

R&S® AdVISE VISUAL INSPECTION SOFTWARE

Artificial intelligence
inside for time-saving
setup routines

Cut out human lack of attention errors



Product Brochure
Version 06.00

ROHDE & SCHWARZ

Make ideas real



AT A GLANCE

R&S®AdVICE visual inspection software automates the process of visually monitoring equipment under test (EUT) during a test sequence. This eliminates errors due to human inattention, ensures reproducible results and simplifies test documentation. A typical application is EMS testing with R&S®ELEKTRA EMC automation software.

Visually monitoring an EUT during a complex test sequence is time-consuming and requires the utmost concentration. Errors can be overlooked in a momentary lapse of attention. Furthermore, many events cannot be reliably monitored with the naked eye, such as slight changes in color or brightness or deviation from a predefined flashing frequency. This is where R&S®AdVICE software overcomes the limitations of the human eye.

R&S®AdVICE uses object based algorithms to analyze the incoming video signal of a camera attached to a PC. With the aid of parameters defined by the user, the software detects any deviations from the target status of the EUT and documents these deviations in a video protocol and status report. R&S®AdVICE can be connected to system software such as R&S®ELEKTRA via a remote control interface. The system software controls the test sequence and creates its own report containing the results created by R&S®AdVICE.

The analysis focuses on regions of interest (ROI). ROIs, drawn by the user, are used to denote the areas of the picture that are to be analyzed and specify which analysis method is to be used in this area.

An optional automatic event detection assistant based on machine learning enables visual monitoring with no configuration effort. The R&S®AdVICE system analyzes up to 30 video frames per second and can see transitory events that a human may miss.

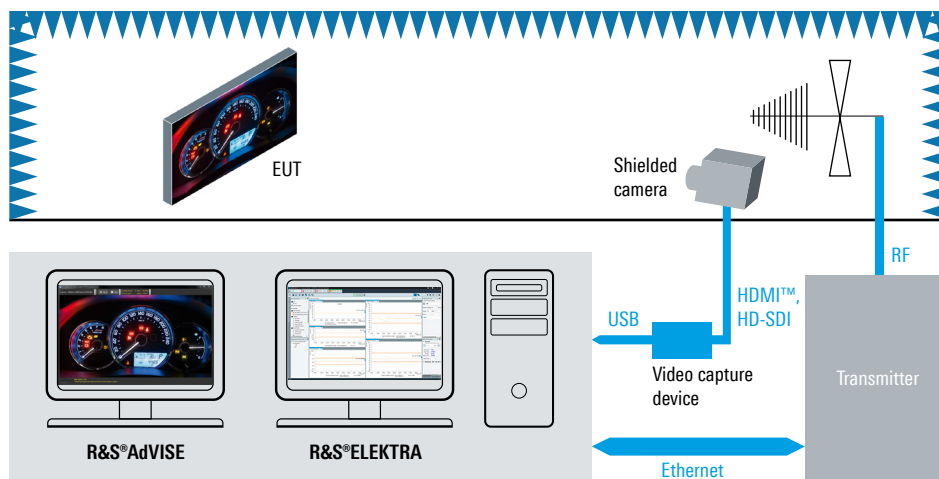
The intuitive and clearly structured user interface makes it possible to configure measurements in only a few minutes. The operator can intervene at any point during the test sequence to deactivate or adjust individual regions.



KEY FACTS

- ▶ Automatic error recognition for EUTs based on camera signal evaluation
- ▶ Continuous monitoring of up to 32 regions at 30 frames per second
- ▶ Optional image tracking to compensate for EUT and camera vibrations
- ▶ Creation of event-controlled video protocols and test reports
- ▶ Runs independently and under the control of system software
- ▶ Optional automatic event detection based on machine learning

R&S®AdVICE in a networked system with EMC control software



BENEFITS

System concept

R&S®AdVICE runs on any controller that fulfills the minimum requirements listed in the specifications. It leaves sufficient processing power to also run control software such as R&S®ELEKTRA on the same controller.

A special video interface to feed the uncompressed camera signal is not necessary. This is performed by an off-the-shelf portable frame grabber connected to the R&S®AdVICE PC via USB 3.0. All cameras with conventional interfaces such as HDMI™ or SDI can be connected.

R&S®AdVICE is an efficient solution for monitoring an EUT from different angles. Thanks to the precise configurability of the ROIs, R&S®AdVICE can analyze multiple cameras simultaneously when their output signals are combined by an upstream multiviewer into a single video signal.

Image tracking

With the image tracking option, R&S®AdVICE automatically adjusts the position of all defined measuring fields to the actual position of the image elements to be evaluated. As a result, R&S®AdVICE visual inspection software can be used even if running motors, shaky turntables or unstable camera suspensions cause the image to vibrate. The option also supports camera repositioning. The measurement configuration can be resumed at the push of a button.

Virtual camera

R&S®AdVICE can also analyze video recordings of completed tests with the R&S®ADV-K1050 virtual camera option. Measurements can be configured in the same way as during real-time operation, except that the software analyzes the content of a video file instead of a camera signal.

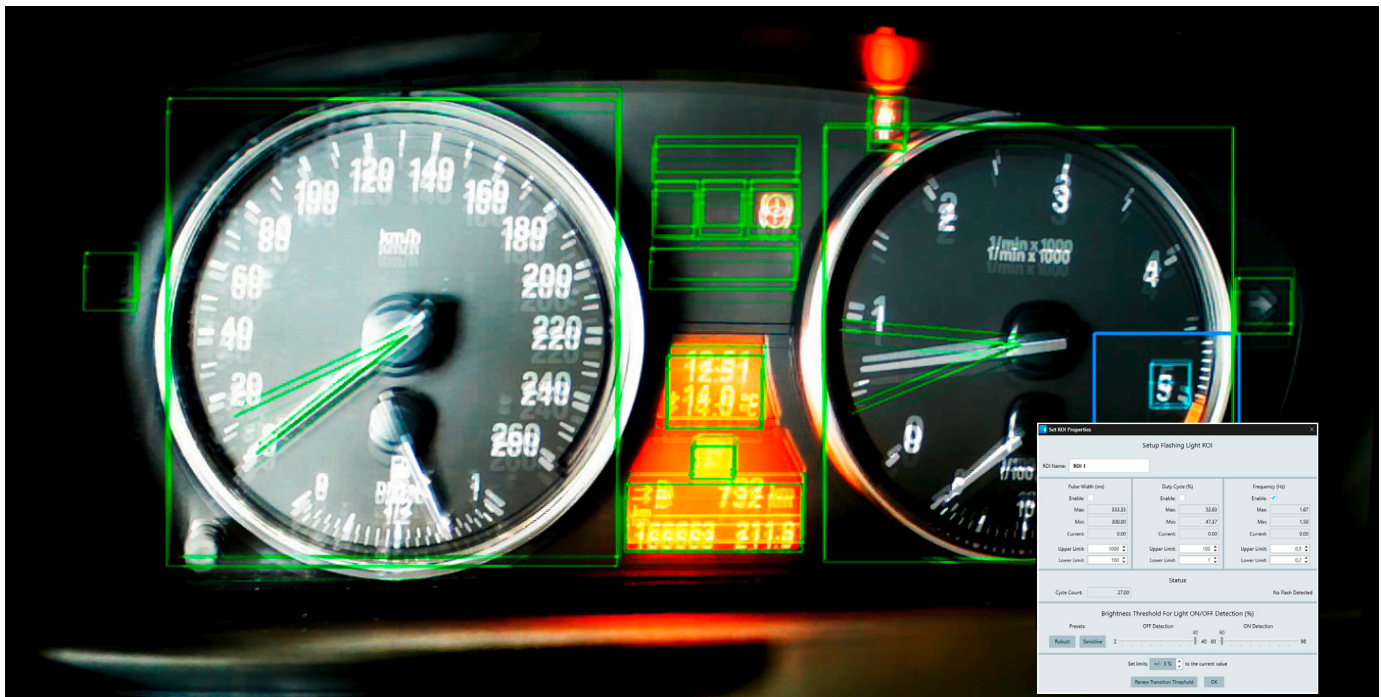
Video protocol and test report

R&S®AdVICE creates a video protocol with an event list. What sets the R&S®AdVICE system apart in usability is the indexing feature of the integrated video player. This feature allows the user to go to any event in the video by clicking on the event information. The player enables the user to collect a single frame as a JPEG image or collect a clip of the video to be used for reports or archiving. The event list can also be saved as a PDF test report.

Automatic event recognition

The optional automatic event recognition assistant ROI eliminates the need to select and configure individual ROIs. Based on machine learning, using a short recording of the desired behavior of the EUT as training material, the ROI automatically detects and marks events in the video stream that may contain faulty behavior. The user, then, approves or discards the suggestions of the automatically detected events.

Image tracking allows EUT monitoring even if vibrations disturb the image recording

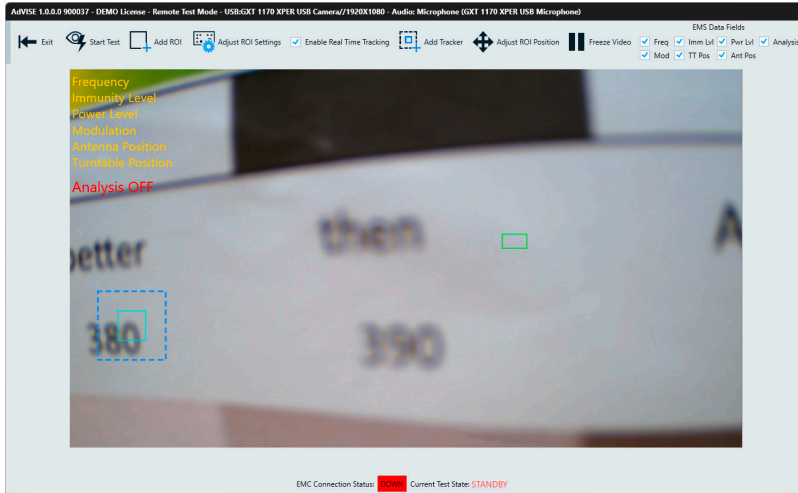


Remote control

R&S®AdVISE has a generic and an extended remote interface to control test sequences. The generic interface is open to all users who wish to control R&S®AdVISE via their own remote control software. R&S®AdVISE will pass back to the remote system a Go/NoGo value indicating whether or not an event condition has been detected. The test software can transmit test information to R&S®AdVISE during the test sequence.

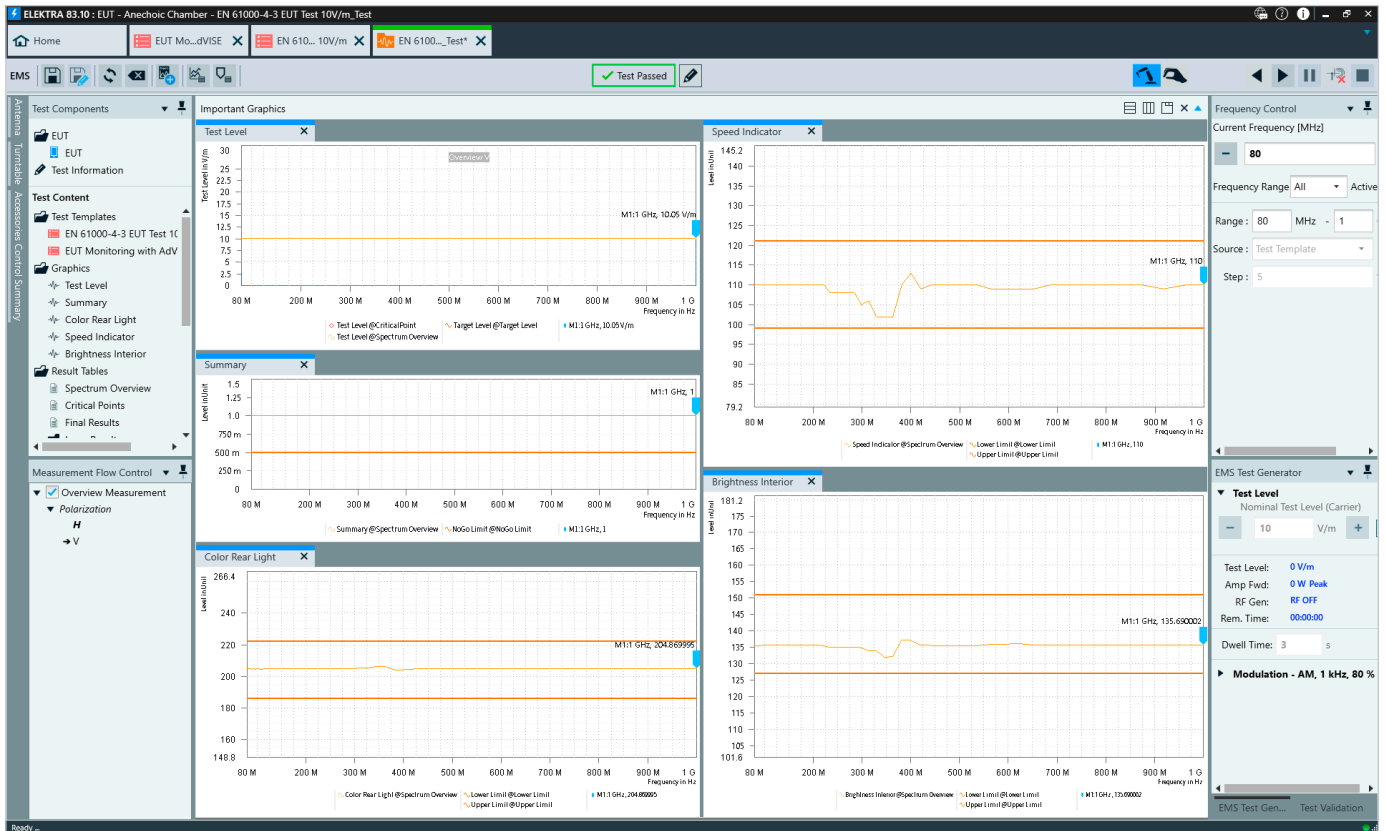
R&S®AdVISE then superimposes this information clearly into the incoming video. This informs the operator of the test's progress while it is running, and makes it easier to assign the event to the corresponding test conditions in the recorded video report.

The extended interface is designed to be used with R&S®ELEKTRA. This interface also provides the measurement results for individual ROIs for graphical processing in R&S®ELEKTRA.



Measurement view with superimposed information of the EMS test conditions

Displaying R&S®AdVISE test results in R&S®ELEKTRA measurement software



OPTIMAL ANALYSIS EFFICIENCY

Regions of interest (ROI) are the mechanism by which the user defines how to use the R&S®AdvISE system. ROIs are small sections of the video surface that the operator specifies by drawing a rectangular box around the area. The analyzers then focus on the video frame areas defined by the ROIs. This increases the speed at which events are captured and helps ensure real-time processing. The R&S®AdvISE system supports parallel monitoring of up to 32 ROIs (R&S®ADV-K1032 option).

Each ROI that is created is assigned to a specific type of event that the ROI is watching for. These types are described in more detail below.

Light (on/off)

Light on/off indicates extreme changes in brightness. In other words, a lamp is either on or off. The analyzer will declare an event if a defined area changes from off to on or from on to off. Examples:

- ▶ Headlights
- ▶ Dashboard indicator lights (ABS, engine oil, temperature, warning, etc.)
- ▶ Tail lights
- ▶ Cockpit warning indicators
- ▶ Interior or exterior lighting

Color change

Color change monitors the color of the observed area. The analyzer will declare an event if the average color of the defined ROI is outside the specified hue range. Example:

- ▶ Indicator that is normally green but turns to amber or red

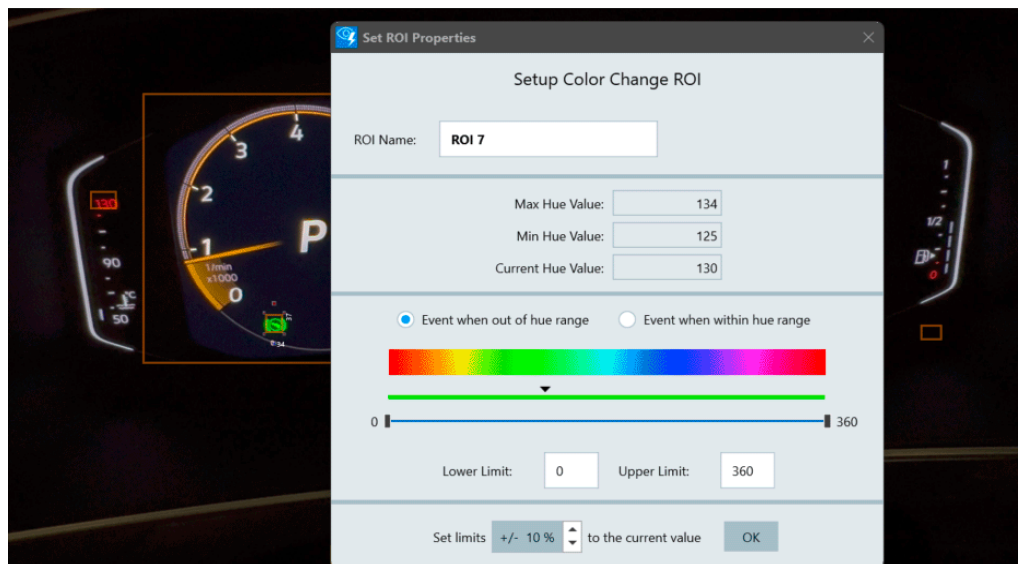
Intensity change

Intensity change monitors the brightness of the observed area. The analyzer will declare an event if the average brightness within the defined ROI is out of the specified luminance range. Examples:

- ▶ Lamps
- ▶ Background illumination



Selecting an ROI type



Checking the background color with "Setup Color Change ROI"

Motion and motion freeze

Motion freeze monitors whether an element is moving or has stopped moving. The analyzer will declare an event if the element that is monitored with this ROI starts or stops moving for a definable time. Examples:

- ▶ Activity indicators
- ▶ Mechanical relays
- ▶ Running counters
- ▶ Running engines

OCR text (R&S®ADV-K1060 option)

OCR text monitors status information. The user can define up to five status messages and choose whether he receives an alarm if none or alternatively if at least one of these messages appears. Examples:

- ▶ Status messages
- ▶ Warning or alarm information
- ▶ Instrument settings

OCR number (R&S®ADV-K1060 option)

OCR number monitors numeric outputs. The user can choose to receive an alarm if the test result is within or outside a definable range. Examples:

- ▶ Test results
- ▶ Temperature
- ▶ Filling level

Checking a text information with "Setup of OCR Text ROI"

Set ROI Properties

Setup of OCR Text ROI

ROI Name: ROI 9

Type: English

Only one line of text:

Black/White Threshold: 0.6 Reset

Smoothing: 0 Reset

Tolerated faults: 1 Reset

Current: System

Event when not matching Event when matching

System Set to current

Set to current

Set to current

Set to current

Set to current

OK

Object in, object out

Object in and object out indicate any changes within a defined area. This can, for example, be an element that moves into or out of this area. The software also detects changes to the objects themselves. Examples:

- ▶ Symbols and icons
- ▶ Numbers and font displays
- ▶ Indicator positions

Analog indicator

Analog indicator monitors the position of a pointer or bar indicator. It supports circular and linear gauges. The operator can configure the analyzer to declare an event if the observed indicator is inside or outside of the specified limits. The value of the indicator position is available and can be processed via the remote interface. Examples:

- ▶ Circular gauge
- ▶ Linear gauge
- ▶ Bar graph indicator
- ▶ Speedometer
- ▶ Revolution counter
- ▶ Level indicator

Checking a numerical test result with "Setup of OCR Number"

Set ROI Properties

Setup of OCR Number

ROI Name: ROI 1

Type: English

Decimal separator: Comma

Black/White Threshold: 0.6 Reset

Alignment: 1 Reset

Smoothing: 1 Reset

Tolerated faults: 1 Reset

Significant Digits: Auto Reset

Current: 1600

Event when out of numerical range Event when within numerical range

Lower Limit: 1000.00 Upper Limit: 1800.00

Set limit +/- 10 using the current value OK

Disturbance

Especially designed for EUTs with larger displays, such as television sets or computer monitors, this ROI detects deviations such as brightness, color or artefacts, from a reference picture. It is similar to the object in/out ROI, but more sensitive to smaller changes in large ROIs.

Flashing lights

Flashing lights monitor the frequency, pulse width and duty cycle of flashing elements, either individually or together. The analyzer will declare an event if at least one of the measured values exceeds the defined limit values.

Examples:

- ▶ Turn indicator
- ▶ Alarms
- ▶ Running lights

Audio monitoring (R&S®ADV-K1062 option)

This option permits frequency-selective monitoring of wanted and unwanted noise. The analyzer generates an error message if the signal spectrum in the selected frequency range violates a pretrained envelope. Alternatively, the ROI can perform time domain analysis of

repetitive sounds. Audio signals can be recorded via the connected camera or PC audio input. Examples:

- ▶ Motor noise
- ▶ Fan noise
- ▶ Test tone distortions

Automatic event detection assistant

Based on a short reference video showing the “pass” of an EUT, the ROI can automatically detect failures of the EUT by analyzing deviations from the reference video. It can detect both spatial and temporal changes, thus identifying failures such as brightness or color changes, as well as changes in a flashing light source. Because the ROI uses artificial intelligence with its inherent imperfections, the final step is for the user to approve or reject the suggestions of the automatically detected events or failures.

Evaluating an event dialog



Detected Events

Drag a column header here to group by that column 🔍

Event	Event Type	Frames	Keep/Discard
Anomaly3	Spatial	23 - 30	<input checked="" type="checkbox"/>
Anomaly4	Spatial	49 - 60	<input checked="" type="checkbox"/>
Anomaly5	Spatial	229 - 429	<input checked="" type="checkbox"/>
Anomaly2	Spatial	357 - 374	<input checked="" type="checkbox"/>
Anomaly3	Spatial	373 - 429	<input checked="" type="checkbox"/>
Anomaly2	Spatial	379 - 402	<input checked="" type="checkbox"/>

Event options

Name:

Disable After this All

Checking a mechanical circular gauge with “Setup Analog Indicator ROI”

Setup Analog Indicator ROI

ROI Name:

Mark Circular Gauge

Mark Linear Gauge

Indicator:

Additional Pointer Stop Range (%):

Position of Indicator Detection Line:

Start Value:

End Value:

Current Value:

Checking the audio spectrum for wanted or unwanted noise with “Setup Frequency Domain Audio ROI”

Setup Frequency Domain Audio ROI

ROI Name:

Average Time:

Frequency Axis:

Observation Frequency:

Upper Frequency:

Lower Frequency:

Distance to envelope: Current: 4.5 dB Worst: -7.5 dB

Event when outside of upper or lower envelope Event when inside of upper and lower envelope

Offset for lower envelope: Offset for upper envelope:

to the next of the spectrum

SPECIFICATIONS IN BRIEF

Specifications in brief

Base software

ROI types	light on, light off; object in, object out; color change; intensity change; analog indicator; flashing frequency (0.2 Hz to 10 Hz), flashing duty cycle, flashing pulse width (0.1 s to 4.9 s); motion freeze (0.03 s to 3.3 s), optional OCR text, OCR number, automatic event detection and audio monitoring
Max. number of parallel monitored ROIs	16 (optional 32)
Video report	1080p30, H.264 coded, file size typically 3 Gbyte/h, max. file size 60 Gbyte, EMS data fields for watermarking: frequency, modulation, immunity level, power level, turntable position
Operation modes	local, remote generic, remote extended
Video interface for live camera	USB video class (UVC), USB 3.0; supporting HDMI™ and HD-SDI via video capture device
Supported camera formats	1080p30; RGB, 4:2:2, 4:4:4; 8 bit, 10 bit
Depth of analysis	8 bit

Options

R&S®ADV-K1032 extension to 32 ROI	
Max. number of parallel monitored ROIs	32
R&S®ADV-K1050 virtual camera input option	
File container	*.mov, *.mp4, *.avi
Coding	H.264, MPEG-2; MPEG-4
Formats	1080p30, 1080p60; other resolutions are possible, but are converted in real time to 1080p
R&S®ADV-K1060 ROI OCR text and number	
OCR text	monitoring a status information
OCR number	monitoring a numeric output
R&S®ADV-K1062 audio monitoring	
Frequency range	50 Hz to 22 kHz (depending on microphone specification)
Level range	0 to -120 dBFS (depending on microphone specification)
Audio interface	live audio sources: embedded audio in USB video class (UVC), PC sounds (loopback); virtual camera audio source: MP2, MP3, AAC coding
Number of channels	1 (left)
R&S®ADV-K1070 image tracking	
Number of trackers	up to 3
Tracking range	300 × 300 pixel
R&S®ADV-K1080 auto detection assistance	
Disturbance type	spatial, temporal

Hardware recommendations

Video capture devices	AV.io HD, AV.io 4k, Elgato Cam Link 4k HDMI™, Magewell Pro Capture Quad HDMI™ PCIe card
Supported and verified shielded cameras for EMC application	► mk-messtechnik GmbH: dAV-Cr-HD ► Audio GmbH: HDCam6E, HDCam7

Minimum controller requirements

CPU	► CPU with support of hyperthreading technology – 8 core, if you use R&S®AdVISE for up to 16 ROIs – 16 core, if you use R&S®ADV-K1032 option (extension to 32 ROIs) ► 3 GHz minimum base frequency
RAM	16 Gbyte
Mass storage	250 Gbyte hard disk, solid-state disk (SSD)
USB, LAN	USB 3.0, 100 Mbit LAN interface, 1 Gbit LAN recommended
Minimum monitor resolution	1920 × 1080 pixel
Operating system	Windows 10, 64 bit

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ORDERING INFORMATION

Designation	Type	Order No.
Visual inspection software	R&S®AdVISE-SW	1434.6518.02
License dongle	R&S®AdVISE-PC	1434.6660.02
Extension to 32 ROIs	R&S®ADV-K1032	1434.6524.02
Virtual camera	R&S®ADV-K1050	1434.6530.02
ROI optical character recognition for text and numbers	R&S®ADV-K1060	1434.6601.02
Audio monitoring	R&S®ADV-K1062	1434.6618.02
Image tracking	R&S®ADV-K1070	1434.6560.02
Automatic detection assistant ROI	R&S®ADV-K1080	1434.6576.02

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