Device comparison

AMA 310
VAROS 109
VAROS 107
VAROS 106

TABLE OF CONTENTS

Chapter 1   **About this document**

This document contains a comparison of KWS measurement receivers.

1.1   Revisions

Version	Reason	Chapter
V1.0 August 2015	First Release	All
V2.0 March 2016	New Device VAROS 106	Chapter VAROS 106 added / Device Comparison updated
V3.0 September 2016	19'' return channel monitoring system / RF switch SW 024	Chapters 2.1.5 and 2.2
V3.1 September 2016	Const. diagram DVB-T2 @ AMA 310	Chapter 2.2
V3.2 September 2016	User editable tuning memory via AMA.remote @ AMA 310, VAROS 106 and VAROS 107	Chapter 2.2
V3.3 October 2016	Headphone jack @ AMA 310	Chapter 2.2
V3.4 November 2016	VBER @ Annex B @ VAROS 106/107 up to $1.00 \cdot 10^{-9}$	Chapter 2.2
V3.5 March 2017	Remote supply VAROS 106 adjustable in 1 V steps, TS data rate measurement @ AMA 310	Chapter 2.2
V3.6 June 2017	MPEG-2 Layer I/II per ISO/IEC 13818-3 corrected to MPEG-1 Layer I/II per ISO/IEC 13818-3	Chapter 2.2
V3.7 Juli 2017	Multi-Stream and PLS option added with DVB-S2	Chapter 2.2
V4.0 December 2017	New Device HE 310 added	Chapter 2.1.7
V4.1 December 2017	SNMPv3, FTP @ AMA 310 added	Chapter 2.2
V4.2 February 2018	Blind Scan @ VAROS 107 and VAROS 107	Chapter 2.2
V4.3 July 2018	DOCSIS3.1 @ VAROS 107 und AMA 310	Chapter 2.2

1.2   Reference documents

This application note refers to the following documents:

- AMA 310 antenna measurement receiver / TV analyzer manual
- AMA 310/UMS 19'' head end unit manual
- VAROS 109 antenna measurement receiver / TV analyzer manual
- VAROS 107 antenna measurement receiver / TV analyzer manual
- VAROS 106 antenna measurement receiver / TV analyzer manual
- Application note AN 006 "Upstream-Monitoring-System UMS"

1.3   Contact with the manufacturer

For the latest information on products from KWS-Electronic, visit our website at www.kws-electronic.de. All contact details can be found there.

Chapter 2 **Device comparison**

2.1 Device overview

2.1.1 AMA 310

High-end combi meter / TV analyzer

- Cable
- Satellite
- Terrestrial

2.1.2 VAROS 106

Combi meter / TV analyzer

- Cable
- Satellite
- Terrestrial

2.1.3   VAROS 107

Combi meter / TV analyzer

- Cable
- Terrestrial

2.1.4   VAROS 109

Satellite meter / TV analyzer

2.1.5   Return channel monitoring system AMA 310/UMS + SW 024 (option) & VAROS 107

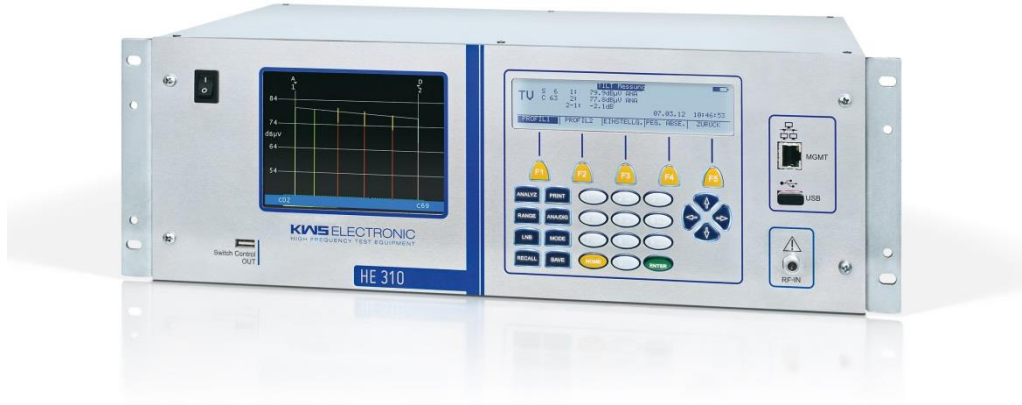High-end single channel / 24 channel return path monitoring system

2.1.6   Return channel monitoring system Kronback X16/KWS & VAROS 107
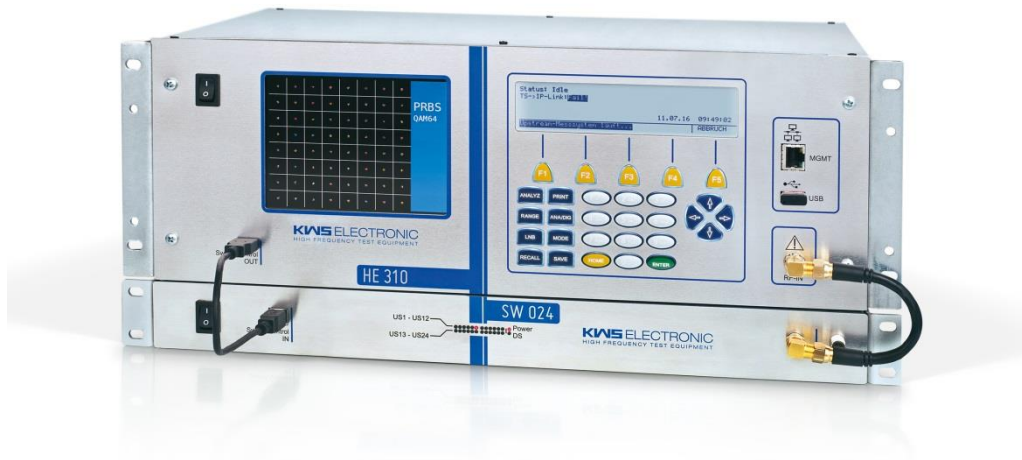

16 channel return path monitoring system (cascadable up to 256 inputs)

2.1.7   Universal monitoring unit for the head-end HE 310

High-end downstream and single channel return path monitoring system

High-end downstream and 24 channel return path monitoring system

2.2 Feature comparison

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Frequency Ranges / MHz				
Satellite	910 – 2150	910 – 2150	-	910 – 2150
TV	45 – 1214	45 – 1214	45 – 1214	-
DOCSIS3.1 downstream	1800 (option)	-	-	-
FM	87.4 – 108.2 45 – 1214 (option)	87.4 – 108.2	87.4 – 108.2	-
RC (return channel)	5 – 65	5 – 65	5 – 65	-
EMI	45 – 1214	45 – 1214	45 – 1214	-
DAB	170 – 250	170 – 250	-	-
Standards				
DVB-S / -S2	●	●	-	●
TV analog	●	●	●	-
DVB-C	●	●	●	-
DOCSIS- (J83B-) / EuroDOCSIS-DS	●	●	●	-
DOCSIS3.1-DS (OFDM)	● (option)	-	-	-
DOCSIS1.0 / 1.1 / 2.0 / 3.0	●	-	●	-
PRBS in return channel	●	-	-	-
DVB-T / -T2	●	●	●	-
DTMB	● (option)	● (option)	● (option)	-
FM	●	●	●	-
DAB / DAB+	●	●	-	-
Interfaces				
RF (IEC, 75 Ω)	●	●	●	-
RF (F, 75 Ω)	-	-	-	●
Common interface (CI)	● (2x)	● (1x)	● (1x)	● (1x)
ASI IN / ASI OUT	●	-	-	-
DVI	●	●	●	●
USB	●	●	●	●
Ethernet (LAN)	●	-	-	-
SCART	●	-	-	-
Optical input (SC/APC)	●	●	●	●
2nd LAN, 2nd USB (for RC monitoring)	● (option)	-	-	-
Analyzer				
Spectrum analyzer for all ranges	●	●	●	●
MAX hold function	●	●	●	-
Level diagram (TV & DAB range)	●	●	●	-
TILT function (TV range)	●	●	●	-
Ingress measurement (return channel)	●	●	●	-
Level measurement				
Measuring range SAT / dBµV	30 – 120	30 – 120	-	30 – 110
Measuring range TV / dBµV	20 – 120	20 – 120	20 – 120	-
Measuring range FM / dBµV	20 – 120	20 – 120	20 – 120	-
Measuring range RC / dBµV	20 – 120	20 – 120	20 – 120	-
Measuring range DAB / dBµV	20 – 120	20 – 120	-	-
Resolution / dB	0.1	0.1	0.1	0.5
Accuracy (at 20°C)	± 1.5 dB	± 1.5 dB	± 1.5 dB	± 2.0 dB
Accuracy (0°C - 40°C)	± 2.0 dB	± 2.0 dB	± 2.0 dB	± 2.5 dB
Level units (dBµV, dBmV, dBm)	●	-	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
ATV performance highlights				
TV standards	B/G, D/K, L, I, M/N	B/G, D/K, L, I, M/N	B/G, D/K, L, I, M/N	-
Colour standards	PAL, NTSC, SECAM	PAL, NTSC, SECAM	PAL, NTSC, SECAM	-
Frequency offset measurement	●	-	-	-
Sound carrier measurement	SC1, SC2, MONO, STEREO, DUAL SOUND	SC1, SC2, MONO, STEREO, DUAL SOUND	SC1, SC2, MONO, STEREO, DUAL SOUND	-
NICAM	●	●	●	-
Teletext per ETS 300706	●	-	-	-
VPS evaluation per ETS 300231	●	-	-	-
S/N measurement per CCIR 569	●	●	●	-
S/N measuring range / dB	40 – 55	40 – 55	40 – 55	-
Noise margin	-	●	●	-
TV line SCOPE function	●	-	-	-
HUM measurement	●	-	-	-
CNI code	●	-	-	-
Picture and sound check	●	●	●	-
FM performance highlights				
Mono / stereo indicator	●	●	●	-
RDS (Station name, PI code)	●	●	●	-
RDS (Dynamic radiotext)	●	-	-	-
Sound check	●	●	●	-
DVB-S performance highlights				
QPSK demodulator per ETS 300421	●	●	-	●
Symbol rates / MSymb/s	2 – 45	2 – 45	-	2 – 45
Frequency offset	●	-	-	-
CBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-	$1.00 \cdot 10^{-8}$
VBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-	$1.00 \cdot 10^{-8}$
MER max. / dB	20	20	-	20
Noise margin	-	●	-	●
Packet errors (PE)	up to $4 \cdot 10^{9}$	up to $4 \cdot 10^{9}$	-	up to $4 \cdot 10^{9}$
Teletext per ETS 300427	●	-	-	-
Subtitling per ETS 300743	●	-	-	-
AFC switch off	●	●	-	●
DVB-S2 performance highlights				
QPSK / 8 PSK demodulator (ETS 302307)	●	●	-	●
16 / 32 APSK demodulator (ETS 302307)	●	●	-	-
Symbol rates / MSymb/s	2 – 45	2 – 45	-	2 – 45
Frequency offset	●	-	-	-
CBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-	$1.00 \cdot 10^{-8}$
LBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-	$1.00 \cdot 10^{-8}$
MER max. / dB	20	20	-	20
Noise margin	-	●	-	●
Packet errors (PE)	up to $4 \cdot 10^{9}$	up to $4 \cdot 10^{9}$	-	up to $4 \cdot 10^{9}$
Automatic DVB-S / -S2 detection	●	●	-	●
Teletext per ETS 300427	●	-	-	-
Subtitling per ETS 300743	●	-	-	-
AFC switch off	●	●	-	●
Multi-Stream (MIS)	● (option)	● (option)	-	-
Physical Layer Scrambling (PLS)	● (option)	● (option)	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Remote supply and satellite equipment control				
Voltages / V	5 – 20	5 – 20	5	14 / 18
Max. current / mA	500	500	100	500
Short circuit protection	●	●	●	●
Current measurement range / mA	0 – 500	0 – 500	-	0 – 500
DiSEqC V1.0	●	●	●	●
DiSEqC V1.1	●	●	-	●
DiSEqC V1.2	●	●	-	●
DiSEqC V2.0	●	●	-	●
UNICABLE per EN 50494	●	●	-	●
JESS per EN 50607 (32 user bands)	●	●	-	●
Antenna wall outlets programmable	●	●	-	●
DiSEqC script function via USB	-	●	-	●
DVB-C / EuroDOCSIS-DS highlights				
QAM demodulator per ETS 300163	●	●	●	-
Symbol rates / MSymb/s	0.5 – 7.2	1.0 – 7.2	1.0 – 7.2	-
QAM constellations	16, 32, 64, 128, 256 QAM	16, 32, 64, 128, 256 QAM	16, 32, 64, 128, 256 QAM	-
Frequency offset	●	-	-	-
BER	$1.00 \cdot 10^{-8}$ or $1.00 \cdot 10^{-9}$	$1.00 \cdot 10^{-8}$ or $1.00 \cdot 10^{-9}$	$1.00 \cdot 10^{-8}$ or $1.00 \cdot 10^{-9}$	-
MER max. / dB	40	40	40	-
Phase Jitter	0.4° - 5.0°	-	-	-
HUM	0.5% - 5.0%	-	-	-
Noise margin	-	●	●	-
Packet errors (PE)	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	-
Teletext per ETS 300427	●	-	-	-
Subtitling per ETS 300743	●	-	-	-
J83B performance highlights				
QAM demodulator per ITU-T J83B	●	●	●	-
Symbol rates / MSymb/s	5057, 5361	5057, 5361	5057, 5361	-
QAM constellations	64, 256 QAM	64, 256 QAM	64, 256 QAM	-
Frequency offset	●	-	-	-
VBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$ or $1.00 \cdot 10^{-9}$	$1.00 \cdot 10^{-8}$ or $1.00 \cdot 10^{-9}$	-
MER max. / dB	40	40	40	-
Phase Jitter	0.4° - 5.0°	-	-	-
HUM	0.5% - 5.0%	-	-	-
Noise margin	-	●	●	-
Packet errors (PE)	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	-
PRBS performance highlights (in the return channel frequency range)				
QAM demodulator	●	-	-	-
Data sequence	PRBS23	-	-	-
Symbol rates / MSymb/s	0.3 – 7.2	-	-	-
QAM constellations	QPSK, 16, 64, 256 QAM	-	-	-
Frequency offset	●	-	-	-
BER	$1.00 \cdot 10^{-8}$	-	-	-
MER max. / dB	40	-	-	-
Phase Jitter	0.4° - 5.0°	-	-	-
HUM	0.5% - 5.0%	-	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
DVB-T performance highlights				
COFDM demodulator per ETS 300744	●	●	●	-
FFT	2k, 8k	2k, 8k	2k, 8k	-
Bandwidths / MHz	6, 7, 8	6, 7, 8	6, 7, 8	
Constellations	QPSK, 16, 64 QAM	QPSK, 16, 64 QAM	QPSK, 16, 64 QAM	-
Guard intervals	1/4, 1/8, 1/16, 1/32	1/4, 1/8, 1/16, 1/32	1/4, 1/8, 1/16, 1/32	-
Frequency offset	●	-	-	-
CBER	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	-
VBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-
MER max. / dB	35	35	35	-
Noise margin	-	●	●	-
Packet errors (PE)	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	-
Impulse response (echo measurement)	●	●	●	-
Teletext per ETS 300427	●	-	-	-
Subtitling per ETS 300743	●	-	-	-
DVB-T2 performance highlights				
COFDM demodulator per ETS 302755	●	●	●	-
Fully compliant to v1.3.1	●	●	●	-
L1 post scrambling	●	●	●	-
FFT	1k, 2k, 4k, 8k, 16k, 32k	1k, 2k, 4k, 8k, 16k, 32k	1k, 2k, 4k, 8k, 16k, 32k	-
Bandwidths / MHz	6, 7, 8	6, 7, 8	6, 7, 8	-
Constellations	QPSK, 16, 64, 256 QAM	QPSK, 16, 64, 256 QAM	QPSK, 16, 64, 256 QAM	-
Guard intervals	1/4, 19/128 1/8, 19/256, 1/16, 1/32, 1/128	1/4, 19/128 1/8, 19/256, 1/16, 1/32, 1/128	1/4, 19/128 1/8, 19/256, 1/16, 1/32, 1/128	-
Pilot patterns	PP1 – PP8	PP1 – PP8	PP1 – PP8	-
Frequency offset	●	-	-	-
CBER	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	-
LBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-
MER max. / dB	35	35	35	-
Noise margin	-	●	●	-
Packet errors (PE)	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	up to $4 \cdot 10^9$	-
Impulse response (echo measurement)	●	●	●	-
Teletext per ETS 300427	●	-	-	-
Subtitling per ETS 300743	●	-	-	-

	AMA 310	**VAROS 106**	**VAROS 107**	**VAROS 109**
DTMB performance highlights				
DTMB demodulator per GB20600-2006	●	●	●	-
Bandwidths / MHz	8	8	8	-
Single carrier mode (C1)	●	●	●	-
Multiple carrier mode (C3780)	●	●	●	-
Constellations	4, 16, 32, 64 QAM, 4 QAM_NR	4, 16, 32, 64 QAM, 4 QAM_NR	4, 16, 32, 64 QAM, 4 QAM_NR	-
FEC	0.4 / 0.6 / 0.8	0.4 / 0.6 / 0.8	0.4 / 0.6 / 0.8	-
Guard intervals	PN420v, PN595c, PN945v, PN420c, PN945c,	PN420v, PN595c, PN945v, PN420c, PN945c,	PN420v, PN595c, PN945v, PN420c, PN945c,	-
Time interleaver	M_240, M_720	M_240, M_720	M_240, M_720	-
Frequency offset	●	-	-	-
CBER	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	-
LBER	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	$1.00 \cdot 10^{-8}$	-
MER max. / dB	32	32	32	-
Noise margin	-	●	●	-
Packet errors (PE)	up to $4 \cdot 10^{9}$	up to $4 \cdot 10^{9}$	up to $4 \cdot 10^{9}$	-
Impulse response (echo measurement)	●	●	●	-
DAB / DAB+ performance highlights				
COFDM demodulator per ETSI EN 300401	●	●	-	-
FFT	2k	2k	-	-
Mode	1	1	-	-
Modulation scheme	DQPSK	DQPSK	-	-
Guard interval	1/4	1/4	-	-
CBER	$1.00 \cdot 10^{-6}$	$1.00 \cdot 10^{-6}$	-	-
MER max. / dB	25	25	-	-
DAB+ frame decoding per ETS TS 102563	●	●	-	-
TII evaluation	●	●	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
DOCSIS3.0 analyzer performance highlights				
Fully backward compatible to DOCSIS1.0, 1.1 and 2.0	●	-	●	-
DOCSIS downstream performance	see J83B	-	see J83B	-
EuroDOCSIS downstream performance	see DVB-C	-	see DVB-C	-
US constellations	QPSK, 8, 16, 32, 64 QAM, 128 QAM (S-CDMA only)	-	QPSK, 8, 16, 32, 64 QAM, 128 QAM (S-CDMA only)	-
US symbol rates / kSymb/s	160, 320, 640, 1280, 2560, 5120	-	160, 320, 640, 1280, 2560, 5120	-
US access modes	TDMA, A-TDMA, S-CDMA	-	TDMA, A-TDMA, S-CDMA	-
US frequency range / MHz	5 – 65	-	5 – 65	-
BPI encryption support	●	-	●	-
BPI+ encryption support	●	-	●	-
Continuous ranging	●	-	●	-
Continuous analysis of DS / US level	●	-	●	-
US equalizer parameter evaluation	●	-	●	-
DS duty factor	●	-	-	-
IP synchronization	●	-	●	-
Scalable PING test	●	-	●	-
Time slice analysis	●	-	●	-
US frequency selection for ranging	●	-	●	-
US and DS speed test	●	-	●	-
8 x DS channel bonding	●	-	●	-
4 x US channel bonding	●	-	●	-

	AMA 310	**VAROS 106**	**VAROS 107**	**VAROS 109**
DOCSIS3.1 downstream analyzer performance highlights (option)				
OFDM demodulator (DOCSIS3.1 conform)	● (FPGA based)	-	-	-
Bandwidth / MHz	24 - 192	-	-	-
FFT	4k, 8k	-	-	-
Cyclic Prefix / µs	0.9375 / 1.25 / 2.5 / 3.75 / 5.0	-	-	-
Roll-Off / µs	0 / 0.3125 / 0.625 / 0.9375 / 1.25	-	-	-
Frequency offset	●	-	-	-
MER max. / dB	45	-	-	-
PLC BER	$1.00 \cdot 10^{-5}$	-	-	-
HUM	1.0% - 5.0%	-	-	-
Channel spectrum	● (real-time)	-	-	-
Constellation diagram	● (real-time)	-	-	-
In-channel frequency response	● (real-time)	-	-	-
Impulse response (echo measurement)	● (real-time)	-	-	-
MER vs. frequency / carrier index	●	-	-	-
Complete PLC evaluation	●	-	-	-
DS profile evaluation (up to 16)	●	-	-	-
Level measurement within 8 MHz sub-channels	●	-	-	-
MER measurement within 8 MHz sub-channels	●	-	-	-
Noise margin (frequency dependant and profile related)	●	-	-	-
Frequency range extension up to 1800 MHz (from Q1 / 2019)	● (option)	-	-	-
Return path performance highlights				
Spectrum analyzer	●	●	●	-
Ingress measurement	●	●	●	-
CW (unmodulated) signals	●	●	●	-
DVB-C measurable in 5 – 65 MHz range	●	-	-	-
J83B measurable in 5 – 65 MHz range	●	-	-	-
PRBS measurable in 5 – 65 MHz range	●	-	-	-
Constellation diagram				
DVB-S	● (real-time)	●	-	●
DVB-S2	● (real-time)	●	-	●
DVB-C	● (real-time)	●	●	-
J83B	● (real-time)	●	●	-
DOCSIS3.1 / OFDM	● (real-time)	-	-	-
DVB-T	● (real-time)	●	●	-
DVB-T2	●	●	●	-
DTMB	●	●	●	-
PRBS	● (real-time)	-	-	-
Colored pseudo-3D display	●	●	●	●

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Electromagnetic interference (EMI) measurement				
Range with antenna EMI 240 / dBµV/m	5 – 105	5 – 105	5 – 105	-
Range with antenna EMI 241 / dBµV/m	3 – 103	3 – 103	3 – 103	-
Automatic field strength display	●	●	●	-
User editable antenna	●	●	●	-
Distance correction	●	●	●	-
Standard upper field strength limit / dBµV/m	27	27	27	-
Upper field strength limit editable	●	●	●	-
ID extraction from characteristic frequency in the cable plant	●	●	●	-
MPEG-2/-4/-H video / audio decoder performance highlights				
MPEG-2 MP@HL per ISO/IEC 13818-2	●	●	●	●
MPEG-4 AVC per ISO/IEC 14496-10	●	●	●	●
MPEG-H HEVC per ISO/IEC 23008-2	●	●	●	-
AVS / AVS+ per GY/T 257.1-2012	● (option)	● (option)	● (option)	-
MPEG-1 Layer I/II per ISO/IEC 13818-3	●	●	●	●
MPEG-2 AAC per ISO/IEC 13818-7	●	●	●	●
MPEG-4 AAC per ISO/IEC 14496-3	●	●	●	●
Dolby Digital AC-3	●	●	●	●
Dolby Digital Plus	●	●	●	●
DAB Audio decoding MPEG-1/2 Layer II per ISO/IEC 11172-3 und 13818-3	●	●	-	-
DAB+ Audio decoding HE-AACv2 per ISO/IEC 14496-3	●	●	-	-
Chinese character set per GB2312	●	●	●	●
NIT evaluation	●	●	●	●
Dynamic PMT	●	●	●	●
Delivery System Descriptor	●	●	●	●
Logical Channel Descriptor (LCD)	●	-	-	-
Logical Channel Numbering (LCN) list	●	-	-	-
Video bit rate measurement	●	●	●	●

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Optical input performance highlights				
Connector	SC/APC	SC/APC	SC/APC	SC/APC
Wavelength / nm	1260 – 1620	1260 – 1620	1260 – 1620	1260 – 1620
Optical filter	-	-	-	-
Max. optical input power / dBm	+8	+8	+8	+8
Return loss / dB	>40	>40	>40	>40
Equivalent input noise / pA/√Hz	<8	<8	<8	<8
RF frequency range / MHz	5 – 2150	5 – 2150	5 – 1200	910 – 2150
Nominal input power / dBm	-7 – +3	-7 – +3	-7 – +3	-7 – +3
Measurable optical power / dBm	-35 – +9	-35 – +9	-35 – +9	-35 – +9
Accuracy / dB	±0.35	±0.35	±0.35	±0.35
Calibrated wavelengths / nm	1310, 1490, 1550	1310, 1490, 1550	1310, 1490, 1550	1310, 1490, 1550
Channel / individual OMI (optical modulation index) measurement	●	●	●	●
Total OMI measurement	●	●	●	-
Optical-RF-conversion for BER, MER, PE measurement, constellation view, picture and sound evaluation, … for ALL RF ranges	●	●	●	●
Upstream measurement system (UMS, option!) performance highlights	AMA 310/UMS or HE 310			
Communication with handheld device / field device VAROS 107 over the HFC network	●	-	-	-
ASK demodulation for handheld device signaling	●	-	-	-
US measurements during active DOCSIS modem service	●	-	-	-
Number of connectable field devices	up to 20	-	-	-
Measurement result output via ASI	●	-	-	-
Measurement result output via Ethernet (UDP)	●	-	-	-
Measurement result output via Ethernet (RTP/UDP)	●	-	-	-
Net data rate of MPEG stream for DS communication / measurement result transmission to the field device / kBit/s	< 700	-	-	-
Real-time spectrum analyzer	●	-	-	-
Frequency range / MHz	4.32 – 65.76	-	-	-
Measuring range / dBμV	0 – 120	-	-	-
Accuracy (at 20°C)	± 1.5 dB	-	-	-
Sweep function (frequency response)	●	-	-	-
TILT function	●	-	-	-
MAX hold function	●	-	-	-
Max. US carrier MER measurement / dB	40	-	-	-
US carrier BER measurement depth	$1.00 \cdot 10^{-8}$	-	-	-
Optional: RF switch control (SW 024)	●	-	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Upstream signal generator				
Number of carriers	-	-	1 or 4	-
Unmodulated carrier transmission	-	-	●	-
Modulated carrier transmission	-	-	●	-
Modulation schemes	-	-	QPSK, 16, 64, 256 QAM	-
Symbol rates / kSymb/s	-	-	320, 640, 1280, 2560, 5120	-
Data content	-	-	PRBS23	-
Transmission level / dBµV	-	-	70 – 112	-
Frequency range	-	-	5 – 65	-
Output MER / dB	-	-	>43	-
Upstream monitoring performance highlights (VAROS 107 (software option!) & AMA 310/UMS or HE 310)				
Display of the return channel spectrum at the head end in real-time (on the field device)	-	-	●	-
Return channel frequency response measurement (wobbel)	-	-	●	-
Assistance for return channel amplifier alignment	-	-	●	-
Waterfall diagram display	-	-	●	-
Automated measurements with protocol creation in XML format	-	-	●	-
Ranging to reference level (forced by the head end device)	-	-	●	-
Measuring of MER, BER and constellation diagram of modulated test carriers generated by the VAROS 107	-	-	●	-
Max hold function	-	-	●	-
Registration and deregistration of field units for exclusive measurement access	-	-	●	-
Upstream monitoring performance highlights (VAROS 107 (software option!) & Kronback X16/KWS)				
Display of the return channel spectrum at the head end in real-time (on the field device)	-	-	●	-
Return channel frequency response measurement (wobbel)	-	-	●	-
Assistance for return channel amplifier alignment	-	-	●	-
Waterfall diagram display	-	-	●	-
Ranging to reference level (forced by the head end device)	-	-	●	-
Max hold function	-	-	-	-
RF input				
Return loss TV / dB	>12	>12	>12	-
Return loss SAT / dB	>10	>10	-	>8
External Voltage V_{eff} (DC – 50 Hz) / V	≤70	≤70	≤70	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Miscellaneous				
Tuning memory storage cells	200	200	200	99
Memory import and export via USB	●	●	●	●
User editable tuning memory via free toolbox in AMA.remote software	●	●	●	-
User editable channel table for TV range via free toolbox in AMA.remote software	●	●	●	-
Printer	●	-	-	-
Remote monitoring and control via SNMPv3 via Ethernet interface	● (option)	-	-	-
SNMP traps	● (option)	-	-	-
FTP functionality (Upload and download of tuning memory files and user-defined channel tables, download of DataLogger result files and screenshots, upload of firmware updates)	● (option)	-	-	-
Replaceable battery	●	●	●	-
Screenshots on USB (hardcopy)	●	●	●	●
Screenshots in internal memory	●	●	●	-
View screenshots from USB	-	●	●	-
Microscope function for fiber inspection	-	●	●	●
Software update via USB	●	●	●	●
Monitoring program	●	-	-	-
Measurement data recording (DataGrabber)	●	●	●	-
Measurement data memory / automatic measurements (DataLogger)	●	●	●	●
Satellite scan support (SatScan)	-	●	-	●
Wizard for installing and adjusting satellite dishes	-	-	-	●
Wizard for a satellite signal quality check at the wall outlet	-	-	-	●
Blind scan in TV frequency range	●	●	●	-
TS data rate measurement (gross and net) with DVB, DOCSIS, DTMB and ASI	●	-	-	-
Keypad illumination	●	●	●	-
Headphone jack (output / 3.5 mm)	●	-	-	-
Scope of delivery				
Power cable	●	●	●	●
External power supply	-	●	●	●
IEC measuring cable 75 Ω	●	●	●	●
Fiber cable SC/APC to SC/APC	●	●	●	-
Fibre cable SC/APC to FC/PC	●	●	-	●
Printed Manual	●	●	●	●
USB stick	●	●	●	●
Leather case	●	-	-	-
Plastic Transport case	-	●	●	●
Protective case with carry strap	-	● (option)	● (option)	●
Accessories				
Rack mounting kit, 19'', 5 RU	●	-	-	-

	AMA 310	VAROS 106	VAROS 107	VAROS 109
Power supply				
Internal power supply	●	-	-	-
External power supply	-	●	●	●
Max. power consumption / W	45	36	36	30
External 12 V supply	●	●	●	●
Li-Ion battery pack	●	●	●	●
Battery voltage / V	14.4	7.2	7.2	7.2
Battery capacity / Ah	6.6	6.6	6.6	6.6