

# 3710A

## Wideband RMS meter

# apparateq

Electronics for Research and Science



- True RMS measurement
- Auxiliary noise statistics, such as peak-to-peak voltage
- Wide frequency range
- Low noise floor
- High accuracy
- Simple operation
- GUI available
- Selection of bandwidths
- Replaces elaborate setups using legacy equipment
- Ideal for eg. power supply testing
- Designed to be connected to energized power supplies

The 3710A offers a simple, accurate and reliable way to carry out measurements of AC RMS voltage over a wide frequency range. Additional noise statistics enhances the use of the 3710A as a noise analyzer.

For the test of power supplies the 3710A is particularly suited. The production test or servicing of a variety of supplies call for the measurement of the noise over a bandwidth of typically 10 or 20 MHz. This has often involved the use of legacy equipment, no longer in production. Also, it has often been a challenge to ensure reliable measurement results, especially under real-life conditions in noisy environments. With the 3710A, such measurements are made swiftly, accurately, and safely.

The 3710A includes a bandwidth setting that allows you to carry out measurements in different bandwidths, including those commonly required for power supply testing. Also, equally important for the testing of power supplies, the 3710A may be connected directly to an energized power supply thanks to its input protection circuitry.

The 3710A contributes only little to the noise being measured. First of all, the 3710A has a low noise floor. Secondly, the design isolates the front end from the interfaces and from its power supply so that ground loops are avoided and capacitively coupled noise is suppressed.

**apparateq**

Apparateq ApS  
Fuglegårdsvænget 30  
DK-2820 Gentofte, Denmark

Tel.: +45 26 59 65 44  
E-mail: [sales@apparateq.com](mailto:sales@apparateq.com)  
Web: [www.apparateq.com](http://www.apparateq.com)

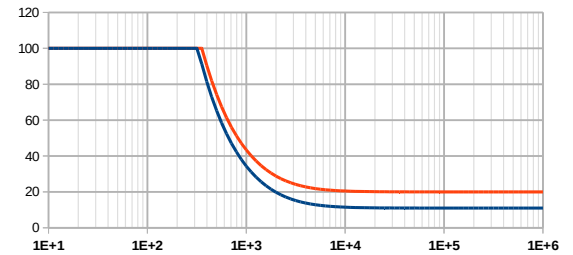
### Specifications and characteristics

|                                   |                                                                                                          |
|-----------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Input range *) **)</b>         | L = 100 mVp full scale, 10 mV RMS @ crest factor 10<br>H = 5 Vp full scale, 500 mV RMS @ crest factor 10 |
| <b>Frequency range *)</b>         | 10 Hz – 20 MHz / 10 MHz / 1 MHz / 100 kHz, ±10%,<br>@ -3dB, user selectable ***)                         |
| <b>Input protection</b>           | DC: Up to 200 V<br>AC: Up to 100 V RMS or 150 Vp up to 300 Hz, derated<br>as shown on the graph.         |
| <b>Accuracy @ 1 kHz *)</b>        | Within ±0.25 %                                                                                           |
| <b>Flatness, re. 1 kHz *)</b>     | 20 MHz range: Over 100 Hz – 10 MHz: Within ±2 %<br>10 MHz range: Over 100 Hz – 5 MHz: Within ±2 %        |
| <b>Temperature coeff. *)</b>      | 0.02 %/K up to 50 % of cut-off<br>0.05 %/K above 50 % of cut-off                                         |
| <b>Input noise *)</b>             | Most sensitive range L:<br>≤6 nV/√Hz, or 27 μV in 20 MHz bandwidth                                       |
| <b>Input impedance *)</b>         | 1 MΩ @ DC                                                                                                |
| <b>Measures (incl. terminals)</b> | 164 mm (L) x 108 mm (W) x 48 mm (H)                                                                      |

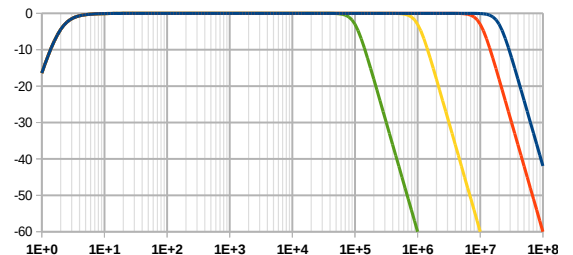
\*) Preliminary specifications; The parameters are yet to be fully characterized.

\*\*) The crest factor of a signal is its peak value divided by its RMS value

\*\*\*) In accordance with theory, the noise bandwidth of the 3710A is slightly larger than the -3dB bandwidth



The maximum allowed RMS voltage over the frequency range; Orange = High range, Blue = Low range.



The frequency response for the different filter settings, from 100 kHz (green) to 20 MHz (blue).

The 3710A is based on a low-noise, balanced front-end with adjustable bandwidth, followed by a pseudo-random sampling stage and a data interface. The data processing and the extraction of statistics are handled by software in the user interface.

The design provides both a wide bandwidth, high dynamic range, high accuracy, a flat response, and does not depend on the signal shape. The 3710A is, in other words, a true RMS responding instrument.

The 3710A does not suffer from the drawbacks of the legacy gear that designers often have had to use when measuring RMS: Burnt thermocouples, overload recovery issues, a poorly defined bandwidth and perhaps range dependent, an accuracy depending on the signal level, safety issues with rail voltages, and so on.

So, what about today's digital oscilloscopes which have RMS and Vpp measurement features? It's true that oscilloscopes are often put into use for PARD \*) measurements, but this is not ideal. First, it may not be safe to connect an oscilloscope to a supply, as its chassis may inadvertently be connected to the rail of the power supply. Secondly, the oscilloscope's supply may inject unwanted mains noise into the test setup. Finally, oscilloscopes do not target low-noise measurements, and may provide too high an RMS reading at low levels.

\*) PARD: Periodic And Random Deviations of the output voltage from the power supply. The "periodic deviations" originate from mains and switching frequencies. The "random deviations" represent the remaining, uncorrelated noise components.

*Need perhaps a cleaner supply voltage? Take a look at our PS-series or PSC series of power supply filters, or at our optical power isolators with ultimate isolation for sensitive applications.*

As a valuable add-on feature, the 3710A provides auxiliary statistics, derived from the sampled data. These statistics include the peak-to-peak voltage over a selected period of time, and a peak hold function, which shows the maximum value until it's being reset by the user. Other statistics included are skewness (the symmetry of the probability density function) and kurtosis (the "peakedness" of the probability density function.) The statistics as well as the RMS measurement may be saved for documentation of the device being tested.

The 3710A comes with two sets of interconnection cables, both having shrouded safety banana plugs for the input of the 3710A. The other end, to be connected to the device under test, has shrouded safety banana plugs or spade lugs. A separate grounding wire may be used to connect the 3710A enclosure to the chassis of the device under test. The cables are kept short for the purpose of noise testing. A touch-protected adapter from banana plugs to BNC female is included, too.

| Cable end for 3710A               | Cable end for the DUT             | Length | Apparateq order # |
|-----------------------------------|-----------------------------------|--------|-------------------|
| Shrouded banana plug x 2, and GND | Shrouded banana plug x 2, and GND | 30 cm  | RMS-CA-01         |
| Shrouded banana plug x 2, and GND | Spade lug x 2, and GND            | 30 cm  | RMS-CA-02         |

Additional cables can be ordered under the listed order numbers. For custom connectors or cable lengths contact Apparateq.