Overview
RF-SE is a professional digital radio monitoring and measurement receiver, which is available in different models. The outstanding reception characteristics are based on a high-performance frontend with preselector filter banks and digital direct-down conversion system approach. The field-proven digital baseband demodulator provides access to all needed measurement and monitoring parameter. Furthermore, various modular blocks like RSCI capability, audio and data decoder, alarm feature, browser based GUI, RFmonitor connector are available to suit the specific needs of the desired application.

Basic Features
- Integrated alarm system with email notification and two independent relay outputs (depending on model)
- Proven long term stability
- Firmware update via DVD or USB
- Possible integration into RFmonitor network
- Service and signalling decoding, e.g. service description, emergency warning feature (EWF)
- Decoding of all DRM data services and signalling, e.g. TextMessages, Journaline, SlideShow.
- Statistical information of each service

Advanced GUI
The RF-SE user interface is designed to provide the full experience of a modern and professional measurement device:
- Same browser based advanced GUI remotely and locally (if available)
- Touchscreen and mouse capability
- Proportional scaling to adapt to different screen sizes
- Either four window view or full screen display of diagrams

Application Decoder
Integrated audio and data decoding, licensed by Fraunhofer IIS:
- Browser-based selection and decoding of audio and data services
- Audio decoding: HE-AACv2, xHE-AAC, with SBR, PS, MPEG Surround Optional; HVXC, CELP
- Display of audio related information, e.g. audio rate, sampling rate, mode
- Streaming and downloading of selected audio service to remote PC

Measurements
High quality measurements on various stages of the reception and decoding chain:
- Field strength (antenna factor can be specified)
- Frequency offset
- Signal to noise ratio (SNR >45dB)
- Modulation error ratio (MER >45dB)
- Delay spread
- Doppler spread
- Error rate of synchronization, FAC CRC, SDC CRC, audio frames, PRBS

Monitoring
The following items can be displayed and monitored:
- Channel impulse response
- Power spectrum and spectrum mask compliance
- Spectrum waterfall
- QAM constellation
- Channel estimation
- History of reception status (sync, FAC CRC, SDC CRC, audio, PRBS) as well as SNR, MER, field strength
- SNR carrier spectrum
- Location of an external USB NMEA-compliant GPS receiver

RSCI Capability
The ETSI standardized RSCI (Receiver Status and Control Interface) protocol
covers the transport of receiver’s status information in addition to the DRM multiplex as well as commands to control the receiver’s behavior:

- Display and recording to file
- Live DCP/UDP output of RSCI
- Integration of external GPS information into rgs tag
- Control via DCP/UDP

Alarm System
Flexible, built-in alarm system with the following features:
- Two independent alarm rules using a configurable combination of spectrum mask violation, RF and SNR level, audio drop-out and level, MDI errors, wrong service ID, frequency offset
- Alarm triggering via email and/or relay outputs (depending on model)

DRM Demodulation
DRM30: below 30MHz, including the SW, MW and LW broadcasting bands
- Robustness modes A, B, C, D
- Spectrum occupancy 4.5, 5, 9, 10, 18, 20kHz
- MSC modes 16 QAM, 64 QAM, and hierarchical (HM-mix, HMsym)
- SDC modes 4 QAM and 16 QAM
- Interleaver depth 0.4s and 2s
- EEP and UEP with all protection ratios / code rates

DRM+: above 30 MHz, incl. the VHF broadcast bands I, II (FM) and III
- Robustness mode E
- Spectrum occupancy 96kHz
- MSC modes 4 and 16 QAM
- SDC mode 4 QAM, code rates 0.5 & 0.25
- Interleaver depth 0.6s
- EEP and UEP with all protection ratios / code rates

Configuration / Remote Control
- Full remote control via LAN
- Browser-based user interface
- Touch TFT display or LCD (depending on model)
- Receivers can be remotely scheduled, controlled and automatically tuned via RSCI
- Optional: CSV-based scheduler

Option DRM+ Diversity
- Second reception channel
- Advanced diversity algorithms, optimized for DRM+

RF-Frontend
RF-Frontend DRM30

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input frequency range</td>
<td>100 kHz to 30 MHz</td>
</tr>
<tr>
<td>Input filtering</td>
<td>Fixed-tuned 11-band pre-selection filter bank as well as bypass</td>
</tr>
<tr>
<td>Input level</td>
<td>-110 dBm to +20 dBm</td>
</tr>
<tr>
<td>Oscillator accuracy</td>
<td>&lt;0.01 ppm</td>
</tr>
<tr>
<td>Usage of external 10 MHz reference possible</td>
<td></td>
</tr>
<tr>
<td>Phase noise at ±20kHz</td>
<td>&lt;-120 dBc/Hz</td>
</tr>
<tr>
<td>Phase noise at ±20kHz</td>
<td>&lt;-150 dBc/Hz</td>
</tr>
<tr>
<td>Level measurement</td>
<td>±1 dB accuracy</td>
</tr>
<tr>
<td>RF data bandwidth</td>
<td>40 kHz, ripple 0.2 dB</td>
</tr>
<tr>
<td>RF mask-monitoring</td>
<td>Up to ±75 kHz</td>
</tr>
<tr>
<td>In-channel IP3</td>
<td>+15 dBm (noise figure 15 dB)</td>
</tr>
<tr>
<td>Out of band IP3</td>
<td>+30 dBm (noise figure 15 dB)</td>
</tr>
</tbody>
</table>

RF-Frontend DRM+

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input frequency range</td>
<td>47MHz to 240MHz</td>
</tr>
<tr>
<td>Input level</td>
<td>-105 dBm to +20 dBm</td>
</tr>
<tr>
<td>Oscillator accuracy</td>
<td>&lt;0.01 ppm</td>
</tr>
<tr>
<td>Usage of external 10 MHz reference possible</td>
<td></td>
</tr>
<tr>
<td>Level measurement</td>
<td>±1 dB accuracy</td>
</tr>
<tr>
<td>RF mask-monitoring</td>
<td>Up to ±90 kHz</td>
</tr>
</tbody>
</table>

RSCI to KML Format Converter
As RSCI is a binary format and it needs ETSI standard experience to be able to interpret the measurement results, an RSCI to KML-file converter can be integrated into the RF-SE. The main features are as follows:
- Parsing of RSCI tags from file compatible to ETSI TS 102 349
- Writing of selected tags (e.g. audio frame error, SNR, MER, field strength) in Open Geospatial Consortium KML/KMZ format
- Classification of tag values in meaningful level ranges including legend generation
- Import to Google Earth possible

Long-term Logging and Analysis
For long-term analysis of transmitter performance, varying transmission characteristics like Ionosphere, weather, sun activity, day/night, seasons or proof of coverage, a long-term logging capability can be integrated into the RF-SE:
- All RF measurements and content information can be logged for up to 120 days
- Display of parameter over time
- Export of all measurements and content information
- Playback of audio and data services at selected time point
- Integrated into the RF-SE user interface, accessible via a web browser, no software installation necessary

Scheduler
Next to the built-in remote control interface via RSCI, a scheduler can be used for monitoring various broadcasting situations:
- CSV-based schedule list containing time slots with date/time/frequency information
- Once activated the schedule is automatically followed and – if desired – corresponding files (e.g. RSCI) are recorded
### Model RF-SE19

- Compact measurement receiver
- DRM30/AM or DRM+ version
- Industrial, 1RU chassis
- Advanced user interface for remote usage
- Integrated audio and data decoder
- Alarm system functionality with email notification
- Integrated RSCI logging and analysis

### Mechanical
- All aluminium chassis
- Industrial 19" 1RU, rack mountable
- All aluminium chassis
- Operating temperature: 0 - 40°C
- Humidity: 20 - 80% non-condensing

### Front Panel Interfaces

<table>
<thead>
<tr>
<th>Interface</th>
<th>Value</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF input</td>
<td>N-type, female, 50 Ohm</td>
<td>Max. input power +25 dBm</td>
</tr>
<tr>
<td>DVD</td>
<td>DVD/CD-ROM</td>
<td></td>
</tr>
<tr>
<td>USB</td>
<td>USB 2.0</td>
<td></td>
</tr>
<tr>
<td>Phones</td>
<td>3.5 mm TRS plug</td>
<td>Stereo audio</td>
</tr>
</tbody>
</table>

### Back Panel Interfaces

<table>
<thead>
<tr>
<th>Interface</th>
<th>Value</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Voltage range: 100-240 V, 50-60 Hz AC</td>
<td>Input current: 230 V, max. 2.5 A; 115 V, max. 5 A</td>
</tr>
<tr>
<td>USB</td>
<td>USB 2.0</td>
<td>E.g. for external GPS, keyboard, mouse</td>
</tr>
<tr>
<td>ETH</td>
<td>RJ45 100Base-T Ethernet</td>
<td>Auto-sensing</td>
</tr>
<tr>
<td>Line OUT</td>
<td>3.5 mm TRS jack</td>
<td>Stereo audio</td>
</tr>
<tr>
<td>VGA</td>
<td>VGA output</td>
<td>Connect the provided VGA cable between these interfaces</td>
</tr>
<tr>
<td>VGA</td>
<td>VGA input</td>
<td></td>
</tr>
<tr>
<td>RS232</td>
<td>UART</td>
<td></td>
</tr>
<tr>
<td>Speakers</td>
<td>6.35 mm TRS jack</td>
<td>Left and right speaker output</td>
</tr>
<tr>
<td>Relays</td>
<td>6.35 mm TRS jack</td>
<td>A and B</td>
</tr>
<tr>
<td>10 MHz ref. input</td>
<td>3 - 4.5 V TTL</td>
<td>BNC</td>
</tr>
<tr>
<td>Loudspeakers</td>
<td>4 W, 4 Ohm, 80 Hz-20 kHz</td>
<td>2 built-in stereo 4&quot; loudspeakers</td>
</tr>
</tbody>
</table>

### Ordering Information

- RF-SE12DRM30: Touchscreen model for DRM30/AM monitoring
- RF-SE12DRMplus: Touchscreen model for DRM+ monitoring
- RF-SE19DRM30: 1RU model for DRM30/AM monitoring
- RF-SE19DRMplus: 1RU model for DRM+ monitoring
- Option MDI: Receiving and decoding input DCP/MDI stream
- Option CSV: Built-in RSCI to CSV format converter
- Option KML: Built-in RSCI to KML format converter
- Option IQF: Logging to IQ file (192kHz/32bit)
- Option DIV: Receiver diversity (DRM+ only)
- Option LOG: Long-term logging and analysis
- Option SCH: Usage of a CSV-based scheduler
- Option HVC: Decoding of AAC, CELP, HVXC instead of xHE/AAC
- Option CAS: Transport case for all models
- Option RAC: 19" rack mounting kit for RF-SE12
- Option 12V: 12VDC instead of 100-240VAC for RF-SE19

Specifications subject to change without notice.