

# Signal Generation

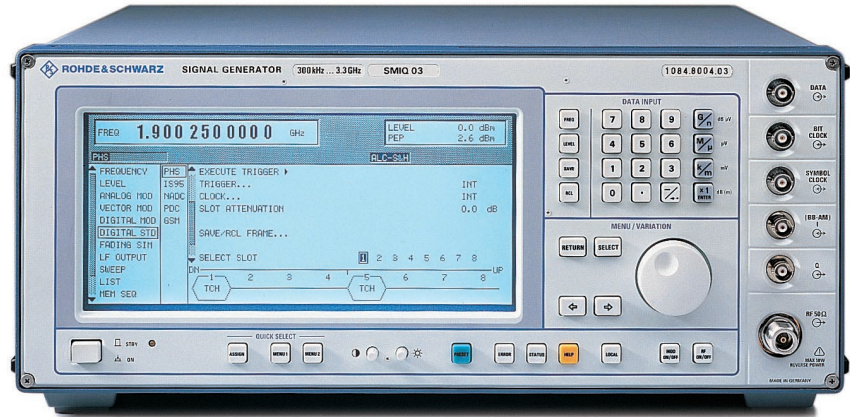
## Vector Signal Generator SMIQ

**SMIQ02/02E: 0.3 to 2.2 GHz**

**SMIQ03/03E: 0.3 to 3.3 GHz**

**Digital signals of your choice**

SMIQ03 (photo 42807)



### Brief description

The Rohde&Schwarz signal generators of the SMIQ family feature both analog and digital modulation to keep pace with the present-day and future

rapid development in the field of digital modulation.

The signal generator family comprises four models which differ in their fre-

quency range and main fields of application.

SMIQ02 and SMIQ03 feature a hitherto unrivalled versatility regarding signal generation and signal quality and are therefore ideal for use in development and type-approval testing.

### Applications, options

| Application                                 | Required option       | SMIQ02E | SMIQ03E | SMIQ02 | SMIQ03 |
|---|-----------------------|---------|---------|--------|--------|
| <b>Digital modulation</b>                   |                       |         |         |        |        |
| GFSK  | SMIQB10               | ●       | ●       | ●      | ●      |
| GMSK  | SMIQB10               | ●       | ●       | ●      | ●      |
| $\pi/4$ DQPSK                               | SMIQB10               | ●       | ●       | ●      | ●      |
| All other digital modulation modes          | SMIQB10               | –       | –       | ●      | ●      |
| Internal data generator incl. 4 Mbit memory | SMIQB11               | ●       | ●       | ●      | ●      |
| <b>Digital mobile radio standards</b>       |                       |         |         |        |        |
| PHS   | SMIQB10 + -B11        | ●       | ●       | ●      | ●      |
| NADC  | SMIQB10 + -B11        | ●       | ●       | ●      | ●      |
| PDC   | SMIQB10 + -B11        | ●       | ●       | ●      | ●      |
| GSM   | SMIQB10 + -B11        | ●       | ●       | ●      | ●      |
| IS-95 CDMA                                  | SMIQB10 + -B11 + -B42 | ○       | ○       | ○      | ○      |
| <b>Fading simulation</b>                    |                       |         |         |        |        |
| 1 channel/6 paths                           | SMIQB14               | –       | –       | ●      | ●      |
| 1 channel/12 paths                          | SMIQB14 + -B15        | –       | –       | ●      | ●      |
| 2 channels/6 paths each (with second SMIQ)  | SMIQB14 + -B15        | –       | –       | ●      | ●      |

● Included in option      ○ Can be retrofitted      – Not available

The economy models SMIQ02E and SMIQ03E have especially been designed for the needs in production environments and satisfy the requirement for an economically attractive solution with an outstanding price/performance ratio.

### Main features

- Versatile and broadband generation of digitally modulated signals up to 7 Msymbol/s
- Analog and digital modulation capabilities
- Generation of TDMA and CDMA signals to all main mobile radio standards
- Broadband I/Q modulator with outstanding vector accuracy
- Optional internal fading simulator to test specifications of mobile radio standards
- Three-year calibration cycle

# Signal Generation

| Option/function/software                   | Designation | SMIQ02E | SMIQ03E | SMIQ02 | SMIQ03 | Order No.    |
|--|-------------|---------|---------|--------|--------|--------------|
| Frequency range up to 3.3 GHz              |             | ○       | ●       | ○      | ●      |              |
| Reference Oscillator OCXO                  | SM-B1       | ○       | ○       | ○      | ○      | 1036.7599.02 |
| FM/φM Modulator                            | SM-B5       | ●       | ●       | ○      | ○      | 1036.8489.02 |
| Modulation Coder                           | SMIQB10     | ○*      | ○*      | ○      | ○      | 1085.5009.02 |
| Data Generator (incl. 4 Mbit memory)       | SMIQB11     | ○       | ○       | ○      | ○      | 1085.4502.02 |
| Memory Extension 8 Mbit                    | SMIQB12     | ○       | ○       | ○      | ○      | 1085.2800.02 |
| Fading Simulator (6 paths)                 | SMIQB14     | –       | –       | ○      | ○      | 1085.4002.02 |
| Fading Simulator (with 6 additional paths) | SMIQB15     | –       | –       | ○      | ○      | 1085.4402.02 |
| IS-95 CDMA (Digital Standard)              | SMIQB42     | ○       | ○       | ○      | ○      | 1104.7936.02 |
| Fast CPU                                   | SM-B50      | –       | –       | ○      | ○      | 1104.8410.02 |
| Low ACP for W-CDMA chip rate 4096 MHz      |             | ○       | ○       | ○      | ○      | 1105.0006.02 |
| Rear Connectors                            | SMIQB19     | ○       | ○       | ○      | ○      | 1085.2997.02 |

● Included in basic model ○ Can be retrofitted – Not available

\* Limited functionality

## Specifications in brief

### Frequency

|   |   |                           |
|---|---|---------------------------|
| Range SMIQ02/SMIQ02E  | 300 kHz to 2.2 GHz                      |                           |
| SMIQ03/SMIQ03E  | 300 kHz to 3.3 GHz                      |                           |
| Resolution  | 0.1 Hz                                  |                           |
| Reference frequency   | Standard                                | Option SM-B1              |
| Aging (after 30 days of operation)                              | $1 \times 10^{-6}$ /year                | $< 1 \times 10^{-7}$ /day |
| Temperature effect (0 to 50°C)                                  | $2 \times 10^{-6}$                      | $< 5 \times 10^{-8}$      |
| Spectral purity   |   |                           |
| Harmonics at level $\leq 10$ dBm                                | $< -30$ dBc                             |                           |
| SSB phase noise at 1 GHz, carrier offset 20 kHz, 1 Hz bandwidth | CW                                      | Vector modulation         |
| SMIQ02/SMIQ03   | $< -126$ dBc                            | $< -123$ dBc              |
| SMIQ02E/SMIQ03E   | $< -116$ dBc                            | $< -113$ dBc              |
| Level   | $-140$ to $+13$ dBm (PEP) <sup>1)</sup> |                           |
| Resolution  | 0.1 dB                                  |                           |
| Total uncertainty for levels                                    |   |                           |
| $> -127$ dBm: $f < 2$ GHz/ $f > 2$ GHz                          | $\pm 1$ dB/ $\pm 1.5$ dB                |                           |
| Frequency response at 0 dBm                                     | $< 1$ dB, typ. $< 0.3$ dB               |                           |

### Modulation

|                                |  |
|--------------------------------|--|
| Internal modulation generator  | 0.1 Hz to 1 MHz, resolution 0.1 Hz   |
| Amplitude modulation           | internal, external AC/DC   |
| Modulation depth               | 0 to 100%  |
| Modulation frequency range     | DC to 50 kHz (RF $> 5$ MHz)  |
| Broadband amplitude modulation | external DC  |
| Modulation frequency range     | DC to 30 MHz   |
| Vector modulation              | external DC  |
| Modulation frequency range     | 30 MHz ( $-3$ dB)  |
| Envelope control               | RF level can be controlled with an analog voltage of 0 to 1 V via the POWER RAMP input |

### Digital modulation with optional Modulation Coder SMIQB10

|                              |  |
|------------------------------|--|
| Internal PRBS                | int., ext. serial, ext.l parallel<br>selectable lengths: $2^9-1$ , $2^{15}-1$ ,<br>$2^{16}-1$ , $2^{20}-1$ , $2^{21}-1$ and $2^{23}-1$ |
| Envelope control             | external or external   |
| Function range               | 1 ksymbol/s to 2.5 Msymbol/s   |
| Modulation modes SMIQ02/03   | 2FSK, 4FSK, GFSK, GMSK, BPSK, QPSK, OQPSK, $\pi/4$ DQPSK, $\pi/4$ QPSK, 8PSK, 16QAM, 32QAM, 64QAM, 256QAM                              |
| Symbol rate FSK, GMSK        | 1 ksymbol/s to 2.5 Msymbol/s   |
| PSK, QAM                     | 1 ksymbol/s to 7 Msymbol/s   |
| Baseband filter              | $\sqrt{\text{cos}}$ , cos, Gauss and Bessel  |
| Modulation modes SMIQ02E/03E | GFSK, GMSK, $\pi/4$ DQPSK  |
| Symbol rate                  | 1 ksymbol/s to 1.3 Msymbol/s   |

### Data generator (option SMIQB11)

Programmable data memory for modulation data, envelope-control and trigger signals. The data generator can be operated only in conjunction with the optional modulation coder.  
Memory capacity 4 Mbit, up to 20 Mbit with SMIQB12

### Modes

automatically repeating, single shot, manually or externally triggered

### Digital standards with options SMIQB10 and SMIQB11

GSM, NADC, PDC, PHS, CDMA, IS-95

### Fading simulation with SMIQ02/SMIQ03 with options SMIQB14, SMIQB15

|                               |  |
|-------------------------------|--|
| RF bandwidth ( $-3$ dB)       | $> 14$ MHz   |
| Number of paths and channels  |  |
| with option SMIQB14           | 6 paths, 1 channel   |
| with options SMIQB14 and -B15 | 12 paths, 1 channel, or 6 + 6 paths, 2 channels with second SMIQ |
| Path attenuation              | 0 to 50 dB   |
| Path delay                    | 0 to 1600 $\mu$ s  |
| Doppler shift                 | 0.1 to 1600 Hz   |

### Modulation with SMIQ02/SMIQ03 with option SM-B5

|                                  |  |
|----------------------------------|--|
| Frequency/phase modulation       | internal, external AC/DC, two-tone with two modulation channels depending on carrier frequency |
| Max. deviation                   | 500 kHz to 2 MHz/5 to 20 rad   |
| FM/φM                            | DC to 2 MHz/DC to 100 kHz  |
| Modulation frequency range FM/φM |  |

### Modulation with SMIQ02E/SMIQ03E

|                               |   |
|-------------------------------|---|
| Frequency/phase modulation    | internal, external AC/DC, two-tone with two modulation channels; with PM: bandwidth 2 MHz only for channel 2 depending on carrier frequency |
| Max. deviation                | 5 to 20 MHz   |
| FM                            | 50 to 200 rad/2.5 to 10 rad   |
| φM, bandwidth 100 kHz/2 MHz   | DC to 8 MHz   |
| Modulation frequency range FM |   |

### General data

|                        |  |
|------------------------|--|
| Remote control         | IEC 625 (IEEE 488)   |
| Command set            | SCPI 1993.0  |
| Power supply           | 90 to 132 V/180 to 265 V (autotesting), 47 to 440 Hz (max. 300 VA) |
| Dimensions (W x H x D) | 435 mm x 192 mm x 460 mm   |
| Weight                 | 25 kg when fully equipped  |

## Ordering information

|                                |                |                       |              |
|--------------------------------|----------------|-----------------------|--------------|
| <b>Vector Signal Generator</b> | 0.3 to 2.2 GHz | SMIQ02                | 1084.8004.02 |
|                                | 0.3 to 3.3 GHz | SMIQ03                | 1084.8004.03 |
|                                | 0.3 to 2.2 GHz | SMIQ02E               | 1106.1506.02 |
|                                | 0.3 to 3.3 GHz | SMIQ03E               | 1106.1506.03 |
|                                | 0,3 to 3,3 GHz | SMIQ03A <sup>2)</sup> | 1084.8004.53 |

### Options

see above

### Extras

|                     |       |              |
|---------------------|-------|--------------|
| Service Kit         | SM-Z3 | 1085.2500.02 |
| Service Manual SMIQ |       | 1085.2445.24 |

<sup>1)</sup> PEP = peak envelope power.

<sup>2)</sup> SMIQ03 including Option SM-B50.