

## New Power Sensors for R&amp;S®NRP, NRT und FSH

# When it comes to power measurements, a reliable sensor is a must

**Power measurements are pivotal in RF and microwave. Even though frequency-selective measurements with spectrum analyzers are gaining in importance, broadband power sensors will remain your first choice when it comes to high measurement speed, low measurement uncertainty and a favourable price/performance ratio. Rohde & Schwarz has again expanded its sensor families by adding four new types (FIGs 1 and 2).**

## Highly efficient

The four new sensors have one characteristic in common: They all feature rms detectors that ensure "correct" measurements even with modulated, harmonic and spurious signals. Correct, in this case, means that the detectors provide an output signal that is proportional to the average power or, as is the case with the R&S®NRT-Z14 and R&S®FSH-Z14 sensors, that follows the envelope power. The envelope power is the signal power during a carrier period, and the average power is an integral value during a modulation period or a first-order expected value for stationary nonperiodic signals. Average power and peak envelope power (PEP) are key parameters for RF and microwave signals. The average power directly determines the propagation range, and the PEP is a quantity for the electrical loads of the components involved in signal transmission and signal generation.

## R&S®NRP-Z55

Thermal sensors have traditionally been used for power measurements. Despite their relatively small dynamic range, they are still the first choice when it comes to high measurement accuracy. This is especially true for the thermal sensors from Rohde & Schwarz, which

feature very low measurement uncertainties over the entire frequency and power range because of their outstanding matching and their customized linearity. Yet the Thermocouple Power Sensor R&S®NRP-Z55 goes even a step further – neither measurement range selection nor the base unit impair the power sensor's measurement accuracy. It is thus a highly accurate reference sensor with a continuous frequency range from DC to 40 GHz. And by controlling the sensor directly via the USB interface of a PC, you obtain a measurement solution with an unrivalled price/performance ratio.

## R&S®NRP-Z91

This new power sensor is highly versatile. Featuring a dynamic range of 90 dB and a frequency range of 9 kHz to 6 GHz, it is ideal for anyone who needs to measure and control RF. Like all other R&S®NRP sensors, it can be directly operated from the USB interface of a PC and is thus suitable for integration into price-sensitive EMC measurement systems. From a technical standpoint, this new sensor represents an innovative multipath architecture [\*] that is currently available only from Rohde & Schwarz. Three simultaneously functioning measurement paths and special detector diodes with a large square-law region ensure

FIG 1 The new sensors at a glance.

Type	Function/technology	Frequency range	Power range	Measurement functions
R&S®NRP-Z55	Thermocouple terminating sensor	DC to 40 GHz	1 µW to 100 mW	Average power
R&S®NRP-Z91	3-path diode terminating sensor	9 kHz to 6 GHz	200 pW to 200 mW	Average power
R&S®NRT-Z14 and R&S®FSH-Z14	Directional power sensor for power and matching measurements	25 MHz to 1 GHz	30 mW to 300 W	Average power, peak power, matching



FIG 2 Rohde & Schwarz again expands its families of sensors by adding four new types.

accurate measurement results plus short measurement times. Moreover, intelligent noise filtering, settable integration times, and gamma and S-parameter correction combine to provide the measurement convenience that is to be expected from a state-of-the-art power meter.

### R&S®NRT-Z14 and R&S®FSH-Z14

These two intelligent sensors are actually small measurement systems. Equipped with a double directional coupler and power sensors for forward and reflected power, they can perform power and matching measurements in the classic radiocommunications frequency bands. The R&S®NRT-Z14 can be operated either on the R&S®NRT base unit or a PC, while the R&S®FSH-Z14 has

been designed for use on the Hand-held Spectrum Analyzer R&S®FSH. The power sensor was designed to permit direct measurements on transmitters and antennas in field applications, production and research and development without having to insert additional directional couplers or attenuator pads. The new sensors are based on the same concept used with the successful R&S®NRT-Z43 / -Z44 sensors and, like them, offer outstanding measurement characteristics: 30 dB directivity for accurate matching and power measurements, immunity to harmonics and spurious (they can therefore be used directly at amplifier output stages), low calibration uncertainty and possible peak power measurement with a settable video bandwidth (4 kHz / 200 kHz / 600 kHz). Moreover, the R&S®NRT-Z14 sensor can measure the average power

of modulated and unmodulated RF bursts as well as the amplitude distribution (CCDF). Both sensors are, of course, virtually free of interaction with the measurement setup. Due to low insertion loss and excellent matching, they do not affect a test setup any more than does a segment of a coaxial cable of the same length. This makes the sensors ideal for monitoring applications.

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More information and data sheets at [www.rohde-schwarz.com](http://www.rohde-schwarz.com) (search term: type designation)

#### REFERENCES

- [\*] Power Meter R&S®NRP – Evolution in power measurement – intelligent sensor technology. News from Rohde & Schwarz (2002) No. 174, pp 12–16