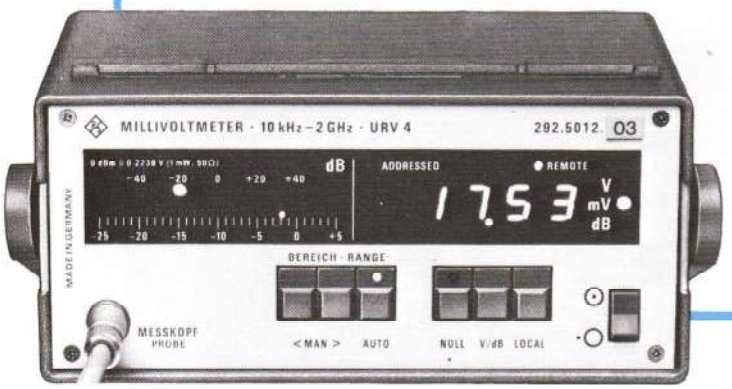
URV 4

## Millivoltmeter URV 4 ♦ 10 kHz to 2 GHz 700 µV to 1000 V/−50 to +73 dBm




- Model 02 for manual measurement
  Model 03 for manual measurement and remote controlled operation via IEC bus
- Digital readout of voltage and level, resolution 1 µV and 0.01 dB
- Additional analog level indication for trimming (rapid tendency indication), resolution 0.5 dB
- RF voltage measurement in coaxial systems up to 350 V

Scale 1:2.5

IEC625Bus

The **URV 4** – the first digital meter of the URV series – is a highly sensitive and accurate **millivoltmeter** measuring RF voltages and levels from 10 kHz to 2 GHz, up to 3 GHz if only used as indicator. Both high-impedance measurements using the probe of low capacitive loading and voltage measurements in any coaxial system (up to 350 V) or systems of standard characteristic impedance (50 and 75 Ω) are possible. To this end a comprehensive range of accessories such as probes and measuring heads is available.

**System compatibility** The URV 4 is available with and without IEC-bus interface, the characteristics remaining the same. In addition to the conventional applications (see also URV 3), the instrument fitted with the IEC-bus connector is especially suitable for use in automatic test assemblies and systems.

**The digital display** gives a readout of the voltage or the level. Its high resolution and accuracy (4000 steps for measuring voltage; 10,000 steps without autoranging) is optimally matched to the overall accuracy of the measuring head and the meter. The measurement ranges can also be pushbutton-selected after switching off the autoranging. The levels are indicated directly in dB relative to 1 mW into 50 Ω in all subranges. When the unknown signal falls out of the selected subrange, the display of the URV 4 flashes.

**Additional analog indication** To facilitate trimming (tendency indication) and for coarse measurements an additional analog indication is provided on the URV 4 in the form of a row of LEDs. The coverage is 30 dB in steps of 1 dB. Since two LEDs light between steps, level differences of 0.5 dB are discernible. The reference value for the analog scale can be taken from the five additional range indications.

**Automatic zeroing** The URV 4 features automatic zeroing for voltage measurements in the most sensitive measurement range. It sets the electrical zero at a keystroke doing away with the tedious and error-prone zero setting by means of a zero adjustment potentiometer. Zero correction is not required in the higher measuring ranges.

A level-proportional DC voltage (100 mV/dB) is available at the **recorder output** provided on the rear panel of the URV 4. Thus with the aid of automatic ranging continuous recording is possible over a dynamic range of 83 dB.

The URV 4 can be powered from the **AC supply** or an external battery (automatic switchover depending on available AC supply voltage).

**Measuring heads** (probes, insertion units, adapters)

The measuring heads are freely interchangeable – also with those of the URV 3. The RF probe set is supplied with the URV 4, the other extras are recommended for use with the set.

| | |
|---|---|
| RF probe alone: | 700 µV to 10 V<br>100 kHz to 1 GHz (indicator up to 2 GHz) |
| RF probe + 20-dB divider: | 7 mV to 100 V/2 to 500 MHz |
| + 40-dB divider: | 70 mV to 1000 V/1 to 500 MHz |
| + BNC adapter | (with or without divider): measurement in any coaxial system up to 350 V (probe +40 dB) |
| + 75-Ω adapter: | 700 µV to 10 V/100 kHz to 500 MHz |
| 10-V insertion unit; 50 or 75 Ω: | 700 µV to 10 V<br>10 kHz to 2 GHz (50 Ω) |
| 100-V insertion unit; 50 Ω:<br>(for powers up to 200 W) | 7 mV to 100 V<br>1 MHz to 2 GHz |

Case containing accessoires and recommended extras

**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.

**Waveform weighting** The URV 4 measures and reads out 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. The following table gives **permissible crest factors** for different test voltages with a weighting error of 2 and 5% **(blue for peak-value measurement).**

| Probe + | 10-V insertion unit | 20-dB divider + 100-V insertion unit | 40-dB divider |
|---|---|---|---|
| Error | 2 / 5% | 2 / 5% | 2 / 5% |
| $V_{meas}$ | crest factor | crest factor | crest factor |
| 3 mV | 10 / 13 | | |
| 10 mV | 3 / 4 | | |
| 30 mV | 1.7 / 2 | 10 / 13 | |
| 100 mV | | 3 / 4 | |
| 300 mV | | 1.7 / 2 | 10 / 13 |
| 1 V | 2.2/3.8 | | 3 / 4 |
| 3 V | 4.1/7.2 | | 1.7 / 2 |
| 10 V | 8.0/ 15 | 2.2/3.8 | |
| 30 V | | 4.1/7.2 | |
| 100 V | | 8.0/ 15 | 2.2/3.8 |
| 300 V | | | 4.1/7.2 |
| 1000 V | | | 8.0/ 15 |

**Accuracy** The operational error consists of the basic error plus the frequency-response error; see the corresponding tables.

**Basic error** in the indicating range 300 to 4000 or −20 to +5 dBm on the analog scale

| | Voltage measurement *) | | Level measurement *) | | |
|---|---|---|---|---|---|
| | 4 mV to 10 V | 0.7 to 4 mV | 35 to+33 dBm | -45 to -35 dBm | -50 to -45 dBm |
| +20 to +25 °C | 1 % of rdg + 3 digits | 1 % of rdg + 30 digits | 0.2 dB | 0.4 dB | 0.6 dB |
| +15 to +30 °C | 2 % of rdg + 3 digits | 2 % of rdg + 40 digits | 0.3 dB | 0.6 dB | 0.8 dB |
| + 5 to +40 °C | 3 % of rdg + 5 digits | 5 % of rdg + 50 digits | 0.5 dB | 1 dB | 1.2 dB |

*) Used only as indicator at voltages < 0.7 mV or levels < −50 dBm.

**Frequency-response error** (reflection coefficients as for URV 3)

| Measuring head | Range | 10 kHz 2 | 5 | 100 kHz 2 | 5 | 1 MHz 2 | 10 MHz | 100 MHz 2 | 5 | 1 GHz 1.6 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-V insertion unit 50 Ω | 0.1 to 10 V | Prozent 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).

## Specifications

### Instrument

**Test input**

Parameters measured ..... voltage/level (dBm)
**Frequency range** ..... 10 kHz to 2 GHz
**Voltage range** ..... 700 µV to 1000 V
Subranges ..... 4/40/400 mV/4/10 V
**Level range** ..... −50 to +73 dBm
Subranges ..... −40/−20/0/+20/+40 dB
Level reference ..... 0 dBm corresponding to 0.2236 V (1 mW into 50 Ω)
Range of indication ..... 300 to 700 µV
Range setting ..... autoranging
pushbuttons for manual setting to next higher/lower subrange

**Auto zeroing** ..... electronic zeroing by pushbutton control for measuring RF voltages <4 mV

**Readout of measured value**

Range indication, analog ..... 5 LEDs for subranges
digital ..... decimal point and unit (mV/V/dB)
Digital display
Voltage ..... 4 digits (4000 steps, 10,000 steps without autoranging), resolution 1 µV
Level ..... 4 digits plus polarity sign, res. 0.01 dB
Analog level indication ..... row of 31 LEDs
Indication range ..... −25 to +5 dB, step size 1 dB, resolution 0.5 dB

**Recorder output** ..... 1 kΩ, shortcircuit-proof
Output voltage ..... positive or negative level-proportional DC voltage, 0 V at 0 dBm (223.6 mV), 100 mV per dB input level variation
Dynamic range ..... 83 dB corres. to −5 to +3.3 V

**IEC-bus connector** (model 03) .. interface in accordance with IEC 625-1 for controlling the operating modes
Interface functions ..... SH1, AH1, T5, L4, SR1, RL1, DC1
Setting time ..... level-dependent, up to 30 meas./s

**Connection of measuring head** . three-contact female connector (for URV measuring head)

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 | 7 V |

**Frequency ranges**

RF probe ..... 100 kHz to 1 GHz (2 GHz)
with 20-dB/40-dB divider ..... 2 to 500 MHz/1 to 500 MHz
10-V insertion unit 50 Ω ..... 10 kHz to 2 GHz (indicator: 3 GHz)
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)

RF probe, 10-V insertion unit ..... 700 µV to 10 V/−50 to +33 dBm
RF probe with 20-dB divider, 100-V insertion unit ..... 7 mV to 100 V/−30 to +53 dBm
RF probe with 40-dB divider ..... 70 mV to 1000 V/−10 to +73 dBm

Error limits ..... see lefthand column under accuracy

### General data

Rated temperature range ..... +5 to +40 °C
Operating temperature range .... −20 to +60 °C (measuring head: 0 to +45 °C)
Storage temperature range ..... −25 to +75 °C (measuring head: −15 to +60 °C)
Power supply, AC supply ..... 115/220 V ±10%, 47 to 440 Hz (4 VA, model 03: 6 VA)
ext. battery ..... 11 to 28 V, 300 (450) mA at 12 V
Dimensions, weight ..... 241 mm×110 mm×219 mm, 2.6 kg (2.9 kg)

### Ordering information

**Order designation** ..... ▶ Millivoltmeter URV 4 with probe
URV 4 without IEC-bus connector . 292.5012.02
with IEC-bus connector ... 292.5012.03

**Accessories supplied**

RF Probe Set URV-Z7, same as for URV 3, connector for battery; power cable

**Recommended extras**

Accessories URV-Z6, 50-Ω/75-Ω adapter and RF insertion units as for URV 3 on page 259

Adapter ZZA-1 for 19" racks ..... 078.8016.00