

# SignalShark<sup>®</sup> 3320

## SignalShark

### Real-Time Remote Analyzer

Real-Time Remote Analyzer  
SignalShark<sup>®</sup> 3320, for the Detection,  
Analysis, Classification and Localization  
of RF Signals between 8 kHz and 8 GHz.

Supports automatic direction finding and  
TDOA.

Solves complex measurement and  
analysis tasks reliably and quickly with  
outstanding RF performance.

Windows 10-based open platform for  
third-party applications.

- › Frequency Range 8 kHz to 8 GHz
- › Extremely Fast Scan Rate of up to 50 GHz/s
- › 40 MHz Real-time Instantaneous Bandwidth
  - FFT overlap at least 75%
  - FFT size: up to 16,384
- › 100 % POI for Signals of Duration Greater than 3.125  $\mu$ s
- › High Dynamic Range (HDR) Receiver
- › ITU-compliant Measurements and Applications
- › Independent FFT and Receiver Path
- › SCPI Remote Control
- › VITA 49 Streaming (Sample Rate up to 25.6 MHz)
- › Modular Design
  - Stand-alone unit
  - 19" rack, 1HU (single / dual device)



[www.narda-sts.com/signalshark3320](http://www.narda-sts.com/signalshark3320)

# Take up the frequency spectrum challenges of today and tomorrow

## Seven Senses for Signals

### Description

The SignalShark is available in different forms. The form factor of the remote analyzer version is ideal for remote control applications. It can be easily mounted in a 19" rack or even in a small custom housing or a tight corner of a vehicle, thanks to its compact size. The use of well-documented SCPI reference commands and VITA 49 compliant I/Q streaming allows easy integration into every software environment.

The SignalShark is equipped with an excellent RF front-end with outstanding sensitivity and dynamic range, and which also provides four switchable RF inputs. In Scan mode, it operates as a super-fast spectrum analyzer. It computes FFTs of up to 16,384 points with at least 75% overlap within its real-time bandwidth of 40 MHz. This means that every signal event can be detected reliably, even if it is extremely short and infrequent.

There is an independent receiver path in addition to the spectrum path. The center frequency and channel bandwidth of this path are freely selectable within the 40 MHz real-time bandwidth. The receiver path is equipped with functions for channel level measurements, modulation analysis, audio demodulation, and I/Q streaming.

The SignalShark supports the use of Narda automatic direction-finding antennas (ADFA). Bearing cycles as short as to 1.2 ms can be achieved. The integrated map and localization software allows reliable homing-in on the signal, even in an urban environment.

The SignalShark is an excellent choice for every localization system based on TDOA, thanks to precise timestamp synchronization and Vita 49 I/Q streaming. The reference clock can be selected from the PPS signal of the internal GNSS receiver, or that of the ADFA's GNSS receiver, or from a dedicated PPS input.

The powerful CPU of the SignalShark can run third-party software and scripts, which makes it easy to extend the capabilities of the SignalShark or to build up a customized stand-alone system.

## Applications

The SignalShark is ideal for applications requiring high sensitivity, high dynamic range, reliable detection of very short and infrequent signal events, and transmitter localization. These requirements are all essential for radio monitoring. Radio monitoring can take different forms, depending on the why it is needed. For example, regulators may monitor the spectrum to ensure that vital public safety and security services run reliably, and that licensed parts of the spectrum are used only by the license holders. The armed forces need to know the actual usage of the spectrum in order to gather tactical or strategic information about potential enemies. Police and intelligence agencies may be interested in the content or at least the meta-data of some signal transmissions, and may also need to locate transmitters used for eavesdropping. Cellular network providers need to be able to quickly trace the source of harmful interference.

The high sensitivity and high dynamic range of the SignalShark ensures that the signals of interest are not hidden in the noise floor and that signal artifacts due to intermodulation will not be confused with real signals. The extraordinarily high FFT overlap in real-time spectrum mode ensures reliable detection of extremely short and/or infrequent signal events. Modulation analysis and occupied bandwidth measurements help regulators to make sure that spectrum usage is as intended. The audio demodulator assists in the classification of analog modulated transmissions under investigation. I/Q streaming enables third-party software to also be used to classify and decode digital transmissions. The use of Narda automatic DF antennas with the integrated statistical localization algorithm allows localization of transmitters, based on AOA. The SignalShark has already been proven to be easily integrated into third-party TDOA systems. Its superior synchronization properties are essential for reliable TDOA-based localization.

Although the SignalShark is optimized for radio monitoring, it can certainly also be used in most applications where a general-purpose spectrum analyzer would normally be required, often providing better RF performance, higher speed, and ease of integration. Its open platform for third-party software and scripts allows fully customized stand-alone solutions that can replace the large, complicated systems that were previously necessary.



## Tasks and Views

Customer applications have formed the basis for the design of the SignalShark family and the layout of the graphical user interface (GUI). This is most clearly seen in the concept of Tasks and Views.

All SignalShark devices are supporting the same GUI. For the SignalShark 3320 Remote Unit, it can be accessed with remote desktop software via a network and can also be run as a stand-alone system by means of an external monitor, keyboard and mouse.

## Tasks

Measurements often consist of a workflow of several steps, such as locating a signal in the spectrum, measuring its level and analyzing its behavior. This involves switching between different measurement modes and settings in each mode when a general-purpose analyzer is used.

However, with the SignalShark, the entire measurement workflow is handled by one or more measurement tasks. These tasks are shown as screen tabs, just like the web pages displayed by a web browser. Each task encapsulates all the measurement parameters and the underlying measurement engine mode. All the measurements in a task are performed at the same time. Up to six measurement visualizations (Views) can be added to adapt a task as required.

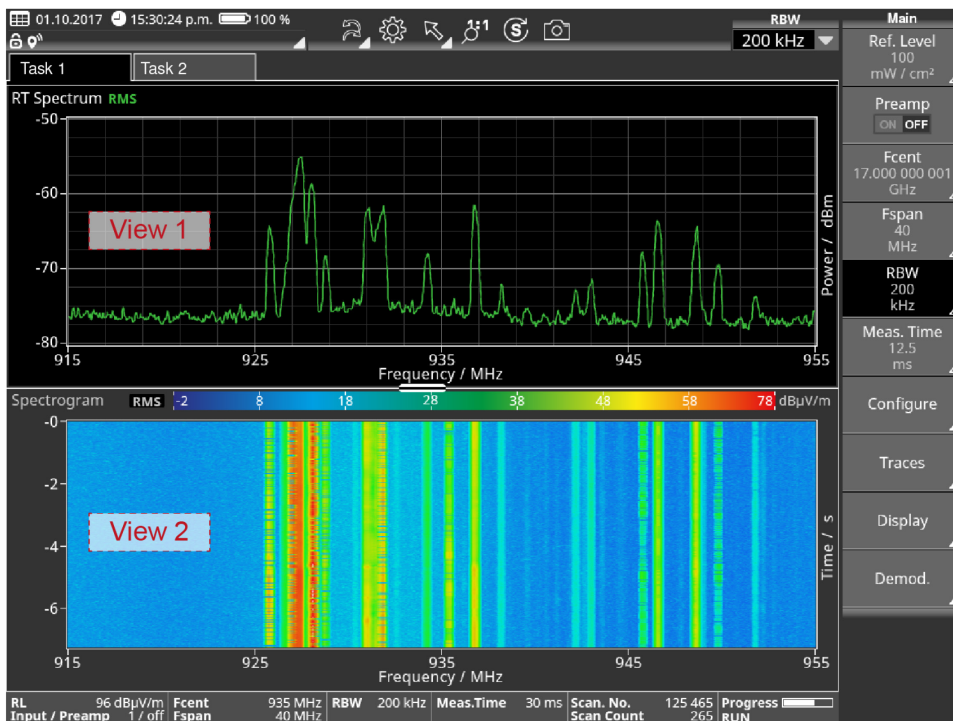
The SignalShark provides several task modes to support a wide variety of measurement applications.

### Spectrum (Scan) Mode

This mode supports measurement of the spectrum over the full frequency span of 8 kHz to 8 GHz in a single measurement at a maximum measurement speed of 50 GHz/s.

### Real-Time Spectrum Mode

Real-Time Spectrum mode enables spectrum measurements with a frequency span of up to 40 MHz in real-time. All frequencies within the frequency span are acquired simultaneously with no time gaps and with a FFT frame overlap of 75%. The FFT frame overlap increases to 87.5% for frequency spans of 20 MHz or less. A second digital down converter is used at the same time for analyzing and demodulating the I/Q data of a separate channel within the 40 MHz real-time bandwidth. The frequency and bandwidth of this channel are selectable.





### Auto DF Mode

This mode supports the use of the Narda ADFA. Each bearing cycle can be as short as 1.2 ms and even the bearings of pulsed signals can be reliably determined as long as the minimum pulse and gap durations are somewhat longer than 2 cycle times. The integrated map and localization software allows the reliable localization of transmitters even in an urban environment by driving a vehicle equipped with an ADFA through the area of interest. The sophisticated state of the art algorithm based on the bearing statistics reliably eliminates the influence of false bearings on the localization result, as long as there are enough line of sight bearings available from enough locations.

### Real-Time Streaming Mode

The I/Q data can be streamed at sample rates of up to 25.6 MHz using the VITA 49 protocol. The stream sink can be an external device connected via the LAN interface or a third party application running on the SignalShark itself.

## Views

Measurements are visualized by means of different views. The frequency domain and channel level can be viewed at the same time, for example, by adding a spectrum view and a level meter view to a measurement task.

### › Spectrum (scanned or real-time)

Shows level versus frequency

- Up to eight different traces based on the +Pk, RMS, Avg, -Pk, or Sample detectors and the maximum, average, or minimum long-term trace functions.
- Up to eight spectrum markers are available.
- Each marker supports one of the following additional functions:
  - noise power density
  - channel power
  - occupied bandwidth, with additional automatic center frequency and channel power measurement.

### › Peak Table (of Spectrum)

A list of relevant signal peaks in the measured spectrum.

### › Spectrogram

Visual representation of the recorded spectrums versus time. Colors represent the signal level. The smallest selectable time resolution is 31.25  $\mu$ s. Detectors compress the high-speed real-time spectrums down to the selected time resolution.

Up to three spectrograms with different detectors are available concurrently

### › Persistence (of real-time Spectrum)

Displays the spectrums as level versus frequency.

Color indicates rate of occurrence. Sporadic signals can be detected easily.

### › Level Meter

Shows the results from an independent receiver path with channel filters:

- Channel levels measured using up to three different detectors are available simultaneously.
- Filters and detectors for EMC measurements are MIL and CISPR compliant.
- Tone Search: The level of one of the detectors modulates the pitch of an audible tone. This is useful for manual direction finding using a handheld directional antenna, and for PIM hunting.
- Modulation detectors for AM, FM and PM. Up to 4 different detectors are available simultaneously.
- Frequency offset
- AFC
- Azimuth direction of the external antenna handle with integrated compass.
- Audio demodulator for AM, Pulse, CW, ISB, USB, LSB, FM, PM, or I/Q with squelch and AGC function. The demodulator and its menu is also available in other views.

## Map

Visualization of the current position and measurement results on a map:

- Labels for each stored data set
- Bearings
- Localization based on statistical evaluation of the bearings and displayed as a transparent heat-map overlay and an ellipse indicating the uncertainty.
- Multiple localization results

## › Bearing

S shows azimuth, elevation, DF quality, and omnidirectional RMS level derived from an automatic DF antenna (ADFA).

## › VITA 49 IQ Streaming

Shows the basic measurement parameter settings while streaming I/Q data according to the Vita 49 standard.

| Tasks and Views |                                 |                        |                                |                |
|-----------------|---------------------------------|------------------------|--------------------------------|----------------|
| View            | Measurement Engine or Task Mode |                        |                                |                |
|                 |                                 | <i>Spectrum (Scan)</i> | <i>RT (Real-Time) Spectrum</i> | <i>Auto DF</i> |
|                 | <i>Spectrum</i>                 | ✓                      | RT                             | ✓              |
|                 | <i>Peak Table (of Spectrum)</i> | ✓                      | RT                             | ✓              |
|                 | <i>Spectrogram</i>              | ✓                      | RT                             |                |
|                 | <i>Persistence</i>              |                        | RT                             |                |
|                 | <i>Level Meter</i>              |                        | ✓                              |                |
|                 | <i>Map</i>                      | ✓                      | ✓                              | ✓              |
|                 | <i>Bearing</i>                  |                        |                                | ✓              |
|                 | <i>VITA 49 IQ Streaming</i>     |                        |                                | ✓              |

## Definitions and Conditions

### Conditions

Specifications apply after 30 minutes warm-up time and an internal equalizer adjustment evoked by the user after the warm-up time. Unless otherwise noted specifications apply within the specified environmental conditions provided the product is within the recommended calibration cycle.

### Specifications with limits

These describe product performance for the given parameter covered by warranty. Specifications with limits (shown as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , max., min.) apply under the given conditions for the product and are tested during production, considering measurement uncertainty.

### Specifications without limits

These describe product performance for the given parameter covered by warranty. Specifications without limits represent values with negligible deviations, which are ensured by design (e.g. dimensions or resolution of a setting parameter).

### Typical values (typ.)

These characterize product performance for the given parameter that is not covered by warranty. When stated as a range or as a limit (shown as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$ , max., min.), they represent the performance met by approximately 80 % of the instruments. Otherwise, they represent the mean value. The measurement uncertainty is not taken into account.

### Nominal values (nom.)

These characterize expected product performance for the given parameter that is not covered by warranty. Nominal values are verified during product development but are not tested during production.

### Uncertainties

These characterize an interval for a given measure and estimate to have a level of confidence of approximately 95 %. Uncertainty is stated as the standard uncertainty multiplied by the coverage factor  $k=2$  based on the normal distribution. The evaluation has been carried out in accordance with the rules of the "Guide for the Expression of Uncertainty in Measurement" (GUM).

## Specifications <sup>a</sup>

### Basic Unit SignalShark 3320

| Frequency  |   |                   |                    |                     |                   |                    |
|--|---|-------------------|--------------------|---------------------|-------------------|--------------------|
| Frequency range                                    | 8 kHz to 8 GHz  |                   |                    |                     |                   |                    |
| Scan rate<br>(full span)                           | > 50 GHz / s @ RBW = 1.6 MHz<br>> 32 GHz / s @ RBW = 100 kHz                                      |                   |                    |                     |                   |                    |
| RBW (RT Spectrum)                                  | 1 Hz to 800 kHz   |                   |                    |                     |                   |                    |
| RBW (Scan Spectrum)                                | 1 Hz to 6.25 MHz  |                   |                    |                     |                   |                    |
| CBW (Level Meter)                                  | 25 Hz to 40 MHz   |                   |                    |                     |                   |                    |
| EMC filter bandwidth<br>(Spectrum and Level Meter) | 10 Hz, 100 Hz, 200 Hz, 1 kHz, 9 kHz, 10 kHz, 100 kHz, 120 kHz & 1 MHz                             |                   |                    |                     |                   |                    |
| Detectors (Spectrum and Level Meter)               | +Pk, RMS, -Pk, Avg and Sample   |                   |                    |                     |                   |                    |
| CISPR Detectors (Level Meter)                      | Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected)                |                   |                    |                     |                   |                    |
| SSB phase noise                                    | <b>f<sub>c</sub></b>  | <b>df = 1 kHz</b> | <b>df = 10 kHz</b> | <b>df = 100 kHz</b> | <b>df = 1 MHz</b> | <b>df = 10 MHz</b> |
|  | 10 MHz  | < -120 dB(1/Hz)   | < -130 dB(1/Hz)    | < -135 dB(1/Hz)     |                   |                    |
|  | 1 GHz   | < -90 dB(1/Hz)    | < -101 dB(1/Hz)    | < -101 dB(1/Hz)     | < -112 dB(1/Hz)   | < -132 dB(1/Hz)    |
| Internal reference frequency                       | Deviation:  |                   |                    |                     |                   |                    |
|  | < 1 ppm<br>(includes initial deviation, aging within the first 2 years, and temperature response) |                   |                    |                     |                   |                    |

| Amplitude  |                                 |   |                                  |  |
|--|---------------------------------|---|----------------------------------|--|
| HDR<br>(High Dynamic Range)  |                                 | SignalShark can detect low level signals even in the presence of very strong signals. It does this by combining high sensitivity with a wide intermodulation-free dynamic range.<br>The DANL and IP2 / IP3 values stated below are valid at the same setting. |                                  |  |
| DANL (Noise Figure)<br>@ attenuator = 0 dB,<br>no preamp                                     | 1 MHz ≤ f ≤ 44 MHz              | < -160 dB(mW/Hz)  | (resultant noise figure < 14 dB) |  |
|  | 44 MHz < f ≤ 3 GHz              | < -159 dB(mW/Hz)  | (resultant noise figure < 15 dB) |  |
|  | 3 GHz < f ≤ 8 GHz               | < -152 dB(mW/Hz)  | (resultant noise figure < 22 dB) |  |
| 2 <sup>nd</sup> order intercept point<br>(IP2, 2 tones)<br>@ attenuator = 0 dB,<br>no preamp | 4 MHz ≤ f < 42 MHz <sup>b</sup> | > 60 dBm  |                                  |  |
|  | 42 MHz ≤ f ≤ 8 GHz              | 40 dBm (typ.)   |                                  |  |
| 3 <sup>rd</sup> order intercept point<br>(IP3, 2 tones)<br>@ attenuator = 0 dB,<br>no preamp | 3 MHz < f ≤ 44 MHz              | > 20 dBm  |                                  |  |
|  | 44 MHz < f ≤ 8 GHz              | 12 dBm (typ.)   |                                  |  |
|  | 44 MHz < f ≤ 3 GHz              | > 2 dBm   |                                  |  |
|  | 3 GHz < f ≤ 8 GHz               | > 5 dBm   |                                  |  |
| Level uncertainty  |                                 | 9 kHz ≤ f ≤ 8 GHz   | < +/- 2 dB                       |  |
| Residual spurs <sup>c</sup><br>@ attenuator = 0 dB   | 8 kHz ≤ f ≤ 44 MHz              | < -120 dBm  | exceptions < -100 dBm            |  |
|  | 44 MHz < f ≤ 3 GHz              | < -115 dBm  | exceptions < -100 dBm            |  |
|  | 3 GHz < f ≤ 6 GHz               | < -110 dBm  | exceptions < -95 dBm             |  |
|  | 6 GHz < f ≤ 8 GHz               | < -105 dBm  | exceptions < -85 dBm             |  |
| IF rejection   |                                 | > 80 dB   |                                  |  |
| Image rejection  |                                 | > 80 dB   |                                  |  |

<sup>a</sup> RF data apply in the temperature range 20 °C to 26 °C at a relative humidity of between 25 and 75 %

<sup>b</sup> Component at f1 + f2 is measured in the direct band (Fcent ≤ 64 MHz in real-time mode)

<sup>c</sup> Typically with only few exceptions. These are documented in the calibration certificate



| Real-Time Spectrum             |  |                                      |
|--------------------------------|--|--------------------------------------|
| Probability of intercept (POI) | 100 % for signal duration greater than 3.125 $\mu$ s | @ RBW = 800 kHz and 75 % FFT Overlap |
| Spectrum rate                  | 1.6 million spectra / s                              | @ RBW = 800 kHz and 75 % FFT Overlap |
| FFT overlap                    | Fspan > 20 MHz                                       | 75 %                                 |
|                                | Fspan $\leq$ 20 MHz, RBW $\leq$ 400 kHz              | 87.5 %                               |

| RF input                                 |  |              |
|--|--|--------------|
| Type (switchable)                        | 1 x N-connector, 50 $\Omega$ (female)<br>3 x SMA-connector, 50 $\Omega$ (female) |              |
| RF destruction limit                     | 20 dBm   |              |
| Max. nominal RF level                    | 15 dBm   |              |
| Maximum DC voltage                       | 25 V   |              |
| Return loss                              | 12 kHz $\leq$ f $\leq$ 3 GHz   | > 9.54 dB    |
|  | 3 GHz < f $\leq$ 6 GHz   | 12 dB (typ.) |
|  | 6 GHz < f $\leq$ 8 GHz   | 10 dB (typ.) |
| Isolation between used and unused inputs | 8 kHz $\leq$ f $\leq$ 1 GHz  | 60 dB (nom.) |
|  | 3 GHz  | 50 dB (nom.) |
|  | 8 GHz  | 35 dB (nom.) |

| General Specifications                                       |   |
|--|---|
| Attenuator   | 0 to 30 dB (0.5 dB steps)   |
| Digitizer  | 16 Bit  |
| GNSS   | Embedded receiver   |
| Internal non-removable memory                                | SSD, mSATA  |
| Removable memory   | microSD (SDXC) / USB 2.0 / USB 3.0  |
| External power supply:                                       | Basic unit, DC input: 10 to 48 VDC<br>AC adapter, input: 100V-240VAC, output: 12VDC, 5.5A<br><br>Plug type: Jack Plug S1017 or Screw Plug S10KS17 |
| Dimensions (H $\times$ W $\times$ D)<br>(without connectors) | 43.5 mm $\times$ 220 mm $\times$ 204 mm (1.71" $\times$ 8.66" $\times$ 8.03")   |
| Weight   | Approx. 2.1 kg / 4.63 lb (stand-alone unit)   |
| Country of origin  | Germany   |
| Recommended calibration interval                             | 24 months   |

| Interfaces  |   |
|---|---|
| 10 MHz reference input  | 1 x SMA-connector, 600 $\Omega$ (female)                                      |
| PPS/trigger input   | 1 x SMA, 100 k $\Omega$ (female)  |
| GNSS antenna input<br>(for additional, external GNSS antenna) | 1 x SMA, 50 $\Omega$ , female<br>(DC voltage for active antennas is supplied) |
| Video   | 1 x DisplayPort   |
| Audio   | 1 x 3.5 mm headphone jack   |
| Ethernet  | 1 x GigE (10/100/1000Base-T), RJ45  |
| USB (host)  | 1 x USB 3.0, 1 x USB 2.0  |
| SD card slot  | 1 x microSD-card (SDXC)   |

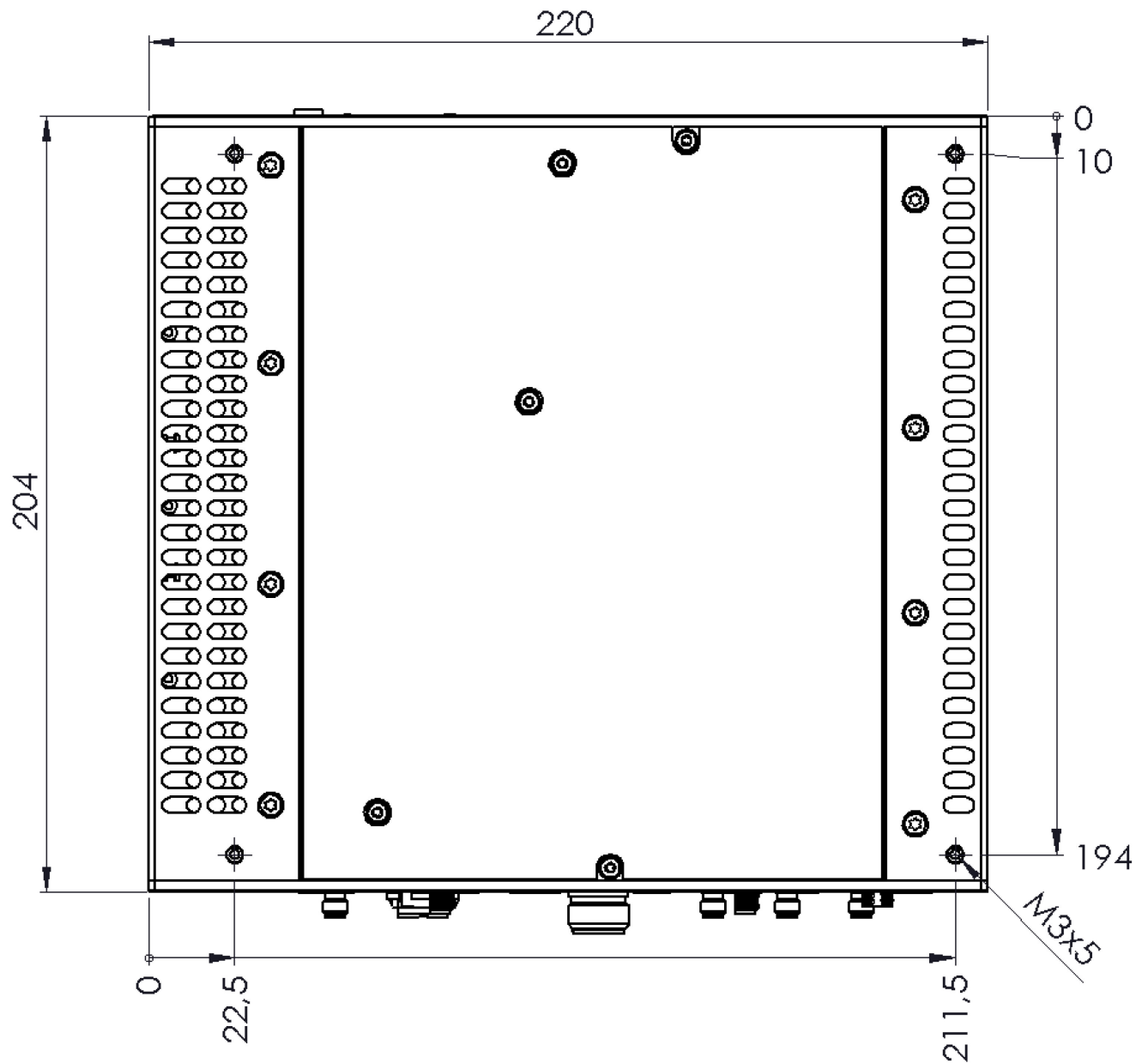
| Remote control and streaming |                                     |
|------------------------------|-------------------------------------|
| Remote control protocol      | SCPI                                |
| I/Q streaming                | VITA 49, sample rate up to 25.6 MHz |
| PC Software                  | Remote Desktop (Windows)            |

| Environmental conditions |   |  |
|--------------------------|---|--|
| MIL-PRF-28800F Class 2   | Operating temperature                           |  |
|                          | Storage temperature                             |  |
|                          | Operating humidity                              |  |
|                          | Random vibration                                |  |
|                          | Functional shock                                |  |
|                          | Bench drop                                      |  |
| Operating temperature    | -20 °C to + 55 °C                               |  |
| Humidity                 | < 29 g/m³ (< 93 % RH at +30 °C), non-condensing |  |
| Climate                  | Storage   | 1K3 (IEC 60721-3) extended to - 20 °C to + 70 °C |
|                          | Transport                                       | 2K4 (IEC 60721-3) restricted - 20 °C to + 70 °C  |
|                          | Operating                                       | 7K2 (IEC 60721-3) extended to - 20 °C to + 55 °C |
| Mechanical               | Storage   | 1M3 (IEC 60721-3)                                |
|                          | Transport                                       | 2M3 (IEC 60721-3)                                |
|                          | Operating                                       | 7M3 (IEC 60721-3)                                |

## Modular Design

### Drawings





All dimensions in mm.

## Ordering Information

Your local Narda sales representative can provide information about all the possible options and will be pleased to offer advice.

The SignalShark Basic Unit is included in all three Basic Sets. Application Packages as well as Software Options and Accessories that provide further advantages are also available.

### SignalShark 3320 Basic Unit:

| SignalShark 3320/01 Basic Set (stand-alone)  | Part number     |
|--|-----------------|
| <p>The Basic Unit set contains the SignalShark Remote Unit, built-in, single device as well as some basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>SignalShark 3320/01 Basic Unit</li> <li>Power Supply 12VDC, 5.5A, 100V-240VAC, plug</li> <li>Equipment feet set for desktop use</li> <li>40 MHz real-time Spectrum, Marker and Peak Table</li> <li>Option, SCPI Remote Control</li> <li>Electronic manual (English)</li> <li>Safety Instructions</li> <li>SignalShark 3320 - Quick Start Guide</li> </ul>              | <b>3320/101</b> |
| SignalShark 3320/02 Basic Set (1x 19", 1 HU)   | Part number     |
| <p>The Basic Unit set contains the SignalShark Remote Unit, 19", 1 HU, single device as well as some basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>SignalShark 3320/02 Basic Unit</li> <li>Power Supply 12VDC, 5.5A, 100V-240VAC, plug</li> <li>Equipment feet set for desktop use</li> <li>40 MHz real-time Spectrum, Marker and Peak Table</li> <li>Option, SCPI Remote Control</li> <li>Electronic manual (English)</li> <li>Safety Instructions</li> <li>SignalShark 3320 - Quick Start Guide</li> </ul>             | <b>3320/201</b> |
| SignalShark 3320/03 Basic Set (2x 19", 1HU)  | Part number     |
| <p>The Basic Unit set contains the SignalShark Remote Unit, 19", 1HU, dual device as well as some basic accessories, and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>SignalShark 3320/03 Basic Unit (dual device)</li> <li>Power Supply 12VDC, 5.5A, 100V-240VAC, plug</li> <li>Equipment feet set for desktop use</li> <li>40 MHz real-time Spectrum, Marker and Peak Table</li> <li>Option, SCPI Remote Control</li> <li>Electronic manual (English)</li> <li>Safety Instructions</li> <li>SignalShark 3320 - Quick Start Guide</li> </ul> | <b>3320/301</b> |

## Application Packages

The application packages make it easy to adapt SignalShark to your requirements. Each package typically consists of application-dependent hardware accessories and/or firmware options, and costs less than purchasing the items individually. Additional packages can be purchased as and when required. Your local Narda sales representative will be happy to assist you in the selection of the right packages for your applications.

| App. Package, Receiver  | Part number       |
|---|-------------------|
| <p>The Receiver Application Package guarantees situational awareness by providing gapless analysis of entire signal bands. It also enables demodulation of AM, FM, LSB, USB, and CW signals.</p> <p><b>Includes:</b></p> <p>3310/95.002    Option, Spectrogram</p> <p>3310/95.003    Option, Level Meter incl. Compass values</p> <p>3310/95.007    Option, Analog Demodulation</p> | <b>3310/94.01</b> |

| App. Package, Automatic DF 1, 200 MHz to 2.7 GHz*   | Part number       |
|---|-------------------|
| <p>This Application Package provides basic equipment and options for vehicle based, automatic direction finding (bearing).</p> <p><b>Includes:</b></p> <p>3360/01        Automatic DF-Antenna 1</p> <p>3300/90.19    Tool, Allen Wrench 3 mm</p> <p>3310/95.005   Option, Automatic DF Antenna Control, Bearing View</p> <p>3300/90.04    ADFA Vehicle Mounting Kit for autom. DF Antenna</p> <p>3603/02       RF-Cable, DC to 8 GHz, N to SMA, 50 Ohm, 5 m</p> <p>3360/98.12    Automatic DF-Antenna Handling and Safety Instructions multilingual</p> | <b>3310/94.05</b> |

\* The additional option "3310/95.006 Mapping and Localization" is recommended for Open Street Map based visualization and heat-map localization.



## Software Options

| Software Option Description   | Part number |
|---|-------------|
| 40 MHz real-time Spectrum, Marker and Peak Table (included in SignalShark 3320 Basic Set) |             |
| Option, SCPI Remote Control (included in SignalShark 3320 Basic Set)                      |             |
| Option, Spectrogram   | 3310/95.002 |
| Option, Level Meter incl. Compass values  | 3310/95.003 |
| Option, Persistence (of real-time Spectrum)   | 3310/95.004 |
| Option, VITA 49   | 3310/95.014 |
| Option, Analog Demodulation   | 3310/95.007 |

## Accessories

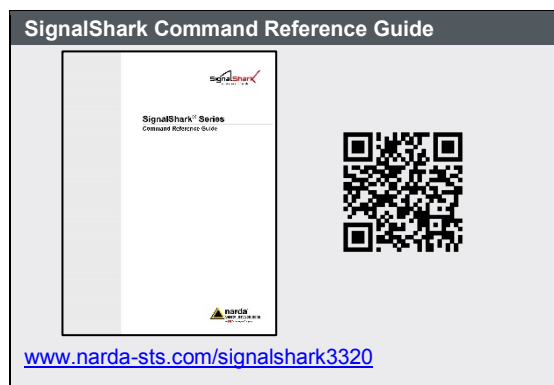
| Accessory Description   | Part number |
|---|-------------|
| Power Supply 12VDC, 5.5A, 100V-240VAC, plug Jack Plug S1017, choose Power Cord 2260/90.65 -.69 (included in SignalShark 3320 Basic Set) | 2259/92.9   |
| Power Supply DC Vehicle Adapter, screw plug   | 2259/92.12  |
| External GNSS Antenna, active   | 3300/90.05  |
| RF Adapter, N Male to SMA Female, 50 Ohm  | 3300/90.13  |
| Headphone, 3.5 mm Plug for SignalShark  | 3300/90.14  |
| Recovery media for SignalShark 3310   | 3310/90.03  |

| Antennas   | Part number |
|--|-------------|
| Directional Antenna 1, 20 MHz to 250 MHz               | 3100/11     |
| Directional Antenna 2, 200 MHz to 500 MHz              | 3100/12     |
| Directional Antenna 3, 400 MHz to 8 GHz                | 3100/13     |
| Loop Antenna, H-Field, 9 kHz to 30 MHz                 | 3100/14     |
| Antenna Adapter, N Male for Handle 3100/10 and 3300/10 | 3100/15     |
| Arm Support for Active Antenna Handle                  | 3100/90.10  |
| Active Antenna Handle for SignalShark, 9 kHz to 8 GHz  | 3300/10     |

## Datasheet Narda DF Antennas

There is a separate DF antenna datasheet, which provides detailed information about the direction-finding antennas available from Narda.

For details about SCPI remote control see:



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