



**ROHDE & SCHWARZ**

Test and Measurement  
Division

## **Operating Manual**

# **Signal Generator**

**AM / FM /  $\phi$ M**

## **SMY01**

**9 kHz - 1040 MHz  
1062.5502.11**

## **SMY02**

**9 kHz - 2080 MHz  
1062.5502.12**

## **SMY43**

**9 kHz - 2080 MHz  
1062.5502.43**

Printed in the Federal  
Republic of Germany



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## Safety Instructions

This unit has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards.

To maintain this condition and to ensure safe operation, the user must observe all instructions and warnings given in this operating manual.

### Safety-related symbols used on equipment and documentation from R&S:

							
Observe operating instructions	Weight indication for units >18 kg	PE terminal	Ground terminal	Danger! Shock hazard	Warning! Hot surfaces	Ground	Attention! Electrostatic sensitive devices require special care

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:  
Pollution severity 2, overvoltage category 2, IP degree of protection 2X, altitude max. 2000 m.  
The unit may be operated only from supply networks fused with max. 16 A.
2. For measurements in circuits with voltages  $V_{rms} > 30\text{ V}$ , suitable measures should be taken to avoid any hazards.  
(using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).
3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made (installation and cabling of the unit to be performed only by qualified technical personnel).
4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.
5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.  
If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.
6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.
7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.  
Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.
8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply.  
If units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.
9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.  
Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.  
Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.  
Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.  
(visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

## Safety Instructions

10. Ensure that the connections with information technology equipment comply with IEC950/EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.  
Keep batteries away from children.  
If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list)  
Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.  
Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. Any additional safety instructions given in this manual are also to be observed.

## Patent Information

This product contains technology licensed by Marconi Instruments LTD. under US patents 4609881 and 4870384 and under corresponding patents in Germany and elsewhere.

# Certified Quality System ISO 9001

**DQS REG. NO 1954-04**

## Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsverfahren hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist nach ISO 9001 zertifiziert.

## Certificate of quality

Dear Customer,

You have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.

The Rohde & Schwarz quality management system is certified according to ISO 9001.

## Certificat de qualité

Cher client,

Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.

Le système de gestion qualité de Rohde & Schwarz a été homologué conformément à la norme ISO 9001.



**ROHDE & SCHWARZ**





Certificate No.: 9502291

This is to certify that:

Equipment type	Order No.	Designation
SMY01	1062.5502.11	Signalgenerator
SMY02	1062.5502.12	Signalgenerator
SMY43	1062.5502.43	Signalgenerator
SMY-B1	1062.7505.02	Reference Oscillator OCXO
SMY-B40	1062.9008.02	High Output Power

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits  
(73/23/EEC revised by 93/68/EEC)
- relating to electromagnetic compatibility  
(89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC)

Conformity is proven by compliance with the following standards:

EN61010-1 : 1991  
EN50081-1 : 1992  
EN50082-1 : 1992

Affixing the EC conformity mark as from 1995

**ROHDE & SCHWARZ GmbH & Co. KG**  
**Mühldorfstr. 15, D-81671 München**

Munich, 1997-10-29

Central Quality Management FS-QZ / Becker



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# Support Center

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---

Für technische Fragen zu diesem Rohde & Schwarz-Gerät steht Ihnen ab sofort unsere Hotline der Rohde & Schwarz Vertriebs-GmbH, Support Center, zur Verfügung.

Unser Team bespricht mit Ihnen Ihre Fragen und sucht Lösungen für Ihre Probleme.

Die Hotline ist Montag bis Freitag von 8.00 bis 17.00 Uhr besetzt.

Bei Anfragen außerhalb der Geschäftszeiten hinterlassen Sie bitte eine Nachricht oder senden Sie eine Notiz per Fax oder e-mail. Wir setzen uns dann baldmöglichst mit Ihnen in Verbindung.

Should you have any technical questions concerning this Rohde & Schwarz product, please contact the hotline of Rohde & Schwarz Vertriebs-GmbH, Support Center.

Our hotline team will answer your questions and find solutions to your problems.

You can reach the hotline Monday through Friday from 8:00 until 17:00.

If you need assistance outside office hours, please leave a message or send us a fax or e-mail. We will contact you as soon as possible.



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P.O.B. 80 14 69  
81614 München / Germany  
Please fax to +49 89 41 29 136 62



# 1 Preparation for Use

## 1.1 Putting into Operation

Before putting the SMY into operation, see to it that

- the covers of the casing are put on and bolted,
- the ventilation ducts are free,
- there are no signal voltage levels exceeding the permissible limits present at the inputs,
- the outputs of the instrument are not overloaded or connected incorrectly.

If this is not observed, the instrument might be damaged.

## 1.2 Power Supply/Power Fuses

The SMY can be operated at a.c. systems of 100 to 120 V and 200 to 240 V at system frequencies of 47 to 440 Hz. The power supply socket is at the rear of the instrument.

Adaption of the power supply, exchange of the power fuse:

- Withdraw the power supply cable.
- Open the cover of the voltage selector at the rear of the instrument using a screwdriver.
- Remove the coding cylinder now accessible and set in in such a way that the voltage value desired can be read from outside.
- Close the cover pressing it firmly.
- Check whether the voltage value desired is visible from outside in the window of the cover.

## 1.3 Mounting into a 19" Rack

The SMY can be mounted into a 19" rack by means of rack adapter ZZA-93 (stock no. 396.4892.00). The mounting instructions are attached to the adapter.

**Caution:** *When mounting into the rack, ensure unhindered admission of air at the perforation of the side panels and air escape at the rear of the instrument.*

## 1.4 Option SMY-B1

The SMY can be equipped with option SMY-B1, reference oscillator, OCXO.

Reference  $\square$  is briefly displayed in the amplitude/modulation display after switch-on of the instrument if the option has been fitted.

Further details can be found in section "Reference Frequency Int/Ext." as well as the data sheet.

### Subsequent fitting of option SMY-B1:

The crystal oscillator has been tuned to nominal frequency with R&S and the appropriate tuning voltage noted on the option. Note this tuning voltage down on a note sheet as the value must be transmitted into the memory of the signal generator after fitting the option.

The fitted option is automatically recognized from the firmware.

- Opening the casing**
- Loosen four screws in the two rear panel feet and withdraw feet.
  - Withdraw the upper cover to the rear.
  - Turn the instrument.
  - Withdraw the lower cover to the rear.
- Fitting the option**
- The option is fitted behind the modules at the free space of the left side panel in such a way that the ribbon cable is at the top. It is fastened mechanically at the side panel by means of the 4 screws supplied.
  - Insert ribbon cable W22 into socket X22 of the power supply unit.
  - Withdraw coaxial cable W28 from socket X711 of the option and connect it to socket X128 of module A4 "synthesis".
- Closing the casing**
- Fix the upper and lower cover in the reverse order as in opening the instrument.
  - Insert and screw down the rear panel feet.
- Set the tuning voltage**
- Switch on special function "Calibration REF-OSC" by means of code 51.
  - Using the tuning voltage previously noted, calculate a value for setting the D/A converter (DAC) according to the following equation:  
$$\text{DAC} = 4096 \times \frac{\text{tuning voltage}}{10 \text{ V}}$$
  - Enter the DAC value.
  - Terminate special function "Calibration REF-OSC" by means of code 52.

The crystal oscillator can be recalibrated to compensate for aging. Calibration is described in the service manual.



## 1.5 Option SMY-B40

The SMY can be equipped with option SMY-B40, pulse modulator and high output power.

The note  $b-40$  is briefly displayed in the amplitude/modulation display after switch-on of the instrument if the option has been fitted.

Further details can be found in the sections "Level" and "Pulse Modulation" as well as in the data sheet.

Fitting or disassembling option SMY-B40 is only possible at the factory or at authorized service centers.



## 2 Manual Operation

Signal generator SMY can be operated easily and comfortably. It can be set via the keyboard, the rotary knob variation and via the IEC-bus remote control interface (remote control of the SMY is described in detail in section 3).

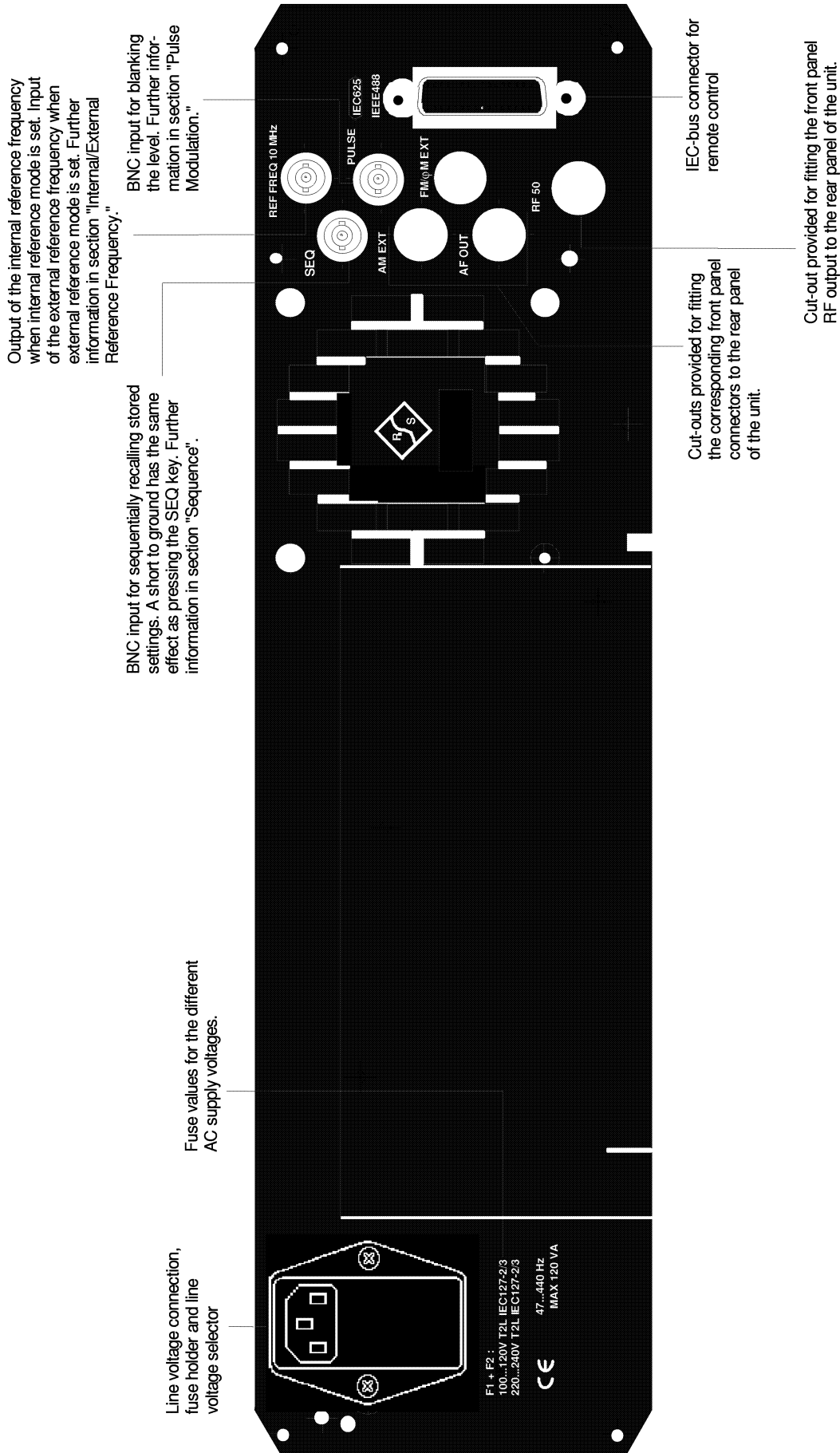
On the following pages, you will find the front and rear panel views of the instrument, each with short explanations.

If you are getting familiar with the SMY and like to have a fast overview, please read section 2.2, "Pattern Setting for First Users", and then section 2.3, "Basic Operation" first.

The complete functions of the manual operation are described as of Section 2.4.

Values mentioned in this section are not guaranteed, only the technical data in the specifications are binding.





## 2.2 Pattern Setting for First Users

The fastest way for first users to get familiar with the operation of the instrument is to execute the pattern setting of this section.

A setting is made from the left to the right in the order Parameter — Data — Unit.

Operating steps	Explanations										
<p>PRESET</p> <input type="checkbox"/>	Reset instrument to the defined status.										
<table border="0"> <tr> <td style="text-align: center;">PARAMETER</td> <td style="text-align: center;">ON/OFF</td> <td style="text-align: center;">DATA</td> <td style="text-align: center;">ENTER/UNITS</td> <td></td> </tr> <tr> <td style="text-align: center;">● RF</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;">2 5 0</td> <td style="text-align: center;"><input type="text"/></td> <td style="text-align: center;">MHz</td> </tr> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS		● RF	<input checked="" type="checkbox"/>	2 5 0	<input type="text"/>	MHz	Set RF to 250 MHz.
PARAMETER	ON/OFF	DATA	ENTER/UNITS								
● RF	<input checked="" type="checkbox"/>	2 5 0	<input type="text"/>	MHz							
<table border="0"> <tr> <td style="text-align: center;">PARAMETER</td> <td style="text-align: center;">ON/OFF</td> <td style="text-align: center;">DATA</td> <td style="text-align: center;">ENTER/UNITS</td> <td></td> </tr> <tr> <td style="text-align: center;">● LEVEL</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;">1 0</td> <td style="text-align: center;"><input type="text"/></td> <td style="text-align: center;">dBm</td> </tr> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS		● LEVEL	<input checked="" type="checkbox"/>	1 0	<input type="text"/>	dBm	Set level to 10 dBm.
PARAMETER	ON/OFF	DATA	ENTER/UNITS								
● LEVEL	<input checked="" type="checkbox"/>	1 0	<input type="text"/>	dBm							

## 2.3 Basic Operation

### Selection of the Parameters

The PARAMETER ON/OFF keypad is used to set the parameter to which numerical entries and variations refer. The set parameter is indicated by the LED flashing. Only one parameter can be set at a time. The only exception is the STEP parameter which is set at the same time as another parameter (to enter the step size for the STEP function). The SHIFT parameters (blue inscription) SWEEP ON, OFF, RESET, START, STOP, STEP, TIME/STEP and SPEC are set by pressing the SHIFT key before the corresponding parameter key.

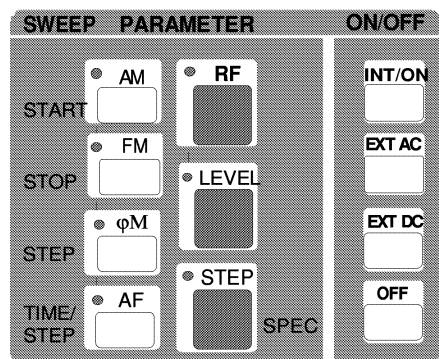


Fig. 2-1 PARAMETER ON/OFF keypad

### Switching the parameters on and off

Parameters which can be switched on and off are AM, FM, φM, AF, LEVEL.

The parameters are switched on by pressing the parameter key and then one of the three ON keys (INT/ON, EXT AC and EXT DC) in the parameter keypad. The parameters are then switched to the stored value of the last setting.

The parameters can also be switched to numerical entry using one of the ENTER/UNITS keys. If the data input is then omitted, the parameter is set again to the stored value of the last setting.

The parameters are switched off by pressing the parameter key and then the OFF key in the ON/OFF key column of the parameter keypad.

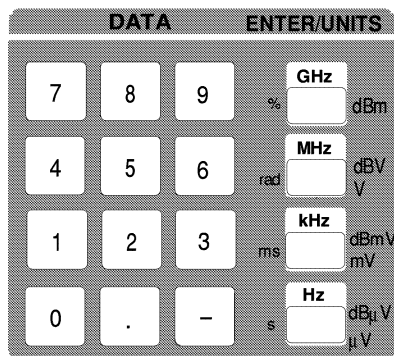



Fig. 2-2 DATA and ENTER/UNITS keypad

### Numerical entry

A value is entered in the order Parameter — Data — Unit:

Example	Input		
Setting the RF to 1 MHz	<div style="display: flex; justify-content: space-around; border-bottom: 1px solid black;"> <span>PARAMETER</span> <span>ON/OFF</span> <span>DATA</span> <span>ENTER/UNITS</span> </div>		
		<input type="text" value="1"/>	<input type="text" value="MHz"/>

The parameter need not be set again for further entries once it has been set (parameter LED on). This does not apply to parameters SPEC, IEC ADD and STEP which only remain set for **one** entry.

The value is set by pressing an ENTER/UNITS key.

Numerical entries must always be terminated by pressing one of the ENTER/UNITS keys. Any of the four ENTER/UNITS keys can be used for parameters without a unit.

Example	Input
Calling memory location setting 5	<div style="text-align: center;"> <span style="background-color: #cccccc; padding: 2px 10px;">MEMORY</span>    <span style="background-color: #cccccc; padding: 2px 10px;">DATA</span>    <span style="background-color: #cccccc; padding: 2px 10px;">ENTER/UNITS</span> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">             RCL  <input style="width: 40px; height: 20px;" type="text"/> </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px; border: 1px solid black;" type="text" value="5"/> </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px;" type="text"/> </div> </div>
Switch-on of special function AM two-tone	<div style="text-align: center;"> <span style="background-color: #cccccc; padding: 2px 10px;">DATA</span>    <span style="background-color: #cccccc; padding: 2px 10px;">ENTER/UNITS</span> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">             ● SHIFT  <input style="width: 40px; height: 20px;" type="text"/> </div> <div style="text-align: center;">             ● STEP  <input checked="" style="width: 40px; height: 20px;" type="checkbox"/> SPEC         </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px; border: 1px solid black;" type="text" value="5"/> </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px;" type="text"/> </div> </div>

### Correction of entry

An entered value can be cleared before being set (i. e. before pressing one of the ENTER/UNITS keys) by pressing the key of the set parameter (LED on) or one of the other parameters.

Entries made via the numerical keypad can be corrected with the key "-" as long as one of the ENTER keys was not pressed. One digit is cleared each time the key "-" is pressed.

### Changing the unit

In order to change the unit displayed, set the parameter (RF or LEVEL) and press the required unit in the ENTER/UNITS column.

Example	Input
The level is displayed in mV and shall be displayed in dbm.	<div style="text-align: center;"> <span style="background-color: #cccccc; padding: 2px 10px;">PARAMETER</span>    <span style="background-color: #cccccc; padding: 2px 10px;">ON/OFF</span>    <span style="background-color: #cccccc; padding: 2px 10px;">DATA</span>    <span style="background-color: #cccccc; padding: 2px 10px;">ENTER/UNITS</span> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;">             ● LEVEL  <input checked="" style="width: 40px; height: 20px;" type="checkbox"/> </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px;" type="text"/> </div> <div style="text-align: center;"> <input style="width: 40px; height: 20px;" type="text"/> dBm         </div> </div>

The parameter key need not be pressed again if the parameter has already been set (LED on).



## Displays

The RF is output with up to 10 digits in the **FREQUENCY display**:

The following is also output in this display:

- step size for STEP variation of RF,
- start and stop frequency as well as frequency step and step time for the RF sweep,
- AF up to 7 digits,
- status codes of the set special functions,
- external reference mode and
- the IEC-bus address.

The following is output in the **AMPLITUDE display**:

- level of the RF signal,
- step size for the STEP variation of the level,
- measured values of internal test points (diagnostic test),
- reference OVERLOAD if the RF output is externally overloaded and
- indication of the fitted options.

The following is output in the **MODULATION display**:

- type of modulation switched on,
- parameters modulation depth and deviation,
- step sizes for the STEP variation of the modulation parameters and AF
- warning LOW or HIGH if the external modulation voltage is not equal to 1 V ( $V_p$ ),
- number of memory location for STO, RCL and SEQ,
- fine variation range with special function "non-interrupting level setting" on,
- numbers of internal test points (diagnostic test) and
- status codes of function/input errors and overrange/underrange settings.

### Display of functions which are not switched on

The parameters of functions which are not switched on such as AM modulation depth or FM deviation are displayed as long as the respective parameter key is pressed.

### Display of entered numerical value

While entering a numerical value (DATA keys), the digits of the newly entered value are progressively output in the display of the related parameter.

## Variation

Parameters AM modulation depth, FM deviation,  $\phi$ M deviation, AF, RF and LEVEL can be varied.

The parameter currently set in the parameter keypad can always be varied using the rotary knob.

For further information, please see section "Variation, Rotary Knob".

## Store - recall

The generator can store settings which can later be recalled. This function is accessed using the keys in the MEMORY keypad. Further information in sections "Store- Recall" and "Sequence".

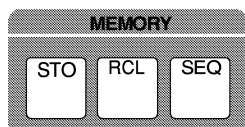


Fig. 2-3 MEMORY keypad

## Special functions

Special functions extend the given settings indicated on the front panel. Further information in section "Special Functions".

## Status

Input errors are indicated in the modulation display by a brief appearance of the status code identifying the error and flashing of the STATUS LED.

Function errors are indicated by continuous flashing of the STATUS LED. The status code describing the error appears in the modulation display when the STATUS key is pressed.

Ovrange/underrange settings are indicated by continuous lighting of the STATUS LED. The status code describing the setting appears in the modulation display when the STATUS key is pressed.

Continuous lighting of the STATUS LED also indicates that a special function is switched on. The status code describing the special function is output in the frequency display by pressing the STATUS key. Further information in section "Status".

## IEC-bus address

The IEC-bus address can be output in the frequency display and set via the keyboard. Further information in section "IEC-bus Address".

## Instrument preset

The generator is set to a defined basic status by means of key PRESET. For further information, please see section "Instrument Preset".

## 2.4 Power-on Status

The generator has the same status when switched on as before switching off.

### Exceptions:

- Local mode is always set.
- An RQS can be output on the IEC bus each time the instrument is switched on.
- For setting the registers of the service request function, see sections "Service Request and Status Registers" and "Resetting Device Function".

A function test is carried out following switch-on. The ROM, EPROM and RAM contents are checked. The LED of the STATUS key flashes if an error is detected. The associated status display is output in the modulation display by pressing the STATUS key.

The preset status is set if the status prior to switch-off cannot be set again because of a memory error.

**Display:** The IEC-bus address set is displayed in the frequency display and the fitted options are indicated in the amplitude/modulation display following power-on for a brief period.

## 2.5 Internal/External Reference Frequency

The internal standard reference source of the SMY is a 10-MHz crystal oscillator. Higher demands on frequency accuracy are satisfied by the option Reference Oscillator SMY-B1, OCXO. Subsequent fitting of this option is described in section "Option SMY-B1".

In internal reference mode, the internal reference signal with a frequency of 10 MHz is present at the female connector REF FREQ 10MHz.

In external reference mode, an external signal with a frequency of 5 or 10 MHz must be fed into the female connector REF FREQ 10MHz. Synchronization to 5 or 10 MHz is automatic.

Frequency at the input/output

REF FREQ 10MHz: 10 MHz

Internal reference mode: Signal output  
( $V_{rms} = 1V$ , EMF),  
female connector REF FREQ 10MHz at the rear panel.

External reference mode: Signal input ( $0.2V \leq V_{rms} \leq 2V$ ,  
sinewave, squarewave or TTL),  
female connector REF FREQ 10MHz at the rear panel.

The internal or external reference is selected using the keyboard or via the IEC bus.

Example	Input	IEC-Bus Code
Setting for external reference		REFERENCE_OSCILLATOR:EXTERNAL
Setting for internal reference		REFERENCE_OSCILLATOR:INTERNAL

**Display:** The note "REF EXT" appears in the frequency display if the external reference mode has been selected.

**Note:** The externally applied reference frequency of 10 MHz must not deviate by more than  $\pm 5 \cdot 10^{-6}$  from 10 MHz.

**Associated instructions:** Special function "Calibration REF-OSC"

## 2.6 Frequency (RF)

**Range:** 9 kHz to 1040 MHz (2080 MHz with SMY02, adjustable as from 5 kHz without guarantee of rated specifications)  
**Resolution:** 1 Hz  
**Units:** GHz, MHz, kHz, Hz  
**Setting:** RF — data — unit

Example	Input	IEC-Bus Code
Setting the RF to 500 MHz		RF 500MHZ

**Display:** The RF output frequency appears in the frequency display.

**Associated instructions:** Internal/external reference frequency

## 2.7 LEVEL

**Range:** -140 to 13 dBm (settable up to 19 dBm without guarantee of rated specifications)  
-134 to 19 dBm with option SMY-B40 (settable as from -140 dBm up to 25 dBm with restricted data)  
**Resolution:** 0.1 dB  
**Units:** dBm, V, mV,  $\mu$ V, dBV, dBmV, dB $\mu$ V  
**Setting:** [SHIFT] — LEVEL — data — unit

Example	Input	IEC-Bus Code
Setting of level 60 dB $\mu$ V		LEVEL 60DBUV
Switching off the level		LEVEL:OFF
Switching on the level to the stored value		LEVEL:ON

**Associated instructions:** Non-interrupting level setting  
Level EMF

**Note:** For output levels > 19 dBm and mismatch load termination of the SMY's RF-output the overvoltage protection of the attenuator can respond to the RF-voltage generated internally (indication OFF and blinking OVERLOAD message in the AMPLITUDE display). The protection switch can be reset by entering a level of < 19 dBm and pressing the INT/ON key.

## 2.8 Non-Interrupting Level Setting

Independent of the set value, the special function "Non-interrupting level setting" permits to attenuate the level electronically up to 20 dB without interruption, i. e. without using the interrupting mechanical attenuator. The value set when switching on the special function is used as reference level. Within the 20-dB range, the level can be set via the keyboard or the IEC bus.

Setting of a level outside the 20-dB range is made using the interrupting mechanical attenuator set. Starting at this new level, further level settings are made non-interruptive again in the range 0 to -20 dB.

If the special function "Non-interrupting level setting" is switched on again when already having been switched on, this has the same effect as if the special function were switched on for the first time, i. e. the full setting range 0 to -20 dB is then available with respect to the set level.

Switching on special function with code 1 } see special functions  
Switching off special function with code 2 }

**Note:** *Specifications concerning level error, modulation depth error and distortion factor with AM do not apply with the special function "Non-interrupting level setting" switched on.*

**Associated instructions:** LEVEL  
Level EMF  
Special functions

## 2.9 Level Control Without Function

With the special function "Level control without function" (ALC off), internal level control is switched over to a sample-and-hold mode. This special function is used for multi-transmitter measurements to achieve a higher signal-to-intermodulation ratio. The self-intermodulation products of two generators connected using a signal divider ( $2 \times 50 \Omega$ ) remain below the following values:

Without option SMY-B40:  
for output levels of 13 dBm                      below -40 dBc  
for output levels of less than 0 dBm           below -70 dBc

With option SMY-B40:  
for 19 dBm    below -50 dBc  
for 16 dBm    below -60 dBc  
for 10 dBm    below -70 dBc.

In this special function, the SMY can be operated as usual.

Switching on special function with code 21

Switching off special function with code 22

**Note:** *The specifications in the data sheet concerning level error, AM and VSWR do not apply in the special function "ALC off".*

**Associated instructions:** LEVEL  
Level EMF  
Special functions

## 2.10 Level EMF

With the special function "Level EMF", the EMF value of the RF voltage is displayed and no longer the value of the RF voltage into 50 Ω. The EMF display appears if one of the units dBμV, dBmV, dBV, V, mV or μV is selected.

Switching on special function with code 3 } see special functions  
 Switching off special function with code 4 }

### Associated

**instructions:** LEVEL  
 Non-interrupting level setting  
 Special functions

## 2.11 Internal AF Modulation Frequency

**Frequency range:** 1 Hz to 500 kHz

**Resolution:** 0.1 Hz

**Resolution of Display:** 7-digit

As a modulation source, the SMY contains an AF synthesizer which is also brought out to be used externally at socket AF INT. The AF signal at the socket is automatically switched on if an internal modulation is activated. It can also be switched on if no internal modulation is activated. The output amplitude is 1V (V<sub>p</sub>).

**Setting the frequency:** AF ——— Data ——— Unit

Example	Input	IEC-Bus Code										
Setting the AF (int. modulation frequency) to 400 Hz	<table border="0"> <tr> <td style="text-align: center;"><b>PARAMETER</b></td> <td style="text-align: center;"><b>ON/OFF</b></td> <td style="text-align: center;"><b>DATA</b></td> <td style="text-align: center;"><b>ENTER/UNITS</b></td> <td></td> </tr> <tr> <td style="text-align: center;">● AF <input type="text"/></td> <td></td> <td style="text-align: center;"><input type="text" value="4"/> <input type="text" value="0"/> <input type="text" value="0"/></td> <td style="text-align: center;"><input type="text" value="Hz"/></td> <td style="text-align: center;">AF 400HZ</td> </tr> </table>	<b>PARAMETER</b>	<b>ON/OFF</b>	<b>DATA</b>	<b>ENTER/UNITS</b>		● AF <input type="text"/>		<input type="text" value="4"/> <input type="text" value="0"/> <input type="text" value="0"/>	<input type="text" value="Hz"/>	AF 400HZ	
<b>PARAMETER</b>	<b>ON/OFF</b>	<b>DATA</b>	<b>ENTER/UNITS</b>									
● AF <input type="text"/>		<input type="text" value="4"/> <input type="text" value="0"/> <input type="text" value="0"/>	<input type="text" value="Hz"/>	AF 400HZ								
Switching on the AF signal to the stored value	<table border="0"> <tr> <td style="text-align: center;">● AF <input type="text"/></td> <td style="text-align: center;"><b>INT/ON</b> <input type="text"/></td> <td></td> <td></td> <td style="text-align: center;">AF:ON</td> </tr> </table>	● AF <input type="text"/>	<b>INT/ON</b> <input type="text"/>			AF:ON						
● AF <input type="text"/>	<b>INT/ON</b> <input type="text"/>			AF:ON								
Switching off the AF signal	<table border="0"> <tr> <td style="text-align: center;">● AF <input type="text"/></td> <td style="text-align: center;"><b>OFF</b> <input type="text"/></td> <td colspan="2" style="text-align: center;">(no effect if internal modulation switched on)</td> <td style="text-align: center;">AF:OFF</td> </tr> </table>	● AF <input type="text"/>	<b>OFF</b> <input type="text"/>	(no effect if internal modulation switched on)		AF:OFF						
● AF <input type="text"/>	<b>OFF</b> <input type="text"/>	(no effect if internal modulation switched on)		AF:OFF								

**Display:** The frequency display indicates both the RF and the AF. The value of the parameter pressed last in the parameter keypad is displayed. An AF-value is characterized by the characters "AF" in front of the numeric value.

### Associated

**instructions:** Modulation (AM, FM, φM)  
 Two-tone modulation

## 2.12 Modulation, AM

- Modulation depth:** 0 to 100 %  
**Resolution:** 0.1 %  
**Ext. modulation frequency range:** DC to 50 kHz  
**Internal modulation frequencies:** 1 Hz to 50 kHz

The internal modulation source and one external modulation source can be switched on simultaneously (see section "Two-tone modulation").

For increasing levels between 7 dBm and 13 dBm (or between 13 dBm and 19 dBm with option SMY-B40), AM specifications are guaranteed only if the modulation depth decreases linearly.

When AM is switched on, the ALC bandwidth is automatically set to "broad" if the special functions 13 and 15 are not active.

The AM specifications are not valid in the special function "ALC bandwidth narrow" (Spec 13).

Setting too large a modulation depth causes the status LED to light up. In this case, the status indication in the modulation display is 70 (see section "Status").

- Setting:** AM — Data — %  
**Selection of modulation source:** AM — INT/ON or AM — EXT AC (EXT DC)  
**Selection of internal modulation frequency:** See section "Internal AF Modulation Frequency".  
**Switching off the AM:** AM — OFF  
**Switching on the AM to the stored value (new value not entered):** AM — INT/ON or AM — EXT AC (EXT DC)

Example	Input	IEC-Bus Code								
Setting and switching on the AM with m=80 %	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> <th>DATA</th> <th>ENTER/UNITS</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="radio"/> AM</td> <td></td> <td>8 0</td> <td>% <input type="text"/></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS	<input checked="" type="radio"/> AM		8 0	% <input type="text"/>	AM 80PCT
PARAMETER	ON/OFF	DATA	ENTER/UNITS							
<input checked="" type="radio"/> AM		8 0	% <input type="text"/>							
Selection of the external modulation source	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> <th>DATA</th> <th>ENTER/UNITS</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="radio"/> AM</td> <td>EXT AC</td> <td></td> <td></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS	<input checked="" type="radio"/> AM	EXT AC			AM:EXTERNAL:AC
PARAMETER	ON/OFF	DATA	ENTER/UNITS							
<input checked="" type="radio"/> AM	EXT AC									
Switching off the AM	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> <th>DATA</th> <th>ENTER/UNITS</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="radio"/> AM</td> <td>OFF</td> <td></td> <td></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS	<input checked="" type="radio"/> AM	OFF			AM:OFF
PARAMETER	ON/OFF	DATA	ENTER/UNITS							
<input checked="" type="radio"/> AM	OFF									

**Display:**      % AM<sup>EXT</sup>

If amplitude modulation is switched on, this is indicated by

AM<sup>EXT</sup>, AM<sup>EXT DC</sup>, AM<sub>INT</sub><sup>EXT</sup>, AM<sub>INT</sub><sup>EXT</sup> and AM<sub>INT</sub><sup>EXT DC</sup>

depending on the modulation source selected.

The modulation depth is output in 3 digits in the modulation display. The display is common to the modulation depth with AM and the deviation with FM/φM. The value of the parameter AM, FM or φM pressed last in the parameter keypad is displayed.

**Comment on AM DC:**

This mode enables external level control or regulation via level detectors with a negative or positive detector voltage.

Modulation frequency..... DC to 50 kHz  
Modulation depth..... 0 to 100 %  
Input voltage..... -1.0 V to +1.0 V

The level variation range is determined by the modulation depth input. A range from -1 V to +1 V corresponds to a change in level from level<sub>0V</sub> · (1-m) to level<sub>0V</sub> · (1+m). With special function AM invers active this level variation is obtained for inverted polarity of the input voltage. This allows to decrease the level by means of a positive input voltage.

Level<sub>0V</sub> is the RF level in V entered numerically.

The maximum control range, e.g. for maximum carrier blanking, is at m = 100 %.

**Associated**

- instructions:** LEVEL  
Internal AF modulation frequency  
Modulation, external source  
Two-tone modulation  
Pulse modulation  
Special function ALC bandwidth  
Special function AM invers





Example	Input	IEC-Bus code								
Setting and switching on the FM with 40 kHz deviation	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> <th>DATA</th> <th>ENTER/UNITS</th> </tr> </thead> <tbody> <tr> <td>● FM <input type="text"/></td> <td></td> <td><input type="text" value="4"/> <input type="text" value="0"/></td> <td><input type="text" value="kHz"/></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS	● FM <input type="text"/>		<input type="text" value="4"/> <input type="text" value="0"/>	<input type="text" value="kHz"/>	FM 40KHZ
PARAMETER	ON/OFF	DATA	ENTER/UNITS							
● FM <input type="text"/>		<input type="text" value="4"/> <input type="text" value="0"/>	<input type="text" value="kHz"/>							
Selection of modulation source EXT AC	<table border="1"> <tbody> <tr> <td>● FM <input type="text"/></td> <td>EXT AC <input type="text"/></td> <td colspan="2"></td> </tr> </tbody> </table>	● FM <input type="text"/>	EXT AC <input type="text"/>			FM:EXTERNAL:AC				
● FM <input type="text"/>	EXT AC <input type="text"/>									
Switching off the FM	<table border="1"> <tbody> <tr> <td>● FM <input type="text"/></td> <td>OFF <input type="text"/></td> <td colspan="2"></td> </tr> </tbody> </table>	● FM <input type="text"/>	OFF <input type="text"/>			FM:OFF				
● FM <input type="text"/>	OFF <input type="text"/>									

**Display:**

4  kHz FM<sup>EXT</sup>

If frequency modulation is switched on, this is indicated by

FM<sup>EXT</sup>, FM<sup>EXT DC</sup>, FM<sub>INT</sub><sup>EXT</sup> or FM<sub>INT</sub><sup>EXT DC</sup>

depending on the modulation source selected.

The deviation is output in 3 digits in the modulation display. The display is common to the deviation with FM and the modulation depth with AM. The value of parameter AM, FM or φM pressed last in the parameter keypad is displayed.

**Associated instructions:**

Internal AF modulation frequency  
Modulation, external source  
Two-tone modulation  
Special functions

## 2.15 Modulation, M

**Deviation:**..... 0 to 400 rad (depending on the carrier frequency)

**Resolution:** ..... 0.001 to 1 rad (depending on the deviation range)

**External modulation frequency range:** ..... 20 Hz to 20 kHz

**Internal modulation frequency range:** ..... 20 Hz to 20 kHz

The internal and one external modulation source can also be switched on simultaneously (cf. section "Two-Tone Modulation").

**Setting:**.....  $\phi M$  — Data — rad

**Selection of the modulation source:**.....  $\phi M$  — INT/ON or  $\phi M$  — EXT AC

**Selection of the int. modulation frequency:** ..... Cf. section "AF modulation frequency internal".

**Switching off the  $\phi M$ :** .....  $\phi M$  — OFF

**Switching on the  $\phi M$  without entering a new value to the one stored:**.....  $\phi M$  — INT/ON or  $\phi M$  — EXT AC

Example	Input	IEC-Bus code								
Setting and switching on the $\phi M$ with a deviation of 20 rad	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> <th>DATA</th> <th>ENTER/UNITS</th> </tr> </thead> <tbody> <tr> <td><math>\phi M</math> <input type="text"/></td> <td></td> <td>2 0</td> <td>rad <input type="text"/></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	DATA	ENTER/UNITS	$\phi M$ <input type="text"/>		2 0	rad <input type="text"/>	PHM:20RAD
PARAMETER	ON/OFF	DATA	ENTER/UNITS							
$\phi M$ <input type="text"/>		2 0	rad <input type="text"/>							
Selection of modulation source INT	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> </tr> </thead> <tbody> <tr> <td><math>\phi M</math> <input type="text"/></td> <td>INT/ON <input type="text"/></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	$\phi M$ <input type="text"/>	INT/ON <input type="text"/>	PHM:INTERNAL				
PARAMETER	ON/OFF									
$\phi M$ <input type="text"/>	INT/ON <input type="text"/>									
Switching off the $\phi M$	<table border="1"> <thead> <tr> <th>PARAMETER</th> <th>ON/OFF</th> </tr> </thead> <tbody> <tr> <td><math>\phi M</math> <input type="text"/></td> <td>OFF <input type="text"/></td> </tr> </tbody> </table>	PARAMETER	ON/OFF	$\phi M$ <input type="text"/>	OFF <input type="text"/>	PHM:OFF				
PARAMETER	ON/OFF									
$\phi M$ <input type="text"/>	OFF <input type="text"/>									

**Display:**

20.0 rad  $\phi M_{INT}^{EXT}$

If  $\phi M$  is switched on, this is indicated, depending on the modulation source, by means of

$\phi M_{EXT}^{EXT}$ ,  $\phi M_{INT}^{EXT}$  or  $\phi M_{INT}^{EXT}$

The phase deviation can be read in 3 digits in the modulation display. The numerical display is common to the deviation with FM or  $\phi M$  and the modulation depth with AM. The value of parameter AM, FM or  $\phi M$  pressed last in the parameter keypad is displayed.

**Associated instructions:**

Internal AF modulation frequency  
Modulation, external source  
Two-tone modulation  
Special functions

## 2.16 Modulation, External Source

Modulation inputs AM EXT and FM/φM EXT are available for the modulation fed externally.

For modulations AM and FM, the two modulation inputs can be a.c.-coupled or d.c.-coupled. Selection is effected using keys EXT AC or EXT DC in the parameter keypad.

The input resistances of both inputs are 100 kΩ when the instrument is delivered.

The input resistances can be changed to 600 Ω by means of internal jumpers. The jumpers are on module "processor" for AM and on module "synthesis" for FM/φM.

The pin positions are:

Input resistance	AM module "processor"	FM/φM module "synthesis"
100 kΩ	X501/2-3	X80/1-2
600 Ω	X501/1-2	X80/2-3

A signal of  $V_p = 1 \text{ V}$  ( $V_{rms} = 0.707 \text{ V}$ ) must be applied to achieve the deviation and modulation depth accuracies guaranteed in the data sheet.

Deviations from the required input voltage are indicated in the modulation display by LOW or HIGH.

The display LOW appears for voltages  $V_p \leq 0.97 \text{ V}$ , the display HIGH for voltages  $V_p \geq 1.03 \text{ V}$ . An external voltmeter must be used if higher accuracy is required.

### Associated

**instructions:** Modulation, AM  
Modulation, FM  
Two-tone modulation

## 2.17 Modulation, Two-tone

Two-tone modulation takes place with the signals from the internal modulation source and an external modulation source.

The corresponding special function AM two-tone or FM/φM two-tone must be switched on in order to connect internal and external modulation signals simultaneously.

Modulation is not switched on simply by switching on the special function. Entry of the modulation parameters and switching on and off the modulations must take place exactly as described in the sections on modulation AM, FM or φM. Separate deviation or modulation depth settings for the internal and external modulations are not possible. The required voltage of the external modulation signal is 1 V ( $V_p$ ).

The total deviation or the total modulation depth is equal to twice the value of the one set after value entry.

Ensure that the permissible maximum values for deviation and modulation depth, as listed on the data sheet, are not exceeded.

Switch on/off codes of the two-tone special functions:

Type of modulation	Switch-on	Switch-off
AM two-tone	5	6
FM/φM two-tone	7	8

Example	Input	IEC-bus code
Switching on special function "FM/φM two-tone"	<div style="text-align: center;"> <span style="background-color: #cccccc; padding: 2px;">DATA</span>    <span style="background-color: #cccccc; padding: 2px;">ENTER/UNITS</span> </div> ● SHIFT    ● STEP <input type="text"/> <input type="text"/> SPEC <input type="text" value="7"/> <input type="text"/>	FM:DUAL:AC or FM:DUAL:DC
Switching off special function "FM/φM two-tone"	● SHIFT    ● STEP <input type="text"/> <input type="text"/> SPEC <input type="text" value="8"/> <input type="text"/>	FM:OFF

**Associated**

**Instructions:** Modulation, (AM, FM/φM)  
Modulation, external source  
Special functions

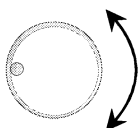
## 2.18 Variation, Rotary Knob

The rotary knob enables parameters to be increased or decreased in selectable steps. The set parameter (whose LED in the parameter keypad is on) is variable.

RF, AF, LEVEL and the modulation depth with AM and the deviation with FM or φM are variable parameter steps.

A STEP size can be entered for each variable parameter which remains stored when the parameter is changed.

**Operation:**



Clockwise rotation increases the value of the parameter set, counter-clockwise rotation decreases it.

**Setting the STEP size:**

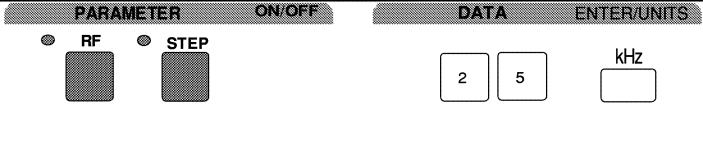
Parameter — Step — Data — Unit

The STEP key must be pressed again for each data input. The parameter key need not be pressed first if the parameter has already been set (LED is on).

The smallest step sizes for the various parameters are:

Frequency (RF)	1 Hz
Frequency (AF)	0.1 Hz
Level (RF)	0.1 dB
Modulation depth (AM)	0.1 %
Deviation (FM)	10 Hz
Deviation (φM)	0.001 rad

The STEP size of the level may only be entered in dB even if V, mV or μV is selected as the level unit.

Example	Input	IEC-bus code
Setting an RF step size of 25 kHz	 <p>The diagram shows a control panel with two rows of buttons. The top row has 'PARAMETER' and 'ON/OFF' buttons. The bottom row has 'RF' and 'STEP' buttons, both of which are lit with small circles above them. To the right of these buttons are three data entry fields: a field containing the number '2', a field containing the number '5', and a field containing the unit 'kHz'.</p>	RF:VAR_STEP 25KHZ

**Display:** A new step size is output in the display of the set parameter until the entry is terminated by the unit key. The set value of the parameter is then displayed.

The step size entered for a parameter can be displayed by pressing the parameter key and then the STEP key.

The step size display is cleared again by pressing a parameter or an ENTER/UNITS key.

## 2.19 Sweep

The SMY provides a digital, step-by-step linear sweep for the RF-frequency (available only with software version 2.0 or higher and with new frontpanel design).

**Start frequency:**..... 5 kHz to 1040 MHz (2080 MHz with SMY02)

**Stop frequency:**..... 5 kHz to 1040 MHz (2080 MHz with SMY02)

**Frequency step:** ..... 1 Hz to 1040 MHz (2080 MHz with SMY02)

**Step time:**..... 10 ms to 5 s

**Resolution:** ..... 1 ms

Example	Input	IEC-bus code
Entry of start frequency	<div style="text-align: center;"><b>DATA</b>    <b>ENTER/UNITS</b></div> ● SHIFT <input type="checkbox"/> START <input type="checkbox"/> <input type="text" value="7"/> MHz <input type="checkbox"/>	RF:START
Entry of step time	● SHIFT <input type="checkbox"/> TIME/ STEP <input type="checkbox"/> <input type="text" value="1"/> s <input type="checkbox"/>	TIME:[RF_SWP]

In the ON mode, the sweep runs from the start frequency to the stop frequency with automatic restart at the start frequency.

The sweep can be stopped by means of the OFF key.

The sweep waits again at the start frequency when the RESET key is pressed.

If the start frequency is larger than the stop frequency, the sweep is performed with negative frequency steps.

The current sweep frequency is indicated in the FREQUENCY display.

The sweep can be stopped by means of the RF key as well. The RF frequency can now be varied. If the RF frequency still lies inside the sweep range, the sweep is continued starting from the current RF frequency upon pressing the ON key.

All other parameters (e. g. level, modulation etc.) can be changed while the sweep is running.

Example	Input	IEC-bus code
Switch on sweep	<div style="text-align: center;"><b>MEMORY</b></div> ● SHIFT <input type="checkbox"/> <input type="checkbox"/> ON	SWP:ON or SWP:AUTO
Switch off sweep	● SHIFT <input type="checkbox"/> <input type="checkbox"/> OFF <div style="text-align: center;"><b>---SWEEP---</b></div>	SWP:OFF
Restart Sweep	● SHIFT <input type="checkbox"/> <input type="checkbox"/> RESET <div style="text-align: center;"><b>---SWEEP---</b></div>	SWP:RESET

## 2.20 Store - Recall

99 complete instrument settings can be stored. These comprise the complete instrument status including all non-displayed settings and all special functions.

### Storing the current instrument setting:

STO — Memory address — ENTER/UNITS

### Recall of an instrument setting:

RCL — Memory address — ENTER/UNITS

After entering the address, press any ENTER/UNITS key to activate store or recall.

### Values of the memory address:

1 to 99 for STO

0 to 99 for RCL

Example	Input			IEC-bus code
	MEMORY	DATA	ENTER/UNITS	
Storing an instrument setting at memory location 7	STO	7	<input type="text"/>	STORE 7
Storing an instrument setting at memory location 25	STO	2 5	<input type="text"/>	STORE 25
Recalling the instrument setting from memory location 7	RCL	7	<input type="text"/>	RECALL 7

Location 0 serves for a special function, i.e. the current instrument setting prior to the last memory or preset recall is stored at this location. This instrument setting can be set again using RCL 0.

Using function SEQ (sequence), the memory settings can be recalled by repeated keying.

**Display:** Reference "MEM" and the memory address are indicated in the modulation display during entry, e.g.:

25  
MEM

**Associated instructions:** Sequence



## 2.21 Sequence

It is possible to recall stored settings in ascending order by repeated keying using the SEQ key in the memory keypad. The same sequencing causes a closure of contacts, as e.g. by means of a foot switch, at the SEQ input (at the rear of the instrument).

The first setting in the sequence of memory calls planned is effected by means of a recall using the RCL key, the setting stored in the next higher memory location is activated by each subsequent keying of the SEQ key or the SEQ input. After the highest memory location number (99), the number of the last RCL call is the one to begin with.

The sequence of the memory addresses starts with 1 if the PRESET key has been actuated before.

Example	Input			IEC-bus code	
Recall of memory locations 7, 8, 9 ...	<b>MEMORY</b>	<b>DATA</b>	<b>ENTER/UNITS</b>	RECALL 7  SEQUENCE  SEQUENCE  . . .	
	RCL	7			
	SEQ				
	SEQ  . . .				

**Display:** The address of the memory location called last is indicated in the modulation display by the text "MEM" following each actuation of the SEQ key.

**Associated instructions:** Store - recall

## 2.22 Special Functions

The special functions enable settings to be made other than those indicated on the front panel.

The special functions are switched on and off using codes (data input) (see Table 2-1).

All special functions which are switched on are switched off using code 0. All special functions are also switched off by a PRESET.

Example	Input	IEC-bus code
Switching on the special function "Non-interrupting level setting"	<div style="text-align: center; background-color: #cccccc; padding: 2px;">DATA      ENTER/UNITS</div> ● SHIFT   ● STEP <input type="text"/> <input type="text"/> SPEC <input type="text" value="1"/> <input type="text"/>	ATTENUATOR:FIXED
Switching off the special function "Non-interrupting level setting"	● SHIFT   ● STEP <input type="text"/> <input type="text"/> SPEC <input type="text" value="2"/> <input type="text"/>	ATTENUATOR:NORMAL
Switching off all special functions	● SHIFT   ● STEP <input type="text"/> <input type="text"/> SPEC <input type="text" value="0"/> <input type="text"/>	

**Display:** The LED of the STATUS key lights up if a special function is switched on. By pressing the status key the code of the special function is output on the FREQUENCY display. If more than one special function is active, the codes are automatically output repeatedly if the STATUS key is pressed continuously or are output one after the other every time the STATUS key is pressed (see section "Status").

Table 2-1 Special functions

Special functions	Code	Remote Control Command
Non-interrupting level setting	1	ATTENUATOR:FIXED
Normal level setting	2	ATTENUATOR:NORMAL
EMF level	3	LEVEL:EMF
Normal level	4	LEVEL
AM two-tone	5	AM:DUAL
AM normal	6	AM
FM/φM two tone	7	FM:DUAL (e.g. FM)
FM/φM normal	8	FM (e.g. FM)
BLANK on	9	BLANK:ON
BLANK off	10	BLANK:OFF
BLANK polarity inverted	11	BLANK:INVERTED
BLANK polarity normal	12	BLANK:NORMAL
ALC bandwidth narrow	13	SPECIAL_FUNCTION 13
ALC bandwidth automatically adapted	14	SPECIAL_FUNCTION 14
ALC bandwidth broad	15	SPECIAL_FUNCTION 15
ALC bandwidth automatically adapted	16	SPECIAL_FUNCTION 16
Set power-on clear flag	17	
Delete power-on clear flag	18	
User request	19	
ALC off	21	SPECIAL_FUNCTION 21
ALC on	22	SPECIAL_FUNCTION 22
AM inverse	23	SPECIAL_FUNCTION 23
AM normal	24	SPECIAL_FUNCTION 24
RF output impedance "open" for LEVEL OFF	25	SPECIAL_FUNCTION 25
RF output impedance 50 Ω for LEVEL OFF	26	SPECIAL_FUNCTION 26
Display of firmware version	29	
Display test	31	SPECIAL_FUNCTION 31
ROM test	33	SPECIAL_FUNCTION 33
RAM test	35	SPECIAL_FUNCTION 35
EEPROM test	37	SPECIAL_FUNCTION 37
Calibrate all	40	SPECIAL_FUNCTION 40
Calibration routine VCO	41	SPECIAL_FUNCTION 41
Calibration routine FM	43	SPECIAL_FUNCTION 43

Table 2-1 Special functions (continued)

Special functions	Code	Remote Control Command
Calibration routine LEVEL PRESET	45	SPECIAL_FUNCTION 45
Calibration RF level on	47	SPECIAL_FUNCTION 47
Terminate calibration of RF level	48	SPECIAL_FUNCTION 48
Level correction off	49	LEVEL:CORRECTION:OFF
Level correction on	50	LEVEL:CORRECTION:ON
Calibration REF-OSC on	51	SPECIAL_FUNCTION 51
Terminate calibration of REF-OSC	52	SPECIAL_FUNCTION 52
FM DC center frequency calibration	55	SPECIAL_FUNCTION 55
Switch off diagnostic test point	100	TEST:OFF
Switch on diagnostic test point	101-116	TEST:POINT 1 (e.g. point 1)

### Explanation of the Individual Special Functions:

<b>Non-interrupting level setting:</b>	Non-interrupting level setting is possible in a range of 20 dB. Cf. section "Non-interrupting Level Setting".
<b>EMF level:</b>	Indication of the EMF voltage. Cf. section "Level EMF".
<b>AM two tone:</b>	AM with internal and external modulation signal. Cf. section "Two-Tone Modulation".
<b>FM/<math>\phi</math>M two tone:</b>	FM or $\phi$ M with internal and external modulation signal. Cf. section "Two-Tone Modulation".
<b>BLANK:</b>	Level blanking with an external TTL signal. Cf. section "Pulse Modulation".
<b>BLANK polarity inverted:</b>	Level blanking with inverted polarity. Cf. section "Pulse Modulation".
<b>ALC bandwidth ...</b>	The bandwidth of the level control loop can be switched to narrow or broad for special purposes. In normal state, it is adapted automatically.
<b>Set (delete) power-on clear flag:</b>	Cf. section "Common, Device-Independent Commands" (Table 3-3).
<b>User request:</b>	When entering the code of this special function, the user triggers a service request via the IEC bus in the LOCAL mode. This service function does not trigger a status indication. Cf. section "Service Request and Status Register".
<b>ALC off:</b>	The level control is switched to sample and hold operation.
<b>AM invers:</b>	For positive AM-signal, the RF-level is reduced.
<b>RF output impedance "OPEN" for LEVEL OFF</b>	When the RF-level is switched off via LEVEL OFF, the RF-output is set to an open impedance.
<b>Display of firmware version:</b>	The special function indicates the number of the firmware version in the amplitude display.
<b>Display test:</b>	The special function indicates all display segments. The indication is held as long as one of the four unit keys is pressed.
<b>ROM test:</b>	The special functions check the data contents. A recognized data error is indicated by a blinking of the status LED and after pressing the status key by means of an error code. Cf. table 2-3, "Status Codes of Errors".
<b>RAM test:</b>	
<b>EEPROM test:</b>	

<b>VCO calibration routine:</b>	Self-calibration for the optimal working point of the VCO-PLL. The calibration routine must only be executed in the case of data loss in the RAM or after the exchange of a module.
<b>FM calibration routine:</b>	Self-calibration of the FM. The calibration routine determines correction values to compensate for the fluctuating modulation sensitivity. The routine is to be executed in the case of considerable variations of the temperature, data loss in the RAM or the exchange of a module.
<b>LEVEL PRESET calibration routine:</b>	Self-calibration for the optimal working point of the level control loop. The calibration routine must only be executed in the case of data loss in the RAM or after the exchange of a module.
<b>Calibration RF level:</b>	Permits the input of correction values for the calibrated RF level (see service manual).
<b>Level correction off/on:</b>	Switching on or off level correction (on = default status).
<b>Calibration REF-OSC:</b>	Permits the input of the correction value for the calibrated reference frequency.
<b>FM DC center frequency calibration:</b>	Calibration of the center frequency when FM DC is set.

## 2.23 Self-Test

The SMY carries out a self-test on power-on and permanently during operation.

The RAM and ROM contents are checked when the instrument is switched on. The most important instrument functions are automatically monitored during operation.

A faulty function determined during the self-test is indicated by a flashing of the status LED and by a SERVICE Request message. The status code to identify the error can be output in the modulation display by pressing the STATUS key (see Table 2-3, status codes of errors and overrange/underrange settings in section "Status").

In addition, 16 internal test points can be scanned via the keyboard or the IEC bus and the results read out and displayed in the amplitude display. This more detailed test facility is described in the Service Manual.

## 2.24 Status

The generator produces numerical status messages to identify special functions and errors.

The status codes of special functions are output in the frequency display. The status codes of errors (input or function errors) are output in the modulation display by the test "Err." in the amplitude display.

They can also be scanned via the IEC bus (see section "Error Handling"). The meanings of the status codes are defined in tables 2-2 and 2-3.

**Operation:** The status codes are output in the frequency and modulation displays as long as the STATUS key is pressed. If several status messages are applicable, the codes are automatically output repeatedly if the STATUS key is pressed continuously or are output one after the other every time the STATUS key is stroked.

**Display:** The STATUS LED **lights up continuously** if special functions are switched on or overrange/underrange settings are made.

The STATUS LED **flashes continuously** in the case of function errors.

The STATUS LED **flashes briefly** in the case of input errors.

The status codes of the special functions are output in the frequency display in the following form:

SPECIALS

The code is 0 if no special function is switched on.

The status codes of the function errors and of overrange/underrange settings are output in the amplitude/modulation display in the following form:

Err. 2

The code is 0 if no error is present.

In the case of operator errors, the status codes of the input errors automatically appear briefly in the amplitude/modulation display in the following form:

Err. 51

**IEC bus:** A Service Request message (SRQ) may be output in the case of input and function errors and overrange/underrange settings. The type of error can be recognized from the event status register. An error code can be read out to permit exact error identification.

Table 2-2 Status codes of the special functions

Code	Meaning
0	No special function switched on
1	Non-interrupting level setting
3	EMF level
5	AM two tone
7	FM/φM two tone
9	BLANK on
11	BLANK polarity inverted
13	ALC bandwidth narrow
15	ALC bandwidth broad
21	ALC off
23	AM invers
25	RF output impedance "OPEN"
47	RF level calibration on
49	Level correction off
51	REF-OSC calibration on

Table 2-3 Status codes of errors and overrange/underrange settings

Code	Meaning
0	No error
<b>Function error</b>	
1	10-MHz reference loop out of synchronisation
2	640-MHz loop out of synchronisation
3	Main oscillator loop out of synchronisation
4	Level control not working
5	External overvoltage at the RF output
6	ROM data error
7	RAM data error of the settings stored
8	RAM data error of the VCO correction values
9	RAM data error of the FM correction values
10	RAM data error of the LEVEL PRESET correction values
11	EEPROM data error of the RF level correction values
12	EEPROM data error of the REF OSC correction values
13	EEPROM data error of the option data block
14	EEPROM disfunction
15	Calibration cannot be executed
<b>Input error</b>	
50	Syntax error
51	Value entry without the permissible range
52	Impermissible unit to the parameter selected
53	Impermissible header (IEC bus)
55	Deviation input is too high with the RF set
56	Variation is not possible unless the respective parameter is switched on (IEC bus).
57	FM DC center frequency calibration is only possible when FM DC is set.
<b>Overrange/Underrange Settings</b>	
70	AM not specified with the level set
71	AM not specified for AF > 50 kHz
72	RF < 9 kHz
73	AM EXT signal out of tolerance
74	FM/φM EXT signal out of tolerance
75	φM not specified for AF < 20 Hz or AF > 20 kHz
76	AF > 500 kHz
77	Level > 13 dBm (> 19 dBm with option SMY-B40)
78	OVEN COLD
81	ALC WIDE is not allowed (with option SMY-B40 at level >19 dBm)
82	TIME/STEP is too small

## 2.25 Instrument Preset

The instrument is set to a defined basic status by pressing the key PRESET.

Table 2-4 Preset status

	Setting
Reference frequency	internal
RF	100 MHz
Amplitude	-30 dBm
Parameter set	RF
Modulation	switched off
AF	switched off
Special functions	switched off
Status and mask registers of the service request functions	unchanged
IEC-bus address	unchanged

	Preset to
RF step	1 MHz
Amplitude, step	0.1 dB
AF	1 kHz
AF step	0.1 kHz
AM modulation depth	30 %
AM step	1 %
FM deviation	10 kHz
FM step	1 kHz
$\phi$ M deviation	1 rad
$\phi$ M step	0.1 rad
Memory locations	unchanged



## 2.26 IEC-Bus Address

The IEC-bus address can be displayed and set using the keys. It is stored until overwritten by a new address. The address range is from 0 to 30. The SMY is set to address 28 on delivery.

Example	Input	IEC-bus code
Output IEC-bus address on display  Set IEC-bus address 7	<div style="text-align: center; background-color: #cccccc; padding: 2px;">DATA    ENTER/UNITS</div> LOC/IEC ADD <input style="width: 40px; height: 20px;" type="text"/>  LOC/IEC ADD <input style="width: 40px; height: 20px;" type="text"/> <input style="width: 40px; height: 20px; text-align: center; border: 1px solid black;" type="text" value="7"/> <input style="width: 40px; height: 20px;" type="text"/>	

**Display:** The IEC-bus address is output in the frequency display which is cleared by pressing any one of the parameter keys or the ENTER/UNITS keys.

