Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as Spectrum Analyzers, Signal Generators, Oscilloscopes, Power Meters, Network Analyzers etc from all the major suppliers such as Keysight, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. We fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 1 year warranty. Our staff have extensive backgrounds in T&M which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, presenting flexible technical + commercial solutions and supplying a loan unit during warranty repair, if available.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based in at Oakley, Bedfordshire in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our 40GHz in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

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R&S®DVM Family

DTV monitoring and analysis

Product Brochure | 03.00

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75 Years of Driving Innovation

ROHDE&SCHWARZ

R&S®DVM Family
At a glance

The R&S®DVM family of instruments combines the tools needed for all monitoring and analysis applications in the area of digital television signal generation and distribution. An extensive range of analysis tools is available to support the development and testing of digital television equipment such as multiplexers, encoders, modulators and associated components.

The R&S®DVM family consists of four base units and one expansion unit, all of which have extremely compact designs. All four base units can be configured in accordance with customer requirements and expanded whenever necessary.

Multiple RF, IP and transport stream signals can be monitored and analyzed simultaneously. For example, up to four RF signals can be monitored in a single height unit at the same time.

Extensive testing can be carried out on a variety of data services. Such as videotext, subtitles, system software updates (SSU) and DVB-H signals including electronic service guide (ESG). Video and audio elementary streams (MPEG-2, MPEG-4/AVC/H.264, AAC and AC-3) are analyzed using special software tools.

A hardware decoder processes SD and HD signals coded with either MPEG-2 or MPEG-4/AVC/H.264 to enable the fast and simple analysis of various video formats. Using the qPSNR analysis, the encoding quality of these video signals is also tested and visualized in realtime.

- Minimal installation effort due to low space requirements and combination of various functions in one instrument
- Minimal training required due to intuitive operating concept
- Cost-effective and future-ready modular design
- Portable and simple operation due to small, lightweight design and integrated display (R&S®DVM400)

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R&S®DVM400

R&S®DVM400 – universal and portable

R&S®DVM400 – universal and portable

- Broadest scope of functions – ideal for development and maintenance
- Monitoring/analysis of transport streams and contents
- Monitoring, analysis and demodulation of RF signals of various standards
- Monitoring, analysis and transcoding of IPTV signals (Gigabit Ethernet)
- Powerful generator and recorder options with extensive TS libraries and TS multiplexer software
- Simultaneous operation of multiple functions
- Small and lightweight, therefore ideal for portable applications

R&S®DVM100/R&S®DVM100L – the space saver

R&S®DVM100/R&S®DVM100L – the space saver

- Ideal for network operators and program providers
- Monitoring/analysis of transport streams and contents
- Monitoring, analysis and demodulation of RF signals [1] of various standards
- Monitoring of up to 20 signals in one system when expanded with the R&S®DVM120

R&S®DVM50 – the starter package

R&S®DVM50 – the starter package

- Particularly cost-effective solution for all monitoring and analysis tasks, whether in the lab, for service applications or unattended in the field
- Monitoring/analysis of transport streams and contents
- Monitoring, analysis and demodulation of RF signals of various standards
- Operation via external PC

R&S®DVM120 – the expansion unit

R&S®DVM120 – the expansion unit

- Add-on to the R&S®DVM100, R&S®DVM100L and R&S®DVM400 for simultaneous monitoring of more than four signals in one system
- Integration into the base unit user interface

[1] R&S®DVM100L only.

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R&S®DVM Family
Benefits and key features

Variety of interfaces for high flexibility
- Support for different types of interfaces
- Low space requirements – simultaneous utilization of different interfaces

Security due to extensive range of monitoring functions
- Detailed monitoring and error logging
- Complete monitoring of all important RF characteristics
- R&S®DVM400: complete monitoring of up to 512 TS IP connections
- Monitoring of transport stream characteristics in accordance with TR 101290 and other advanced criteria
- Monitoring of additional characteristics using templates
- Simple recording and archiving of transport stream segments by means of the TS Capture function

Effective operation due to detailed configuration options
- Individually configurable measurements
- Permanent or temporary suppression of error messages with Hiding of Events function
- Protection against unauthorized use with Protection Management function
- Monitoring of multiple signals through a single input with Scheduler Suite

Powerful network functions
- Operation via an integrated web server
- Integration in network management systems via the built-in SNMP interface
- Transmission of transport stream elements or programs in the network using the Streaming function
- Simple data exchange using FTP
- Firewall-protected access

Extensive analysis and visualization functions
- In-depth TS analysis including PCR and PTS
- Analysis of DVB-H signals, including ESG
- Detailed data service analysis
- Analysis of video encoding quality (qPSNR analysis)
- Detailed elementary stream analysis using separate software tools

Fast program identification and video quality assessment
- Extensive functions decoding

Transport stream recording and generation
- The R&S®DVM400 offers additional functions for recording and generating transport streams

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Rear view of the R&S®DVM100L, including four ASI and two RF interfaces

Variety of interfaces for high flexibility

Support for different types of interfaces

A wide variety of interfaces are available with the R&S®DVM family of instruments:

- TS interfaces
  - ASI/SMPTE310M
  - SPI (R&S®DVM400 only)
- IP interfaces (R&S®DVM400 only)
  - Electrical (RJ-45)
  - Optical (SFP housing)
- RF interfaces
  - DVB-T/H (2k and 8k mode)
  - DVB-S/S2
  - DVB-C
  - J.83/B
  - ATSC/8VSB

Low space requirements – simultaneous utilization of different interfaces

Different types of interfaces can be integrated in a single instrument at the same time. The R&S®DVM400, for example, can be furnished with all of the aforementioned interfaces. Even multiple interfaces of the same type can be installed. Each of the R&S®DVM instruments can simultaneously monitor up to four signals. The R&S®DVM50 can monitor a maximum of four DVB-T signals, for example. The R&S®DVM120 expansion unit makes it possible to monitor up to eight additional signals. In addition to being internally measured, transport streams contained in RF and IP signals can also be output over BNC connectors.

Large-scale integration offers significant advantages:

- Monitoring applications: simple integration even when space is at a premium
- Portable operation in different networks: Only one instrument is required, regardless of the transmission standard being used

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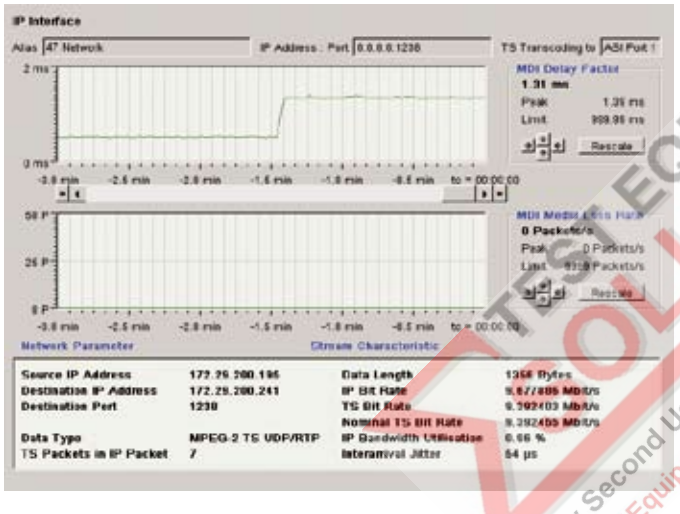
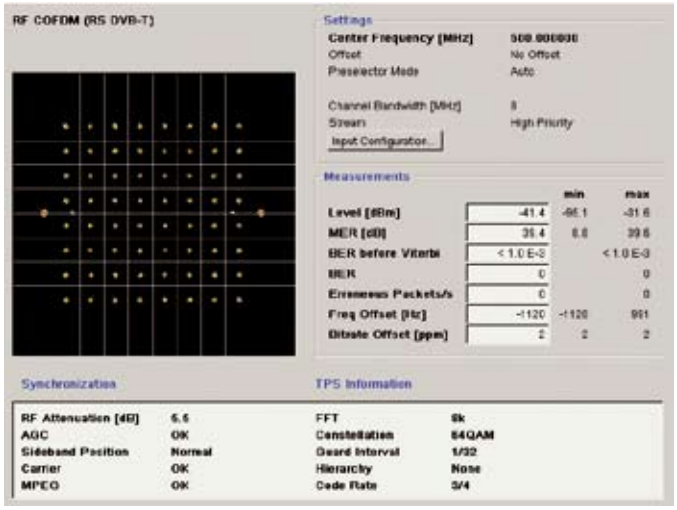
Side view of the R&S®DVM400 with all available interfaces except for the SPI interface, which is on the front panel

Security due to extensive range of monitoring functions

Overview of the measurement results of a TS IP connection including the graphic display of delay factor and media loss rate



Constellation diagram and measurement results displayed for a DVB-T signal



Detailed monitoring and error logging

All signals are monitored seamlessly at the RF, IP and multiplex levels (MPEG-2 TS). Errors are logged with detailed additional information and statistically recorded. Each error scenario triggers alarm relays, SNMP traps and display icons. The user can individually configure the alarm triggers.

Complete monitoring of all important RF characteristics

The signal characteristics that can be monitored include level, frequency deviation, BER, MER, C/N, SNR and E_b/N_o.[1)]

The constellation diagram presents the measurement results in a clear structure. The measurement accuracy is outstanding. When performing a MER measurement of a DVB-T signal for instance, a typical value of 38 dB is achieved. This enables the detection of even minor signal modifications at high signal quality.

R&S®DVM400: complete monitoring of up to 512 TS IP connections

Extensive measurements permit a reliable assessment of the signal quality. These measurements include delay factor (MDI-DF), media loss rate (MDI-MLR), IP bit rate, IP packet jitter, IP inter-arrival time and payload bit rate. The MDI-DF and MDI-MLR measurement results are graphically displayed for simple analysis.

Monitoring of transport streams in accordance with TR 101290 and other advanced criteria

All [2)] of the characteristics specified in the TR 101 290 Measurement Guidelines with priority 1, 2 and 3 are simultaneously monitored for every component of all transport streams being analyzed.

1) Measurements are standards-dependent.
2) Buffer-related measurements are excluded. These can be analyzed for a selected video or audio element.

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Additional monitoring criteria

- Encryption: verification of the encryption status and the changing of the key (odd/even)
- TS Modification: This function checks whether the transport stream has been modified. Under certain conditions, these modifications can go undetected when performing measurements in line with TR 101 290, but they may be unintentional. Audio loss, for example, is not detected in line with TR 101 290 if the multiplexer modifies the PMT accordingly
- DVB-H signals: Monitoring is performed to check the time slicing and to determine whether the transmitted content is received intact and error-free
- SFNs (DVB-T): The MIP is completely monitored in line with TR 101 290
- Data rates: Element types such as audio and video are monitored to determine if they comply with the specified upper and lower data rate limits. For intermittent transmissions such as with DVB-H, the duration of the measurement cycle for averaging can be set for as long as 150 seconds. Shorter measurement cycles (100 ms) can be selected in order to determine data rate peaks. The various profiles (MGB) are implemented in line with TR 101290. This ensures the comparability of the results

Monitoring of additional characteristics using templates

Template monitoring allows the comparison of numerous transport stream characteristics with predefined values. There are many types of errors that can only be detected in this way. For example:

- Missing programs
- Missing program elements such as audio
- Data rates that exceed or fall short of the specified limits for single programs or components
- Incorrect program identifiers

A special feature of this function is the automatic generation of a template based on the transport stream being applied. The template is generated simply by pressing a key, which eliminates cumbersome manual setup.

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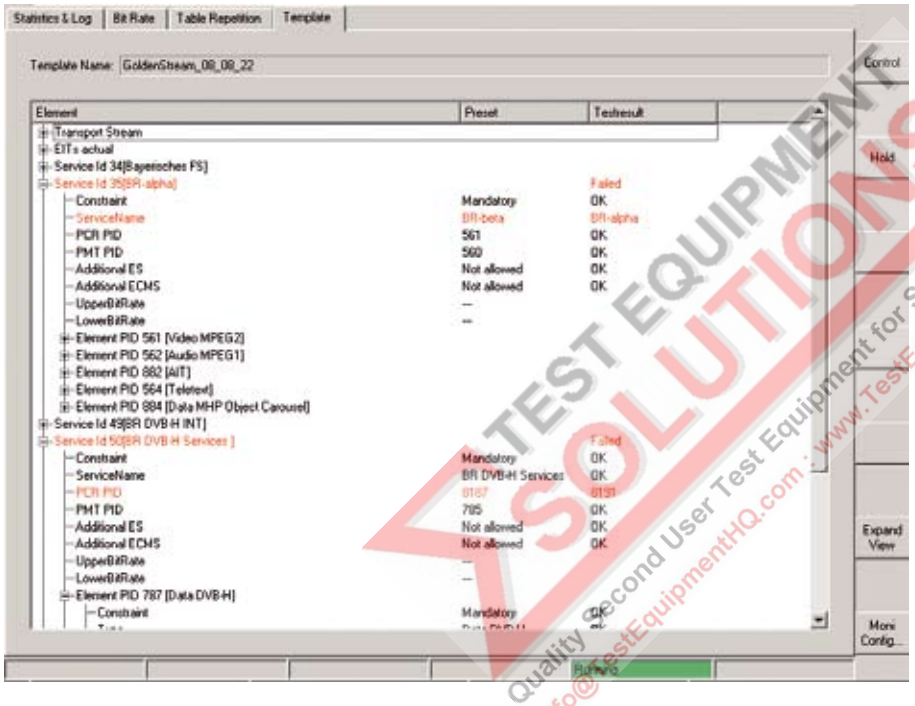
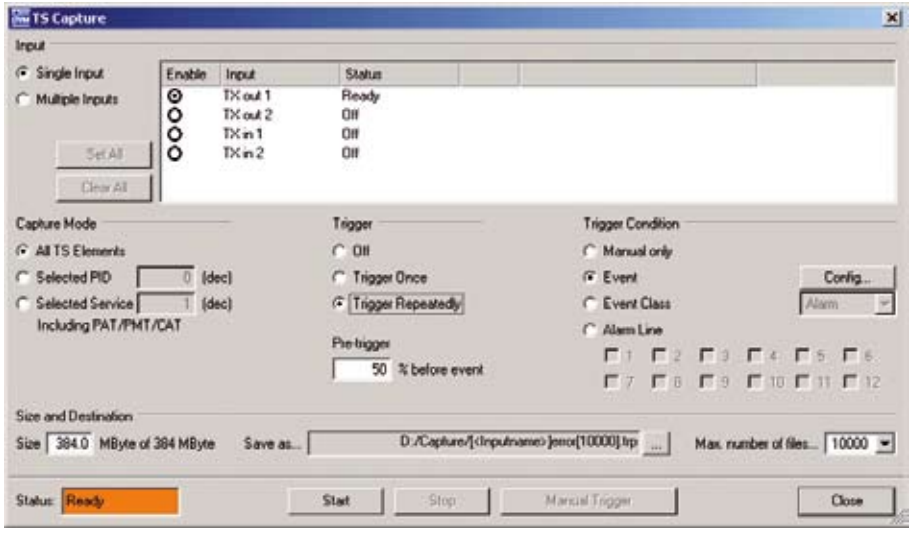
R&S®DVM graphical user interface: overview of the monitored signals as well as the contents of a selected signal (left), log entries and error counter (right)

Simple recording and archiving of transport stream segments by means of the TS Capture function

The TS Capture function allows event-controlled archiving of transport stream segments on the system hard disk for later analysis and for verification or documentation purpose. This makes it possible to automatically record incorrect segments. The function supports simultaneous monitoring of up to 20 transport streams. The TS recordings can be configured by means of versatile settings such as PID filter, pretrigger size and start event.



Fast and simple verification of the measurement results derived from the Template monitoring function



TS Capture: configuration window

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Effective operation due to detailed configuration options

Individually configurable measurements

Each measurement can be individually activated. In addition to measurement-specific properties, characteristics such as threshold values and priority level can be configured.

Permanent or temporary suppression of error messages with Hiding of Events function

The Hiding of Events function permits the permanent or temporary suppression of error messages for specific measurements and TS elements. Messages related to already detected but unrecoverable errors can be suppressed without completely deactivating the measurement in progress.

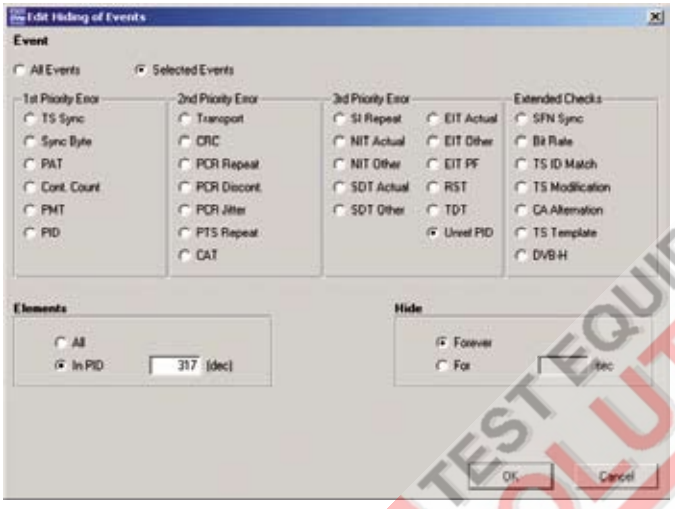
Protection against unauthorized use with Protection Management function

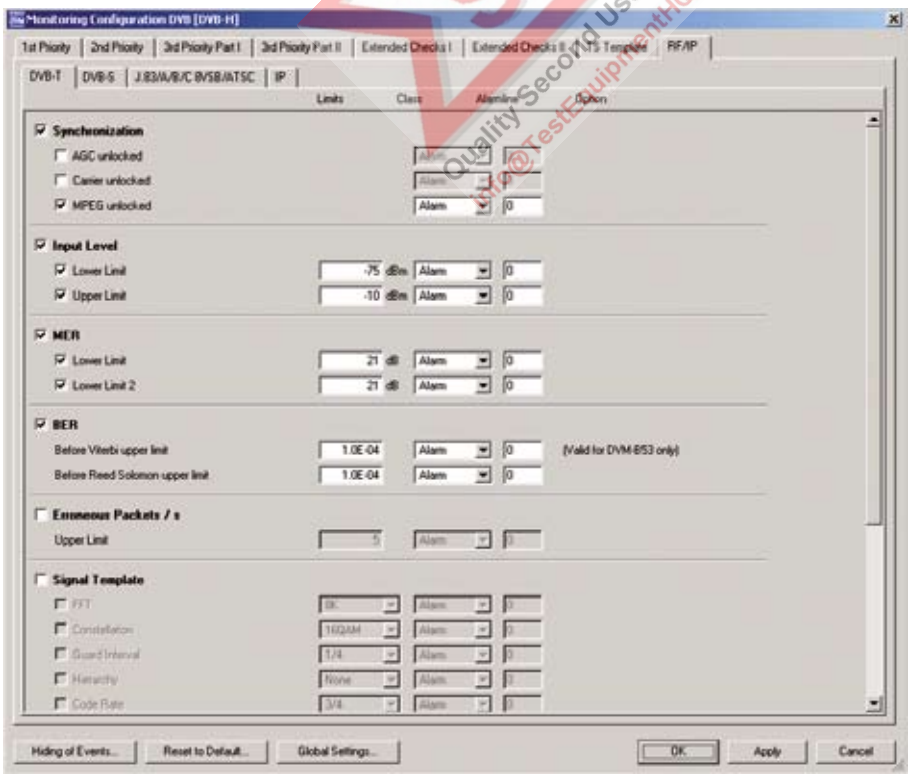
In the case of monitoring applications, multiple users might need access to the same instrument. These users might have to perform different tasks. To prevent incorrect operation and unauthorized access, different functions can be individually activated for each user:

- Viewer: display of monitoring results and settings
- Operator: viewer rights plus use of analysis tools, start, stop and clear for monitoring
- Administrator: operator rights plus configuration of the monitoring functions and the instrument, operations with data files, firmware update and access to the operating system

Each user receives a unique user name and password.

Configuration window of Hiding of Events function





Monitoring configuration: configuration window for all signal monitoring measurements; the RF measurements tab is shown

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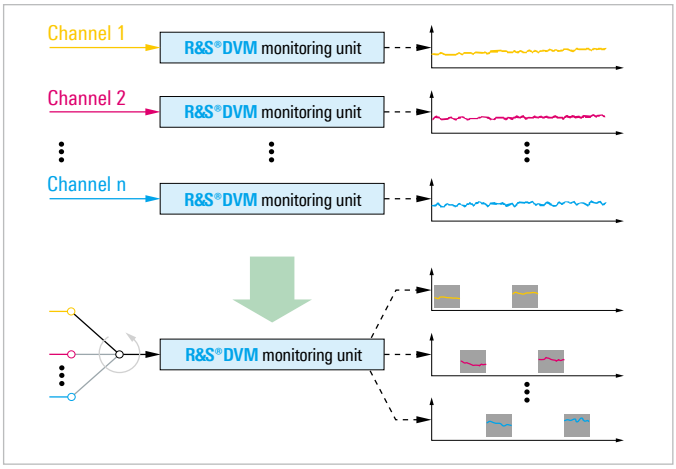


The Scheduler Suite enables a single unit of the R&S®DVM monitoring system to check any number of channels in sequence

Monitoring of multiple signals through a single input with the Scheduler Suite

The Scheduler Suite expands the functionality of the instruments through the automatic, time-controlled switching of the monitored signal and the monitoring configuration.

In addition, the Scheduler Suite logs the RF measurement values and provides a graphic display.

Switching of the signal

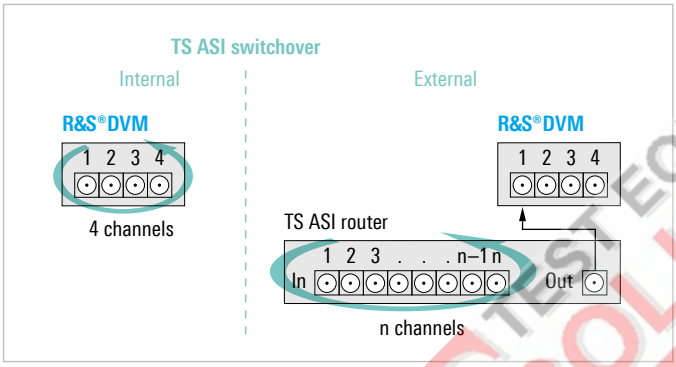
By switching between signals or interfaces, multiple signals can be sequentially monitored with only one instrument:

- ASI: selection of a different interface on the instrument or on an external ASI switching matrix
- RF: selection of a different receive frequency
- IP: selection of a different IP address

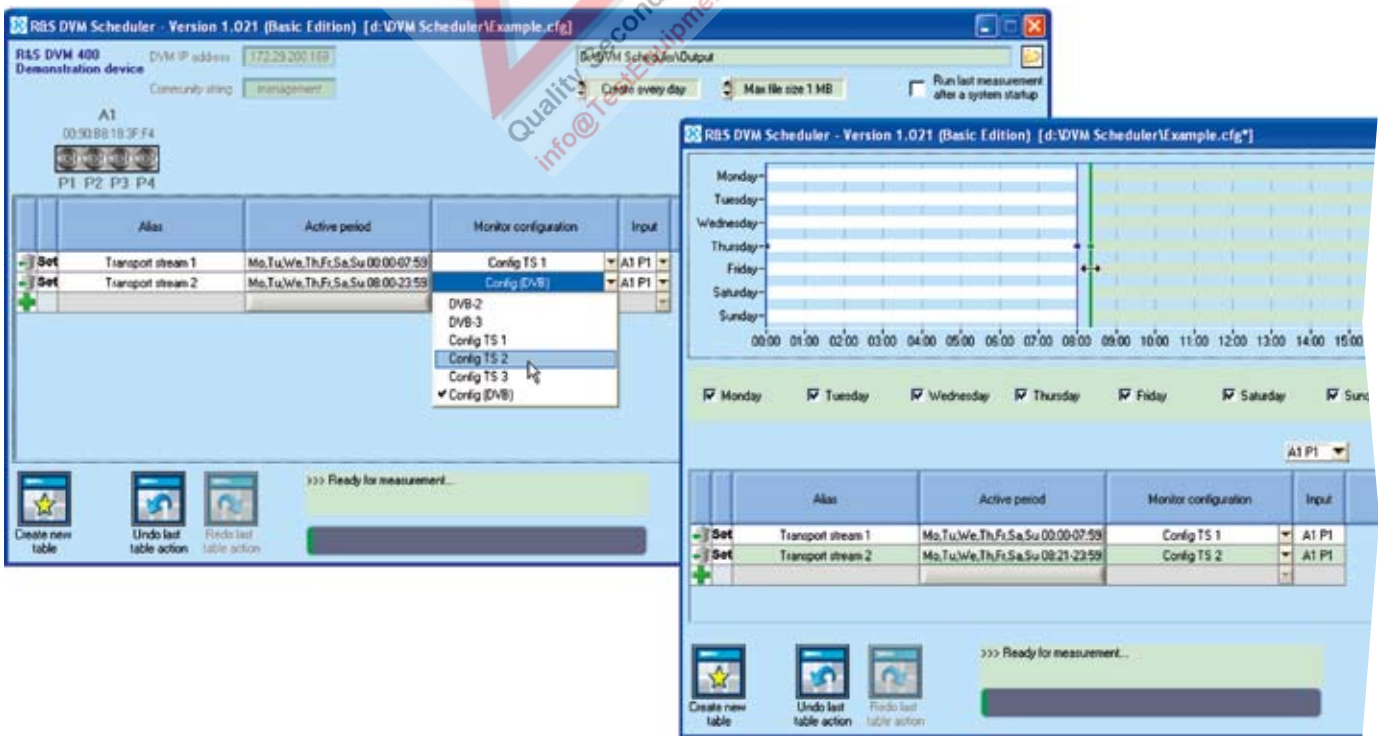
Monitoring configuration

The current monitoring configuration can be adapted automatically when a different signal is selected. This ensures that the configuration always matches the signal being monitored.

The internal ASI switching matrix of the R&S®DVM monitoring systems permits cyclic selection of four TS ASI feeds; this number can be increased by using an external router



Configuration of the monitoring times by means of the graphical user interface



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Powerful network functions

Operation via an integrated web server

The integrated web server permits convenient remote operation of the instruments. This is done via an Internet browser that supports Java. The web servers supports two types of access:

- Using the Viewer application, measurement results from up to five different locations can be independently and simultaneously reviewed. All monitoring results, including the graphic displays, are shown. Up to six constellation diagrams can be simultaneously displayed
- The R&S®DVM Desktop application can be used to conduct analyses and modify configurations. The functions correspond to those on the instrument and access can be restricted with the Protection Management feature

Integration in network management systems via the built-in SNMP interface

The instruments of the R&S®DVM family feature an SNMP interface, allowing easy integration into network management systems. Errors detected by the instrument are signaled via SNMP traps. Each of the monitoring functions is individually configurable. All results derived from the monitoring functions can be queried.

Transmission of transport stream elements or programs in the network using the Streaming function

Selected TS elements or programs can be sent to any network IP address for external processing and analysis. This function, which is available with each instrument of the R&S®DVM family, can be carried out independent of an IPTV interface. It can be used, for example, to display a video program on a remote PC.

For some applications, a low data rate must be maintained. In this case, the Low Bit-Rate Streaming function can be used to significantly reduce the data rate of MPEG-2 SDTV signals (~ 400 kbit/s).

Simple data exchange using FTP

The instruments of the R&S®DVM family feature a password-protected FTP server for the simple exchange of data.

Firewall-protected access

An integrated firewall protects the instruments from unauthorized access.

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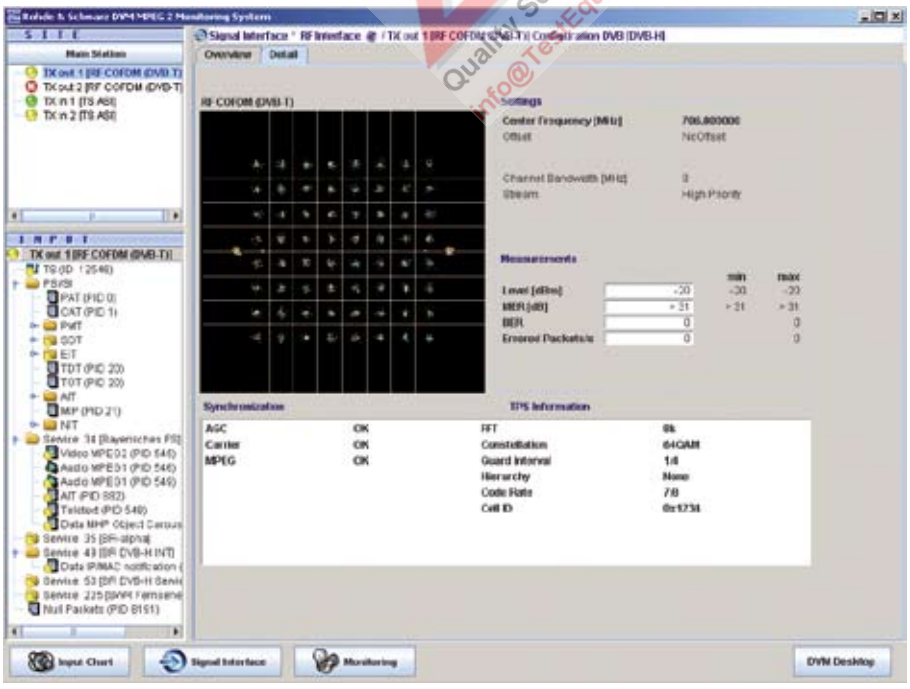
Presentation of the measurement results with the Viewer application



Extensive analysis and visualization functions

All analysis and visualization functions can be used during monitoring. The graphical user interface is structured so that it also displays the status of all monitored signals.

In-depth TS analysis including PCR and PTS

- Graphic display of data and table repetition rates with average, maximum and minimum values
- SI, PSI and PSIP table interpretation
- TS and PES packet header interpretation
- Header MAP
  Graphic display of the TS packet distribution of a select PID in the transport stream
- PCR analysis
  Graphic display of PCR offset, PCR drift rate, PCR overall jitter, PCR accuracy, PCR repetition with zoom and scroll functions
  Profiles: MGF1, MGF2, MGF3
- PTS analysis
  Graphic display of PTS/PCR delay and PCR repetition with zoom and scroll functions
- Realtime buffer analysis
  - Graphic display of the various model buffers
  - Supported video formats: SDTV and HDTV, MPEG-2 and H.264/AVC/MPEG-4 coded
  - Supported audio format: MPEG-1 layer 2
  - Methods: video buffer verifier (VBV), leak method, hypothetical reference decoder (HRD)

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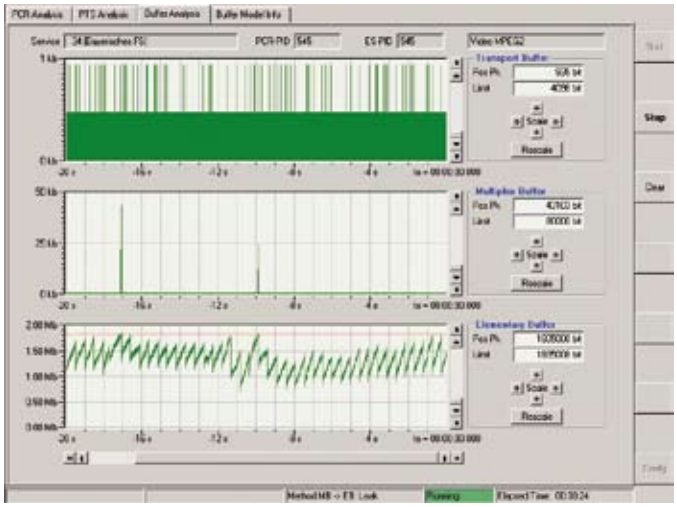
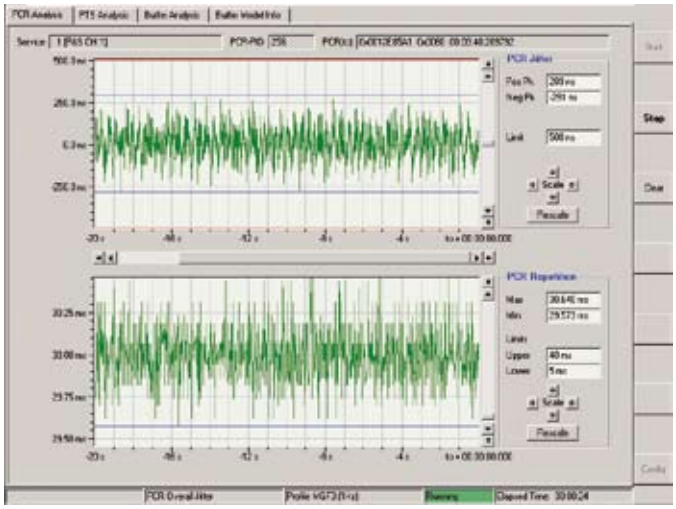
Buffer analysis: display of the individual buffers in chronological sequence



PCR analysis: display of the measurement values in chronological sequence

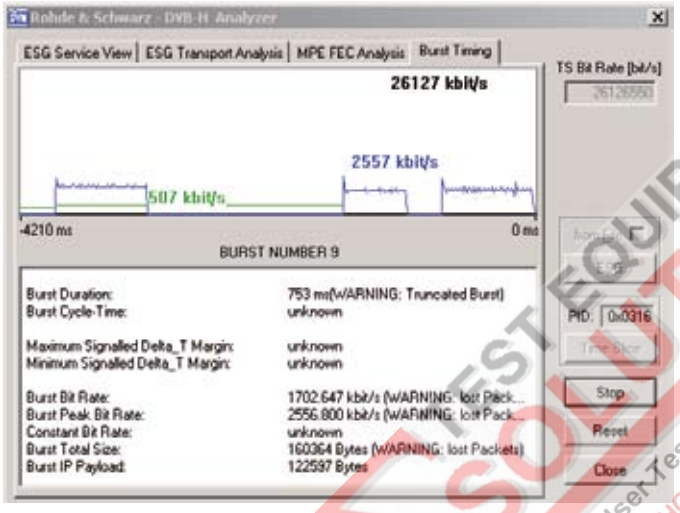


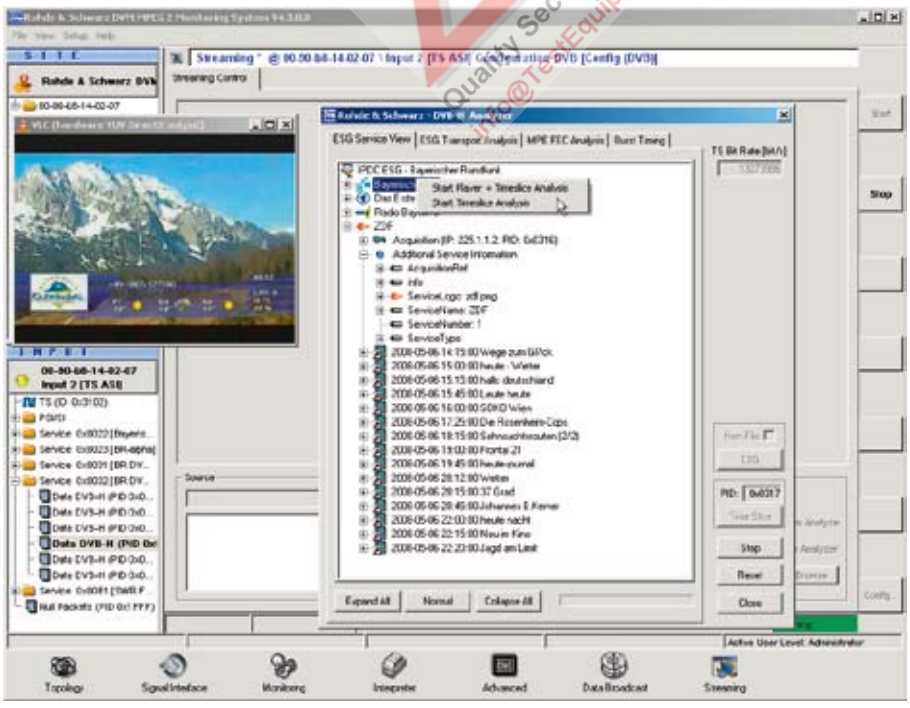
Analysis of DVB-H signals, including ESG

All important characteristics of a live signal are analyzed in detail:

- Time slicing and bursts
  Graphic display of the data rates as well as detailed information regarding the data rates and timing
- MPE FEC
  - Error protection characteristics: data segment and structure
  - Detected transmission errors: before and after FEC (row, frame and IP packets)
- Electronic service guide (ESG)
  - Support for OMA BCAST ESG and DVB IPDC ESG (XML format)
  - Parsing information and warnings
  - Checking of the signaling in the transport stream (PSI/SI, NIT and INT linkage)
  - Checking of the ESG processing flow
  - ESG service view: overview of all programs with dvmdetailed information
  - ESG transport analysis view: display of the ESG protocol components (FDT elements, bootstrap, SGDD, SGDU, etc.)
  - Saving of extracted ESG files
  - Saving of analysis reports
- Video decoding
  - Realtime de-encapsulation and forward error correction of individual programs
  - Display of the decoded program

Analysis of DVB-H time slicing





R&S®DVM GUI with ESG service view and decoded DVB-H program

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Detailed data service analysis

The transmission protocols of a wide range of data service can be analyzed directly in the live signal. The following protocols are supported:

- DVB object carousel – MHP application download
- DVB data carousel – system software update (SSU)
- Multiprotocol encapsulation (MPE) – IP data transmission
- Data streaming – videotext, subtitles, VPS, WSS and proprietary data transmission
- Data piping – proprietary data transmission

Extensive analysis functions are available:

- Checking of data services signaling
- Interpreter for the protocol segments
- Raw data display of the transmitted content
- Extensive timing measurements: data rates, repetition rates and loading times for object and data carousels

Analysis of video encoding quality (qPSNR analysis)

The encoding quality (qPSNR) of a selected program is analyzed in realtime. Supported video formats are SDTV and HDTV up to 1080i, MPEG-2 or H.264/AVC/MPEG-4 coded. The analysis encompasses the following:

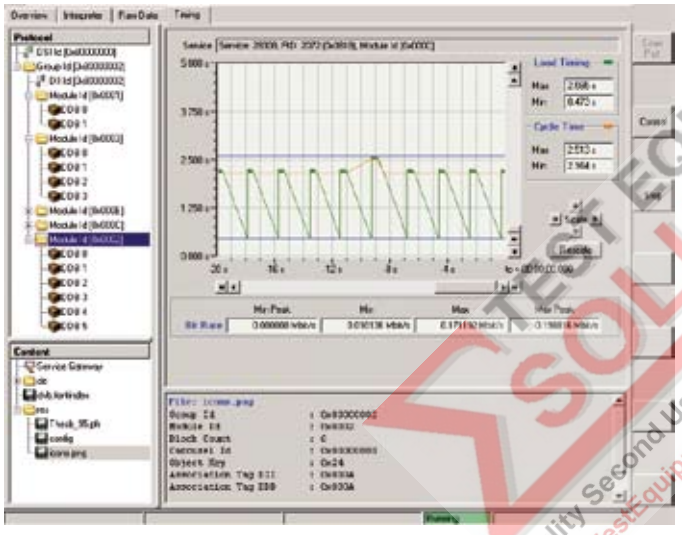
- Continuous monitoring of all I frames
- Graphic display of the qPSNR values versus time and as a histogram
- Logging of all measurement values in a .CSV file on the hard disk
- Offline analysis of I, B and P frames if quality falls below preset limits

Detailed elementary stream analysis using separate software tools

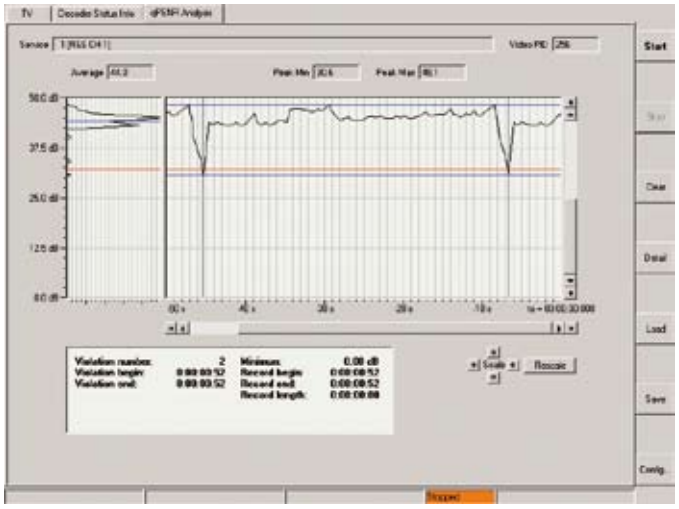
The analysis of video and audio elementary streams is carried out using separate software tools.

- R&S®DV-ESA: detailed analysis of MPEG-2 video elementary streams
- R&S®DVM-K200/201: detailed analysis of video elementary streams (H.264/AVC/MPEG-4 coded) and audio elementary streams (MPEG-1/2, AAC or Dolby AC-3 coded)

Carousel analysis



qPSNR analysis – analysis of the video encoding quality



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Fast program identification and video quality assessment

Extensive functions decoding

The optional hardware decoder allows any program in the various transport streams to be decoded. The transport stream is fed into the instrument via an RF, IP or ASI interface. Supported formats:

- Video: SDTV and HDTV up to 1080i, MPEG-2 or H.264/AVC/MPEG-4 coded
- Audio: MPEG-1 layer 2 and Dolby Digital

The video and audio signals can be presented on external displays through a wide variety of interfaces [1] (DVI/HDMI, SDI/HD-SDI, RGB/YPbPr and CCVS).

An on-screen display (OSD) provides a quick overview of the technical characteristics of an HD video signal.

With the R&S®DVM400, the picture is also presented on the integrated display.

[1] Instrument-dependent.

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Decoded picture with OSD

Transport stream recording and generation

The R&S®DVM400 offers additional functions for recording and generating transport streams
This functionality is controlled via an additional GUI.

The features include the following:

- Seamless and endless generation of MPEG-2 transport streams
- Transport stream recording and playback
- Extensive transport libraries
  For details, see the "Stream Libraries" data sheet, PD 5213.7202.31
- Software for generating transport streams
  The R&S®DV-ASC advanced stream combiner software option makes it possible to create transport streams for generation via the R&S®DVM400 generator hardware. The functions are described in the R&S®DV-ASC data sheet, PD 5213.7654.31

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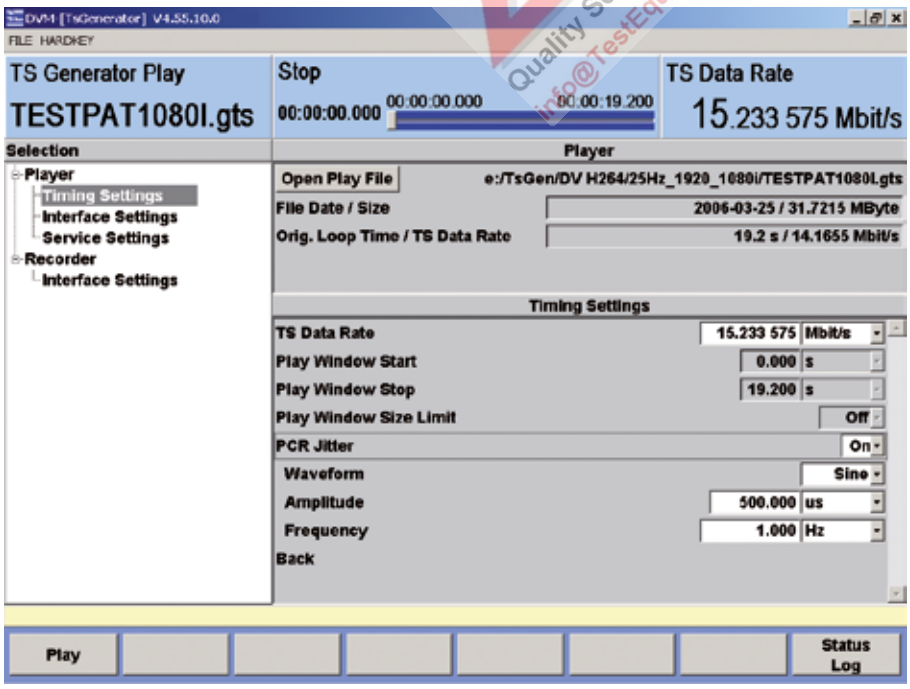
Graphic user interface for transport stream recording and generation



R&S®DVM Family

Model overview

Base units					Expansion unit
	R&S®DVM50 [1]	R&S®DVM100	R&S®DVM100L	R&S®DVM400	R&S®DVM120
Height	1 HU	1 HU	1 HU	4 HU	1 HU
Number of transport streams that can be monitored in parallel	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4 (with RF inputs) 1 to 8 (without RF inputs)
Number of RF signals that can be demodulated and monitored in parallel	1 to 4	–	1 to 2	1 to 4	1 to 4
Expansion by the R&S®DVM120 for a total of:	–	20 TS and 16 RF inputs	20 TS and 18 RF inputs	20 TS and 20 RF inputs	–
Local operation	PC required	via external monitor, external keyboard and mouse	via external monitor, external keyboard and mouse	integrated color display, keys and rotary knob; if necessary, external mouse and keyboard	via base units
Remote operation via web server	yes	yes	yes	yes	via base units
SNMP (incl. traps)	yes	yes	yes	yes	via base units
Alarm relays	–	yes	yes	yes	via base units
TS monitoring and analysis including TS capture	yes	yes	yes	yes	yes
ES and data service analysis	yes	yes	yes	yes	yes
Streaming function	via PC interface	yes	yes	yes	via base units
Software decoder	yes	yes	yes	yes	yes
Hardware decoder with various interfaces	yes	yes	yes	yes	yes
Recorder and generator options	–	–	–	yes	–
Gigabit Ethernet/IP interface, monitoring functions and transcoding	–	–	–	yes	–
Reference clock input	–	–	–	yes	–
SPI input and output	–	–	–	yes	–

[1] The operation of the R&S®DVM50 requires a PC. Some of the functions specified are only available via the PC.

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Application and configuration examples

Example 1: monitoring at the transmitter site

The operator of a DVB-T network monitors the broadcast signals (2) at the transmitter site with respect to errors at the RF and transport stream levels. Additionally, the operator monitors the transport streams fed to the transmitter. Neither detailed analyses nor transport stream recordings are required.

Instrument configuration

R&S®DVM100L		
1 ×	R&S®DVM100L	MPEG-2 monitoring system
1 ×	R&S®DVM-B1	MPEG analysis board
4 ×	R&S®DVM-K1	TS monitoring, activation of one channel
1 ×	R&S®DVM-B500	RF carrier board
2 ×	R&S®DVM-B53	DVB-T/DVB-H receiver module, 2k and 8k mode

Example 2: monitoring at the multiplex center

The operator of a multiplex center checks the generated transport streams (6) for correctness. Some of the signals to be processed are received via satellite and cable (three DVB-S2 and six DVB-C signals). For cost reasons, these signals are monitored only in the Scan mode (RF signals and the contained TS). For visualizing the broadcast programs (SD and HD, with MPEG-2 or H.264 coding) the operator uses external displays connected to the R&S®DVM100L/120. The operator occasionally performs analyses on the transport stream and records TS segments.

Instrument configuration

R&S®DVM100L		
1 ×	R&S®DVM100L	MPEG-2 monitoring system
1 ×	R&S®DVM-B1	MPEG analysis board
4 ×	R&S®DVM-K1	TS monitoring, activation of one channel
1 ×	R&S®DVM-K2	TS capture, recording by MPEG analysis board
1 ×	R&S®DVM-K10	In-depth analysis
1 ×	R&S®DVM-K12	TS template monitoring
1 ×	R&S®DVM-B500	RF carrier board for R&S®DVM-B50/B51
1 ×	R&S®DVM-B50	Demodulator module
1 ×	R&S®DVM-K501	DVB-C J.83/A/C demodulation
1 ×	R&S®DVM-B51	DVB-S/DVB-S2 receiver module
1 ×	R&S®DVM-B30	Video and audio hardware decoder (SDTV)
1 ×	R&S®DVM-K32	HDTV and Dolby decoding upgrade
and R&S®DVM120		
1 ×	R&S®DVM120	MPEG-2 monitoring system
1 ×	R&S®DVM-B1	MPEG analysis board
4 ×	R&S®DVM-K1	TS monitoring, activation of one channel
1 ×	R&S®DVM-B30	Video and audio hardware decoder (SDTV)
1 ×	R&S®DVM-K32	HDTV and Dolby decoding upgrade

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Example 3: DTV analyzer for portable applications

The operator of a DVB-C network uses a portable instrument for checking both the broadcast signals (DVB-C) as well as the signals (Gigabit Ethernet) distributed on the backbone. To check the DVB-C signals, the operator requires high dynamic range during the MER measurement. The transport stream, elementary streams or data services are repeatedly analyzed and TS segments are recorded. The operator displays the broadcast programs (SD and HD, with MPEG-2 or H.264 coding) directly on the instrument.

Instrument configuration

R&S®DVM400		
1 ×	R&S®DVM400	Digital video measurement system
1 ×	R&S®DVM400-B1	MPEG analysis board
1 ×	R&S®DVM-K1	TS monitoring, activation of one channel
1 ×	R&S®DVM-K2	TS capture, recording by MPEG analysis board
1 ×	R&S®DVM-K10	In-depth analysis
1 ×	R&S®DVM-K11	Data broadcast analysis
1 ×	R&S®DV-ESA	Elementary stream analyzer, MPEG-2 ES analysis
1 ×	R&S®DVM400-B30	Video and audio hardware decoder (SDTV)
1 ×	R&S®DVM-K32	HDTV and Dolby decoding upgrade
1 ×	R&S®DVM400-B500	RF carrier board and decoder extension
1 ×	R&S®DVM-B50	Demodulator module
1 ×	R&S®DVM-K501	DVB-C, J.83/A/C demodulation
1 ×	R&S®DVM-K509	High-quality MER measurements
1 ×	R&S®DVM400-B40	Gigabit Ethernet interface module

Example 4: universal instrument in development

For the development of DTV components, a designer employs a "jack-of-all-trades".

Instrument configuration

R&S®DVM400		
1 ×	R&S®DVM400	Digital video measurement system
Transport stream monitoring and analysis		
1 ×	R&S®DVM400-B1	MPEG analysis board
1 ×	R&S®DVM-K1	TS monitoring, activation of one channel
1 ×	R&S®DVM-K2	TS capture, recording by MPEG analysis board
1 ×	R&S®DVM-K10	In-depth analysis
1 ×	R&S®DVM-K12	TS template monitoring
Data service and elementary stream analysis		
1 ×	R&S®DVM-K11	Data broadcast analysis
1 ×	R&S®DV-ESA	Elementary stream analyzer, MPEG-2 ES analysis
1 ×	R&S®DVM-K200	H.264 analyzer
1 ×	R&S®DVM-K201	Dolby AC-3 audio option for H.264 analyzer
Video and audio decoding		
1 ×	R&S®DVM400-B30	Video and audio hardware decoder (SDTV)
1 ×	R&S®DVM-K30	HD/SD – SDI video output
1 ×	R&S®DVM-K32	HDTV and Dolby decoding upgrade
RF monitoring, analysis and demodulation		
1 ×	R&S®DVM400-B500	RF carrier board and decoder extension
1 ×	R&S®DVM400-B504	RF carrier board extension
1 ×	R&S®DVM-B50	Demodulator module
1 ×	R&S®DVM-K501	DVB-C, J.83/A/C demodulation
1 ×	R&S®DVM-K502	J.83/B demodulation
1 ×	R&S®DVM-K503	ATSC/8VSB demodulation
1 ×	R&S®DVM-K509	High-quality MER measurements
1 ×	R&S®DVM-B51	DVB-S/DVB-S2 receiver module
1 ×	R&S®DVM-B53	DVB-T/DVB-H receiver module, 2k and 8k mode
Transport stream generation, recording and playback		
1 ×	R&S®DVM400-B2	TS generator (GTS)
1 ×	R&S®DVM400-B3	Upgrade TS recorder (TRP), up to 90 Mbit/s
1 ×	R&S®DVM400-B4	Upgrade TS recorder (TRP), up to 214 Mbit/s
1 ×	R&S®DV-HDTV	HDTV sequences
1 ×	R&S®DV-H264	H.264 stream library
1 ×	R&S®DV-DVBH	DVB-H stream library
1 ×	R&S®DV-TCM	Test card M sequences
1 ×	R&S®DV-ASC	Advanced stream combiner

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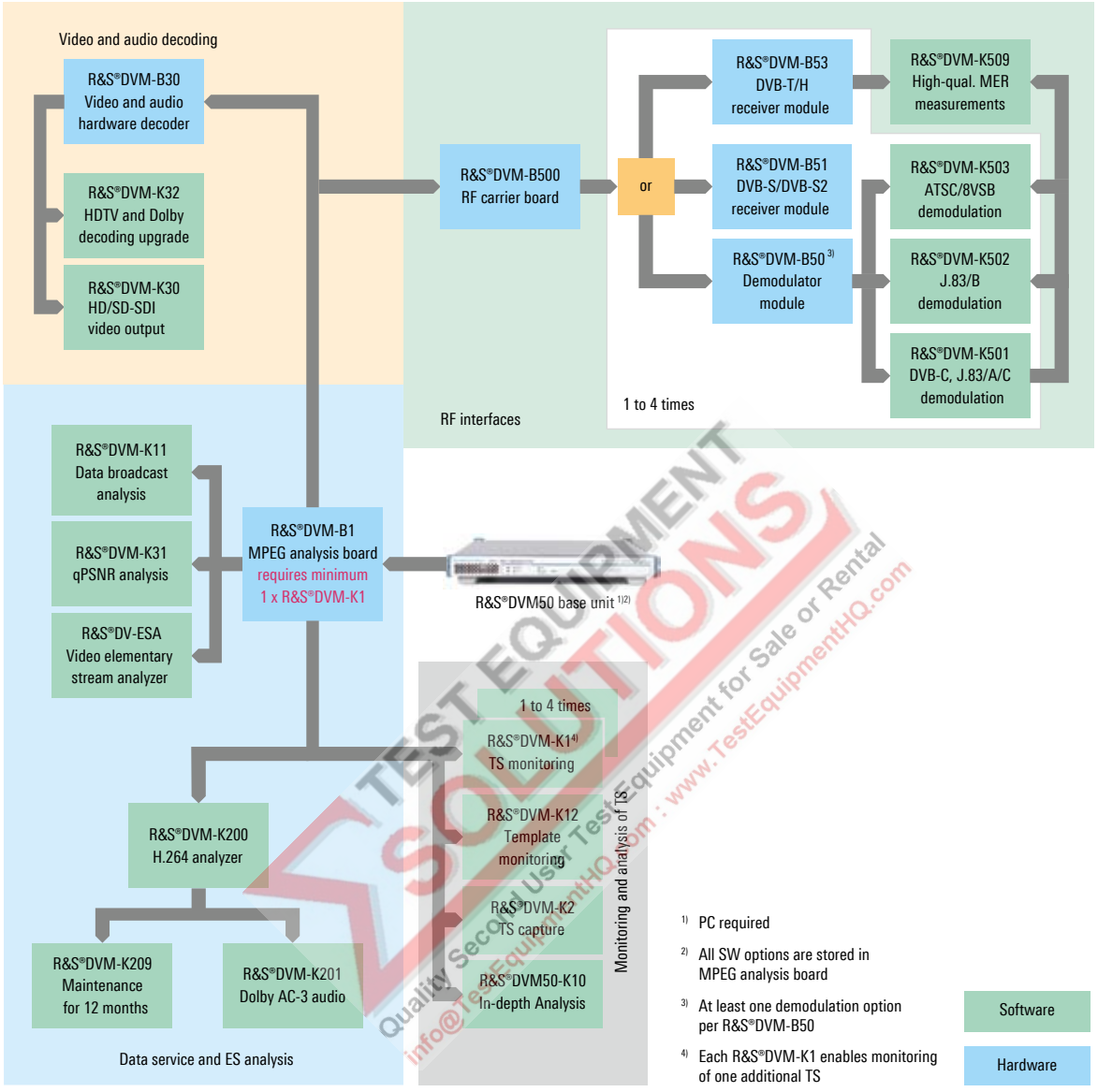
Configuration of the instruments

R&S®DVM50 V1.23



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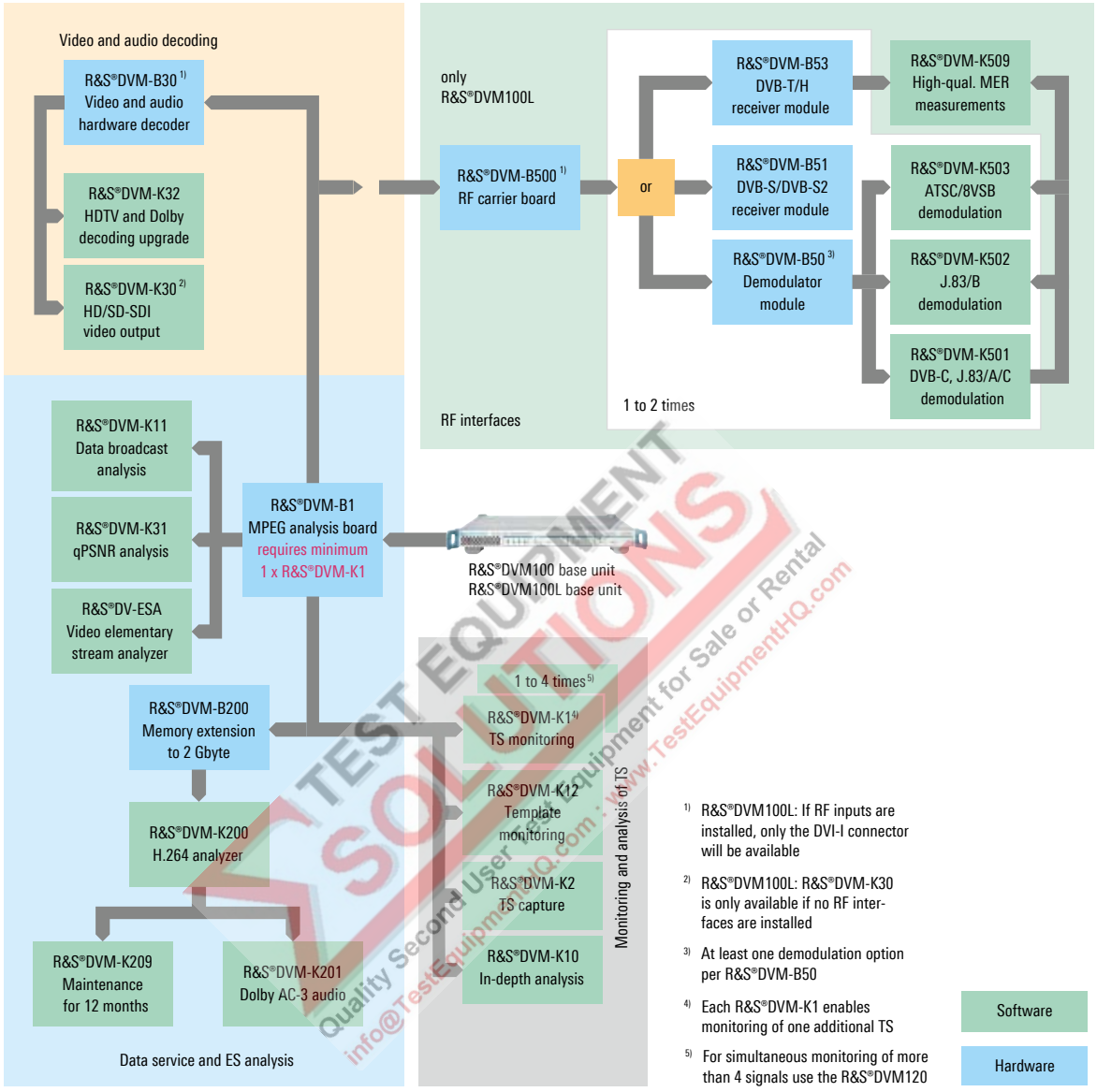
R&S®DVM100 / R&S®DVM100L V1.23



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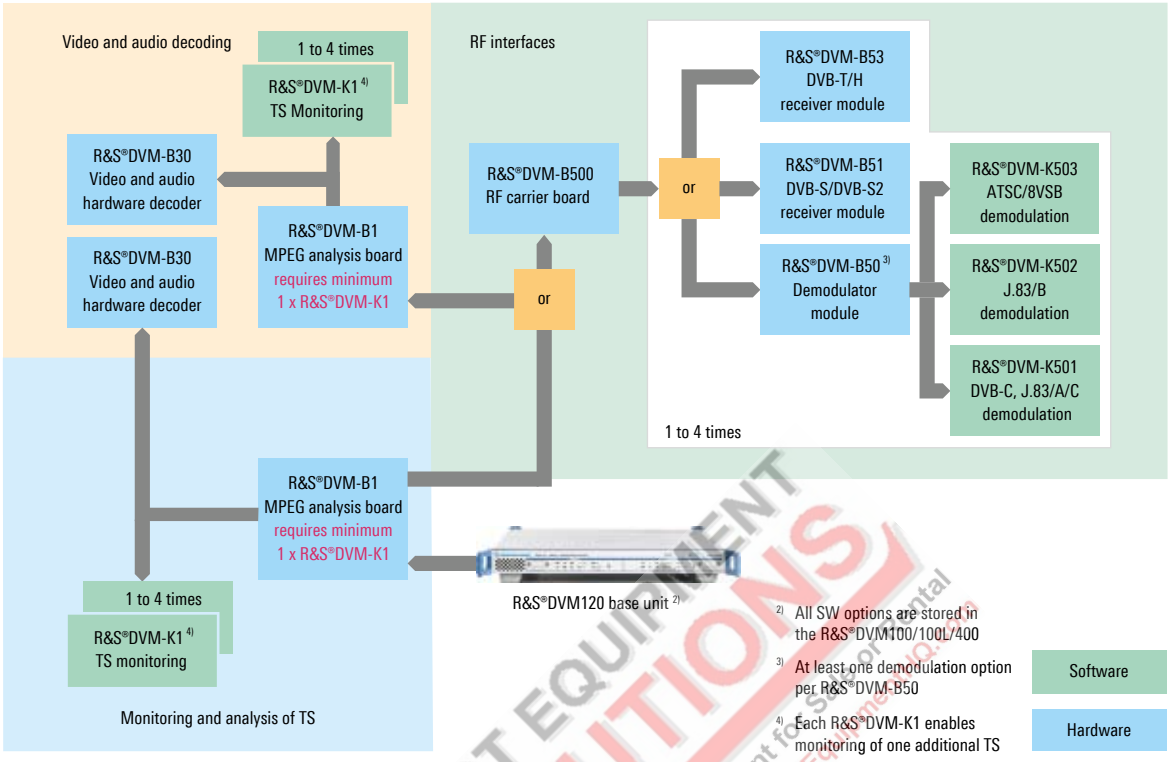
R&S®DVM120 V1.23



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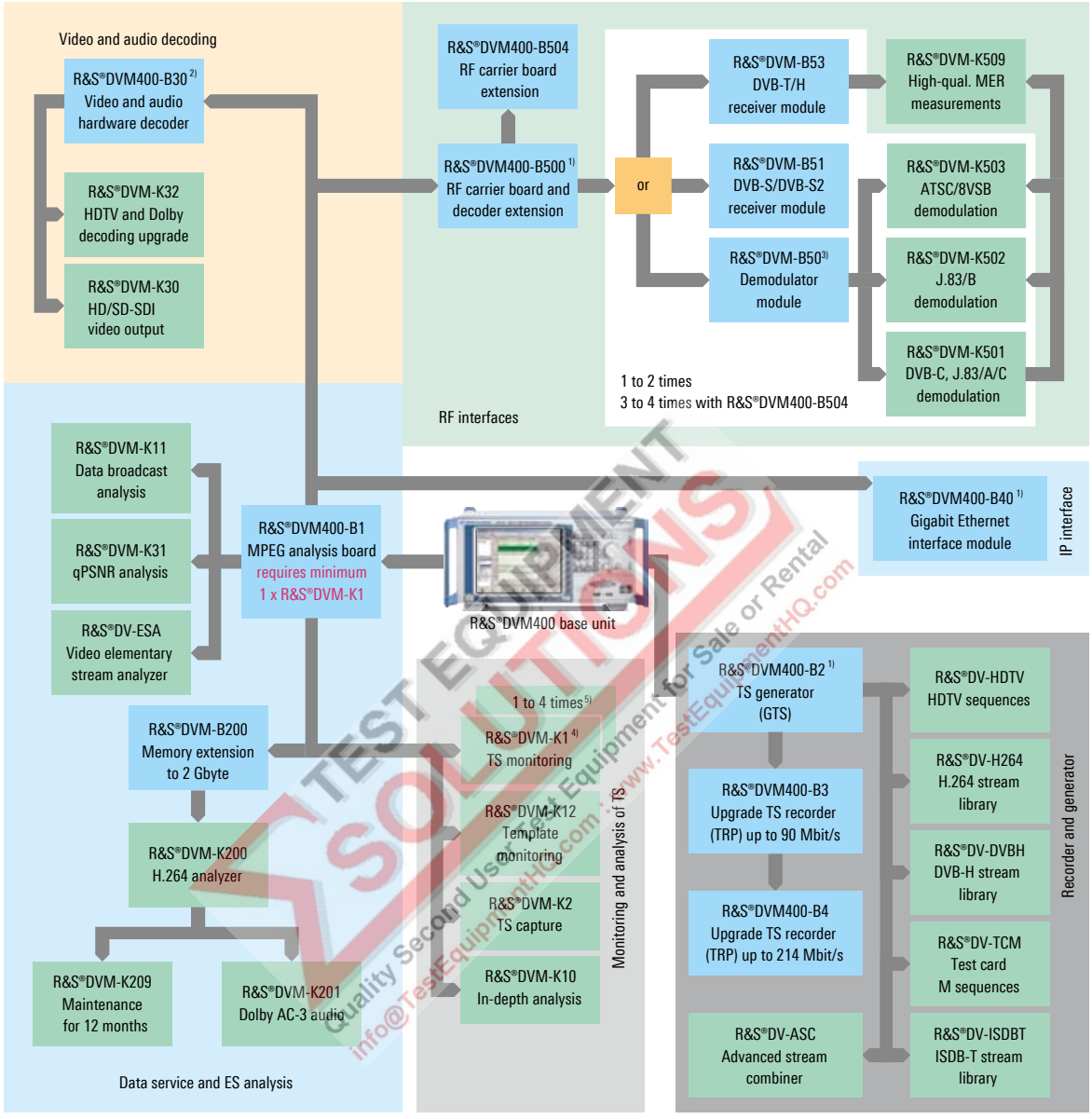
R&S®DVM400 V1.23



1) Only 2 choices from the following 3 possible:
   - R&S®DVM400-B500
   - R&S®DVM400-B2
   - R&S®DVM400-B40

2) Use of the integrated display and speaker of the R&S®DVM400-B30 hardware decoder requires the R&S®DVM400-B500

3) At least one demodulation option per R&S®DVM-B50

4) Each R&S®DVM-K1 enables monitoring of one additional TS

5) For simultaneous monitoring of more than 4 signals use the R&S®DVM120

Software

Hardware

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Ordering information

Designation	Type	Order No.
Base units		
MPEG-2 Monitoring System	R&S®DVM50	2085.1900.03
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware		
MPEG-2 Monitoring System	R&S®DVM100	2085.1600.03
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware, connector for relay contacts		
MPEG-2 Monitoring System	R&S®DVM100L	2112.7050.02
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware, connector for relay contacts		
Digital Video Measurement System	R&S®DVM400	2085.1800.03
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware, connector for relay contacts, mouse		
Expansion unit		
MPEG-2 Monitoring System	R&S®DVM120	2085.1700.03
Accessories: power cable, crossed patch cable		
Transport stream monitoring and analysis		
MPEG Analysis Board	R&S®DVM-B1	2085.3283.02
MPEG Analysis Board	R&S®DVM400-B1	2085.5505.02
TS Monitoring, activation of one channel	R&S®DVM-K1	2085.5211.02
TS Capture, recording by MPEG analysis board	R&S®DVM-K2	2085.5234.02
In-Depth Analysis	R&S®DVM-K10	2085.5228.02
In-Depth Analysis	R&S®DVM50-K10	2085.5434.02
TS Template Monitoring	R&S®DVM-K12	2085.5328.02
Data service and elementary stream analysis		
qPSNR Analysis, video coding real-time analysis	R&S®DVM-K31	2085.5457.02
Data Broadcast Analysis	R&S®DVM-K11	2085.5311.02
Elementary Stream Analyzer, MPEG-2 ES analysis	R&S®DV-ESA	2085.8904.02
H.264 Analyzer	R&S®DVM-K200	2112.7850.02
Dolby AC-3 Audio, option for H.264 analyzer	R&S®DVM-K201	2112.7867.02
Maintenance for 12 Months, option for H.264 analyzer	R&S®DVM-K209	2112.7873.02
Video and audio decoding		
Video and Audio Hardware Decoding Video: SDTV, MPEG-2, H.264 Audio: MPEG-1/2	R&S®DVM-B30	2085.5570.02
Video and Audio Hardware Decoding Video: SDTV, MPEG-2, H.264 Audio: MPEG-1/2	R&S®DVM400-B30	2085.5540.02
HD/SD–SDI Video Output	R&S®DVM-K30	2085.5440.02
HDTV and Dolby Decoding Upgrade	R&S®DVM-K32	2085.5486.02
RF monitoring, analysis and demodulation		
RF Carrier Board	R&S®DVM-B500	2085.5634.02
RF Carrier Board and Decoder Extension	R&S®DVM400-B500	2085.5563.02
RF Carrier Board Extension	R&S®DVM400-B504	2085.5670.02
Demodulator Module	R&S®DVM-B50	2085.5605.02
DVB-C, J.83/A/C Demodulation	R&S®DVM-K501	2112.7815.02
J.83/B Demodulation	R&S®DVM-K502	2112.7821.02
ATSC/8VSB Demodulation	R&S®DVM-K503	2112.7838.02
High-quality MER measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	2112.7844.02
DVB-S/DVB-S2 Receiver Module	R&S®DVM-B51	2085.5611.02
DVB-T/DVB-H Receiver Module, 2k and 8k mode	R&S®DVM-B52	2085.5657.02

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Designation	Type	Order No.
IPTV monitoring, analysis and transcoding (R&S®DVM400 only)		
Gigabit Ethernet Interface Module	R&S®DVM400-B40	2085.5557.03
Transport stream generation, recording and playback (R&S®DVM400 only)		
TS Generator (GTS)	R&S®DVM400-B2	2085.5511.02
Upgrade TS Recorder (TRP), up to 90 Mbit/s	R&S®DVM400-B3	2085.5528.03
Upgrade TS Recorder (TRP), up to 214 Mbit/s	R&S®DVM400-B4	2085.5534.03
HDTV Sequences	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library	R&S®DV-H264	2085.9052.02
DVB-H Stream Library	R&S®DV-DVBH	2085.8704.02
Test Card M Sequences	R&S®DV-TCM	2085.7708.02
Advanced Stream Combiner, dongle for USB interface	R&S®DV-ASC	2085.8804.03
Rack installation kits		
19" Adapter, 1 HU, 1/1 for design 2000 housing for R&S®DVM50/100/100L/120	R&S®ZZA-111	1096.3254.00
19" Adapter for design 2000 housing, 4U, 7/8 T250 for R&S®DVM400	R&S®ZZA-S03	1105.6756.00
Extras		
Memory Extension, to 2 Gbyte	R&S®DVM-B200	2085.5592.02
Keyboard with USB Interface (US keyboard)	R&S®PSL-Z2	1157.6870.03
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.02
Documentation of R&S®DVM50/100/120/400 Calibration Values	R&S®DVM-DCV	2082.0490.29
Operating manual, printed format	–	2085.1839.12
Type designation: accessories (-Z), option (-B), software (-K)		
Service options Service options can only be ordered in connection with the purchase of an instrument.		
Repair service		
One-Year Repair Service following the warranty period	R&S®RO2DVM50 R&S®RO2DVM100 R&S®RO2DVM100L R&S®RO2DVM400 R&S®RO2DVM120	please contact your local sales office
Two-Year Repair Service following the warranty period	R&S®RO3DVM50 R&S®RO3DVM100 R&S®RO3DVM100L R&S®RO3DVM400 R&S®RO3DVM120	please contact your local sales office
Four-Year Repair Service following the warranty period	R&S®RO5DVM50 R&S®RO5DVM100 R&S®RO5DVM100L R&S®RO5DVM400 R&S®RO5DVM120	please contact your local sales office
Calibration service		
Two-Year Calibration Service	R&S®CO2DVM50 R&S®CO2DVM100 R&S®CO2DVM100L R&S®CO2DVM400 R&S®CO2DVM120	please contact your local sales office
Three-Year Calibration Service	R&S®CO3DVM50 R&S®CO3DVM100 R&S®CO3DVM100L R&S®CO3DVM400 R&S®CO3DVM120	please contact your local sales office
Five-Year Calibration Service	R&S®CO5DVM50 R&S®CO5DVM100 R&S®CO5DVM100L R&S®CO5DVM400 R&S®CO5DVM120	please contact your local sales office

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AQAP-2110
Audit report GP T3.1-NO 05.03

For data sheet, see
PD 5213.5274.22
and www.rohde-schwarz.com

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Data without tolerance limits is not binding | Subject to change

*0.14 €/min within German wireline network; rates may vary in other networks (wireline and mobile) and countries.

R&S®DVM Family
Specifications

R&S®DVM50
R&S®DVM100L
R&S®DVM120
R&S®DVM400

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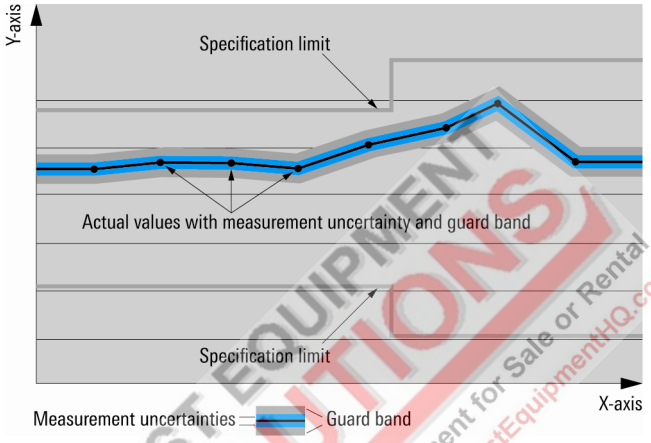
Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

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Base units

R&S®DVM50

To operate the R&S®DVM50, you require a PC with the R&S®DVM50 controller software running. This PC provides the graphical user interface, remote control, and SNMP functionality.

Instrument-specific general data		
Instrument control via external PC	Ethernet	10/100BaseT

TS monitoring and analysis		
MPEG analysis board	R&S®DVM-B1 [1]	1, providing up to 4 TS ASI interfaces
TS monitoring	R&S®DVM-K1 [1]	up to 4
TS template monitoring	R&S®DVM-K12	1
TS capture	R&S®DVM-K2	1
In-depth analysis	R&S®DVM50-K10	1
Data broadcast analysis	R&S®DVM-K11	1
MPEG-2 elementary stream analyzer	R&S®DV-ESA	1
H.264 elementary stream analyzer	R&S®DVM-K200	1
Dolby AC-3 audio elementary stream analyzer	R&S®DVM-K201 extension for R&S®DVM-K200	1
qPSNR analysis	R&S®DVM-K31	1

Video and audio decoding		
Maximum number of hardware decoders	R&S®DVM-B30 and options	1

RF monitoring, analysis, and demodulation		
Maximum number of RF inputs		up to four
RF carrier board	R&S®DVM-B500	up to four R&S®DVM-B50/ R&S®DVM-B51/R&S®DVM-B53
RF modules and standards	R&S®DVM-B50 and R&S®DVM-K501	DVB-C, J.83/A/C
	R&S®DVM-B50 and R&S®DVM-K502	J.83/B
	R&S®DVM-B50 and R&S®DVM-K503	ATSC/8VSB
	R&S®DVM-B51	DVB-S/S2
	R&S®DVM-B53	DVB-T/DVB-H
Extension		
High-quality MER measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	1 per R&S®DVM50 system

Minimum PC system requirements (not part of the equipment supplied)		
CPU		Pentium III, 700 MHz
System memory		256 Mbyte RAM, 2 Gbyte RAM with R&S®DVM-K200
Remote interface		Ethernet 100BaseT
Display resolution		1024 × 768 pixels
Operating system		Windows XP, Service Pack 2

Accessories		quick start guide, operating manual with firmware on CD, power cable, Ethernet patch cable (crossover)

[1] At least one option per system required.

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R&S®DVM100L

Local operation requires an external monitor, keyboard, and mouse, or is via a PC/laptop as when operated by remote control.

Instrument-specific general data		
Integrated controller		
CPU		Pentium M, 1.5 GHz
System memory		1 Gbyte
	R&S®DVM-B200	2 Gbyte
System hard drive	IDE hard drive	min. 60 Gbyte (min. 50 Gbyte available for user data)
Operating system		Windows XP Embedded
Remote control	Ethernet	SNMP file transfer via integrated FTP server remote desktop (VNC and web browser) remote client
Universal serial bus		1 × USB 1.0 1 × USB 2.0
Display interface		SVGA, 15-pole D-Sub female
	display resolution	1024 × 768 pixels to 1600 × 1200 pixels
Alarm line contacts		12 potential-free contacts 15-pole D-Sub female
Remote control interface	Ethernet	10/100/1000BaseT, RJ-45 connector
MPEG analysis board control interface	Ethernet	10/100BaseT, RJ-45 connector for up to 5 MPEG analysis boards

TS monitoring and analysis		
MPEG analysis board	R&S®DVM-B1 [2]	1, providing up to 4 TS ASI interfaces
TS monitoring	R&S®DVM-K1 [2]	up to 4
TS template monitoring	R&S®DVM-K12	1
TS capture	R&S®DVM-K2	1
In-depth analysis	R&S®DVM50-K10	1
Data broadcast analysis	R&S®DVM-K11	1
MPEG-2 elementary stream analyzer	R&S®DV-ESA	1
H.264 elementary stream analyzer	R&S®DVM-K200	1
Dolby AC-3 audio elementary stream analyzer	R&S®DVM-K201 extension for R&S®DVM-K200	1
qPSNR analysis	R&S®DVM-K31	1

Video and audio decoding		
Maximum number of hardware decoders	R&S®DVM-B30 and options	1

RF monitoring, analysis, and demodulation		
Maximum number of RF inputs		up to two
RF module carrier board	R&S®DVM-B500	up to two R&S®DVM-B50/ R&S®DVM-B51/R&S®DVM-B53
RF modules and standards	R&S®DVM-B50 and R&S®DVM-K501	DVB-C, J.83/A/C
	R&S®DVM-B50 and R&S®DVM-K502	J.83/B
	R&S®DVM-B50 and R&S®DVM-K503	ATSC/8VSB
	R&S®DVM-B51	DVB-S/S2
	R&S®DVM-B53	DVB-T/DVB-H
Extension		
High-quality MER measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	1 per R&S®DVM100L system

[2] At least one option per system required.

Instrument controller performance		
CPU		Pentium M, 1.5 GHz
System memory		1 Gbyte RAM
Operating system		Windows XP Embedded

Instrument extension		
TS and RF analysis and monitoring		R&S®DVM120 and options

Accessories		
		quick start guide, operating manual with firmware on CD, power cable, Ethernet patch cable (crossover), USB mouse

R&S®DVM120

The instrument can only be used to expand the R&S®DVM100L, or R&S®DVM400. For this purpose, a hub including patch cable is required. These components are not part of the equipment supplied.

Instrument-specific general data		
Instrument control via R&S®DVM100L/400	Ethernet	10/100BaseT

TS monitoring and analysis		
MPEG analysis board	R&S®DVM-B1 [3]	up to two, providing up to 8 TS ASI interfaces
TS monitoring	R&S®DVM-K1 [3]	up to 8

Video and audio decoding		
Maximum number of hardware decoders	R&S®DVM-B30 and options	1

RF monitoring, analysis, and demodulation		
Maximum number of RF inputs	no second R&S®DVM-B1	up to four
RF module carrier board	R&S®DVM-B500	up to four R&S®DVM-B50/ R&S®DVM-B51/R&S®DVM-B53
RF modules and standards	R&S®DVM-B50 and R&S®DVM-K501	DVB-C, J.83/A/C
	R&S®DVM-B50 and R&S®DVM-K502	J.83/B
	R&S®DVM-B50 and R&S®DVM-K503	ATSC/8VSB
	R&S®DVM-B51	DVB-S/S2
	R&S®DVM-B53	DVB-T/DVB-H
Extension		
High-quality MER measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	1 per R&S®DVM100L/R&S®DVM400 system

Accessories		
		quick start guide, operating manual with firmware on CD, power cable, Ethernet patch cable (crossover)

[3] At least one option per instrument required.

R&S®DVM400

Instrument-specific general data		
Integrated controller		
CPU		Pentium M, 1.5 GHz
System memory		1 Gbyte
	R&S®DVM-B200	2 Gbyte
System hard drive	IDE hard drive	min. 60 Gbyte (min. 50 Gbyte available for user data)
Operating system		Windows XP Embedded
Remote control	Ethernet	SNMP file transfer via integrated FTP server remote desktop (VNC and web browser) remote client
Universal serial bus		1 × USB 1.0 1 × USB 2.0
Display interface		SVGA, 15-pole D-Sub female
	display resolution	1024 × 768 pixels to 1600 × 1200 pixels
Alarm line contacts		12 potential-free contacts [4] 15-pole D-Sub female
Remote control interface	Ethernet	10/100/1000BaseT, RJ-45 connector
MPEG analysis board control interface	Ethernet	10/100BaseT, RJ-45 connector for up to 5 MPEG analysis boards
External reference clock		
Clock		10 MHz
Level		0.1 V to 2 V (RMS)
Connector		75 Ω, BNC (female)
Application		• TS analysis • TS generator/recorder • RF frontends
Parallel TS interface		SPI in line with EN 50083-9
Level		LVDS
Connector		25-pole D-Sub (female)
Direction	input	instrument front panel
	output	instrument rear panel

TS monitoring and analysis		
MPEG analysis board	R&S®DVM400-B1	1, providing up to 4 TS ASI interfaces
TS monitoring	R&S®DVM-K1	up to 4
TS template monitoring	R&S®DVM-K12	1
TS capture	R&S®DVM-K2	1
In-depth analysis	R&S®DVM50-K10	1
Data broadcast analysis	R&S®DVM-K11	1
MPEG-2 elementary stream analyzer	R&S®DV-ESA	1
H.264 elementary stream analyzer	R&S®DVM-K200	1
Dolby AC-3 audio elementary stream analyzer	R&S®DVM-K201 extension for R&S®DVM-K200	1
qPSNR analysis	R&S®DVM-K31	1

Video and audio decoding		
Maximum number of hardware decoders	R&S®DVM400-B30 and options	1

IP monitoring, analysis, and transcoding		
Maximum number of IP interface modules	R&S®DVM400-B40	1

[4] With the R&S®DVM400: If the trigger input for the TS recorder is used, only 11 relay contacts are available.

RF monitoring, analysis, and demodulation		
Maximum number of RF inputs		up to two R&S®DVM-B50/ R&S®DVM-B51/R&S®DVM-B53 up to four in total with R&S®DVM-B504
RF module carrier board	R&S®DVM400-B500	
RF carrier board extension	R&S®DVM400-B504	
RF modules and standards	R&S®DVM-B50 and R&S®DVM-K501	DVB-C, J.83/A/C
	R&S®DVM-B50 and R&S®DVM-K502	J.83/B
	R&S®DVM-B50 and R&S®DVM-K503	ATSC/8VSB
	R&S®DVM-B51	DVB-S/S2
	R&S®DVM-B53	DVB-T/H
Extension		
High-quality MER measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	1 per R&S®DVM400 system

TS generator and recorder		
Generator baseboard including SDTV stream library for DVB and ATSC	R&S®DVM400-B2	player for signals in Rohde & Schwarz generator transport stream format (GTS)
Upgrade TS player and recorder	R&S®DVM400-B3	player and recorder for TS raw bit stream up to 90 Mbit/s 1st hard drive extension
Upgrade TS player and recorder	R&S®DVM400-B4	upgrade for R&S®DVM-B3 up to 214 Mbit/s 2nd hard drive extension
Stream libraries and tools		
MPEG-2 HDTV sequences		R&S®DV-HDTV
H.264 SDTV and HDTV sequences		R&S®DV-H264
DVB-H stream library		R&S®DV-DVBH
Test card M sequences		R&S®DV-TCM
ISDBT transport stream library		R&S®DV-ISDBT
Software multiplexer for customized transport stream creation		R&S®DV-ASC

Instrument extension		
TS and RF analysis and monitoring		R&S®DVM120 and options

Accessories		quick start guide, operating manual with firmware on CD, power cable, Ethernet patch cable (crossover), USB mouse

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General data for all R&S®DVM instruments

Mechanical resistance		
Vibration		
Sinusoidal		5 Hz to 50 Hz, max. 1.8 g at 55 Hz, max. 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6
Random		10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E

Environmental conditions		
Operating temperature range		+5 °C to +40 °C
Permissible temperature range		+5 °C to +40 °C
Storage temperature range		–40 °C to +70 °C
Climatic resistance	+25 °C/+40 °C cyclically at 85 % rel. humidity, R&S®DVM400 95 %	in line with EN 60068-2-30

Electromagnetic compatibility		in line with EN 55011:
	R&S®DVM50/R&S®DVM100L	class B,
	R&S®DVM400	class A, EN 61326

Power supply		100 V to 240 V ± 10 % 50 Hz to 60 Hz ± 5 %
Power factor correction (PFC)		in line with EN 61000-3-2
Power consumption	R&S®DVM50	max. 60 VA, typ. 40 VA
	R&S®DVM100L	max. 100 VA, typ. 60 VA
	R&S®DVM120	max. 60 VA, typ. 40 VA
	R&S®DVM400	max. 175 VA, typ. 80 VA

Weight (with one MPEG analysis board)	R&S®DVM50	4.4 kg (9.70 lb)
	R&S®DVM100L	5.4 kg (11.90 lb)
	R&S®DVM120	4.4 kg (9.70 lb)
	R&S®DVM400	7.8 kg (17.20 lb)
Dimensions (W × H × D) without handles and feet	R&S®DVM50/120	427 mm × 44 mm × 450 mm (16.81 in × 1.73 in × 17.72 in)
	R&S®DVM100L	427 mm × 44 mm × 550 mm (16.81 in × 1.73 in × 21.65 in)
	R&S®DVM400	375 mm × 176 mm × 285 mm (14.76 in × 6.93 in × 11.22 in)
Dimensions (W × H × D)	R&S®DVM50/120	465.1 mm × 59.6 mm × 517 mm (18.31 in × 2.35 in × 20.35 in) (19"; 1 height unit)
	R&S®DVM100L	465.1 mm × 59.6 mm × 617 mm (18.31 in × 2.35 in × 24.29 in) (19"; 1 height unit)
	R&S®DVM400	410 mm × 194 mm × 317 mm (16.14 in × 7.64 in × 12.48 in) (7/8 × 19"; 4 height units)

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Transport stream monitoring and analysis

MPEG analysis board (R&S®DVM-B1/R&S®DVM400-B1)

Signal inputs		
TS input		
Number		4
Connector		BNC 75 Ω
Mode		ASI, SMPTE 310M (user-selectable)
ASI		in line with EN 50083-9 (2002) 270 Mbit/s; 188/204/208 byte
SMPTE 310M		in line with BP 400 SMPTE 19.392658 Mbit/s 188 byte
Maximum cable length		180 m
Max. data rate across all inputs	depending on TS content	216 Mbit/s

Monitoring		
Monitoring engines	R&S®DVM-K1	1 to 4 at least one R&S®DVM-K1 option required

Signal output		
Loop-through output		input 1 to 4 user-selectable as loop-through output

Common interface		
Interface for CAM module with dimensions of a type I PC card	descrambled service available for decoding by hardware decoder (R&S®DVM-B30/R&S®DVM400-B30 option required)	in line with EN 50 221 R 206 001 TS 101 669

Board control		
Interface	Ethernet	10/100BaseT

TS monitoring (R&S®DVM-K1)

Broadcasting standard		
	independently selectable for every activated signal input	DVB ATSC SCTE

Views and function		
Site tree		status overview of all inputs definable site name definable input name
TS tree		tree display of TS structure with event indication in TS tree element
Topology		selectable background display with status display (to be positioned as required) for all enabled signal inputs TS pie chart can be added
Background image format		GIF
Recommended image size for 1024 × 768 pixels viewing area		740 × 550 (W × H) pixels without pie chart 740 × 345 (W × H) pixels with pie chart
Monitoring		realtime TS monitoring data rate analysis table repetition analysis (for details, see extra box below)

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Streaming	MPEG-2 SDTV, HDTV	video software decoding
		write to file for PID
		PID streaming to external PC

Monitoring		
Display of monitoring test results		
Site tree		status indication for all inputs
Input tree		status indication for all TS elements
Statistics counter		error seconds of top-level test parameter
Log view		event description with • date/time • class (event, alarm, info, system) • detail information • PID number • service number
Bit rate view		bargraph display with peak hold for each section
Table repetition view		bargraph display with peak hold for each section
Size of statistics counter		up to 9999 error seconds
Size of event log	realtime view	1000 lines
	deferred view (log to file)	only limited by space on hard drive
Event class		configurable for each monitoring parameter • alarm • warning • info for system events • system
Limits		configurable for each applicable monitoring parameter
Alarm line		configurable for each monitoring parameter
Log type		• transition (new entry by change of status only) • continuous (new entry every second in case of event)
Log filter	realtime log	• system + alarm • system + warning • system + info

Log to file scheduling		• new log file every day • new log file every hour • new log file after 1 min to 1000 min • new log file after 1000 to 100000 events
Hiding of events		
Number of hidden event definitions		up to 200
Event filter		• top-level monitoring parameter • PID
Hiding time		• 0 s to 99999999s • infinite
Monitoring configuration		unlimited number of different configurations, import/export feature for quick exchange, global assignment (one setting for some or all inputs), single assignment (different settings for each input)

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DVB monitoring measurements

TR 101 290 V1.2.1 – 1st priority monitoring		
TS synchronization	1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		single byte invalid successive bytes invalid
PAT	0.1 s to 9999.9 s	upper repetition period table ID scrambled
Continuity count		discontinuous packet order packet occurs more than twice packet lost incorrect use of discontinuity flag
PMT	0.1 s to 9999.9 s	upper repetition period scrambled
PID distance	0.1 s to 9999.9 s	video upper period
	0.1 s to 9999.9 s	audio upper period
	0.1 s to 9999.9 s	data upper period
	“excluding of PID” feature	up to 10 PID numbers

TR 101 290 V1.2.1 – 2nd priority monitoring		
Transport		error indicator
CRC		error in PAT error in CAT error in PMT error in NIT error in BAT error in SDT error in EIT error in TOT error in SIT error in TSDT error in MIP error in AIT
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period
PCR jitter	10 ns to 999999 ns	upper limit
	profiles	MGF1 (10 MHz) MGF2 (100 MHz) MGF3 (1 Hz)
	test mode	accuracy [5] overall jitter – including packet arrival time
PTS repetition	1 ms to 99999 ms	upper period
CAT	0.1 s to 9999.9 s	missing table ID

[5] Recommended by TR 101 290 for monitoring.

TR 101 290 V1.2.1 – 3rd priority monitoring		
SI repetition	1 ms to 9999 ms	PAT lower period
	limit is equal to limit of 1st priority PAT	PAT upper period
	1 ms to 9999 ms	CAT lower period
	limit is equal to limit of 1st priority CAT	CAT upper period
	1 ms to 9999 ms	PMT lower period
	limit is equal to limit of 1st priority PMT	PMT upper period
	1 ms to 9999 ms	NIT ACTUAL lower period
	0.1 s to 9999.9 s	NIT ACTUAL upper period
	1 ms to 9999 ms	NIT OTHER lower period
	0.1 s to 9999.9 s	NIT OTHER upper period
	1 ms to 9999 ms	SDT ACTUAL lower period
	0.1 s to 9999.9 s	SDT ACTUAL upper period
	1 ms to 9999 ms	SDT OTHER lower period
	0.1 s to 9999.9 s	SDT OTHER upper period
	1 ms to 9999 ms	BAT lower period
	0.1 s to 9999.9 s	BAT upper period
	1 ms to 9999 ms	EIT ACTUAL PF lower period
	0.1 s to 9999.9 s	EIT ACTUAL PRESENT upper period
	1 ms to 9999 ms	EIT ACTUAL FOLLOWING upper period
	0.1 s to 9999.9 s	EIT OTHER PF lower period
	1 ms to 9999 ms	EIT OTHER PRESENT upper period
	0.1 s to 9999.9 s	EIT OTHER FOLLOWING upper period
	1 ms to 9999 ms	RST lower period
	0.1 s to 9999.9 s	RST upper period
	1 ms to 9999 ms	TDT lower period
	0.1 s to 9999.9 s	TDT upper period
	1 ms to 9999 ms	TOT lower period
	0.1 s to 9999.9 s	TOT upper period
	1 ms to 9999 ms	AIT lower period
	0.1 s to 9999.9 s	AIT upper period
NIT actual	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period table ID
NIT other	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
SDT actual	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period table ID
SDT other	limit is equal to limit of SI repetition	repetition – lower period
	limit is equal to limit of SI repetition	repetition – upper period
EIT actual	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period following repetition – upper period table ID
EIT other	limit is equal to limit of SI repetition	PF repetition – lower period
	limit is equal to limit of SI repetition	present repetition – upper period following repetition – upper period
EIT present/following		section missing
RST	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	table ID
TDT	limit is equal to limit of SI repetition	lower period
	limit is equal to limit of SI repetition	upper period table ID
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT or CAT
	“excluding of PID” feature	up to 10 PID numbers

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Extended checks I – monitoring		
TS	0 Mbit/s to 216 Mbit/s	lower/upper bit rate
Service	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Video	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Audio	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Other	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Null packet	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
PAT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
PMT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
CAT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
NIT ACTUAL	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
NIT OTHER	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
BAT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
SDT ACTUAL	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
SDT OTHER	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
EIT ACTUAL PF	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
EIT ACTUAL schedule	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
EIT OTHER PF	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
EIT OTHER schedule	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
TDT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
TOT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
RST	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
MIP	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
AIT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate

For all bit rate measurements	“excluding of PID” feature	10 PID numbers
	separate measurement profiles for each measurement	MGB1 (payload, 1 s, 1 s) MGB1A (payload, 1 s, 10 s) MGB1B (payload, 1 s, 30 s) MGB2 (payload, 100 ms, 1 s) MGB2A (payload, 100 ms, 100 ms) MGB2B (payload, 100 ms, 500 ms) MGB5 (payload, 1 s, 5 s) MGB5A (payload, 2 s, 60 s) MGB5B (payload, 3 s, 90 s) MGB5C (payload, 4 s, 120 s) MGB5D (payload, 5 s, 150 s) MGB1 (188, 1 s, 1 s) MGB1A (188, 1 s, 10 s) MGB1B (188, 1 s, 30 s) MGB2 (188, 100 ms, 1 s) MGB2A (188, 100 ms, 100 ms) MGB2B (188, 100 ms, 500 ms) MGB5 (188, 1 s, 5 s) MGB5A (188, 2 s, 60 s) MGB5B (188, 3 s, 90 s) MGB5C (188, 4 s, 120 s) MGB5D (188, 5 s, 150 s)

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Extended checks II – monitoring		
SFN synchronization		presence – more than one MIP presence – megaframe without MIP structure – invalid MIP TS header structure – inconsistent length field structure – setting of max. delay out of range structure – synchronization time stamp structure – CRC error in MIP pointer – does not match location of MIP periodicity – unperiodic MIP insertion periodicity – MIP pointer not constant
	0.0 µs to 5000000.0 µs	timing – max. deviation
	0 bit/s to 100000 bit/s	bit rate – inconsistency
TS ID match	0 to 65535	specified TS ID
TS modification		change of TS ID additional service service disappeared additional element element disappeared change of element stream type change of PCR PID
CA alternation		CA flag ON CA flag OFF alternation of key
DVB-H	0 Mbit/s to 200 Mbit/s	constant bit rate lower than specified
	0 Mbit/s to 200 Mbit/s	constant bit rate higher than specified
	0 Mbit/s to 200 Mbit/s	burst peak bit rate lower than specified
	0 Mbit/s to 200 Mbit/s	burst peak bit rate higher than specified
	0.0 s to 99.9 s	burst off-time longer than specified
	0 % to 99 %	estimated power saving lower than specified
	–9999 ms to +9999 ms	min. Delta-T margin lower than specified
	–9999 ms to +9999 ms	max. Delta-T margin higher than specified
		IP packet error before MPE FEC

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ATSC and SCTE monitoring test parameter

MPEG/TS monitoring		
TS synchronization	1 packet to 7 packets	loss after packets
	1 packet to 31 packets	lock after packets
Sync byte		single byte invalid successive bytes invalid
Continuity count		discontinuous packet order packet occurs more than twice packet lost incorrect use of discontinuity flag
Transport		error indicator
CRC		error in PAT error in CAT error in PMT error in MGT error in VCT error in STT error in RRT error in EIT error in ETT error in CETT error in DET error in LTST error in DCCT error in DCCSCT
PID distance	0.1 s to 9999.9 s	video upper period
	0.1 s to 9999.9 s	audio upper period
	0.1 s to 9999.9 s	data upper period
	“excluding of PID” feature	up to 10 PID numbers
Unreferenced PID	0.1 s to 9999.9 s	waiting period after change in PMT or CAT
	“excluding of PID” feature	up to 10 PID numbers

ATSC/PSIP monitoring		
PSIP basics		base PID
MGT	1 ms to 9999 ms	repetition lower period
	1 ms to 9999 ms	repetition upper period
VCT	1 ms to 9999 ms	CVCT repetition lower period
	0.1 s to 9999.9 s	CVCT repetition upper period
	1 ms to 9999 ms	TVCT repetition lower period
	0.1 s to 9999.9 s	TVCT repetition upper period
STT	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
RRT	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
ETI	1 ms to 9999 ms	EIT-0 repetition lower period
	0.1 s to 9999.9 s	EIT-0 repetition upper period
	1 ms to 9999 ms	EIT-1 repetition lower period
	0.1 s to 9999.9 s	EIT-1 repetition upper period
	1 ms to 9999 ms	EIT-2 repetition lower period
	0.1 s to 9999.9 s	EIT-2 repetition upper period
	1 ms to 9999 ms	EIT-3 repetition lower period
	0.1 s to 9999.9 s	EIT-3 repetition upper period
	1 ms to 9999 ms	EIT-4 to 127 repetition lower period
	0.1 s to 9999.9 s	EIT-4 to 127 repetition upper period
ETT	1 ms to 9999 ms	ETT-0 to 127 repetition lower period
	0.1 s to 9999.9 s	ETT-0 to 127 repetition upper period
CETT	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
DET	1 ms to 9999 ms	DET-0 repetition lower period
	0.1 s to 9999.9 s	DET-0 repetition upper period
	1 ms to 9999 ms	DET-1 repetition lower period
	0.1 s to 9999.9 s	DET-1 repetition upper period
	1 ms to 9999 ms	DET-2 to 127 repetition lower period
	0.1 s to 9999.9 s	DET-2 to 127 repetition upper period

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LTST	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
DCCT	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
DCCSCT	1 ms to 9999 ms	repetition lower period
	0.1 s to 9999.9 s	repetition upper period
PAT	0.1 s to 9999.9 s	repetition upper period table ID scrambled
CAT	0.1 s to 9999.9 s	missing table ID

Services I – monitoring		
PCR repetition	1 ms to 99999 ms	lower period
	1 ms to 99999 ms	upper period
PCR discontinuity	1 ms to 99999 ms	upper limit
PCR jitter	10 ns to 999999 ns	upper limit
	profiles	MGF1 (10 mHz) MGF2 (100 mHz) MGF3 (1 Hz)
	test mode	accuracy overall jitter – including packet arrival time
PTS repetition	1 ms to 99999 ms (700 ms)	upper period
PMT	0.1 s to 9999.9 s	upper period scrambled

Services II – bit rate monitoring		
TS	0 Mbit/s to 216 Mbit/s	lower/upper bit rate
Service	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Video	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Audio	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Other	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
Null packet	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
PAT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
PMT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
CAT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
MGT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
CVCT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
TVCT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
STT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
RRT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
EIT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
ETT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
CETT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
DET	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
LTST	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
DCCT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate
DCCSCT	0 Mbit/s to 200 Mbit/s	lower/upper bit rate

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For any bit rate monitoring	"excluding of PID" feature	10 PID numbers
	separate measurement profiles for each measurement	MGB1 (payload, 1 s, 1 s) MGB1A (payload, 1 s, 10 s) MGB1B (payload, 1 s, 30 s) MGB2 (payload, 100 ms, 1 s) MGB2A (payload, 100 ms, 100 ms) MGB2B (payload, 100 ms, 500 ms) MGB5 (payload, 1 s, 5 s) MGB5A (payload, 2 s, 60 s) MGB5B (payload, 3 s, 90 s) MGB5C (payload, 4 s, 120 s) MGB5D (payload, 5 s, 150 s) MGB1 (188, 1 s, 1 s) MGB1A (188, 1 s, 10 s) MGB1B (188, 1 s, 30 s) MGB2 (188, 100 ms, 1 s) MGB2A (188, 100 ms, 100 ms) MGB2B (188, 100 ms, 500 ms) MGB5 (188, 1 s, 5 s) MGB5A (188, 2 s, 60 s) MGB5B (188, 3 s, 90 s) MGB5C (188, 4 s, 120 s) MGB5D (188, 5 s, 150 s)

Extended monitoring		
TS modification		change of TS ID additional service service disappeared additional element element disappeared change of element stream type change of PCR PID
TS ID match	0 to 65535	specified TS ID
CA alternation		CA flag ON CA flag OFF

TS capture (R&S®DVM-K2)

Capture modes		• recording of a transport stream at a single TS input • simultaneous recording of several transport streams at up to 20 TS inputs • recording of a complete transport stream or individual PIDs or services • triggered recording (trigger on error) with extensive trigger capabilities
Size	capture of single TS input	up to 384 Mbyte per TS file
	simultaneous capture of several TS inputs	up to 96 Mbyte per TS file
Capture trigger		trigger once or repeatedly (up to 1000 times) • manual • monitoring event (parameter) • event class • alarm line
File formats		• TS packet raw data • TS packet with packet counter • TS packet with 90 MHz reference clock

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In-depth analysis (R&S®DVM-K10, R&S®DVM50-K10)

Packet interpreter	applicable packet filter (combinations possible): • any element of the TS tree • payload unit start indicator • adaptation field control	• display of TS packet in hex and ASCII • interpretation of TS header • snapshot or continuous update
Table and PES interpreter	applicable filter: • any element of the TS tree • for table sections only: table ID, table ID extension, section number	• interpretation of table section or PES packet header • snapshot or continuous update
Header map		• display of packet header, PID or symbol for up to 262000 TS packets • highlighted script for TS packets with corresponding PID by selection of any element of the TS tree
TS list		• extended display of the TS in tabular form with 9 columns: group, content, ID, CA, ECM PID, PID, PCR PID, rate (in Mbit/s), % bandwidth (continuously updated) • sorter function in 'Stop' mode
PCR analysis	applicable profiles: MGF1 (10 mHz) MGF2 (100 mHz) MGF3 (1 Hz)	• graphical display: PCR overall jitter, PCR accuracy, PCR frequency drift or PCR offset (up to ten minutes) • graphical display of PCR repetition (up to ten minutes) • long-term determination of min./max. peak values
PTS analysis		• graphical display of PTS/PCR delay (up to ten minutes) • graphical display of PTS repetition (up to ten minutes) • long-term determination of min./max. peak values
Buffer analysis	leak method or VBV/HRD method	• graphical display of transport buffer, multiplex buffer and elementary buffer (up to ten minutes) • long-term determination of min./max. peak values
Buffer model info	leak method or VBV/HRD method	summarized information of buffer fullness, bit rates, data delay, and elementary stream info

Electronic program guide (EPG) display)		
Supported standards		• DVB • ATSC/SCTE
Evaluated tables	all transmitted EIT tables	• actual and other TS • present/following and scheduled
Displays		• EPG tree for actual and other TS • timeline display of all EPG services • detailed event information on single service

Thumbnail display		
Supported formats	video	• MPEG-2 SDTV and HDTV • MPEG-4/AVC/H.264 SDTV and HDTV
	audio	• MPEG-1/2 (mono, stereo) • Dolby Digital
Displays	mosaic	video displays
	EPG	video displays with current program information
	detail	video displays with video and audio stream info, including graphic audio level indication

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TS template monitoring (R&S®DVM-K12)

Transport stream	0 to 65535	TS ID
	0 to 65535	network ID
	0 to 65535	orig. network ID
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
EMM	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
User private data	0 to 8191	PID
	optional, not allowed	constraint
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Unreferenced PIDs	0 to 8191	PID
	optional, not allowed	constraint
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Null packets	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Table	0 to 8191	PID
	0 to 255	Table_id
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Services	0 to 65535	service ID
	mandatory, optional, not allowed	constraint
		service name
	0 to 8191	PCR PID
	0 to 8191	PMT PID
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Elementary stream	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	about 50 different types (see below)	type
	yes, no	conditional access
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
Parental rating	3 letters	country code
	undefined, age [4 to 18], user-defined [16 to 256]	rating
ECMs	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	0 Mbit/s to 214 Mbit/s	lower bit rate
	0 Mbit/s to 214 Mbit/s	upper bit rate
EIT present/following	1 to 999999	upper repetition period
EIT scheduled [1 to 16]	1 to 999999	upper repetition period

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For any bit rate monitoring	separate measurement profiles for each element	MGB1 (payload, 1 s, 1 s) MGB1A (payload, 1 s, 10 s) MGB1B (payload, 1 s, 30 s) MGB2 (payload, 100 ms, 1 s) MGB2A (payload, 100 ms, 100 ms) MGB2B (payload, 100 ms, 500 ms) MGB5 (payload, 1 s, 5 s) MGB5A (payload, 2 s, 60 s) MGB5B (payload, 3 s, 90 s) MGB5C (payload, 4 s, 120 s) MGB5D (payload, 5 s, 150 s) MGB1 (188, 1 s, 1 s) MGB1A (188, 1 s, 10 s) MGB1B (188, 1 s, 30 s) MGB2 (188, 100 ms, 1 s) MGB2A (188, 100 ms, 100 ms) MGB2B (188, 100 ms, 500 ms) MGB5 (188, 1 s, 5 s) MGB5A (188, 2 s, 60 s) MGB5B (188, 3 s, 90 s) MGB5C (188, 4 s, 120 s) MGB5D (188, 5 s, 150 s)
Supported elementary stream types: Video MPEG-1, Video MPEG-2, Audio MPEG-1, Audio MPEG-2, Private Data, PES Private Date, MHEG ISO/IEC13 522, DMS ISO/IEC 13818-1, ATM Specific ITU-T Rec. H.222.1, DMS_CC ISO/IEC 13818-6 type A, DMS_CC ISO/IEC 13818-6 type B, DMS_CC ISO/IEC 13818-6 type C, DMS_CC ISO/IEC 13818-6 type D, Auxiliary ISO/IEC 13818-1, Audio ADTS ISO/IEC 13818-1, Visual ISO/IEC 14496-2, Audio LATM ISO/IEC 14496-3, PES Flex. Mux. ISO/IEC 14496-1, Section Flex. Mux. ISO/IEC 14496-1, Synchr. Download Protocol ISO/IEC 13818, PES Metadata, Section Metadata, Data Carousel Metadata, Object Carousel Metadata, Synchr. Download Protocol Metadata, IPMP Stream ISO/IEC 13818-11, Video AVC ISO/IEC14496-10, User Private Stream, VBI Data, VBI Teletext, Subtitling, Audio AC3, Audio Enhanced AC3, AIT, Audio DTS, Audio AAC, Data Piping, Data Asynchronous Streaming, Data Synchronized Streaming, Data Multiprotocol Encapsulation, Data Carousel, Data Object Carousel, Data DVB ATM Stream, Data Higher Protocol, Data System Software Update (UNT), Data IP/MAC Notification (INT), Data MHP Object Carousel, Data MHP Multiprotocol Encapsulation, Data DVB-H		

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Data service and elementary stream analysis

Data broadcast analysis (R&S®DVM-K11)

Analysis of all DVB data broadcast protocols

	Data piping	Data streaming	MPE	Data carousel	Object carousel
Overview	display of descriptors used and name of tables containing the descriptors				
Interpreter	TS header	PES header	section	section (DSI, DII and DDB header)	
Raw data	content of TS packet	content of PES packet	content of section	content of DDB section	
Timing measurements	bit rate of ES repetition time of payload_unit_ start_indicators	bit rate of PES repetition time of PES header	bit rate of selected section repetition time of selected section	bit rate of selected module, DSI, DII section repetition time of selected DII, DSI section loading time of selected module	

Analysis of DVB-H services

Only for inputs that are assigned a monitoring configuration in line with DVB.

ESG service view	supported ESG types: IPDC in line with DVB (ETSI TS 102 471/ encapsulated textual ESGXML fragment) BCAST in line with OMA (service guide for mobile broadcast services)	• ESG type • name of network provider • DVB-H services • current transmissions • planned transmissions
ESG transport analysis	supported ESG types: IPDC in line with DVB (ETSI TS 102 471/ encapsulated textual ESGXML fragment) BCAST in line with OMA (service guide for mobile broadcast services)	• bootstrap FLUTE session • ESG FLUTE sessions with – containers – pictures – SDP files • saving of extracted ESG files to hard drive
Burst timing		• burst duration • burst cycle time • maximum and minimum of signaled Delta-T margin • burst bit rate • burst peak bit rate • constant bit rate • burst total size • burst IP payload
FEC analysis		• FEC usage • number of rows • number of padding columns • number of puncturing bytes • burst FEC code rate • receiver on-time and off-time • power saving from start • DVB-H encapsulation overhead • erroneous rows before and after FEC decoding • frame error rate (FER) • MPE frame error rate (MFER) • correct IP packets before and after FEC • erroneous IP packets before and after FEC • IP packet error rate before and after FEC • IP packet error rate before FEC from start
Decoding		• display of DVB-H content via VLC • zoom function (50 % to 200 %) • data cache from 0.3 s to 15 s

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Elementary stream analyzer (R&S®DV-ESA)

Software package for detailed offline analysis of video elementary streams.

Simple automated software call for the elementary stream elements selected in the R&S®DVM GUI (TS tree).

For more details, refer to the R&S®DVQ-B1 Quality Explorer Suite data sheet, section “Elementary Stream Analyzer”.

H.264 and Dolby analysis

Software package for detailed offline analysis of video and audio elementary streams with the following options:

H.264 analyzer (R&S®DVM-K200)

Dolby AC-3 audio (R&S®DVM-K201, option for H.264 analyzer)

Supports Dolby AC3, Dolby Digital Plus, Dolby E.

Maintenance for 12 months (R&S®DVM-K209, option for H.264 analyzer)

Video coding analysis – qPSNR (R&S®DVM-K31)

This software option measures the quasi-peak signal-to-noise ratio of MPEG-2 and H.264 video streams in SD or HD resolution. This single-ended measurement is performed in order to analyze the video coding quality.

Features		
Graphical display of qPSNR versus time and history diagram		
Automatic recording of measured video stream if set qPSNR limit is violated		
Replay of recorded video streams		by: • integrated software player with R&S®DVM50/R&S®DVM100L/ R&S®DVM400 (MPEG-2 only) • TS generator with R&S®DVM400 and installed R&S®DVM400-B2 option
Save and load of qPSNR analysis data		containing: • qPSNR values versus time • limit violation descriptions • recorded video streams

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Video and audio decoding

The R&S®DVM-K1 TS monitoring option allows MPEG-2 SD and HD programs to be decoded and displayed. The results are displayed in a separate GUI window.

The following hardware decoder options allow MPEG-2-coded and H.264-coded SD and HD video signals to be decoded. Audio decoding is also supported. Various interfaces are available to connect external displays. Descrambling is supported via the common interface of the R&S®DVM-B1. Using the R&S®DVM400-B500 option, the decoded picture and the decoded sound can be output directly on the R&S®DVM400; no additional accessories are required.

Video and audio hardware decoder (R&S®DVM-B30 and R&S®DVM400-B30)

Decoding of a program selected via the GUI.

Supported video and audio formats		
Video formats	coding method	MPEG-2 (MP@ML) H.264/AVC (MP)
	resolution	480i/576i (standard definition)
Audio formats	coding method	MPEG-1/MPEG-2 layer I

HDTV and Dolby decoder expansion (R&S®DVM-K32)

Additionally supported formats		
Video formats	coding method	MPEG-2 (MP@HL) H.264/AVC (MP)
	resolution	1080i 720p 480p/576p
Audio formats	coding method	Dolby Digital AC-3 Dolby Digital Plus (for up to 6 channels) AAC HE-AAC v2/MPEG-4 Part 3

HD/SD-SDI video/audio output (R&S®DVM-K30)

Activation of the HD/SD-SDI output including embedded audio.

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Video and audio interfaces of the different R&S®DVM instruments

Availability depends on installed options (R&S®DVM-K32/DVM-K32-30).

Format	Type	R&S®DVM50/R&S®DVM100L [6]/ R&S®DVM120 [7]		R&S®DVM400	
		Front	Rear	Front	Rear
Audio					
8-channel AES/EBU	digital	–	–	–	15-pole
S/PDIF optical a) Decoded stereo b) Coded (e.g. AC3)	digital	–	–	–	TOS link
L/R stereo	analog	–	headphone jack	loudspeaker [8]	headphone jack
HDMI	digital	DVI-I [9]			DVI-I [9]
(HD-)SDI	digital		BNC [10]		BNC
Video					
(HD)-SDI/CCVS	digital/analog	–	BNC [10]	–	2 × BNC [11]
HDMI/DVI [12]	digital	DVI-I [9]	–	–	DVI-I [9]
R or Y (HD/SD)	analog				
G or Cr (HD/SD)	analog				
B or Cb (HD/SD)	analog				
Y/C R&S®DVM400 internal	analog	–	–	integrated display[13]	–

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[6] If RF inputs are installed, only the DVI-I connector will be available.

[7] For each installed analyzer.

[8] Mono.

[9] References under Audio and Video refer to the same connector.

[10] (HD)-SDI and CCVS share one BNC connector (selectable).

[11] One for (HD)-SDI and one for CCVS. Both connectors are located on the side of the instrument and are part of the MPEG analysis board.

[12] The connector is DVI-I but HDMI (including audio) and DVI protocols are supported (configuration via GUI).

[13] Displayed picture has standard-definition resolution.

RF monitoring, analysis, and demodulation

RF carrier board (R&S®DVM-B500 and R&S®DVM400-B500/ R&S®DVM500-B504)

Required for integrating an RF receiver module in the R&S®DVM50/R&S®DVM100L/R&S®DVM120/R&S®DVM400.

R&S®DVM-B500	for RF receiver integration in the R&S®DVM50/R&S®DVM120	up to 4 R&S®DVM-B50/R&S®DVM-B51/ R&S®DVM-B53
	for RF receiver integration in the R&S®DVM100L	up to 2 R&S®DVM-B50/R&S®DVM-B51/ R&S®DVM-B53
R&S®DVM400-B500	for RF receiver integration in the R&S®DVM400	up to 2 R&S®DVM-B50/R&S®DVM-B51/ R&S®DVM-B53
	for use with the R&S®DVM400-B30 hardware decoder	live video display on integrated display
R&S®DVM400-B504	for RF receiver integration in the R&S®DVM400	up to 2 additional R&S®DVM-B50/ R&S®DVM-B51/R&S®DVM-B53 (i.e. a total of 3 or 4)

J.83/A/C (DVB-C); J.83/B; ATSC (R&S®DVM-B50 with R&S®DVM-K501/R&S®DVM-K502/R&S®DVM-K503/R&S®DVM-K509)

Demodulator module (R&S®DVM-B50)

Standards	The standard is defined by using the R&S®DVM-K501/R&S®DVM-K502/ R&S®DVM-K503 demodulation options. At least one standard is required for each demodulator module. Different standards can be installed in a module. The standard can then be selected via the user interface.	
	R&S®DVM-K501	J.83/A/C (DVB-C)
	R&S®DVM-K502	J.83/B
	R&S®DVM-K503	ATSC/8VSB
Frequency range		10 MHz to 80 MHz, 110 MHz to 1000 MHz
Frequency resolution		1 kHz
Roll-off	automatic selection in line with the selected standard	0.115, 0.12, 0.13, 0.15, 0.18
Input level		–65 dBm to –20 dBm
Input connector		BNC (female) 75 Ω
Output	via R&S®DVM-B1 or R&S®DVM400-B1 MPEG analysis board	TS ASI BNC (female) 75 Ω
Measurements	values for 64QAM/8VSB and frequency range 10 MHz to 71 MHz and 119 MHz to 1000 MHz	
RF input level	–40 dBm to –20 dBm	±1.5 dB
	<–40 dBm	±2 dB
Synchronization		OK/unlocked
RF carrier frequency offset	internal synchronization at 500 MHz	<2 ppm
	with external synchronization (R&S®DVM400 only)	<2 Hz
Symbol rate offset	internal synchronization at 500 MHz	<2 ppm
	with external synchronization (R&S®DVM400 only)	<2 symbol/s

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Modulation error ratio (MER)		
Range	standard	up to 35 dB
	with R&S®DVM-K509 option	up to 40 dB
Uncertainty	20 dB to 30 dB	±1.0 dB
	30 dB to 35 dB	±1.5 dB
Bit error ratio before Reed-Solomon (BER)	range 0.0; 0.1×10^{-8} to 1.0×10^{-3}	$0.1 \times 10^{-exponent}$
Packet error ratio after Reed-Solomon (PER)	range 0.0; 0.1×10^{-8} to 2.0×10^{-4}	$0.1 \times 10^{-exponent}$
Constellation diagram		with standard-specific grid
Monitoring		
Input level		lower/upper limit
Synchronization		
Carrier		OK, unlocked
MPEG		OK, unlocked
Modulation error ratio (MER)		lower limit
Bit error ratio before Reed-Solomon (BER)		upper limit
Packet error ratio after Reed-Solomon (PER)		upper limit

DVB-C, J.83/A/C demodulation (R&S®DVM-K501)

Standard	for R&S®DVB-B50 RF demodulator module	J.83/A/C (DVB-C)
Modulation		4QAM, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM
Bandwidth		6 MHz, 7 MHz, 8 MHz
Symbol rate		2.0 Msymbol/s to 6.999 Msymbol/s

J.83/B demodulation (R&S®DVM-K502)

Standard	for R&S®DVB-B50 RF demodulator module	J.83/B
Modulation		64QAM, 256QAM
Bandwidth		6 MHz, 7 MHz, 8 MHz
Symbol rate		2.0 Msymbol/s to 6.999 Msymbol/s

ATSC/8VSB demodulation (R&S®DVM-K503)

Standard	for R&S®DVB-B50 RF demodulator module	ATSC/8VSB
Modulation		8 VSB
Bandwidth		6 MHz
Symbol rate		10.762238 Msymbol/s

High-quality MER measurements for the R&S®DVM-B50/R&S®DVM-B53 (R&S®DVM-K509)

Increase in the modulation error ratio (MER) measurement range [14]

[14] See sections “Demodulator module (R&S®DVM-B50)” and “DVB-T/DVB-H (R&S®DVM-B53)”.

DVB-S/DVB-S2/DIRECTV (R&S®DVM-B51)

Standard		• DVB-S (EN 300421) • DVB-S2 (EN 302307 broadcast services) • DIRECTV
Frequency range		950 MHz to 2150 MHz
Frequency resolution		1 kHz
Roll-off	automatic selection in line with the selected standard	
	DVB-S	0.35
	DVB-S2	0.20
Input level		–65 dBm to –20 dBm
Input connector		F (male) 75 Ω
Output	via R&S®DVM-B1 or R&S®DVM400-B1 MPEG analysis board	TS ASI BNC (female) 75 Ω
Modulation		QPSK, 8PSK
Code rate	DVB-S and DIRECTV	1/2, 2/3, 3/4, 5/6, 6/7, 7/8
	DVB-S2	3/5, 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Symbol rate	DVB-S and DIRECTV	up to 45 Msymbol/s
	DVB-S2	up to 31 Msymbol/s
LNB control		detachable
Max. power supply (one module installed)		400 mA
Max. power supply across all modules (several modules installed)	R&S®DVM100L, R&S®DVM400	600 mA
	R&S®DVM50, R&S®DVM120	1000 mA
Mode		Universal/DiSEqC1.0
Measurements		
RF input level		±2 dB
Synchronization		OK, unlocked
Modulation error ratio (MER)		
Range		8.6 dB to 27.0 dB
Uncertainty		±2 dB
Carrier to noise (C/N)	derived from in-band measurement	
Range		9.0 dB to 27.4 dB
Uncertainty		±2 dB
E_b/N_o	derived from in-band measurement	
Range		4.2 dB to 24.4 dB
Uncertainty		±2 dB
BER before LDPC	DVB-S2	0.0; 1.0×10^{-8} to 1.0×10^{-3}
BER before BCH	DVB-S2	0.0; 2.3×10^{-4} to 1.0×10^{-3}
BER before Viterbi	DVB-S/DIRECTV	0.0; 3.0×10^{-8} to 7.6×10^{-6}
Errored packets	number of errored TS packets per second	0 to 9999
Constellation		order of constellation
Pilots		ON, OFF
Code rate		number of code rate
Spectrum		normal, inverted
Constellation diagram		with standard-specific grid

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Monitoring		
Input level		lower/upper limit
Synchronization		
Carrier		OK, unlocked
Unique word processor		locked, unlocked
Modulation error ratio (MER)		lower limit
Carrier to noise (C/N)		lower limit
E_b/N_o		lower limit
BER before LDPC	DVB-S2	upper limit
BER before BCH	DVB-S2	upper limit
BER before Viterbi	DVB-S/DIRECTV	upper limit
Errored packets	number of errored TS packets per second	upper limit
Signal template		
Constellation		OK, failed
Pilots	DVB-S2	OK, failed
Code rate		OK, failed
Spectrum		OK, failed
FEC frame		OK, failed

DVB-T/DVB-H (R&S®DVM-B53)

Standard		DVB-T/H (ETSI EN 300 744)
Number of receiver paths per module		1
Input		
Connector		BNC
Impedance		75 Ω
VSWR		1.5
DC voltage		80 V
Maximum CW RF power	no damage	20 dBm
Input level range	preselector ON, QPSK, code rate 1/2	typ. –92 dBm to 0 dBm
Frequency range	preselector OFF	30 MHz to 1000 MHz
Frequency resolution		1 Hz
Output	via R&S®DVM-B1 or R&S®DVM400-B1 MPEG analysis board	TS ASI BNC (female) 75 Ω
Preselector		
Mode		auto ON, OFF
Frequency range		150 MHz to 300 MHz and 450 MHz to 900 MHz
Bandwidth (–3 dB)	VHF	45 MHz
	UHF	130 MHz
Gain		10 dB
IF rejection		
1st IF (1219.5 MHz)	preselector ON	90 dB
2nd IF (36.125 MHz)	preselector ON	100 dB
Image rejection		
1st image (RF + 2439 MHz)	preselector ON	70 dB
2nd image (RF + 72.25 MHz)	preselector ON	90 dB
Noise figure	preselector ON	8 dB
	preselector OFF	14 dB
Third order intercept	preselector ON, RF attenuation = 0 dB, 2 CW signals (–35 dBm, RF + 16 MHz/RF + 32 MHz)	0 dBm
	preselector OFF, RF attenuation = 0 dB, 2 CW signals (–25 dBm, RF + 16 MHz/RF + 32 MHz)	12 dBm
Immunity to signals in other channels	preselector ON	compliant to MBRAI (IEC 62002-2), terminal category a
Modulation		COFDM
FFT mode	automatic detection	2k, 8k
QAM order	automatic detection	4QAM, 16QAM, 64QAM
QAM hierarchy	automatic detection	none, alpha = 1, 2, 4
Guard interval	automatic detection	1/4, 1/8, 1/16, 1/32

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Code rate	automatic detection	1/2, 2/3, 3/4, 5/6, 7/8
Bandwidth		6 MHz, 7 MHz, 8 MHz
Measurements		
RF input level		
Range		typ. –97 dBm to 0 dBm
Resolution		0.1 dB
Uncertainty	DVB-T/H signal, C/N ≥ 20 dB, adjacent channel (N ± 1) level ≤ input level	≤1.5 dB
Modulation error ratio (MER)		
Range	standard	18 dB to 31 dB
	with R&S®DVM-K509 option	18 dB to 35 dB (typ. 38 dB)
Resolution		0.1 dB
Uncertainty	18 dB ≤ MER ≤ 30 dB	≤1.0 dB
	30 dB < MER ≤ 35 dB	≤2.0 dB
BER before Viterbi	QPSK, 16QAM/non-hierarchical	0.0; 1.0×10^{-8} to 1.0×10^{-1}
	64QAM, 16QAM/hierarchical	$<1.0 \times 10^{-3}$; 1.0×10^{-3} to 1.0×10^{-1}
BER before Reed-Solomon		0.0; 1.0×10^{-8} to 5.0×10^{-3}
Errored packets	number of errored TS packets per second	0 to 9999
Frequency offset		
Range		±200 kHz
Resolution		1 Hz
Uncertainty		uncertainty of reference freq. ± 3 digits
Bit rate offset		
Range		±50 ppm
Resolution		1 ppm
Uncertainty		uncertainty of reference freq. ± 1 digit
TPS information		
FFT mode		value of FFT mode
Constellation		order of constellation
Guard interval		value of guard interval
Hierarchy		use of hierarchical transmission
Code rate		value of code rate
Cell ID		0x0000 to 0xFFFF
Time slicing	DVB-H	use of time slicing
MPE FEC	DVB-H	use of MPE FEC
In-depth interleaver	DVB-H	use of in-depth interleaving
Constellation diagram		with standard-specific grid
Synchronization		
RF attenuation		0 dB to 50 dB
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked

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Monitoring		
Input level		lower, upper limit
Synchronization		
RF attenuation		lower, upper limit
Automatic gain control (AGC)		OK, unlocked
Sideband position		normal, inverse, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Reference frequency		OK, unlocked
Modulation error ratio (MER)		lower limit
BER before Viterbi		upper limit
BER before Reed-Solomon		upper limit
Errored packets	number of errored TS packets per second	upper limit
Frequency offset		lower, upper limit
Bit rate offset		lower, upper limit
Signal template		
FFT		OK, failed
Constellation		OK, failed
Guard interval		OK, failed
Hierarchy		OK, failed
Code rate		OK, failed
Cell ID		OK, failed
Time slicing	DVB-H	OK, failed
MPE FEC	DVB-H	OK, failed
In-depth interleaver	DVB-H	OK, failed

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IPTV monitoring, analysis, and TS ↔ IP transcoding (R&S®DVM400-B40, only for R&S®DVM400)

Views		
IP interface	display for selected TS-IP link	graphical display of MDI DF and MDI LR numeric display of network parameter and stream characteristics
Channel log	display of all defined TS-IP links	numeric display of network parameter and stream characteristics
Monitoring	errored seconds	synchronization MDI delay factor MDI media loss rate stream characteristics
	log report	in line with definition in R&S®DVM-K1

IP interface		
Physical layer		IEEE 802.03
Bit rate		10/100/1000 Mbit/s
Connectors		RJ-45 SFP interface for optical SFP module
IP encapsulation		in line with Pro-MPEG code of practice #3 release 2
Protocol		
Version		IPv4
Signaling		multicast, unicast
Transport of TS packet		UDP and UDP/RTP
To join multicast group		IGMPv3

TS interface		
Number		3
Direction	switchable	input/output
Connector		BNC 75 Ω
Type		ASI in line with EN 50083-9 (2002) 270 Mbit/s, 188 byte
Maximum cable length	input	60 m

Transcoding		
Simultaneous transcoding	overall	up to 3
	IP to TS	up to 3
	TS to IP	up to 2
IP settings for TS to IP transcoding		
Number of TS per IP packet		1 to 7
FEC		in line with Pro-MPEG code of practice #3 release 2
Protocol		UDP | UDP/RTP
Time to live (TTL)	only for multicast streams	1 to 255

IP analysis performance		
Maximum number of TS-IP links		512
Maximum bandwidth		1 Gbit/s
Cycle rate for parallel evaluation of TS-IP links	400 Mbit/s to 500 Mbit/s	100 %
	800 Mbit/s to 1Gbit/s	50 %

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View measurements		
Source IP address		
Destination IP address		
Protocol		UDP UDP/RTP
Data type		MPEG-2 TS UDP MPEG-2 TS UDP/RTP
TS packets in IP packet		1 to 7
Data length		
IP bit rate		
TS bit rate		
Nominal TS bit rate	deferred from TS PCR value	
IP bandwidth utilization	referenced to 1 Gbit/s	0.01 % to 10 %
MDI-DF (delay factor)	in line with RFC 4545	±1 µs
MDI-LR (media loss rate)	in line with RFC 4545	
RTP interarrival jitter	in line with RFC 3550	±1 µs

View monitoring		
Synchronization	0 to 9	loss after seconds
	0 to 9	sync after seconds
MDI-DF (delay factor)	0.00 to 9999.00	upper limit
MDI-LR (media loss rate)	0 to 9999	upper limit
Stream characteristics		
RTP interarrival jitter	in line with RFC 3550	
Data type		MPEG-2 TS UDP MPEG-2 TS UDP/RTP unknown
TS packets in IP packet		1 to 7
Data length	0 to 99999	lower limit
	0 to 99999	upper limit
IP bit rate	0 to 999999999	lower limit
	0 to 999999999	upper limit
TS bit rate	0 to 999999999	lower limit
	0 to 999999999	upper limit
Nominal TS bit rate	deferred from TS PCR value	lower limit, upper limit

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Transport stream generation, recording, and replay (only for R&S®DVM400)

TS generator (GTS, R&S®DVM400-B2/R&S®DVM400-B40)

Signal interfaces for MPEG-2 transport stream (R&S®DVM400-B2 only)

Serial interfaces		
Number of inputs/outputs		2/2
Connector		BNC 75 Ω
Mode		ASI, SMPTE 310M (user-selectable)
ASI		in line with EN 50083-9 (2002) 270 Mbit/s 188/204/208 byte
SMPTE 310M		in line with BP 400 SMPTE 19.392658 Mbit/s 188 byte
Maximum cable length		180 m
Parallel interfaces (R&S®DVM400 base unit)		
Number of inputs/outputs		1/1
Connector		25-pole connector (female) on front panel
Synchronous parallel interface		SPI, in line with EN 50083-9
Level		LVDS
Clock		84.375 kHz to 20 MHz
Mode	TRP (input)	8 bit data
	TRP (output)	8 bit data, 1 bit data valid,1 bit packet sync
	T10	8 bit data, 1 bit data valid,1 bit packet sync
	GTS (output only)	8 bit data, 1 bit data valid,1 bit packet sync (188, 204, 208 bytes per packet; data valid is active for all bytes)
Serial loopthrough outputs for MPEG-2 transport stream		
Number		2
Connector		BNC 75 Ω
Mode		ASI, SMPTE 310M (according to signals applied to serial inputs)
ASI		in line with EN 50083-9 (2002)
SMPTE 310M		in line with BP 400 SMPTE

Signal interfaces for MPEG-2 transport stream (R&S®DVM400-B40 only)

Serial interfaces		
Number of inputs/outputs		1/1
Connector	allocates one of the three BNC connectors indicated above in the section "IPTV monitoring, analysis, and TS ↔ IP transcoding"	BNC 75 Ω
Mode		ASI
ASI		in line with EN 50083-9 (2002) 270 Mbit/s 188 byte
Maximum cable length		60 m
IP interface (input/output)		
Physical layer		IEEE 802.03
Bit rate		10/100/1000 Mbit/s
Connectors		RJ-45 SFP interface for optical SFP module
IP encapsulation		in line with Pro-MPEG code of practice #3 release 2

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Protocol		
Version		IPv4
Signaling		multicast, unicast
Transport of TS packet		UDP and UDP/RTP
To join multicast group		IGMPv3

Characteristics of the MPEG-2 transport stream generator (R&S®DVM400-B2/R&S®DVM400-B40)

Format		in line with ISO/IEC 1-13818
Number of TS that can be generated simultaneously		1
File format		GTS (Rohde & Schwarz proprietary)
Storage medium		R&S®DVM system hard disk
Signal set		moving picture sequences and test patterns with test tones for 625 and 525 lines DVB/ATSC systems for detailed information, refer to the "Stream Libraries for Rohde & Schwarz TS Generators" data sheet
Supported interfaces	R&S®DVM400-B2: simultaneous outputs	2 × ASI/SMPTE 310M **and** 1 × SPI
	R&S®DVM400-B40: alternative outputs	1 × ASI or 1 × IP
Sequence length		endless and seamless generation with repetition of video, audio, and data contents
Data rate		675 kbit/s to 214 Mbit/s (including null packets)
Useful data rate		max. 90 Mbit/s
Data volume		max. 80 Mbyte useful data
Length of transport stream packets	ATSC	188/208 byte (settable)
	DVB	188/204 byte (settable)
PCR jitter	form	sine, rectangle, and triangle
	frequency	1 mHz to 100 kHz
	amplitude	0 ms to 1 ms
	increment	0.1 µs

Upgrade TS recorder/player (TRP) up to 90 Mbit/s (R&S®DVM400-B3)

Format	any bit sequence	8 bit, 10 bit
Number of signals that can be replayed/generated simultaneously		1
File format		binary
Storage medium	option-specific hard drive	min. 120 Gbyte
Buffer		80 Mbyte
Max. data volume		limited only by size of hard drive
Min. data rate		675 kbit/s
Max. data rate	buffer	214 Mbit/s
	hard drive	90 Mbit/s
Replay		
Supported interfaces	simultaneous output	2 × ASI/SMPTE 310M, 1 × SPI
Determination of data rates	automatically	on the basis of the obtained PCR values
	or manually	
Endless replay		frame-exact cut at transition from end of file to beginning of file
Seamless loop (realtime update of TS values)	selectable	continuity counter PCR/PTS/DTS TOT/TDT

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Recording		
Supported interfaces	selection OFF	2 × ASI/SMPTE 310M, 1 × SPI

Upgrade TS recorder/player (TRP) up to 214 Mbit/s (R&S®DVM400-B4)

Data rate enhancement (R&S®DVM400-B3)		214 Mbit/s
Doubling of hard disk storage capacity	with additional hard disk	min. 120 Gbyte

HDTV sequences (R&S®DV-HDTV)

Several transport streams for testing the MPEG-2 HDTV signal processing.

For detailed information, refer to the "Stream Libraries for Rohde & Schwarz TS Generators" data sheet.

H.264 stream library (R&S®DV-H264)

Several transport streams for testing the H.264 SDTV and HDTV signal processing.

For detailed information, refer to the "Stream Libraries" data sheet.

DVB-H stream library (R&S®DV-DVBH)

Several transport streams for testing the entire DVB-H signal processing chain.

For detailed information, refer to the "Stream Libraries" data sheet.

Test card M sequences (R&S®DV-TCM)

Several transport streams for testing various DTV receiver and decoder STB functions.

For detailed information, refer to the "Stream Libraries" data sheet.

ISDB-T transport stream library (R&S®DV-ISDBT)

Several transport streams for testing various DTV receiver and decoder STB functions.

For detailed information, refer to the "Stream Libraries" data sheet.

Advanced stream combiner (R&S®DV-ASC)

Comprehensive software tool for generating transport stream files in GTS (Rohde & Schwarz proprietary) or TRP format.

For detailed information, refer to the "Stream Libraries" data sheet.

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Rack installation sets

19" adapter for R&S®DVM50/100L/120 (R&S®ZZA-111)

For installation of the instruments with handle in a 19" rack.

19" adapter for R&S®DVM400 (R&S®ZZA-S03)

For installation of the R&S®DVM400 with handle in a 19" rack.

Controller expansion

Memory extension to 2 Gbyte (R&S®DVM-B200)

Integrated controller	R&S®DVM100L, R&S®DVM400	
System memory	standard	1 Gbyte
	with R&S®DVM-B200	2 Gbyte

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Ordering information

Designation	Type	Order No.
Base unit		
MPEG-2 Monitoring System	R&S®DVM50	2085.1900.03
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware		
MPEG-2 Monitoring System	R&S®DVM100L	2112.7050.02
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware, connector for relay contacts		
Digital Video Measurement System	R&S®DVM400	2085.1800.03
Accessories: quick start guide in printed format, operating manual on CD, power cable, crossed patch cable, CD with firmware, connector for relay contacts, mouse		
Expansion unit		
MPEG-2 Monitoring System	R&S®DVM120	2085.1700.03
Accessories: power cable, crossed patch cable		
Transport stream monitoring and analysis		
MPEG Analysis Board	R&S®DVM-B1	2085.3283.02
MPEG Analysis Board	R&S®DVM400-B1	2085.5505.02
TS Monitoring, activation of one channel	R&S®DVM-K1	2085.5211.02
TS Capture, recording by MPEG analysis board	R&S®DVM-K2	2085.5234.02
In-Depth Analysis	R&S®DVM-K10	2085.5228.02
In-Depth Analysis	R&S®DVM50-K10	2085.5434.02
TS Template Monitoring	R&S®DVM-K12	2085.5328.02
Data service and elementary stream analysis		
qPSNR Analysis, realtime analysis of video coding	R&S®DVM-K31	2085.5457.02
Data Broadcast Analysis	R&S®DVM-K11	2085.5311.02
Elementary Stream Analyzer, MPEG-2 ES analysis	R&S®DV-ESA	2085.8904.02
H.264 Analyzer	R&S®DVM-K200	2112.7850.02
Dolby AC-3 Audio, option for H.264 analyzer	R&S®DVM-K201	2112.7867.02
Maintenance for 12 Months, option for H.264 analyzer	R&S®DVM-K209	2112.7873.02
Video and audio decoding		
Video and Audio Hardware Decoding Video: SDTV, MPEG-2, H.264 Audio: MPEG-1/2	R&S®DVM-B30	2085.5570.02
Video and Audio Hardware Decoding Video: SDTV, MPEG-2, H.264 Audio: MPEG-1/2	R&S®DVM400-B30	2085.5540.02
HD/SD-SDI Video Output	R&S®DVM-K30	2085.5440.02
HDTV and Dolby Decoding Upgrade	R&S®DVM-K32	2085.5486.02
RF monitoring, analysis and demodulation		
RF Carrier Board	R&S®DVM-B500	2085.5634.02
RF Carrier Board and Decoder Extension	R&S®DVM400-B500	2085.5563.02
RF Carrier Board Extension	R&S®DVM400-B504	2085.5670.02
Demodulator Module	R&S®DVM-B50	2085.5605.02
DVB-C, J.83/A/C Demodulation	R&S®DVM-K501	2112.7815.02
J.83/B Demodulation	R&S®DVM-K502	2112.7821.02
ATSC/8VSB Demodulation	R&S®DVM-K503	2112.7838.02
High-Quality MER Measurements for R&S®DVM-B50 and R&S®DVM-B53	R&S®DVM-K509	2112.7844.02
DVB-S/DVB-S2 Receiver Module	R&S®DVM-B51	2085.5611.02
DVB-T/DVB-H Receiver Module, 2k and 8k modes	R&S®DVM-B53	2085.5657.02
IPTV monitoring, analysis, and transcoding (R&S®DVM400 only)		
Gigabit Ethernet Interface Module	R&S®DVM400-B40	2085.5557.03

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Designation	Type	Order No.
Transport stream generation, recording, and playback (R&S®DVM400 only)		
TS Generator (GTS)	R&S®DVM400-B2	2085.5511.02
Upgrade TS Recorder (TRP), up to 90 Mbit/s	R&S®DVM400-B3	2085.5528.03
Upgrade TS Recorder (TRP), up to 214 Mbit/s	R&S®DVM400-B4	2085.5534.03
HDTV Sequences	R&S®DV-HDTV	2085.7650.02
H.264 Stream Library	R&S®DV-H264	2085.9052.02
DVB-H Stream Library	R&S®DV-DVBH	2085.8704.02
Test Card M Sequences	R&S®DV-TCM	2085.7708.02
ISDB-T Transport Stream Library	R&S®DV-ISDBT	2085.9146.02
Advanced Stream Combiner, dongle for USB interface	R&S®DV-ASC	2085.8804.03
Rack installation kits		
19" Adapter, 1 HU, 1/1 for design 2000 housing for the R&S®DVM50/100L/120	R&S®ZZA-111	1096.3254.00
19" Adapter for design 2000 housing, 4 HU, 7/8 T250 for the R&S®DVM400	R&S®ZZA-S03	1105.6756.00
Extras		
Memory Extension to 2 Gbyte	R&S®DVM-B200	2085.5592.02
Keyboard with USB Interface (US character set)	R&S®PSL-Z2	1157.6870.03
Mouse with USB Interface, optical	R&S®PSL-Z10	1157.7060.02
Documentation of R&S®DVM50/R&S®DVM100L/R&S®DVM120/ R&S®DVM400 Calibration Values	R&S®DVM-DCV	2082.0490.29
Operating Manual, printed format	R&S®ERST.2	2085.1839.12
Type designation: accessories (-Z), option (-B), software (-K)		

Service options Service options can only be ordered in connection with the purchase of an instrument.		
Repair service		
One-Year Repair Service following the warranty period	R&S®RO2DVM50 R&S®RO2DVM100L R&S®RO2DVM400 R&S®RO2DVM120	please contact your local sales office
Two-Year Repair Service following the warranty period	R&S®RO3DVM50 R&S®RO3DVM100L R&S®RO3DVM400 R&S®RO3DVM120	please contact your local sales office
Four-Year Repair Service following the warranty period	R&S®RO5DVM50 R&S®RO5DVM100L R&S®RO5DVM400 R&S®RO5DVM120	please contact your local sales office
Calibration service		
Two-Year Calibration Service	R&S®CO2DVM50 R&S®CO2DVM100L R&S®CO2DVM400 R&S®CO2DVM120	please contact your local sales office
Three-Year Calibration Service	R&S®CO3DVM50 R&S®CO3DVM100L R&S®CO3DVM400 R&S®CO3DVM120	please contact your local sales office
Five-Year Calibration Service	R&S®CO5DVM50 R&S®CO5DVM100L R&S®CO5DVM400 R&S®CO5DVM120	please contact your local sales office

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License information

The firmware of this device contains open source software. Details on the open source software packages used and the license agreements are provided in the release notes.

For product brochure, see PD 5213.5274.12 and www.rohde-schwarz.com

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