



# SPM-32, SPM-33 Selective Level Meter

for level and voltage measurements in the range 200 (50) Hz to 620 kHz or 1.62 MHz



- Selective and wideband measurements
- Synthesizer gives high frequency accuracy
- Frequency settings: numeric entry by means of keyboard, in steps, or in quasi-analog mode
- Frequency search; AFC
- Absolute and relative level measurements
- Digital level and voltage display and autoranging
- Quasi-analog bar graph shows result trends
- Integral demodulator and loudspeaker
- Memory for 100 setups/fixed frequencies
- 100 results can be stored
- Powered by internal batteries or external a.c. adaptor/charger
- Carrying case for meter and accessories (option)

## Applications

The compact, handy, battery-powered SPM-32 and SPM-33 Selective Level Meters have been designed as multi-function in-service test sets for CF transmission systems with up to 300 voice channels. The lower frequency limit of (50)200 Hz makes measurements in the audio and voice range possible. From 50 to 200 Hz, measurements are possible but with lower accuracy and sensitivity.

Selective and wideband measurements of level and noise at balanced and coaxial test points can be made. If higher levels are to be measured, e.g. power line carrier systems, the necessary external attenuator is available as an accessory.

The instruments can therefore handle practically all field tests that are carried out during the installation, maintenance and monitoring of CF systems as operated by PTTs, the railways or public utility companies in the energy sector for example. The SPM-32 or SPM-33 form a complete FDM test set with the PS-33 level generator.

## Characteristics

As far as easy operation is concerned, the instruments can be compared with larger, up-market bench equipment. By using high scale integration and SMD (surface mounted devices), the size and volume of both units are far below that of conventional sets used in similar applications.

Frequency range, SPM-32 . . . . .	200 (50) Hz to 620 kHz
SPM-33 . . . . .	200 (50) Hz to 1.62 MHz
Frequency error limits . . . . .	$\pm 3 \times 10^{-6} \pm 1$ Hz
Input impedance, coaxial . . . . .	75 $\Omega$ , high impedance
balanced . . . . .	75, 150 (135), 600 $\Omega$ and high impedance
Display range, $Z_0 = 75 \Omega$ , bandwidth 25 Hz	
Selective, $f \geq 10$ kHz . . . . .	-120 to +20 dBm
Display resolution . . . . .	0.01 dB
Bandwidth, selectable . . . . .	25 Hz*, 1.74 kHz (1.95 kHz), 3.1 kHz * 100 Hz as option
Weight . . . . .	approx. 1 kg
Ambient temperature, nominal range . . . . .	0 to +50°C

The tuning frequency is produced by a synthesizer, so ensuring high frequency accuracy and stability. The frequency can be entered by means of a numeric keypad, in steps or in the quasi-analog mode. The result is either displayed as an absolute level or voltage or as a level difference, i.e. the difference between a measured value and a reference value. Results are shown on a digital display which has a max. resolution of 0.01 dB. Autoranging has been provided to make operation even easier. A fast bar graph indicates level trends (resolution 0.1 dB). One

hundred setups/fixed frequencies can be stored to reduce the work involved in routine measurements. The SPM-33 can be run on its own internal batteries which are monitored to prevent incorrect results when the battery goes low. The SPM-33 can be powered from an a.c. adaptor/charger LNT-1 when measurements of some duration are being made. When the SPM-33 is switched on a selftest is run, this is followed by a calibration routine. Display symbols indicate if a fault is present, and the fault type.

## Other characteristics and applications

### SPM-32 Level Meter, BN 2033/11 and SPM-33 Level Meter, BN 2033/01

- Frequency search: Finds hot tones and spurious discrete frequencies that exceed a certain threshold level (adjustable). The speed of the search depends on the bandwidth.
- Range of bandwidths: The user has a choice of three bandwidths. The 25 Hz bandwidth is used to measure pilots, carrier leaks and frequency spectra. The units can also be fitted with a 100 Hz bandwidth (option, replaces 25 Hz bandwidth) which is ideal for in-service measurements on FM carrier telegraphy systems operating at 50 baud. The filter with the 1.74 kHz noise bandwidth can be used to make weighted noise measurements on single voice channels operating in the carrier frequency range; the flat 3.1 kHz filter is used for unweighted measurements.
- Noise averaging (AVRG) and (MAX. HOLD): Noise averaging is used to reduce display jitter so making it possible to read off results more accurately, e.g. noisy signals and noise measurements. MAX. HOLD is used to display and freeze the greatest level that has been measured during a certain period. This measurement mode is useful when measuring strongly fluctuating levels.
- Result memory: Up to 100 results and the appropriate measurement parameters can be stored and recalled when required.
- Voltage display: Voltage measurements are possible from about 1  $\mu$ V (selective) to 3.8 V. The result is given with 4 places in  $\mu$ V, mV or V.
- Demodulator: Demodulates single sideband signals (upper or lower sideband); the integral loudspeaker is used for qualitative signal assessment at any of the available bandwidths.
- Power line carrier measurements: PLC systems may use levels up to +50 dBm, however, high impedance measurements on levels of this magnitude can be made using a balanced attenuator (for versions BN 2033/01 and /11).

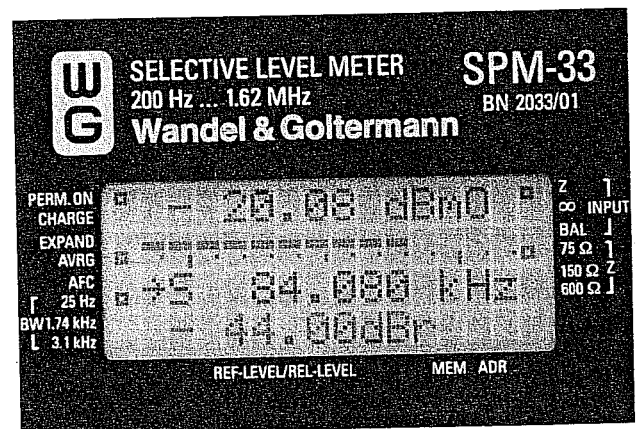
### SPM-32 Level Meter, BN 2033/12 and

### SPM-33 Level Meter, BN 2033/02 (North American version)

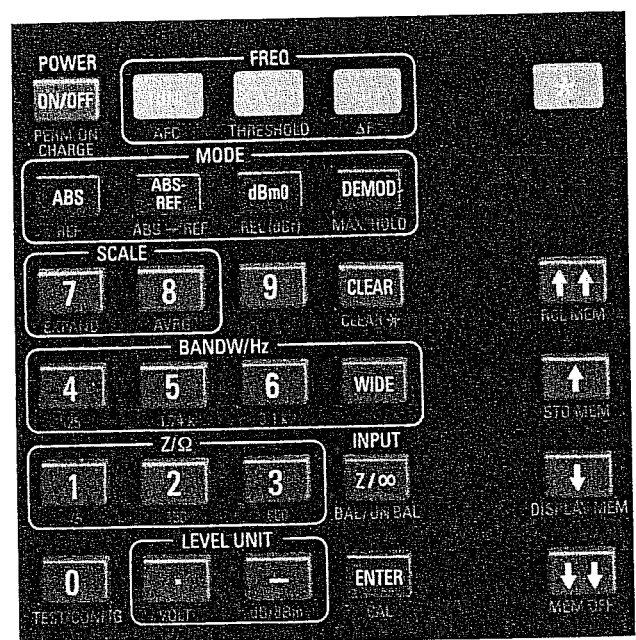
- Different to versions BN 2033/01 and /11 in the following ways:
- Measures and displays noise in dBnC or dBnC0 (bandwidth 1.95 kHz)
  - WECO connectors

### SPM-33, BN 2033/03 (Japanese version)

- Different to version BN 2033/01 in the following ways:
- Specially designed for measurements on balanced systems,  $Z_0 = 75, 150 (135) \text{ and } 600 \Omega$
  - Balanced I-214 connectors



Display showing results and selected parameters



Keypad

Unless otherwise stated, the data are valid for the nominal range of use immediately after switch-on.

**Inputs**

Coaxial input\* . . . . . Versacon® 9 Universal Connector  
 is compatible with all common connector systems  
 Input impedance, selectable . . . . . 75 Ω, high impedance  
 Frequency range, SPM-32 . . . . . 200 (50) Hz to 620 kHz  
 SPM-33 . . . . . 200 (50) Hz to 1.62 MHz  
 Return loss . . . . . ≥40 dB  
 Balanced input<sup>1)</sup> . . . . . 3-pole CF connector  
 (BN 2033/01 and /11)  
 Input impedance, selectable . . . . . 75 Ω, 150 Ω\*, 600 Ω, high impedance  
 \*) 135 Ω for BN 2033/02 and /12  
 Frequency range, SPM-32 . . . . . 200 (50) Hz to 620 kHz  
 SPM-33 . . . . . 200 (50) Hz to 1.62 MHz  
 Return loss at f = 10 kHz . . . . . ≥40 dB  
 Signal balance ratio to CCITT O.121,  
 f ≤ 620 kHz . . . . . ≥40 dB  
 f > 620 kHz . . . . . ≥30 dB  
 Maximum load for both inputs  
 (as input signal and common mode signal)  
 Input level . . . . . +30 dBm  
 D.C. input voltage . . . . . 60 V from Z<sub>out</sub> ≥ 600 Ω

**Frequency**

Frequency setting  
 numeric via keypad, resolution . . . . . 1 Hz  
 In steps by means of increment key, smallest step . . . . . 1 Hz  
 Quasi-analog with up/down keys, resolution  
 (depends on bandwidth) . . . . . 200 Hz to 1 Hz  
 Automatic frequency settings  
 Automatic search (single shot), adjustable level threshold  
 AFC  
 Accuracy . . . . . < ±1 Hz ± 1% of selected bandwidth  
 Frequency display . . . . . LCD, 7 digits  
 Error limits for tuning frequency including  
 one year's aging . . . . . ±3 × 10<sup>-6</sup> ± 1 Hz

**Level measurements**

Measured quantities  
 Power Level (dBm) referred to . . . . . 1 mW  
 Voltage level (dB) referred to . . . . . 0.775 V  
 BN 2033/01, /11, and /03  
 Level difference in . . . . . dB  
 Level in . . . . . dBm0, dB0  
 Relative level . . . . . dBr  
 or noise in . . . . . dBm  
 BN 2033/02 and /12 also have dBmC, dBmC0  
 Voltage (dependent on selected range) . . . . . μV, mV, V  
 MAX. HOLD . . . . . displays the max. rms value  
 aid for use with fluctuating signals

**Level and voltage display**

Digital display, max. resolution . . . . . 0.01 dB  
 Quasi-analog bar graph as trend display  
 Scale, selectable . . . . . 140 dB/10 dB ± 2 dB  
 Resolution, expanded display . . . . . 0.1 dB  
 Voltage, digital display . . . . . 4 digits

1) BN 2033/02 and /12: Connector (135 Ω) compatible with WECO 241A  
 Connector (600 Ω) compatible with WECO 310  
 BN 2033/03: Connector compatible with I-214

**Display range**

Intrinsic spurious noise up to max. test level (dBm)

Input	Selective	Wideband
Coaxial 75 Ω	< -120 <sup>1)</sup> to +20 dBm	< -50 to +20 dBm
Bal- anced 75 to 150 Ω	< -105 <sup>1)</sup> to +20 dBm	< -50 to +20 dBm
600 Ω	< -110 <sup>1)</sup> to +10 dBm	< -60 to +10 dBm

1) For a bandwidth of 25 Hz, f ≥ 10 kHz; bal. 75 Ω: -100 dBm

**Error limits of the level display**

for Z<sub>in</sub> = Z<sub>out</sub> = Z<sub>o</sub>, after calibration, with noise averaging, MAX HOLD off, battery mode, includes rounding errors and the signal balance ratio of test item ≥ 20 dB

Intrinsic error and variation with level at 10 kHz and (23 ± 3)<sup>o</sup>C (table values in dB)

Bal., all bandwidths	±0.4			±0.9	—
Co-axial Bandwidth > 100 Hz					
100 Hz bandwidth	±0.3	±0.1	±0.3	±0.4	±0.6
25 Hz bandwidth				±0.4	
Level range/dBm (75/135/150 Ω)	+20	0	0	-70	-80 -90 -100
Level range/dBm, dB (600 Ω)	+10			-80	-90 -100 -110

Variation of level display with frequency referred to 10 kHz, the input level being ≥ 40 dB above the intrinsic noise level

Coaxial	Z <sub>o</sub> = 75 Ω	±0.3 dB	±0.5 dB
Bal.	Z <sub>o</sub> = 75 to 150 Ω	±0.3 dB	±0.5 dB
	Z <sub>o</sub> = 600 Ω	±0.4 dB	±0.6 dB
Frequency range		200 Hz	620 kHz 1.62 MHz

**Total error**

(the total of all previously listed errors, SPM-32 up to 620 kHz only)

Error limits (selective) <sup>1)</sup>	f = 200 Hz to 620 kHz	±0.7 dB	
	f = 200 Hz to 1.62 MHz	±0.9 dB	
Error limits (wideband) <sup>2)</sup>	f = 200 Hz to 620 kHz	±0.8 dB	—
	f = 200 Hz to 1.62 MHz	±1 dB	—

Level range/dBm (75/135/150 Ω) +20 -40 -80  
 Level range/dB, dBm (600 Ω) +10 -50 -90

1) rms measurements  
 2) For sinusoidal voltage average measurement, rms display

**Selectivity, bandwidth, selectable**

Nominal value	Effective noise bandwidth	Bandwidth for attenuation < 3 dB	Centre frequency ± Δf for attenuation > 60 dB
25 Hz	—	24 Hz	±250 Hz
100 Hz <sup>1)</sup>	—	80 Hz	±400 Hz
1.74 kHz	1.74 kHz ± 10 %	1450 Hz	±2 kHz
(BN 2033/01)			
1.95 kHz	1.95 kHz ± 10 %	1650 Hz	±2 kHz
(BN 2033/02)			
3.1 kHz	3.1 kHz ± 15 %	2.7 kHz	±2 kHz

1) Option, replaces 25 Hz. Values for +10 to +35<sup>o</sup>C

Image frequency and IF attenuation . . . . . > 60 dB

Harmonic ratio  $a_{k2}, a_{k3}$   
for fundamentals  $\geq 2$  kHz . . . . . >60 dB

**Demodulator**

Single sideband demodulation,  
selectable . . . . . upper or lower sideband  
Integral loudspeaker, volume adjustable

**Memory**

100 user-programmable setups.  
Entry and recall by means of keypad. Setups are cleared  
by being overwritten.

**General specifications**

**Power supply**

Battery or mains operation  
Dry batteries (fitted) . . . . . 2 off, 9 V IEC 6LF22  
Option NiCd batteries (2 off) . . . . . 9 V IEC 6F 22  
Separate a.c. adapter/charger for recharging NiCd batteries.  
It is possible to charge the batteries and make measurements  
at the same time.

**Operating time**

with dry batteries . . . . . approx. 8 h  
with NiCd batteries . . . . . approx. 2 h

EMI/RFI . . . . . to Bundespost 1046/1984

**Ambient temperature**

Nominal range of use . . . . . 0 to +50°C  
Limits operating range . . . . . -10 to +55°C  
Storage and transport . . . . . -40 to +70°C

Dimensions (w×h×d in mm) . . . . . 110×200×60

Weight with batteries . . . . . approx. 1 kg

**Ordering information**

<b>Level Meter SPM-32*</b> (CF connector)	<b>BN 2033/11</b>
<b>Level Meter SPM-32*</b> Noise Measurements in dBmC <sup>1)</sup> , WECO connectors	<b>BN 2033/12</b>
<b>Level Meter SPM-33*</b> (CF connector)	<b>BN 2033/01</b>
<b>Level Meter SPM-33*</b> Noise Measurements in dBmC <sup>1)</sup> , WECO connectors	<b>BN 2033/02</b>
<b>Level Meter SPM-33*</b> like BN 2033/01, but with I-214 bal. connectors <sup>2)</sup>	<b>BN 2033/03</b>

Supplied accessories:  
two dry batteries, carrying strap

<b>Options (no extra charge)</b>	
124 Ω <sup>3)</sup> instead of 150 Ω	BN 2033/00.60
135 Ω <sup>3)</sup> instead of 150 Ω	BN 2033/00.61
140 Ω <sup>3)</sup> instead of 150 Ω	BN 2033/00.62

<b>Option (charged extra)</b>	
100 Hz bandwidth <sup>3)</sup> instead of the 25 Hz bandwidth	BN 2033/00.52

<b>Accessories (charged extra)</b>	
NiCd batteries (two required) with charger contact	BN 820/00.50
A.C. adapter/charger LNT-1	BN 2068/01
Please specify power cord <sup>4)</sup> required:	
European plug	K 490
U.S. plug	K 491
U.K. plug	K 492
Australian plug	K 493
Leather carrying case (black) for SPM-32 or SPM-33	BN 926/22
MK-1 Equipment case <sup>5)</sup>	BN 2090/04
for SPM-32 or SPM-33, LNT-1, Adaptor and connecting cables	
MK-4 Equipment case <sup>5)</sup>	BN 2092/20
for SPM-32/-33, PS-33 and LNT-1	

\* Fitted with the Versacon® 9 75 Ω basic connector and BNC insert. Other types of insert – see Versacon® 9 data sheet – should be ordered with the SPM-33

1) A bandwidth of 1.95 kHz instead of 1.74 kHz  
2) If required cable K 438: I-214 (m) CF, 1 m, K 474 2×I-214 (m), 1.5 m  
3) To be ordered together with the SPM-33 (can only be factory fitted)  
4) For further information see accessories data sheet.  
5) For specification see relevant data sheet MK-1 and MK-4