



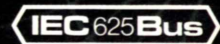
ROHDE & SCHWARZ

ZPV

VECTOR ANALYZER

0.1 to 2000 MHz

Intelligent vector voltmeter for direct measurement of complex quantities



VECTOR ANALYZER ZPV

measures and indicates directly on a digital readout:

complex voltage and voltage ratio

s parameters, impedance, admittance, reflection coefficient, VSWR, return loss, transmission factor and transfer constant

group delay and group-delay variation

delivers any desired representation:

linear or logarithmic

absolute or normalized

polar or cartesian

digital on 2 four-digit readouts, analog on 2 tendency indications, on recorders or display units via analog outputs

offers optimum operating convenience due to built-in "intelligence"

can be extended to form a calculator-controlled network analyzer system

Uses

Vector measurement Automation of test setups

The Vector Analyzer ZPV implements a completely new, elegant technique for the measurement of complex quantities. The basic unit consists of a **dual-channel vector voltmeter** measuring according to magnitude and phase and a **microprocessor-controlled analyzer section** weighting, normalizing and converting the measured voltage vectors into the desired complex quantity. Thus the ZPV outdoes conventional analog vector voltmeters in operating convenience and display possibilities. Its typical applications are control engineering, crystal, antenna and amplifier measurements, etc.

Various options permit the intelligence of the set to be matched with the requirements of the specific application. The **IEC-bus Option ZPV-B1** enables use of the ZPV in automatic test systems. The Vector Analyzer is ideal for automating test setups which are to measure the phase in addition to the voltage.

Two-port measurement

When using the **s-parameter Option ZPV-B2** the application range of the set is extended considerably. In this case, direct indication of the measured impedance, admittance, s parameter, VSWR, etc., is obtained. Elaborate mathematical transformations or aids, such as transformation diagrams, e.g. the Smith chart, are no longer required and the resulting graphic inaccuracies and pos-

sible reading errors are excluded. The desired quantity is displayed on a digital readout. The fully automatic operation of the ZPV simplifies two-port measurements such that they can also be performed by unskilled personnel.

Group-delay measurement

The **Group-delay Option ZPV-B3** permits group-delay measurement of high accuracy (down to 1 ns, typ.), the group delay or group-delay variation being directly displayed on a digital readout. When using this option, the ZPV is especially suitable for manual or automatic checking of two-port nominal characteristics, e.g. in servicing or goods outwards inspection.

Cost-effective use in two-port measurements and fully automatic test assemblies

The possibility of combining the ZPV with virtually all conventional signal generators is essential for its extremely favourable price/performance ratio. This applies in particular to two-port measurements. Since in most cases this equipment is already available, it is often sufficient to buy a ZPV for enabling network analyses and other complex measurements. To ensure fully automatic operation, the ZPV can be combined with any IEC-bus-compatible processor and the corresponding synthesizers so that fully automatic systems can be set up at a particularly economical price.

Characteristics

Great operating convenience

The clear and non-confusing front panel includes large, illuminated keys which optically indicate every device status set. These pushbuttons are arranged in function-determined groups; senseless combinations are electronically inhibited. Very legible digital displays plus alpha- numerics for the dimension make for results that can be read off quickly and without error. For adjustment purposes, a quasi-analog linear indication is available, permitting adjustment points such as maxima or phase zero crossings to be found rapidly.

Amplitude and frequency autoranging

Range selection is fully automatic due to the built-in microprocessor so that the measured value can be read off directly after selecting the mode and physical unit. For swept-frequency operation and special display modes the amplitude and frequency autoranging facilities can be disconnected.

Automatically tuned filter

The ZPV incorporates an automatically tuned filter which provides for stable indication of noise-corrupted test signals. The microprocessor analyzes the stability of the signal and determines the time constant required for fluctuation-free display of the result.

Calibration at the push of a button

For complex measurements a reference plane has to be defined. This is done in the ZPV at the push of button, determining phase zero, magnitude = unity and reference characteristic impedance. These values are stored in the built-in microprocessor and maintained even when changing the test mode so that new calibration is required only if the test setup is modified. For two-port measurements it is best to use a balanced test setup so that the same calibration conditions exist for all frequencies. If the test setup is frequently changed, an adjustable short helps to obtain equal test conditions. In the case of fully

automatic operation using calculator control this aid is not required since the routine is able to calculate the reference plane from the frequency information.

Microprocessor-controlled recorder outputs

Control voltages monitored by the microprocessor ensure that high-precision signals are always available at the X and Y outputs. Transient response of the synchronization stage due to sampling is suppressed. Consequently the Vector Analyzer ZPV can also be used in swept-frequency operation; however, the sweep rate of the ZPV, which is slow compared with sweeper display units, has to be considered. The test results obtained in swept-frequency checkouts can be plotted on a recorder or displayed on a storage oscilloscope up to a dynamic range of 110 dB. For narrowband sweeping, for instance in crystal testing, additional special outputs are available.

Variety of display

The two digital readouts of the ZPV indicate both components of the measured complex quantity. The display can be in cartesian or polar coordinates, linear, logarithmic, absolute or relative. For an overview of the different possibilities of test result representation see pages 4 and 5.

System compatibility

With the IEC-bus Option ZPV-B1 the ZPV becomes fully programmable. The IEC bus permits both setting of all modes on the instrument and outputting of all test results. Various methods of data transfer ensure optimum data transmission speed. In addition to the separate output of real and imaginary components or magnitude and phase, the complete complex quantity can be transmitted as one data word. The readout is either dependent on the measurement time or independent of time so that optimum use of the measurement speed is made. Manually selected modes can be output via the IEC bus. Basic Software ZPV-K1 and ZPV-K2 facilitate programming of automatic measurements with the desktop Tektronix Graphic Computing System 4051, permitting whole program sections to be called up by means of code numbers (see page 10).