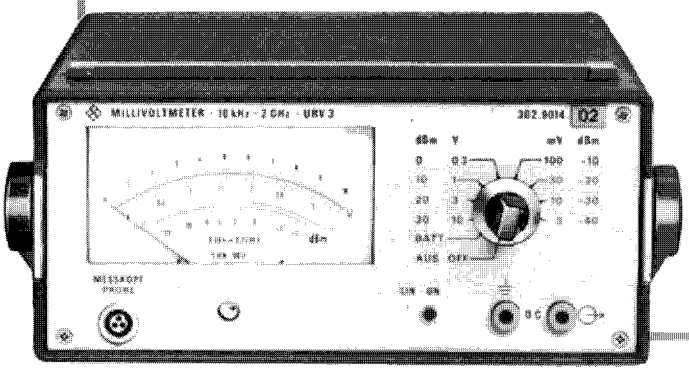
URV 3 Millivoltmeter URV 3 ♦ 10 kHz to 2 GHz/0.7 mV to 1050 V



- Handy RF millivoltmeter for mobile and stationary use
- High-impedance voltage measurement with RF probe and dividers;
- Voltage and level measurement using insertion units with defined characteristic impedance of 50 or 75 Ω
- Basic error 2%
- Universal powering system – battery, accumulator, power supply unit or external source

Scale 1:2.5

The **Millivoltmeter URV 3,** the analog unit of the URV family, is a highly sensitive and accurate voltage and level meter for the frequency range from 10 kHz to 2 GHz (up to 3 GHz if only used as an indicator).

A broad range of accessories, such as probe, dividers, insertion units and adapters, and battery operation capability permit versatile mobile and stationary use of the voltmeter.

Applications

RF voltage measurement High-impedance measurements with RF probe in broadband amplifiers, on resonant circuits of oscillators, narrowband amplifiers and filters; measurements with impedance-matched RF insertion unit at the outputs of transmitters and other coaxial systems. True rms-value measurement possible up to 3 V and peak-value measurement from 1 V RF voltage.

Adjustment to maximum, minimum or nominal value Determination of the 3-dB points as a function of frequency.

Gain or attenuation measurement on passive or active four-terminal networks as a function of frequency (frequency response).

Level measurement in dBm referred to 0 dBm = 1 mW into Z = 50 Ω (0.2236 V), correction of level indication (according to relation 10 log $\frac{50}{Z}$): −1.76 dB at Z = 75 Ω.

Characteristics

The URV 3 affords extremely constant indication and zero setting as well as easy reading of measured values. Low capacitive and resistive loading by the RF probe minimize measuring errors introduced by detuning of resonant circuits, damping and unwanted phase shifts in feedback networks, etc. Mismatching is negligible thanks to the low reflection coefficient of the RF insertion units.

Measuring principle, measuring heads In accordance with the well-proven control method used by the URV instruments, the RF voltage is converted into a proportional DC voltage with high linearity so that the accuracy is exclusively determined by the matching of the characteristics of the diodes incorporated in the measuring head. This makes the **measuring heads of the Millivoltmeters URV 3 and URV 4 freely interchangeable** without degrading the error limits.

Depending on the order number selected, the RF probe is supplied with the URV 3; the other accessories are recommended extras.

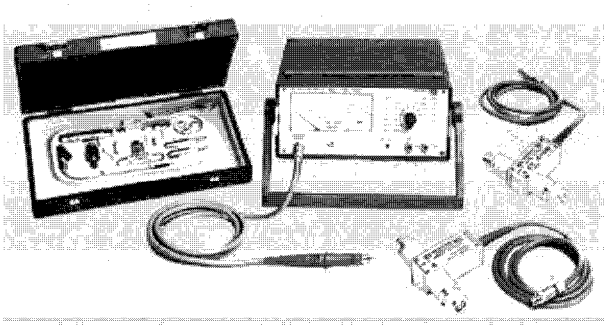
Connections and measuring possibilities:

Measurement using
probe alone (700 µV to 10.5 V, C_{in} = 2.5 pF)
probe +20-dB divider (up to 105 V, C_{in} = 1 pF)
+40-dB divider (up to 1050 V, C_{in} = 0.5 pF)
+coaxial BNC adapter (with or without divider; with 40-dB divider for instance up to 350 V)
+75-Ω adapter (RF voltage measurement in 75-Ω coaxial systems, 100 kHz to 500 MHz)

coaxial insertion units with low reflection coefficients
10-V insertion unit (700 µV to 10.5 V, 50 Ω: 10 kHz to 2 GHz, 75 Ω: 10 kHz to 1.6 GHz)
100-V insertion unit (7 mV to 105 V, 1 MHz to 2 GHz, 50 Ω)

Appropriately terminated, the 100-V insertion unit is suitable for measurements on power stages up to 200 W.

URV 3 with measuring heads and insertion units plus case accommodating small parts



Input Impedance of RF probe The input impedance of the RF probe is given by the input capacitance C_{in} (see to the right) and the parallel input resistance R_p, which is dependent on the test voltage (100 kΩ to 1 MΩ between 1 mV and 10 V) and, above 3 MHz, also on the frequency.

Indication, waveform weighting The RF voltage and level are indicated on a precision moving-coil meter on separate scales in eight subranges which can be manually selected. The level indication in dBm is valid for 50-Ω coaxial systems but can also be used to advantage for relative measurements in case of an undefined source impedance.

Rms-value measurement The URV 3 measures and reads the rms value in the three most sensitive measurement ranges. At voltages above 1 V, it measures the peak-to-peak value (V_{pp}) but reads out the value $V_{pp}/2\sqrt{2}$ corresponding to the rms value for sinusoidal voltages.

Accuracy The operational error consists of the basic error plus the frequency-response error. At room temperature the basic error is 2%; for the frequency-response error see the table below.

Frequency response error in % of reading

Measuring head	Range	10 kHz	100 kHz	1 MHz	10 MHz	100 MHz	1 GHz 2
		2 5	2 5	2		2 5	1.6 2
10-V insertion unit 50 Ω	0.1 to 10 V	Percent v.M.		1		2 5 7	12 20
	0.7 to 100 mV			2		3 7 10	12 20
10-V insertion unit 75 Ω	0.1 to 10 V			1		2 5 7	15
	0.7 to 100 mV			2		3 7 10	15
100-V insertion unit 50 Ω	1 to 100 V		20 5 2	1		2 5 7	12 20
	7 to 1000 mV		30 10 3	2		3 7 10	12 20
RF probe *)	0.1 to 10 V	20 5 2		1		3 7	18
	0.7 to 100 mV	20 5		3		5 10	15
with 20-dB divider	1 to 100 V			20	11	13	16
	7 to 1000 mV			20	13	15	20
with 40-dB divider	10 to 1000 V			15	6	8	12
	0.07 to 10 V			20	8	10	15
with 75-Ω adapter	0.1 to 10 V	20 5 2		1		3	10
	0.7 to 100 mV	20 5		3		5	12

*) Probe alone or with 20-dB or 40-dB divider in BNC adapter (50-Ω coaxial system).

Reflection coefficients

Measuring head	Z_0	10 kHz 100 kHz 1 MHz 10 MHz 100 MHz 1 GHz 2					
						2 5	1.6
10-V insertion unit	50 Ω	Reflection coefficient in %	1			2 5	10 15
	75 Ω		3			5 15	20
100-V insertion unit	50 Ω		1				2
75-Ω adapter	75 Ω		1.5			3	10

Specifications

Instrument

Test input

Parameters measured ..... voltage (V, mV)/level (dBm)
Frequency range ..... 10 kHz to 2 GHz
Voltage range ..... 700 µV to 1050 V (with dividers)
Subranges ..... 3/10/30/100 mV/0.3/1/3/10 V
Level range ..... −50 to +73 dBm
Subranges ..... −40/−30/−20/−10/0/+10/+20/+30 dBm
Level reference ..... 0 dBm corresponding to 1 mW into 50 Ω (0.2236 V)
Range of indication ..... 300 to 700 µV or −57 to −50 dBm
Connection of measuring head . three-contact socket (for URV meas. heads)

Recorder output (shortcircuit-proof)

Output voltage ..... 1 V at final value 10,
3.3 V at final value 3.3,
10 V at final value 10 in range 10 V
Output impedance ..... 1 kΩ
Polarity ..... positive, referred to ground
Connectors ..... two 4-mm sockets
Setting time ..... approx. 100 ms for test voltages >10 mV (increasing with decreasing volt.)

RF measuring heads ..... RF probe with 20-dB and 40-dB dividers as well as BNC adapter and 75-Ω adapter
10-V insertion unit (50, 75 Ω)
100-V insertion unit (50 Ω)

Input impedance of RF probe ... R_p >80 kΩ (up to 10 MHz), C_{in} = 2.5 pF
with 20-dB divider ..... R_p >1 MΩ (up to 20 MHz), C_{in} = 1 pF
with 40-dB divider ..... R_p >10 MΩ (up to 20 MHz), C_{in} = 0.5 pF

Voltage rating	V DC	V_{rms} (sinew.)	V_p
RF probe	400 V	15 V	22 V
with 20-dB divider	1000 V	150 V	220 V
with 40-dB divider			
up to 100 MHz	1000 V	1050 V	1500 V
up to 500 MHz	1000 V	210 V	1500 V
10-V insertion unit	50 V	15 V	22 V
100-V insertion unit	1000 V	150 V	220 V
75-Ω adapter (P_{max} = 2 W)	12 V	12 V	17 V

Frequency ranges

RF probe ..... 100 kHz to 1 GHz (from 20 kHz to 2 GHz if only used as indicator)
with 20-dB/40-dB divider ..... 1 to 500 MHz/0.5 to 500 MHz
10-V insertion unit, 50 Ω ..... 10 kHz to 2 GHz (up to 3 GHz if only used as indicator)
10-V insertion unit, 75 Ω ..... 10 kHz to 1.6 GHz
100-V insertion unit, 50 Ω ..... 1 MHz to 2 GHz
75-Ω adapter ..... 100 kHz to 500 MHz

Voltage ranges (level ranges Z = 50 Ω)

RF probe, 10-V insertion unit ..... 700 µV to 10.5 V/−50 to +33 dBm
RF probe with 20-dB divider ..... 7 mV to 105 V/−30 to +53 dBm
100-V insertion unit ..... 7 mV to 105 V/−30 to +53 dBm
RF probe with 40-dB divider ..... 70 mV to 1050 V/−10 to +73 dBm

Error limits (sinewave voltages)

Operational error = basic error + frequency response error (see left)

Basic error at t_{amb} +20 to +25 °C 2% of fsd
t_{amb} +15 to +30 °C 2.5% of fsd
t_{amb} + 5 to +40 °C 2.5% of fsd +2% of rdg

General data

Rated temperature range	+ 5 to +40 °C	Measuring heads
Operating temperature range	−20 to +60 °C	0 to +45 °C
Storage temperature range	−25 to +75 °C	−15 to +60 °C

Power supply ..... battery compartment for operation with: 4 single cells 1.5 V, R-20, DIN 40 866 and IEC, lead-acid accumulator or AC supply unit: external source 5 to 8 V/35 mA

Service life
Battery (alkali-manganese cells) approx. 200 h
Lead-acid accumulator ..... approx. 70 h
Dimensions, weight ..... 241 mm×110 mm×219 mm, 2.5 kg

Ordering information

Order designation ..... ▶ Millivoltmeter URV 3
URV 3 with probe 302.9014.02
URV 3 without probe 302.9014.12

Accessories supplied

RF Probe Set URV-Z7 ..... comprising earth cable with clip, earth sleeve, earth strip, hook tip, solder tip, case
(only with model 02)

4 batteries, R-20, IEC

Recommended extras

Accessories URV-Z6 ..... 292.5364.02 comprising 20-dB divider, 40-dB divider, BNC adapter URV-Z for RF probe, including reducing sleeve for dividers

For RF probe
50-Ω Adapter URV-Z50 ..... 394.9816.50
75-Ω Adapter URV-Z3 ..... 243.9118.70 comprising adapters from UNI-9 socket to 2.5/6 connector, to 1.6/5.6 connector and to BNC conn.

RF insertion units (other connectors on request)	50 Ω N connect.	50 Ω Dezifix B	75 Ω Dezifix B
10-V Insertion Unit URV-Z2	288.8010.55	288.8010.54	288.8010.74
100-V Insertion Unit URV-Z4	283.7716.55	—	—

Power Supply (6 V) EGT-Z (220/115 V, 50/60 Hz), with connecting cable for buffer operation and charging 201.5414.00
Lead-acid Storage Battery (6 V) EGT-Z 201.5437.00