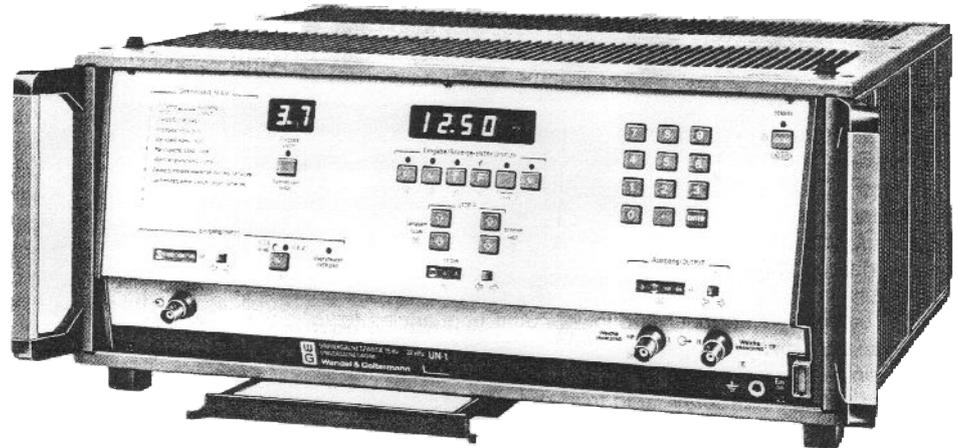




UN-1 Universal Network and Filter

for a wide range of measurement tasks and signal shaping: 0 to 150 kHz

IEEE 488
IEC 625



- Offers a wide selection of functions ranging from low-pass, high-pass, band-pass, band-stop and branching filters to weighting and delay networks
- Signal shaper in the time domain
- Octave, half-octave, third-octave band filters, electro-acoustic, low-pass and high-pass filters with switch selectable A or B frequency sequences conforming to DIN/IEC requirements
- Weighting filters (A, B, C, D) and pink noise network for acoustic measurements, conforming to DIN or IEC requirements
- Weighting filters for the voice and sound-programme channels conforming to CCITT or CCIR Recs.
- Additional transfer functions can be provided on request
- Dialog program for any function on request

- Manufacturers of frequency division multiplex, time division multiplex and data transmission equipment.
- Manufacturers of audio systems, amplifiers, filter networks and speech coding devices.
- Telecommunication administrations, radio and TV companies and their research departments.

- The automotive industry and avionics
- Manufacturers of control systems
- Materials research departments

- Institutes investigating architectural acoustics
- Universities, polytechnics and research institutes carrying out mechanical and acoustic vibration research

- Manufacturers and users of medical instruments for analysis of complex vibrations
- Biomedical clinics, E.N.T. clinics and research institutes

The UN-1 Universal Network and Filter can be set to any of the most frequently used transfer functions in the AF range. Over 30 different operating modes are provided in the standard version. In addition to more than 2000 frequency settings, various filter slopes, relative bandwidths or delay times can be entered depending on which operating mode has been selected. The filter you want is therefore ready in seconds.

In spite of the immense number of possible settings the UN-1 is easy to operate via its keyboard.

Using the IEC Bus Interface (available on request), all the UN-1's functions can be remotely controlled – by an external computer for example. This means that the UN-1 can be economically incorporated in automatic test systems.

For special applications, a maximum of 20 extra operating modes, specified by the customer, can be retrofitted for tasks that even the standard UN-1 with its wide range cannot handle. A dialog program for use on a desktop computer is also available and with this practically any transfer function can be realised.

Frequency range	0 to 150 kHz
Frequency settings	16 Hz (1 Hz) to 32 kHz
Operating modes	low-pass, high-pass, band-pass, band-stop, branching, weighting filters, delay network
Slope for high/low-pass filters up to	72 dB/octave for the Cauer filter
Signal input and output	V_p max. 6 V
Impedances, switchable	75, 150, 600 Ω
additionally	$Z_{in} = 1\text{ M}\Omega$ and $Z_{out} = 5\ \Omega$
Intrinsic noise ($V_p \leq 1\text{ V}$), typically	0.1 mV
Intrinsic distortion factor ($V_p \leq 1\text{ V}$)	$\leq 0.1\%$

Further Applications and Characteristics

Standard operating modes

The filter operating modes that are permanently stored (low-pass, high-pass etc.) and the filter characteristics (Butterworth, Chebishev, Bessel, Causer, IEC) can be called up with a two digit code number.

Depending on the filter operating mode, the frequency setting entered via the keypad is interpreted as a cutoff frequency or a centre frequency in the range 16 Hz to 32 kHz, or with limited accuracy in the range 1 Hz to 35.7 kHz. The STEP buttons provide a facility for stepping through the frequency range and so considerably simplify operation. The minimum step length is 1 Hz.

The range of slope settings for the high- and low-pass filters is very large. The greatest slope (158 dB/octave) is attained by the Causer filters.

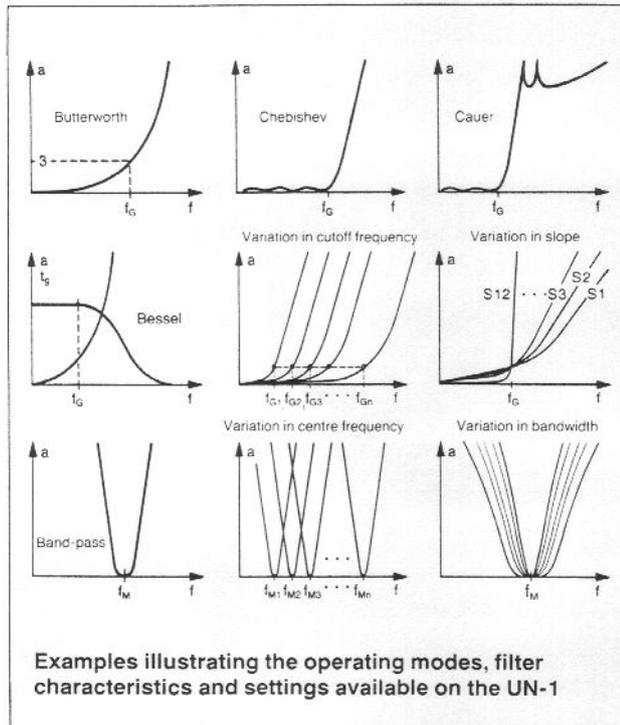
The Bessel low-pass filters have a linear phase response in the pass-band which gives a practically transient-free response to a step input. In the "narrow band-pass" operating mode certain relative bandwidths in the range 7% to 30% can be selected.

The notch filter has an attenuation of at least 60 dB at any frequency selected. The upper and lower cutoff frequencies for the wide band-pass and band-stop filters are not mutually dependent, and so can be selected as required.

Standard *octave*, *half-octave* and *third-octave band-pass filters* are available for acoustic measurements, acoustic *low-pass* and *high-pass* filters as specified by DIN/IEC can also be obtained. The possibility of stepping through the frequency range according to the standard A or B series is also an advantage for frequency analysis.

The A, B, C and D weighting filters, which comply with international specifications, are provided for weighted acoustic level measurements.

The UN-1 also contains those weighting networks which are widely used in the telecommunications industry for carrying out noise-voltage measurements in the voice or sound-programme channels as defined in CCITT/CCIR Recs. and Bell specifications.



In the "delay network" operating mode, delays between 0.2 and 20 ms can be set depending on bandwidth.

User-specific functions

A maximum of twenty operating modes can be retrofitted for special applications. Forms for ordering *Special Networks* are available. When filling in these forms the user may specify the transfer function with its poles and zeroes, or use the polynomial form. The function required can also be expressed in terms of its variation of attenuation with frequency.

In many applications a large variety of different networks have to be setup in a short time. To handle these situations a *dialog program* on a cassette for use with a desktop computer (CU-85 Control Unit or HP 85 computer) or on diskette for use with the HP 200 series computers, is available.

The program, which provides dialog prompts on a screen, can be used to obtain practically any transfer function when the UN-1 is controlled via the <IEC 625>/IEEE 488 Interface Bus. The transfer functions are expressed as poles or zeroes or as coefficients of the relevant polynomial. If a transfer function is to be used frequently it can be stored on the data storage media for later use.

Remote control

All front panel settings of the UN-1 can be controlled by an external computer connected via the <IEC 625>/IEEE 488 Interface Bus (interface card on request).

This means that the UN-1 can be integrated in automatic test systems, e.g. for harmonic distortion measurements on electro-acoustic and telecom subassemblies and equipment, testing PCM codec modules, noise investigations on drive mechanisms, and vibration measurements on motors etc.

Balanced inputs or outputs

When used in conjunction with the *SPMZ-110 Balancing Attachment* the UN-1 can be connected to balanced inputs or outputs.

The SPMZ-110 contains balancing transformers for the frequency ranges 15 Hz to 20 kHz and 300 Hz to 150 kHz (200 kHz). The impedances are switch selectable, and the values of 200 Ω and 300 Ω , which are common in broadcasting, are also available.

The Adaptor BN 884/00.02 is provided for matching the UN-1 input to the SPMZ-110.

Special characteristics of the UN-1

The device has a signal input and two outputs which can normally be used interchangeably. In the "branching" operating mode, however, one output is used for the low frequency output and the other for the high frequency output.

The input impedance can be switched from the high impedance setting to 75 Ω , 150 Ω or 600 Ω . Depending on the range, selected peak values of 1 V or 6 V are permissible for the input voltage. An overload indicator shows if the input level is too high. When the output is switched from the low impedance setting to 75 Ω , 150 Ω or 600 Ω , the output level increases by +6 dB. This also means that the insertion loss of the network can be neglected for matching purposes.

The coaxial connectors at the inputs and outputs of the UN-1 can be converted to all standard systems.

Mounting brackets for fitting the UN-1 into a 19" rack are also available. Covers for the front and back panels are provided to protect the UN-1 from water and mechanical damage during transportation and storage.

Specifications of the Universal Network and Filter

UN-1

Unless otherwise noted, the given specifications are valid for the rated ranges of use of a.c. line voltage, a.c. line frequency and ambient temperature.

Frequency¹⁾

Frequency range 10 Hz (0 Hz) to 150 kHz
 Normal frequency settings 16 Hz to 32 kHz
 Extended range 1 Hz to 35.7 kHz

Frequency setting

Single keypad entries, size of frequency step in range
 16 Hz (1 Hz) to 1 kHz 1 Hz
 1 kHz to 10 kHz 10 Hz
 10 kHz to 32 kHz (35.7 kHz) 100 Hz

STEP mode (slow or fast)

All frequency values as per single keypad entries. Switchable to the A or B frequency sequence according to DIN 45 401, and DIN 45 654 and IEC Publ. 225.

Signal input and outputs*

Signal input unbalanced
 Input impedance, switchable 75, 150, 600 Ω each ±0.5%
 and $\geq 1 \text{ M}\Omega \parallel \leq 50 \text{ pF}$

Signal outputs I and II²⁾ unbalanced
 Output impedance, switchable $\leq 5 \Omega \parallel \leq 100 \text{ pF}$
 and 75, 150, 600 Ω each ±0.5%

Permissible load impedance Z_L $\geq 75 \Omega$
 Max. input and output voltage (peak value V_p)

Voltage range $\leq 1 \text{ V}$ 1.1 V
 Voltage range $\leq 6 \text{ V}$ 6 V

Overload indicator

Intrinsic harmonic ratio a_{k_2}, a_{k_3}

at max. input voltage
 High pass (2.0 to 2.3), band-stop (4.0; 4.1),
 and delay network (7.0) operating modes $\cong 50 \text{ dB}$
 All other op. modes $\cong 60 \text{ dB}$

Intrinsic noise at outputs I or II

Input terminated with 75 Ω,
 weighted frequency range 10 Hz to 150 kHz
 Voltage range $\leq 1 \text{ V}$ $\cong -70 \text{ dB}$
 typical values for low-pass,
 band-pass, band-stop -80 dB
 Voltage range $\leq 6 \text{ V}$ $\cong -54 \text{ dB}$
 typical values for low-pass,
 band-pass, band-stop -64 dB

Operating mode 0.0

Connection between input and output
 Attenuation at 1 kHz $0 \pm 0.2 \text{ dB}$
 Max. variation in attenuation referred to 1 kHz
 over frequency range
 10 Hz to 100 kHz $\pm 0.15 \text{ dB}$
 100 kHz to 150 kHz $\pm 0.30 \text{ dB}$

Standard operating modes and settings

No.	Operating mode	Parameters	
1.0 1.1 1.2 1.3 1.4	Low-pass	F: cutoff freq., S: Slope $f \gg F$	
	Butterworth	F/kHz, S = 6, 12, 18, ..., 72 dB/octave	
	Chebyshev	F/kHz, S = 12, 18, 24, ..., 60 dB/octave	
	Bessel ³⁾	F/kHz, S = 12, 24, 36, 48, 60 dB/octave	
	Cauer	F/kHz (atten. for $f \geq 1.3 F$: $\geq 60 \text{ dB}$)	
1.4	Electro-acoustic as per DIN 45 654 (IEC)	F/kHz	
2.0 2.1 2.2 2.3	High-pass	F: cutoff freq., S: Slope $f \ll F$	
	Butterworth	F/kHz, S = 6, 12, 18, ..., 72 dB/octave	
	Chebyshev	F/kHz, S = 12, 18, 24, ..., 60 dB/octave	
	Cauer	F/kHz (atten. for $f \leq 0.76 F$: $\geq 60 \text{ dB}$)	
2.3	Electro-acoustic as per DIN 45 654 (IEC)	F/kHz	
3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9	Band-pass	F: centre freq., $\Delta f/F$: bandwidth, f_- and f_+ : lower or upper cutoff freq.	
	3.0	Octave complying with DIN 45 651	F/kHz
	3.1	Half-octave complying with IEC-Publ. 225	F/kHz
	3.2	Third-octave complying with DIN 45 652	F/kHz
	3.3	Octave } with A-weighting	F/kHz
	3.4	Half-octave } complying with	F/kHz
	3.5	Third-octave } DIN 45 633	F/kHz
	3.6	Octave } with A-weighting	F/kHz
	3.7	Third-octave } and pink noise	F/kHz
3.8	Narrow band	F/kHz, $\Delta f/F = 7, 10, 15, 20, 30 \%$	
3.9	Wideband	$f_-/kHz, f_+/kHz$	

1) All specifications are valid for the frequency range 10 Hz to 150 kHz or for the entry range 16 Hz to 32 kHz. The transfer function is guaranteed in the extended frequency range 0 to 10 Hz or the entry range 1 Hz to 35.7 kHz.

2) Both outputs are interchangeable – expect in operating mode BRANCHING where output I is the high frequency output and II the low frequency output.

3) Low-pass with transient-free step response and linear phase response.

No.	Operating mode	Parameters
4.0 4.1	Band-stop	F: notch frequency, f_- and f_+ : lower and upper cutoff frequency
	Notch	F/kHz
	Wideband-stop	$f_-/kHz, f_+/kHz$
5.0	Branching filter	F: crossover frequency, S: slope
	Butterworth	F/kHz, S = 12, 24, 36 dB/octave
Weighting networks		
6.0	A-weighting filter to DIN 45 633	
6.1	B-weighting filter to DIN 45 633	
6.2	C-weighting filter to DIN 45 633	
6.3	D-weighting filter to IEC-Publ. 573	
6.4	Pink noise network 3 dB/octave in range 16 Hz to 20 kHz	
6.5	Psophometer filter to CCITT Rec. P. 53	
6.6	C-message weighting network to Bell-Publ. 41 009	
6.7	C-message weighting with 1010 Hz notch filter to Bell-Publ. 41 009	
6.8	Sound-programme network to CCIR Rec. 468-2 and DIN 45 405 (Draft)	
6.9	Programme-weighting network (USA) to CCITT and Bell Specifications	
7.0	Group delay networks	F: Cutoff freq., t_g : group delay $f \leq F$
	Delay network	$F = 20 \text{ Hz to } 20 \text{ kHz}$ or $t_g = 0.2 \text{ ms to } 20 \text{ ms}$; $F \times t_g = 4$

General Specifications

Power supply

Rated ranges of use of a.c. line voltage, selectable 110/117/127/220/227/237 V, - 12 to + 10 %
 Rated range of use of a.c. line frequency 47.5 to 63 Hz
 Power consumption approx. 115 VA
 Safety class according to IEC 348 and VDE 0411 Class I

Ambient temperature

Rated range of use +5 to +40°C
 Storage and transport -40 to +70°C

Dimensions in mm

Bench model	19" Rack mounting (DIN 41 494)
Width with handles 477	Width 443
Height overall 199	Height (4 units) 175
Depth with handles 434	Depth 379

19" conversion kit BN 700/00.04

Weight approx. 14 kg

Options

<IEC 625>/IEEE 488 Interface Bus

for remote control of all UN-1 operating functions.

Special Networks¹⁾

Operating mode numbers 8.0 to 8.9 and 9.0 to 9.9 are reserved for user specified networks.

Accessories

Dialog Program

Cassette for CU-85 control unit or HP 85 desktop computer, diskette for HP 9000 Series 200 computers (model nos. 216, 220, 226, 236). Practically any transfer function can be realised via the <IEC 625>/IEEE 488 Interface Bus.

SPMZ-110 Balancing Attachment

for connecting the UN-1 to balanced devices

Connectors, balanced, floating 3 pole CF connectors
 Input I/output I 15 Hz to 20 kHz
 Input impedance 300 Ω, 600 Ω, 50 kΩ
 Output impedance 200 Ω, 600 Ω, ≈10 Ω

Input II/output II 300 Hz to 150 kHz
 Input impedance 75 Ω, 140 Ω, 150 Ω, 600 Ω, 12 kΩ
 Output impedance 75 Ω, 140 Ω, 150 Ω, 600 Ω, ≈10 Ω
 For extra data consult the SPMZ-110 Specification Sheet.

Connector adaptor

for matching the UN-1 input to the SPMZ-110

Ordering Information

Universal Network and Filter UN-1 *	BN 884/01
Options (at extra cost)	
Interface Bus <IEC 625> Card	BN 853/06
with Adaptor plug IEC 625/IEEE 488 (S 834) and connecting cable for IEEE 488 (K 420)	
Special Networks ¹⁾	BN 884/00.04
Accessories (at extra cost)	
Dialog Program for CU-85/HP 85, German	BN 884/00.01
English	BN 884/00.03
Dialog Programm 2 for HP 9000 Series 200 computers	
3½" diskette, German/English	BN 884/00.06
5¼" disk, German/English	BN 884/00.07
Balancing Attachment SPMZ-110	BN 613/01
Connector Adaptor	BN 884/00.02
Front and back panel covers (1 set), SD-4	BN 700/00.24
Control Unit CU-85	BN 981/01

1) Order form No. 0884/00.79 (graph/table) or Order form No. 0884/00.78 (poles/zeros or polynomial) available on request.

* Equipped with the 75 Ω basic connector Versacon® 9 and BNC adapter. For other adapter types, see "Specification Sheet Versacon® 9", and order chosen type when ordering instrument.