

# TV Broadcast Measurements

## TV Test Receiver Family EFA

### Test receivers and demodulators for analog and digital (DVB-C) TV signals

Note: EFA model 20 with Rohde & Schwarz label available in Europe, Middle East and Japan only; in all other areas available as model DDS200 by Tektronix (photo 42462)



### Brief description

TV Test Receiver and Demodulator Family EFA is a new equipment generation with outstanding performance features and excellent transmission characteristics. The TV test receivers and demodulators are able to receive and demodulate both conventional AM vestigial sideband signals and quadrature-amplitude-modulated DVB signals with high precision, measure a variety of transmission parameters and are ideal for measurement and monitoring applications in cable networks and TV transmitter stations.

#### The family members:

- Model 12  
**Analog TV test receiver**, tunable, selective, standard B/G
- Model 20  
**Digital (QAM) TV test receiver** (DVB-C), tunable, selective
- Model 23  
**Digital (QAM) TV demodulator** (DVB-C), broadband
- Model 33  
**Analog TV demodulator**, broadband, standard B/G
- Model 72  
**Analog TV test receiver**, tunable, selective, standard M
- Model 78  
**Analog TV test receiver**, tunable, selective, standards D/K, I

- Model 83  
**Analog TV demodulator**, broadband, standard M
- Model 89  
**Analog TV demodulator**, broadband, standards D/K, I

### Applications

TV Test Receiver Family EFA from Rohde & Schwarz is a versatile and high-performance TV test receiver and demodulator platform that is able to keep pace with the rapid development in television.

A QAM demodulator is available for digital video broadcasting in cable networks (DVB-C), allowing all necessary measurements to be made on digital channels.

The EFA family also comprises an analog TV test receiver for monitoring all other TV channels.

QAM demodulator and analog receiver can be combined in a compact unit which can be expanded by adding further options, eg an MPEG2 decoder (EFA-B4) or NICAM decoder (EFA-B2). In particular the Preselection Option EFA-B3 adds excellent selectivity characteristics to the demodulator models.

### Features

#### TV test receiver models 12, 72 and 78

- Selective test receiver, frequency or channel entry
- Measurement functions for
  - input power/level
  - vision carrier offset frequency
  - vision/sound carrier spacing (level and frequency)
  - FM sound carrier and pilot deviation
- Upgradable to dual-mode instrument, ie analog and digital (DVB-C) receiver in one compact unit (option EFA-B1)
- Group-delay correction can be switched off
- Models 12, 78: NICAM Demodulator EFA-B2

#### QAM test receiver model 20 and QAM demodulator model 23

- World's first test receiver for DVB-C signals
- 4QAM to 256QAM selectable
- Constellation diagram with automatic result analysis
- Integrated noise generator for measurement of noise margin
- IF filters of various bandwidth specially developed for DVB (standard 8 MHz, optional 6 MHz)

- Self-adapting equalizer for in-depth signal analysis in transmission channel:
  - echo measurement
  - amplitude and phase response
- Alarm register with 1000 memory locations for the following errors:
  - signal level (threshold adjustable)
  - synchronization
  - bit error rate (threshold adjustable)
  - non-corrected MPEG errors
- MPEG2 Decoder EFA-B4 (option) can be integrated
- Preselection (model 23 only)
- IEC/IEEE bus, RS-232 interface
- Compact unit (3 height units)
- Frequency range 47 to 862 MHz; demodulator models 23, 33, 83 and 89 with RF Preselection EFA-B3, lower cutoff frequency 5 MHz (return-channel-compatible)
- Modular design
  - easy retrofitting of options
- Comprehensive measurement and monitoring functions
- Excellent price/performance ratio
- Platform for new digital technologies

### TV demodulator models 33, 83 and 89

- Nyquist demodulator, broadband RF input
- Retrofittable RF Preselection EFA-B3 (option), the broadband input remains usable
- Same measurement functions as test receiver
- Group-delay correction can be switched off
- Models 33, 89: NICAM Demodulator EFA-B2

### All EFA models

- Simple, user-friendly hardkey and softkey control

most important measurement tool for QAM signals is the constellation diagram (see below right).

A further family member is the analog demodulator. In addition to the selective receiver section there is also a broadband receiver section, which with measurements directly at the source and single-channel occupancy (TV transmitter) provides results of highest precision. A high-grade preselection module can be connected ahead of this broadband converter module.

An MPEG2 decoder for video and audio processing and evaluation of the transport stream generated by the QAM demodulator can be integrated for comprehensive measurements on the FM sound carriers of analog TV. Furthermore, a NICAM sound demodulator is available.

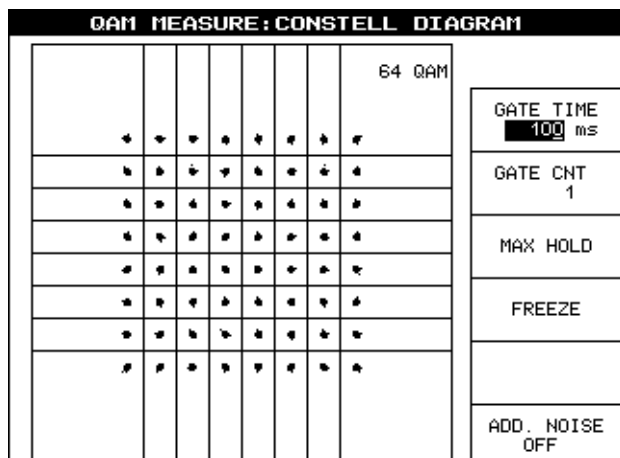
### Family concept

With its modular design the extremely compact, only three units high TV Test Receiver EFA is made for easy upgrading and high versatility. One of the EFA family members is the analog TV test receiver with selective receiver section. The measurement menu of the analog TV test receiver is shown below left.

Another family member is the DVB test receiver with QAM demodulator. A QAM demodulator is used for processing the TV channel converted to IF. The

| MEASURE                     |         |               |          |
|-----------------------------|---------|---------------|----------|
| RF                          | CHANNEL | RF-LEVEL      | STANDARD |
| 48.250 MHz                  | 2       | 74.3 dBuV     | B/G      |
| VISION CARRIER              |         |               |          |
| LEVEL                       |         | 74.3 dBuV     |          |
| FREQUENCY                   |         | 48.250000 MHz |          |
| MEASURED FREQUENCY          |         | 48.323200 MHz |          |
| AFC FREQUENCY               |         | 48.342600 MHz |          |
| SOUND CARRIER               |         |               |          |
| VISION/SOUND1 CARRIER RATIO |         | 12.5 dB       |          |
| VISION/SOUND2 CARRIER RATIO |         | 14.8 dB       |          |
| INTERCARRIER1 FREQUENCY     |         | 5.5319 MHz    |          |
| INTERCARRIER2 FREQUENCY     |         | 5.5322 MHz    |          |
| FM DEVIATION SOUND1         |         | 32.1 kHz      |          |
| FM DEVIATION SOUND2         |         | 32.0 kHz      |          |
| FM DEVIATION PILOT          |         | 2.918 kHz     |          |
| PILOT FREQUENCY             |         | 54.184 kHz    |          |
| PILOT                       |         | STEREO        |          |

Measurement menu in analog TV test receiver mode



Constellation diagram in QAM demodulator mode

# TV Test Receiver Family EFA

## Specifications in brief

### Analog TV test receiver and TV demodulator RF/IF characteristics

|                                                                                                                                            |                                                                                                                                                       |                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Frequency (vision carrier)</b>                                                                                                          | <b>Test receiver</b>                                                                                                                                  | <b>Demodulator</b>                                               |
| Frequency range<br>with optional RF Preselection EFA-B3                                                                                    | 45 to 860 MHz                                                                                                                                         | 45 to 900 MHz<br>5 to 900 MHz                                    |
| Intermediate frequency                                                                                                                     | 38.9 MHz                                                                                                                                              | 38.9 MHz                                                         |
| Frequency setting                                                                                                                          | channel number (+ special channels),<br>vision carrier frequency or<br>memory location number (00 to 99)                                              | 1 Hz                                                             |
| Resolution                                                                                                                                 | 1 Hz                                                                                                                                                  | 1 Hz                                                             |
| Frequency accuracy                                                                                                                         | $< \pm 3 \times 10^{-6} \times$ receive frequency                                                                                                     |                                                                  |
| Image-frequency rejection                                                                                                                  |                                                                                                                                                       |                                                                  |
| VHF                                                                                                                                        | $\geq 70$ dB                                                                                                                                          |                                                                  |
| UHF                                                                                                                                        | $\geq 50$ dB                                                                                                                                          |                                                                  |
| Adjacent-channel rejection                                                                                                                 | $\geq 48$ dB (std. B/G)                                                                                                                               | $\geq 48$ dB (std. B/G)                                          |
| <b>RF input</b>                                                                                                                            | selective                                                                                                                                             | broadband                                                        |
| Connector                                                                                                                                  | on front panel<br>(BNC female) or<br>rear panel:<br>50 $\Omega$ : N or<br>75 $\Omega$ : BNC fem.                                                      | N female,<br>on rear panel                                       |
| Impedance (model-dependent)                                                                                                                | 50 $\Omega$ or 75 $\Omega$                                                                                                                            | 50 $\Omega$                                                      |
| Level range                                                                                                                                | 100 $\mu$ V to 1 V <sup>1)</sup><br>(40 to 120 dB $\mu$ V <sup>1)</sup> )<br>30 $\mu$ V to 1 mV <sup>1)</sup><br>(30 to 60 dB $\mu$ V <sup>1)</sup> ) | 10 mV to 2.5 V <sup>1)</sup>                                     |
| with 10 dB preamplifier                                                                                                                    |                                                                                                                                                       |                                                                  |
| Return loss                                                                                                                                | 50 $\Omega$ : $\geq 14$ dB<br>75 $\Omega$ : $\geq 12$ dB                                                                                              | $\geq 30$ dB                                                     |
| <b>IF input</b>                                                                                                                            | BNC female, on rear panel, 50 $\Omega$                                                                                                                | 50 to 350 mV <sup>1)</sup>                                       |
| Level range                                                                                                                                | 20 to 200 mV <sup>1)</sup><br>(86 to<br>106 dB $\mu$ V <sup>1)</sup> )                                                                                | 94 to<br>111 dB $\mu$ V <sup>1)</sup> )                          |
| Return loss (33 to 40 MHz)                                                                                                                 | $\geq 20$ dB                                                                                                                                          | $\geq 30$ dB                                                     |
| Crosstalk attenuation RF/IF                                                                                                                | $\geq 70$ dB                                                                                                                                          | $\geq 70$ dB                                                     |
| <b>IF output</b>                                                                                                                           | BNC female, on rear panel, 50 $\Omega$                                                                                                                |                                                                  |
| Level                                                                                                                                      | 100 mV <sup>1)</sup> (100 dB $\mu$ V <sup>1)</sup> )                                                                                                  |                                                                  |
| Return loss (33 to 40 MHz)                                                                                                                 | $\geq 20$ dB                                                                                                                                          | $\geq 20$ dB                                                     |
| <b>Video characteristics</b>                                                                                                               |                                                                                                                                                       |                                                                  |
| <b>Video outputs</b><br>with optional Video Distributor<br>EFA-B6                                                                          | BNC female on front/rear panel, 75 $\Omega$                                                                                                           | 2x as above                                                      |
| Level of CVS 0-signal with zero<br>reference pulse, inphase signal                                                                         | 1.12 V pp $\pm 2\%$                                                                                                                                   | 1.12 V pp $\pm 2\%$                                              |
| Setting range                                                                                                                              | $\pm 3$ dB                                                                                                                                            | $\pm 3$ dB                                                       |
| DC offset with zero carrier<br>with optional Video Distributor<br>EFA-B6                                                                   | 0 $\pm 20$ mV                                                                                                                                         | 0 $\pm 20$ mV<br>can be switched to<br>0 V for blanking<br>value |
| Return loss (0 to 6 MHz)                                                                                                                   | $\geq 26$ dB                                                                                                                                          | $\geq 26$ dB                                                     |
| Decoupling of outputs (level variation at terminated output when switching at<br>the other outputs between short circuit and open circuit) | $\leq 1\%$                                                                                                                                            | $\leq 1\%$                                                       |
| <b>Quadrature signal output</b><br>with optional Video Distributor<br>EFA-B6                                                               | BNC female, on rear panel, 75 $\Omega$                                                                                                                | additional BNC<br>female on front<br>panel                       |
| Gain difference, referred to nominal<br>video output level                                                                                 | $\leq 0.5$ dB                                                                                                                                         | $\leq 0.5$ dB                                                    |
| Return loss (0 to 6 MHz)                                                                                                                   | $\geq 20$ dB                                                                                                                                          | $\geq 20$ dB                                                     |
| <b>Input of external zero reference pulse</b>                                                                                              | BNC female, on rear panel, 75 $\Omega$                                                                                                                |                                                                  |
| Input level                                                                                                                                | $> +1$ V                                                                                                                                              | $> +1$ V                                                         |
| Delay of zero reference pulse,<br>referred to control pulse                                                                                | 3 $\mu$ s                                                                                                                                             | 3 $\mu$ s                                                        |
| <b>Synchronous demodulation</b>                                                                                                            | continuous or clamped to back porch,<br>selectable                                                                                                    |                                                                  |
| Time constant of sync demodulator,<br>selectable                                                                                           | fast, normal, slow                                                                                                                                    | fast, normal, slow                                               |
| for continuous control                                                                                                                     | fast, normal, slow                                                                                                                                    | fast, normal, slow                                               |
| for sampled control                                                                                                                        | normal, slow                                                                                                                                          | normal, slow                                                     |
| <b>Signal/noise ratio</b>                                                                                                                  |                                                                                                                                                       |                                                                  |
| Unweighted, $V_{in} > 200$ mV                                                                                                              |                                                                                                                                                       | $\geq 60$ dB                                                     |

|                                                                                      |                                      |                            |
|--------------------------------------------------------------------------------------|--------------------------------------|----------------------------|
| Weighted to CCIR Rec. 567                                                            |                                      |                            |
| $V_{in} > 200$ mV                                                                    |                                      | $\geq 67$ dB               |
| 50 $\Omega$ : input attenuation 0 dB:                                                |                                      |                            |
| $V_{in} = 3$ mV (70 dB $\mu$ V)                                                      | $\geq 56$ dB                         |                            |
| 1 mV (60 dB $\mu$ V), with preampl.                                                  | $\geq 52$ dB                         |                            |
| Periodic noise (peak measurement)                                                    |                                      |                            |
| up to 1 kHz                                                                          |                                      | $\geq 52$ dB               |
| 1 kHz to 5 MHz                                                                       |                                      | $\geq 60$ dB               |
| 5 to 6 MHz                                                                           |                                      | $\geq 50$ dB               |
| <b>Linear distortion</b>                                                             |                                      |                            |
| Amplitude frequency response                                                         |                                      |                            |
| Standard B/G, 0 to 4.5 MHz                                                           | $\pm 0.5$ dB                         | $\pm 0.25$ dB              |
| 4.8 MHz                                                                              | $-3/+0.5$ dB                         | $-3/+0.25$ dB              |
| D/K, 0 to 5.5 MHz                                                                    | $\pm 0.5$ dB                         | $\pm 0.25$ dB              |
| I, 0 to 4.5 MHz                                                                      | $\pm 0.5$ dB                         | $\pm 0.25$ dB              |
| Group-delay response (0 to 4.8 MHz); standard B/G                                    | fully equalized, can be switched off |                            |
| Group-delay correction                                                               |                                      |                            |
| without group-delay correction                                                       | $< \pm 20$ ns                        | $< \pm 12$ ns              |
| with group-delay correction                                                          |                                      |                            |
| 0 to 3.7 MHz                                                                         | $< \pm 20$ ns                        | $< \pm 12$ ns              |
| 4.43 MHz                                                                             | $< \pm 20$ ns                        | $< \pm 20$ ns              |
| 4.8 MHz                                                                              | $< \pm 50$ ns                        | $< \pm 50$ ns              |
| Additional group delay ripple<br>caused by SAW filter                                | $< \pm 20$ ns                        | $< \pm 20$ ns              |
| <b>Transient response</b>                                                            |                                      |                            |
| 2T pulse amplitude                                                                   |                                      | $< \pm 2\%$                |
| 2T k factor                                                                          | $\leq 1\%$                           | $\leq 1\%$                 |
| 20T pulse amplitude                                                                  |                                      | $< \pm 3\%$                |
| Chrominance/luminance gain                                                           |                                      | $< \pm 3\%$                |
| Chrominance/luminance delay                                                          |                                      |                            |
| without group-delay correction                                                       | $< \pm 20$ ns                        | $< \pm 12$ ns              |
| with group-delay correction                                                          | $< \pm 20$ ns                        | $< \pm 20$ ns              |
| <b>Nonlinear distortion</b>                                                          |                                      |                            |
| Luminance nonlinearity (8 to 100%)                                                   | $< 2\%$                              | $< 2\%$                    |
| Differential gain (10 to 90%)                                                        | $< \pm 2\%$                          | $< \pm 2\%$                |
| Differential phase (10 to 90%)                                                       | $< \pm 2^\circ$                      | $< \pm 1^\circ$            |
| Intermodulation                                                                      |                                      |                            |
| Low-distortion mode<br>(vision carrier: $-8$ /sound carrier:<br>$-10$ /SB: $-16$ dB) | $\geq 72$ dB <sup>2)</sup>           |                            |
| (sound carrier: $-10$ dB/SB: 10 to<br>90%, $-0.85$ to $+5$ MHz)                      |                                      | $\geq 55$ dB <sup>3)</sup> |
| <b>Q signal</b>                                                                      |                                      |                            |
| Phase error of switching carrier                                                     | $\leq \pm 1^\circ$                   | $\leq \pm 1^\circ$         |
| Bandwidth ( $-3$ dB)                                                                 | approx. 1.5 MHz                      | approx. 1.5 MHz            |

### Audio characteristics

|                                                                                                         |                                                                                             |          |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------|
| <b>Audio outputs</b>                                                                                    | Lemo-Triax female, in pairs; front panel: unbalanced, rear panel: balanced, floating, <35 Ω |          |
| Additional connectors with optional Split-Carrier Demodulator EFA-B5                                    | broadband output on front panel (unbalanced) and pilot output on rear panel (BNC female)    |          |
| Signals                                                                                                 | mono, left/right sound 1/sound 2                                                            |          |
| Level (±30 kHz deviation, f <sub>mod</sub> = 500 Hz)                                                    | +6 dBm ±0.2 dB into 600 Ω                                                                   |          |
| <b>Audio parameters</b>                                                                                 |                                                                                             |          |
| (Intercarrier demodulator; improved values are obtained with optional Split-Carrier Demodulator EFA-B5) |                                                                                             |          |
| Stereo/dual-sound method                                                                                | A2 (IRT)                                                                                    | A2 (IRT) |
| Frequency response                                                                                      | ≤0.5 dB                                                                                     | ≤0.5 dB  |
| Deemphasis, can be switched off                                                                         | 50 μs                                                                                       | 50 μs    |
| Distortion at ±50 kHz deviation                                                                         | <0.5%                                                                                       | <0.5%    |
| Stereo crosstalk attenuation                                                                            | ≥40 dB                                                                                      | ≥40 dB   |
| Channel crosstalk attenuation                                                                           |                                                                                             |          |
| with ±30 kHz spurious FM                                                                                | ≥74 dB                                                                                      | ≥74 dB   |
| Intercarrier S/N ratio (weighted to CCIR 468-3)                                                         |                                                                                             |          |
| All-black picture                                                                                       | ≥55 dB                                                                                      | ≥55 dB   |
| FuBK test pattern                                                                                       | ≥48 dB                                                                                      | ≥48 dB   |
| Sinewave modulation (receiver 10 to 75%, demodulator 0 to 75%)                                          |                                                                                             |          |
| 0 to 5 MHz                                                                                              | ≥46 dB                                                                                      | ≥46 dB   |
| 242 ±15 kHz                                                                                             | ≥42 dB                                                                                      | ≥42 dB   |
| Split-carrier S/N ratio, measured at IF output (weighted to CCIR 468-3, deemphasis 50 μs)               | ≥50 dB                                                                                      | ≥62 dB   |

<sup>1)</sup> The levels are RMS values of the sync pulse.

<sup>2)</sup> Referred to sync pulse.

<sup>3)</sup> Referred to b/w transition.

## Test parameters

|                                                                                  | Resolution | Accuracy                                           |
|----------------------------------------------------------------------------------|------------|----------------------------------------------------|
| Vision carrier power/level<br>in $\mu\text{V}$ /mV, dB $\mu\text{V}$ , dBm, dBpV | 0.1 dB     | $\pm 3$ dB (demodulator $\pm 2$ dB)                |
| Vision carrier frequency                                                         | 20 Hz      | $\pm 3 \times 10^{-6} \times$ receive<br>frequency |
| Vision/sound carrier level ratio                                                 | 0.1 dB     | $\pm 2$ dB                                         |
| Vision/sound carrier frequency<br>spacing                                        | 100 Hz     | $\pm 200$ Hz (with unmodulated<br>sound carrier)   |
| FM sound carrier deviation                                                       | 100 Hz     | $\pm 3 \times 10^{-2} \times \Delta f \pm 200$ Hz  |
| FM pilot deviation                                                               | 10 Hz      | $\pm 200$ Hz                                       |
| FM pilot frequency                                                               | 1 Hz       | $\pm 10$ Hz                                        |

## DVB test receiver (QAM)

The test receiver complies with DVB specifications ETS300429 and ETR290.

## RF IF characteristics (further data same as analog TV test receiver)

|                                   |                                                           |
|-----------------------------------|-----------------------------------------------------------|
| Frequency range                   | 47 to 862 MHz                                             |
| Level range of input signal       | 100 $\mu\text{V}$ to 700 mV (40 to 117 dB $\mu\text{V}$ ) |
| Input impedance (model-dependent) | 50 $\Omega$ or 75 $\Omega$                                |
| Channel bandwidth                 | 8 MHz (2/4/6 MHz optional),<br>selectable                 |
| IF input                          | 36 MHz; BNC female on rear panel                          |
| Impedance                         | 50 $\Omega$                                               |
| Level range                       | 10 to 100 mV (80 to 100 dB $\mu\text{V}$ )                |
| IF output                         | 36 MHz; BNC female on rear panel                          |
| Impedance                         | 50 $\Omega$                                               |
| Level                             | 45 mV (93 dB $\mu\text{V}$ )                              |

## Demodulator characteristics

|                                   |                                                                                                                                                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Modulation mode                   | 4, 16, 32, 64, 128 and 256QAM                                                                                                                      |
| Roll-off factor                   | 0.13; 0.15; 0.20; 0.25; 0.30; selec-<br>table                                                                                                      |
| Insertion loss                    | $\leq 1.5$ dB (64QAM)                                                                                                                              |
| Symbol rate                       | 1.5 to 7 Mbaud                                                                                                                                     |
| Equalizer                         | self-adapting, selectable                                                                                                                          |
| Reed-Solomon decoder              | 204, 188, 8; selectable                                                                                                                            |
| Bit error rate measurement range  | 1.0 E-3 to 0.1 E-9                                                                                                                                 |
| Interleaving                      | interleaver (Forney), L = 12                                                                                                                       |
| Energy dispersal                  | ESS 309 to DVB specification                                                                                                                       |
| Internal noise generator (on/off) |                                                                                                                                                    |
| C/N ratio                         | 12 to 62 dB                                                                                                                                        |
| Setting                           | in steps of 0.1 dB                                                                                                                                 |
| Filters                           | automatic conversion and correct set-<br>ting of C/N ratio if optional filters (2, 4<br>or 6 MHz) are fitted                                       |
| Outputs                           | parallel MPEG data stream to LVDS<br>standard (188.204 bytes), serial<br>MPEG data stream (ASI), serial data<br>stream before Reed-Solomon decoder |
| MPEG decoder                      | available as option EFA-B4                                                                                                                         |
| Screen                            | LCD with 240 x 320 pixels                                                                                                                          |
| Sync information on               | symbol rate, carrier recovery,<br>equalizer, MPEG2 frame                                                                                           |

## Test parameters (at 64QAM)

|                         | Range          | Tolerance                   |
|-------------------------|----------------|-----------------------------|
| Level                   | -60 to +10 dBm | $\pm 3$ dB, typ. $\pm 1$ dB |
| MER                     | 24 to 30 dB    | $\leq \pm 0.3$ dB           |
|                         | 30 to 35 dB    | $\leq \pm 0.7$ dB           |
|                         | 35 to 40 dB    | $\leq \pm 1.5$ dB           |
| SNR                     | 24 to 30 dB    | $\leq \pm 0.4$ dB           |
|                         | 30 to 35 dB    | $\leq \pm 0.8$ dB           |
|                         | 35 to 40 dB    | $\leq \pm 1.8$ dB           |
| Carrier suppression     | 25 to 40 dB    | $\leq \pm 1$ dB             |
|                         | 40 to 50 dB    | $\leq \pm 1.5$ dB           |
|                         | 50 to 60 dB    | $\leq \pm 3$ dB             |
| I/Q amplitude imbalance | 0 to 5%        | $\leq \pm 0.02\%$           |
| I/Q phase error         | 0 to 5°        | $\leq \pm 0.02^\circ$       |
| Frequency offset        | $\pm 100$ kHz  | $\leq \pm 3$ kHz            |

|                                |                       |                                 |
|--------------------------------|-----------------------|---------------------------------|
| BER                            | Range<br>2E-4 to 1E-3 | Tolerance<br><5% $\pm 2$ digits |
| Symbol rate (auto search mode) | 0E-9 to 2E-4          | <1% $\pm 2$ digits              |
|                                | 1.5 to 6.99 Msymb/s   | $\leq \pm 0.003$ Msymb/s        |

## General data

|                             |                                                                                   |
|-----------------------------|-----------------------------------------------------------------------------------|
| Display                     | monochrome LCD (320 x 240) with<br>backlighting                                   |
| Interfaces                  | IEC625-2/IEEE488 bus<br>RS-232<br>printer (Centronics)                            |
| Rated temperature range     | +5 to +45 °C                                                                      |
| Operating temperature range | 0 to +50 °C                                                                       |
| Storage temperature range   | -40 to +70 °C                                                                     |
| Power supply                | 100 to 120/220 to 240 V +10/-15%<br>(automatic voltage selection),<br>50 to 60 Hz |
| Dimensions (W x H x D)      | 450 mm x 147 mm x 460 mm                                                          |
| Weight                      | 12 kg                                                                             |

## Ordering information

### TV Test Receiver \*)

|                                              |     |              |  |
|----------------------------------------------|-----|--------------|--|
| Standard B/G, stereo/dual sound              |     |              |  |
| IF 38.9 MHz, RF 45 to 860 MHz, IEC/IEEE bus  | EFA | 2067.3004.12 |  |
| Standard M/N                                 |     |              |  |
| IF 45.75 MHz, RF 55 to 890 MHz, IEC/IEEE bus | EFA | 2067.3004.72 |  |
| Standard D/K, stereo/dual sound              |     |              |  |
| or standard I, mono                          |     |              |  |
| IF 38.9 MHz, RF 45 to 860 MHz, IEC/IEEE bus  | EFA | 2067.3004.78 |  |

### TV Demodulator \*)

|                                              |     |              |  |
|----------------------------------------------|-----|--------------|--|
| Standard B/G, stereo/dual sound              |     |              |  |
| IF 38.9 MHz, RF 45 to 900 MHz, IEC/IEEE bus  | EFA | 2067.3004.33 |  |
| Standard M/N                                 |     |              |  |
| IF 45.75 MHz, RF 55 to 900 MHz, IEC/IEEE bus | EFA | 2067.3004.83 |  |
| Standard D/K, stereo/dual sound              |     |              |  |
| or standard I, mono                          |     |              |  |
| IF 38.9 MHz, RF 45 to 900 MHz, IEC/IEEE bus  | EFA | 2067.3004.89 |  |

### DVB-C Test Receiver, selective \*)

|                                                                             |     |              |  |
|-----------------------------------------------------------------------------|-----|--------------|--|
| 4/16/32/64/128/256QAM,<br>Output MPEG data stream, constellation<br>diagram | EFA | 2067.3004.20 |  |
|-----------------------------------------------------------------------------|-----|--------------|--|

### DVB-C Test Receiver, broadband\*)

|                                                                             |     |              |  |
|-----------------------------------------------------------------------------|-----|--------------|--|
| 4/16/32/64/128/256QAM,<br>Output MPEG data stream, constellation<br>diagram | EFA | 2067.3004.23 |  |
|-----------------------------------------------------------------------------|-----|--------------|--|

### Accessories supplied

Adapter Lemo-Triax to XLR (stereo), power cable

### Options

|                                      |         |              |  |
|--------------------------------------|---------|--------------|--|
| QAM Demodulator (for analog units)   | EFA-B1  | 2067.3604.02 |  |
| NICAM Demodulator Standard B/G       | EFA-B2  | 2067.3610.02 |  |
| Standard I                           | EFA-B2  | 2067.3610.04 |  |
| RF Preselection (for TV demodulator) | EFA-B3  | 2067.3627.02 |  |
| MPEG2 Decoder                        | EFA-B4  | 2067.3633.02 |  |
| Video Distributor                    | EFA-B6  | 2067.3656.02 |  |
| Residual Picture Carrier Measurement | EFA-B8  | 2067.3727.02 |  |
| 6 MHz SAW Filter                     | EFA-B11 | 2067.3691.02 |  |

### Extras

|                                                   |         |              |  |
|---------------------------------------------------|---------|--------------|--|
| EFA Calibration Data Documentation                | EFA-DCV | 2082.0490.09 |  |
| 19" Adapter                                       | ZZA-931 | 0396.4892.00 |  |
| Lemo-Triax connector (mono) with connecting cable |         | 2067.7451.00 |  |
| Service Manual                                    |         | 2068.0950.24 |  |

\*) Test receivers are available with 50  $\Omega$  or 75  $\Omega$  impedance, demodulators with 50  $\Omega$  only; please enclose filled-in Configuration Sheet (available from your local Rohde & Schwarz representative) with your order.