R&S®DVM Measurement Solutions for Compressed Digital TV
Specifications

R&S®DVM50
R&S®DVM100
R&S®DVM100L
R&S®DVM120
R&S®DVM400

75 Years of Driving Innovation

ROHDE & SCHWARZ

CONTENTS

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

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 boards	R&S®DVM-B500	up to four R&S®DVM-B50/B51or up to two R&S®DVM-B50/B51 in combination with one R&S®DVM-B52
	R&S®DVM-B520	up to two R&S®DVM-B52 (twin receiver)
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-B52	DVB-T (twin receiver)
Extension		
MER up to 40 dB for R&S®DVM-B50	R&S®DVM-K509	1 per R&S®DVM50 system
Second receiver path for R&S®DVM-B52	R&S®DVM-K52	1 per R&S®DVM-B52

Minimum PC system requirements (not part of the equipment supplied)		
CPU		Pentium III; 700 MHz
System memory		256 Mbyte RAM
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)

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[1] At least one option per system required.

R&S®DVM100

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. 40 Gbyte (available for user data min. 30 Gbyte)
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	10/100/1000BT, 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

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

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

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[2] At least one option per system required.

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. 40 Gbyte (available for user data min. 30 Gbyte)
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	10/100/1000BT, 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[3]	1, providing up to 4 TS ASI interfaces
TS monitoring	R&S®DVM-K1[3]	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

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/B51or
	R&S®DVM-B520	up to one R&S®DVM-B52 (twin receiver)
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-B52	DVB-T (twin receiver)
Extension		
MER up to 40 dB for R&S®DVM-B50	R&S®DVM-K509	1 per R&S®DVM50 system
Second receiver path for R&S®DVM-B52	R&S®DVM-K52	1 per R&S®DVM-B52

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[3] At least one option per system required.

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

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®DVM100, 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®100/100L/400	Ethernet	10/100BaseT

TS monitoring and analysis		
MPEG analysis board	R&S®DVM-B1[4]	up to two, providing up to 8 TS ASI interfaces
TS monitoring	R&S®DVM-K1[4]	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/B51or
		up to two R&S®DVM-B50/B51 in combination with one R&S®DVM-B52
	R&S®DVM-B520	up to two R&S®DVM-B52 (twin receiver)
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-B52	DVB-T (twin receiver)
Extension		
MER up to 40 dB for R&S®DVM-B50	R&S®DVM-K509	1 per R&S®DVM50 system
Second receiver path for R&S®DVM-B52	R&S®DVM-K52	1 per R&S®DVM-B52

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

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[4] 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. 40 Gbyte (available for user data min. 30 Gbyte)
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[5] 15-pole D-Sub female
Remote control interface	Ethernet	10/100/1000BT, 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		LVSD
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

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

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[5] 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 four, up to two R&S®DVM-B50/B51 and up to one R&S®DVM-B52 (twin receiver)
RF module carrier board	R&S®DVM400-B500	
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-B52	DVB-T (twin receiver)
Extension		
MER up to 40 dB for R&S®DVM-B50	R&S®DVM-K509	1 per R&S®DVM50 system
Second receiver path for R&S®DVM-B52	R&S®DVM-K52	1 per R&S®DVM-B52

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 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

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 class B, 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®DVM100	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®DVM100	5.2 kg (11.46 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®DVM50/100/120	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®DVM50/100/120	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)

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

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
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)

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[6]
		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

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

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[6] Recommended by TR 101 290 for monitoring.

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

Extended checks I – monitoring		
TS	0 Mbit/s to 216000000 Mbit/s	lower/upper bit rate
Service	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Video	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Audio	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Other	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Null packet	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
PAT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
PMT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
CAT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
NIT ACTUAL	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
NIT OTHER	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
BAT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
SDT ACTUAL	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
SDT OTHER	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
EIT ACTUAL PF	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
EIT ACTUAL schedule	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
EIT OTHER PF	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
EIT OTHER schedule	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
TDT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
TOT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
RST	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
MIP	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
AIT	0 Mbit/s to 200000000 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 (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) MGB2B (188, 1 s, 5 s)

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

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
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 216000000 Mbit/s	lower/upper bit rate
Service	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Video	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Audio	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Other	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
Null packet	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
PAT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
PMT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
CAT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
MGT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
CVCT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
TVCT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
STT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
RRT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
EIT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
ETT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
CETT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
DET	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
LTST	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
DCCT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
DCCSCT	0 Mbit/s to 200000000 Mbit/s	lower/upper bit rate
For any bit rate monitoring	"excluding of PID" feature	10 PID numbers
	separate measurements profiles for each measurement	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) MGB2B (188, 1 s, 5 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 27 MHz reference clock

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 262 000 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[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

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 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/s	upper bit rate
EMM	0 to 8191	PID
	mandatory, optional, not allowed	constraint
	0 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/s	upper bit rate
User private data	0 to 8191	PID
	optional, not allowed	constraint
	0 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/s	upper bit rate
Unreferenced PIDs	0 to 8191	PID
	optional, not allowed	constraint
	0 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/s	upper bit rate
Null packets	0 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/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 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/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 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/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 bit/s to 214000000 bit/s	lower bit rate
	0 bit/s to 214000000 bit/s	upper bit rate
EIT present / following	1 to 999999	upper repetition period
EIT scheduled [1 to 16]	1 to 999999	upper repetition period
For any bit rate monitoring	separate measurement profiles for each element	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) MGB2B (188, 1 s, 5 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

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.

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

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 product brochure, 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)

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

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. 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

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

Activation of the HD/SD SDI output.

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

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

Format	Type	R&S® DVM50/R&S®DVM100/ R&S®DVM100L[7]/R&S®DVM120[8]		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[9]	headphone jack
HDMI	digital	DVI-I[10]			DVI-I[10]
Video					
(HD)-SDI/CCVS	digital/analog	–	BNC[11]	–	2 × BNC[12]
HDMI/DVI[13]	digital	DVI-I[10]	–	–	DVI-I[10]
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[14]	-

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

[8] For each installed analyzer.

[9] Mono.

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

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

[12] 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.

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

[14] Displayed picture has standard-definition resolution.

RF monitoring, analysis, and demodulation

RF carrier board (R&S®DVM-B500/520 and R&S®DVM400-B500)

Required for integrating an RF receiver module in the R&S®DVM50/100L/120/400.

R&S®DVM-B500	for RF receiver integration in the R&S®DVM50/120	up to 4 R&S®DVM-B50/51/53 or up to 2 R&S®DVM-B50/51with 1 R&S®DVM-B52 (twin receiver)
	for RF receiver integration in the R&S®DVM100L	up to 2 R&S®DVM-B50/51/53
R&S®DVM-B520	for RF receiver integration in the R&S®DVM50/120	up to 2 R&S®DVM-B52 (twin receiver)
	for RF receiver integration in the R&S®DVM100L	up to 1 R&S®DVM-B52 (twin receiver)
R&S®DVM400-B500	for RF receiver integration in the R&S®DVM400	up to 2 R&S®DVM-B50/51/53 with 1 R&S®DVM-B52 (twin receiver)
	for use with the R&S®DVM400-B30 hardware decoder	live video display on integrated display

J.83/A/C (DVB-C); J.83/B; ATSC (R&S®DVM-B50 with R&S®DVM-K501/502/503/509)

Demodulator module (R&S®DVM-B50)

Standards	The standard is defined by using the R&S®DVM-K501/502/503 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

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-K501/502/503 (R&S®DVM-K509)

Increase in the modulation error ratio (MER) measurement range		
Range		up to 40 dB
Uncertainty	20 dB to 30 dB	±1.0 dB
	30 dB to 35 dB	±1.5 dB

DVB-S/DVB-S2/DIRECTV (R&S®DVM-B51)

Standard		• DVB-S (EN 300421) • DVB-S2 (EN 3023307 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)
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		400 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	$0.0; 1.0 \times 10^{-8}$ to 1.0×10^{-3}
BER before BCH	DVB-S2	$0.0; 2.3 \times 10^{-4}$ to 1.0×10^{-3}
BER before Viterbi	DVB-S/DIRECTV	$0.0; 3.0 \times 10^{-8}$ 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
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/H (R&S®DVM-B52)

The DVB-T receiver module offers two separate receive paths. The second receiver is activated by using the R&S®DVM-K52 option.

Standard		DVB-T/H (ETSI EN 300 744)
Number of receiver paths per module		1
	R&S®DVM-K52	2
Frequency range		174 MHz to 230 MHz and 470 MHz to 862 MHz
Frequency resolution		166.667 kHz
Input level		–75 dBm to –20 dBm
Input connector		BNC (female) 75 Ω
Number of inputs	standard	1
	R&S®DVM-K52	2
Output	via R&S®DVM-B1 or R&S®DVM400-B1 MPEG analysis board	TS ASI BNC (female) 75 Ω
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
Code rate	automatic detection	1/2, 2/3, 3/4, 5/6, 7/8
Bandwidth		5 MHz, 6 MHz, 7 MHz, 8 MHz
Measurements		
RF input level		±2 dB
Synchronization		
Automatic gain control (AGC)		OK, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Modulation error ratio (MER)		
Range		15 dB to 31 dB
Uncertainty		±2 dB
BER before Reed-Solomon		$0.0; 0.1 \times 10^{-8}$ to 1.0×10^{-3}
Errored packets	number of errored TS packets per second	0 to 9999
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
Constellation diagram		with standard-specific grid
Monitoring		
Input level		lower, upper limit
Synchronization		
Automatic gain control (AGC)		OK, unlocked
Carrier		OK, unlocked
MPEG		OK, unlocked
Modulation error ratio (MER)		lower limit
BER before Reed-Solomon		upper limit
Errored packets	number of errored TS packets per second	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

DVB-T/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
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
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	$0.0; 1.0 \times 10^{-8}$ to 1.0×10^{-1}
	64QAM, 16QAM/hierarchical	$<1.0 \times 10^{-3}; 1.0 \times 10^{-3}$ to 1.0×10^{-1}
BER before Reed-Solomon		$0.0; 1.0 \times 10^{-8}$ 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
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

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
Connector		RJ-45
IP encapsulation		in line with pro-MPEG code of practice – 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 – 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 %

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

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

TS generator (GTS, R&S®DVM400-B2)

Signal inputs for MPEG-2 transport stream

Serial inputs		
Number		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 input (R&S®DVM400 base unit)		
Number		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, 8 bit (8 bit data)
		T10, 10 bit
		8 bit data,
		1 bit data valid,
		1 bit packet sync

Signal outputs for MPEG-2 transport stream

Serial outputs		
Number		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 (selectable)
		packet/continuous (selectable)
SMPTE 310M		in line with BP 400 SMPTE
		19.392658 Mbit/s
		188 byte
Maximum cable length		180 m
Parallel input (R&S®DVM400 base unit)		
Number		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, 8 bit
		8 bit data
		1 bit packet sync automatically generated and
		1 bit data valid configurable:
		− exactly 188 bytes active
		− constantly active with packet length of 204 or 208 bytes
		T10, 10 bit
		8 bit data
		1 bit data valid
		1 bit packet sync

Loop-through outputs for MPEG-2 transport stream

Serial outputs		
Number		2
Connector		BNC 75 Ω
Mode		ASI, SMPTE 310M (in line with the signals applied to the serial inputs)
ASI		in line with EN 50083-9 (2002)
SMPTE 310M		in line with BP 400 SMPTE

Characteristics of the MPEG-2 transport stream generator

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" product brochure
Supported interfaces	simultaneous output	2 × ASI/SMPTE 310M, 1 × SPI
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. 80 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
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. 80 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" product brochure.

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 for Rohde & Schwarz TS Generators" product brochure.

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 for Rohde & Schwarz TS Generators" product brochure.

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 for Rohde & Schwarz TS Generators" product brochure.

Advanced stream combiner (R&S®DV-ASC)

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

Rack installation sets

19" adapter for R&S®DVM50/100/100L/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®DVM100, R&S®DVM100L, R&S®DVM400	
System memory	standard	1 Gbyte
	with R&S®DVM-B200	2 Gbyte

Ordering information

Designation	Type	Order No.
Base units		
MPEG-2 Monitoring System	R&S®DVM50	2085.1900.03
MPEG-2 Monitoring System	R&S®DVM100	2085.1600.03
MPEG-2 Monitoring System	R&S®DVM100L	2112.7050.02
Digital Video Measurement System	R&S®DVM400	2085.1800.03
Expansion unit		
MPEG-2 Monitoring System	R&S®DVM120	2085.1700.03
Monitoring and analysis of transport streams		
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		
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 for R&S®DVM-B52	R&S®DVM-B520	2085.5640.02
RF Carrier Board and Decoder Extension	R&S®DVM400-B500	2085.5563.02
Demodulator Module	R&S®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-K501/502/503	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-B52	2085.5628.02
Second DVB-T/H Receiver Path	R&S®DVM-K52	2085.5470.02
DVB-T/DVB-H Receiver Module, 2k and 8k modes	R&S®DVM-B53	2085.5657.02
Monitoring, analysis, and transcoding of IPTV (R&S®DVM400 only)		
Gigabit Ethernet Interface	R&S®DVM400-B40	2085.5557.02

Designation	Type	Order No.
Generation, recording, and replay of transport streams (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		
For R&S®DVM50/100/100L/120	R&S®ZZA-111	1096.3254.00
For R&S®DVM400	R&S®ZZA-S03	1105.6756.00
Controller expansion		
Memory Extension to 2 Gbyte	R&S®DVM-B200	2085.5592.02

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

Option identification: R&S®DVM-Bxxx = hardware option; R&S®DVM-Kxxx = software option.

Specifications apply under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal automatic adjustments performed. "Typical values" are designated with the abbreviation "typ." These values are verified during the final test but are not assured by Rohde & Schwarz. "Nominal values" are design parameters that are not assured by Rohde & Schwarz. These values are verified during product development but are not specifically tested during production.

Rohde & Schwarz equipment is designed for reliable operation up to an altitude of 3000 m above sea level, and for transport up to an altitude of 4500 m above sea level.

About Rohde & Schwarz

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

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