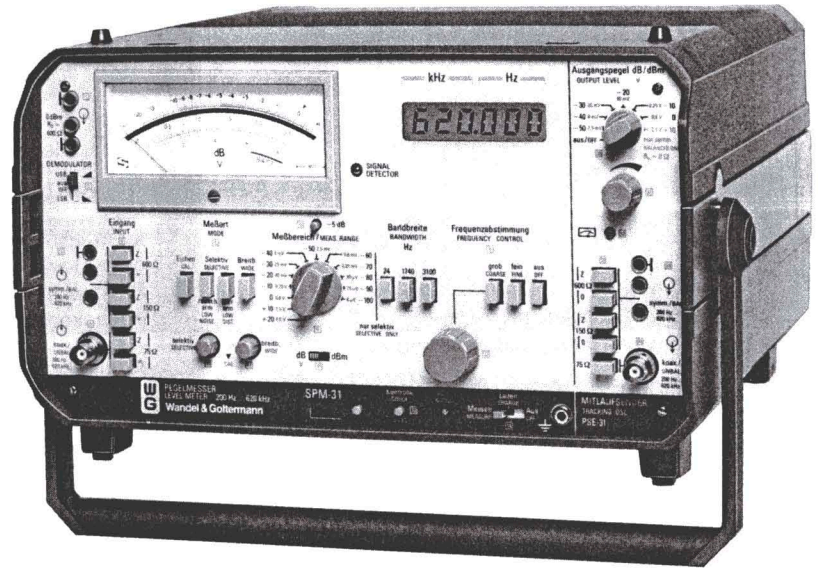




# SPM-30, SPM-31 Selective Level Meters

for the frequency range 200 Hz to 1.62 MHz or 620 kHz; with generator section



- Selective and wideband measurements
- Scaled in dB, dBm or volts
- Synthesizer ensures excellent frequency accuracy
- Digital frequency display with 1 Hz resolution
- Fast signal detection
- Demodulator output
- Mains and battery operation
- Lightweight, compact, and easy to operate

## Applications

The SPM-30 and SPM-31 Level Meters are used for level measurements on FDM communications systems operating with a small or medium number of channels. Owing to their compactness and operation free of a.c. power, these Level Meters are particularly suitable for mobile service in maintenance and for measuring on communications systems actually carrying traffic. So the SPM-30 and SPM-31 are especially useful to Postal Administrations, Railways, or Public Utility Companies. Moreover, in-service measurements on the VFT System FM 120 is possible (100 Hz bandwidth version). Owing to the accuracy and versatility of the SPM-30 and SPM-31, many applications are also found in the original manufacture and testing of these systems or of the individual modules in a system. If the Generator has been incorporated, the combination is a complete measuring setup for attenuation and gain measurements. The send and receive frequencies can be offset from one another while making end-to-end measurements when the PS-30 Level Generator is used also.

## Characteristics

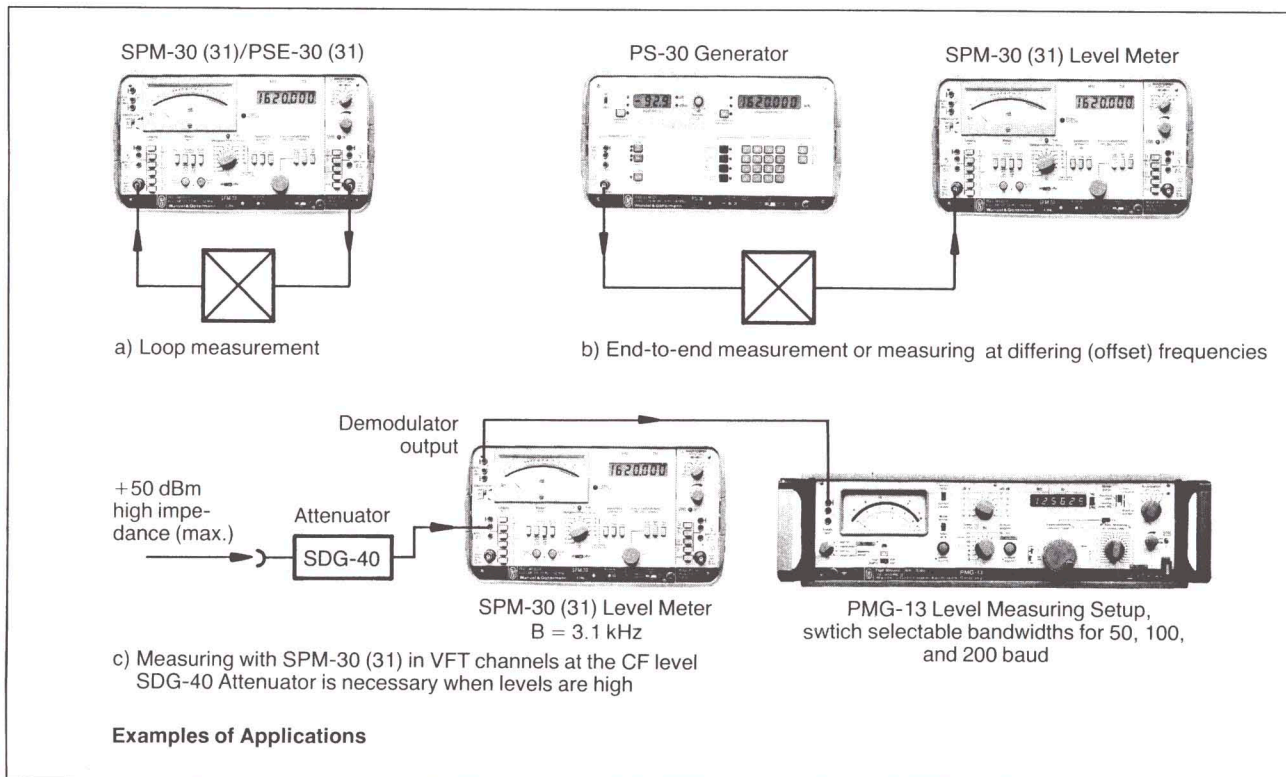
A frequency synthesizer produces the local oscillator frequencies of the Selective Level Meter. Thus, the high accuracy and stability are assured by this modern technique. A manually rotatable knob gives a smooth flywheel effect while swiftly tuning over the complete frequency band in one range. Frequencies are presented on a digital display with 1 Hz resolution. Levels are measured in various bandwidths as either low noise or as low distortion. A large scale analog meter provides the level readings. The fine scale divisions of 0.1 dB and 5 dB scale offset assist the operator so that measurement errors may be kept small. Both voltage level and power level as well as voltages are measurable.

Frequency range	200 Hz to 1.62 MHz
SPM-30, coaxial . . . . .	200 Hz to 1.62 MHz
balanced . . . . .	200 Hz to 620 kHz
SPM-31, coaxial and balanced . . . . .	200 Hz to 620 kHz
Input impedance,	
coaxial . . . . .	75 Ω, high impedance
balanced . . . . .	(135) 150 Ω, 600 Ω, high impedance
Measurement range for 0 dB reading (2.5, 8 V), selective	
Level . . . . .	-100 to +20 dB/dBm
Voltage . . . . .	8 μV, 25 μV, ..., 8 V
Bandwidths, switch selectable . . . . .	24 Hz <sup>*)</sup> , 1.74 kHz, 3.1 kHz
	<sup>*)</sup> if requested, 100 Hz
Send level range	
(PSE-30 or PSE-31) . . . . .	-60 to +1 dB/dBm
Voltage . . . . .	0.8 mV, 25 mV, ..., 0.8 V
Weight, with PSE-30/PSE-31 . . . . .	approx. 12 kg

## Further Characteristics and Applications

Besides the aforementioned features of the Level Meter, it has some exceptional characteristics:

- **Blocking of the frequency setting:** if a selected frequency ought to be held constant over the long-term, e.g. when a test signal is monitored continuously, then the frequency setting may be *frozen* by means of a depressed key. After that the SPM-30 or SPM-31 cannot be manually tuned, but the set-up frequency is maintained with high accuracy.
- **The switchable frequency display:** an LCD display presents the frequency values at 100 Hz resolution with coarse frequency setting or 1 Hz with fine frequency setting.
- **The fast signal detector:** to search for discrete frequencies within a band, e.g. for spurious signals, the Level Meter is equipped with a *fast signal detector*. This signal detector is a signal lamp that responds when, during the scanning of a frequency band, a signal appears within the receive bandwidth of the Level Meter and also exceeds a certain level threshold. This device is useful also when the frequency tuning is done at a rapid rate and signals are discovered that otherwise would be missed by the analog meter because of the slow meter movement response. Some signals are not noticeable if the meter needle does not move, so they escape being recognized as valid signals.
- **The high sensitivity:** the level measuring range is switchable in 10 dB steps. A meter with a 20 dB scale presents the level reading, so that the lowest still readable level is  $-120$  dB/dBm. A push button allows the indicated level to be shifted by  $-5$  dB, so the reading accuracy is raised, as a consequence.  
Applications in the sector of electric utility companies and in general electronics are assisted by voltage measurements with the SPM-30 and SPM-31.
- **The variable bandwidths:** the Receiver bandwidths are switch selectable according to measurement task. Bandwidths of 24 Hz (or 100 Hz), 1.74 kHz, and 3.1 kHz are incorporated. The 24 Hz bandwidth is used for very selective measurements, e.g. while searching for noise or interference signals or for the measurement of pilot levels. Level Meters with the 100 Hz bandwidth are particularly useful for in-service measurements on FM voice frequency telegraph systems operating at a 50 baud transmission rate. The 1.74 kHz and 3.1 kHz bandwidths permit faster tuning and are intended for measuring within voice-grade channels. The effective noise bandwidth of the 1.74 kHz filter corresponds to the equivalent noise bandwidth of the CCITT Psophometer Filter; but the 3.1 kHz bandwidth corresponds to the telephone channel bandwidth. For overview measurements, or for end-to-end measurements that do not have frequency synchronization between generator and receiver, the SPM-30/31 is also equipped with a wideband receiver section.
- **The semi-automatic calibration:** a tracking calibration signal, synchronized with the tuned frequency, is used for calibrating the Receiver in selective mode. Calibration is done semi-automatically, therefore no extra frequency tuning is needed during this process.
- **The switch selectable demodulation:** the incorporated demodulator allows demodulation of single sideband signals in upright or inverted position. The converted signal is available at the demodulator output for further processing externally.
- **The compact die-cast metal enclosure:** the Level Meters are assembled in strong cases that are just right for the rough conditions of service found in mobile operation; the cases are easily carried by swing handles that lock in position. Also the battery chargers for the rechargeable batteries (Option) are incorporated in the Level Meters.





The given specifications are valid, when not otherwise stated, for the rated operating ranges of the ambient temperature, a.c. line voltage and line frequency.

**Inputs**

- Coaxial input\* . . . . . Universal connector Versacon® 9, adaptable to all commercially available connector systems
- Input impedance, switchable . . . . .  $Z_o = 75 \Omega$  and high impedance (bridged)
- Frequency range: SPM-30 . . . . . 200 Hz to 1620 kHz  
SPM-31 . . . . . 200 Hz to 620 kHz
- Return loss at 10 kHz . . . . .  $\geq 40$  dB
- Tapping loss for high impedance (bridged) input . . . . .  $\leq 0.05$  dB
- Balanced input . . . . . 3 pole CF connector
- Input impedance, switchable . . . . .  $Z_o = 150 \Omega^*$ ; 600  $\Omega$ ; and high impedance (bridged)  
\*) 135  $\Omega$  on request
- Frequency range . . . . . 200 Hz to 620 kHz
- Signal balance ratio . . . . .  $\geq 40$  dB
- Return loss at 10 kHz . . . . .  $\geq 40$  dB
- Tapping loss for high impedance input  
Z = 150  $\Omega$  . . . . .  $\leq 0.05$  dB  
Z = 600  $\Omega$  . . . . .  $\leq 0.1$  dB
- Permissible input voltage for all inputs
- Overload limit with  $Z_o$  . . . . .  $V_{r.m.s.} \leq 10$  V
- D.C. voltage limit across high impedance (bridged) termination . . . . .  $\leq 70$  V

**Frequency**

- Frequency setting
- Continuously adjustable over the whole frequency range without change-over
- fine, in steps of . . . . . 1 Hz
- coarse, in steps of . . . . . 100 Hz
- Frequency display . . . . . 6 or 7 digit LCD
- Resolution . . . . . 1 Hz
- Error limits of frequency display for
- f  $\leq 100$  kHz . . . . .  $\pm 1$  Hz
- f  $\leq 620$  kHz . . . . .  $\pm 10$  Hz
- f  $\leq 1.62$  MHz (only SPM-30) . . . . .  $\pm 20$  Hz
- Synchronous tuning of the Level Generator PS-30 is possible.

**Level indication**

- Reading in voltage level calibration (0 dB  $\cong 0.775$  V), power level calibration (0 dBm  $\cong 1$  mW in  $Z_o$ ) or voltage (V)
- Measuring ranges for 0 dB (2.5 V, 8 V) meter reading
- Level: selective . . . . .  $-100$  to  $+20$  dB/dBm
- wideband . . . . .  $-50$  to  $+20$  dB/dBm
- Switchable in steps of . . . . . 10 dB
- with depressed push button . . . . . additional 5 dB
- Voltage: selective . . . . . 8  $\mu$ V, 25  $\mu$ V, ..., 8 V
- wideband . . . . . 8 mV, 25 mV, ..., 8 V
- Meter scale ranges
- Level . . . . .  $-20$  dB to  $+1$  dB
- Maximum resolution . . . . . 0.1 dB
- Voltage . . . . . 0 to 2.8 V, 0 to 8.5 V
- Fast signal detector with LED
- Threshold referred to 0 dB meter reading . . . . . approx.  $-15$  dB

**Level calibration**

- Wideband . . . . . calibration signal frequency, 10 kHz (fixed)
- Selective . . . . . calibration signal frequency tracks synchronously with Receiver tuning

**Individual errors**

- for selective and wideband measurements
- Error limits of meter reading in range 0 dB (0 dBm) at 0 dB reading;  $Z_{in} = Z_{source} = Z_o$  and f = 10 kHz
- Selective after calibration and  $(23 \pm 3)^\circ\text{C}$  . . . . .  $\pm 0.1$  dB
- In range 0 to  $50^\circ\text{C}$  and wideband . . . . .  $\pm 0.15$  dB
- Error limits of range switching referred to 0 dB (0 dBm) range at f = 10 kHz
- Selective, level range  $+20$  to  $-70$  dB/dBm . . . . .  $\pm 0.15$  dB
- level range  $-80$  to  $-100$  dB/dBm . . . . .  $\pm 0.2$  dB
- Wideband . . . . .  $\pm 0.15$  dB
- Variation of level reading with frequency, referred to 10 kHz at  $Z_{in} = Z_{source} = Z_o$

Frequency*)	200 Hz	1 kHz	100 kHz	620 kHz	1.62 MHz
Z = 75 $\Omega$	(23 $\pm$ 3) $^\circ\text{C}$ . . . . . $\pm 0.1$ dB				
	0 to $+50^\circ\text{C}$ . . . . . $\pm 0.15$ dB				
Z = 150, 600 $\Omega$	$\pm 0.2$ dB	$\pm 0.15$ dB			—

\*) SPM-31 up to 620 kHz

**Error limits of meter scale**

- for readings  $+1$  to  $-3$  dB . . . . .  $\pm 0.1$  dB
- $-3$  to  $-6$  dB . . . . .  $\pm 0.2$  dB
- $-6$  to  $-10$  dB . . . . .  $\pm 0.3$  dB

**Total error**

- (Combination of all individual error limits introduced previously)
- Total error limits after calibration at  $Z_{in} = Z_{source} = Z_o$  and meter reading  $-6$  to  $+1$  dB
- Selective measurements, levels  $\geq -80$  dB/dBm . . . . .  $\pm 0.5$  dB
- Wideband measurements, levels  $\geq -50$  dB/dBm . . . . .  $\pm 0.5$  dB

**Selectivity**

Bandwidth, switchable amongst

Bandwidth	24 Hz*)	1.74 kHz	3.1 kHz
3 dB bandwidth	24 Hz	—	—
Effective noise bandwidth	—	1.74 kHz	3.1 kHz
Rejection at: $\Delta f = \pm 70$ Hz	$\geq 40$ dB	—	—
	$\geq 70$ dB	—	—
	—	$\geq 60$ dB	$\geq 60$ dB

\*) If requested, 100 Hz ( $\geq 50$  dB rejection at  $\Delta f = \pm 350$  Hz)

Image frequency and IF suppression . . . . .  $\geq 70$  dB

**Harmonic ratio,  $a_{k_2}$  and  $a_{k_3}$**

- in low distortion mode with a sensitivity increase of 50 dB over the measuring range for the total power, total power  $\leq 0$  dB (0 dBm)
- Fundamental frequency
- $\geq 3$  kHz . . . . .  $\geq 70$  dB
- $\geq 1$  kHz, bandwidth 24 Hz . . . . .  $\geq 70$  dB
- $\geq 300$  Hz, bandwidth 24 Hz . . . . .  $\geq 65$  dB

### Intrinsic noise

Input terminated by  $Z_0$   
 Wideband measurements  $\leq -70$  dB/dBm  
 Selective measurement, 24 Hz bandwidth, low noise,  $\geq 10$  kHz  
 for  $Z_0 = 75 \Omega$ ,  $600 \Omega$   $\leq -130$  dB/dBm  
 for  $Z_0 = 150 \Omega$   $\leq -130$  dB ( $-125$  dBm)  
 The values are 15 dB higher for the 1.74 kHz bandwidth and  
 18 dB higher for the 3.1 kHz bandwidth.

### Outputs

Demodulator output,  $Z_{out} = 600 \Omega$  . . . 3 pole CF connector  
 Output level  
 0 dB meter indication . . . . . approx. 0 dB at  $600 \Omega$  load  
 Single-sideband demodulation, switchable to upright or inverted  
 Mid-band output frequency . . . . . 2 kHz  
 D.C. output . . . . . 3 pole CF connector  
 Voltage proportional to meter indication,  
 $Z_{out} = 5 k\Omega$  . . . . . 0 V to +5 V  
 Control output\*  
 for remote tuning of Level Generator PS-30 . . . . . coaxial, BNC  
 Output level at  $Z_{source} = Z_0 = 75 \Omega$  . . . . . approx. 0 dBm  
 Frequency range: SPM-30 . . . . . 4 MHz to 5.62 MHz  
 SPM-31 . . . . . 4 MHz to 4.62 MHz  
 Reference frequency output\* . . . . . coaxial, BNC  
 for synchronization of PS-30 in remote tuning mode  
 Output level at  $Z_{source} = Z_0 = 75 \Omega$  . . . . . approx. 0 dBm  
 Frequency . . . . . 1 MHz

### General Specifications

Power supply  
 Mains operation  
 Rated ranges of use for a.c. line voltage,  
 switch selectable . . . . . 93.5 to 141 V/187 to 262 V  
 Rated range of use for a.c. line frequency . . . . . 45 to 66 Hz  
 Power consumption,  
 while measuring or recharging battery . . . . . 25 VA  
 Safety class to IEC 348 and VDE 0411 . . . . . Class I  
 Battery operation with option, BN 4502/00.02  
 Tolerable ambient temperature  
 Rated range of use . . . . .  $0^\circ\text{C}$  to  $+50^\circ\text{C}$   
 Storage and transport . . . . .  $-40^\circ\text{C}$  to  $+60^\circ\text{C}$   
 Dimensions (w x h x d) in mm . . . . . 317 x 175 x 342  
 Weight  
 (with batteries and Tracking Generator) . . . . . approx. 12 kg

### Options

**Rechargeable battery pack**, BN 4502/00.02  
 for SPM-30 or SPM-31  
 Operating time . . . . . approx. 8 h  
 Charge time . . . . . approx. 14 h  
**Tracking Generator PSE-30** for . . . . . SPM-30  
**PSE-31** for . . . . . SPM-31

Frequency range	PSE-30	PSE-31
Balanced output	0.2 to 620 kHz	
Coaxial output (unbalanced)	0.2 to 1620 kHz	0.2 to 620 kHz

Frequency tuning and display see Level Meter

### Generator outputs

Coaxial output\* . . . . . Universal connector Versacon® 9  
 Output impedance . . . . .  $75 \Omega$   
 Level range . . . . .  $-60$  to  $+1$  dB/dBm or 0.8 mV to 0.85 V  
 Balanced output . . . . . 3 pole CF connector  
 Output impedance, selectable . . . . .  $150 \Omega^*)$ ;  $600 \Omega$ ;  $<5 \Omega$   
 \*)  $135 \Omega$  on request  
 Level range . . . . .  $-60$  to  $+1$  dB/dBm or 0.8 mV to 0.85 V  
 with impedance  $Z_{source} < 5 \Omega$  . . . . .  $-60$  to  $+11$  dB/dBm  
 or 0.8 mV to 2.8 V

Return loss at 10 kHz . . . . .  $\geq 40$  dB  
 Signal balance ratio . . . . .  $\geq 40$  dB

### Output level

Send level displayed on receiver's meter when push button  
 is pressed  
 Level setting range  
 in 10 dB steps . . . . .  $-50$  to  $+0$  dB/dBm  
 or 2.5 mV, 8 mV, ..., 0.8 V  
 Balanced output,  $Z_{source} \approx 0 \Omega$  . . . . .  $-50$  to  $+10$  dB/dBm  
 or 2.5 mV, 8 mV, ..., 2.5 V  
 continuous with pot . . . . .  $-10$  to  $+1$  dB  
 Error limits of output level for  $Z_{source} = Z_{out} = Z_0$  at  $f = 10$  kHz,  
 output level 0 dB/dBm . . . . .  $\pm 0.2$  dB  
 Extra errors at any level,  $Z_{source} = Z_{out} = Z_0$  . . . . .  $\pm 0.15$  dB  
 Frequency response error limits referred to 10 kHz  
 Coaxial output . . . . .  $\pm 0.15$  dB  
 Balanced output . . . . .  $\pm 0.3$  dB  
 Total error limits for  $Z_{source} = Z_{out} = Z_0$   
 referred to indicated level . . . . .  $\pm 0.5$  dB  
 Harmonic ratio  $a_{k_2}$  and  $a_{k_3}$   
 for meter readings  $\leq 0$  dB . . . . .  $\geq 40$  dB  
 Suppression of nonharmonic spurious signals  
 for output levels  $\geq -40$  dB . . . . .  $\geq 60$  dB

### Ordering Information

#### Level Meter

**SPM-30\***, bandwidths 24 Hz, 1.74 kHz, 3.1 kHz **BN 4502/01**  
 bandwidths 100 Hz, 1.74 kHz, 3.1 kHz **BN 4502/03**  
**SPM-31\***, bandwidths 24 Hz, 1.74 kHz, 3.1 kHz **BN 4505/01**  
 bandwidths 100 Hz, 1.74 kHz, 3.1 kHz **BN 4505/03**

#### Options (at extra cost)

Tracking Generator PSE-30\* for SPM-30 **BN 4502/00.01**  
 Tracking Generator PSE-31\* for SPM-31 **BN 4505/00.01**  
 Rechargeable battery pack **BN 4502/00.02**  
 Impedance  $135 \Omega$  instead of  $150 \Omega^1)$

#### Accessories (at extra cost)

Return Loss Measuring  
 Attachment RFZ-12<sup>2)</sup> **BN 810/01**  
 Signal Balance Ratio Measuring  
 Attachment SDZ-12<sup>2)</sup> **BN 811/01**  
 Impedance Measuring  
 Attachment SFZ-1<sup>2)</sup> **BN 385/04**  
 Balanced Attenuator SDG-40<sup>2)</sup> **BN 608/00.01**  
 Adaptor CF (F) – WE (M) **S 132**  
 Front and back panel covers SD-940 (1 set) **BN 4502/00.03**

1) SPM-30: BN 4502/00.12, SPM-31: BN 4505/00.12  
 PSE-30: BN 4502/00.05, PSE-31: BN 4505/00.05  
 2) For specifications and further information for ordering see Measurement  
 Accessory Leaflet.  
 \* Equipped with the  $75 \Omega$  basic connector Versacon® 9 and BNC adapter.  
 For other adapter types, see "Specification Sheet Versacon® 9", and order  
 chosen type when ordering instrument.