

SignalShark<sup>®</sup>

# SignalShark

## Real-Time Handheld Analyzer

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

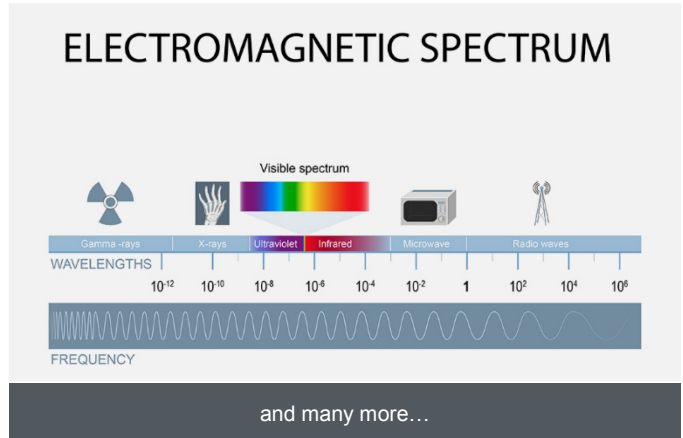
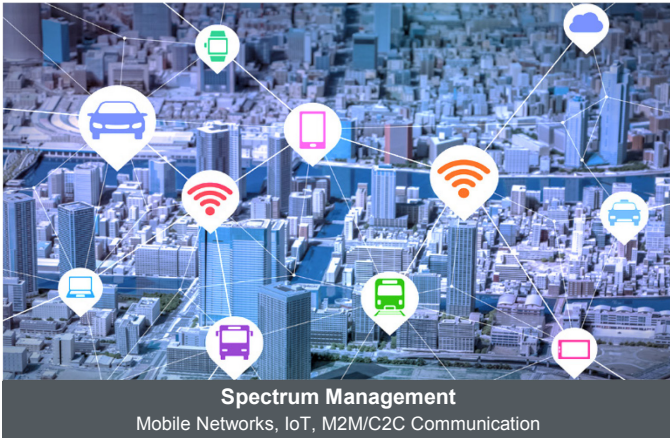
Solves complex measurement and  
analysis tasks reliably and quickly with  
the same RF performance as  
comparable desktop instruments.

- › Frequency range 8 kHz to 8 GHz
- › Extremely fast Scan Rate of up to 50 GHz/s
- › 40 MHz Real-Time instantaneous bandwidth
- › Powerful, live persistence spectrum to find hidden signals
- › 100 % POI for signals longer than 3.125  $\mu$ s
- › High Dynamic Range (HDR) Receiver
- › High level accuracy



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

## Take on the frequency spectrum challenges of today and tomorrow



## Seven Senses for Signals

### Description

Like a Shark, that highly efficient hunter in the ocean, Narda SignalShark derives its success in measurement from the interplay of its highly developed senses.

Its 40 MHz real-time bandwidth captures the spectrum of even very short-pulsed signals  $> 3.125\mu s$  with a POI of 100 %. This guarantees a consistent awareness of all spectrum events.

Due to its distinguished analysis functions as real-time spectrum, spectrogram and persistence, measured signals are analyzed with a very high frequency and time resolution.

### Applications

More and more devices have to share the available frequency ranges because of the rapid development in new technologies such as the Internet of Things (IoT), machine-to-machine (M2M) or car-to-car (C2C) communications and expanding 4G/5G mobile networks.

Whether making a wideband measurement of an entire frequency range, detecting hidden signals, reliably capturing very short impulses or localizing interference signals, SignalShark provides comprehensive measurement solutions for the increasingly complex RF spectrum.

## Tasks and Views

The design and GUI layout of SignalShark is based on customer applications. This can be seen most clearly in the concept of Tasks and Views.

### Tasks

Often a real-live measurement is a workflow of several measurement steps, like finding a signal in the spectrum, measuring its level and analyzing its behavior. With typical analyzers, you have to switch between different measurement modes and settings within the modes.

With SignalShark you can handle a complete measurement workflow within one or several measurement task. Measurement tasks are represented by a tab on the screen, like a web site within a web browser. They encapsulate all measurement parameters and the underlying measurement engine mode. Within a task, all measurements can be performed at the same time. You can add up to six measurement visualizations (Views) to a task, to adapt it to your needs.

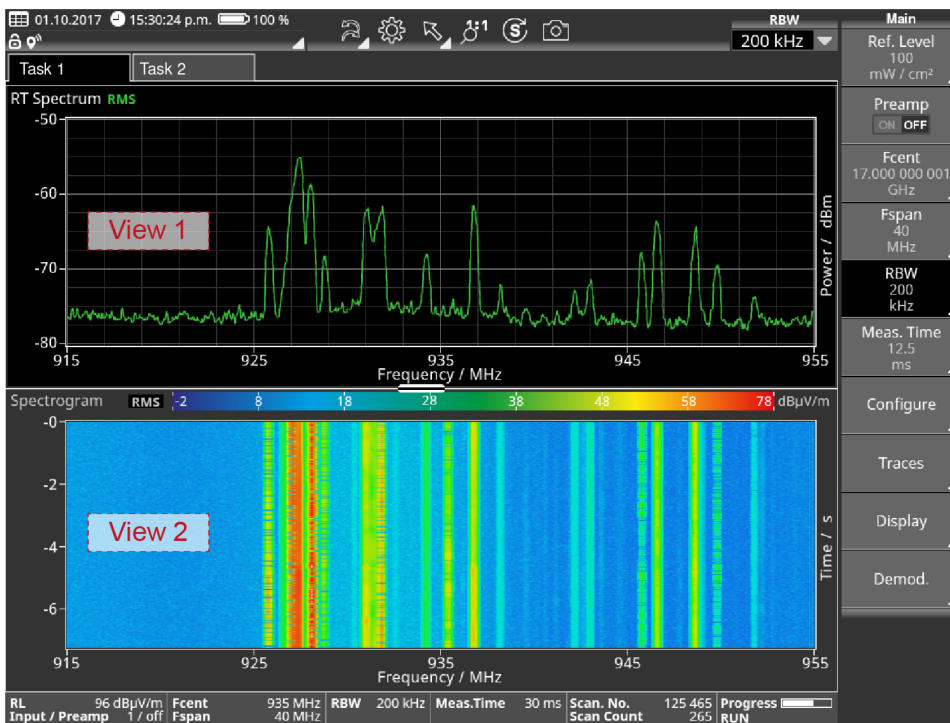
To support a wide variety of measurement applications, SignalShark provides several task modes.

### Spectrum (Scan) Mode

This mode supports measuring the spectrum with full frequency span of 8 kHz up to 8 GHz within one measurement and a maximum measurement speed of 50 GHz/s.

### Real-Time Spectrum Mode

The Real-Time Spectrum mode enables real-time spectrum measurements with a frequency span of up to 40 MHz. This frequency span will be acquired simultaneously in frequency and gapless in time with 75% of overlapping of the FFT frames. For frequency spans  $\leq 20$  MHz the overlapping of the FFT frames increases to 87.5 %. At the same time a second digital down converter is used for analyzing and demodulating the I/Q data of a separate channel with selectable frequency and bandwidth within the 40 MHz real-time bandwidth.



## Views

Measurements are visualized within different kind of views. You can look at the frequency domain and channel level 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 over frequency.
- › **Peak Table** (of Spectrum)  
List of relevant signal peaks in the measured spectrum.
- › **Spectrogram**  
Visual representation of recorded spectra over time. Colors represent the signal level. The smallest selectable time resolution is 31.25  $\mu$ s. Detectors compress the high-speed real time spectra to the selected time resolution.
- › **Level Meter (& Compass)**  
Shows channel level as bar graph and the direction of the active antenna handle.
- › **Persistence** (of real time Spectrum)  
Displays spectra as level versus frequency.  
Color indicates rate of occurrence. Sporadic signals can be detected easily.

Tasks and Views		Measurement Engine or Task Mode	
View		<i>Spectrum (Scan)</i>	<i>RT (Real-Time) Spectrum</i>
		<i>Spectrum</i>	✓
<i>Peak Table of Spectrum</i>		✓	RT
<i>Spectrogram</i>		✓	RT
<i>Persistence</i>			RT
<i>Level Meter and Compass</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 <, ≤, >, ≥, ±, 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 <, ≤, >, ≥, ±, 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 percent. 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).



## General Specifications <sup>a</sup>

### Basic Unit SignalShark 3310/01

Frequency																			
Frequency Range	8 kHz – 8 GHz																		
Scan Rate (full span)	> 50 GHz / s @ RBW = 1.6 MHz > 32 GHz / s @ RBW = 100 kHz																		
RBW (RT Spectrum)	1 Hz ... 800 kHz																		
RBW (Scan Spectrum)	1 Hz ... 6.25 MHz																		
CBW (Level Meter)	25 Hz ... 40 MHz																		
EMC Filter BW (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 & Sample																		
CISPR Detectors (Level Meter)	Cpeak, CRMS & CAvg (EMC Filter with CISPR BW must be selected)																		
SSB Phase noise	<table border="1"> <thead> <tr> <th><math>f_c</math></th> <th>df = 1 kHz</th> <th>df = 10 kHz</th> <th>df = 100 kHz</th> <th>df = 1 MHz</th> <th>df = 10 MHz</th> </tr> </thead> <tbody> <tr> <td>10 MHz</td> <td>&lt; -120 dB(1/Hz)</td> <td>&lt; -130 dB(1/Hz)</td> <td>&lt; -135 dB(1/Hz)</td> <td></td> <td></td> </tr> <tr> <td>1 GHz</td> <td>&lt; -90 dB(1/Hz)</td> <td>&lt; -101 dB(1/Hz)</td> <td>&lt; -101 dB(1/Hz)</td> <td>&lt; -112 dB(1/Hz)</td> <td>&lt; -132 dB(1/Hz)</td> </tr> </tbody> </table>	$f_c$	df = 1 kHz	df = 10 kHz	df = 100 kHz	df = 1 MHz	df = 10 MHz	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)
	$f_c$	df = 1 kHz	df = 10 kHz	df = 100 kHz	df = 1 MHz	df = 10 MHz													
	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 includes initial deviation, aging within first 2 years and temperature response																		

Amplitude													
HDR (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. The DANL and IP2 / IP3 values stated below are valid at the same setting.												
DANL (Noise Figure) @ attenuator = 0 dB, no preamp	<table border="1"> <thead> <tr> <th>1 MHz ≤ f ≤ 44 MHz</th> <th>&lt; -160 dB(mW/Hz)</th> <th>(resultant noise figure &lt; 14 dB)</th> </tr> </thead> <tbody> <tr> <td>44 MHz &lt; f ≤ 3 GHz</td> <td>&lt; -159 dB(mW/Hz)</td> <td>(resultant noise figure &lt; 15 dB)</td> </tr> <tr> <td>3 GHz &lt; f ≤ 8 GHz</td> <td>&lt; -152 dB(mW/Hz)</td> <td>(resultant noise figure &lt; 22 dB)</td> </tr> </tbody> </table>	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)			
	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 (IP2, 2 tones) @ attenuator = 0 dB, no preamp	<table border="1"> <thead> <tr> <th>4 MHz ≤ f &lt; 42 MHz <sup>b</sup></th> <th>&gt; 56 dBm</th> </tr> </thead> <tbody> <tr> <td>42 MHz ≤ f ≤ 630 MHz</td> <td>30 dBm (typ.)</td> </tr> <tr> <td>630 MHz &lt; f ≤ 8 GHz</td> <td>40 dBm (typ.)</td> </tr> </tbody> </table>	4 MHz ≤ f < 42 MHz <sup>b</sup>	> 56 dBm	42 MHz ≤ f ≤ 630 MHz	30 dBm (typ.)	630 MHz < f ≤ 8 GHz	40 dBm (typ.)						
	4 MHz ≤ f < 42 MHz <sup>b</sup>	> 56 dBm											
	42 MHz ≤ f ≤ 630 MHz	30 dBm (typ.)											
630 MHz < f ≤ 8 GHz	40 dBm (typ.)												
3 <sup>rd</sup> order intercept point (IP3, 2 tones) @ attenuator = 0 dB, no preamp	<table border="1"> <thead> <tr> <th>3 MHz &lt; f ≤ 44 MHz</th> <th>&gt; 20 dBm</th> </tr> </thead> <tbody> <tr> <td>44 MHz &lt; f ≤ 8 GHz</td> <td>12 dBm (typ.)</td> </tr> <tr> <td>44 MHz &lt; f ≤ 3 GHz</td> <td>&gt; 2 dBm</td> </tr> <tr> <td>3 GHz &lt; f ≤ 8 GHz</td> <td>&gt; 5 dBm</td> </tr> </tbody> </table>	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				
	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 @ attenuator = 0 dB	<table border="1"> <thead> <tr> <th>8 kHz ≤ f ≤ 44 MHz</th> <th>&lt; -120 dBm</th> <th>exceptions &lt; -100 dBm (frequency list t.b.d.)</th> </tr> </thead> <tbody> <tr> <td>44 MHz &lt; f ≤ 3 GHz</td> <td>&lt; -115 dBm</td> <td>exceptions &lt; -100 dBm (frequency list t.b.d.)</td> </tr> <tr> <td>3 GHz &lt; f ≤ 6 GHz</td> <td>&lt; -110 dBm</td> <td>exceptions &lt; -95 dBm (frequency list t.b.d.)</td> </tr> <tr> <td>6 GHz &lt; f ≤ 8 GHz</td> <td>&lt; -105 dBm</td> <td>exceptions &lt; -85 dBm (frequency list t.b.d.)</td> </tr> </tbody> </table>	8 kHz ≤ f ≤ 44 MHz	< -120 dBm	exceptions < -100 dBm (frequency list t.b.d.)	44 MHz < f ≤ 3 GHz	< -115 dBm	exceptions < -100 dBm (frequency list t.b.d.)	3 GHz < f ≤ 6 GHz	< -110 dBm	exceptions < -95 dBm (frequency list t.b.d.)	6 GHz < f ≤ 8 GHz	< -105 dBm	exceptions < -85 dBm (frequency list t.b.d.)
	8 kHz ≤ f ≤ 44 MHz	< -120 dBm	exceptions < -100 dBm (frequency list t.b.d.)										
	44 MHz < f ≤ 3 GHz	< -115 dBm	exceptions < -100 dBm (frequency list t.b.d.)										
	3 GHz < f ≤ 6 GHz	< -110 dBm	exceptions < -95 dBm (frequency list t.b.d.)										
6 GHz < f ≤ 8 GHz	< -105 dBm	exceptions < -85 dBm (frequency list t.b.d.)											
IF rejection	> 80 dB												
Image rejection	> 80 dB												

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

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

Real-Time Spectrum		
Probability of intercept – POI	100 % for signals longer 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 3 x SMA-connector, 50 $\Omega$ , female	
RF destruction limit	20 dBm	
Max. nominal RF level	10 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.)

General Specifications	
Attenuator	0 ... 25 dB (0.5 dB Steps)
Digitizer	16 Bit
GNSS	Embedded receiver and antenna
Internal non removable Memory	SSD, mSATA
Removable memory	microSD (SDXC) / USB 2.0 / USB 3.0
External power supply:	Base device DC input: 10 to 48 VDC Adapter 12VDC, 5.5A, 100V-240VAC
Battery	2 x Lithium-ion rechargeable battery pack, hot-swappable during operation Operating time: approx. 3 hours (typical, with both batteries) Charging time: approx. 4.2 hours (nominal, with both batteries charging in base device) Charging time: approx. 3 hours (nominal, with external charger)
<i>In many countries, the battery is available from several public distributors.</i>	
Dimensions (H x W x D)	230 mm x 335 mm x 85 mm (9.06" x 13.19" x 3.35")
Weight	Approx. 4.1 kg / 9.04 lbs (with one battery)
Country of origin	Germany

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 <i>(for additional, external GNSS antenna)</i>	1 x SMA, 50 $\Omega$ , female (DC voltage for active antennas is supplied)
Display Size and Resolution:	10.4", 1024 x 768 pixels, Color Resistive touch
Video	1 x Display Port
Audio	1 x 3.5 mm headphone jack Built-in loudspeaker Built-in microphone
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
PC Software	Configuration Software <sup>c</sup>

Environmental conditions	
MIL-PRF-28800F Class 2	Operating temperature
	Storage temperature
	Operating humidity
	Random vibration
	Functional shock
	Transit drop
Temperature – operating	- 10 °C to + 55 °C with battery
	- 10 °C to + 55 °C with external power supply
	0 °C to + 40 °C with external power supply when charging batteries
Humidity	< 29 g/m <sup>3</sup> (< 93 % RH at +30°C), non-condensing
Climatic	Storage 1K3 (IEC 60721-3) extended to - 20 °C to + 70 °C (batteries removed)
	Transport 2K4 (IEC 60721-3) restricted - 20 °C to + 70 °C
	Operating 7K2 (IEC 60721-3) extended to - 10 °C to + 55 °C
Mechanical	Storage 1M3 (IEC 60721-3)
	Transport 2M3 (IEC 60721-3)
	Operating 7M3 (IEC 60721-3)
Ingress Protection	IP 52 (with antenna attached and interface protectors closed)
	IP 67 (stored in the hardcase)

..

<sup>c</sup> Available from July 2018

## Ordering Information

Your local Narda representative will inform you of all possible options and will be pleased to provide you with advice.

### SignalShark Basic Unit:

All configurations are based on the SignalShark Basic Set.

SignalShark Basic Set	Part number
<p>The Basic Unit set contains the SignalShark as well as some basic accessories and supports 40 MHz real-time spectrum analysis, marker and peak table.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>• SignalShark 3310/01 Basic Unit</li> <li>• 2x Battery Pack, Rechargeable</li> <li>• Power Supply 12VDC, 5.5A, 100V-240VAC, plug</li> <li>• Touch pen for resistive touch screen</li> <li>• 40 MHz real-time Spectrum, Marker and Peak Table</li> <li>• Electronic manual (English)</li> <li>• Safety Instructions</li> <li>• SignalShark 3310 - Quick Start Guide</li> </ul>	<b>3310/101</b>

### Software Options

Software Option Description	Part number
40 MHz real-time Spectrum, Marker and Peak Table (included in SignalShark Basic Set 3310/101)	<b>Basic Set</b>
Option, Spectrogram	<b>3310/95.002</b>
Option, Level Meter incl. Compass values	<b>3310/95.003</b>
Option, Persistence (of real-time Spectrum)	<b>3310/95.004</b>
Option, SCPI Remote Control	<b>3310/95.012</b>
Option, VITA 49	<b>3310/95.014</b>
Option, Analog Demodulation <sup>d</sup>	<b>3310/95.007</b>

### Accessories

Accessory Description	Part number
Power Supply 12VDC, 5.5A, 100V-240VAC, plug, Jack Plug S1017, choose Power Cord 2260/90.65 -.69	<b>2259/92.09</b>
Power Supply DC Vehicle Adapter, screw plug	<b>2259/92.12</b>
Battery Pack Set, rechargeable, Li-Ion, 2 x RRC2057, Li-Ion, 7V5 , 6.4Ah	<b>2259/92.16</b>
Double Charger Set, external, for 2259/92.16, choose Power Cord 2260/90.70 -.74	<b>2259/92.17</b>
Vehicle power adapter for charger set 2259/92.17	<b>2259/92.15</b>
Additional GNSS Antenna, external, active	<b>3300/90.05</b>
Touch pen for resistive touch screen	<b>3300/90.07</b>
Carrying Strap for Basic Unit	<b>3300/90.08</b>
RF Adapter, N Male to SMA Female, 50 Ohm	<b>3300/90.13</b>
Headphone, 3.5mm Plug for SignalShark	<b>3300/90.14</b>
Hardcase for SignalShark 3310	<b>3310/90.01</b>
Recovery media for SignalShark 3310	<b>3310/90.03</b>
10.4" Screen Protector Film	<b>3310/90.04</b>

<sup>d</sup> Available from July 2018



Accessory Description	Part number
Directional Antenna 1 20 MHz - 250 MHz	3100/11
Directional Antenna 2 200 MHz - 500 MHz	3100/12
Directional Antenna 3 400 MHz - 6 GHz / 8 GHz	3100/13
Loop Antenna, H-Field 9kHz-30MHz	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, 9kHz - 8GHz	3300/10

## Datasheet Narda DF Antennas

An additional DF antenna datasheet provides detailed information about direction finding antennas available from Narda.

## Application Packages

The application packages make it easy to adapt SignalShark to your needs. A package typically consists of application dependent hardware accessories and/or firmware options and has a discount compared to an individual purchase. If needed, additional packages can be purchased also at a later time. Your local Narda representative will be happy to help you select the right application packages for your application.

Receiver <sup>e</sup>	Part number
<p>The Receiver Application Package guarantees situational awareness by providing gapless analysis of whole signal bands. It also enables demodulation of AM, FM, LSB, USB, and CW signals.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>3310/95.002      Option, Spectrogram</li> <li>3310/95.003      Option, Level Meter incl. Compass values</li> <li>3310/95.007      Option, Analog Demodulation <sup>e</sup></li> </ul>	3310/94.01

Remote Control	Part number
<p>Option VITA 49 requires option SCPI Remote Control for device setup and streaming control. This application package makes it easy to obtain the greatest benefits of SignalShark's remote control functionality.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>3310/95.012      Option, SCPI Remote Control</li> <li>3310/95.014      Option, VITA 49</li> </ul>	3310/94.10

Off-Site Extension	Part number
<p>This Application Package provides suitable accessories for applications that involve operation in vehicles or outdoors. A hard shell case with wheels and a retractable handle provides secure (IP 67) the transport of the SignalShark and all accessories. The DC adapter enables powering the device from a vehicle. An easily and quickly worn carry strap provides hands-free support for viewing the SignalShark allowing even long-term measurements to be made comfortably.</p> <p><b>Includes:</b></p> <ul style="list-style-type: none"> <li>2259/92.12      Power Supply DC Vehicle Adapter, screw plug, Jack Plug S10KS17</li> <li>2259/92.17      Double Charger Set, External for 2259/92.13, choose Power Cord 2260/90.70 -.74</li> <li>2259/92.15      Vehicle power adapter for charger set for 2259/92.14</li> <li>3310/90.01      Hardcase for SignalShark 3310</li> <li>3300/90.14      Headphone, 3.5mm Plug for SignalShark</li> <li>3300/90.08      Carrying Strap for Basic Unit</li> <li>3310/90.04      10.4" Screen Protector Film</li> </ul>	3310/94.07

<sup>e</sup> Available from July 2018



**Narda Safety Test Solutions GmbH**  
Sandwiesenstraße 7  
72793 Pfullingen, Germany  
Phone: +49 7121 9732-0  
Fax: +49 7121 9732-790  
E-Mail: support.narda-de@L3T.com  
www.narda-sts.com

**Narda Safety Test Solutions**  
435 Moreland Road  
Hauppauge, NY11788, USA  
Phone: +1 631 231-1700  
Fax: +1 631 231-1711  
E-Mail: TestSolutions.INFO@L3T.com  
www.narda-sts.com

© Names and logo are registered trademarks of Narda Safety Test Solutions GmbH and L3 Communications Holdings, Inc.  
Trade names are trademarks of the owners.