R3172 Specifications

Frequency

Frequency range:	9 kHz to 26.5 GHz	
Preamplifier OFF		Harmonic order (N)
band 0:	9 kHz to 3.3 GHz	1
band 1:	3.2 to 7.1 GHz	1
band 2:	7 to 14.7 GHz	2
band 3:	14.5 to 26.5 GHz	4
Preamplifier ON		
band 0:	9 kHz to 3.3 GHz	1

Frequency reading accuracy (Start, Stop, CF, Marker):	± (Reading of frequency x Frequency reference accuracy + Span x Span accuracy + RBW x 0.15 + 60 Hz)
Counter	
Resolution:	1 Hz to 1 kHz
Accuracy:	± (Marker frequency x Frequency reference accuracy + Residual FM + 1 LSD) (S/N ≥25 dB, span ≤200 MHz)
Frequency reference accuracy	
Stability:	$\pm 2 \times 10^{-6}$/year
Temperature stability:	$\pm 1 \times 10^{-5}$ (0 to +50°C)
Frequency span	
Range:	1 kHz to 26.5 GHz, 0 Hz (zero span)
Accuracy:	≤±1%
Residual FM	
Zero span:	≤ (60 Hzp-p x N) /100 ms
Noise sideband	
Frequency ≤2.6 GHz:	≤-100 dBc/Hz (at 10 kHz offset, RBW 300 Hz (OPT.27)) ≤-105 dBc/Hz (at 20 kHz offset)
Frequency >2.6 GHz:	≤ (-98 + 20 logN) dBc/Hz (at 10 kHz offset, RBW 300 Hz (OPT.27) ≤ (-103 + 20 logN) dBc/Hz (at 20 kHz offset)
Resolution bandwidth at 3 dB	
Range:	1 kHz to 3 MHz (1-3-10 sequence)
Accuracy:	±20% 1 kHz to 1 MHz ±25% 3 MHz
Selectivity (60 dB:3 dB):	<15 : 1
QP (6 dB) Range:	1 MHz, 120 kHz, 9 kHz (200 Hz (OPT.27))
Video bandwidth:	10 Hz to 3 MHz (1-3-10 sequence)

Amplitude range

Measuring range	+30 dBm to displayed average noise level
Maximum input level	(Input attenuator ≥10 dB)
Preamplifier OFF:	+30 dBm, 0 VDC max.
Preamplifier ON:	+13 dBm, 0 VDC max.
Indication range	
Log:	10 x 10 div, 10, 5, 2, 1 dB/div
Linear:	10% of reference level/div
Reference level range	
Preamplifier OFF:	(Input attenuator 0 to 70 dB)
Log:	-64 to +60 dBm (0.1 dB step)
Linear:	+141.1 µV to +223.6 V
Preamplifier ON:	(Input attenuator 0 to 30 dB)
Log:	-82 to +10 dBm (0.1 dB step)
Linear:	+17.76 µV to +707.1 mV
Input attenuator range:	0 to 70 dB (10 dB step)

Sweep

Sweep time:	10 ms to 1000 s (Sweep time under 20 ms can be set up at span 100 MHz or less)
Accuracy:	±2%
Trigger mode:	FREE RUN, LINE, VIDEO, EXT, TV
Sweep mode:	REPEAT, SINGLE

Dynamic range

Displayed average noise level:	RBW 1 kHz, VBW 10 Hz, input attenuator 0 dB, f ≥10 MHz
Preamplifier OFF	
10 MHz to 3.3 GHz (band 0):	-117 dBm + 2 f (GHz) dB*1
3.2 to 7.1 GHz (band 1):	-112 dBm*1
7 to 14.7 GHz (band 2):	-111 dBm*1
14.5 to 22 GHz (band 3):	-107 dBm*1
22 to 26.5 GHz (band 3):	-104 dBm*1
Preamplifier ON	
1 MHz to 3.3 GHz:	-132 dBm + 3 f (GHz) dB
1 dB gain compression	
Preamplifier OFF	
200 MHz to 3.3 GHz (band 0):	>0 dBm (mixer input level)
3.2 to 26.5 GHz (band 1 to 3):	>-5 dBm (mixer input level)
Preamplifier ON	(Input attenuator 0 to 30 dB)
200 MHz to 3.3 GHz (band 0):	>-25 dBm (RF input level)

Spurious response: preamplifier OFF
Second harmonic distortion:

Frequency range	Mixer level	Distortion level
100 to 800 MHz	-30 dBm	≤-70 dBc
≥800 MHz (band 0)	-30 dBm	≤-80 dBc
≥3.3 GHz	-10 dBm	≤-100 dBc

Third order intermodulation distortion:	≤-80 dBc (200 MHz to 3.3 GHz, band 0) ≤-70 dBc (3.2 to 26.5 GHz, band 1 to 3) (mixer input level -30 dBm, two signal difference >50 kHz)
Image/Multiple/ Out of band response:	<-70 dBc (10 MHz ≤ f ≤18 GHz) <-60 dBc (18 GHz < f ≤23 GHz) <-50 dBc (23 GHz < f ≤26.5 GHz)
Residual response:	(Input terminated 50 Ω , input attenuator 0 dB, f ≥1 MHz)
Preamplifier OFF:	≤-100 dBm (band 0) ≤-90 dBm (band 1 to 3)
Preamplifier ON:	≤-105 dBm (band 0)

**1: For a temperature range of 20 to 30°C. Add 2 dB for a temperature range of 0 to 50°C.*

Amplitude accuracy

Frequency response
(after calibration and preselector peak, attenuator 10 dB)
Preamplifier OFF

Frequency range	Relative		Absolute*2	
	20 to 30°C	0 to 50°C	20 to 30°C	0 to 50°C
100 kHz to 3 GHz	±0.5 dB	±1.0 dB	±0.6 dB	±1.0 dB
9 kHz to 3.3 GHz	±1.5 dB	±2.0 dB	±1.5 dB	±2.0 dB
3.3 to 7.1 GHz	±1.6 dB	±1.8 dB	±1.8 dB	±2.5 dB
7.1 to 14.7 GHz	±1.8 dB	±2.0 dB	±2.0 dB	±3.0 dB
14.7 to 26.5 GHz	±2.5 dB	±3.0 dB	±3.0 dB	±4.0 dB

Preamplifier ON

Frequency range	Relative		Absolute*2	
	20 to 30°C	0 to 50°C	20 to 30°C	0 to 50°C
100 kHz to 2.7 GHz	±1.0 dB	±1.0 dB	±1.0 dB	±1.0 dB
9 kHz to 3.3 GHz	±2.0 dB	±2.0 dB	±2.0 dB	±2.0 dB

Calibration signal level accuracy:	-20 dBm ±0.3 dB
IF gain error (after automatic calibration):	±0.5 dB
Scale indication accuracy (after automatic calibration)	
Log:	±1.5/90 dB, ±1.0/10 dB, ±0.2/1 dB
Liner:	±5% of reference level
Input ATT switching error:	≤±1.1/10 dB, 2 dB max. (9 kHz to 12 GHz) ≤±1.3/10 dB, 2.5 dB max. (12 to 18 GHz) ≤±1.8/10 dB, 3.5 dB max. (18 to 26.5GHz) in reference to an attenuation of 10dB at 30 MHz

**2: In reference to 30 MHz calibration signal.*

Resolution bandwidth switchinglevel error (after automatic calibration):	±0.5 dB
Total level accuracy Preamplifier OFF:	±1.5 dB (REF = -50 to 0 dBm, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, f = 100 kHz to 3 GHz, after automatic calibration)

I/O

RF input	
Connector:	N connector (female) (changeable to SMA female)
Impedance:	50 Ω (nominal)
VSWR (at tuned frequency)	
Preamplifier OFF:	<1.5 : 1 (9 kHz to 3.3 GHz, band 0) (typical) <2 : 1 (3.2 to 26.5 GHz, band 1 to 3) (typical) with input ATT 10 to 70 dB
Preamplifier ON:	<2.5 : 1 (9 kHz to 3.3 GHz, band 0) (typical)
Probe power:	±12 V (nominal), 4-pin connector
Calibration output signal:	BNC female, 50 Ω (nominal) 30 MHz, -20 dBm
10MHz reference input:	BNC female, 500 Ω (nominal) -10 to +10 dBm
External trigger input:	BNC female
Y axis output:	BNC female Approx. 2 V in full scale (10 dB/div)
Phone output:	Small size monophonic female
GPIB interface:	IEEE-488 BUS connector
Serial interface:	D-Sub 9-pins
Printer interface:	D-Sub 25-pins, ESC/P, ESC/P-R, PCL
Video output:	VGA (15-pins, female)
Floppy disk:	3.5-inch, MS-DOS format

General specifications

Operating temperature:	0 to +50°C Relative humidity 85% or less (no condensation)
Storage temperature:	-20 to +60°C, Relative humidity 85% or less
Power source: 100 VAC: 200 VAC:	Automatic switching to 100 or 200 VAC 100 to 120 VAC, 50 to 60 Hz 220 to 240 VAC, 50 to 60 Hz
Power consumption:	<200 VA
Dimension:	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding feet and connectors)
Mass:	<16 kg (excluding options, cover, and accessories)

Options

OPT.16 to 20, 27, 29 or 73, please refer options for R3182 (page 16 to 17).

OPT.03 Local signal output for external mixer

Frequency range:	4.0 to 7.6 GHz
Output level:	>+8 dBm
Output impedance:	50 Ω (nominal)
Connector:	SMA female

OPT.74 Tracking generator

Frequency range:	100 kHz to 3 GHz
Output level range:	0 to -59.9 dBm
Output level accuracy:	±0.5 dB (30 MHz, -10 dBm, +20 to +30°C)
Output level flatness:	±1.0 dB (100 kHz to 1 GHz) ±1.5 dB (100 kHz to 3 GHz) (reference signal level: -10 dBm, frequency: 30 MHz)
Output level switching uncertainly:	±1.0 dB (100 kHz to 1 GHz, output level ≥-30 dBm) ±2.0 dB (100 kHz to 2.6 GHz) ±3.0 dB (100 kHz to 3 GHz) (reference level: -10 dBm)
Spurious output Harmonic: Non-harmonic:	 ≤-20 dBc (output level: -10 dBm) ≤-30 dBc (output level: -10 dBm)
TG leakage	≤-100 dBm (input ATT: 0dB)
Output impedance: VSWR:	50 Ω (nominal) ≤2 (output level ≤-10 dBm) (typical)
Maximum allowable input level:	+15 dBm ±10 VDC
Mass:	≤1 kg

R3182 Specifications

Frequency

Frequency range:	9 kHz to 40 GHz	
Preamplifier OFF		Harmonic order (N)
band 0:	9 kHz to 3.3 GHz	1
band 1:	3.2 to 7.1 GHz	1
band 2:	7 to 14.7 GHz	2
band 3:	14.5 to 27 GHz	4
band 4:	26.5 to 30 GHz	4
band 5:	29.5 to 40 GHz	8
Preamplifier ON		
band 0:	9 kHz to 3.3 GHz	1

Frequency reading accuracy (Start, Stop, CF, Marker):	± (Reading of frequency x Frequency reference accuracy + Span x Span accuracy + RBW x 0.15 + 60 Hz)
Counter	
Resolution:	1 Hz to 1 kHz
Accuracy:	± (Marker frequency x Frequency reference accuracy + Residual FM + 1 LSD) (S/N ≥25 dB, span ≤200 MHz)
Frequency reference accuracy	
Stability:	$\pm 2 \times 10^{-6}$/year
Temperature stability:	$\pm 1 \times 10^{-5}$ (0 to +50°C)
Frequency span	
Range:	1 kHz to 40 GHz, 0 Hz (zero span)
Accuracy:	≤±1%
Residual FM	
Zero span:	≤ (60 Hzp-p x N) /100 ms
Noise sideband	
Frequency ≤2.6 GHz:	≤-100 dBc/Hz (at 10 kHz offset, RBW 300 Hz (OPT.27)) ≤-105 dBc/Hz (at 20 kHz offset)
Frequency >2.6 GHz:	≤ (-98 + 20 logN) dBc/Hz (at 10 kHz offset, RBW 300 Hz (OPT.27)) ≤ (-103 + 20 logN) dBc/Hz (at 20 kHz offset)
Resolution bandwidth at 3 dB	
Range:	1 kHz to 3 MHz (1-3-10 sequence)
Accuracy:	±20% 1 kHz to 1 MHz ±25% 3 MHz
Selectivity (60 dB:3 dB):	<15 : 1
QP (6 dB) Range:	1 MHz, 120 kHz, 9 kHz
Video bandwidth:	10 Hz to 3 MHz (1-3-10 sequence)

Amplitude range

Measuring range	+30 dBm to displayed average noise level
Maximum input level	(Input attenuator ≥10 dB)
Preamplifier OFF:	+30 dBm, 0 VDC max.
Preamplifier ON:	+13 dBm, 0 VDC max.
Indication range	
Log:	10 x 10 div, 10, 5, 2, 1 dB/div
Linear:	10% of reference level/div
Reference level range	
Preamplifier OFF:	(Input attenuator 0 to 70 dB)
Log:	-64 to +60 dBm (0.1 dB step)
Linear:	+141.1 µV to +223.6 V
Preamplifier ON:	(Input attenuator 0 to 30 dB)
Log:	-82 to +10 dBm (0.1 dB step)
Linear:	+17.76 µV to +707.1 mV
Input attenuator range:	0 to 70 dB (10 dB step)

Sweep

Sweep time:	10 ms to 1000 s (Sweep time under 20 ms can be set up at span 100 MHz or less)
Accuracy:	±2%
Trigger mode:	FREE RUN, LINE, VIDEO, EXT, TV
Sweep mode:	REPEAT, SINGLE

Dynamic range

Displayed average noise level:	RBW 1 kHz, VBW 10 Hz, input attenuator 0 dB, f ≥10 MHz
Preamplifier OFF	
10 MHz to 3.3 GHz (band 0):	-117 dBm + 2 f (GHz) dB*1
3.2 to 7.1 GHz (band 1):	-114 dBm*1
7 to 14.7 GHz (band 2):	-112 dBm*1
14.5 to 27 GHz (band 3):	-110 dBm*1
26.5 to 30 GHz (band 4):	-107 dBm*1
29.5 to 40 GHz (band 5):	-106 dBm*1
Preamplifier ON	
1 MHz to 3.3 GHz:	-132 dBm + 3 f (GHz) dB
1 dB gain compression	
Preamplifier OFF	
200 MHz to 3.3 GHz (band 0):	>0 dBm (mixer input level)
3.2 to 40 GHz (band 1 to 5):	>-5 dBm (mixer input level)
Preamplifier ON	(Input attenuator 0 to 30 dB)
200 MHz to 3.3 GHz (band 0):	>-25 dBm (RF input level)

Spurious response: preamplifier OFF
Second harmonic distortion:

Frequency range	Mixer level	Distortion level
100 to 800 MHz	-30 dBm	≤-70 dBc
≥800 MHz (band 0)	-30 dBm	≤-80 dBc
≥3.3 GHz	-10 dBm	≤-95 dBc

Third order intermodulation distortion:	≤-80 dBc (200 MHz to 3.3 GHz, band 0) ≤-75 dBc (3.2 to 30 GHz, band 1 to 4) ≤-70 dBc (29.5 to 40 GHz, band 5) (mixer input level -30 dBm, two signal difference >50 kHz)
Image/Multiple/ Out of band response:	<-70 dBc (10 MHz ≤ f ≤18 GHz) <-65 dBc (18 GHz < f ≤26.5 GHz) <-60 dBc (26.5 GHz < f ≤34 GHz) <-50 dBc (34 GHz < f ≤40 GHz)
Residual response:	(Input terminated 50 Ω , input attenuator 0 dB, f ≥1 MHz)
Preamplifier OFF:	≤-100 dBm (band 0) ≤-90 dBm (band 1 to 5)
Preamplifier ON:	≤-105 dBm (band 0)

**1: For a temperature range of 20 to 30°C. Add 2 dB for a temperature range of 0 to 50°C.*

Amplitude accuracy

Frequency response
(after calibration and preselector peak, attenuator 10 dB)
Preamplifier OFF

Frequency range	Relative		Absolute*2	
	20 to 30°C	0 to 50°C	20 to 30°C	0 to 50°C
100 kHz to 3 GHz	±0.5 dB	±1.0 dB	±0.6 dB	±1.0 dB
9 kHz to 3.3 GHz	±1.5 dB	±2.0 dB	±1.5 dB	±2.0 dB
3.3 to 7.1 GHz	±1.6 dB	±1.8 dB	±1.8 dB	±2.5 dB
7.1 to 14.7 GHz	±1.8 dB	±2.0 dB	±2.0 dB	±3.0 dB
14.7 to 26.5 GHz	±2.5 dB	±3.0 dB	±3.0 dB	±4.0 dB
27 to 30 GHz	±3.0 dB	±3.5 dB	±3.5 dB	±4.5 dB
30 to 40 GHz	±3.5 dB	±4.0 dB	±4.0 dB	±5.0 dB

Preamplifier ON

Frequency range	Relative		Absolute*2	
	20 to 30°C	0 to 50°C	20 to 30°C	0 to 50°C
100 kHz to 2.7 GHz	±1.0 dB	±1.0 dB	±1.0 dB	±1.0 dB
9 kHz to 3.3 GHz	±2.0 dB	±2.0 dB	±2.0 dB	±2.0 dB

Calibration signal level accuracy:	-20 dBm ±0.3 dB
IF gain error (after automatic calibration):	±0.5 dB
Scale indication accuracy (after automatic calibration)	
Log:	±1.5/90 dB, ±1.0/10 dB, ±0.2/1 dB
Liner:	±5% of reference level

**2: In reference to 30 MHz calibration signal.*

Input ATT switching error:	≤±1.1/10 dB, 2 dB max. (9 kHz to 12 GHz) ≤±1.3/10 dB, 2.5 dB max. (12 to 18 GHz) ≤±1.8/10 dB, 3.5 dB max. (18 to 26.5GHz) ≤±2.2/10 dB, 4 dB max. (26.5 to 40GHz) in reference to an attenuation of 10dB at 30 MHz
Resolution bandwidth switchinglevel error (after automatic calibration):	±0.5 dB
Total level accuracy	
Preamplifier OFF:	±1.5 dB (REF = -50 to 0 dBm, ATT = 10 dB, 2 dB/div, RBW = 300 kHz, f = 100 kHz to 3 GHz, after automatic calibration)

I/O

RF input	
Connector:	K connector (male)
Impedance:	50 Ω (nominal)
VSWR (at tuned frequency)	
Preamplifier OFF:	<1.5 : 1 (9 kHz to 3.3 GHz, band 0) (typical) <2 : 1 (3.2 to 26.5 GHz, band 1 to 3) (typical) <2.2 : 1 (26.5 to 40 GHz, band 4, 5) (typical) with input ATT 10 to 70 dB
Preamplifier ON:	<2.5 : 1 (9 kHz to 3.3 GHz, band 0) (typical)
Probe power:	±12 V (nominal), 4-pin connector
Calibration output signal:	BNC female, 50 Ω (nominal) 30 MHz, -20 dBm
External mixer local output	
Connector:	SAM female
Impedance:	50 Ω (nominal)
Frequency range:	4.0 to 7.6 GHz
Output level:	>+8 dBm
10MHz reference input:	BNC female, 500 Ω (nominal) -10 to +10 dBm
External trigger input:	BNC female
Y axis output:	BNC female Approx. 2 V in full scale (10 dB/div)
Phone output:	Small size monophonic female
GPIB interface:	IEEE-488 BUS connector
Serial interface:	D-Sub 9-pins
Printer interface:	D-Sub 25-pins, ESC/P, ESC/P-R, PCL
Video output:	VGA (15-pins, female)
Floppy disk:	3.5-inch, MS-DOS format

General specifications

Operating temperature:	0 to +50°C Relative humidity 85% or less (no condensation)
Storage temperature:	-20 to +60°C, relative humidity 85% or less
Power source:	Automatic switching to 100 or 200 VAC
100 VAC:	100 to 120 VAC, 50 to 60 Hz
200 VAC:	220 to 240 VAC, 50 to 60 Hz
Power consumption:	<200 VA
Dimension:	Approx. 424 (W) x 177 (H) x 300 (D) mm (excluding feet and connectors)
Mass (without option):	<18 kg (excluding options, cover, and accessories)

Options

OPT.16 External mixer (26.5 to 40 GHz)

Frequency range:	26.5 to 40 GHz
Average noise level:	≤- 99 dBm (typical value at RBW 1 kHz, VBW 10 Hz)
Frequency response:	±5 dB (typical)
1 dB gain squeeze:	-1 dBm
Maximum input level:	+20 dBm (continuous wave (CW) power)

OPT.17 External mixer (40 to 60 GHz)

Frequency range:	40 to 60 GHz
Average noise level:	≤- 93 dBm (typical value at RBW 1 kHz, VBW 10 Hz)
Frequency response:	±5 dB (typical)
1 dB gain squeeze:	-1 dBm
Maximum input level:	+20 dBm (CW power)

OPT.18 External mixer (50 to 75 GHz)

Frequency range:	50 to 75 GHz
Average noise level:	≤- 90 dBm (typical value at RBW 1 kHz, VBW 10 Hz)
Frequency response:	±5 dB (typical)
1 dB gain squeeze:	-6 dBm
Maximum input level:	+20 dBm (CW power)

OPT.19 External mixer (75 to 110 GHz)

Frequency range:	75 to 110 GHz
Average noise level:	≤- 85 dBm (75 to 85 GHz) ≤- 80 dBm (85 to 110 GHz) (typical value at RBW 1 kHz, VBW 10 Hz)
Frequency response:	±5 dB (typical)
1 dB gain squeeze:	-6 dBm
Maximum input level:	+20 dBm (CW power)

OPT.20 High-stability frequency reference

Reference frequency source accuracy	
Stability:	±2 x 10^{-8}/day ±1 x 10^{-7}/year
Warm-up drift (nominal):	±5 x 10^{-8} (typical) (25°C, 10 minutes after tuning the power on)
Temperature drift:	±5 x 10^{-8} (0 to +40°C, with reference to +25°C)

OPT.27 Narrow-band resolution bandwidth

3-dB resolution bandwidth:	300 Hz, 100 Hz, 30Hz
Bandwidth accuracy:	±20%
6-dB resolution bandwidth:	200 Hz

OPT.29 Time-domain high-speed sweeps

Sweep time:	50 µs to 10 ms
Sweep time accuracy:	±1%
Trace detector:	Sample
Trace point:	501

OPT.73 Wide-range FM demodulation
Internal mixer mode

Measuring amplitude range:	**> -50 dBm + input attenuation value (at center frequency 1 GHz, RBW Wide, -20 dB or more than reference level)**
FM deviation	
Measuring range:	**2.5 MHz, 1 MHz, 500 kHz, 250 kHz, 100 kHz, 50 kHz, 25 kHz, 10 kHz**
Linearity error*:	**≤ (2 % of measuring range)**
Offset error*:	**≤ (4 % of measuring range + K + Readout of frequency x Frequency reference accuracy)**
	K; 8 kHz (measuring range 2.5 MHz to 250 kHz)
	2 kHz (measuring range 100 kHz to 10 kHz)
Demodulation frequency bandwidth (3 dB):	**≥300 kHz (nominal)**

External mixer mode (one of OPT.16, 17, 18 or 19 is required)

FM deviation	
Measuring range:	**500 MHz, 250 MHz, 100 MHz, 50 MHz, 25 MHz, 10 MHz, 5 MHz, 2.5 MHz, 1 MHz, 500 kHz, 250 kHz, 100 kHz, 50 kHz, 25 kHz, 10 kHz**
Linearity error*:	**≤ (2 % of measuring range)**
Offset error*:	**≤ (4 % of measuring range + K + Readout of frequency x Frequency reference accuracy)**
	K; 128 kHz (measuring range 500 MHz to 5 MHz)
	8 kHz (measuring range 2.5 MHz to 250 kMz)
	2 kHz (measuring range 100 kHz to 10 kMz)
Demodulation frequency bandwidth (3 dB):	**≥300 kHz (nominal)**

** These errors are values obtained by executing "FM Demod ALL CAL" software, after warming up the R3172/3182 and optional mixer for 30 minutes or more.*

Specifications may change without notification.