narda
Safety Test Solutions

Datasheet SignalShark EMF Monitoring System

SignalShark

Conforms to EMF Directive 2013/35/EU

5G

Monitoring system for 24/7 recording of EMF emissions between 9 kHz and 6 GHz and also between 24.25 GHz and 29.5 GHz

SignalShark EMF performs continuous long-term measurements to record the electromagnetic emissions from radio installations in the frequency range from 9 kHz to 6 GHz as well as in the range from 24.25 GHz to 29.50 GHz, without the need for specialist staff to be present.

It is a receiver designed for fixed, outdoor installation with connection facilities for two EMF antennas and built-in mobile communications LTE router with integrated OpenVPN client.

The SignalShark EMF measurements are frequency selective and based on configurable measurement packages. They thus differentiate between such services like VHF radio, DAB radio, TETRA/APCO P25, DVB-T, 2G/GSM, 3G/UMTS, 4G/LTE, 5G, IoT, and radar. The measurement results are saved in XML format on the monitoring system. They are subsequently compressed and then transmitted via the built-in cellular modem to the user's central server, where they can be stored and evaluated.

SignalShark EMF can be operated without technical staff, is easily transported, and meets wide-ranging requirements for ruggedness as well as for automation and remote control

- 9 kHz to 6 GHz, 24.25 to 29.5 GHz
- Fits into 3 cases
- Can be shipped with standard parcel service
- Quick and easy to set up even by non-experts
- Automatic measurements

System overview

The technological basis of the SignalShark EMF is the SignalShark 3330 Outdoor Unit real-time receiver. It is operated with either two isotropic antennas or with one isotropic antenna and the 5G FR2 LNB omnidirectional antenna from Narda, fitted with radomes that were designed for the EMF sector.

For ease of use, an antenna is combined into a probe module, which includes at least the antenna with radome and a mounting arm with the necessary cables. The isotropic H field antenna covers a frequency range from 9 kHz to 250 MHz, and the isotropic E field antenna covers a frequency range from 200 MHz to 6 GHz.

The 5G FR2 LNB omnidirectional antenna has a donut-shaped omnidirectional pattern and must be aligned in the X-Y plane with the transmission source to maximize reception. It incorporates a dual-band downconverter that converts the 5G millimeter wave to the SignalShark EMF receive band. Band A supports frequencies between 24.25 GHz and 27.5 GHz, while Band B covers frequencies between 26.5 GHz and 29.5 GHz. The RF cable between antenna and basic unit only transmits frequencies up to a maximum of 6 GHz, which greatly reduces the cable loss compared with a 30 GHz cable.

The receiver and probe modules of the SignalShark EMF are mounted on a collapsible mast. Tear resistant bags that can be filled with water, gravel, or sand as ballast are used to secure the SignalShark EMF against strong winds by distributing them as needed on the base element of the mast.

SignalShark EMF is transported in three standard, rugged, lockable hard case trolleys for transport and can be shipped with the majority of parcel services.

Once it has been set up and connected to the power network, the SignalShark EMF starts automatically. It runs a predefined measurement package that either covers the entire frequency range of the currently connected antennas, or only parts of the range using adjustable measurement parameters. The number of measurements can be determined by the measurement package as well as by specifying a time period.

The measurement results are stored as an XML format file on the SignalShark EMF and include the following in addition to the field strength values for each frequency point: date, time, GNSS position, and temperature.

The SignalShark EMF transmits the latest measurement results it has produced once per hour (or at a selectable interval) to the user's server. A built-in mobile communications router in the Outdoor Unit EMF is used for this. The SignalShark EMF does not perform any measurements while this transmission takes place to ensure that this does not affect the measurement results. If the SignalShark EMF is unable to transmit the results because there is no mobile network connection, the results will be stored for at least ten days. Alternatively, remote desktop access can be used to transfer data manually.

Access to the SignalShark EMF system is very transparent: The SignalShark platform is based on a computer running an embedded Windows 10. Software running on the device can be closed or minimized when the SignalShark EMF operating system needs to be used, such as when opening log files. Because it acts just like a computer that can be accessed through a network, it is even possible to make connections to the SignalShark EMF using the remote desktop protocol (RDP).

The frequencies to be measured and the necessary parameters can be specified by the user in XML based measurement packages. These are read and converted into measurements by the Python based software 'SignalShark EMF BU' installed on the SignalShark EMF (on the basic unit).

The SignalShark EMF is supplied with a measurement package file that can be used as a basis for individual customizations.

No programming expertise is needed to configure, select, and start a measurement package. Using the separately available Python based software 'SignalShark EMF PC', users can use a simple graphical interface to select the main parameters of a measurement package such as the start and end frequencies of the frequency band of interest, the measurement bandwidth (RBW) and measurement time. The parameters are saved in an XML file and transmitted to one or more SignalShark EMF monitoring systems out in the field.

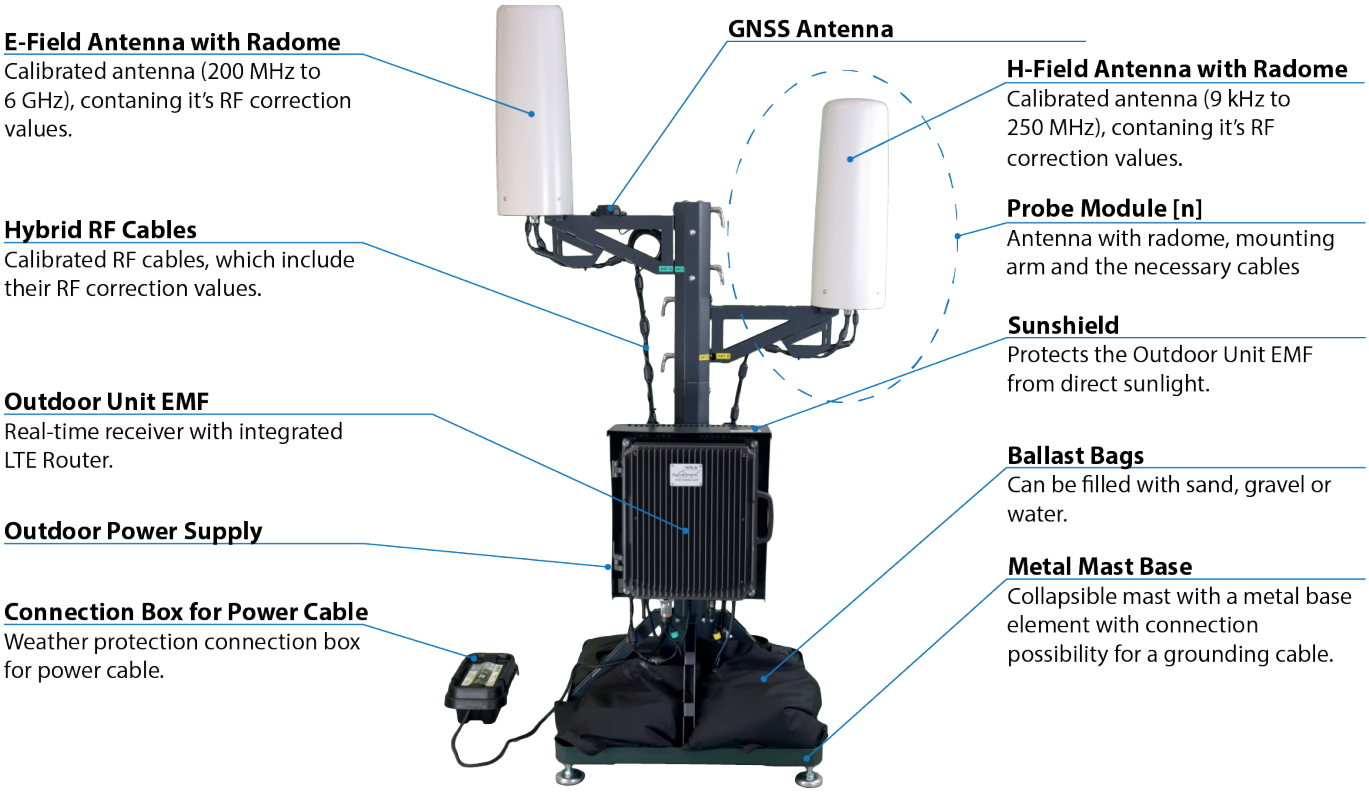


Fig. 1. Example of a built-up SignalShark EMF montitoring system using the two isotropic probe modules.

Probe Modules

The probe module available for the SignalShark EMF consist of two isotropic antennas as well as a third omnidirectional antenna in the 5G FR2-range that all have a proven track record in the EMF sector:

- Probe module 1:
  Isotropic H field antenna (9 kHz – 250 MHz)
- Probe module 2:
  Isotropic E field antenna (200 MHz – 6 GHz) + GNSS
- Probe module 3:
  Omnidirectional E field antenna (24.25 GHz – 29.5 GHz)

The isotropic antennas allow frequency selective measurement of the H field or E field on three axes sequentially. Calculation of the total field strength is done by the measurement unit built-in the Outdoor Unit EMF. The antennas provided are “isotropic” antennas as commonly used in the EMF sector. It is also possible to use specific axes in both antennas for specific measurements if required.

As the two isotropic antennas together cover a frequency range from 9 kHz to 6 GHz, they can be used to capture most of the radio services that are in common use today. This includes the classic broadcast radio and mobile communications services, as well as the 3.6 GHz frequency band for the new 5G standard.

For the FR2 frequency range, the downconverter 5G FR2 LNB omnidirectional antenna from Narda, with the two bands n257 (Band B) and n258 (Band A), can be used in combination with the SignalShark EMF.

The 5G FR2 LNB omnidirectional antenna offers a reception characteristic that roughly corresponds to that of a donut. Ideal reception results are therefore obtained from an X-Y spatial plane.

The omnidirectional antenna is perfect for boundary compliance testing and to measure background levels.

All three antennas are equipped with a radome and therefore comply with protection class IP 54.

There are two connectors to each antenna: RF signal (N connector) and Control (multipin plug). Each antenna is connected to the Outdoor Unit EMF by a hybrid cable (approx. 1.5 m long).

The antenna factors stored in the multipin plug of the antenna together with the attenuation values stored in the multipin plug of the cable are automatically taken into account. This ensures that the Outdoor Unit EMF always indicates the true field strength value.

The control cables are fed to the SignalShark RF module within the outdoor casing via an overvoltage protection circuit.

The two assembled probe modules are separated by about 700 mm and mounted at different heights on the SignalShark EMF to reduce any mutual interference as much as possible.

Fig. 2. Probe Module: Isotropic three axis EMF antenna in a radome, with antenna arm for mounting.

System architecture and terminology

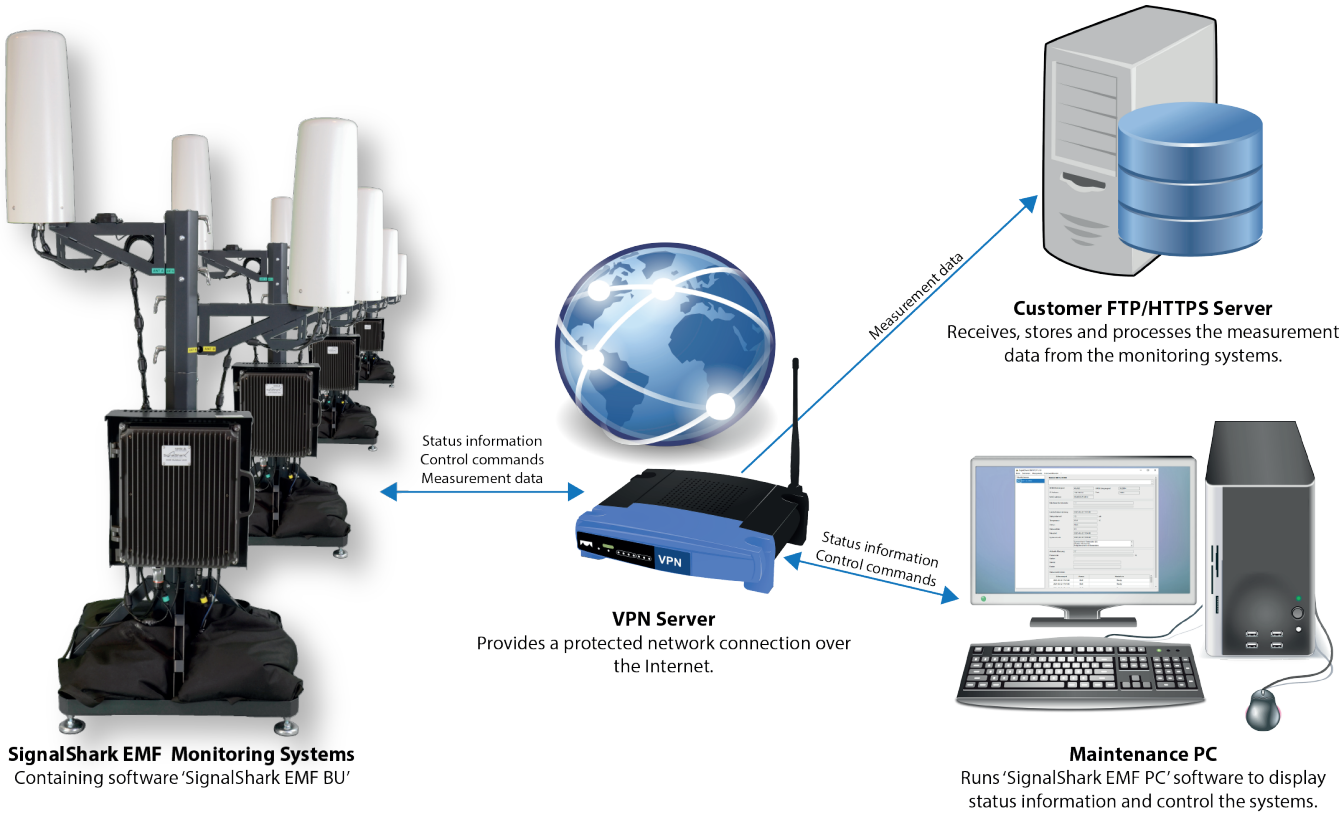


Fig. 3. System architecture overview

SignalShark EMF monitoring system

SignalShark EMF monitoring system basically consist of a Outdoor Unit EMF and two probe modules fitted to a collapsible mast. They start up automatically as soon as they are connected to the power supply, log in to the mobile network, and start to transmit status messages. They can be controlled using network commands and autonomously perform measurements based on measurement package files.

SignalShark EMF BU

The SignalShark EMF BU software ("SignalSharkEMFBU") is installed on each SignalShark EMF, on the basic unit, and performs the actual measurements among other functions.

SignalShark EMF PC

The optionally available SignalShark EMF PC software ("SignalSharkEMFPC") enables monitoring and control of the available monitoring systems in the network. Measurement packages and limit value curves can be created using the software, which can then be transmitted to the monitoring system as part of a measurement assignment. Various other network commands can also be transmitted to one or more monitoring systems in addition to the actual measurement tasks.

Measurement packages

Measurement packages are XML based files that can be created and edited using a simple entry mask in the PC software. They contain all the information needed to enable a monitoring system to perform a sequence of measurements. The measurement packages determine which frequency channels are to be measured and the parameter settings to be used (e.g. RBW, measurement time).

Limit lines

Limit lines are also realized as XML based files that are created and edited using a simple entry mask in the PC software. The maximum permitted level values for each frequency as defined in the particular standards can be set using these files. These values can be used as thresholds for the measurement data that is to be saved.

Transmission of status and commands

At regular intervals, each monitoring system transmits (by a UDP broadcast) status messages that contain information such as the GNSS position, status, start time, current measurement, and the actual ambient temperature. These messages can be received by all the PCs in the network by means of the SignalShark EMF PC software.

As soon as the PC software receives a status message, it can transmit a command to the particular monitoring system within a short time window to start a new measurement, for example.

Status interval

Each system sends a status message approximately every 15 seconds by default.

The time period between two status messages can be set using parameters in the SignalShark EMF BU software. No communication takes place while a measurement is in progress so that the measurement results are not distorted.

Network (VPN connection)

LTE routers are built-in to the SignalShark EMF monitoring system. These allow a data link to be set up using a cellular modem. For security, the devices cannot be addressed directly over the Internet. Instead, communication is tunnelled through the Internet via a virtual private network (VPN). This functionality is also provided by the built-in LTE router. The monitoring systems act as VPN clients.

VPN server

To set up the VPN network, a VPN server is required to which the monitoring system can connect. The VPN server can be implemented in different ways, depending on the customer requirements, and is therefore not included in the package.

FTP / HTTPS server

The monitoring system connects at predefined intervals with an FTP / HTTPS server in the network. The server receives the data transmitted from the monitoring system, saves and processes them. This server is a part of the customer’s system and is therefore not included in the SignalShark EMF package.

Definitions and Conditions

Conditions
Unless otherwise noted, specifications apply after 30 minutes warm-up time within the specified environmental conditions. 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 the dispersion of the values attributed to the measurands with an estimated confidence level 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 to the Expression of Uncertainty in Measurement” (GUM).

Specifications[a]

SignalShark Outdoor Unit EMF, Modem R[n]

Frequency						
Frequency range	9 kHz to 6 GHz					
Scan rate	> 50 GHz/s			@ RBW = 1.6 MHz (resolution 800 kHz)		
(basic unit, full span)	30 GHz/s (typ.)			@ RBW = 100 kHz (resolution 50 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 (Spectrum and Level Meter)	10 Hz, 100 Hz, 200 Hz, 1 kHz, 9 kHz, 10 kHz, 100 kHz, 120 kHz and 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	**f_c**	**df = 1 kHz**	**df = 10 kHz**	**df = 100 kHz**	**df = 1 MHz**	**df = 10 MHz**
	10 MHz	< -120 dBc (1/Hz)	< -130 dBc (1/Hz)	< -135 dBc (1/Hz)		
	1 GHz	< -90 dBc (1/Hz)	< -101 dBc (1/Hz)	< -101 dBc (1/Hz)	< -112 dBc (1/Hz)	< -132 dBc (1/Hz)
Internal reference frequency	Deviations:			< 1 ppm		
	(includes initial deviation, aging within the 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	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)
		44 MHz < f ≤ 3 GHz	- 162 dB (mW/Hz) (typ.)	(resultant noise figure 12 dB)
		3 GHz < f ≤ 8 GHz	< - 152 dB (mW/Hz)	(resultant noise figure < 22 dB)
	2nd order intercept point (IP2, 2 tones) @ attenuator = 0 dB, no preamp	4 MHz ≤ f < 42 MHz[b]	> 60 dBm	
		42 MHz ≤ f ≤ 8 GHz	40 dBm (typ.)	
	3rd order intercept point (IP3, 2 tones) @ attenuator = 0 dB, no preamp	3 MHz < f ≤ 44 MHz	> 20 dBm	
		3 MHz < f ≤ 44 MHz	26 dBm (typ.)	
		44 MHz < f ≤ 630 MHz	> 4 dBm	
		630 MHz < f ≤ 3 GHz	> 6 dBm	
		44 MHz < f ≤ 3 GHz	14 dBm (typ.)	
		3 GHz < f ≤ 8 GHz	> 5 dBm	
		3 GHz < f ≤ 8 GHz	12 dBm (typ.)	
Level uncertainty	9 kHz ≤ f ≤ 8 GHz		< ± 2 dB	
Residual spurs[c] @ 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			

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

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

c Typically with only few exceptions. These are documented in the calibration certificate

Real-Time Spectrum			
Signal duration for 100 % POI	@ RBW = 800 kHz	> 3.125 µs without attenuation and spectral growth	
		> 2 ns with attenuation proportional to the spectral growth	
Spectrum rate	1.6 million spectra / s	@ RBW = 800 kHz and 75 % FFT Overlap	
FFT overlap	Fspan > 20 MHz	75 %	
	Fspan ≤ 20 MHz, RBW ≤ 400 kHz	87.5 %	
RF Input			
Type (switchable)	2 x N-connector, 50 Ω (female)		
RF destruction limit	20 dBm		
Max. nominal RF level	15 dBm		
Maximum DC voltage	25 V		
Return loss (VSWR)	12 kHz ≤ f ≤ 3 MHz	> 9.54 dB	(VSWR < 2.00)
	3 GHz < f ≤ 6 GHz	12 dB (typ.)	(VSWR = 1.67 (typ.))
	6 GHz < f ≤ 8 GHz	10 dB (typ.)	(VSWR = 1.93 (typ.))
Isolation between used and unused inputs	8 kHz ≤ f ≤ 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 (GPS / QZSS, GLONASS, BeiDou, Galileo) Coordinates representation as decimal degree (DegDec - ddd.ddddd)		
Internal non-removable memory	ssD, mSATA	30 GB system partition 28 GB configuration settings and user data	
GNSS antenna input (for additional, external GNSS antenna)	1 x SMA, 50 Ω (female) (DC voltage for active antennas is supplied)		
LTE	1 x SMA, 50 Ω (female)		
External power supply	Basic unit, DC input: 10 to 30 VDC, ≥ 45 W AC adapter, input: 100V-240VAC, output: 12VDC, 5.5A Plug type: 3-pin with waterproof housing (CNLINKO: BD-24-C03PE-01-002)		
Passive cooling	Fanless design for low maintenance operation.		
Dimensions (H x W x D)	See drawing on page 15		
Weight — Built-up system	Approx. 39.4 kg / 86.9 lb (with ice creation the weight can increase significantly)	(complete mast, outdoor unit EMF and 2x probe modules)	
Case 1	Approx. 29.3 kg / 64.6 lb	(incl 4x ballast bags, mast base, mast element 2, accessories and tools)	
Case 2	Approx. 24.1 kg / 53.1 lb	(incl 2x probe modules, mast element 4)	
Case 3	Approx. 29.5 kg / 65.1 lb	(incl outdoor unit EMF with sunshield and mast element 3, weatherproof power connection box, manuals)	
Country of origin	Germany		
Recommended calibration interval	24 months		

Specifications 3330/05, Modem R1		
R[n][d] Frequencies		Region 1: Europe[e], The Middle East, Africa 4G (LTE-FDD): B1, B3, B5, B7, B8, B20 4G (LTE-TDD): B40 3G: B1, B5, B8 2G: B3, B8
RUT241	RF technologies	2G, 3G, 4G
	Max RF power	33 dBm @GSM, 24 dBm @WCDMA, 23 dBm @LTE
	Transmission rates	4G (LTE) – Cat 4 up to 150 Mbps, 3G – Up to 42 Mbps, 2G – Up to 236.8 kbps

RUT241 router must be used in compliance with any and all applicable national and international laws and with any special restrictions regulating the utilization of the communication module in prescribed applications and environments.

External antennas used with RUT241 must be installed to provide a separating distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

Any external antenna gain must meet RF exposure and maximum radiated output power limits of the applicable rule section.

Failure to observe these instructions could result in your RF exposure exceeding the relevant guideline limits.

d R[n]: Respective region in which the installed LTE router can be used.

e Regional availability - excluding Russia & Belarus.

Remote Control and Streaming		
Remote control protocol		SCPI
FFT streaming		VITA49 compliant
IQ streaming		VITA49 IQ streaming, sample rate up to 25.6 MHz[f, g]
Remote Software		Remote Desktop for PC, Tablet and Smartphone (Windows, Android, IOS)

Additional Functions		
Noise power density measurement		Can be measured with up to eight markers at a time.
Channel power measurement		Can be measured with up to eight markers at a time.
Occupied bandwidth measurement		According to ITU-R SM.443-4, with additional automatic center frequency and channel power measurement. Can be measured with up to eight markers at a time.
Field strength measurement		According to ITU-R SM.378-7
CISPR Detectors		Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected)
Modulation detectors		AM, FM and PM. Up to 4 different detectors are available simultaneously
Frequency offset measurement		For CBW ≤ 1 MHz (using modulation detectors)
Analog demodulation and recording		AM, Pulse, CW, ISB, USB, LSB, FM, PM, or IQ signals can be demodulated with squelch and AGC function. The demodulated signal can be stored as WAV-file.

Environmental Conditions		
MIL-PRF-28800F Class 2		Operating temperature Storage temperature Operating temperature Random vibration Functional shock Transit drop
Operating temperature		-20 °C to + 55 °C
Humidity		< 29 g/m³ (< 93 % RH at +30 °C)
IP class		IP 65
Climate	Storage	1K3 (IEC 60721-3) extended to - 40 °C to + 70 °C
	Transport	2K4 (IEC 60721-3) restricted to - 40 °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)

Compliance		
EMC	European Union	Complies with RED Directive 2014/53/EU and EN 301 489-1 V2.2.3, EN 301 489-52 V1.2.1, EN 301 511 V12.5.1, EN 301 908-2 V13.1.1, EN 301 908-13 V13.2.1, EN 301 908-1 V15.1.1, EN 61326-1:2021
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018

f Applies for integrated 1 Gbit Ethernet interface.

g 25.6 MHz IQ data streaming is not possible due to bandwidth limitation caused by the modem and/or 100 Mbit LAN.

Specifications - Isotropic Probe Modules

Probe Module 1 (H-field) 3581/902

RF Data			
Frequency range		9 kHz to 250 MHz The correction factors determined individually during calibration are stored in an EEPROM and are applied automatically when used in conjunction with the SignalShark basic unit.	
Antenna type		H-field	
Sensor type		Three-axis active magnetic loop design with scanned axes	
Dynamic range[h]		2.5 µA/m to 560 mA/m (typ.)	
Maximum field strength (destruction limit)		250 A/m / f [MHz] (nom.)	
Displayed Average Noise Level (DANL) in conjunction with the SignalShark basic unit		Frequency range > 1 MHz (RBW = 1 kHz)	Single-axis measurement with isotropic antenna 0.5 µA/m (typ.)
Measurement range limit (for single CW signal)		560 mA/m (typ.)	
RF connector		N-Connector, 50 Ω, male	

General Specification			
Operating temperature		-10 °C to +50 °C	
Humidity		< 29 g/m³ (< 93 % RH at +30 °C), non-condensing	
IP class		IP 54 (antenna connected)	
Climate	Storage	1K3 (IEC 60721-3) extended to - 10 °C to + 50 °C	
	Transport	2K4 (IEC 60721-3) restricted to - 40 °C to + 70 °C	
	Operating	7K2 (IEC 60721-3) extended to - 10 °C to + 50 °C	
Mechanical	Storage	1M3 (IEC 60721-3)	
	Transport	2M3 (IEC 60721-3)	
	Operating	7M3 (IEC 60721-3)	
EMC	European Union	Complies with RED Directive 2014/53/EU and IEC/EN 61326 -1: 2021	
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11	
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B	
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010	
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018	
Dimensions		See drawing on page 16	
Weight		Approx. 2.85 kg / 6.3 lb (with ice creation the weight can increase significantly)	(incl the antenna with radome and a mounting arm with the necessary cables)
Recommended calibration interval		24 months	
Country of origin		Germany	

Measurement uncertainty		
Expanded measurement uncertainty (in conjunction with SignalShark basic unit and 1.5 m RF cable)	Frequency range	Single-axis measurement with isotropic antenna
	9 kHz – 60 MHz	3.07 dB
	> 60 MHz – 250 MHz	3.77 dB

h For a signal to noise ratio of 10 dB (RBW = 1 kHz); 3 MHz to 250 MHz

Probe Module 2 (E-field) 3502/901

RF Data			
Frequency range		200 MHz to 6 GHz The correction factors determined individually during calibration are stored in an EEPROM and are applied automatically when used in conjunction with the SignalShark basic unit.	
Antenna type		E-field	
Sensor type		Three-axis design with scanned axes	
Dynamic range[i]		0.14 mV/m to 160 V/m (typ.)	
Maximum field strength (destruction limit)		435 V/m or 50 mW/cm² (nom.)	
Displayed Average Noise Level (DANL) in conjunction with the SignalShark basic unit		Frequency range 900 MHz (RBW = 1 kHz) 2.1 GHz (RBW = 1 kHz)	Single-axis measurement with isotropic antenna 33 µV/m (typ.) 25 µV/m (typ.)
Measurement range limit (for single CW signal)		200 V/m (typ.)	
RF connector		N-Connector, 50 Ω, male	

General Specification			
Operating temperature		-10 °C to +50 °C	
Humidity		< 29 g/m³ (< 93 % RH at +30 °C), non-condensing	
IP class		IP 54 (antenna connected)	
Climate	Storage	1K3 (IEC 60721-3) extended to - 10 °C to + 50 °C	
	Transport	2K4 (IEC 60721-3) restricted to - 40 °C to + 70 °C	
	Operating	7K2 (IEC 60721-3) extended to - 10 °C to + 50 °C	
Mechanical	Storage	1M3 (IEC 60721-3)	
	Transport	2M3 (IEC 60721-3)	
	Operating	7M3 (IEC 60721-3)	
EMC	European Union	Complies with RED Directive 2014/53/EU and IEC/EN 61326 -1: 2021	
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11	
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B	
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010	
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018	
Dimensions		See drawing on page 16	
Weight		Approx. 2.85 kg / 6.3 lb (with ice creation the weight can increase significantly)	(incl the antenna with radome and a mounting arm with the necessary cables)
Recommended calibration interval		24 months	
Country of origin		Germany	

Measurement uncertainty		
Expanded measurement uncertainty (in conjunction with SignalShark basic unit and 1.5 m RF cable)	Frequency range	Single-axis measurement with isotropic antenna
	200 MHz – 800 MHz	3.00 dB
	> 800 MHz – 3 GHz	2.90 dB
	> 3 GHz – 4.5 GHz	2.81 dB
	> 4.5 GHz – 6 GHz	3.90 dB

i For a signal to noise ratio of 10 dB (RBW = 1 kHz); 1.8 GHz to 2.2 GHz

Specifications - Omnidirectional Probe Module

Probe Module 3 (E-field) 3591/902

RF Data				
Frequency range		Band A: 24.25 GHz to 27.50 GHz Band B: 26.50 GHz to 29.50 GHz The frequency band can be selected in the user interface of the basic unit. The correction factors determined individually during calibration are stored in an EEPROM and are applied automatically when used in conjunction with the SignalShark basic unit.		
Antenna type		E-field		
Sensor type		Downconverter with omnidirectional antenna design		
Dynamic range[j]			Att OFF	Att ON
	Band A	@ 26 GHz:	270 uV/m to	200 V/m (typ.)
	Band B	@ 28 GHz:	360 uV/m to	200 V/m (typ.)
Maximum field strength (destruction limit)		435 V/m		
Displayed Average Noise Level (DANL) in conjunction with the SignalShark basic unit		Frequency range	Single-axis measurement with omnidirectional antenna	
		26 GHz (RBW = 1 kHz)	94 µV/m (typ.)	
		28 GHz (RBW = 1 kHz)	126 µV/m (typ.)	
Measurement range limit (for single CW signal)		200 V/m (typ.)		
RF connector		N-Connector, 50 Ω, male		

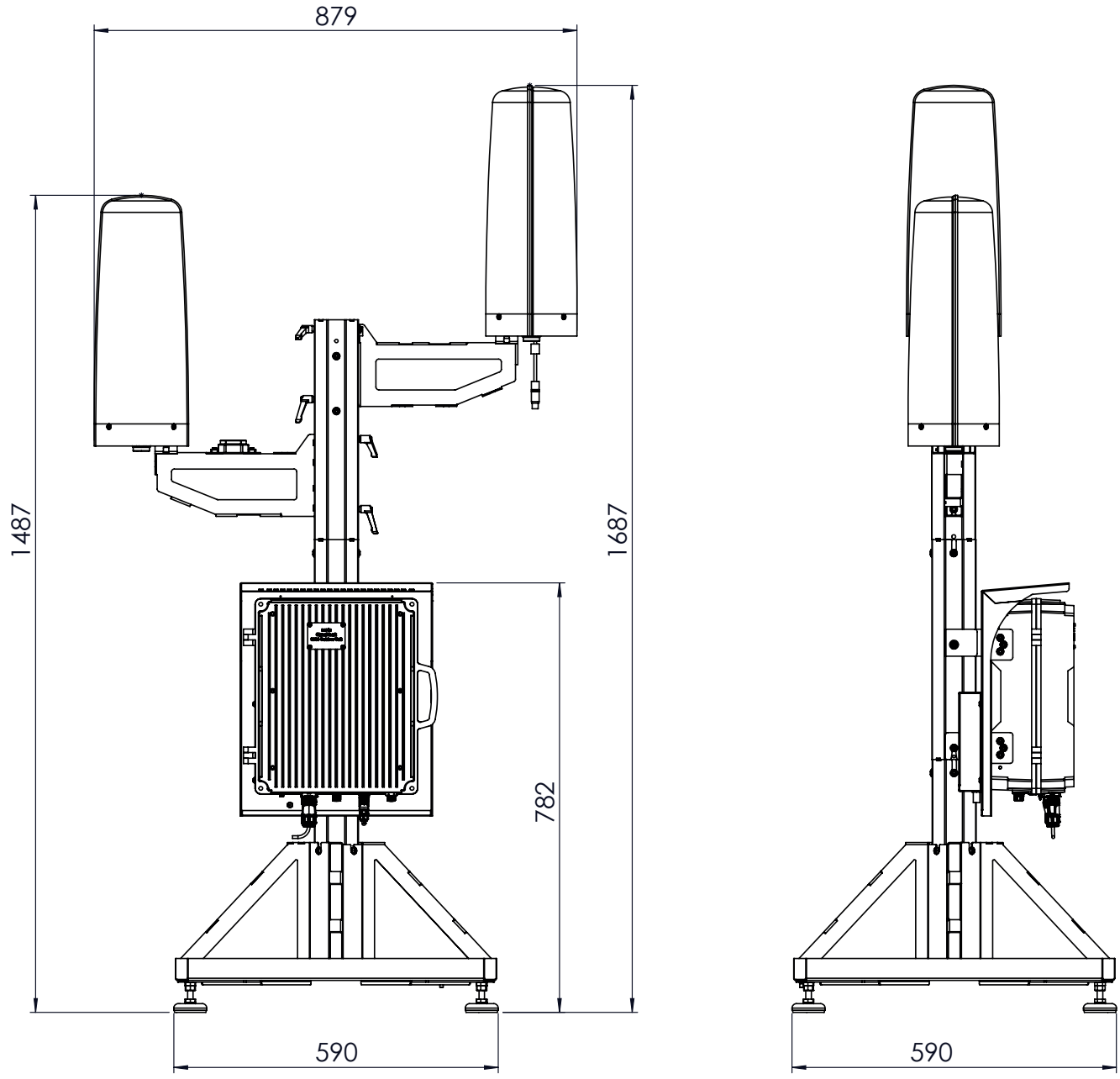
General Specification		
Operating temperature		-10 °C to +50 °C
Humidity		< 29 g/m³ (< 93 % RH at +30 °C), non-condensing
IP class		IP 54 (antenna connected and USB flap closed)
Climate	Storage	1K3 (IEC 60721-3) extended to - 10 °C to + 50 °C
	Transport	2K3 (IEC 60721-3) extended to - 30 °C to + 70 °C
	Operating	7K2 (IEC 60721-3) extended to - 10 °C to + 50 °C
Mechanical	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)
EMC	European Union	Complies with EMC Directive 2014/30/EU and IEC/EN 61326 -1: 2021
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018
Dimensions		See drawing on page 16
Weight		Approx. 3 kg / 6.6 lb (with ice creation the weight can increase significantly) (incl the antenna with radome and a mounting arm with the necessary cables)
Recommended calibration interval		24 months
Country of origin		Germany

Measurement uncertainty		
Expanded measurement uncertainty (in conjunction with SignalShark basic unit and 1.5 m RF cable)	Frequency range	Single-axis measurement with omnidirectional antenna
	24.25 GHz – 29.5 GHz	2.95 dB

j For a signal to noise ratio of 10 dB (RBW = 1 kHz)

Drawing - SignalShark EMF 3330/20x

System dimensions

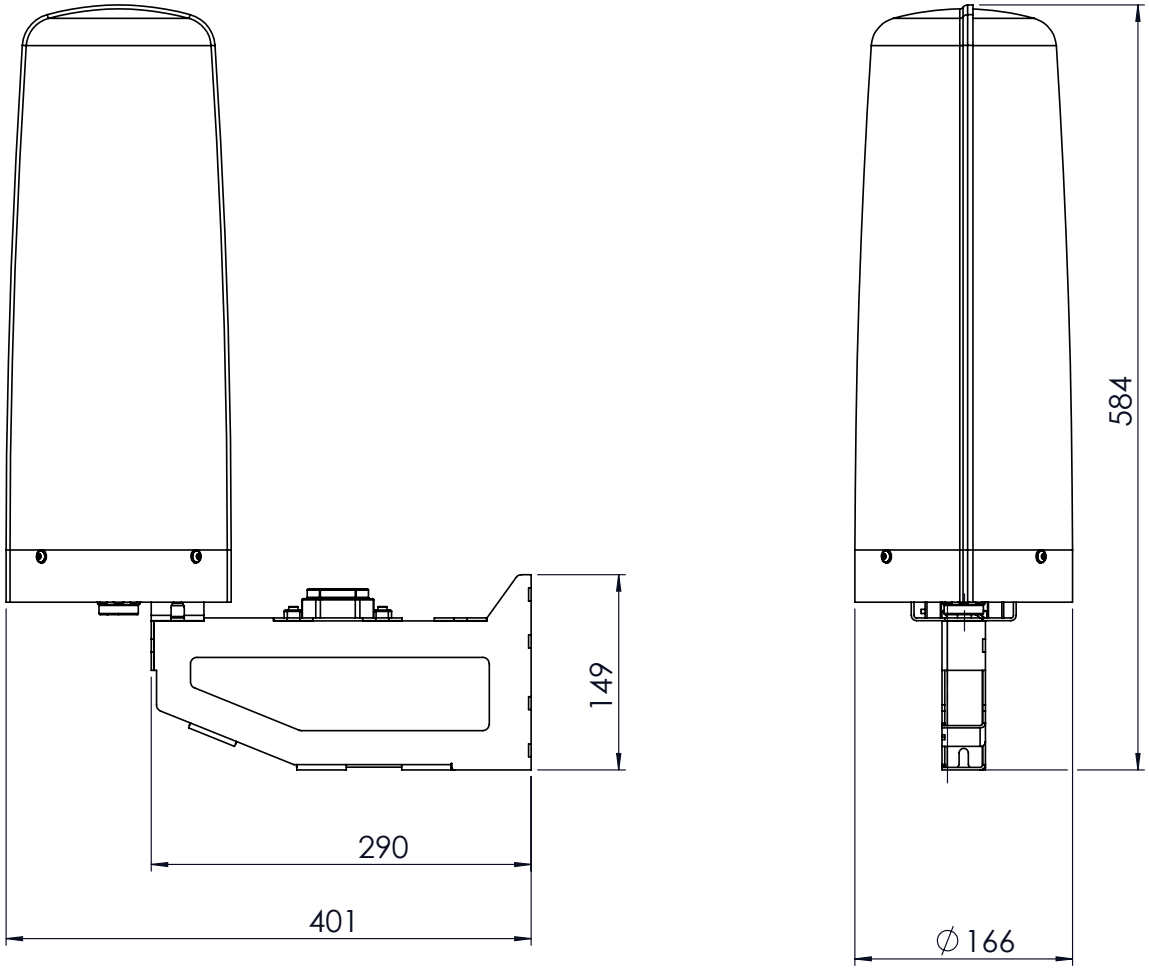


All dimensions are given in mm.

For low-maintenance operation, the system is passively cooled and therefore requires no fan.
Protection against direct sunlight must be provided!

Drawing - SignalShark EMF 35xy/90x

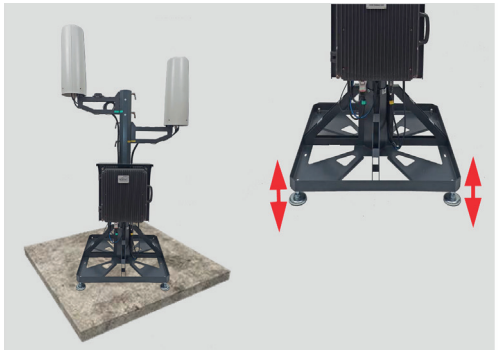
Probe Module dimensions



All dimensions are given in mm.

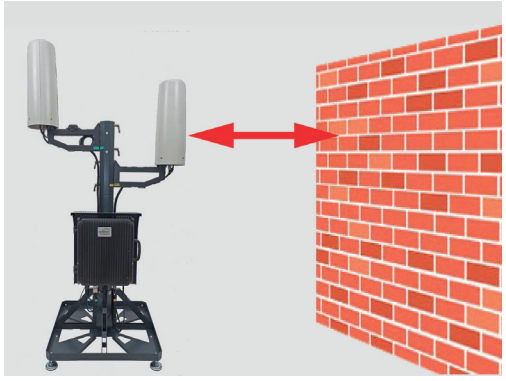
Installation requirements

› The setup location should have a solid and even ground.
› Compensate slight unevenness via the adjustable feet on the mast base.

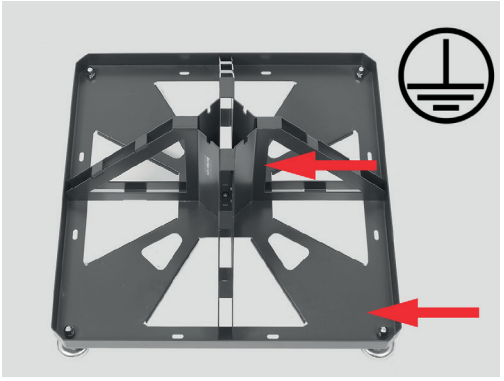


› If possible, do not place the unit in an exposed position.
› Take lightning protection measures when installing in exposed locations (e.g. on a roof). Observe national regulations.

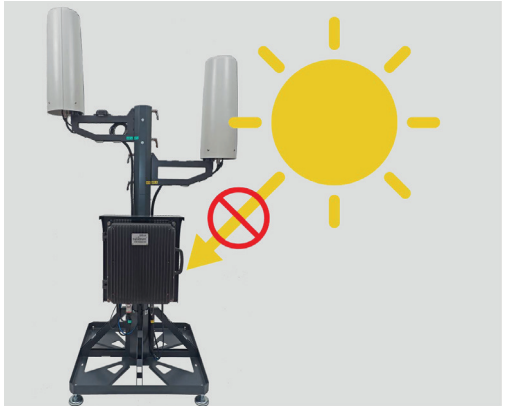
› Keep a distance of 2 meters (e.g. walls, roof edges, parapets, masts)



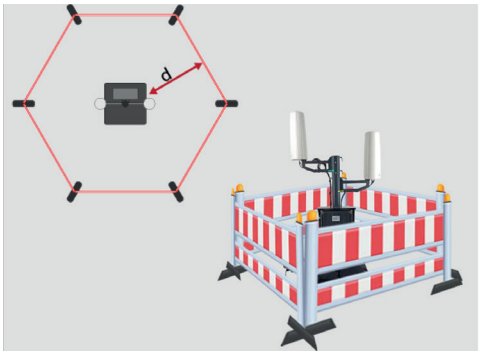
› The ground screw is located either underneath the mast base or on the mast base.



› The site should have good cellular and GNSS reception.
› Protect the front of the Outdoor Unit EMF from direct sunlight.



› If necessary, pull a bird guard over the complete system and tie it at the bottom.
› Provide fencing if required. Distances:
  › Metal d = 2.5 m
  › Plastic d = 1.5 m



Ordering Information

The SignalShark Outdoor Unit EMF, is included in the Basic Sets. Application Packages as well as Software Options and Accessories that provide additional signal analysis capabilities are also available.
Your local Narda sales representative can provide information about all the possible options and will be pleased to offer advice.

Basic Unit Set

SignalShark Outdoor Unit EMF, Modem R1 Basic Set*	Part number

The Basic set contains the “SignalShark Outdoor Unit EMF, Modem R1”, as well as basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions.
Includes:
› SignalShark EMF module (3330/902):
  › SignalShark Outdoor Unit EMF, Modem R1 (3330/05)
  › Software, Outdoor Unit EMF Measurement (SignalShark EMF BU) (3330/93.04)
  › Sunshield (3330/90.23)
  › Mast Device Attachment (3330/90.24)
  › Power Supply 12VDC, 5A, 100V-240VAC, IP67 (2259/92.27)
  › Velcro fastener, 30 x 2 cm
  › Cable clamp, 7 mm x 12 mm
› Toolbag:
  › Temperature sensor (3330/90.17)
  › Tool, Allen Wrench 6 mm, T-Handle (3300/90.22)
  › Tool, Torx TX30 (3330/90.18)
  › Tool, open-ended wrench 17 (3330/90.19)
  › Tool, angled Torx TX30 (3330/90.20)
  › LTE Antenna (3330/90.05)
› Collapsible Mast:
  › Mast Base (3330/90.21)
  › Mast Base Extension (3330/90.22)
  › Mast Probe Attachment (3330/90.25)
› Probe Module 1, 9 kHz to 250 MHz, H (3581/901)
› Probe Module 2, 200 MHz to 6 GHz, E and GNSS (3502/901)
› Weatherproof power Connection box (3330/90.16)
› Ballast Bag for Collapsible Mast, 4 pcs (3330/90.12)
› Option, SCPI Remote Control
› USB Stick: SW and Manuals, ordered options (3310/93.01)
› SignalShark EMF - Quick Start Guide and Safety Instructions (3330/98.22)
› SignalShark EMF - Assembling Instructions (3330/98.06)
› SignalShark Outdoor Unit Case 1 (3330/90.13)
› SignalShark Outdoor Unit Case 2 (3330/90.14)
› SignalShark Outdoor Unit Case 3 (3330/90.26)
	3330/203
	
	(only available in countries with corresponding radio approval)

* Europe only (Regional availability - excluding Russia & Belarus.).
For other regions, please contact your local Narda sales representative for further information.

Software Options and PC Software

Software options allows the adaption of the device feature set to your needs.

Description	Part number
40 MHz real-time Spectrum, Marker and Peak Table (included in SignalShark EMF Basic Set). Via the "*Spectrum (Scan)*"-, "*RT (Real-Time) Spectrum*"- "*Auto DF*"-, and "*IQ Analyzer*"-Tasks, the following View(s) can be accessed: › Spectrum View › Peak Table (of Spectrum) View	**Included in Basic Set**
Option, Spectrogram Via the "*Spectrum (Scan)*"- and "*RT (Real-Time) Spectrum*"-Tasks, the following View(s) can be accessed: › Spectrogram View	**3310/95.002**
Option, Level Meter incl. Compass values Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Level Meter View	**3310/95.003**
Option, Persistence (of real-time Spectrum) Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Persistence View	**3310/95.004**
Option, Analog Demodulation Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Spectrum View › Level meter View	**3310/95.007**
Option, SCPI Remote Control (included in SignalShark EMF Basic Set)	**3310/95.12** **Included in Basic Set**
Option, VITA 49[k] Via the "*RT Streaming*"-Task, the following View(s) can be accessed: › VITA 49 FFT Streaming View › VITA 49 IQ Streaming View	**3310/95.014**
Option, IQ Analyzer, Recorder, Trigger, Magn. View Via the "*IQ Analyzer*"-Task, the following View(s) can be accessed: › IQ Magnitude View › IQ Spectrum View › IQ Spectrogram View	**3310/95.018**
Software, Outdoor Unit EMF Remote Control (PC) (SignalShark EMF PC)	**3330/93.03**

k Requires Option 3310/95.012 "Option, SCPI Remote Control"

Accessories

Accessory Description	Part number
GNSS Antenna, Screw Mounting, Active	**3330/90.04**
LTE Antenna	**3330/90.05**

Antennas	Part number
Probe Module 1, 9 kHz to 250MHz, H	**3581/901**
Probe Module 2, 200 MHz to 6 GHz, E and GNSS	**3502/901**
Probe Module 3, 24.25 GHz to 29.5 GHz, omn.[I]	**3591/902**

I Available from mid 2024

SignalShark Family

There are several different instrument types in the SignalShark family:
SignalShark Handheld, SignalShark Remote Unit, SignalShark Outdoor Unit Modem R[n] Basic Set and SignalShark EMF Monitoring System, R[n].
For more information, please visit our website www.narda-sts.com

SignalShark Handheld

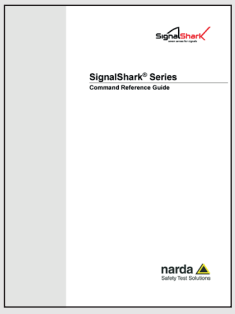
SignalShark Remote Unit

SignalShark Outdoor Unit

SignalShark EMF

Narda DF Antennas Datasheet

SignalShark Command Reference Guide



Narda Safety Test Solutions GmbH
Sandwiesenstrasse 7
72793 Pfullingen, Germany
Phone +49 7121 97 32 0
info@narda-sts.com

www.narda-sts.com

Narda-MITEQ
North American Sales Office
435 Moreland Road
Hauppauge, NY11788, USA
Phone +1 631 231 1700
info@narda-sts.com

Narda Safety Test Solutions S.r.l.
Via Benessea 29/B
17035 Cisano sul Neva, Italy
Phone +39 0182 5864 1
nardait.support@narda-sts.it

Narda Safety Test Solutions GmbH
Beijing Representative Office
Xiyuan Hotel, No. 1 Sanlihe Road, Haidian
100044 Beijing, China
Phone +86 10 6830 5870
support@narda-sts.cn