Transforming concept into great user experience

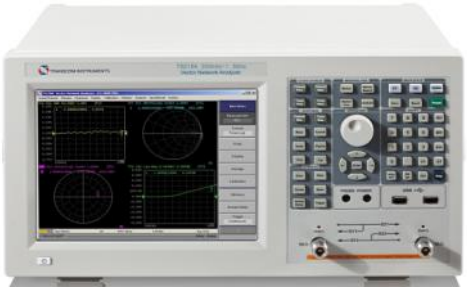
A–Series
Vector Network Analyzer

Transcom Vector Network Analyzer

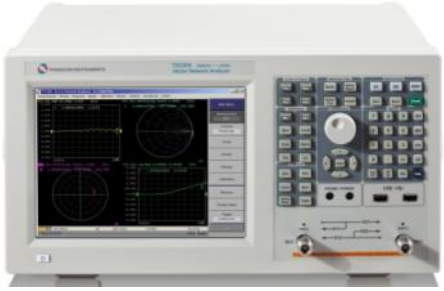
T5215A | T5230A | T5231A

300 kHz – 1.5 GHz / 3 GHz

Datasheet

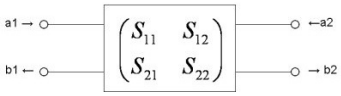


T5215A



T5230A

T5231A



T5230A and T5231A cover the frequency range from 300 kHz to 3 GHz whereas T5215A from 300 kHz to 1.5 GHz. These high performance VNAs have large dynamic range, low noise level and low trace noise. Their frequencies cover all bands of wireless communication. These VNAs are widely used in microwave device measurement in wireless communication, broadcast, television devices, radar devices, semiconductors and many more. T5230A/T5215A are both bench-top instruments highly suitable for indoor testing. They are usually used in production lines, RF laboratories and universities. On the other hand, T5231A is the portable version of T5230A, which is specifically designed for field-testing. Both bench-top and portable share the same set of specification.

Main Features

Large frequency range
300kHz to 3GHz (T5230A/ T5231A)
300kHz to 1.5GHz (T5215A)

Large dynamic range
>125dB (IFBW=10Hz), 130dB typical

Low noise level
<-120dB (IFBW=10Hz)

Low trace noise
1mdB rms (IFBW=3kHz)

High measurement speed
125µs/point (IFBW=30kHz)

High effective directivity
>45dB

Remote Control
LAN/GPIB/USB

Very low power consumption
60W

"One-Key-Test" solution

Specifications Overview

Measurement Range	
Impedance	50Ω, 75Ω[1]
Test port connector	N-type, female
Number of test ports	2
Frequency range	300 kHz to 3.0 GHz (T5230A & T5231A) 300 kHz to 1.5 GHz (T5215A)
Full CW frequency accuracy	$\pm 5\times10^{-6}$
Frequency resolution	1Hz
Number of measurement points	2 to 10001
Measurement bandwidths	1Hz to 30kHz (in 1 / 1.5 / 2 / 3 / 5 / 7 steps)
Dynamic range (IF bandwidth 10 Hz)	125dB, typ.130dB

[1] Use 75Ω connector via adapter

Measurement Accuracy		
Accuracy of transmission measurements (magnitude / phase)		
	+5 dB to +15 dB	0.2 dB/2º
	-50 dB to +5 dB	0.1 dB/1º
	-70 dB to -50 dB	0.2 dB/2º
	-90 dB to -70 dB	1.0 dB/6º
Accuracy of reflection measurements (magnitude / phase)		
	-15 dB to 0 dB	0.4 dB/3º
	-25 dB to -15 dB	1.5 dB/7º
	-35 dB to -25 dB	4.0 dB/22º
Trace stability		
Trace noise magnitude (IF bandwidth 3 kHz)	1 mdB rms	
Temperature dependence (per one degree of temperature variation)	0.02 dB	

Effective System Data1	
Effective directivity	45 dB
Effective source match	40 dB
Effective load match	45 dB

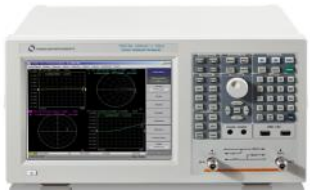
[1] Applies over the temperature range of 23°C ± 5°C after 40 minutes of warming-up, with less than 1°C deviation from the full two-port calibration temperature, at output power of -5 dBm and IF bandwidth 10 Hz.

Test Port Output	
Match (w/o system error correction)	15 dB
Power range	-55 dBm to +10 dBm
Power accuracy	±1.0 dB
Power resolution	0.05 dB
Harmonics distortion	< -30 dBc
Non harmonics distortion	< -30 dBc

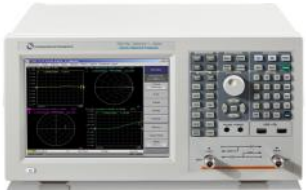
Test Port Input	
Match (w/o system error correction)	25 dB
Damage level	+26 dBm
Damage DC voltage	+35 V
Noise level (IF bandwidth 10 Hz)	< -120 dBm

Measurement Speed				
Measurement time per point	125µs			
Source to receiver port switchover time	< 10ms			
Typical cycle times versus number of measurement points (IFBW 30kHz)	51	201	401	1601
Uncorrected (Start 300kHz, stop 10MHz)	13 ms	52 ms	104 ms	413 ms
Full two-port calibration (Start 300kHz, stop 10MHz)	46 ms	123 ms	226 ms	844 ms
Uncorrected (Start 10MHz, stop 8GHz)	7 ms	27 ms	53 ms	207 ms
Full two-port calibration (Start 10MHz, stop 8GHz)	34 ms	73 ms	125 ms	434 ms

General Data	
Display	10.4 inch TFT color LCD, touch screen
External trigger input connector	BNC female, Input level range: 0 to +5 V
External reference frequency	BNC female; 10 MHz; 2 dBm ± 2 dB
VGA video output	15-pin mini D-Sub; female; driving the VGA compatible monitors
GPIB connector (optional)	24-pin D-Sub (type D-24), female; compatible with IEEE-488
USB connector	Female; provides connection to printer, ECal module, USB storage
LAN connector	10/100/1000 Base T Ethernet, 8-pin configuration
Operating temperature range	+5°C to +40°C
Storage temperature range	-45°C to +55°C
Humidity	90% (25°C)
Atmospheric pressure	84 to 106.7 kPa
Calibration interval	2 years
Power supply	220 ± 22 V (AC), 50 Hz
Power consumption	60W
Dimensions (W × H × D) in mm	440 × 231 × 360 (T5215A / T5230A) 330 × 220 × 150 (T5231A)
Weight	12.5 kg (T5215A / T5230A) 7.1 kg (T5231A)


T5215A


T5231A


T5230A

Measurement Capabilities	
Measured parameters	S_{11}, S_{12}, S_{21} & S_{22}
Number of measurement channels	Up to 16 independent logical channels. Each logical channel is represented on the screen as an individual channel window. A logical channel is defined by such stimulus signal settings as frequency range, number of test points, power level, etc.
Data traces	Up to 16 data traces can be displayed in each channel window. A data trace represents one of such parameters of the DUT as S-parameters, response in time domain, input power response.
Memory traces	Each of the 16 data traces can be saved into memory for further comparison with the current values.
Data display formats	Logarithmic magnitude, linear magnitude, phase, expanded phase, group delay, SWR, real and imaginary parts, Smith chart diagram and polar diagram.

Sweep Features	
Measured points per sweep	Set by the user from 2 to 10001
Sweep type	Linear frequency sweep, logarithmic frequency sweep and segment frequency sweep, when the stimulus power is a fixed value; and linear power sweep when frequency is a fixed value.
Segment sweep features	A frequency sweep within several independent user-defined segments. Frequency range, number of sweep points, source power and IF bandwidth should be set for each segment.
Power	Source power from –55 dBm to +10 dBm with resolution of 0.05 dB. In frequency sweep mode the power slope can be set up to 2 dB/GHz for compensation of high frequency attenuation in connection wires.
Sweep trigger	Trigger modes: continuous, single, hold Trigger sources: internal, manual, external

Trace Functions	
Trace display	Data trace, memory trace or simultaneous indication of data and memory traces.
Trace math	Data trace modification by math operations: addition, subtraction, multiplication or division of measured complex values and memory data.
Autoscaling	Automatic selection of scale division and reference level value to have the trace most effectively displayed.
Electrical delay	Calibration plane moving to compensate for the delay in low-loss tests setup. Compensation for electrical delay in a DUT during measurements of deviation from linear phase.
Phase offset	Phase offset defined in degrees
Statistics	Calculation and display of mean, standard deviation and peak-to-peak deviation for a data trace.

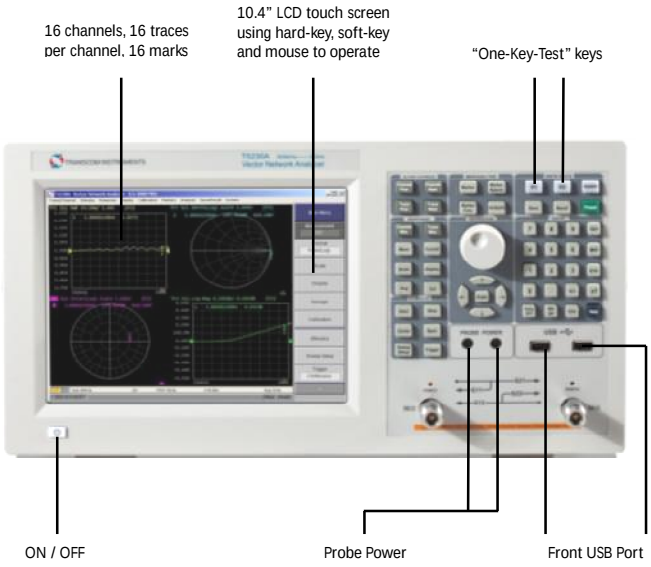
Accuracy Enhancement	
Calibration	Calibration of a test setup (which includes the Analyzer, cables and adapters) significantly increases the accuracy of measurements. Calibration allows for correction of the errors caused by imperfections in the measurement system: system directivity, source and load match, tracking and isolation.
Calibration methods	The following calibration methods with various sophistication and accuracy enhancement level are available: - reflection and transmission normalization; - full one-port calibration; - one-path two-port calibration; - full two-port calibration;
Reflection and transmission normalization	Magnitude and phase correction of frequency response errors for reflection or transmission measurements.
Full one-port calibration	Magnitude and phase correction of frequency response, correction of directivity and source match errors for one-port reflection measurements.
One-path two-port calibration	Calibration for reflection and one-way transmission measurements. Similar to one-port calibration for reflection measurements. Magnitude and phase correction of frequency response and correction of source match errors for transmission measurements.
Full two-port calibration	Calibration for full S-parameter matrix measurement of a DUT. Magnitude and phase correction of frequency response for reflection and transmission measurements, correction of directivity, source match, load match and isolation. Isolation calibration can be omitted.
Directivity calibration (optional)	Correction of directivity additional to the reflection normalization.
Isolation calibration (optional)	Correction of isolation additional to transmission normalization, one-path two-port calibration or full two-port calibration.
Error correction interpolation	When the user changes the settings such as start/stop frequencies and number of sweep points, which are different from the settings at the time of calibration, interpolation or extrapolation of the calibration coefficients will be applied.

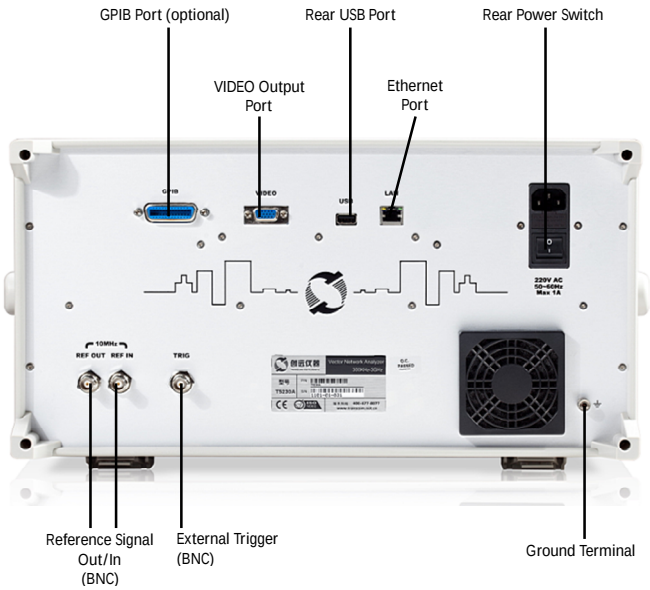
Marker Functions	
Data markers	Up to 16 markers for each trace. Reference marker available for delta marker operation. Smith chart diagram supports 5 marker formats: linear magnitude/phase, log magnitude/phase, real/imaginary, R + jX and G + jB. Polar diagram supports 3 marker formats: linear magnitude/phase, log magnitude/phase, and real/imaginary.
Reference marker	Enables indication of any maker values as relative to the reference marker
Marker search	Search for max, min, peak or target values on a trace
Marker search additional features	User-definable search range. A function for specific condition tracking or single operation search.
Setting parameters by markers	Setting of start, stop and center frequencies by the stimulus value of the marker and setting of reference level by the response value of the marker.
Marker math functions	Statistics, bandwidth
Statistics	Calculation and display of mean, standard deviation and peak-to-peak in a frequency range limited by two markers on a trace.
Bandwidth	Determines the bandwidth between cutoff frequency points of an active marker or absolute maximum. The bandwidth value, center frequency, upper and lower frequencies, Q value and insertion loss are displayed.

Data Analysis

Port impedance conversion	The function of conversion of the S-parameters measured at 50Ω port into the values, which could be determined if measured at a test port with an arbitrary impedance.
De-embedding	The function allows to mathematically exclude from the measurement result the effect of the fixture circuit connected between the calibration plane and the DUT. This circuit should be described by an S-parameter matrix in a Touchstone file.
Embedding	The function allows to mathematically simulate the DUT parameters after virtual integration of a fixture circuit between the calibration plane and the DUT. This circuit should be described by an S-parameter matrix in a Touchstone file.
S-parameter conversion	The function allows conversion of the measured S-parameters to the following parameters: reflection impedance and admittance, transmission impedance and admittance and inverse S-parameters.
Time domain transformation	The function performs data transformation from frequency domain into response of the DUT to various stimulus types in time domain. Modeled stimulus types: bandpass, lowpass impulse, and lowpass step. Time domain span is set by the user arbitrarily from zero to maximum, which is determined by the frequency step. Windows of various forms are used for better tradeoff between resolution and level of spurious sidelobes.
Time domain gating	The function mathematically removes unwanted responses in time domain what allows for obtaining frequency response without influence from the fixture elements. The function applies reverse transformation back to frequency domain after cutting out the user-defined span in time domain. Gating filter types: bandpass or notch. For better tradeoff between gate resolution and level of spurious sidelobes the following filter shapes are available: maximum, wide, normal and minimum.
Limit Test	The limit test is a function to perform the pass/fail judgment based on the limit line you set in the limit table. In limit test, if the measured value is within the upper or lower limits indicated by the limit lines, the result is pass; if it is exceeded, the result is fail for all measurement points on the trace. Measurement points in the stimulus range with no limit lines are consider pass.
Ripple Test	The ripple test is a function for evaluating the results on a pass/fail basis based on the ripple limit, which is set using the ripple limit table. You can specify up to 12 frequency bands, which permits a test for each frequency band.

Front and Rear Panels





Product specification and description in this document subject to change without notice

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