

# Тестеры видеосигнала VTC/VTE/VTS



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Барнаул (3852)73-04-60  
Белгород (4722)40-23-64  
Брянск (4832)59-03-52  
Владивосток (423)249-28-31  
Волгоград (844)278-03-48  
Вологда (8172)26-41-59  
Воронеж (473)204-51-73  
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Ижевск (3412)26-03-58  
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Казань (843)206-01-48  
Калининград (4012)72-03-81  
Калуга (4842)92-23-67  
Кемерово (3842)65-04-62  
Киров (8332)68-02-04  
Краснодар (861)203-40-90  
Красноярск (391)204-63-61  
Курск (4712)77-13-04  
Липецк (4742)52-20-81

Киргизия (996)312-96-26-47

Магнитогорск (3519)55-03-13  
Москва (495)268-04-70  
Мурманск (8152)59-64-93  
Набережные Челны (8552)20-53-41  
Нижний Новгород (831)429-08-12  
Новокузнецк (3843)20-46-81  
Новосибирск (383)227-86-73  
Омск (3812)21-46-40  
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Оренбург (3532)37-68-04  
Пенза (8412)22-31-16

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Пермь (342)205-81-47  
Ростов-на-Дону (863)308-18-15  
Рязань (4912)46-61-64  
Самара (846)206-03-16  
Санкт-Петербург (812)309-46-40  
Саратов (845)249-38-78  
Севастополь (8692)22-31-93  
Симферополь (3652)67-13-56  
Смоленск (4812)29-41-54  
Сочи (862)225-72-31  
Ставрополь (8652)20-65-13

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Сургут (3462)77-98-35  
Тверь (4822)63-31-35  
Томск (3822)98-41-53  
Тула (4872)74-02-29  
Тюмень (3452)66-21-18  
Ульяновск (8422)24-23-59  
Уфа (347)229-48-12  
Хабаровск (4212)92-98-04  
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# AT A GLANCE

Rohde & Schwarz offers audio/video test and measurement instruments covering the entire value chain in the consumer electronics sector – the R&S®VTC video test center for development applications, the R&S®VTE video tester for automated applications in test setups and the R&S®VTS compact video tester for manufacturing applications. The R&S®VTC/VTE/VTS video testers are used for testing video and audio interfaces on consumer electronics equipment.

With test modules for HDMI™, MHL™ and analog AV interfaces and comprehensive analysis capabilities, these instruments support a spectrum of applications. The future-oriented, modular platforms accommodate up to eight (R&S®VTC), three (R&S®VTE) or one (R&S®VTS) test module(s) and can be equipped with additional software to optimally suit the requirements of specific applications.

The test instruments perform standard interface protocol tests and also analyze media content in realtime during application tests on consumer electronics equipment. This makes it easy to verify whether mobile devices provide the required video quality when video content is transmitted over a Long Term Evolution (LTE) link. It is also possible to measure the picture failure point (PFP) on broadcast and cellular terminal devices.



# MODEL OVERVIEW



## R&S®VTC video test center High-end platform for A/V interface testing of consumer electronics devices

Accommodates up to eight different test modules

- ▶ Large 11.6" touchscreen
- ▶ 4 HU, 19"
- ▶ Extensive protocol testing and audio/video analysis capabilities
- ▶ Powerful built-in PC with up to two hard drives



## R&S®VTE video tester Compact all-purpose tester for A/V interface testing in quality assurance and for test system integration

Accommodates up to three different test modules

- ▶ 7" touchscreen
- ▶ 3 HU, 1/2 19"
- ▶ Extensive protocol testing and audio/video analysis capabilities
- ▶ Powerful built-in PC with up to two hard drives



## R&S®VTS compact video tester A/V interface testing in device manufacturing

Cost-effective A/V interface testing with one test module

- ▶ Extremely compact with only 1 HU, 1/2 19"
- ▶ Operation via remote control/operation or external I/O
- ▶ Protocol testing and basic audio/video analysis capabilities
- ▶ Power-saving built-in PC

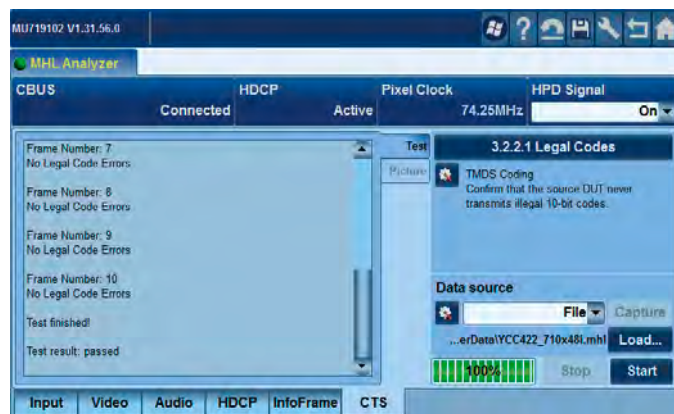
# MOBILE HIGH-DEFINITION LINK (MHL) INTERFACE TESTING

When equipped with the R&S®VT-B2350 MHL RX/TX option, the R&S®VTC/VTE/VTS video testers can perform source and sink protocol tests on the MHL interface. Source, sink and dongle tests in 24-bit mode as well as sink and dongle tests in PackedPixel mode are supported. R&S®VT-B2351 (MHL RX PackedPixel) provides additional capabilities for testing sources in PackedPixel mode.

## Realtime protocol analysis

The R&S®VT-B2350/-B2351 options feature extensive analysis functions for verifying MHL sources such as mobile phones. Audio and video content is output in realtime on the R&S®VTC or transmitted via an auxiliary HDMI port and played on a TV. Moreover, the R&S®VTC displays the relevant protocol parameters:

- ▶ Video timing parameters such as pixel clock and resolution in line with CEA-861-F
- ▶ Audio data
- ▶ High-bandwidth digital content protection (HDCP) status and the keys used
- ▶ Auxiliary video InfoFrame (AVI), audio InfoFrame, source product description (SPD) and MPEG InfoFrame



## Control bus (CBUS) testing

The R&S®VT-K2356 CBUS tracer option is used to simulate and display CBUS communications between the device under test and the module. The test instrument can send and receive commands and display the data traffic.

## Generation of user-defined patterns and patterns in line with MHL, CEA-861-E

Equipped with the R&S®VT-B2350 MHL RX/TX option, the instruments can also output user-defined MHL test signals, read a sink's EDID data and configure InfoFrames in order to test MHL-capable sink devices such as TVs or dongles for compliance with the standard. The user can define test sequences using a software application to import BMP or TIFF format files.

## Compliance testing of sources, sinks and dongles for MHL interfaces

In addition to performing realtime measurements, the R&S®VTC/VTE/VTS video testers with the R&S®VT-B2350 MHL RX/TX / R&S®VT-B2351 MHL RX PackedPixel options provide raw test modes (additional software option) for MHL source, sink and dongle system tests in line with MHL compliance test specification. The testing procedure can also be found on the MHL consortium website in the method of implementation (MOI) documents.

As an option, the raw data stream can be tested offline for compliance with the standard



The R&S®VT-B2350 option enables the R&S®VTC video test center to perform source and sink protocol tests on the MHL interface



The R&S®VT-B2351 option enables the test instruments to perform source protocol tests on the MHL interface in PackedPixel mode

# HIGH-DEFINITION MULTIMEDIA INTERFACE (HDMI) TESTING

The R&S®VT-B2363 HDMI RX/TX 600 MHz module supports extensive HDMI interface testing. Powerful analysis functions are available for verifying HDMI sources such as set-top boxes, Blu-ray Disc™ players, media servers and tablets. HDMI sinks such as TVs and projectors are stimulated and tested using the flexible signal generation functions.

## Interfaces

- ▶ HDMI IN: HDMI signal analysis up to 18 Gbit/s
- ▶ HDMI OUT: HDMI signal generation up to 18 Gbit/s, audio input for ARC testing
- ▶ SPDIF IN: audio analysis/signal routing to HDMI IN (ARC)

## Signal generation and analysis

- ▶ In line with HDMI 2.0a (covering CEA-861F and VESA standards)
- ▶ Support of HDCP 1.4 and 2.2
- ▶ Video signals covered up to 4k/UHD resolution (60 Hz progressive, 4:4:4)

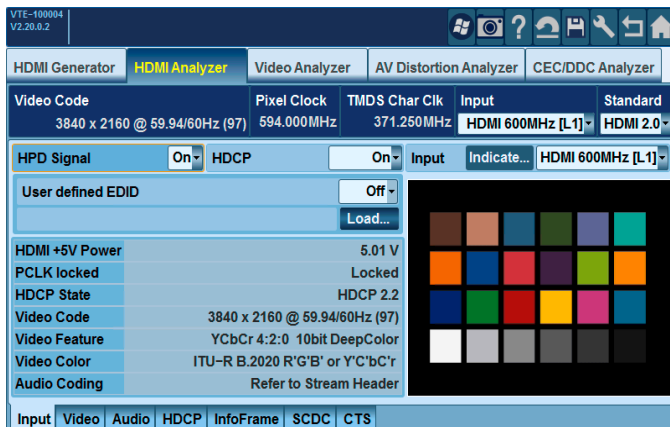
The following software options provide the required signal generation and analysis functions:

## HDMI signal analysis up to 18 Gbit/s

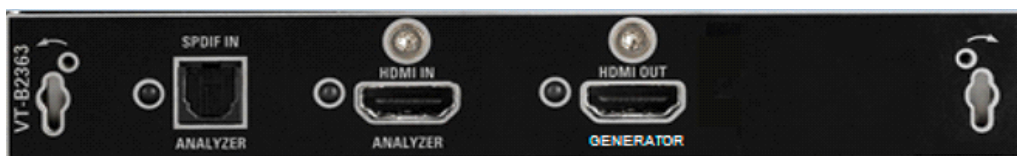
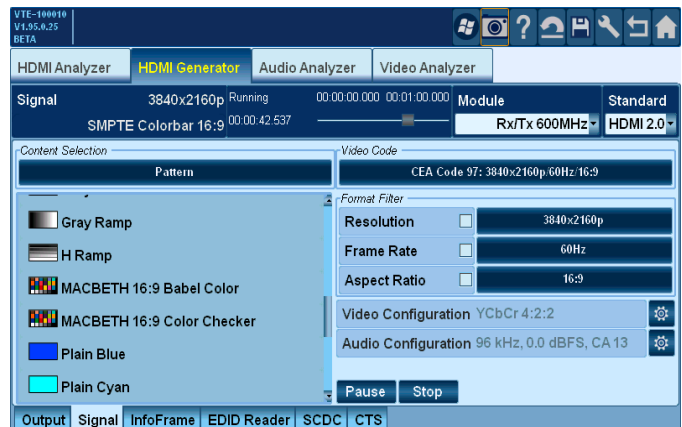
The R&S®VT-K2364 HDMI RX option allows HDMI signal analysis and includes the following features:

- ▶ EDID library to simulate sinks capabilities
- ▶ HDCP 1.4/2.2 descrambling
- ▶ Audio/video output
- ▶ Extensive audio and video content analysis
  - Display of relevant protocol parameters
  - Video timing parameters such as pixel clock and resolution in line with CEA-audio data
  - High-bandwidth digital content protection (HDCP) status and keys used
  - Auxiliary video InfoFrame (AVI), audio InfoFrame, HDMI vendor specific InfoFrame (H14b VSIF), HDMI Forum vendor specific InfoFrame (HF-VSIF), dynamic range and mastering InfoFrame (DRM), source product description (SPD) and MPEG InfoFrame
  - Status and control data channel (SCDC) status
  - TMDS error detection

HDMI analysis: display of video signal and basic interface data



HDMI generator: selection of test pattern and format



R&S®VT-B2363 HDMI RX/TX 600 MHz module

## HDMI signal generation up to 18 Gbit/s (6G mode)

The R&S®VT-K364 HDMI TX option supports HDMI signal generation and includes the following features:

- ▶ Hot plug detection (HPD)
- ▶ HDCP on/off
- ▶ Display and saving of sink's EDID data
- ▶ Configurable pixel shift and line shift function to generate moving content based on static patterns
- ▶ Configurable video amplitude
- ▶ Audio analysis for ARC signals on HDMI OUT connector with audio analysis option (see page 11)
- ▶ Static pattern generation
  - Extensive pattern library including chess board, PLUGE, noise, colors, multiburst, 3D cross talk, 3D contrast and SMPTE
  - All CEA-861F (VIC1 to VIC107) and VESA video formats up to 4K resolution
- ▶ Eight-channel PCM sine tone generator with the following definable parameters
  - Sine tone frequency
  - Sampling rate
  - Audio level
  - Resolution
- ▶ Uncompressed moving picture payout (R&S®VT-K361 HDMI moving pictures)
  - Up to 8 Gbyte of uncompressed video/audio data (approx. 13 s FullHD content (1080p, 4:4:4, 12 bit/pixel, 60 Hz) approx. 4 s UHD content (4k×2k, 4:4:4, 8 bit/pixel, 60 Hz))
  - Several test sequences such as lip-sync, moving color bar (EMC) and moving text
  - Definable parameters such as pixel encoding, DVI mode, 3D mode, level and bit depth
- ▶ User-defined test patterns and sequences based on imported video data (BMP, TIFF of YUV16 format) with eight-channel PCM audio (WAV file based) (AVG pattern import software)
- ▶ Status and control data channel (SCDC) status display
- ▶ Generation of nonstandard signals for stress testing (R&S®VT-K362 HDMI TX option user-defined timing)
  - Timing adjustment
  - InfoFrame adaptation (also supporting HDR meta data signaling)

## HDMI 1.4 and 2.0a testing in line with the HDMI compliance test specification (CTS)

Extensive CTS testing is supported by the options indicated below. Several tests in the given categories are supported and approved by the HDMI Forum. Rohde&Schwarz is an active member of the HDMI Forum, continuously adding and approving new CTS test IDs. Please see the R&S®VTx specifications for more details on the individual tests that are supported.

- ▶ R&S®VT-K2367 HDMI 1.4 CTS source test
  - 7.4 Protocol, 7.5 Video, 7.6 Audio, 7.7 Interoperability with DVI, 7.8 Advanced Features
- ▶ R&S®VT-K367 HDMI 1.4 CTS sink test
  - 8.4 Protocol, 8.5 Video, 8.6 Audio, 8.7 Interoperability with DVI, 8.8 Advanced Features
- ▶ R&S®VT-K2368 HDMI 2.0 CTS source test
  - 7.2 TMDS Protocol, 7.3 TMDS Pixel Encoding, 7.4 Video Timing, 7.5 Audio Encoding, 7.6 HDMI-VSIFs, 7.7 AVI InfoFrame, 7.8 Audio InfoFrame and GCP, 7.9 Audio Channel Status, 7.12 High Dynamic Range InfoFrame
- ▶ R&S®VT-K368 HDMI 2.0 CTS sink test
  - 8.2 TMDS Protocol, 8.3 Pixel Decoding, 8.4 Video Timing, 8.5 Audio Decoding and Rendering, 8.7 HDMI-VSIFs, 8.8 EDID

The following features of the implementation make CTS testing simple and efficient:

- ▶ Start of tests at the push of a button
- ▶ Partial execution of tests for debugging purpose
- ▶ Test result logging
- ▶ Clear and easy-to-read test results
- ▶ Simple-to-understand methods of implementation (MOIs)

HDMI CTS testing: selection of test ID



# TIME DOMAIN ANALYSIS SOLUTION WITH FULL 6 Gbps SUPPORT FOR TMDS SOURCES

The R&S®VT-B2380 TMDS time domain analyzer module is an easy-to-use, cost-effective time domain analysis solution for ensuring that video interfaces electrically comply with the relevant standards. The solution consists of the actual test module and an interface-specific test point access (TPA) adapter that can be connected via RF cables and control lines.

## Powerful eye diagram analysis using subsampling

Transition minimized differential signaling (TMDS) technologies typically have repetitive signals with frequencies of up to 6 GHz that can be easily detected using subsampling. This measurement function is more compact and more cost-effective than realtime solutions. The resulting eye diagram can be used to determine key parameters such as amplitude, rise/fall times, signal-to-noise ratio, jitter, bias voltage and offset.

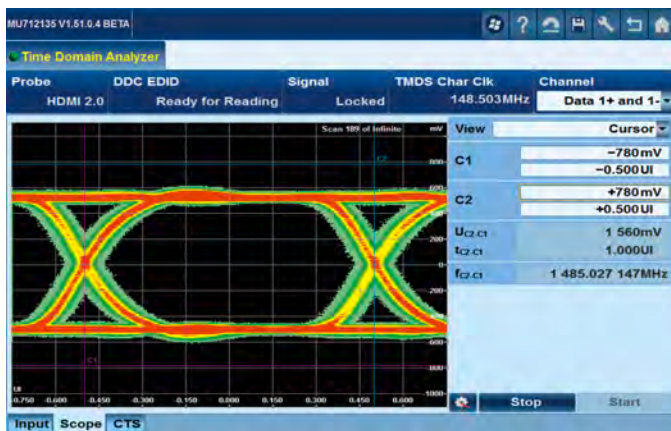
Different measurement views are available during eye diagram analysis. Users can choose between cursor measurement, histogram and mask view.

## Precompliance measurement solution for HDMI sources

Using the R&S®VT-Z2385 HDMI type A TPA test adapter (plug), the base module can be easily expanded to test HDMI sources such as set-top boxes and tablets. The test adapter has a switch matrix that can be used to switch between the differential signals to be analyzed. The adapter also features EDID emulation and capacitance measurement logic to put the DUT into the correct operating mode.

In addition to the eye diagram, this solution also offers an option that supports measurements in order to check whether an actual compliance test can be passed successfully.

Eye diagram of an HDMI 2.0 signal



R&S®VT-Z2385 HDMI type A TPA test adapter



In combination with the R&S®VT-Z2385 HDMI type A TPA test adapter, the R&S®VT-B2380 TMDS time domain analyzer module permits eye diagram measurements on HDMI 2.0 sources



# ANALOG AUDIO/VIDEO INTERFACE TESTING

Equipped with the R&S®VT-B2370 analog A/V RX option, the Rohde & Schwarz video testers can also perform video analysis on composite signals and component interfaces as well as analyze two-channel unbalanced analog audio. In order to decode or analyze the different A/V signals, the complementary measurement options described on page 10 are required.

## Composite (CCVS, CVBS) signal analysis

Via its composite BNC input, the analyzer board is able to receive composite color video signals (CCVS) or color video baseband signals (CVBS). The phase alternating line (PAL) and national television system committee (NTSC) color standards are supported.

## Y<sub>C</sub>C<sub>r</sub>/RGB/RGBHV component signal analysis

By adding the R&S®VT-K2731 component support option, the three component BNC inputs can be activated in order to analyze SD and HD component signals, which are transmitted as Y<sub>C</sub>C<sub>r</sub> or RGB color difference signals, as well as VGA (RGBHV). When measuring VGA signals, the two designated BNC inputs for two-channel analog audio are utilized to receive and measure the horizontal and vertical sync signals.

## Powerful two-channel audio analysis

The two available unbalanced audio BNC inputs allow users to analyze analog stereo signals from consumer electronics devices such as set-top boxes and headphone outputs on smartphones and tablets when the R&S®VT-K2150 audio analysis option described on page 10 is installed.

The R&S®VT-B2370 option can be used to measure analog composite and component signals as well as two-channel audio signals





# COMPLEMENTARY FUNCTIONS FOR MEDIA CONTENT ANALYSIS

In addition to carrying out protocol tests and displaying the transmitted video and audio content, the video testers can automatically analyze the content transmitted from the different analysis modules.

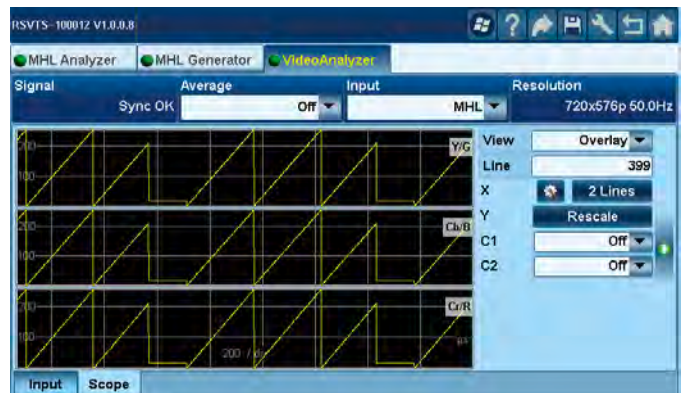
## Video analysis of composite or digital component signals in the time domain

The R&S®VT-K2100 video analysis option measures the timing and level of each component of the digital or analog video signal. Results are displayed in the time domain (scope); measurements are triggered on lines or pixels. Two markers are available to show results in detail. To verify whether color transmission is correct, the color amplitudes can be displayed graphically in vectorscope mode. The option also shows the digital YCbCr/RGB values for any desired pixel. The R&S®VT-K2101 video measurements option extends the video analysis option with automated signal parameter measurements on noise, frequency response, linear and nonlinear distortions on composite and component signals.

## Double-ended video and audio quality analysis

The R&S®VT-K2111 A/V distortion analysis option relies on realtime difference analysis to identify differences between the measured video/audio signal and a reference signal. The reference signal is recorded and saved via the test interface before the measurement is carried out. The option displays the measured video signal, the reference signal and the difference picture in realtime. It also gives deeper insight into the difference picture through detailed numerical and graphical analysis. It shows PSNR, SSIM and MOS at frame level. Results are displayed graphically and as numerical values in a table. A powerful trigger function also reveals errors that viewers can see, such as the picture failure point (PFP).

The timing and level of composite or digital and analog component signals are measured in the time domain



## Audio analysis

The R&S®VT-K2150 audio analysis option is a tool for determining the quality of audio signals processed in user equipment. This option supports users in analyzing uncompressed audio data transmitted over MHL, HDMI or the analog inputs on up to eight channels based on audio parameters such as audio level, frequency response, interchannel phase, S/N ratio, distortion and crosstalk.

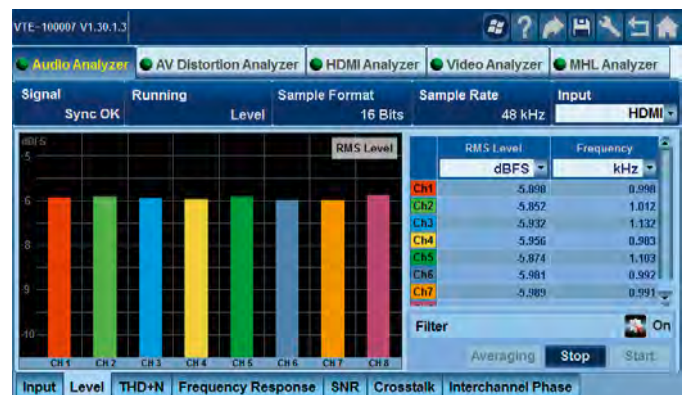
## Psycho-acoustic measurements

Speech quality assessment in line with ITU recommendations is optionally supported. Perceptual evaluation of speech quality (PESQ) in line with ITU-T P.862 is available with the R&S®VT-K2158 PESQ measurement option. Perceptual objective listening quality analysis (POLQA) in line with ITU-T P.863 can be performed with the R&S®VT-K2159 POLQA measurement option.

The difference picture analysis function detects video degradations and analyzes them using suitable metrics



The R&S®VT-K2150 audio analysis option supports essential audio measurements on the available interfaces



# RF TEST SIGNAL GENERATION FOR TV AND AUDIO BROADCAST STANDARDS

The R&S®VT-B600 broadcast TX modulator module is a cost-effective multistandard signal source with outstanding signal quality that supports all common broadcast systems. This module can generate signals for a wide range of standards – including audio and TV, analog and digital, terrestrial, satellite and cable.

## Realtime coding of all relevant analog and digital standards

The main function is realtime generation of modulated signals for a wide range of transmission standards. A powerful, universal hardware platform is used for baseband signal processing, which controls the broadband vector modulator. Users can switch from one transmission standard to another by loading the appropriate FPGA firmware.

Various modulation parameters such as constellation, code rate and FFT mode must be defined for each transmission standard. These parameters can be varied independently from the transport stream to be transmitted.

Digital and analog TV standards for cable, satellite and terrestrial transmission:

- ▶ Digital terrestrial TV: DVB-T2, DVB-T, ATSC/8VSB, ISDB-T, ISDB-T<sub>B</sub>, DTMB
- ▶ Digital satellite TV: DVB-S, DVB-S2, DIRECTV
- ▶ Digital cable TV: DVB-C, J.83/B, ISDB-C
- ▶ Digital mobile TV: DVB-H, T-DMB, ISDB-T 1-segment, CMMB, MediaFLO™, ATSC-M/H
- ▶ Analog TV: B/G, D/K, M/N, I, L
- ▶ Digital and analog audio broadcasting standards
- ▶ DAB, DAB+, ISDB-T<sub>SB</sub>, FM/RDS

## Integrated transport stream player and analog audio/video generator

The R&S®VT-B600 broadcast TX modulator comes with the baseband sources required for the installed transmission standards. User-defined test streams and signals from the Rohde&Schwarz stream library can be played out using the transport stream player. The audio/video generator can be used to generate PAL, SECAM and NTSC test patterns and audio signals for analog TV.

## Extensive test signal libraries of transport streams and analog test patterns

Rohde&Schwarz offers a wide range of transport stream libraries for its broadcast signal generators. For the transport stream generator, libraries for SDTV, HDTV, H.264, DVB-H, ISDB-T and TCM are available. The transport stream player supports libraries for DAB, DAB+, CMMB, ATSC-M/H, ISDB-TB and MediaFLO™.



The R&S®VT-B600 option generates test signals for stimulating broadcast receivers

# EASY OPERATION

## Local operation via touchscreen

The R&S®VTC video test center and R&S®VTE video tester have capacitive touchscreens to enable straightforward, intuitive control. The instruments also have a rotary knob and navigation keys, as well as ports for connecting a USB mouse and keyboard. They come with a DVI and a display port output to connect an external monitor. The R&S®VTS compact video tester is locally operated only with external I/O devices.

The graphical user interface and base software are identical on all units and support several languages.

## Remote control and remote operation over a network from a tablet or PC

The video testers can be operated remotely over a network from a tablet or PC using a remote desktop or VNC link. They are integrated into the network like a regular PC via Ethernet cable or additional Wi-Fi dongle.

## Remote control for integration in automated test systems

In addition to standard functions provided from the operating system, the test instruments have a VXI-11 remote control interface that accepts SCPI commands compliant with the industry standard. This makes it easy to integrate the instruments into automated test setups.

Remote control drivers for different development environments such as LabVIEW, C++ or Java are also provided.

## GUI of the R&S®VTC and R&S®VTE

Tabs for selecting an application with LED symbols indicating active/inactive status

Toolbar for fast access to important and global settings and information

The screenshot shows the GUI of the R&S VTC/VTE. At the top, there are tabs for 'MHL Generator', 'MHL Analyzer', and 'AV Distortion Analyzer'. The 'AV Distortion Analyzer' is active. Below the tabs is a toolbar with icons for Windows, help, refresh, save, settings, and home. The main display area is divided into several sections: 'Signal' (OK), 'Frame' (1 of 1), 'Cycle' (---), 'Synchronisation' (Self Referenced), 'Reference' (---), and 'Input' (MHL). The central part shows two video frames: 'Signal' and 'Reference', with a 'Difference' image below them. To the right is a results table with columns 'Current' and 'Worst'. Below the table are buttons for 'Start', 'Stop', and 'Clear'. At the bottom, there are secondary tabs for 'Input', 'List', and 'Trace'. A 'Settings' button is also visible in the bottom right corner.

	Current	Worst
Signal	OK	
Loop Detection	OK	
Frame	1	1
Cycle	---	---
[ - ] Video		
Freeze	OK	OK
Black Frame	OK	OK
PSNR Y	23.8dB	20.4dB
PSNR Cb	36.8dB	31.7dB
PSNR Cr	34.7dB	29.5dB
SSIM	0.968	0.631
Mos-V	---	---
[ + ] Audio Lost		

Secondary tabs for grouping the results and parameters for a given application, allowing different display modes to be activated

Result display shows configuration dialogs as well as graphical and numerical result windows for the currently active application

Control for starting or stopping measurements not run continuously and changing their configuration

# APPLICATION EXAMPLES

## Testing MHL and HDMI interfaces for conformance with the standard

The MHL and HDMI interface protocols of consumer electronics devices are tested for standard-conformant behavior during development and certification to ensure the devices' interoperability with other components. Especially at the development stage, the key capability required of test equipment is to display protocol parameters in realtime, with simultaneous decoding and analysis of the media content. A special application is conformance testing in line with the compliance test specifications (CTS) as a final interoperability test. The MHL/HDMI CTS tests require offline analysis of the raw data transmitted on the TMDS channels. Software extensions allow offline analysis to complement MHL/HDMI signal realtime analysis.

Testing video and audio interfaces on mobile devices such as tablets or mobile phones



## Testing video over LTE on mobile devices

With the introduction of LTE, more and more video content is transmitted via mobile radio links. Common applications include video conferencing and video streaming. To check the immunity to interference of video transmissions on the mobile device, mobile device conformance tests simulate interference on the LTE link. This is done by embedding errors in the IP data stream or by introducing noise or fading to degrade RF signal transmission.

A typical test setup consists of an R&S®CMW500 wideband radio communication tester, a mobile device with an MHL or HDMI video output, and an R&S®VTC video test center or R&S®VTE video tester with the appropriate interface cards and analysis options.

The R&S®CMW500 generates the video data stream and simulates errors that typically occur in the IP data stream during network transmission, such as packet delay and packet loss. The mobile phone decodes the incoming video data and outputs it to the video tester via its A/V interface. The video tester can then reliably detect video degradations, either operator-controlled or using automatic test routines.

## Testing A/V performance on set-top boxes, Blu-ray Disc™ and media players

For optimal playback of media content over set-top boxes, Blu-ray Disc™ and media players, it is necessary to test the quality and correctness of the actual A/V content. During development, tests need to be performed to determine the long-term stability, immunity to interference as well as video and audio quality. Equipped with the appropriate interface module and the various analysis options, the Rohde&Schwarz instrument is able to reproducibly measure these quality characteristics.

## Testing of sink devices such as TVs, projectors and A/V receivers

Manufacturers and test houses can use Rohde&Schwarz test and measurement instruments and the appropriate generator modules to measure HDMI and MHL sinks in various test scenarios. In addition to testing format support and protocols, which are purely functional tests, sophisticated A/V test sequences can be used to test the picture processing unit and panel characteristics.

The R&S®VTC and the R&S®SFU for testing a set-top box



# ORDERING INFORMATION

Designation	Type	Order No.
<b>Base units and extensions</b>		
<b>Base units</b>		
Video test center	R&S®VTC	2115.7400.02
Video tester	R&S®VTE	2115.7300.02
Compact video tester	R&S®VTS	2115.7100.02
<b>Base unit extension</b>		
480 Gbyte SSD HDD	R&S®VT-B3025	2115.7697.02
<b>HDMI options (600 MHz)</b>		
<b>HDMI module option</b>		
HDMI RX/TX 600 MHz module	R&S®VT-B2363	2115.7716.06
<b>HDMI generator options</b>		
HDMI TX	R&S®VT-K364	2115.8570.02
HDMI moving pictures	R&S®VT-K361	2115.7545.02
HDMI user defined timing	R&S®VT-K362	2115.8293.02
<b>HDMI analyzer option</b>		
HDMI RX	R&S®VT-K2364	2115.8587.02
<b>HDMI CTS testing options</b>		
HDMI 1.4 CTS sink test	R&S®VT-K367	2115.8612.02
HDMI 2.0 CTS sink test	R&S®VT-K368	2115.8629.02
HDMI 1.4 CTS source test	R&S®VT-K2367	2115.8635.02
HDMI 2.0 CTS source test	R&S®VT-K2368	2115.8641.02
<b>HDMI options (300 MHz)</b>		
HDMI TX 300 MHz	R&S®VT-B360	2115.7500.06
HDMI CTS sink test	R&S®VT-K365	2115.8312.02
HDMI RX 225 MHz	R&S®VT-B2360	2115.7616.06
HDMI RX 300 MHz	R&S®VT-B2361	2115.7639.06
HDMI CTS source test	R&S®VT-K2365	2115.8270.02
CEC tracer	R&S®VT-K2366	2115.8306.02
<b>MHL options</b>		
MHL RX/TX	R&S®VT-B2350	2115.7622.06
MHL RX PackedPixel	R&S®VT-B2351	2115.7645.06
MHL CTS system sink test	R&S®VT-K355	2115.8006.02
MHL CTS system source test	R&S®VT-K2355	2115.8012.02
CBUS tracer	R&S®VT-K2356	2115.8287.02
<b>TDA options</b>		
TMDS time domain analyzer	R&S®VT-B2380	2115.7597.06
HDMI type A TPA (plug)	R&S®VT-Z2385	2115.7668.02
HDMI CTS source test (elec.)	R&S®VT-K2385	2115.8529.02
<b>Analog options</b>		
Analog A/V RX	R&S®VT-B2370	2115.7600.06
Component support	R&S®VT-K2371	2115.8258.02
<b>AV analysis options</b>		
Video analysis	R&S®VT-K2100	2115.8029.02
Video measurements	R&S®VT-K2101	2115.8264.02
A/V distortion analysis	R&S®VT-K2111	2115.8041.02
Audio analysis	R&S®VT-K2150	2115.8235.02
Speech quality measurement PESQ	R&S®VT-K2158	2115.8541.02
Listening quality analysis POLQA	R&S®VT-K2159	2115.8558.02

Designation	Type	Order No.
<b>Broadcast modulator options</b>		
<b>Modulator options</b>		
Broadcast TX modulator	R&S®VT-B600	2115.7522.06
Frequency extension 3 GHz	R&S®VT-K3083	2115.8335.02
Electronic attenuator 110 dB	R&S®VT-K3084	2115.8341.02
AWGN generator	R&S®VT-K1340	2115.8329.02
Extended I/Q input	R&S®VT-K2600	2115.8358.02
<b>Digital modulation systems</b>		
DVB-T/DVB-H coder	R&S®VT-K601	2115.8106.02
DVB-C/ISDB-C/J.83/B coder	R&S®VT-K602	2115.8112.02
DVB-S/DVB-S2 coder	R&S®VT-K608	2115.8135.02
ISDB-T/ISDB-T <sub>SB</sub> /ISDB-T <sub>B</sub> coder	R&S®VT-K606	2115.8129.02
T-DMB/DAB coder	R&S®VT-K611	2115.8158.02
DTMB(GB20600-2006) coder	R&S®VT-K612	2115.8164.02
DIRECTV legacy modulation coder	R&S®VT-K609	2115.8141.02
CMMB coder	R&S®VT-K615	2115.8170.02
DVB-T2 coder	R&S®VT-K616	2115.8187.02
DVB-C2 coder	R&S®VT-K617	2115.8193.02
ATSC-M/H 8VSB coder	R&S®VT-K618	2115.8206.02
<b>Analog modulation systems</b>		
FM/RDS coder	R&S®VT-K670	2115.8212.02
ATV Multistandard coder	R&S®VT-K695	2115.8229.02
<b>Digital baseband</b>		
TRP player	R&S®VT-K22	included in R&S®VT-B600
Basic stream library	R&S®LIB-K70	2116.9558.02
Extended SDTV library	R&S®LIB-K71	2116.9564.02
Extended HDTV library	R&S®LIB-K72	2116.9570.02
3D TV library	R&S®LIB-K73	2116.9587.02
T-DMB/DAB streams	R&S®LIB-K51	2116.9364.02
DAB+ streams	R&S®LIB-K53	2116.9387.02
ISDB-T <sub>B</sub> streams	R&S®LIB-K54	2116.9393.02
CMMB streams	R&S®LIB-K55	2116.9406.02
ATSC and ATSC Mobile DTV streams	R&S®LIB-K56	2116.9412.02
DVB-T2 MI streams	R&S®LIB-K57	2116.9429.02
EMC streams	R&S®LIB-K58	2116.9435.02
DMB streams France	R&S®LIB-K59	2116.9441.02
Customer-specific transport streams	R&S®DV-SCA	on request
<b>Analog baseband</b>		
Video generator	R&S®VT-K23	included in R&S®VT-B600
ATV video signals	R&S®LIB-K50	2116.9358.02
Customer-specific analog signals	R&S®ATV-SCA	on request



## Service options

Extended warranty, one year	R&S°WE1	
Extended warranty, two years	R&S°WE2	
Extended warranty, three years	R&S°WE3	
Extended warranty, four years	R&S°WE4	Please contact your local
Extended warranty with calibration coverage, one year	R&S°CW1	Rohde&Schwarz sales office.
Extended warranty with calibration coverage, two years	R&S°CW2	
Extended warranty with calibration coverage, three years	R&S°CW3	
Extended warranty with calibration coverage, four years	R&S°CW4	

**Архангельск** (8182)63-90-72  
**Астана** (7172)727-132  
**Астрахань** (8512)99-46-04  
**Барнаул** (3852)73-04-60  
**Белгород** (4722)40-23-64  
**Брянск** (4832)59-03-52  
**Владивосток** (423)249-28-31  
**Волгоград** (844)278-03-48  
**Вологда** (8172)26-41-59  
**Воронеж** (473)204-51-73  
**Екатеринбург** (343)384-55-89  
**Иваново** (4932)77-34-06

**Ижевск** (3412)26-03-58  
**Иркутск** (395)279-98-46  
**Казань** (843)206-01-48  
**Калининград** (4012)72-03-81  
**Калуга** (4842)92-23-67  
**Кемерово** (3842)65-04-62  
**Киров** (8332)68-02-04  
**Краснодар** (861)203-40-90  
**Красноярск** (391)204-63-61  
**Курск** (4712)77-13-04  
**Липецк** (4742)52-20-81

**Киргизия** (996)312-96-26-47

**Магнитогорск** (3519)55-03-13  
**Москва** (495)268-04-70  
**Мурманск** (8152)59-64-93  
**Набережные Челны** (8552)20-53-41  
**Нижний Новгород** (831)429-08-12  
**Новокузнецк** (3843)20-46-81  
**Новосибирск** (383)227-86-73  
**Омск** (3812)21-46-40  
**Орел** (4862)44-53-42  
**Оренбург** (3532)37-68-04  
**Пенза** (8412)22-31-16

**Россия** (495)268-04-70

**Пермь** (342)205-81-47  
**Ростов-на-Дону** (863)308-18-15  
**Рязань** (4912)46-61-64  
**Самара** (846)206-03-16  
**Санкт-Петербург** (812)309-46-40  
**Саратов** (845)249-38-78  
**Севастополь** (8692)22-31-93  
**Симферополь** (3652)67-13-56  
**Смоленск** (4812)29-41-54  
**Сочи** (862)225-72-31  
**Ставрополь** (8652)20-65-13

**Казахстан** (772)734-952-31

**Сургут** (3462)77-98-35  
**Тверь** (4822)63-31-35  
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**Тула** (4872)74-02-29  
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**Ульяновск** (8422)24-23-59  
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**Челябинск** (351)202-03-61  
**Череповец** (8202)49-02-64  
**Ярославль** (4852)69-52-93