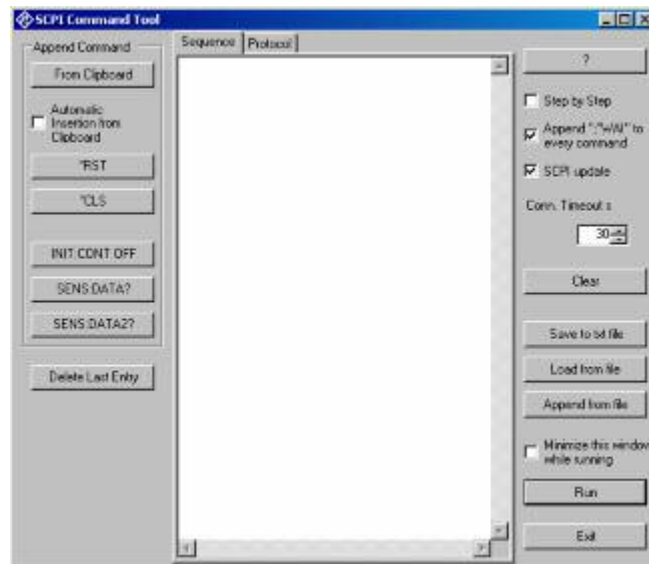


Figure 1: User interface after start of the program

- Copy the commands from the SCPI recorder in the UPV window (using key combination CTRL+C or “Copy” in the context menu) and paste them into the text box in the centre of the window of the application program with button “From Clipboard” in the “Append” panel, key combination CTRL+V or “Paste” in the context menu.
- The text content from the clipboard can also be appended to the text by clicking the button “From Clipboard” in the field “Append Command”.
- If checkbox “Automatic Insertion from Clipboard” is activated, any text copied to the clipboard will immediately be inserted. After insertion of the text, the clipboard is cleared. The checkbox is automatically deactivated when a sequence is run.
- The other buttons in the “Append Command” field can be used to append the commands written on the respective buttons.
- The button “Delete Last Entry” removes the last command line from the sequence.
- The textbox in the center contains either the SCPI command sequence or the protocol of execution of a sequence. The contents can be chosen using the “Sequence” and “Protocol” tabs on top. The display changes automatically to “Protocol” when the execution of a sequence is started and back to “Sequence” when the execution is completed.
- The “?” button provides a short explanation of the program.
- If the “Step by Step” checkbox is activated, the program prompts the user after each command.
- Appending “;*WAI” to every command causes the instrument to wait for the completion of the last command before the next is executed. Thus it may be made sure that the measurement has terminated before the result is queried:

```
INIT:CONT OFF;*WAI
SENS:DATA?
```

- The connection timeout determines the maximum time allowed between a query and the corresponding response from the instrument. It must be larger than the longest measurement time set in the analyzer.
- The “Clear” button deletes all entries in the displayed text box.
- The “Save to txt file”, “Load from file” and “Append from file” buttons may be used for the respective file operations on the commands in the text box. Furthermore a communication protocol can be saved using the “Save to txt file” button.
- The option “Minimize this window while running” causes the window of the application program to be reduced to an entry in the task bar while the commands are sent to the UPV firmware. The window is restored after the last command in the text box has been executed.
- “Exit” ends the application program and closes the control window.

Example Sequence

The following example sequence shows how to use the application program. The assumed task is to preset the instrument, perform a two-channel rms measurement, store the results of the first measurement as reference values, perform a second rms measurement and obtain the results of the second rms measurement as dB values relative to the first results. To this end, perform the following steps:

- Start the application program from the desktop icon or from the programs folder in the start menu.
- Click the “*RST” button to enter this command to the list as first entry. The *RST command presets the instrument to a defined state.
- Click the “INIT:CONT OFF” button to append this command. This command will later on start a single measurement.

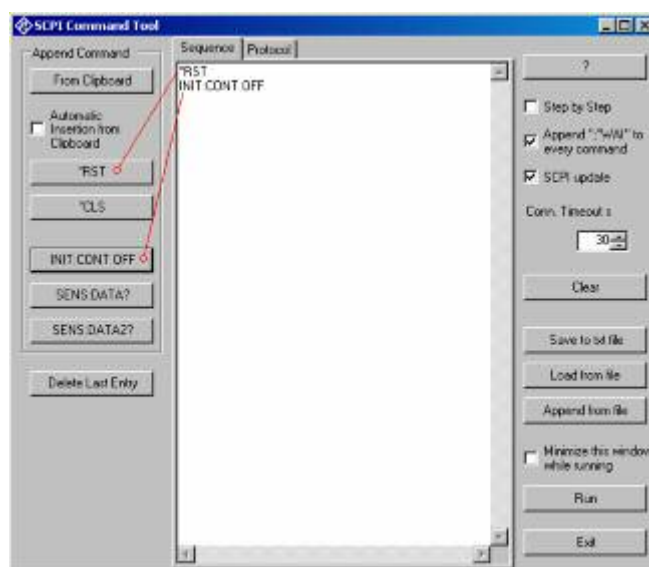


Figure 2: User interface after insertion of the first two commands

- Change to the UPV window.

- Open the SCPI recorder by clicking on item “SCPI Recording” in the “Sequence” menu.
- Open the function config panel from the “DispConfig” menu or by right-clicking in the numeric result display and clicking on “Config” in the context menu.
- In the column for channel 1, open the “Reference” combo box and click on “Store Ch1”. This setting stores the current result of channel 1 as reference value for relative units in channel 1. The command for this operation appears in the SCPI recorder window.

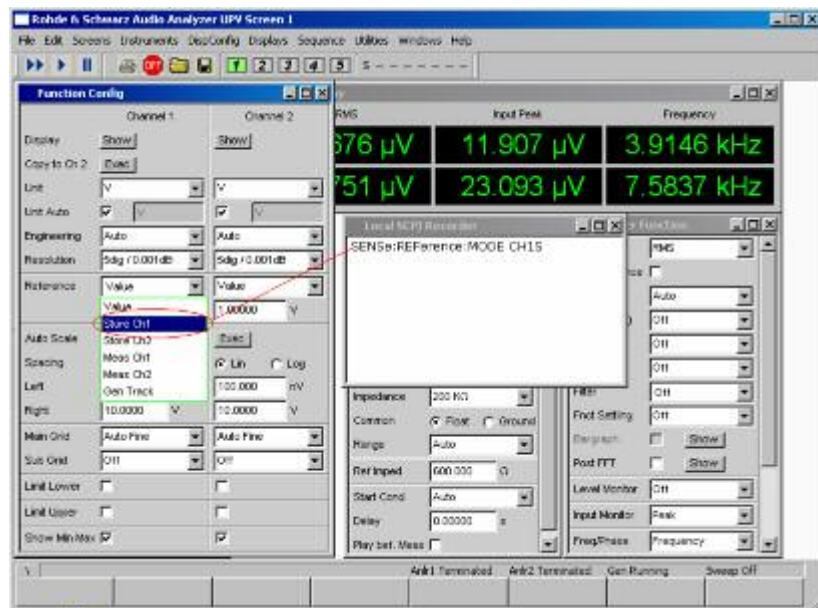


Figure 3: Logging of the command to store the current result as reference value of channel 1

- In the column for channel 2, open the “Reference” combo box and click on “Store Ch2”. This setting stores the current result of channel 2 as reference value for relative units in channel 2.

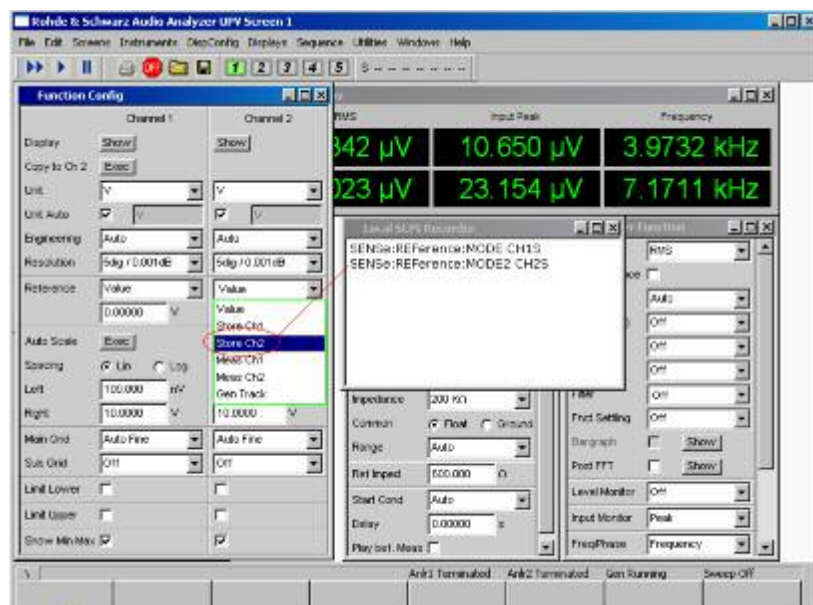


Figure 4: Logging of the command to store the current result as reference value of channel 2

In the column for channel 1, open the “Unit” combo box and click on “dBr”. This switches the unit of channel 1 to dB, relative to the first stored reference value.

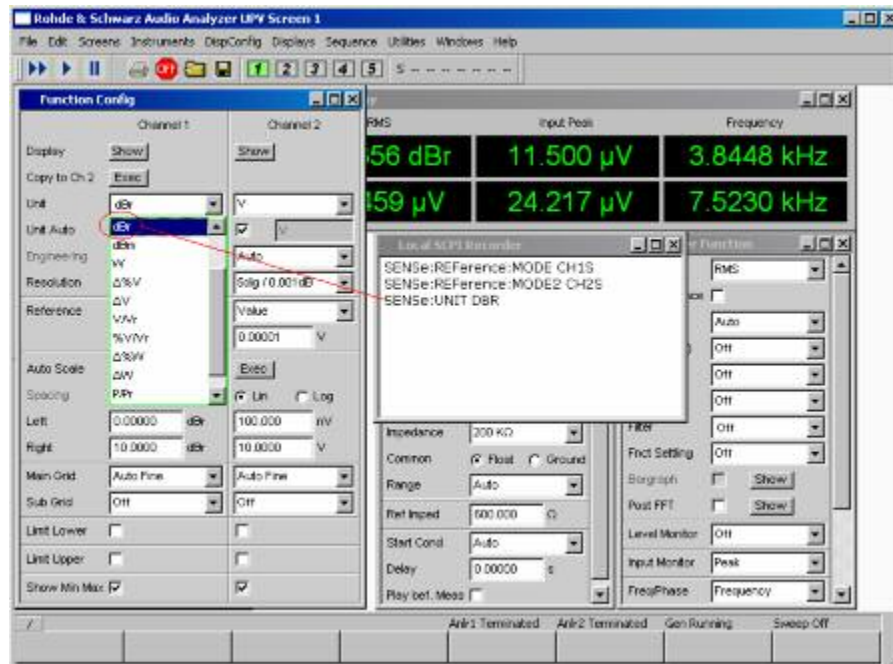


Figure 5:

In the column for channel 2, open the “Unit” combo box and click on “dBr”. This switches the unit of channel 2 to dB, relative to the second stored reference value.

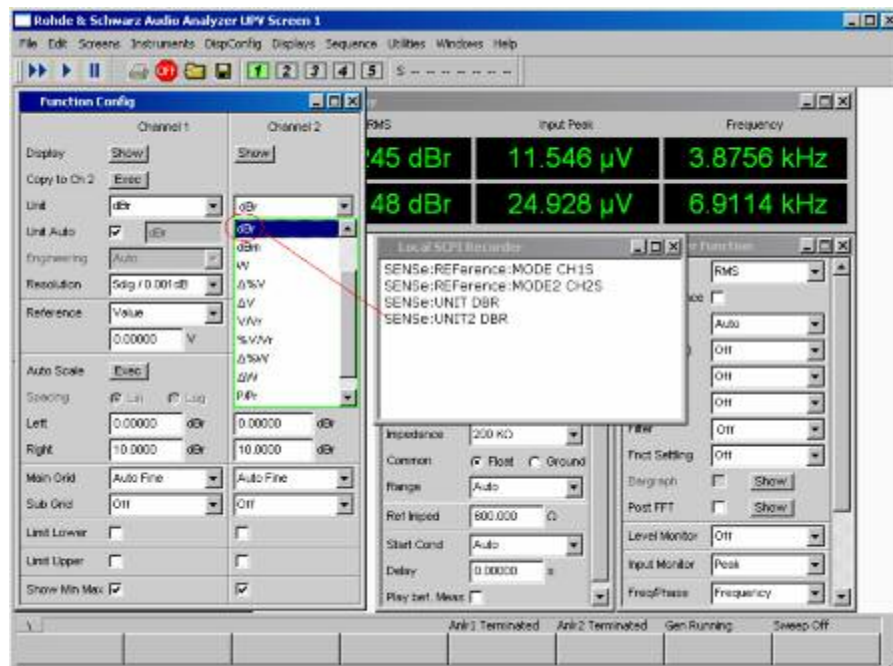


Figure 6:

- Highlight the entries in the SCPI Recorder window and copy them to the clipboard

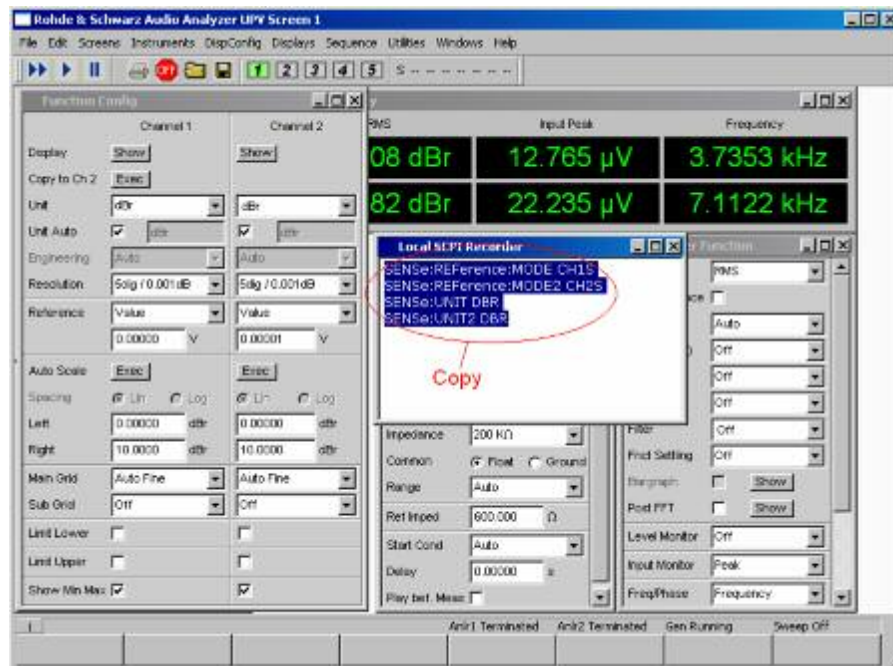


Figure 7:

- Change to the window of the application program
- Paste the text from the clipboard to the text box by right-clicking into the textbox and clicking “Paste” or by clicking the “From Clipboard” button in the “Append Command” field.

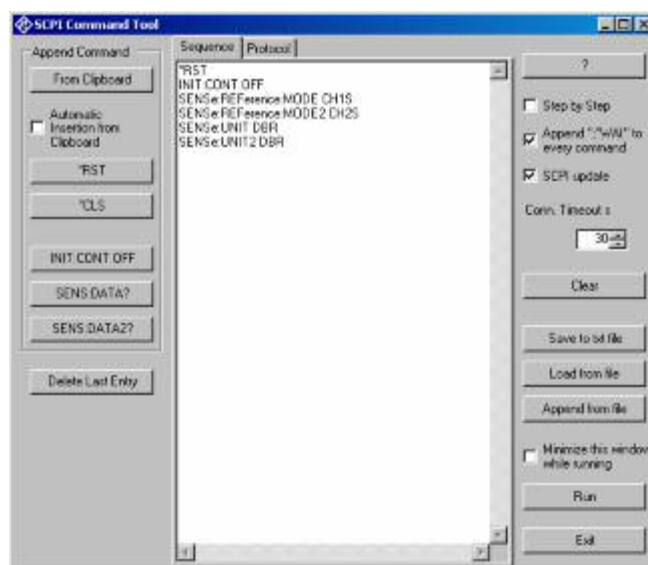


Figure 8: User interface after pasting the commands from the SCPI recorder

- Click the “INIT:CONT OFF” button to append the command for starting another single measurement.
- Click the “SENS:DATA?” button to append the query command for the result of channel 1.

- Click the “SENS:DATA2?” button to append the query command for the result of channel 2.

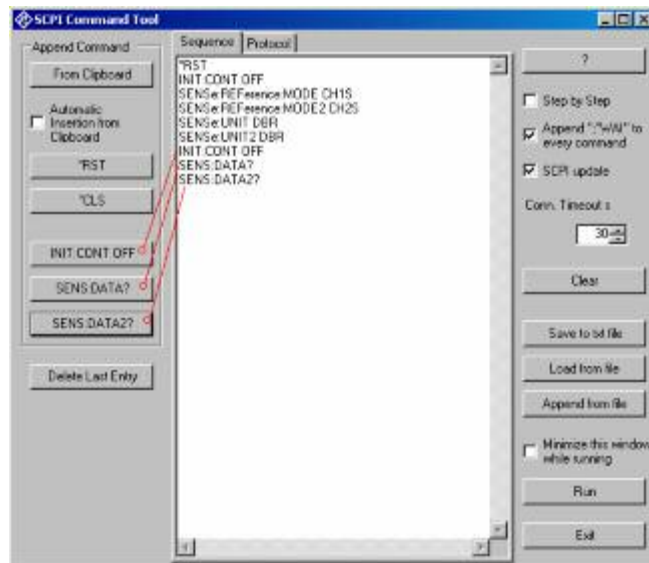


Figure 9: User interface with complete sequence

Clicking the “Run button” causes the application program to send the commands one by one to the UPV firmware. First the instrument is preset so that the original state is restored. Then a single measurement is started. The two subsequent commands store the results of this measurement as reference values for both channels. With the next two commands the unit is changed to dB relative to the stored reference. Finally a second measurement is started, and the last two commands query the ratio between the result of the second measurement and the result of the first measurement in dB for each channel. The results are shown in message boxes which have to be closed by the operator before the program continues.

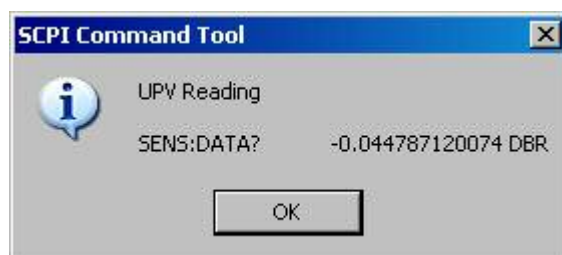


Figure 10: Window displaying the first queried result

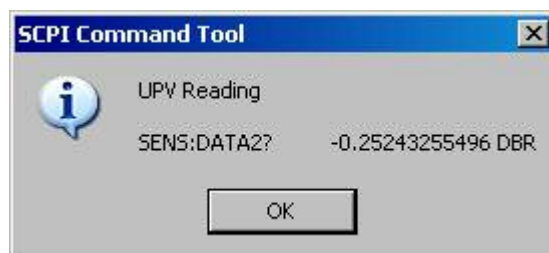


Figure 11: Window displaying the second queried result

After the execution of the sequence has completed, the communication protocol can be reviewed by clicking the “Protocol” tab above the text box.

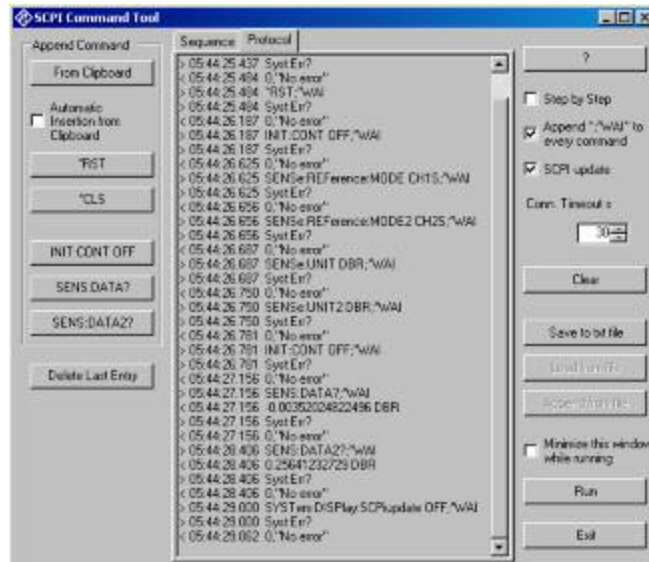


Figure 12: User interface with communication protocol

Working with the Source Code

Loading the Source Code to the IDE

- Download “1GA53_VB2003.zip”, “1GA53_VB2005.zip” or “1GA53_VB2008.zip” according to the version of the VB.Net IDE installed on the UPV
- Unzip the file to the VB.Net projects folder on the UPV hard disk
- Open file “SCPIcontrol.sln” from the VB.Net IDE

The help button only works when file “1GA53.rtf” is present in folder “C:\Program Files\Rohde&Schwarz\SCPIControl”.

Modifying the program

The user interface can then be modified and enhanced, e.g. by adding more buttons for inserting additional commands.

Open the solution explorer in the IDE, right-click on “Form1.vb” and Click “View Designer” or “View Code”, respectively.

Copy one of the existing buttons in the designer and paste it to the GroupBox1 which has to be enlarged for this purpose. Edit the text of the button in the “Properties” window. Double-click the new button in the designer and copy the text of one of the existing “Append Command” buttons to the new sub. Edit the copied code according to the command to be inserted.

Literature

- R&S® UPV User Manual
http://www2.rohde-schwarz.com/en/products/test_and_measurement/audio/UPV-|-Manuals-|-22-|-2224-|-2234.html
- “Standard Commands for Programmable Instruments (SCPI)”
<http://www.ivifoundation.org/docs/SCPI-99.PDF>

Ordering Information

Ordering Information		
Type of instrument		
Description	Instrument type	Ordering number
Audio Analyzer	R&S®UPV or	1146.2003.02
	R&S®UPV66	1146.2003.66
Universal sequence controller	R&S®UPV-K1	1401.7009.02

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

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- ISO 14001-certified environmental management system



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