

Anritsu envision : ensure

ShockLine™ Modular Vector Network Analyzers

MS46131A

1 MHz to 43.5 GHz



Introduction

The MS46131A is part of the ShockLine™ family of Vector Network Analyzers from Anritsu. It is a modular 1-port VNA that is configurable as single or dual 1-port VNAs controlled from a single PC. The MS46131A is available in three frequency ranges: 1 MHz to 8/20/43.5 GHz, and is capable of S-parameter and time domain measurements.

The 1-port MS46131A is based on patented ShockLine™ VNA-on-chip technology, which simplifies the internal VNA architecture at high frequencies, reduces instrument cost, and enhances accuracy and measurement repeatability. The combination of low cost and good performance make ShockLine™ VNAs ideal candidates for testing 1-port RF and microwave passive devices to 43.5 GHz.

The MS46131A series is controlled through USB from an external PC. The MS46131A runs the same software as the rest of the ShockLine family, providing a powerful graphical user interface for debugging and manual testing of devices. The software also has comprehensive remote programming support for automated test applications.

This document provides detailed specifications for the MS46131A series Vector Network Analyzers and related options.

Instrument Models and Operating Frequencies

Base Model

- MS46131A, 1-Port ShockLine VNA

Requires one Frequency Option

- MS46131A-010, 1 MHz to 8 GHz
- MS46131A-020, 1 MHz to 20 GHz
- MS46131A-043, 1 MHz to 43.5 GHz

Principal Options

- MS46131A-002, Time Domain



MS46131A-043 1-Port ShockLine Modular VNA

Table of Contents

Definitions 4

High Level Noise 5

Receiver Compression Levels 5

Output Power Settings 5

Measurement Stability 5

Frequency Resolution, Accuracy, and Stability 5

Uncorrected (Raw) Port Characteristics 5

MS46131A-010 VNA System Performance with Manual Cal Kits 6

MS46131A-020 VNA System Performance with Manual Cal Kits 7

MS46131A-043 VNA System Performance with Manual Cal Kits 8

MS46131A-043 VNA System Performance with Manual Cal Kits 9

MS46131A-010 VNA System Performance with SmartCal™ 10

MS46131A-010 VNA System Performance with SmartCal™ 11

MS46131A-010, MS46131A-020 VNA System Performance with SmartCal™ 12

MS46131A-010, MS46131A-020 VNA System Performance with SmartCal™ 13

MS46131A-043 VNA System Performance with Precision AutoCal™ 14

Standard Capabilities 15

Calibration and Correction Capabilities 17

Optional Capabilities 17

Remote Operability 17

Standard Device Connections 18

MS46131A Top Panel 18

MS46131A Bottom Panel 19

Recommended External PC Configuration 19

Mechanical 19

Regulatory Compliance 19

Environmental 19

Warranty 19

Ordering Information 20

Definitions

	All specifications and characteristics apply under the following conditions, unless otherwise stated: MS46131A base model, revision 1
Warm-Up Time	After 60 minutes of warm-up time, where the instrument is left in the ON state.
Temperature Range	Over the 25 °C ± 5 °C temperature range.
Error-Corrected Specifications	Specifications are valid over 23 °C ± 3 °C, with < 1 °C variation from calibration temperature. Error-corrected specifications are warranted and include guard-bands, unless otherwise stated.
Frequency Bands in Tables	When a frequency is listed in two rows of the same table, the specification for the common frequency is taken from the lower frequency band.
User Cables	Specifications do not include effects of any user cables attached to the instrument.
Discrete Spurious Responses	Specifications may exclude discrete spurious responses.
Internal Reference Signal	All specifications apply with the internal 10 MHz frequency reference.
Interpolation Mode	All specifications are with Interpolation Mode Off.
Standard	Refers to instruments without Options.
Typical Performance	Typical performance indicates the measured performance of an average unit. It does not include guard-bands and is not covered by the product warranty. Typical specifications are shown in parenthesis, such as (-102 dB), or noted as Typical.
Characteristic Performance	Characteristic performance indicates a performance designed-in and verified during the design phase. It is not covered by the product warranty.
Recommended Calibration Cycle	12 months (Residual specifications also require calibration kit calibration cycle adherence.)
Instrument Grounding	For optimum performance and ESD protection, the AC power cord to the external power supply should be plugged into a AC socket with a ground. If this is not possible, the ground receptacle on the MS46131A can be used to ground the chassis.
Specifications Subject to Change	All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site: www.anritsu.com

The instrument may be protected by one or more of the following patents: 6894581, 7088111, 7545151, 7683633, 7924024, 8417189, 8718586, 10116432, 9967085, 9964585, 9860054, 9733289, and 9366707, depending upon the model and option configuration of the instrument.

High Level Noise

1-Port: Measured at 100 Hz IF bandwidth and at High power level, RMS.

Frequency	Magnitude (dB)	Phase (deg)
1 MHz to 8 GHz	0.009 (0.003 typical)	0.12 (0.03 typical)
> 8 GHz to 40 GHz	0.006 (0.001 typical)	0.1 (0.02 typical)
> 40 GHz to 43.5 GHz	0.009 (0.002 typical)	0.12 (0.03 typical)

Receiver Compression Levels

Port power level beyond which the response may be compressed more than 0.1 dB. Performance is typical.

Frequency Range	Standard (dBm)
1 MHz to 43.5 GHz	+ 5

Output Power Settings

Performance is typical.

Power Setting	Standard
High (default)	0 dBm (±2dB)
Low	- 20 dBm (±2dB)

Measurement Stability

Performance is typical

Frequency	Magnitude (dB/°C)	Phase (deg/°C)
1 MHz to 43.5 GHz	0.02	0.3

Frequency Resolution, Accuracy, and Stability

Resolution	Accuracy	Stability	Aging
1 Hz	± 1.0 ppm (at time of calibration)	± 1.0 ppm from -10 °C to +55 °C, typical	± 1.0 ppm/year, typical

Uncorrected (Raw) Port Characteristics

User and System Correction Off. All specifications are typical.

Frequency Range	Directivity (dB)	Port Match (dB)
1 MHz to 8 GHz	> 6	> 6
> 8 GHz to 43.5 GHz	> 10	> 10

MS46131A-010 VNA System Performance with Manual Cal Kits

Error-Corrected Specifications

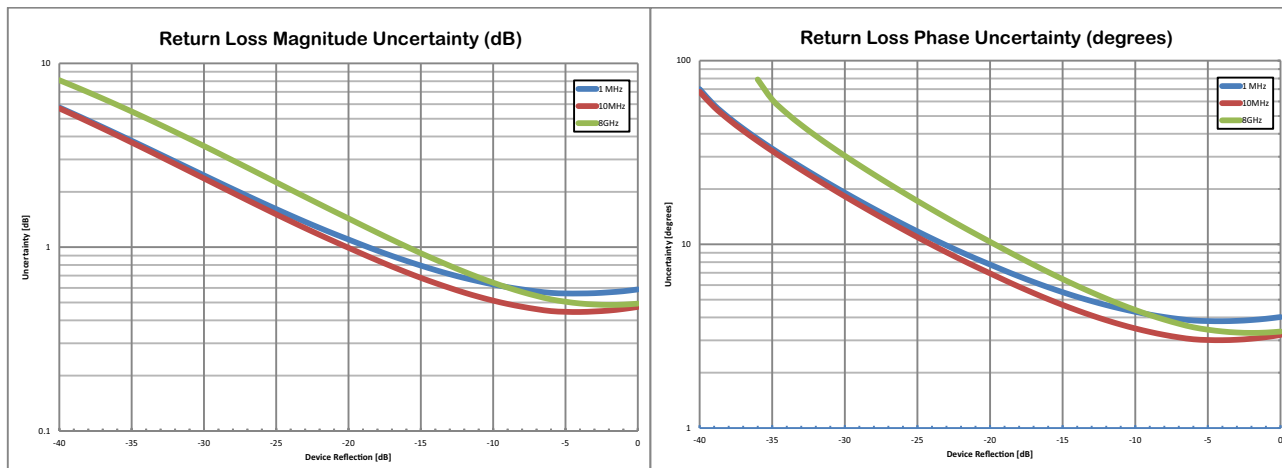
With calibration using TOSLN50A-8 or TOSLNF50A-8 N type connector calibration kits.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 6 GHz	≥ 42	≥ 33	± 0.15
> 6 GHz to 8 GHz	≥ 37	≥ 33	± 0.15

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-020 VNA System Performance with Manual Cal Kits

Error-Corrected Specifications

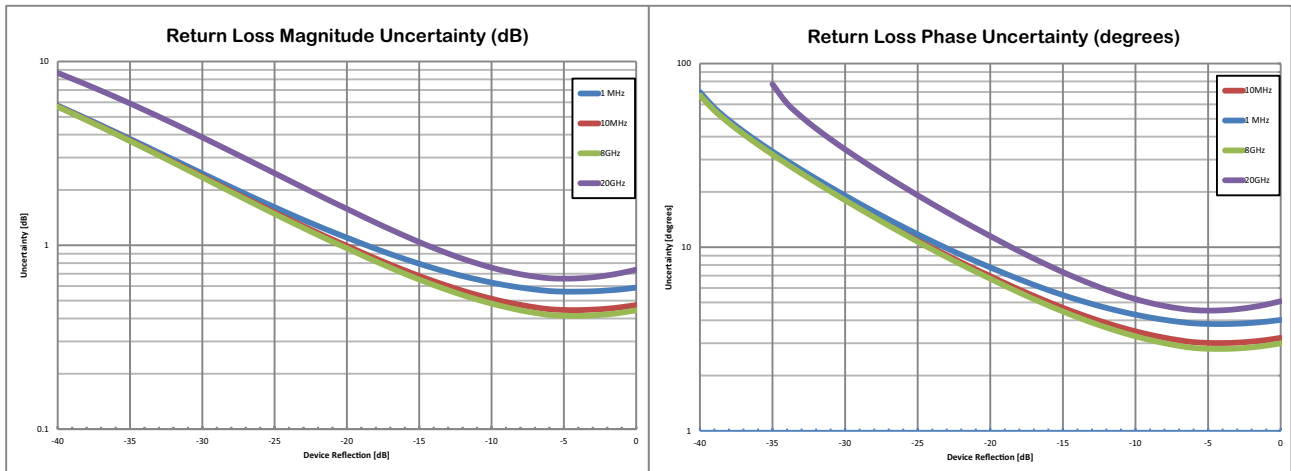
With calibration using the TOSLK50A-20 or TOSLKF50A-20 K type connector calibration kits.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 10 GHz	≥ 42	≥ 33	± 0.15
> 10 GHz to 20 GHz	≥ 36	≥ 26	± 0.15

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-043 VNA System Performance with Manual Cal Kits

Error-Corrected Specifications

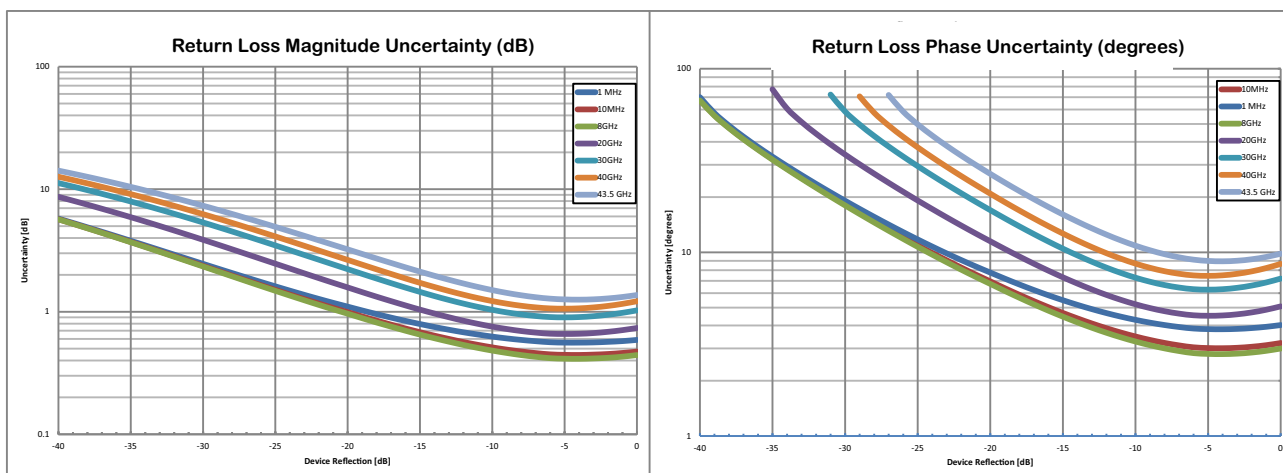
With calibration using TOSLK50A-43.5 or TOSLKF50A-43.5 K type connector calibration kits with generic calibration coefficients.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 10 GHz	≥ 42	≥ 33	± 0.15
> 10 GHz to 20 GHz	≥ 36	≥ 26	± 0.15
> 20 GHz to 30 GHz	≥ 32	≥ 22	± 0.15
> 30 GHz to 40 GHz	≥ 30	≥ 20	± 0.15
> 40 GHz to 43.5 GHz	≥ 28	≥ 20	± 0.2

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-043 VNA System Performance with Manual Cal Kits

Error-Corrected Specifications

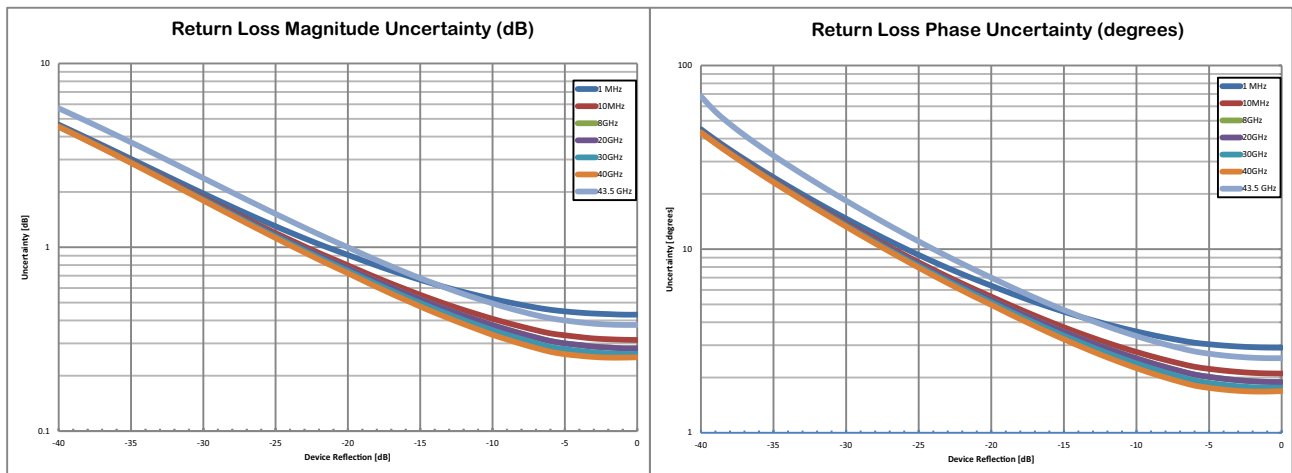
With calibration using TOSLK50A-43.5 or TOSLK50A-43.5 K type connector calibration kits with .s1p definitions.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 50 MHz	≥ 45	≥ 45	± 0.15
> 0.05 GHz to 10 GHz	≥ 45	≥ 45	± 0.15
> 10 GHz to 20 GHz	≥ 45	≥ 45	± 0.15
> 20 GHz to 30 GHz	≥ 45	≥ 44	± 0.15
> 30 GHz to 40 GHz	≥ 45	≥ 42	± 0.15
> 40 GHz to 43.5 GHz	≥ 42	≥ 41	± 0.2

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-010 VNA System Performance with SmartCal™

Error-Corrected Specifications

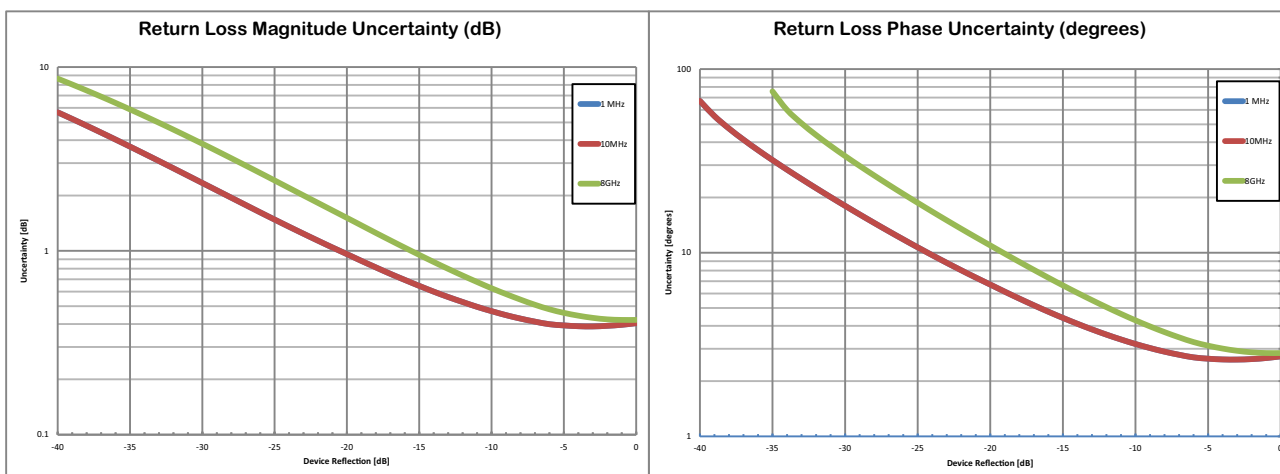
With calibration using the 2-port MN25208A SmartCal™ automatic calibration kit with connector options MN25208A-001, -002, -003

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 1 GHz	≥ 42	≥ 35	± 0.15
> 1 GHz to 5 GHz	≥ 42	≥ 35	± 0.08
> 5GHz to 8 GHz	≥ 36	≥ 35	± 0.1

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-010 VNA System Performance with SmartCal™

Error-Corrected Specifications

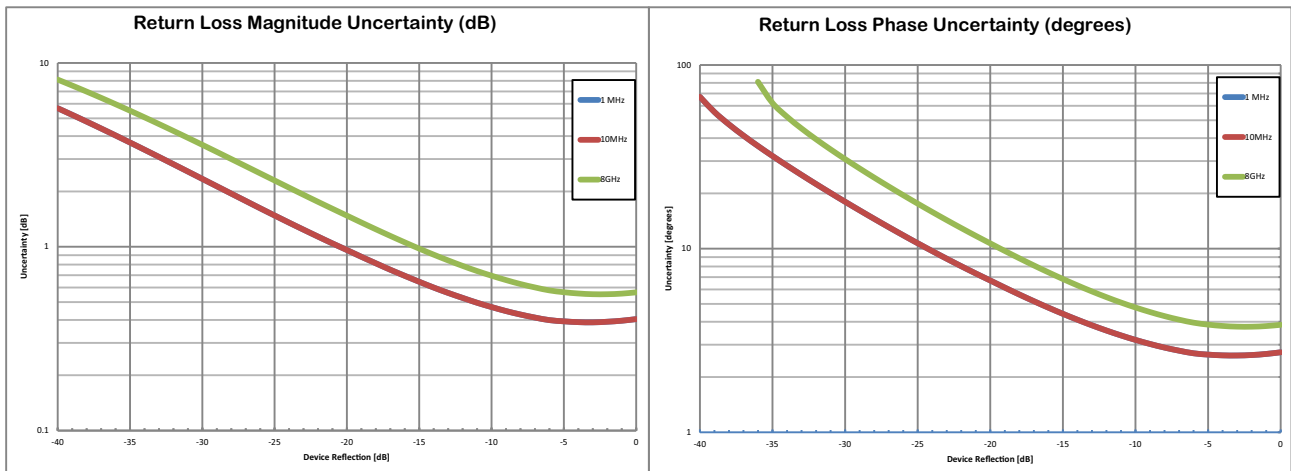
With calibration using the 4-port MN25408A SmartCal™ automatic calibration kit with connector options MN25408A-001, -002, -003

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 1 GHz	≥ 42	≥ 35	± 0.15
> 1 GHz to 5 GHz	≥ 37	≥ 35	± 0.08
> 5 GHz to 8 GHz	≥ 37	≥ 32	± 0.2

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-010, MS46131A-020 VNA System Performance with SmartCal™

Error-Corrected Specifications

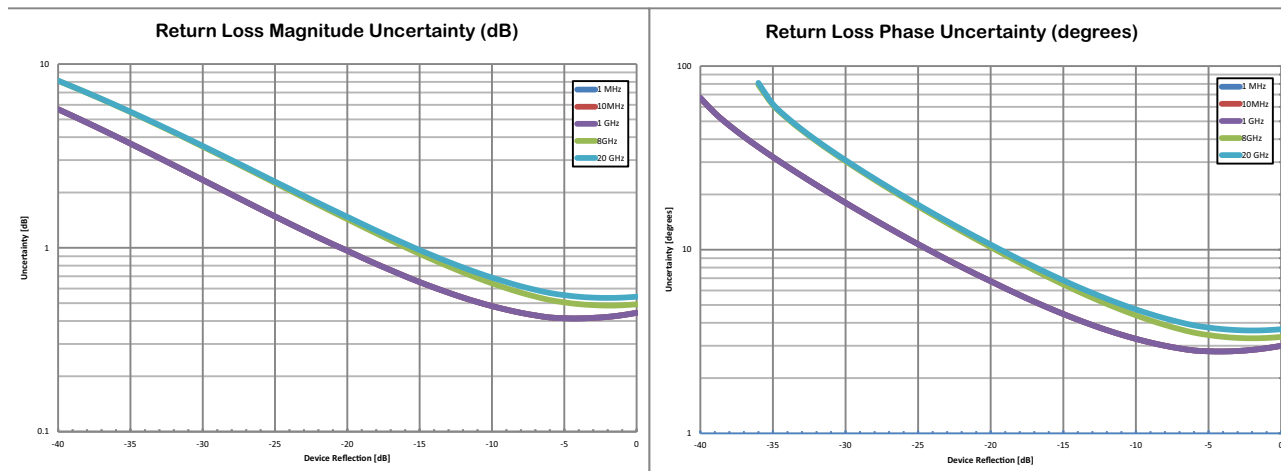
With calibration using the 2-port MN25218A SmartCal™ automatic calibration kit.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 1 GHz	≥ 42	≥ 33	± 0.15
> 1 GHz to 10 GHz	≥ 37	≥ 33	± 0.15
> 10 GHz to 18 GHz	≥ 37	≥ 33	± 0.15
> 18 GHz to 20 GHz	≥ 37	≥ 33	± 0.20

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-010, MS46131A-020 VNA System Performance with SmartCal™

Error-Corrected Specifications

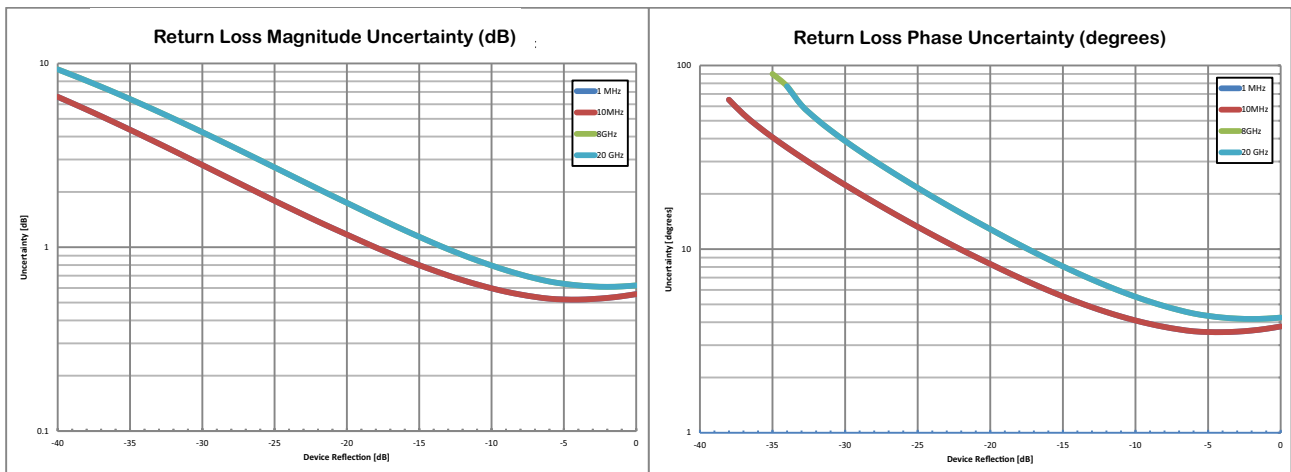
With calibration using the 4-port MN25418A SmartCal™ automatic calibration kit.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to 10 MHz	≥ 40	≥ 31	± 0.15
> 10 MHz to 6 GHz	≥ 40	≥ 31	± 0.15
> 6 GHz to 18 GHz	≥ 35	≥ 31	± 0.20
> 18 GHz to 20 GHz	≥ 35	≥ 31	± 0.20

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



MS46131A-043 VNA System Performance with Precision AutoCal™

Error-Corrected Specifications

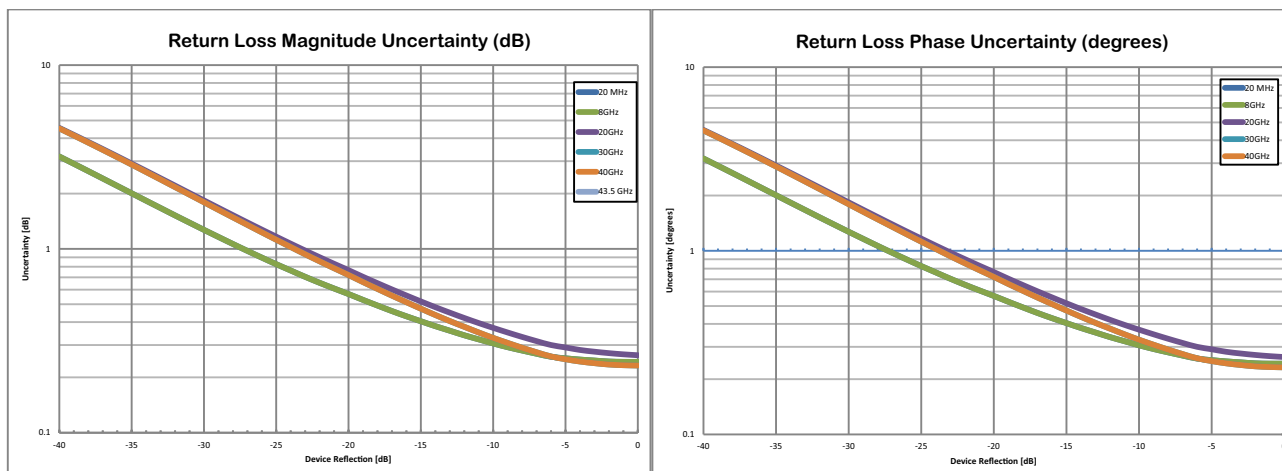
With calibration using the 36585K automatic calibration kit with type K connectors.

Frequency Range	Directivity (dB)	Source Match (dB)	Reflection Tracking ^a (dB)
1 MHz to < 10 GHz	≥ 50	≥ 49	± 0.15
10 GHz to < 20 GHz	≥ 45	≥ 49	± 0.15
20 GHz to < 30 GHz	≥ 45	≥ 45	± 0.10
30 GHz to 40 GHz	≥ 45	≥ 45	± 0.10

a. Characteristic performance.

Measurement Uncertainties

The graphs give measurement uncertainties after the above error-corrected calibration. The errors are a worst-case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For reflection uncertainties, it is assumed that $S_{21} = S_{12} = 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com.



Standard Capabilities

Operating Frequencies	
MS46131A-010	1 MHz to 8 GHz
MS46131A-020	1 MHz to 20 GHz
MS46131A-043	1 MHz to 43.5 GHz
Measurement Parameters	
1-Port Measurements	S11 or any user-defined combination of a1, b1, 1
Domains	Frequency Domain, Time (Distance) Domain (Option 2)
Sweeps	
Frequency Sweep Types	Linear, Log, CW, or Segmented
Display Graphs	
Single Rectilinear Graph Types	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance
Dual Rectilinear Graph Types	Log Mag and Phase, Linear Mag and Phase, Real and Imaginary
Circular Graph Types	Smith Chart (Impedance), Polar
Measurements Data Points	
Maximum Data Points	2 to 16,001 points
Limit Lines	
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
Single Limit Readouts	Uses interpolation to determine the intersection frequency.
Test Limits	Both single and segmented limits can be used for PASS/FAIL testing.
Ripple Limit Lines	
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
Ripple Value	Absolute Value or Margin
Test Limits	Both single and segmented limits can be used for PASS/FAIL testing.
Averaging	
Point-by-Point	Point-by-point (default), maximum number of averages = 200
Sweep-by-Sweep	Sweep-by-sweep, maximum number of averages = 4096
IF Bandwidth	
	10, 20, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300 kHz
Reference Plane	
Line Length or Time Delay	The reference planes of a calibration or other normalization can be changed by entering a line length or time delay.
Dielectric Constants	Dielectric constants may be entered for different media so the length entry can be physically meaningful.
Dispersion Modeling	Dispersion modeling is used in the cases of microstrip and waveguide to take into account frequency dependent phase velocities.
Attenuation	Attenuation (with frequency slope) and constant phase offsets can be entered to better describe any reference plane distortions. The frequency dependence exponent is changeable.
Auto Modes	Automatic reference plane finding tools are available for phase alone or phase + magnitude. These routines do a fitting process on phase or phase and magnitude to estimate the reference plane location and enter correcting values.
De-embedding	For more complete reference plane manipulation, the full de-embedding system can also be used.
Measurement Frequency Range	
Frequency Range Change	Frequency range of the measurement can be narrowed within the calibration range without recalibration.
CW Mode	CW mode permits single frequency measurements also without recalibration.
Interpolation Not Activated	If interpolation is not activated, the subset frequency range is forced to use calibration frequency points.
Interpolation Activated	If interpolation is activated, any frequency range that is a subset of the calibration frequency range can be used, but there may be some added interpolation error.
Channels, Display, and Traces	
Channels and Traces	16 channels, each with up to 16 traces
Display Colors	Unlimited colors for data traces, memory, text, markers, graticules, and limit lines
Trace Memory and Math	Up to 20 trace memories per channel can be used to store trace measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Inter-trace Math	Any two traces within a channel can be combined (via addition, subtraction, multiplication, or division) and displayed on another trace. An equation editor mode is also available that allows the combination of trace data, trace memory and S-parameter data in more complex equations. Over 30 built-in functions are available. Simple editing tools and the ability to save/recall equations are also provided.

Scale Resolution

	Minimum per division, varies with graph type.
Log Magnitude	0.001 dB
Linear Magnitude	10 μ U
Phase	0.01°
Group Delay	0.1 ps
Time	0.0001 ps
Distance	0.1 μ m
SWR	10 μ U
Power	0.01 dB

Markers

Markers	12 markers + 1 reference marker
Marker Coupling	Coupled or decoupled
Marker Overlay	Display markers on active trace only or on all traces when multiple trace responses are present on the same trace
Marker Data	Data displayed in graph area or in table form
Reference Marker	Additional marker per trace for reference
Marker Statistics	Mean, maximum, minimum, standard deviation
Marker Search and Tracking	Per trace or over a marker region Search and/or track for minimum, maximum, peak, or target value. Multiple marker search ranges per trace are available.

Other

Filter Parameters	Display bandwidth (user-selectable loss value), corner and center frequencies, loss, Q, and shape factors.
S-Parameter Conversion	Z Impedance Y Admittance 1/S

Calibration and Correction Capabilities

Calibration Methods		Open-Short-Load (OSL) Offset-Short (SSL) Triple-Offset-Short (SSS) SmartCal™ AutoCal™
Correction Models		
Standard Configuration		Reflection Frequency Response 1-Port S-parameter
Coefficients for Calibration Standards		Use the Anritsu calibration kit USB memory device to load kit coefficients and characterization files. Enter coefficients into user-defined locations. Use complex load models.
Interpolation		Allows interpolation between calibration frequency points.
Dispersion Compensation		Selectable as Coaxial, other non-dispersive (e.g., for coplanar waveguide), Waveguide, or Microstrip
Embedding/De-embedding		The MS46131A is equipped with an Embedding/De-embedding system.
De-embedding		De-embedding is generally used for removal of test fixture contributions, modeled networks, and other networks described by S-parameters (s2p files) from measurements.
Embedding		Similarly, the Embedding function can be used to simulate matching circuits for optimizing amplifier designs or simply adding effects of a known structure to a measurement.
Multiple Networks		Multiple networks can be embedded/de-embedded and changing the port and network orientations is handled easily.
Impedance Conversion		Allows entry of different reference impedances (complex values) for different ports

Optional Capabilities

Time Domain Measurements, Option 2	Displays all S-parameters and overlays with Frequency Domain, Low-pass Mode with added harmonics frequency list flexibility, Band-pass Mode, Phasor Impulse Mode, Windowing, Gating (pass-band or reject-band), and Frequency with Time Gate.
------------------------------------	---

Remote Operability

ShockLine supports several remote operability options.

Communication Type	Data Format	Performance	Description
Drivers	IVI-C drivers are available for download from the Anritsu website. The IVI-C package supports National Instruments LabVIEW and LabWindows, C#, .NET, MATLAB, and Python programming environments.		
Triggering	Start Trigger	Software and Digital Edge	
	Input Range	+3.3 V logic level (+5 V tolerant)	
	Minimum Trigger Width	50 ns	
	Trigger Delay	6 μs, typical	

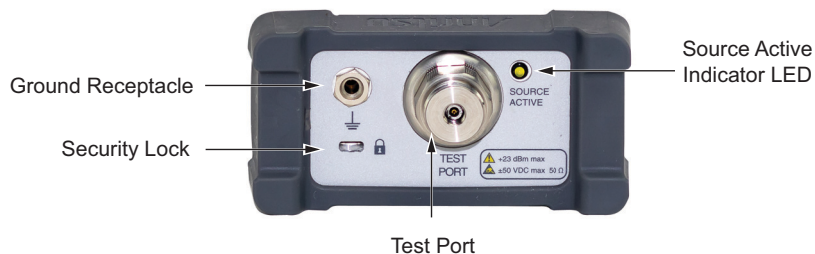
Standard Device Connections



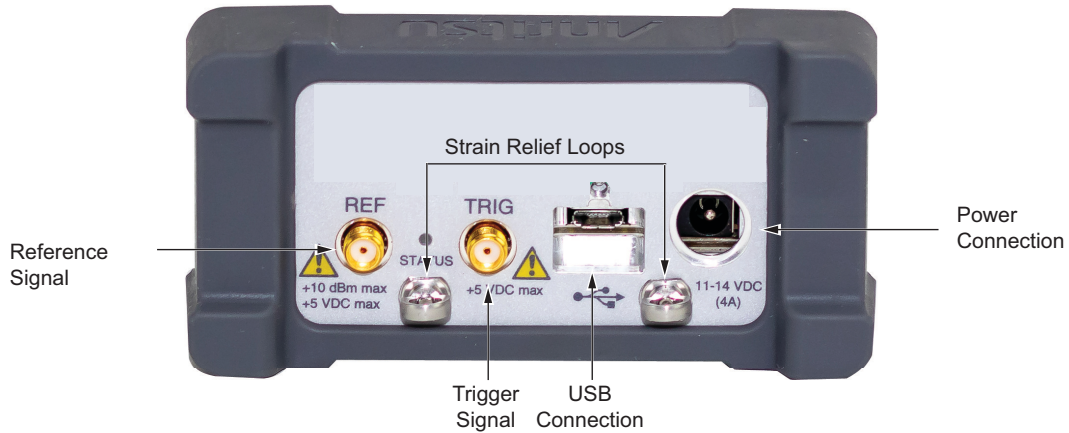
MS46131A Device Connections

Test Port 1	
MS46131A-010	N(f)
MS46131A-020	Ruggedized K(m)
MS46131A-043	Ruggedized Extended-K™(m)
Damage Input Levels	+23 dBm maximum, ±50 VDC maximum
USB Ports	
	One Micro USB 2.0 port for connecting to an external PC controller. For more than two MS46131A instruments on one PC, an externally powered USB 2.0 hub is recommended.
Power Input	
	Input connector for external power supply.
10 MHz In	
Connector Type	SMA(f)
Signal	+0 dBm, typical; 50 Ω, nominal
External Trigger Input	
Connector Type	SMA(f)
Voltage Input	0 to 3.3 V input (5 V tolerant)
Impedance	High impedance (> 100 kΩ)
Pulse Width	50 ns minimum input pulse width
Trigger Delay	6 μs typical

MS46131A Top Panel



MS46131A Bottom Panel



Recommended External PC Configuration

CPU	Intel® Core™ i5-6300U Processor
RAM	4 GB
Disk	120 GB
DirectX	Version 9 with Windows Display Driver Model (WDDM) installed ShockLine software is compatible with Windows® 7,8, 8.1, or 10; 32 or 64 bit operating systems
USB	One USB 2.0 (or higher) type A port per MS46131A used To increase the number of USB ports available, an externally powered USB hub may also be used.

Mechanical

Dimensions	Dimensions listed are for the instrument body.
H x W x D	191.8 mm x 107 mm x 54 mm
Weight	< 1 kg (< 2.2 lb), typical weight

Regulatory Compliance

European Union	EMC 2014/30/EU, EN 61326:2013, CISPR 11/EN 55011, IEC/EN 61000-4-2/3/4/5/6/8/11 Low Voltage Directive 2014/35/EU Safety EN 61010-1:2010 RoHS Directive 2011/65/EU applies to instruments with CE marking placed on the market after July 22, 2017
Australia and New Zealand	RCM AS/NZS 4417:2012
South Korea	KCC-REM-A21-0004

Environmental

	MIL-PRF-28800F Class 2
Operating Temperature Range	-10 °C to 55 °C
Storage Temperature Range	-51 °C to 71 °C
Maximum Relative Humidity	95 % RH at 30 °C, non-condensing
Altitude	4600 meters, operating and non-operating

Warranty

Instrument and Built-In Options	3 years from the date of shipment (standard warranty)
Calibration Kits	Typically 1 year from the date of shipment
Test Port Cables	Typically 1 year from the date of shipment
Warranty Options	Additional warranty available

Ordering Information

Instrument Models	
Base Model	MS46131A, ShockLine™ 1-Port Modular VNA
Required Option	MS46131A-010, 1 MHz to 8 GHz, type N(f) port
(Select one frequency option only)	MS46131A-020, 1 MHz to 20 GHz, Ruggedized type K(m) port (compatible with 3.5 mm and SMA connectors)
	MS46131A-043, 1 MHz to 43.5 GHz, Ruggedized type Extended-K™(m) port (compatible with standard K (2.92 mm), 3.5 mm, and SMA connectors)
Included Accessories	
	Each VNA comes with a set of included accessories
User Documentation	Getting Started with Anritsu Flier, provides access to all ShockLine web content and services
Power	40-187-R, 12 V, 5 A Power supply (and power cord)
USB Cable	USB-A to Micro-B cable, 2000-1816-R, 1.8 m (6 ft)
VNA Options	
Main Options	MS46131A-002, Time Domain with Time Gating
Calibration Options	MS46131A-098, Standard Calibration, ISO 17025 compliant, without data
	MS46131A-099, Premium Calibration, ISO 17025 compliant, with data
Precision Automatic Calibrator Modules	
MN25208A	2-port USB SmartCal Module, 300 kHz to 8.5 GHz (available with connector Options -001 N(f), -002 K(f), -003 3.5 mm(f))
MN25408A	4-port USB SmartCal Module, 300 kHz to 8.5 GHz (available with connector Options -001 N(f), -002 K(f), -003 3.5 mm(f))
MN25218A ¹	2-port USB SmartCal Module, 300 kHz to 20 GHz (available with connector Option -002 K(f))
MN25418A	4-port USB SmartCal Module, 300 kHz to 20 GHz (available with connector Option -002 K(f))
36585K-2M	K Connector Precision AutoCal Module, 70 kHz to 40 GHz, K(m) to K(m)
36585K-2F	K Connector Precision AutoCal Module, 70 kHz to 40 GHz, K(f) to K(f)
36585K-2MF	K Connector Precision AutoCal Module, 70 kHz to 40 GHz, K(m) to K(f)
2000-1809-R	Serial to USB Adapter (required for use with 36585 AutoCal module if control PC does not have a serial port)
Mechanical Calibration Kits	
3650A	SMA/3.5 mm Calibration Kit, Without Sliding Loads, DC to 26.5 GHz, 50 Ω
3650A-1	SMA/3.5 mm Calibration Kit, With Sliding Loads, DC to 26.5 GHz, 50 Ω
3652A	K Connector Calibration Kit, Without Sliding Loads, DC to 40 GHz, 50 Ω
3652A-1	K Connector Calibration Kit, With Sliding Loads, DC to 40 GHz, 50 Ω
3653A	N Connector Calibration Kit, Without Sliding Loads, DC to 18 GHz, 50 Ω
OSLN50A-8	Precision N Male Open/Short/Load Mechanical Calibration Tee, DC to 8 GHz, 50 Ω
OSLNF50A-8	Precision N Female Open/Short/Load Mechanical Calibration Tee, DC to 8 GHz, 50 Ω
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee, DC to 8 GHz, 50 Ω
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee, DC to 8 GHz, 50 Ω
OSLN50A-18	Precision N Male Open/Short/Load Mechanical Calibration Tee, DC to 18 GHz, 50 Ω
OSLNF50A-18	Precision N Female Open/Short/Load Mechanical Calibration Tee, DC to 18 GHz, 50 Ω
TOSLN50A-18	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee, DC to 18 GHz, 50 Ω
TOSLNF50A-18	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee, DC to 18 GHz, 50 Ω
TOSLK50A-20	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee, DC to 20 GHz, 50 Ω
TOSLKF50A-20	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee, DC to 20 GHz, 50 Ω
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee, DC to 40 GHz, 50 Ω
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee, DC to 40 GHz, 50 Ω
TOSLK50A-43.5	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee, DC to 43.5 GHz, 50 Ω Includes .s1p files for data-based calibration support
TOSLKF50A-43.5	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee, DC to 43.5 GHz, 50 Ω Includes .s1p files for data-based calibration support

1. Applies to Rev 2 SmartCal Modules. MN25218A with serial numbers <1817999 operate from 1 MHz to 20 GHz.

Adapters

1091-26-R	Adapter, SMA(m) to N(m), DC to 18 GHz, 50 Ω
1091-27-R	Adapter, SMA(f) to N(m), DC to 18 GHz, 50 Ω
1091-80-R	Adapter, SMA(m) to N(f), DC to 18 GHz, 50 Ω
1091-81-R	Adapter, SMA(f) to N(f), DC to 18 GHz, 50 Ω
71693-R	Ruggedized adapter, K(f) to N(f), DC to 18 GHz, 50 Ω
33KK50C	Calibration Grade Adapter, DC to 43.5 GHz, K(m) to K(m), 50 Ω
33KKF50C	Calibration Grade Adapter, DC to 43.5 GHz, K(m) to K(f), 50 Ω
33KFKF50C	Calibration Grade Adapter, DC to 43.5 GHz, K(f) to K(f), 50 Ω
34NK50	Precision Adapter, N(m) to K(m), DC to 18 GHz, 50 Ω
34NKF50	Precision Adapter, N(m) to K(f), DC to 18 GHz, 50 Ω
34NFK50	Precision Adapter, N(f) to K(m), DC to 18 GHz, 50 Ω
34NFKF50	Precision Adapter, N(f) to K(f), DC to 18 GHz, 50 Ω
34VFK50A	Precision Adapter, DC to 43.5 GHz, V(f) - K(m), 50 Ω
34VFKF50A	Precision Adapter, DC to 43.5 GHz, V(f) - K(f), 50 Ω
34VK50A	Precision Adapter, DC to 43.5 GHz, V(m) - K(m), 50 Ω
34VKF50A	Precision Adapter, DC to 43.5 GHz, V(m) - K(f), 50 Ω
K220B	Precision Adapter, DC to 40 GHz, K(m) to K(m), 50 Ω
K222B	Precision Adapter, DC to 40 GHz, K(f) to K(f), 50 Ω
K224B	Precision Adapter, DC to 40 GHz, K(m) to K(f), 50 Ω

Test Port Cables, Flexible, Ruggedized, Phase Stable



15 Series Cable Example

15NNF50-1.0B	Test Port Cable, Flexible, Phase Stable, N(f) to N(m), 1.0 m
15NNF50-1.5B	Test Port Cable, Flexible, Phase Stable, N(f) to N(m), 1.5 m
15NN50-1.0B	Test Port Cable, Flexible, Phase Stable, N(m) to N(m), 1.0 m
15LL50-1.0A	Test Port Cable, Armored, Phase Stable, DC to 20 GHz, 3.5 mm(m) to 3.5 mm(m), 1.0 m, 50 Ω
15LLF50-1.0A	Test Port Cable, Armored, Phase Stable, DC to 20 GHz, 3.5 mm(m) to 3.5 mm(f), 1.0 m, 50 Ω
15KK50-1.0A	Test Port Cable, Armored, Phase Stable, DC to 20 GHz, K(m) to K(m), 1.0 m, 50 Ω
15KKF50-1.0A	Test Port Cable, Armored, Phase Stable, DC to 20 GHz, K(m) to K(f), 1.0 m, 50 Ω

Phase-Stable 18 GHz and 43.5 GHz Semi-Rigid Cables (Armored)



3670 Series Cable Example

3670N50-1	0.3 m (12"), DC to 18 GHz, N(f) to N(m), 50 Ω
3670NN50-1	0.3 m (12"), DC to 18 GHz, N(m) to N(m), 50 Ω
3670N50-2	0.6 m (24"), DC to 18 GHz, N(f) to N(m), 50 Ω
3670NN50-2	0.6 m (24"), DC to 18 GHz, N(m) to N(m), 50 Ω
3670K50A-1	0.3 m (12"), DC to 43.5 GHz, K(f) to K(m), 50 Ω
3670K50A-2	0.6 m (24"), DC to 43.5 GHz, K(f) to K(m), 50 Ω

Phase-Stable 20 GHz and 40 GHz Test Port Cables (Flexible)


3671 Series Cable Example

3671KFS50-60	60 cm (23.6 in), DC to 20 GHz, K (f) to 3.5 mm (m), 50 Ω
3671KFSF50-60	60 cm (23.6 in), DC to 20 GHz, K (f) to 3.5 mm (f), 50 Ω
3671KFKF50-60	60 cm (23.6 in), DC to 40 GHz, K (f) to K (f), 50 Ω
3671KFK50-100	100 cm (39.4 in), DC to 40 GHz, K (f) to K (m), 50 Ω

Tools

01-201	Torque End Wrench, 5/16 in, 0.9 N.m (8 lbf.in) (for tightening male devices, for SMA, 3.5 mm, 2.4 mm, K, and V connectors)
01-203	Torque End Wrench, 13/16 in, 0.9 N.m (8 lbf.in) (for tightening ruggedized SMA, 2.4 mm, K and V test port connectors)
01-204	End Wrench, 5/16 in, Universal, Circular, Open-ended (for SMA, 3.5 mm, 2.4 mm, K, and V connectors)
More Information	Refer to our Precision RF & Microwave Components Catalog for descriptions of adapters and other components.

Notes

Training at Anritsu

Anritsu has designed courses to help you stay up to date with technologies important to your job. For available training courses, visit: www.anritsu.com/training



• United States

Anritsu Americas Sales Company
450 Century Parkway, Suite 190
Allen, TX 75013, U.S.A.
Phone: +1-800-Anritsu (1-800-267-4878)

• Canada

Anritsu Electronics Ltd.
700 Silver Seven Road, Suite 250
Kanata, Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

• Brazil

Anritsu Eletronica Ltda.
Praça Amadeu Amaral, 27 - 1 Andar
01327-010 - Bela Vista - Sao Paulo - SP
Brazil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

• Mexico

Anritsu Company, S.A. de C.V.
Blvd Miguel de Cervantes Saavedra #169 Piso 1,
Col. Granada
Mexico, Ciudad de Mexico, 11520, MEXICO
Phone: +52-55-4169-7104

• United Kingdom

Anritsu EMEA L td.
200 Capability Green
Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

• France

Anritsu S.A.
12 avenue du Québec, Bâtiment Iris 1- Silic 612,
91140 Villebon-sur-Yvette, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

• Germany

Anritsu GmbH
Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

• Italy

Anritsu S.r.l.
Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

List Revision Date: 20191126

• Sweden

Anritsu AB
Isafjordsgatan 32C
164 40 Kista, Sweden
Phone: +46-8-534-707-00

• Finland

Anritsu AB
Teknobulevardi 3-5
FI-01530 Vantaa, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

• Denmark

Anritsu A/S
c/o Regus Fairway, Arne Jacobsens Allé 7, 5th floor,
2300 Copenhagen S, Denmark
Phone: +45-7211-2200

• Russia

Anritsu EMEA Ltd.
Representation Office in Russia
Tverskaya str. 16/2, bld. 1, 7th floor
Moscow 125009, Russia
Phone: +7-495-363-1694
Fax: +7-495-935-8962

• Spain

Anritsu EMEA Ltd.
Representation Office in Spain
Paseo de la Castellana, 141.
Planta 5, Edificio Cuzco IV
28046, Madrid, Spain
Phone: +34-91-572-6761

• United Arab Emirates

Anritsu EMEA Ltd.
Dubai Liaison Office
902 Aurora Tower
P O Box: 500311- Dubai Internet City
Dubai, United Arab Emirates
Phone: +971-4-3758479
Fax: +971-4-4249036

• India

Anritsu India Private Limited
6th Floor, Indiqube ETA, No.38/4
Adjacent to EMC2, Doddanekundi, Outer Ring Road
Bengaluru 560048, India
Phone: +91-80-6728-1300
Fax: +91-80-6728-1301

• Singapore

Anritsu Pte. Ltd.
11 Chang Charn Road, #04-01, Shriro House
Singapore 159640
Phone: +65-6282-2400
Fax: +65-6282-2533

• P.R. China (Shanghai)

Anritsu (China) Co., Ltd.
Room 2701-2705, Tower A
New Caohejing International Business Center
No. 391 Gui Ping Road
Shanghai 200233, P.R. China
Phone: +86-21-6237-0898
Fax: +86-21-6237-0899

• P.R. China (Hong Kong)

Anritsu Company Ltd.
Unit 1006-7, 10/F.
Greenfield Tower, Concordia Plaza
No. 1 Science Museum Road
Tsim Sha Tsui East, Kowloon
Hong Kong, P.R. China
Phone: +852-2301-4980
Fax: +852-2301-3545

• Japan

Anritsu Corporation
8-5, Tamura-cho, Atsugi-shi, Kanagawa, 243-0016
Japan
Phone: +81-46-296-6509
Fax: +81-46-225-8352

• South Korea

Anritsu Corporation, Ltd.
5FL, 235 Pangyoeyeok-ro
Bundang-gu, Seongnam-si
Gyeonggi-do 13494, South Korea
Phone: +82-31-696-7750
Fax: +82-31-696-7751

• Australia

Anritsu Pty. Ltd.
Unit 20, 21-35 Ricketts Road
Mount Waverley, Victoria 3149, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

• Taiwan

Anritsu Company Inc.
7F, No. 316, Sec. 1, NeiHu Rd. Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817