

CATALOGO DE DIGMESS



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HM Series Digital Multimeters

digimess® concept

CE



HM300

HM100



HM200



The **digimess®** HM series is a comprehensive range of low cost general purpose hand held digital multimeters including 2000, 4000 & 6000 count models. As well as standard DC/AC volts, DC/AC current & resistance ranges, all models in the HM series include temperature, capacitance, diode test, continuity test & data hold. Additional features depending on the specific model include true rms, back lit LCD displays, frequency, duty cycle, max/min/rel value & transistor HFE (using the supplied multi-function adapter). All units are supplied with integral rubber holsters, test leads, batteries, K type thermocouples & operating manuals. HM300 also includes a moulded carrying case, RS232 cable &

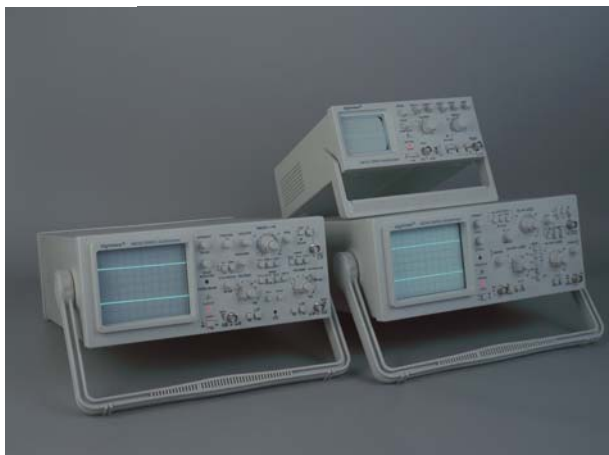
Specification

Model No	HM100	HM200	HM300
Order No	HUC55-01	HUC55-02	HUC55-03
No of counts	2000	4000	6000
DC volts	200mV, 2V, 20V, 200V, 600V 0.7%	400mV 1.0%, 4V, 40V, 400V, 1000V 0.5%	600mV, 6V, 60V, 600V 0.5% 1000V 0.8%
AC volts	200mV, 2V, 20V, 200V 0.8% 600V 1.0%	400mV 3.0%, 4V, 40V, 400V, 1000V 1.0%	600mV 1.0%, 6V, 60V, 600V 0.8% 700V 1.0% TRMS
DC current	200uA, 2000uA, 20mA, 200mA, 1.2% 2A, 10A 2.0%	400uA, 4000uA, 40mA, 400mA, 4A, 10A 1.5%	600uA, 6000uA 0.8%, 60mA, 600mA 1.2% 10A 1.5%
AC current	200uA, 2000uA, 20mA, 200mA, 1.5% 2A, 10A 3.0%	400uA, 4000uA, 40mA, 400mA, 4A, 10A 1.5%	600uA, 6000uA 1.0%, 60mA, 600mA 1.5% 10A 2.0% TRMS
Resistance	200, 2k, 20k, 200k, 2M, 20M 1.0%	400, 4k, 40k, 400k, 4M 0.5% 40M 1.5%	600, 6k, 60k, 600k, 6M 1.0% 60M 1.5%
Capacitance	20nF, 200nF, 2uF, 20uF, 200uF, 1000uF 4.0%	50nF, 500nF, 5uF, 50uF, 100uF 3.0%	6nF 2.0% 60nF, 600nF, 6uF 1.0% 60uF, 600uF, 6mF 1.5%
Frequency	N/A	50Hz, 500Hz, 5kHz, 50kHz 100kHz 0.1% also duty cycle	6kHz, 60kHz, 600kHz, 6MHz to 10MHz 0.1%, 60MHz
Temperature	-20C to 0C 5.0%, 0C to 400C 1.0%, 400C to 1000C 2.0%	-55C to 0C 9.0%, 1C to 400C 2.0%, 401C to 1000C 2.0%	-40C to -20C +/-2C, -19C to 350C 0.5%, 351 to 1000C 2%
Miscellaneous	Data hold, max value, auto/ man range, continuity, diode test, HFE, back lit, auto power off, multi-function adapter for HFE, temp & capacitance	Data hold, rel value, auto/man range, continuity, diode test, auto power off, wrong connection protection, multi- function adptr for temp & capacitance	Data hold, max/min value, auto range, trms, continuity, diode test, back lit, auto power off, RS232 cable & s/w, moulded carrying case
Safety specification	IEC1010 CAT III 600V	IEC1010 CAT III 600V IEC1010 CAT II 1000V	IEC1010 CAT III 1000V
Dimensions & weight	158 x 74 x 31mm, 220g	185 x 85 x 38mm, 380g	195 x 92 x 43mm, 380g

MO Series Analogue Oscilloscopes

digimess® concept

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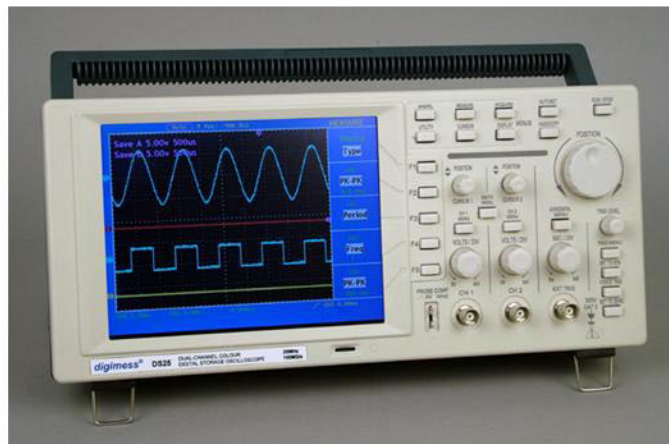
The **digimess®** MO series is a comprehensive range of general purpose analogue oscilloscopes including single and dual channel models. All types feature 8 x 10 screens, X-Y modes and built in probe calibration signals. Triggering modes are Auto, Norm and TV, with the 40MHz and 60MHz versions also including PP Auto triggering for automatic triggering without the need for level adjustment. Signal delay lines and Z modulation inputs are provided as standard on the 20MHz, 40MHz and 60MHz models and all units include X1/X10 probes.

Specification				
Model & order No	MO10 HUC70-01	MO20 HUC 70-02	MO40 HUC70-03	MO60 HUC70-04
No of channels & bandwidth	Single 10MHz	Dual 20MHz	Dual 40MHz	Dual 60MHz
Accelerating voltage	1.3kV	2kV	14kV	14kV
Screen size	8 x 10, 1div = 6mm	8 x 10, 1div = 10mm	8 x 10, 1div = 10mm	8 x 10, 1div = 10mm
Delay line	No	Yes	Yes	Yes
Vertical input	1Mohm 30pF <400Vdc, 5mV - 5V/div 3%	1Mohm 25pF <400Vdc, 5mV - 5V/div 3%	1Mohm 25pF <400Vdc, 5mV - 5V/div 3%	1Mohm 25pF <400Vdc, 5mV - 5V/div 3%
Vertical mode	CH1	CH1, CH2, ALT, ADD, CHOP, INVERT CH2	CH1, CH2, ALT, ADD, CHOP, INVERT CH2	CH1, CH2, ALT, ADD, CHOP, INVERT CH2
Horizontal	0.1S/div - 0.1uS/div 3%	0.5S/div - 0.2uS/div 3%	0.2S/div - 0.2uS/div 3%	0.1S/div - 0.1uS/div 3%
Triggering mode	Auto, Norm, TV	Auto, Norm, TV, Auto PP	Auto, Norm, TV, Auto PP	Auto, Norm, TV, Auto PP
Trigger source	INT, LINE, EXT	INT, CH1, CH2, VERT, LINE, EXT	INT, CH1, CH2, VERT, LINE, EXT	INT, CH1, CH2, VERT, LINE, EXT
Calibration signal	1kHz 0.5Vpp square wave	1kHz 0.5Vpp square wave	1kHz 0.5Vpp square wave	1kHz 0.5Vpp square wave
Z axis input	No	Sensitivity 5V, 10kohm, max 50V	Sensitivity 5V, 10kohm, max 50V	Sensitivity 5V, 10kohm, max 50V
X-Y mode	Yes	Yes	Yes	Yes
Input voltage	110/220V +/- 10% AC			
Dimensions W x L x H & weight	220 x 270 x 90mm 3kg	320 x 418 x 130mm 6.5kg	320 x 418 x 130mm 6.5kg	320 x 418 x 130mm 6.5kg

DS25 Colour 25MHz digital oscilloscope

digimess® concept

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The **digimess®** DS25 is a general purpose 25MHz bandwidth, 2 channel 100MS/s, colour digital storage oscilloscope. This compact and light weight unit (optional battery pack) features a large 7.8 inch colour STN LCD display with 640 x 480 resolution and 256 colours. The specification includes a sampling rate from 10S/s to 100MS/s (12.8GS/s max equivalent), 8 bit vertical resolution, Auto-setup and Auto-calibration. Up to 4 waveforms can be stored and a USB interface is fitted as standard. The oscilloscope is supplied with two X1/X10 probes, USB lead, PC software, mains lead and manual.

Specification

DISPLAY Screen Resolution Type Persistence Waveform interpolation Format Zoom INPUT Coupling Impedance Max input voltage Channel delay time (typical) Probe attenuation coefficient DATA ACQUISITION Real time sampling rate Equivalent sample rate Sampling modes Average HORIZONTAL Sampling range Record length Time base range Sample rate /delay time accy Time interval (T) measurement accuracy full bandwidth VERTICAL A/D converter Sensitivity Displacement range Analogue bandwidth Single bandwidth Low frequency response Rise time DC gain accuracy DC measuring accuracy average sampling mode	7.8 inch Colour STN LCD 640 x 480, 256 colours Dots or vectors Off, 1s, 2s, 5s, infinite Sin (x)/x YT and XY Expands window to full size between 2 cursors DC, AC 1MΩ ± 2%, 20pF ± 3pF 300V (peak) CAT II 150ps X1, X10, X100, X1000 100MS/s max per channel 12.8GS/s max per channel Sample, Peak Detection, Average 4, 16, 64, 128 10S/s - 100MS/s 6k points per channel 5ns/div - 5s/div, 1-2-5 steps ± 100ppm for any time interval ≥ 1ms Single: ± (1 sample time int + 100ppm x reading + 0.6ns) >average 16 : ± (1 samp int + 100ppm x reading + 0.4ns) 8 bit resolution, 2 channel 5mV/div - 5V/div ± 10div (5mV/div - 5V/div) 25MHz Full bandwidth ≥ 5Hz AC coupling -3dB ≤ 17.5ns ± 5% ± 5% reading + 0.05 divs after averaging more than 16 times	TRIGGER Trigger source Trigger mode Trigger coupling Trigger sensitivity (Edge triggering) Trigger level range Trigger level accuracy (for signals with rise/fall times ≥ 20ns) Trigger displacement Trigger sensitivity (video & typical mode) Video triggering X/Y MODE X axis Y axis PROBE COMP SIGNAL Output voltage Frequency MEASUREMENT Cursor Auto WAVEFORM MATHS Function GENERAL Power supply Battery (optional) Power consumption Working temperature Relative humidity Weight Dimensions (W x H x D) ORDER INFORMATION HUC75-00 DS25 HUC75-10 DS25-BATT	CH1, CH2, EXT, EXT/5, Auto, Norm, Single, Edge, TV AC, DC, HF Rej, LF Rej DC coupling : CH1 & CH2: 1div, EXT: 0.1V, EXT/5: 0.5V AC coupling 1 div for >50Hz INT: ± 6 divs from screen ctr, EXT: ± 600mV, EXT/5: ± 3V INT: ± 0.3divs, EXT: ± (40mV + 6% of set value) EXT/5: ± (200mV + 6% of set value) 655 divs for pre-trig and 4 divs for post-trig INT: 2 divs of pk-pk value, EXT: 400mV, EXT/5: 2V Supports PAL, NTSC and SECAM for any field or line CH1/CH2 5V 1kHz square wave Voltage difference (ΔV) and time difference (ΔT) Pk-pk value, average value, rms value, freq and period CH1-CH2, CH2-CH1, CH1+CH2 100-240Vac rms 50/60Hz 7.4V lithium rechargeable < 15W 5 - 40C 20 - 80% 1kg 350 x 157 x 120mm 25MHz colour scope 25MHz colour scope with battery option fitted
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Function Generator FG 100

digimess® compact

Order No.: H.UC 65-00



The function generator FG 100 is conceived as a "standard signal source" for daily laboratory use. The wide frequency range from 0.5 Hz to 20 MHz in connection with the signal forms offered and the special functions ensures that a further application field is covered. The internal sweep function allows a direct representation of transmitting curves on oscilloscopes or Y/t recorders. The precise digital frequency setting and the high frequency constancy, which is unusual in this price category, render this function generator interesting even for the most demanding applications. As a versatile signal source, the FG 100 will therefore soon be indispensable to every laboratory technician. Like all devices of the GRUNDIG **digimess®** series, the FG 100 has a microprocessor control system providing simple operation by means of the „quattro Key“

operating concept, as well as a self-diagnostics feature and complete remote controllability via the serial RS-232 C interface. The requested parameters such as frequency and signal amplitude are automatically set with the digital rotary switch. The remote controllability via PC interface allows the installation of the FG 100 into automatic test systems of various kinds. The FG 100 thus also fulfills the demands made by industrial companies. By means of the two 16-digit alphanumeric LC display lines with background illumination, you are always informed of all measured values and settings. Due to its excellent price/performance ratio this generator will find wide-spread application in design, production, service and training. This generator should be present in every measuring field.

Technical Data

General Features

Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Relative humidity	80%
Air pressure	70 ... 106 kPa
Operating position	horizontal or inclined by ± 15°
Operating voltage	a.c. voltage, 115/230 V (+10%, -15%), 47 ... 63 Hz
Power requirement	max. 20 VA (max. 20 W)
Fuses	T 80 L 250 V (230 V), T 160 L 250 V (115 V)
Protection class	I acc. to DIN EN 61010 Part 1 (VDE 0411 Part 1), 3/94
Interference suppression	EN 55011 class B, Vfg. 1046/1984, VDE 0871 category B
Dimension (in mm)	225 × 85 × 200 (W × H × D)
Mass of FG 100,	abt. 1.9 kg
including packing and accessories	abt. 2.9 kg

Specifications

Frequency range	0.5 Hz ... 20 MHz
Frequency setting	4 digits
Accuracy of the frequency setting (at nominal temperature)	± 0.5%, ± 0.05% after the automatic calibration for > 10 Hz
Duration of the auto-calibration of the frequency	abt. 0.8 s for f > 100 Hz, abt. 0.8 ... 30 s for f < 100 Hz
Temperature coefficient of the frequency	< ± 5 × 10 ⁻⁴ /K
Time coefficient of the frequency	< ± 1 × 10 ⁻³ /5 min after 30 min

Signal Output

Output impedance	50 Ω ± 1.5%, unsymmetrical
Output voltage U _{SS}	10 mV ... 10 V/50 Ω
Max. output level incl. offset voltage	$U_{SS} + 2 \cdot U_{offset} \leq 10.00 \text{ V}$
Setting of the output voltage	3 digits
Accuracy of the output voltage f = 1 kHz	± 3%
Additional frequency error of the output voltage	± 5% in the range of 10 Hz ... 100 kHz ± 10% in the range of 0.5 Hz ... 20 MHz
Temperature coefficient of the output voltage	< ± 5 × 10 ⁻³ /K
d.c. voltage offset of the signal (U _{offset})	± 2.5 V/50 Ω, adjustment in 10 mV steps
Accuracy of the setting of the offset voltage	± (2% + 20 mV)
Output signal	sine, square, triangle, sawtooth
Nonlinear distortion factor of the sine signal	< 1% for 20 Hz ... 20 kHz, < 5% for 100 kHz ... 10 MHz
Rise time of the square signal	< 15 ns
Nonlinearity of the square signal (5 ... 95%)	< 1%
Adjustment of the pulse-duty factor	15 ... 85% for square and triangle 1% steps
Sweep	max. 1: 50, internal, digital, discrete
Sweep repetition interval	10 ms ... 60 s

Synchronous Output

Output voltage U _{SS}	5 V ± 10% at idling, pulse-duty factor abt. 1:1, CMOS compatible „Start“ pulse with a width of approx. 5 μs in the SWEEP operation
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Display

Double-spaced alphanumeric LC display with 2 × 16 digits and background illumination. Frequency, level, units, decimal point as well as measuring functions and system messages.

Interface/Remote Control

FG 100 is completely remote controllable via the RS-232 C interface with 1,200 to 9,600 Bd.

FG200 2MHz Sweep Function Generator

digimess® concept

Order No: HUC 61-00

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The **digimess®** FG200 is a general purpose microprocessor controlled 2MHz sweep function generator. The unit features a power up self-test and is operated by a combination of soft touch buttons and rotary controls, resulting in a modern and easy to use instrument for engineers of all levels. This versatile instrument includes a 5 digit frequency display for internal or external signals and a 3 digit output amplitude display. The frequency, amplitude and attenuation ranges are indicated by leds as well as the selected waveform shape, the unit also includes both internal and external frequency sweep modes. The instrument is supplied with an operating manual, bnc test lead

Specification	
Frequency range	0.2Hz to 2MHz in 7 decade ranges
Frequency accuracy	+/- 0.5%
Output waveforms	Sine, square and triangle
Output impedance	50ohm
Output voltage	1mVpp to 10Vpp (into 50ohm load) 1mVpp to 20Vpp (into 1kohm load)
Attenuation	0dB, -20dB, -40dB, -60dB
TTL output voltage and impedance	< 0.8V and > 3V, 600ohm
Offset	-5V to +5V
Duty cycle	20% to 80%
Sine wave distortion	< 2%
Triangle wave non-linearity	< 1%
Square wave rise time	< 100nS
Sweep modes	Internal linear, Internal log, External sweep
External counter input	0.2Hz to 20MHz
Input voltage	110/220Vac +/- 10% 50Hz max 30W
Dimensions W x L x H and weight	265 x 215 x 90mm, 2kg

Arbitrary Function Generator AFG 100

digimess® compact

Order No.: H.UC 66-00



Freely definable waveforms in spite of a tight budget? That's no problem with the arbitrary function generator AFG 100 from Grundig Instruments. Besides featuring the standard sinusoidal, square wave, triangular and ramp signal functions, the generator can also be used to freely define waveforms or download measured one-off signals with a digital oscilloscope and reproduce them as often as required. This makes the AFG 100 the ideal instrument for synthesizing stimuli signals. Its frequency range of 0.01 Hz to over 12 MHz opens up a wide array of applications, whether it be the synthesis of mechanical vibrations, the simulation of typical waveforms in vehicle electrical systems, the simulation of physiological signals in the field of medical engineering or the generation of signals in video and RF engineering. In conjunction with the optional signal synthesis software package, the AFG 100 is suitable even for the less experienced user hand-

ling sophisticated applications. As with all the instruments of the Grundig *digimess®* range, the AFG 100 is controlled by a microprocessor. This makes it easy to use thanks to the „quattro key“ operating concept and provides self-diagnosis and complete remote control and evaluation capabilities via the standard RS 232 C interface. The desired parameters, such as frequency, signal level and waveform can be set by means of the digital shaft encoder. The remote control facility via the PC interface allows the AFG 100 to be used in automatic test systems, thus satisfying the requirements for a modern signal generator. Two 16-digit alphanumeric LC display lines with background lighting constantly provide the operator with information on all setting values. The excellent price-performance ratio ensures that the AFG 100 will find wide application in the fields of development, production, service and training. The AFG 100 is a must for every test bench!

Technical Data

General

Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Relative humidity	20% ... 80%
Atmospheric pressure	70 kPa ... 106 kPa
Operating position	horizontal or inclined by ± 15°
Operating voltage	alternating voltage 230 V/115 V (+10%, -15%), 47 ... 63 Hz
Power consumption	27 VA (max. 27 W)
Safety class	I acc. to EN 61010-1 (DIN VDE 0411 Part 1, 11/93)
Radio interference suppression	EN 55011 Class B, VDE 0871 Category B
Dimensions (in mm)	225 x 85 x 200 (L x H x D)
Dimensions of packing (in mm)	315 x 115 x 270 (L x H x D)
Weight of AFG 100	approx. 2.5 kg
Weight of AFG 100 incl. packing	approx. 3.5 kg

Specifications

Frequency range	0.01 Hz ... 12.5 MHz for sinusoidal and square wave signals 0.01 Hz ... 100 kHz for triangular and ramp signals 5 digits or 0.001 Hz
Frequency setting	
Accuracy of frequency setting (at nominal temperature)	± 0.01% ± 0.0002 Hz
Temperature coefficient of frequency	± 100 ppm in operating temperature range

Signal output

Output impedance	50 Ω ± 1.5%, unbalanced
Output voltage V_{op}	10 mV ... 10 V/50 Ω
Output voltage setting	3 digits
Accuracy of output voltage at $f = 1$ kHz	± [2% + 20 mV]
Additional frequency error of output voltage	± 1 dB in the range 10 Hz ... 1 MHz, ± 3 dB 0.01 Hz ... 10 MHz
Temperature coefficient of output voltage	< ± 5 × 10 ⁻³ /K
Direct voltage offset of signal (V_{offset})	± 2.5 V in 10 mV steps
Accuracy of offset voltage setting	± (1% + 20 mV)
Output signal	sinusoidal, square wave, triangular, ramp (up, down) arbitrary
Distortion factor of sinusoidal signal	< 0.5% in the range 10 Hz ... 100 kHz
Rise time of square wave signal	< 25 ns
Overshoot of square wave signal	< 0.5% + 30 mV
Non-linearity of triangular signal (5% ... 95%)	< 1%

Arbitrary signal characteristics

Horizontal resolution (length of signals)	8192 points
Vertical resolution of level	1024 points (10 Bit)
Sample period	30 ns × 2 ^{N-1} , N = 1 ... 32

SWEEP function

Frequency change for the SWEEP function	0.01 Hz ... 12.5 MHz (100 kHz for triangular and ramp signals)
Sweep type	linear, logarithmic – discrete
Direction of frequency change	rising, falling
Period of repetition for the SWEEP function	10 ms ... 60 s

Amplitude modulation

Source of modulation signal	internal, external
Frequency range of external modulation input	0 Hz ... 20 kHz
Amplitude of external signals (V_m)	2 V for AM modulation depth $m = 100\%$
Input impedance of external AM input	100 kΩ
Frequency range of internal modulation oscillator	from approx. 100 Hz to approx. 10 kHz, discrete frequency values
Depth of amplitude modulation	0 to 100%, 1% steps for internal generator of AM

Square wave synchronisation output

Output voltage V_{op}	5 V ± 10% CMOS
Duty cycle of output signal	approx. 1:1 for periodical signals pulse "Start" with a width of approx. 5 μs at the sweep function

Display

Two-line alphanumerical LC display with 2 x 16 digits and background lighting. The display shows setting values such as level, frequency, units, decimal point and system signals.

Interface/Remote control

The AFG 100 has full remote control facilities via the RS 232 C interface with 1,200 to 19,200 Bd.

Automatic RLC Meter RLC 100

digimess® compact

Order No.: H.UC 31-00



The RLC 100 is a compact RLC Meter with excellent features. With its basic accuracy of 0.5% the RLC 100 is the right measuring instrument for the Parameter measurement of passive components in daily laboratory and service work, the cost effective alternative to the more expensive precision RLC measuring instruments in the GRUNDIG electronics **digimess®** range. The fully automatic choice of the measuring range of the RLC 100 allows fast working. The measuring objects are connected up by means of two grip clamps. The tried-and-tested 4-line connection effectively suppresses stray capacitance. In addition to compensation of (the adapter residual capacity by simply pressing a button) this ensures a maximum measuring accuracy even with small L and C values. The internal polarization voltage allows the C measurement at electrolytic capacitors. It goes without saying that the RLC 100 is also suitable for random tests of components.

Deviations of test samples from the reference components can be represented either absolutely i.e. directly in numerical values of the respective measuring unit or relatively in percentage.

The RLC 100, like all other devices of the GRUNDIG electronics **digimess®** series, is controlled by a micro-processor. Allowing simple operation by means of our "quattro Key" operating concept, device self-diagnosis and complete remote control via standard interface RS 232 C.

The 16-digit alphanumeric display line with background illumination always informs you about all measuring and preset values. Due to its excellent price/performance ratio this RLC will be applied in production, service and training.

The Operating Philosophy

GRUNDIG **digimess®** devices are logical, operating your RLC 100 is "child's play", by means of only 4 function keys!



The Function Levels

Firstly, and most importantly, this is the "secret" of the clearly arranged function levels of the RLC 100.

- 1 Choose the primary measuring function directly by pressing the corresponding function key for a **short time**.
- 2 Choose the extended measuring function by pressing the corresponding function key for a **long time** ($t > 1$ s).
- 3 Choose the MENU by pressing the corresponding function keys for a **long time** ($t > 1$ s), the keys now have alternative meanings.

The User Guide

The RLC 100 "shows text in clear"! Simply follow the MENU guide in order to set individual special functions.

Bd-Rate Protocol

Technical Data

General Data

Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Relative humidity	20 to 80%
Atmospheric pressure	70 to 106 kPa
Operating position	horizontal or inclined by ± 15°
Operating voltage	sinusoidal alternating voltage (distortion factor < 5%) 115/230 V (+10%/–15%), internally switchable, 50 to 60 Hz (± 5%)
Power consumption	max. 8 W
Fuses	T 32 L/250 V (230 V~) T 63 L/250 V (115 V~)
Safety class	I, according to DIN EN 61010 Part 1 (VDE 0411 Part 1), 3/94
Radio interference suppression	EN 55011 Class B, Vfg 1046/1984, VDE 0871 Category B
Dimensions (L x H x D)	225 mm x 85 mm x 200 mm
Dimensions of packing	310 mm x 110 mm x 265 mm
Weight of RLC 100	approx. 1.8 kg
incl. packing and accessories	approx. 2.6 kg

Specification

Measuring parameters	R, L, C, Q (D), Δ, δ
Equivalent connection	series or parallel connection
Connection of the measuring object	four-wire line with Kelvin terminals
Measuring frequencies	1 kHz ± 3%
Measuring voltages	< 2 V
Selection of measuring range	automatically or within fixed range
Polarization of the measuring object	internal voltage source, approx. 2 V
Measuring time	max 400 ms for R, L, C, Δ, δ approx. 1.2 s for Q (D) in the fixed range

Measuring Range of Parameters

Measuring parameters	Measuring range from to
R	1 mΩ – 1.999 MΩ
L	0.1 μH – 199.9 H
C	0.1 pF – 1.999 mF
Q _R	0.001 – > 1.200
Q _L	< 1.0 – 199
D _C	0.001 – > 1.200
δ	– 100.0% – + 199.9%

Table 1: Measuring range of parameters

Measuring Tolerances of Measuring Ranges

Note: The specific measuring tolerances are indicated at a nominal temperature of 23 °C ± 2 °C. The measuring tolerances are raised by 50% per 10 °C deviation in the range of the operating temperature. The measuring tolerances apply to measuring value displays greater than 10% of the measuring range i.e. for displays in the range of 200 to 1999. The following conditions must be fulfilled at the same time:

$D_C < 1$, $Q_R < 1$ or $Q_L > 1$ and $C < 200$ pF (referring to ground).

Equivalent connection	Series connection					Parallel connection		
Measuring range R [Ω]	0 –	1 2	2 20	3 200	4 2k	5 20k	6 200k	7 2M
Measuring error R	–	± 2% ± 3 dig	± 1% ± 3 dig	± 0.5% ± 2 dig			± 1% ± 2 dig	± 2% ± 3 dig
Measuring error Q	–	± 3% ± 0.01	± 3% ± 0.005	± 2% ± 0.005	± 2% ± 0.005	± 2% ± 0.005	± 3% ± 0.005	± 3% ± 0.008

Additional error for R measurement in response to Q: $0.5 \times Q$ [%]

Table 2: Measuring Tolerances of R measurement

Equivalent connection	Series connection					Parallel connection		
Measuring range L [H]	0 –	1 200 μ	2 2m	3 20m	4 200m	5 2	6 20	7 200
Measuring error L	–	± 2% ± 3 dig	± 1% ± 3 dig	± 0.5% ± 2 dig			± 1% ± 2 dig	± 2% ± 3 dig
Measuring error Q	–	± 10% ± 2 dig	± 10% ± 1 dig			± 10% ± 2 dig		

Additional error for L measurement in response to Q: $0.5 \times Q$ [%]. Is not specified for $Q > 50$.

Table 3: Measuring Tolerances of L measurement

Equivalent connection	Series connection					Parallel connection		
Measuring range C [F]	0 2m	1 200 μ	2 20 μ	3 2 μ	4 200 n	5 20 n	6 2 n	7 200 p
Measuring error C	± 2% ± 8 dig	± 2% ± 5 dig	± 1% ± 3 dig	± 0.5% ± 2 dig			± 1% ± 2 dig	± 2% ± 3 dig
Measuring error D	not specif.	± 3% ± 0.01	± 2% ± 0.005	± 2% ± 0.005	± 2% ± 0.005	± 2% ± 0.005	± 2% ± 0.005	± 3% ± 0.01

Additional error for C measurement in response to D: $0.5 \times D$ [%]

The measuring error for D measurement is specified only when $C \geq 100$ pF.

Table 4: Measuring Tolerances of D measurement

Display

The RLC 100 is equipped with a 16-digit alphanumeric LC matrix display with lighting. It indicates measuring parameters, operating modes, measuring values with the current measuring unit as well as the functions by menu and system messages.

Remote Control

The RLC 100 can be fully controlled and can be read out via the serial interface RS 232 C.

Data transmission rate	1,200 to 9,600 Bd	End characters on receiving	LF (10 dec.)
Length of data character	8 bit	End characters on transmission	CR + LF (13 dec. + 10 dec.)
Number of STOP bits	1	Length of input buffer	64 characters
Parity	none	Length of output buffer	256 characters
Protocol	RTS/CTS, without (NONE)		

RLC 200 RLC Meter

digimess® expert

Order No.: H.UC 30-00



The RLC 200, an automatic RLC meter, is designed for the manual or fully automatic measurement of components.

Full remote control is possible via an RS-232 interface.

All the usual component parameters such as resistance, conductance, inductance, capacitance, Q factor and loss factor can be determined with a basic accuracy of 0.2%. Deviations from the reference components can be represented either absolutely or relatively.

The information is displayed on a large, backlit alpha-numeric LCD.

In addition to parameter measurements, DC voltages up to 400 V can be measured with a resolution of 100 µV.

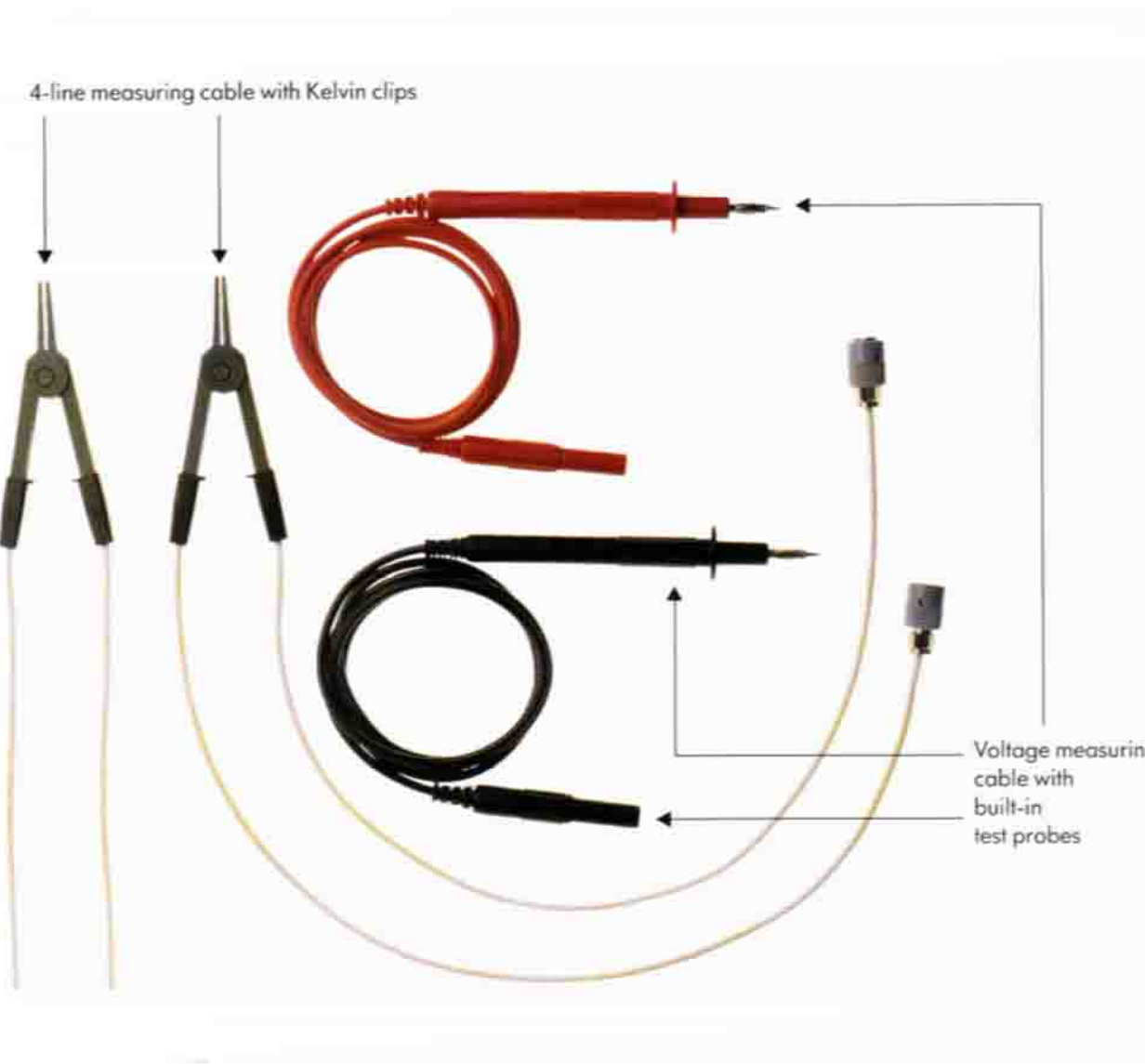
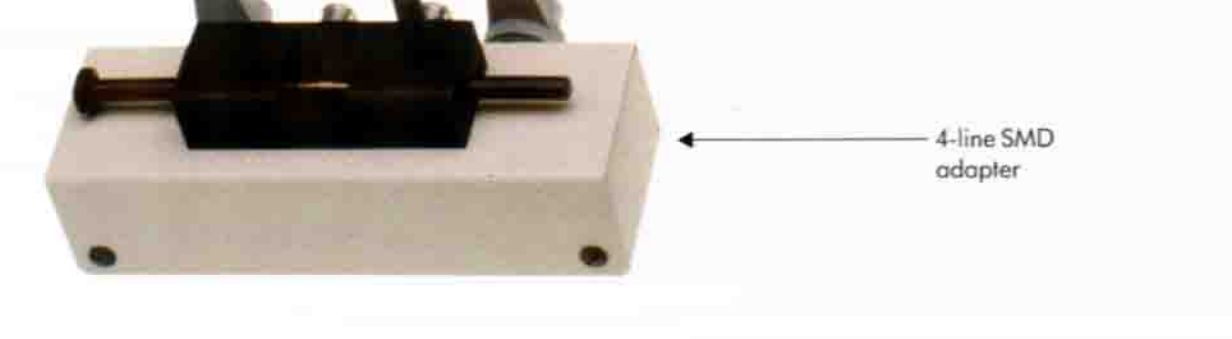
The package includes extensive accessories including an adapter for radial and axial components, an adapter for SMD components and a 4-line measuring cable with Kelvin clips (see overleaf).

As you can see, the RLC 200 offers an unbeatable price/performance ratio.

Delivery package

Meter complete with mains cable, replacement fuses and operating instructions, 4-line RLC adapter for radial and axial components, 4-line SMD adapter, 4-line measuring cable with Kelvin clips,

2 voltage measuring cables with integrated test probes, 1 cable for external polarization voltage and 1 measuring earth cable.



Measuring parameters and measurement ranges

G	1 nS	–	10 S	1 nS
C	0.1 pF	–	20 mF	0.1 pF
L	0.1 μH	–	20 kH	0.1 μH
D	0.001	–	2	0.001
Q	0.1	–	500	0.1
U=	0.1 mV	–	400 V	0.1 mV
Δ%	–999%	–	+999%	0.1%

Measurement specifications

Measuring parameters	R, G, C, L, D, Q, U _m , Δ/Δ%
Type of connection	Series or parallel connection with 4-pin arrangement of measuring terminals
Measuring frequencies	100 Hz, 1 kHz
Measuring voltage	50 mV, 1 V
Polarization of test object	
Internal voltage source	+5 V
External voltage source	≤ +30 V
Selection of measurement range	Automatic or as fixed range
Input resistance of DC voltmeter	> 9 MΩ
Triggering	internal, manual, external via RS 232 C
Measuring time	200 ms
Display	3 1/2 - digit (measured value and unit)
Interface	RS 232 C
Remote control functions:	R, G, C, L, D, Q, U _m , automatic measuring parameter selection, measurement types, measuring frequencies, measuring voltages, automatic measurement range selection or fixed range, absolute and percentage deviation (Δ/Δ%) with input of reference value, triggering and acoustic short-circuit indicator
Data output	Measuring parameter, measurement type, measured value

Measurement tolerances

The following measurement tolerances apply for a reference temperature of +23 °C ± 1 °C. In the case of deviations from the reference temperature, the tolerance increases by 50% for every 10 °C.

Measurement tolerances for R and G (Q < 1, D > 1) and for L and C (Q > 1, D < 1)

The measurement tolerance T_{meas} is calculated using the following equation:

$$T_{meas} = \left[\pm \left(A \sqrt{1 + P_m^2} \right) \pm K \right] K_f$$

- A = basic accuracy in %
P_m = parameter Q (for R-G-measurement) or parameter D (for L-C-measurement)
K = additional error in the last digit (dig)
K_f = temperature coefficient error

The following equations can be used to calculate impedance Z from R, G, C and L:

$$|Z| = R = 1/G \quad |Z| = 2 \pi f L \quad \text{and} \quad |Z| = \frac{1}{2 \pi f C}$$

Basic accuracy A + additional error K where U_{meas} = 1 V

Impedance Z	Measuring frequency	
	100 Hz	1 kHz
100 mΩ ≤ Z < 2 Ω	± 0.5% ± 2 dig	± 0.5% ± 2 dig
2 Ω ≤ Z < 20 Ω	± 0.3% ± 2 dig	± 0.3% ± 1 dig
20 Ω ≤ Z < 200 Ω	± 0.2% ± 2 dig	± 0.2% ± 1 dig
200 Ω ≤ Z < 2 kΩ	± 0.2% ± 2 dig	± 0.2% ± 1 dig
2 kΩ ≤ Z < 20 kΩ	± 0.2% ± 2 dig	± 0.2% ± 1 dig
20 kΩ ≤ Z < 500 kΩ	± 0.2% ± 2 dig	± 0.2% ± 1 dig
500 kΩ ≤ Z < 5 MΩ	± 0.3% ± 3 dig	± 0.3% ± 2 dig
5 MΩ ≤ Z < 20 MΩ	± 1% ± 5 dig	± 1.0% ± 2 dig

Where impedance |Z| ≥ 20 MΩ (0 < G ≤ 50 nS), U_{meas} = 1 V. The measurement tolerance is specified using the conductance deviation G = ± 2 nS for both measuring frequencies.

Where impedance |Z| < 100 mΩ (0 < R < 100 mΩ), U_{meas} = 50 mV. The measurement tolerance is specified using the resistance deviation R = ± 2 mΩ for both measuring frequencies.

All percentages refer to the displayed measured values.

Basic accuracy A + additional error K where U_{meas} = 50 mV

Impedance Z	Measuring frequency	
	100 Hz	1 kHz
100 mΩ ≤ Z < 2 Ω	not specified	± 0.8% ± 3 dig
2 Ω ≤ Z < 20 Ω	± 0.5% ± 3 dig	± 0.5% ± 2 dig
20 Ω ≤ Z < 200 Ω	± 0.3% ± 3 dig	± 0.3% ± 2 dig
200 Ω ≤ Z < 2 kΩ	± 0.3% ± 3 dig	± 0.3% ± 2 dig
2 kΩ ≤ Z < 20 kΩ	± 0.3% ± 3 dig	± 0.3% ± 2 dig
20 kΩ ≤ Z < 500 kΩ	± 0.3% ± 3 dig	± 0.3% ± 2 dig
500 kΩ ≤ Z < 5 MΩ	± 0.5% ± 5 dig	± 0.5% ± 3 dig
5 MΩ ≤ Z < 20 MΩ	not specified	± 3.0% ± 3 dig

Where impedance |Z| ≥ 20 MΩ (0 < G ≤ 50 nS), U_{meas} = 50 mV. The measurement tolerance is specified using the conductance deviation G = ± 3 nS for the measuring frequency 1 kHz.

Where impedance |Z| < 100 mΩ (0 < R < 100 mΩ), U_{meas} = 50 mV. The measurement tolerance is specified using the resistance deviation R = ± 3 mΩ for the measuring frequency 1 kHz.

All percentages refer to the displayed measured values.

Measurement tolerance of loss factor D

The measuring tolerance T_{meas} of loss factor of capacitances D can be calculated using the equation:

$$T_{meas} = 0.1 D_m \pm D$$

- D_m = measured value D (display ed D-value)
D = additional error

Additional error D where f_{meas} = 1 kHz

Capacitance C	Measuring voltage	
	50 V	1 V
10 pF ≤ C < 100 pF	not specified	± 0.005
100 pF ≤ C < 10 nF	± 0.005	± 0.005
10 nF ≤ C < 100 µF	± 0.004	± 0.003
100 µF ≤ C < 1 mF	± 0.010	± 0.005

Additional error D where f_{meas} = 100 Hz

Capacitance C	Measuring voltage	
	50 V	1 V
10 pF ≤ C < 1 nF	not specified	± 0.005
1 nF ≤ C < 10 nF	± 0.005	± 0.005
10 nF ≤ C < 100 µF	± 0.003	± 0.003
100 µF ≤ C < 1 mF	± 0.005	± 0.003
1 mF ≤ C < 10 mF	not specified	± 0.010

Measurement tolerance of Q factor

The tolerance is ± 0.2 in the impedance range 100 mΩ ≤ |Z| < 20 MΩ for R or G as test object.

The measurement tolerance of the Q factor of inductances is calculated using the following equation: T_{meas} = 0.1 Q_m ± Q

Q_m = measured value Q Q = additional error (display ed Q-value)

Additional error Q where f_{meas} = 1 kHz

Inductance L	Measuring voltage	
	50 mV	1 V
100 µH ≤ L < 1 mH	± 0.5	± 0.4
1 mH ≤ L < 100 H	± 0.3	± 0.3
100 H ≤ L < 1 kH	± 1.5	± 0.5
1 kH ≤ L < 2 kH	not specified	± 0.5

Additional error Q where f_{meas} = 100 Hz

Inductance L	Measuring voltage	
	50 mV	1 V
1 mH ≤ L < 10 mH	not specified	± 0.3
10 mH ≤ L < 2 H	± 0.7	± 0.3

Measurement tolerance with DC voltage

In all measurement ranges, the measurement tolerance with DC voltage is: T_{meas} = 0.2% ± 1 dig.

The percentages refer to the displayed value. With a short-circuited input, the display may fluctuate by a maximum of ± 0.2 mV.

The specified values apply for a reference temperature of 23 °C ± 1 °C. In the case of deviations from the reference temperature, the tolerance increases by 50% for every 10 °C.

Environmental conditions

Nominal temperature	+23 °C ± 1 °C
Operating temperature	+0 °C ... +50 °C
Relative atmospheric humidity	40 ... 80%
Atmospheric pressure	86 ... 106 kPa
Interference suppression	VfG 243/1991

Power supply	
Operating voltage	Sinusoidal AC voltage 110/220 V (± 10%) (internally switchable) 50 ... 60 Hz (± 5%)
Power consumption	16 VA
Fuses	T 80 mA/250 V (220 V~), T 160 mA/250 V (110 V~)
Protection class	I, in accordance with IEC 348, corresponds DIN VDE 0411 Part 1 E8 1
Dimensions (W x H x D)	291 mm x 108 mm x 259 mm
Dimensions of packing	338 mm x 138 mm x 408 mm
Weight	approx. 2.8 kg
Weight incl. packing and accessories	4.5 kg

Automatic RLC Meter RLC 300

digimess® expert

Order No.: H.UC 35-00



The RLC 300 is a top-notch precision system RLC meter. With its basic accuracy of 0.1%, the RLC 300 is exactly the right instrument for measuring the parameters of passive components in development and research laboratories, in quality departments and automatic production processes etc. As a GPIB instrument with fully automatic measuring capabilities, the RLC 300 constitutes a cost-effective alternative to other more established precision RLC measuring instruments. The RLC 300's fully automatic selection of the measuring range and the component recognition facility also permit rapid operation in manual mode, even by less experienced personnel. The items to be measured are connected up via various adapters included in the scope of supply. Other special adapters are available on request. The tried and tested four-line connection technology provides effective suppression of stray capacitance. Besides compensating the adapter's residual capacitance by simple pressing a button, this feature ensures maximum measuring accuracy even with small L and C values. Four selectable measuring frequencies from 50 Hz to 10 Hz permit adjustment to each application. In the monitor mode the display shows the load on the item being measured.

The internal polarisation voltage allows the C measurement to be made on electrolytic capacitors. The RLC 300 is, of course, also ideally suitable for carrying out random tests of components. Deviations of tested objects from the reference components can be displayed either absolutely, i.e. directly in numerical values of the respective measuring unit, or relatively in percentage terms. A good/bad display with pre-set tolerance is possible.

Like all the other measuring instruments in the Grundig Instruments **digimess®** range, the RLC 300 is controlled by a microprocessor. This means simple operation by means of the extended "quattro key" operating concept, self-diagnosis of the measuring instrument and complete remote control via the standard interfaces IEEE 488.2 and RS 232 C.

The 16-digit alphanumeric LC display with background illumination keeps you well informed at all times about all measuring and setting values. Due to its excellent price-performance ratio this RLC meter will find wide acceptance in production, service, research and development.

Fully Automatic Feature

„Switch on and measure“ without the need for any presetting. That's the normal mode of operation of the RLC 300!

In the following example a component combination with an initially unknown impedance is connected to the terminals of the RLC 300. The RLC 300 automatically displays the dominant component, a capacitance of 146.85 Picofard:

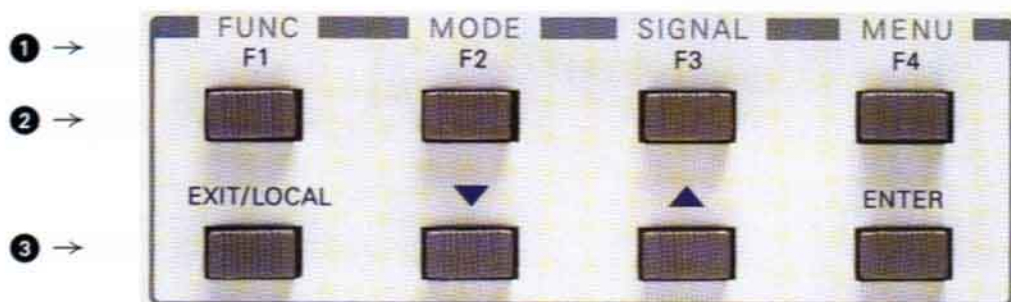


The RLC 300 also recognises that a parallel circuit (C_p) is involved and the dissipation factor D of the unknown component combination is 0.184 based on the selected measuring frequency. In many cases this result will suffice. It was not necessary thus far for the user to have any knowledge of the RLC 300 to obtain a measuring result.

The more "sophisticated" user will not be satisfied yet and will carry out more comprehensive analyses, eager to find out the reason for this relatively large dissipation factor. No problem for the RLC 300! Let's make a short excursion through the operating fields of the RLC 300.

The Operating Philosophy

Grundig **digimess**® instruments obey the rules of logic and so operating your RLC 300 is child's play, involving only 8 function keys.



The Function Levels

Firstly, and most importantly, this is the "secret" of the clearly arranged function levels of the RLC 300.

- 1 Choose the primary function group **FUNCTION**, a **MODE**, the **SIGNAL** parameters or the user **MENU** by pressing the corresponding function key.
- 2 Following the selection of a function group, the keys receive a new meaning (soft keys **F1**, **F2**, **F3**, **F4**) which is shown in the bottom line of the display.
- 3 Using the help keys in the second row, move the cursor, choose bigger or smaller and acknowledge your input. Using the LOCAL key, leave the current menu or put the RLC 300 into manual mode if you were previously in remote control mode.

The User Guide

There's no fooling the RLC 300 – it shows "plain text"! Simply follow the MENU guide in order to set individual special functions. Just press the **FUNCTION** key,

followed by **MAN**ual, to continue with our example.

The RLC 300 display offers you the following options:



Manual: |Z|φ
R L C |Z|φ

Select /Z/ to determine directly the modulus and phase angle of the connected complex impedance:



Z : 1.0641 MΩ
φ : -79.59 °

Select R to measure directly the value of the dissipation components:



Rf: 5.888 MΩ
D : 0.184

You think that's all too complicated for less experienced personnel?

We don't think so!

The Long-term Memory

The **User-menu** offers you 4 presettings which you can define yourself for special applications, save with the

STOre function and call up at any time via the **RCL** (Recall) function.

Yes, but what do I do if the measured results have to be evaluated automatically?



-- User menu --
STO RCL TEST LCD

No problem for the RLC 300!

Communication

Don't lose sight of your measured values. Like all instruments in the **digimess** series, the RLC 300 is extremely communicative. Not only PC freaks, but also serious

users will be highly delighted with the RLC 300 providing both RS 232 and IEEE 488.2 interfaces-standard and at no extra cost, needless to say!



Interface type:
GPIB

Choose the interface that suits you best!

Technical Data RLC 300

General Data

Nominal temperature:	+23 °C ± 2 °C
Operating temperature:	+5 °C a +40 °C
Relative humidity:	20% - 80%
Atmospheric pressure:	70 kPa - 106 kPa
Operating position:	horizontal or inclined by ± 15°
Operating voltage:	sinusoidal alternating voltage, distortion factor < 5% 230 V or 115 V (+10% -15%), internally switchable, 47 - 63 Hz
Power consumption:	max. 20 W
Fuses:	Miniature fuse T 100 L 250 V for mains voltage 230 V Miniature fuse T 200 L 250 V for mains voltage 115 V
Safety class:	I, according to DIN EN 6110 Part 1 (VDE 0411 Part 1, 3/94)
Radio interference suppression:	EN 55011 Class B, Vfg 1046/1984, VDE 0871 Category B
Dimensions (L x H x D):	291 mm x 120 mm x 259 mm
Dimensions of packing:	418 mm x 155 mm x 355 mm
Weight	
of RLC 300:	approx. 3,5 kg
incl. packing and accessories:	approx. 5,2 kg

Specifications

Measuring functions

Measuring parameters:

/Z/	modulus of impedance	D	dissipation factor
R	resistance	Q	quality factor
L	inductivity	φ	phase displacement (phase angle)
C	capacitance		

Measuring combinations:

Parameter	AUTO	MAN		
R	Q	Q	D	L, C
L	Q	Q	D	R
C	D	Q	D	R
Z	N/A	φ		

Tolerance measurement:

Δ	absolute deviation of the measured value from the reference value input
δ	relative deviation from the reference value input
COMP	good/bad comparison with reference value, tolerances adjustable

Variable equivalent circuit of the measured object:

- series circuit
- parallel circuit

Selection of measuring range:

- automatic
- manual (fixed range, switchover upwards, switchover downwards)

Selection of measuring function:

- automatic
- manual

Triggering of measurements:

- automatic
- single (manual)

Measuring time (applies to fixed range or following selection of measuring range):

- approx. 300 ms for measuring signal level of 1 V
- approx. 400 ms for measuring signal level of 50 mV

Averaging: 10 x

Connection type of measured object: 4-line arrangement with earth terminal

Correction of residual parameters:

- SHORT < 10 Ω
- OPEN > 100 k Ω

Einlaufzeit: 20 min

Measuring signal

Measuring frequencies: 50 Hz, 100 Hz, 1 kHz, 10 kHz

Level of measuring signal: 1 V (normal)
50 mV (low)

Output impedance: 100 Ω

Polarisation of measured object: 2 V (internal)
0 - 30 V (external)

Level monitor of measuring signal and polarisation voltage:

Parameter	Range	Accuracy
Voltage	0.001 mV - 1.000 V	$\pm (3\% + 0.1 \text{ mV})$
Current	0.1 nA - 10.00 mA	$\pm (3\% + 10 \text{ nA})$
BIAS	0 - 30.00 V	$\pm (1\% + 10 \text{ mV})$

Measuring range

Measuring parameter	Measuring range	Resolution	Max. measured value (manual)
/Z/, R	20.00 m Ω - 20.000 M Ω	0.01 m Ω	199.9 M Ω
L	1.000 μ H - 20.000 kH	0.001 μ H	635.5 kH
C	1.000 pF - 20.00 mF	0.001 pF	399.9 mF
D	0.0001 - 9.9999	0.0001	
Q	0.01 - 199.9	0.01	
φ	-179.99° - +180.00°	0.01°	
δ	-99.99% - +199.9%	0.01%	

Measuring accuracy

The validity of the specifications depends on the following conditions:

- Warm-up time 20 min
- Connecting up the measured object via the adapters supplied; otherwise the error specifications are related to the plug connector level.
- Capacitance of the Li, Lu sockets against earth must not exceed 200 pF.
- The corrections short and open were carried out.

Measuring errors during /Z/, R, L, C measurement

The error is defined by the equation:

$$A = \pm (A_b + K_s + K_p) \times K_l \times K_t \quad [\%]$$

where:	A_b ... basic error	(see Table 0 - 1)
	K_s ... additional error for low impedances	(see Table 0 - 2)
	K_p ... additional error for high impedances	(see Table 0 - 2)
	K_l ... coefficient of measuring signal level	(see Table 0 - 3)
	K_t ... temperature coefficient	(see Table 0 - 4)

For R measurements the above error applies for $Q_m \leq 0.1$, where Q_m is the measured value.

When Q_m is > 0.1 , the error for resistance measurement is defined by the equation:

$$A \times \sqrt{1 + Q_m^2} \quad [\%]$$

For L, C measurement, the above equation applies to the error for $D_m \leq 0.1$, where D_m is the measured value.

When D_m is > 0.1 , the error for the L, C measurement is defined by the equation:

$$A \times \sqrt{1 + D_m^2} \quad [\%]$$

For converting C and L to the impedance Z, the following equations apply:

$$|Z| = 2 \pi f_{MeB} L$$

$$|Z| = \frac{1}{2 \pi f_{MeB} C}$$

Measuring error for dissipation factor D

The measuring error for the dissipation factor is defined by the equation:

$$D_A = \pm A/100 \quad [\text{absolute value } D]$$

The equation for the measuring error applies to $D_m \leq 0.1$, where D_m is the measured value for the dissipation factor D.

When D_m is > 0.1 , the measuring error is defined by the equation:

$$D_A \times (1 + D_m)$$

Measuring error for quality factor Q

The measuring error is defined by the equation:

$$Q_A = \pm \frac{Q_m^2 \times D_A}{1 + Q_m \times D_A}$$

where Q_m is the measured value of quality factor Q. The equation for the measuring error applies to $Q_m \times D_A < 1$.

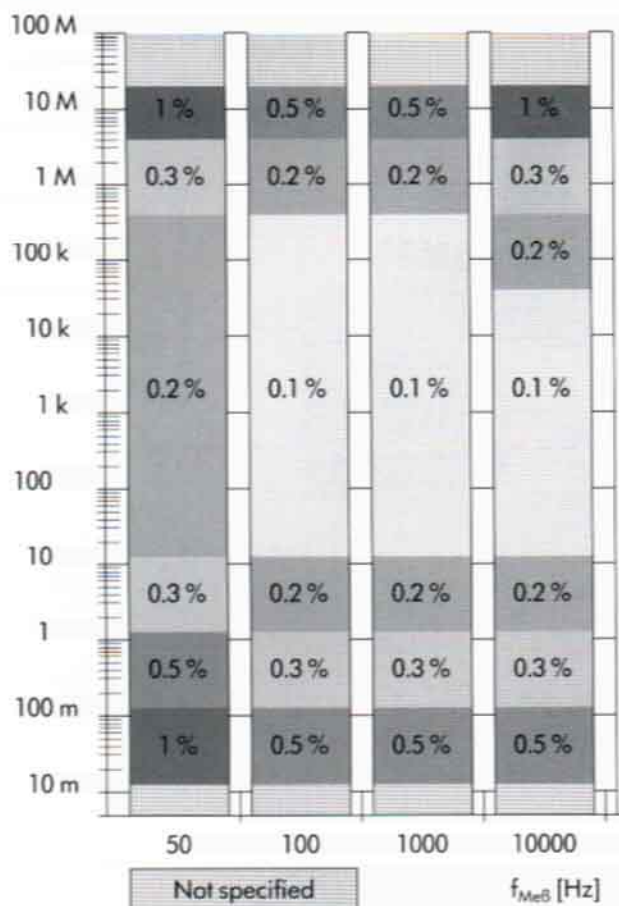
Measuring error for phase displacement φ

The measuring error is defined by the equation:

$$\frac{180}{\pi} \times \frac{A}{100} \quad [\text{grad}]$$

Table 0-1 Intrinsic error A_b

Basic accuracy

 $|Z|$ [Ω]**Table 0-2 Additional error**

Frequency	Ks [%]	Kp [%]
50 Hz	$2 \times \frac{0.1}{ Z_m }$	$2 \times Z_m \times 10^{-7}$
100 Hz - 10 kHz	$\frac{0.1}{ Z_m }$	$ Z_m \times 10^{-7}$

 $|Z_m|$... = Modulus of measured impedance.

The effect of the additional error Ks is negligible in the case of high frequencies while the effect of the additional error Kp is negligible in the case of low frequencies.

Table 0-3 Coefficient of measuring signal level

Measuring signal level	normal (1 V)	low (50 mV)
k_1	1	2

Table 0-4 Temperature coefficient

Temperature [°C]	5	11	21	25	35	40
k_1	—	2	1.5	1	1.5	2

Display panel

The RLC 300 is equipped with a two-line 16-digit alpha-numeric LCD matrix display with background illumination. The display shows test results, error messages or the instrument's manu-guided settings.

Interface IEEE 488.2

Interface standards:	ANSI/IEEE Std 488.1-1987 and IEEE Std 488.2-1992
Interface functions:	SH1, AH1, SR1, T5, L4, RL1, PPO, DC1, DT1, E1
Length of input buffer:	64 characters
Length of output buffer:	256 characters
General instructions and inquiries:	*CLS, *ESE, *ESE?, *ESR?, *SRE, *SRE?, *STB?, *IDN?, *RST, *TST?, *TRG, *OPC, *OPC?, *WAI

Interface RS 232 C

Communication is based on the ASCII character set. The data transmission rate (baud rate) can be chosen from 1200 Bd to 9600 Bd.

Baud rate:	1200 Bd, 2400 Bd, 4800 Bd, 9600 Bd
Length of data character:	8 Bit
Number of STOP bits:	1
Parity:	none
Communication protocol:	RTS/CTS, none
Separator:	'CR' + 'LF', 13 dec. +10 dec.
Length of input buffer:	64 characters
Length of output buffer:	256 characters

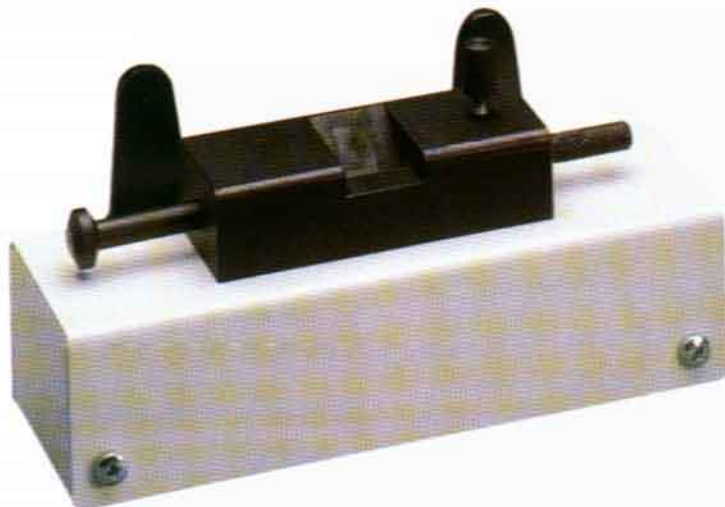
System interfaces of the RLC 300

The RLC 300 is equipped, as standard, with the IEEE 488.2 and RS 232 C interfaces for communication with a PC. All function and parameters can be set and the instrument's set values and conditions can be transmitted.

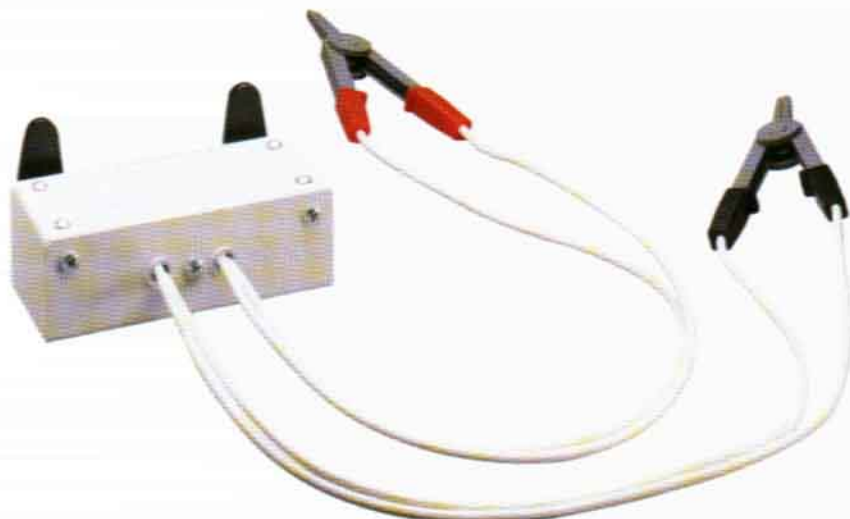
Scope of supply

The instrument comes complete with a power cable, replacement fuses and operating instructions, 4-lead RLC adapter for radial and axial components, 4-lead SMD

adapter, e-lead adapter with Kelvin test terminals and measuring earth cable.



4-lead SMD adapter



4-lead adapter with Kelvin test terminals

DM 100 Digital Multimeter

digimess® compact

Order no.: H.UC 50-00



The digital multimeter DM 100 is yet another addition to the GRUNDIG electronics range of innovative service measuring instruments. Like the others in the range, the DM 100 is based on a sophisticated microprocessor-controlled operating concept and offers extensive self-test functions. User guidance takes place via an LCD.

This device is equipped with a special feature allowing all measurements (with the exception of voltage measurements in the 1 kV range) to be performed via two input sockets. This greatly reduces the risk of damage to the device in the event of a faulty measurement.

All the settings are carried out using only a few keys. This operating concept is in line with the GRUNDIG electronics objective of allowing the user to work with the instrument after just a few minutes without having to refer to written documentation.

The DM 100 is a 4½-digit multimeter with a maximum DC voltage measuring error of 0.05% of full scale

+ 0.05% of the measured value and a DC current measuring error of 0.1% of f.s. + 0.05% of m.v. in all current and voltage measuring ranges. Measuring functions such as auto ranging, hold range, unit display and true r.m.s. measurement are, of course, provided.

The measuring mode can be set to either fast or slow. The device is equipped with offset correction and automatic calibration which can be applied as required. Five different means of relative measured value representation, including dB measurement, are available (selectable over menu).

All the functions of the instrument can be controlled via the built-in RS-232 C interface.

The DM 100 is suitable for a wide range of applications in the fields of research, production, training and service due to its performance data and its unbeatable price/performance ratio.

Measuring with the DM 100 is so simple!



Current, voltage and resistance measuring can be selected directly using the corresponding function keys. After the mains voltage has been switched on,

the device is ready for DC voltage measuring and auto ranging is active.

Three further menu levels can be reached using the FUNC key.



Explanation of menu displays:

Zero	: Offset correction on/off
SI	: Slow measuring mode (max. 5 measurements/sec) on/off
Cal	: Auto calibration on/off
Next	: Proceed to next menu level
RUp	: Increase measuring range (Range Up)
RDn	: Decrease measuring range (Range Down)
RH	: Auto ranging on/off
Rel	: Relative measuring on/off Selection of five relative measurement alternatives
Tst	: Perform self-test
BdR	: Adjustment of baud rate for remote control
Exit	: Exit menu. Return to default status

Technical data

Measuring functions

- AC and DC voltage measurement
- AC and DC current measurement
- Resistance measurement
- Continuity test with acoustic signal

Special characteristics of device

- Offset correction using the ZERO function
- Suppression of auto calibration
- Automatic selection of measuring range using the Hold function
- Relative representation of measured value:
Relation to reference value, deviation from reference value (absolute and percentage), product with reference value, dB
- Internal test procedures
- Remote control via RS-232 C

Calibration data	Duration: approx. 14 secs, Interval: ≥ 20 mins
Warm-up time	15 mins
Measuring range switchover	Automatic/manual
Measuring rates	5 or 25 measurements/sec
Display	16-digit alphanumeric LCD, backlit
Display contents	Function menu, measuring parameters, key functions, data transmission parameters (for remote control)
Output format	a, "Measuring parameter Measured value Unit of measurement" b, "Type of measured value representation Value"

Voltage measurement

Maximum voltage at input sockets:
(DC voltage value V_{DC} or r.m.s. of the AC voltage V_{rms})

Input sockets	Range	U_{DC}, V_{rms}	Load duration
L – GND H – GND H_{1kV} – GND	–	500 V 1000 V 1500 V	constant constant constant
H – L	200 mV	150 V 250 V	constant 5 secs
	2 V	150 V 250 V	constant 5 secs
	20 V 200 V	500 V 500 V	constant constant
H_{1kV} – L	1000 V	1000 V	constant

DC voltage measurement

Measuring range	Resolution (LSD)
200 mV	10 μ V
2 V	100 μ V
20 V	1 mV
200 V	10 mV
2000 V *	100 mV

* Measurements only possible up to 1000 V

Input resistance	10 M Ω
Measuring accuracy	0.05% f.s. + 0.05% of m.v. (valid for up to 6 months following calibration by manufacturer)

AC voltage measurement (r.m.s. measurement)

Measuring range	Resolution (LSD)
200 mV	10 μ V
2 V	100 μ V
20 V	1 mV
200 V	10 mV
2000 V *	100 mV

* Measurements only possible up to 1000 V

Frequency range	20 Hz ≤ f ≤ 20 kHz
Input resistance	R _p - 10 M Ω , C _p - 45 pF
Measuring accuracy	Specified in the frequency range 20 Hz to 2 kHz (valid for up to 6 months following calibration by manufacturer)
Crest factor	2

Resistance measurement

Maximum voltage at input sockets:
(DC voltage value V_{DC} or r.m.s. of the AC voltage V_{rms})

Input sockets	$U_{eff} = V_{rms}$	Load duration
H – GND H – L L – GND	500 V 15 V 500 V	constant constant constant

Measuring range	Resolution (LSD)	Measured current
200 Ω	10 m Ω	1 mA
2 k Ω	100 m Ω	1 mA
20 k Ω	1 Ω	10 μ A
200 k Ω	10 Ω	10 μ A
2 M Ω	100 Ω	1 μ A
20 M Ω	1 k Ω	100 nA

Measuring accuracy	0.05% of f.s. + 0.1% of m.v. (valid for up to 6 months following calibration by manufacturer)
Continuity test with acoustic signal	R < 10 Ω < 10 (with relative representation of measured value)

Current measurement

Maximum input currents I_m for input sockets: (DC current value or r.m.s. of the input signal)

Range	I_m	Load duration
200 μ A	1 A	constant
	10 A	10 secs
2 mA	1 A	constant
	10 A	10 secs
20 mA	1 A	constant
	10 A	10 s
200 mA	2 A	constant
	10 A	10 s
2 A	4 A	constant
	10 A	10 secs
20 A *	10 A	constant

* Measurements only possible up to 10 A

DC current measurement

Measuring range	Resolution (LSD)	Voltage drop
200 μ A	10 nA	200 mV
2 mA	100 nA	200 mV
20 mA	1 μ A	200 mV
200 mA	10 μ A	220 mV
2 A	100 μ A	300 mV
20 A *	1 mA	600 mV

* Measurements only possible up to 10 A

Measuring accuracy	0.1% of f.s. + 0.05% of m.v. (valid for up to 6 months following calibration by manufacturer)
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AC current measurement (r.m.s. measurement)

Measuring range	Resolution (LSD)	Voltage drop (100 Hz)
200 μ A	10 nA	200 mV
2 mA	100 nA	200 mV
20 mA	1 μ A	200 mV
200 mA	10 μ A	220 mV
2 A	100 μ A	300 mV
20 A *	1 mA	600 mV

* Measurements only possible up to 10 A

Frequency range	20 Hz ≤ f ≤ 20 kHz
Measuring accuracy	0.2% of f.s. + 0.3% of m.v. Specified in the frequency range 20 Hz to 2 kHz (valid for up to 6 months following calibration by manufacturer)
Crest factor	2

DM200 Digital Multimeter

digimess® concept

Order No: HUC 51-00

CE



The **digimess®** DM200 is a very competitively priced 4000 count bench multimeter with a basic accuracy of 0.3%. The unit features an 18mm high back lit LCD display with annunciators as well as a 42 segment bar graph. In addition to standard multimeter functions the DM200 also includes True RMS measurement, capacitance, frequency and RS232. The meter is powered by either mains supply or AA batteries and includes an integral storage compartment for leads resulting in a fully portable instrument. The unit is supplied with a mains lead, test leads, RS232 lead, software, carrying strap and operating manual.

Specification	
Display	4000 count 18mm high back lit LCD with 42 segment bar graph
DC volts	400mV, 4V, 40V, 400V, 1000V 0.3% Input impedance 10Mohm
AC volts (True RMS)	4V, 40V 0.8%, 400V, 750V 1.2% Input impedance 10Mohm
DC current	4mA, 40mA, 400mA 0.8%, 10A 1.5%, 20A for 30 seconds
AC current (True RMS)	4mA, 40mA, 400mA 1.5%, 10A 2.0%, 20A for 30 seconds
Resistance	400, 4k, 40k, 400k 0.5%, 4M 1.0%, 40M 1.5%
Capacitance	4nF, 40nF, 400nF, 4uF-20uF 2.0%, 20uF-40uF 5.0%
Frequency	100, 1k, 10k, 100k, 600kHz 0.1% Sensitivity 100mV 1Hz-20kHz, 500mV 20kHz-600kHz
Continuity test	<40ohm, 2kHz tone
Miscellaneous	Auto and manual range, data hold, delay, max, min, rel, memory store/recall, diode test, RS232
Safety specification	IEC1010 CAT II 1000VDC or 750V AC rms
Power requirements	110/220VAC +/- 10% 50/60Hz or 1 x PP3 and 6 x AA batteries
Dimensions & weight	238(W) x 230(L) x 83(H) mm, 1.5kg

LF-Millivoltmeter MV 100

digimess® compact

Order No.: H.UC 25-00



The MV 100 millivoltmeter is the first-choice measuring instruments among LF technicians and electronic acoustics specialists in their daily work. With a frequency range of 5 Hz to 88 kHz, the MV 100 opens up a vast array of applications such as LF equipment measurements, sound analyses, e.g. on machines, as well as ultrasonic analyses. The MV 100 operates on a purely digital basis. Adjustable time constants and a bar graph that can be activated also permit the evaluation of critical signals with widely fluctuating levels, such as are typical for certain applications. Standard filter and special functions, e.g. psophometric filter, harmonic distortion or selective measurement, considerably extend the MV 100's range of applications thus creating, in conjunction with the TG 100 low-distortion generator, a complete LF analyser. Supplemented by the optional software package and extended to produce a fully automatic LF test bench, the MV 100 can be used for

even the most sophisticated tasks. As with all the instruments of the Grundig **digimess®** series, the MV 100 is controlled by a microprocessor, resulting in straightforward operation due to the "quattro key" operating concept, self-diagnosis and complete remote control and evaluation capabilities via the standard RS 232 C interface. The desired parameters, such as operating mode and filter centre frequencies can be set with the digital shaft encoder. The remote control option via the PC interface enables the MV 100 to be used in automatic test systems and thus satisfies the requirements for a modern LF measuring instrument. Two 16-digit alphanumeric LC display lines with background lighting provide constant information on all measuring and setting values. The excellent price-performance ratio means that the MV 100 finds wide application in development; production, service and training activities. The MV 100 is a must for every LF test bench!

Technical Data

General	
Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Relative humidity	80%
Atmospheric pressure	70 ... 106 kPa
Operating position	horizontal or inclined by ± 15°
Operating voltage	alternating voltage, 115/230 V (+10%, -15%), 47 ... 63 Hz
Power consumption	max. 15 VA (max. 15 W)
Fuses	T 63 L 250 V (230 V), T 125 L 250 V (115 V)
Safety class	II, according to DIN EN 61010-1 and IEC 536
Radio interference suppression	EN 55011 Class B, VDE 0871 Category B
Dimensions (in mm)	225 x 85 x 200 (L x H x D)
Weight of MV 100	approx. 1.5 kg
incl. packing and accessories	approx. 1.7 kg
Measurements	
Level wide band, non-weighted, weighted	
Level-selective, Noise and interference voltages	
Distortion factor THD+N, second harmonic distortion, third harmonic distortion	
Third octave analysis, user mode, frequency	
Measuring input	
Input resistance	1 MΩ // 25 pF
Input voltage range	max. 100 V _{rms}
Ranging	autoranging
Monitor output	0.5 ... 1.5 V _{pp} to Ri ~ 4700 Ω for oscilloscope
Specifications	
Frequency ranges non-weighted	5 Hz ... 22 kHz and 5 Hz ... 88 kHz switchable
Frequency range weighted	5 Hz ... 22 kHz
Frequency response weighting	linear, acc. to CCIR 468-3 (DIN 45405 A-weighting) with third octave filter 125/160/200 Hz/.../12.5 kHz 48 dB/octave rms, peak, quasi-peak acc to CCIR 468-3 (DIN 45405)
Rectification	< 10 μV (R _{source} < 1 kΩ, 5 Hz ... 22 kHz, non-weighted)
Residual noise	
Level Display	
Resolution	4 digit, dBu, dBV, V adjustable. Bargraph trend display add on. 0.01 dB (0.2 dB for Trend display)
Measuring accuracy	
Frequency response error	Basic error < 0.1 dB (f = 1 kHz/0 dBu)
Residual distortion factor	< 0.1 dB 20 Hz ... 22 kHz (typ. 0.05 dB) < 0.01% (typ. 0.003%)
Selective measurement	
Frequency range	20 Hz ... 44 kHz
3 dB filter bandwidth	5 Hz (20 Hz ... 22 kHz), 10 Hz (20 Hz ... 44 kHz)
Reverse attenuation at ± 10 Hz	> 80 dB (20 Hz ... 22 kHz)
Rectification	rms
Residual noise	< 0.25 μV (source resistance < 1 kΩ)
Distortion measurement	
Measuring frequency second harmonic distortion, third harmonic distortion	
Measuring frequency	30 Hz ... 11 kHz for second harmonic distortion, 30 Hz ... 7.65 kHz for third harmonic distortion
Attenuation of the fundamental	250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 16 kHz
Display	notch filter 12. order, band reject attenuation > 90 dB in dB or %, linear and weighted
Individual weighting functions	
via software option via RS 232 interface loadable in user mode	

Display

Two-line alphanumeric LC display with 2 x 16-digits and background lighting. The display shows the level, frequency, units, decimal point as well as measuring functions and system signals.

Interface/Remote control

The MV 100 has full remote control/evaluation capability via the optoisolated RS 232 C interface with 1,200 to 9,600 Bd.

HY Series Power Supply Units

digimess® concept

CE



The **digimess®** HY series is a comprehensive range of low cost general purpose linear power supply units containing single, dual and triple output models. All models can operate in either constant voltage or constant current modes and feature large red LED displays for ease of viewing.

The dual and triple output types also include external switching for independent, tracking, series and parallel modes of operation. All units are supplied with mains leads and operating manuals.

Specification					
Model No	HY3003	HY3003-2	HY3003-3	HY3010	HY3020
Order No	HUC42-01	HUC42-02	HUC42-03	HUC42-04	HUC42-05
No of outputs	Single	Dual	Triple	Single	Single
Output voltage	0-30V	2 x 0-30V	2 x 0-30V, 5V	0-30V	0-30V
Output current	0-3A	2 x 0-3A	2 x 0-3A, 3A	0-10A	0-20A
Line regulation	<0.02% + 1mV	<0.02% + 1mV	<0.02% + 1mV	<0.02% + 3mV	<0.02% + 3mV
Load regulation	<0.01% + 5mV	<0.01% + 5mV	<0.01% + 5mV	<0.02% + 10mV	<0.02% + 25mV
Ripple & noise	<1mVrms	<1mVrms	<1mVrms	<3mVrms	<3mVrms
Display	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 1.5% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 1.5% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 1.5% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 1.5% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 1.5% + 2 dig
Input voltage	110/220V +/- 10% AC				
Dimensions	291 x 158 x 136mm	365 x 265 x 164mm	365 x 265 x 164mm	365 x 265 x 164mm	365 x 265 x 164mm
Weight	4kg	10kg	11kg	10kg	20kg

SM Series Power Supply Units

digimess® concept

CE



The **digimess®** SM series is a range of general purpose switch mode power supply units featuring high output currents and voltages. All models can operate in either constant voltage or constant current modes and feature large red LED displays for ease of viewing. The switch mode design results in small and light weight units compared to their linear equivalents. All units are supplied with mains leads and operating manuals.

Specification			
Model No	SM5020	SM3040	SM10010
Order No	HUC43-01	HUC43-02	HUC43-03
No of outputs	Single	Single	Single
Output voltage	0-50V	0-30V	0-100V
Output current	0-20A	0-40A	0-10A
Line regulation	<0.02% + 3mV	<0.02% + 3mV	<0.02% + 3mV
Load regulation	<0.02% + 10mV (at I <6A) <0.1% + 5mV (at I >6A)	<0.02% + 10mV (at I <6A) <0.1% + 5mV (at I >6A)	<0.02% + 10mV (at I <6A) <0.1% + 5mV (at I >6A)
Ripple & noise	<3mVrms	<3mVrms	<10mVrms
Display	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 2.0% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 2.0% + 2 dig	2 x 3.5 digit LED Accuracy : V - 1.0% + 2 dig I - 2.0% + 2 dig
Input voltage	110/220V +/- 10% AC (external selector switch)		
Dimensions	365 x 265 x 164mm	365 x 265 x 164mm	365 x 265 x 164mm
Weight	7kg	7kg	7kg

DP Series Power Supply Units

digimess® concept

CE



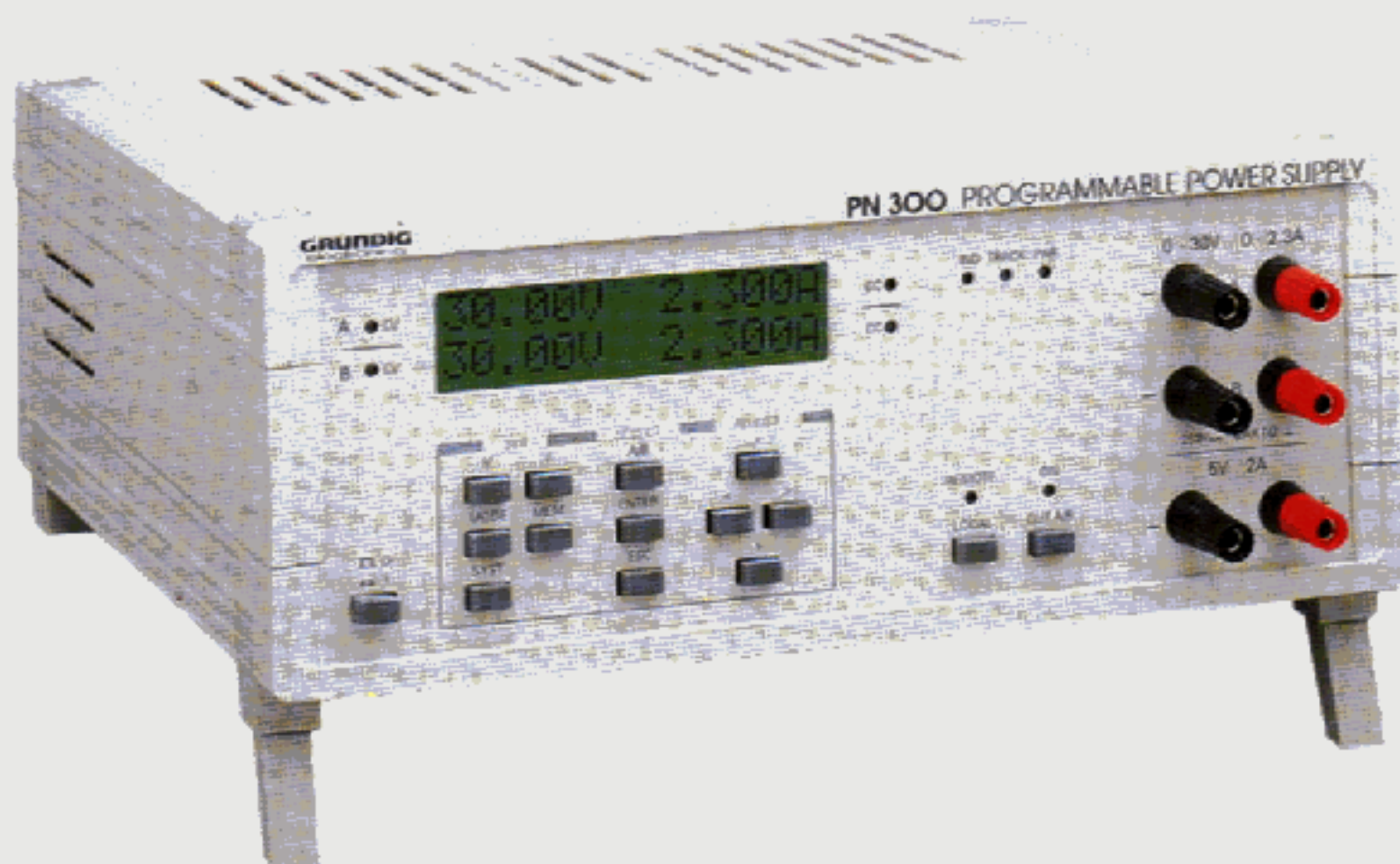
The **digimess®** DP series is a comprehensive range of digitally programmable precision linear power supply units containing single and triple output versions. All models can operate in either constant voltage or constant current modes and feature separate 4 digit LED displays for both voltage and current. Parameters are set by push button controls and multiple output settings can be stored and recalled, output on/off switches are also included. The triple output types also include external switching for independent, tracking, series and parallel modes of operation. All units are supplied with mains leads and operating manuals.

Specification				
Model No	DP3005	DP5003	DP3005-3	DP5003-3
Order No	HUC44-01	HUC44-02	HUC44-03	HUC44-04
No of outputs	Single	Single	Triple	Triple
No of stored o/p's	3	3	6	6
Output voltage	0-30V	0-50V	2 x 0-30V, 5V	2 x 0-50V, 5V
Output current	0-5A	0-3A	2 x 0-5A, 3A	2 x 0-3A, 3A
Resolution	V : 10mV, I : 10mA	V : 10mV, I : 10mA	V : 10mV, I : 10mA	V : 10mV, I : 10mA
Line regulation	CV <5mV, CC <5mA	CV <5mV, CC <5mA	CV < 5mV, CC <5mA	CV < 5mV, CC <5mA
Load regulation	CV <5mV, CC <5mA	CV <5mV, CC <5mA	CV < 5mV, CC <5mA	CV < 5mV, CC <5mA
Ripple & noise	CV <1mVrms CC <3mA rms	CV <1mVrms CC <3mA rms	CV <1mVrms CC <3mA rms	CV <1mVrms CC <3mA rms
Display accuracy	V : 0.1% + 2 dig I : 0.5% + 3 dig	V : 0.1% + 2 dig I : 0.5% + 3 dig	V : 0.1% + 2 dig I : 0.5% + 3 dig	V : 0.1% + 2 dig I : 0.5% + 3 dig
Input voltage	110/220V +/- 10% AC (external selector switch)			
Dimensions	132 x 160 x 270mm	132 x 160 x 270mm	260 x 160 x 370mm	260 x 160 x 370mm
Weight	6.3kg	6.3kg	12.5kg	12.5kg

PN 300 – Programmable Power Supply Unit

digimess® expert

Order no.: H.UC 40-00



The programmable power supply unit PN 300 is yet another addition to Grundig range of innovative service measuring instruments. Like the others in the range, PN 300 is based on a sophisticated microprocessor-controlled operating concept. Operation takes place over an LCD.

All the settings are carried out using only a few keys. This operating concept is in line with Grundig objective of allowing the user to work with the instrument after just a few minutes without having to refer to written documentation.

Despite its compact dimensions, the instrument supplies two variable DC voltages of 0-30 V/0-2.3 A and a fixed voltage of 5 V/2 A. The variable output voltages can be adjusted separately in tracking mode or in parallel. In parallel operation, a maximum of 30 V and 4.6 A is

possible. The basic setting accuracies for voltages and currents are 0.05% and 0.5% respectively. The operating modes Constant voltage (CV) and Constant current (CC) are possible.

The minimum increments for voltage and current settings are 10 mV and 1 mA respectively.

All the functions of the instrument can be controlled over the combined RS-232 C/IEEE 488.2 interface.

Up to 5 sets of instrument settings can be saved and loaded as required.

PN 300 is suitable for a wide range of applications in the fields of research, production, training and service on the basis of its performance data and its unbeatable price/performance ratio.

Operating modes for sources A, B

Independent, Parallel, Tracking, Constant voltage (CV), Constant current (CC), optional protection by current limiting or output disabling.

Sources A, B

Output voltage	0 V - 30 V
Output current	0 A - 2.3 A
Setting accuracy: Voltage	$\pm (0.05\% + 15 \text{ mV})$
Current	$\pm (0.5\% + 10 \text{ mA})$
Interference voltage at output	1 mV _{rms} in the bandwidth 15 Hz to 15 MHz
Measuring accuracy: Voltage	$\pm (0.5\% + 100 \text{ mV})$
Current	$\pm (0.5\% + 10 \text{ mA})$
Stability of output voltage on mains fluctuations	$\pm (0.01\% + 3 \text{ mV})$
Stability of output voltage on load change	$\pm (0.02\% + 6 \text{ mV})$
Setting increments: Voltage	10 mV
Current	1 mA
Maximum output voltage to ground	250 V _{rms}
Control response	$\leq 300 \mu\text{s}$ damping time for the adjusted voltage in the range $\pm 15 \text{ mV}$
Indication on display: Voltage	max. 30,00 V
Current	max. 2,300 A

Parallel operation of sources A and B

Output current	0.3 A - 4.6 A
Setting accuracy: Current	$\pm (1\% + 20 \text{ mA})$
Measuring accuracy: Current	$\pm (1\% + 20 \text{ mA})$
Indication on display: Current	max. 4,600 A

Source 5 V/2 A

Output voltage	5 V $\pm 5\%$
Output current	max. 2 A
Interference voltage at output	2 mV _{rms}

General

Interfaces	RS 232 C (1200, 2400, 4800, 9600 Bd), IEEE 488,2
Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Operating voltage	230 V/115 V (+10%/-15%)
Mains frequency	50 - 60 Hz
Power consumption	450 VA
Protection class	I according to EN 61010/DIN VDE 0411, Part 1 1993
Interference suppression	Vfgr. 1046, 1984; VDE 0871 Category B
Dimensions (in mm)	291 × 120 × 259 (W × H × D)
Weight	6.8 kg
Weight incl. packaging and accessories	8.4 kg
Accessories supplied with the package	Mains cable, operating instructions, various miniature fuses

HV Series Power Supply Units

digimess® concept

CE



The **digimess®** HV series is a range of general purpose switch mode power supply units featuring high output voltages. All models can operate in either constant voltage or constant current modes and feature short circuit protection. Large red LED displays for both voltage and current are included, along with fully shrouded 4mm safety sockets. The switch mode design results in small and light weight units compared to their linear equivalents. All units are supplied with mains leads and operating manuals.

Specification			
Model No	HV10001	HV20001	HV30001
Order No	HUC46-01	HUC46-02	HUC46-03
No of outputs	Single	Single	Single
Output voltage	0-100V	0-200V	0-300V
Output current	0-1A	0-1A	0-1A
Line regulation	CV <0.02% + 3mV CC <0.5% + 3mA	CV <0.02% + 3mV CC <0.5% + 3mA	CV <0.02% + 3mV CC <0.5% + 3mA
Load regulation	CV < 0.01% +5mV CC <0.2% + 5mA	CV < 0.02% +10mV CC <0.5% + 5mA	CV < 0.02% +10mV CC <0.5% + 5mA
Ripple & noise	CV <10mV rms CC <60mA rms	CV <10mV rms CC <60mA rms	CV <10mV rms CC <60mA rms
Display	2 x 3.5 digit LED Accuracy : V- 1.0% + 2 digits I- 2.0% + 2 digits	2 x 3.5 digit LED Accuracy : V- 1.0% + 2 digits I- 2.0% + 2 digits	2 x 3.5 digit LED Accuracy : V- 1.0% + 2 digits I- 2.0% + 2 digits
Input voltage	110/220V +/- 10% AC (external selector switch)		
Dimensions	291 x 158 x 136mm	365 x 265 x 164mm	365 x 265 x 164mm
Weight	4kg	7kg	7kg

SG100 RF Signal Generator

digimess® concept

Order No: HUC 63-00

CE



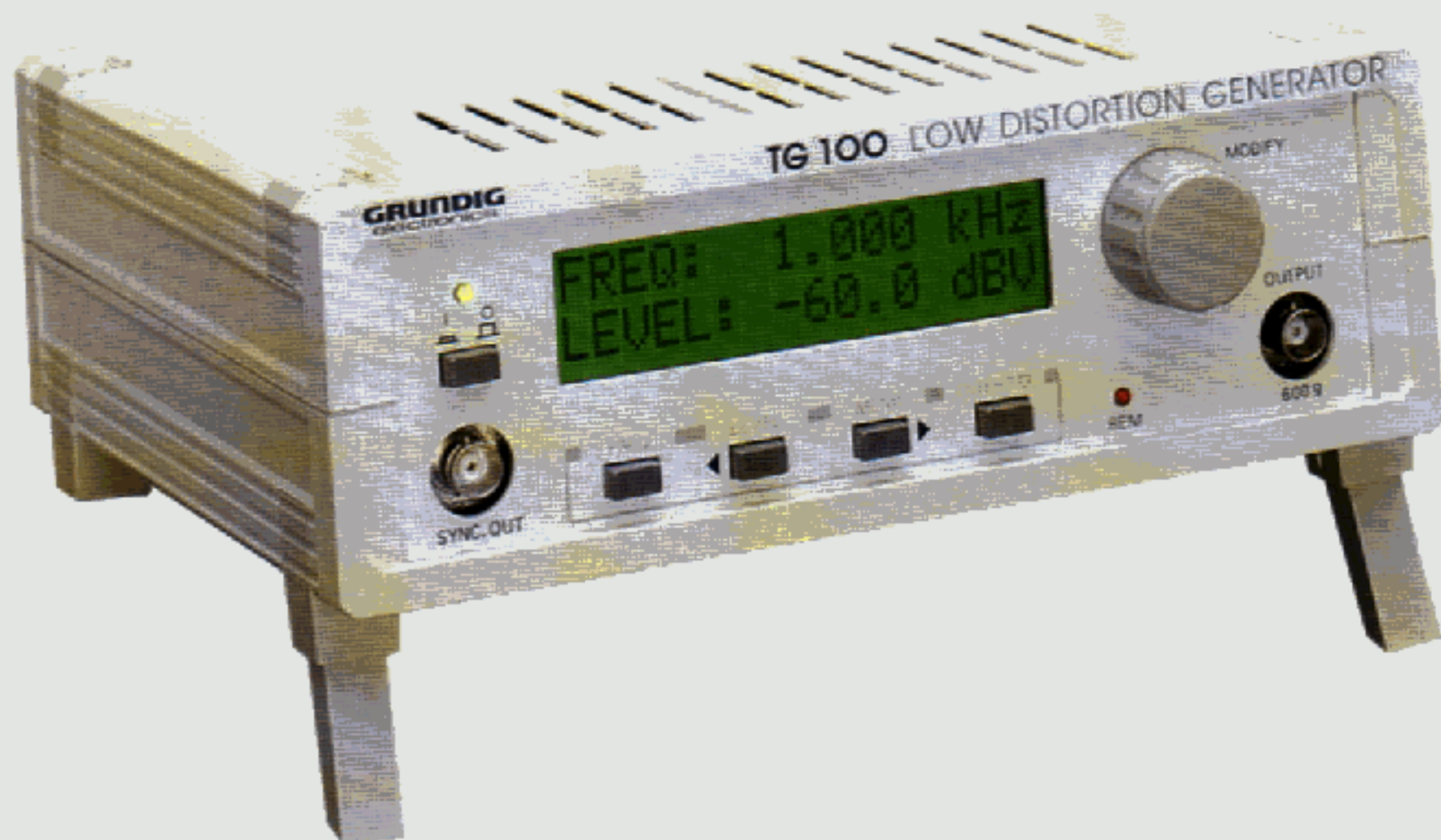
The **digimess®** SG100 is a very competitively priced microprocessor controlled RF signal generator. The unit covers the frequency 100kHz to 150MHz (450MHz 3rd harmonic) in 6 ranges. A fine adjust control allows precise frequency selection and the set frequency is displayed by a 4 digit LED readout. The generator also includes both internal and external AM and FM modulation as well as an audio signal output. The SG100 is supplied with operating manual and mains lead.

Specification	
Frequency ranges	Range 1) 100kHz - 320kHz
	Range 2) 320kHz - 1MHz
	Range 3) 1MHz - 3.2MHz
	Range 4) 3.2MHz - 10MHz
	Range 5) 10MHz - 35MHz
	Range 6) 35MHz - 150MHz (450MHz on 3rd harmonic)
Output amplitude	0 – >300mVrms continuously variable
Modulation FM, AM	Internal 1kHz sine wave
	External 50Hz - 20kHz
Audio output	Frequency 1kHz +/- 20%
	Distortion < 3%
	Output amplitude > 1.5Vrms
Display	4 digit LED
Input voltage	110/220V +/- 10% 50Hz +/- 5%
Weight	3kg
Dimensions W x L x H	293 x 240 x 90mm

Sine Wave Generator TG 100

digimess® compact

Order No.: H.UC 60-00



The sine wave generator TG 100 is a new laboratory standard for LF measurements. Due to its low distortion factor TG 100 becomes an indispensable signal source for demanding applications in the LF field. GRUNDIG electronics have thus provided a direct link with their successful sound generators TG 40 and TG 41 which were sold on a large scale owing to their signal quality and moderate price. Now GRUNDIG electronics offering instead of them a digital synthesizer generator with a quartz-precision frequency adjustment and high spectral purity. Parameters such as: $\leq 0.02\%$ distortion factor in the frequency range of 10 Hz to 10 kHz speak for themselves. In addition to this we would like to draw your attention to the new operating comfort of our TG 100 which allows e.g. an adjustment of the output level direct into dBV, into dBm or as an effective value into mV or V by means of the digital rotary switch the burdensome converting becomes irrelevant because our TG 100 automatically takes care of this task! The disconnectible

rectangular output for the triggering of digital components is compatible to CMOS-logic rounds off the picture of the TG 100.

Like all instruments in the GRUNDIG electronics **digimess®** series TG 100 is microprocessor-controlled, which leads to simple operation due to the "quattro Key" operating concept, device self-diagnosis and complete remote control via standard RS-232 C interface.

The desired parameters such as frequency and signal amplitude can be adjusted by the digital rotary switch directly. The 16-digit alphanumeric LC display line with background illumination provides regular information on the measuring values and the settings. Due to its favourable price-/performance ratio this generator will be applied in many fields such as research, production, service and training.

Technical Data

General Technical Data

Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 ... +40 °C
Relative humidity	20 to 80%
Atmospheric pressure	70 to 106 kPa
Operating position	horizontal or inclined, with an incline of ± 15°
Operating voltage	sinusoidal alternating voltage (distortion factor < 5%) 115/230 V (+10%/–15%), internally switchable, 50 to 60 Hz (± 5%)
Power consumption	max. 15 VA
Fuses	T 50 L/250 V (230 V~), T 100 L/250 V (115 V~)
Safety class	I, according to DIN EN 61010 Part 1 (VDE 0411 Part 1), 3/94
Radio interference suppression	EN 55011 Class B, Vfg 1046/1984, VDE 0871 Category B
Dimensions (mm)	225 × 85 × 200 (W × H × D)
Weight:	
TG 100	approx. 1.9 kg
incl. packing and accessories	approx. 2.9 kg

General Specifications of Signal Outputs

Frequency range	1 Hz to 1 MHz
Frequency setting	4 digits
Setting accuracy of frequency	± 0.5% at nominal temperature ± 0.05% at nominal temperature and autocalibration
Duration of autocalibration of the frequency	approx. 100 ms for frequencies $f > 100$ Hz, approx. 0.1 s to 15 s for frequencies $f < 100$ Hz
Temperature coefficient of frequency	$< \pm 5 \cdot 10^{-4}$
Time coefficient of frequency	$< \pm 1 \cdot 10^{-3}/5$ min after 30 min warm-up time
Output signal	sine, rectangle (disconnectible)
Warm-up time	30 min

Sinusoidal-Output

Harmonic distortion of the output signal	$\leq 0.02\%$ for 10 Hz to 10 kHz $\leq 0.05\%$ for 10 kHz to 50 kHz $\leq 0.1\%$ for 50 kHz to 100 kHz $\leq 1\%$ for 100 kHz to 200 kHz $\leq 3\%$ for 200 kHz to 1 MHz
Output impedance	600 Ω ± 1.5%, asymmetric
Output voltage	3.16 V/600 Ω
Accuracy of output voltage	± 0.5 dB at 1 kHz
Temperature coefficient of output voltage	$< \pm 5 \cdot 10^{-3}/K$
Frequency response	± 0.5 dB for 20 Hz to 20 kHz, ± dB for 1 Hz to 1 MHz
Output voltage divider	0 dB to –70 dB in steps of 0.1 dB, tolerance ± 0.7 dB

Rectangular-Output

Output voltage	5 V ± 10% in idle speed, mark-to-space ratio abt. 1:1, CMOS compatible
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Display

Two-line alphanumeric LC display with 2 × 16 digits and background illumination showing frequency, level, units, decimal point as well as measuring functions and system information.

Interface/Remote Control

The TG 100 can be fully remote controlled via RS-232 C interface with 1,200 to 9,600 Bd.

Soft Workshop

digimess® soft

Order No.: H.UC 90-10

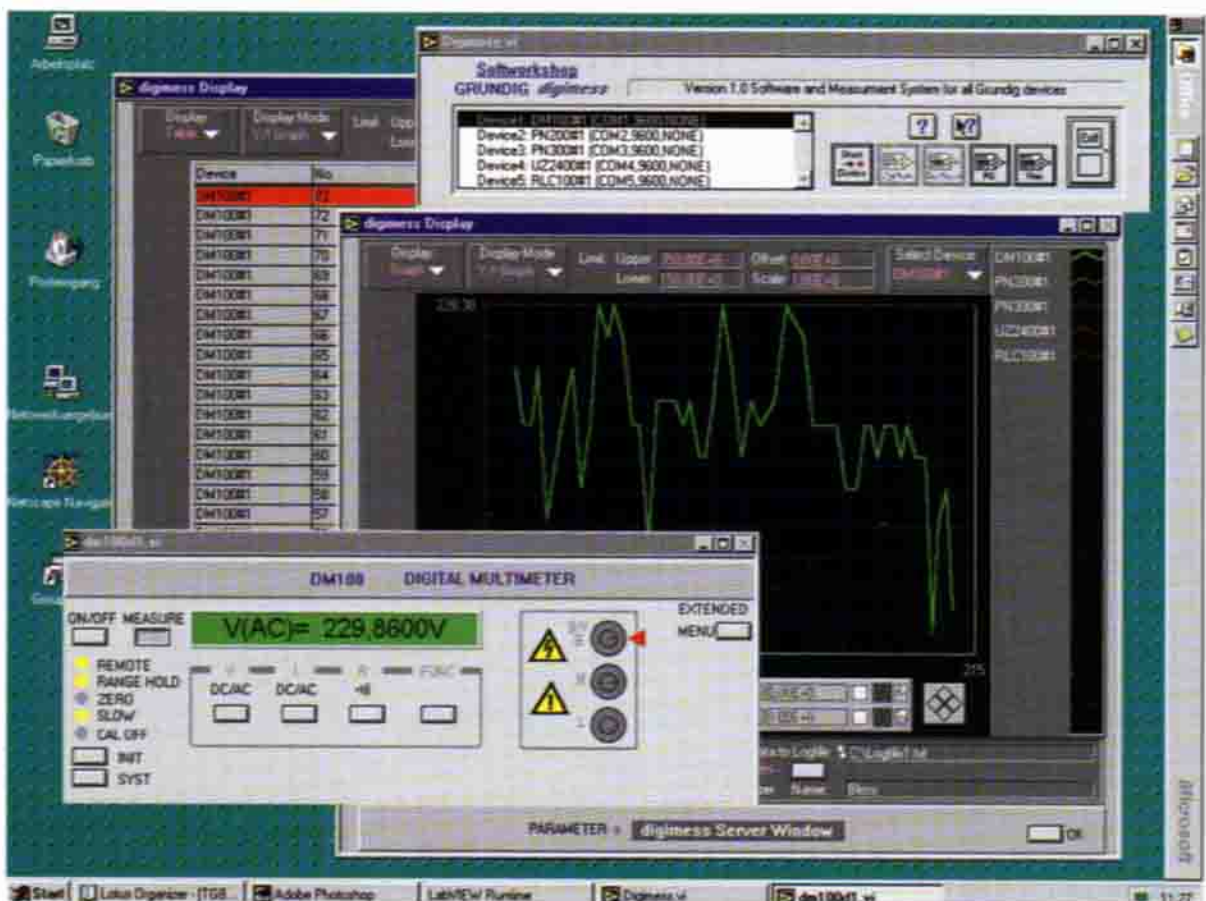


Fig. 1: Working example "DM 100 as a data logger"

The Soft Workshop is the logical extension to Grundig's **digimess**® range of measuring instruments and our response to a host of customer enquiries concerning PC measuring technology. The ultimate aim of the Soft Workshop is parametering instead of programming. This appeal to anyone keen to utilise modern measuring technology but not keen on constantly sorting out communication problems with his PC. As someone familiar with electrical measuring technology on a general level, at least one or more measuring instruments from the **digimess**® range and as the user of one of the well-known operating systems WIN 95 or WIN NT, exploiting the Soft Workshop to automate your particular measuring task will be child's play which will call for only elementary skills in handling the operating systems. Operate your virtual **digimess**® unit just as you would your real measuring instrument. Adopt an intuitive approach to your work and leave it to the Soft Workshop to analyse and document your measurements in a wide variety of ways. Use, for example, "your" data

logger immediately within an extended virtual instrument. Compile complete test sequences based on the integrated, self-learning sequencer program. The basic Soft Workshop version contains the basic backup features for all the **digimess**® measuring instruments available up to a certain date as well as recommended products from other suppliers. Soft Workshop is built around current software sets which, at the same time, act as a "key" for every measuring instrument to be operated under Soft Workshop and have to be available for each type of unit. This approach is particularly welcome to the large number of users who have already acquired one software set and are now aiming to extend their options with the Soft Workshop. The Soft Workshop, which is programmed in G, is characterised by ease of operation, interfaces with standard office packages and data analysis programs as well as excellent value for money. All this ensures that the Soft Workshop will find wide application in the fields of research, development, production, service and training.

Soft Workshop system survey

General

The Soft Workshop is a software package for creating PC-based measuring technology applications, preferably with instruments from Grundig's **digimess**® range. The Soft Workshop uses existing software sets.

System requirements	IBM-compatible PC
Minimum processor	486 DX
Recommended processor	Pentium 100 or greater
Hard disk	15 MB free storage space
Interfaces	minimum one free RS 232 interface
Operating system	Windows 95, Windows NT
Disk drives	3 1/2 inch disk drive, CD Rom disk drive
Interfaces	At least one free COM (RS 232) interface

digimess® system software

Software sets	each digimess ® unit is supplied with so-called software sets, consisting of one Labview Runtime surrounding, one specific Labview unit driver and one 25-pole RS 232 connecting cable with additional 25-pole to 9-pole adapter.
Soft workshop	Extension of existing software sets with functions for data saving, display, prototyping, evaluation, automated measuring sequences, integrated sequencer program

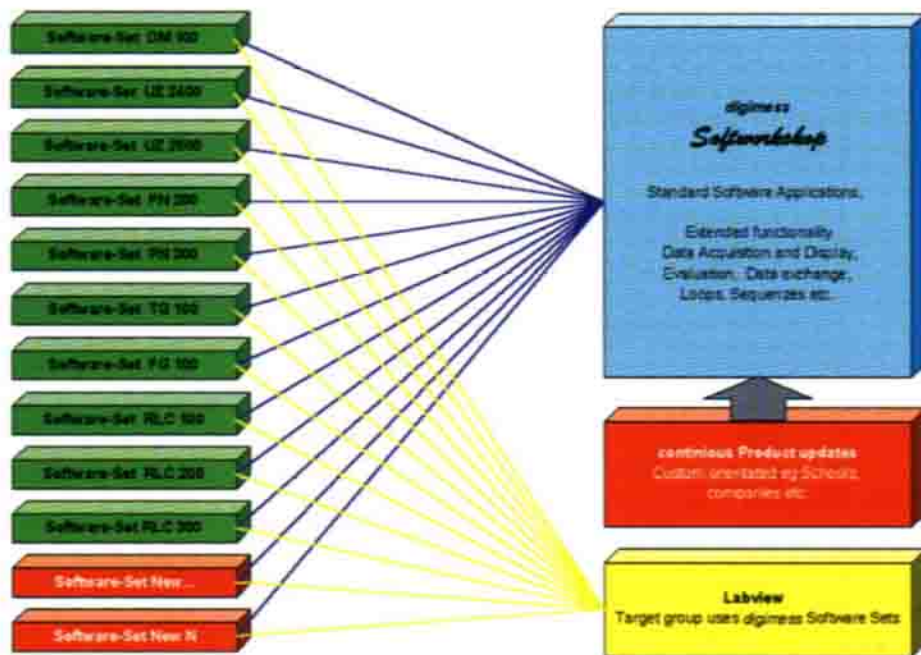


Fig. 2: digimess® software system components

Display

Minimum 800 x 600 Super VGA graphic or higher, laptop operation possible, optimum display with a screen resolution of 1024 x 768.

Interface/Remote control

Soft Workshop assists RS 232 C, IEC bus interface, system controller SC 600.



LabVIEW[®] software set

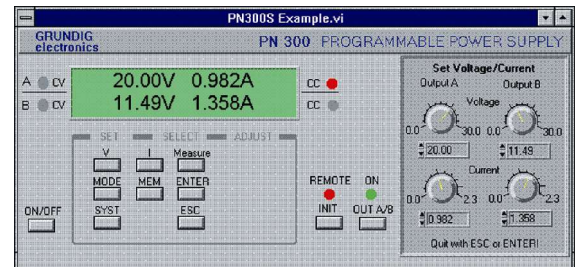
Installation notes

Example of PN300

Computer configuration

Processor	:	Minimum 80486
RAM	:	Minimum 8Mb
Operating system	:	Microsoft Windows [®]
Hard disk space	:	Minimum 8Mb

- 1) Start Windows[®] and select the File "Run" command
Start SETUP Disk 1 with "A:\SETUP.EXE"
Select installation directory
Click on button for "Complete installation"
Installation of Disk 1 is completed
- 2) Select the File "Run" command
Start SETUP Disk 2 with "A:\SETUP.EXE"
Select the same installation directory as above
Click on button for "Complete installation"
Installation of Disk 2 is complete



After the installation of both disks the program is started using "GRUNDIG.EXE" in the program group of "GRUNDIG". The program manages the installed device drivers and serves as a system control program. The SETUP of Disk 1 is not required again for installing several device drivers.

Cable

The enclosed cables are for connection between the PC and the device. A specific connection direction is not necessary. The 9 pin to 25 pin adapter is provided for cases where 9 pin connections are present.

Program Start

The program selected from the program group of "GRUNDIG" by a double click or CR. However, first the interface parameters COM1 or COM 2 have to be correctly defined and should match those set on the device (Refer to the device's manual for changing the settings).

Incorrect interface parameters will cause an error message in the form of a switch, which will become invisible by pressing it or by correctly configuring the interface.

General notes

The programs have been developed using the system LabVIEW[®] by National Instruments. The user can control the program with the LabVIEW[®] run time or he can modify the existing source texts with a complete version of it. System users can install the drivers in extensive program systems without problems.

Error Messages

- | | | |
|------------|---|---|
| Error Init | - | incorrect interface or parameters were selected |
| | - | device switched off or no cable has been attached |
| | - | device is in local mode |

- | | | |
|------------|---|--|
| In general | - | virtual devices can be closed using ALT – F4 in case faults occur |
| | - | in case the baud rate has been incorrectly set, the device has to be switched on again |
| | - | a new initialisation (INIT) has to be made after manually setting local mode |
| | - | the system has to be initialised again (SYST) after incorrect definition of interface parameters |

19" Adapters MA 19-1 and MA 19-2

digimess® compact, digimess® expert

Order No.: H.UC 00-10 (19" adapter single MA 19-1)

Order No.: H.UC 00-20 (19" adapter dual MA 19-2)



19" systems are well established particularly in the areas of research and industry, at universities and polytechnics, but increasingly in general training applications as well. The MA 19 series of 19" adapters belong to the Grundig **digimess®** range of measuring instruments and can be easily integrated into existing test and measuring systems. The **digimess®** compact series reveals a further feature, enabling you to design your own individual test and measuring workplace. The MA 19 system avoids the pitfalls of previous modular systems, since each measuring instrument in the **digimess®** series has its own power supply. The compact series can therefore be operated again as separate units whenever measuring requirements change. The 19" adapters are available in two versions. The **MA 19-1** can accommodate one unit from the "expert" range while the **MA 19-2** can accommodate two units from the "compact" series.

Common features of the 19" adapters:

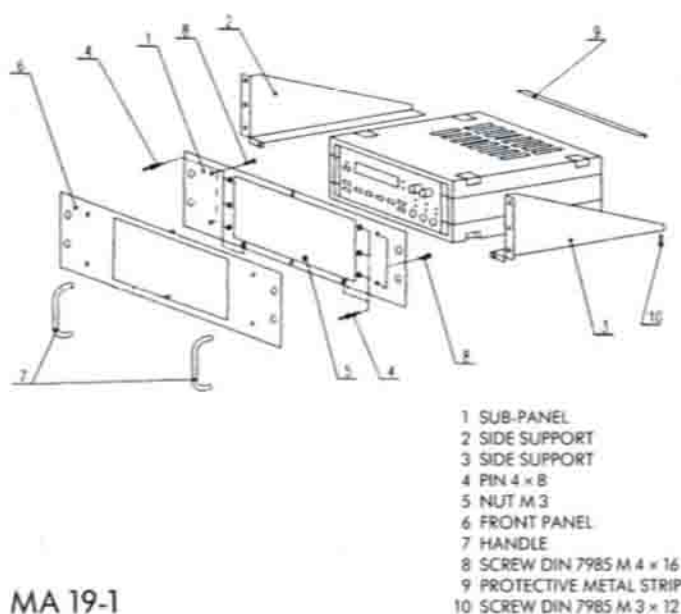
- Integrate Grundig **digimess®** instruments in existing 19" systems.
- Installation height of 3 HU.
- Supplied in assembled condition.
- Easy installation by the final customer.
- Colour-matched to the other Grundig **digimess®** system components.

Special feature of the MA 19-2:

- Modular system to cater for units from the compact series.

Technical Data MA 19-1

Scope of supply	19" frame including all retaining elements for fitting one digimess® expert unit, two front handles.
Supply condition	complete, pre-assembled
Colour of front plate	industrial grey RAL 7035
Colour of front handles	royal blue RAL 5010
Retaining elements	fine metal passivated
Dimensions (in mm)	483 × 133.35 × 275 (W × H × D) without front handles and power supply cable
Installation depth	approx. 330 mm incl. power supply cable
Weight	approx. 1.25 kg

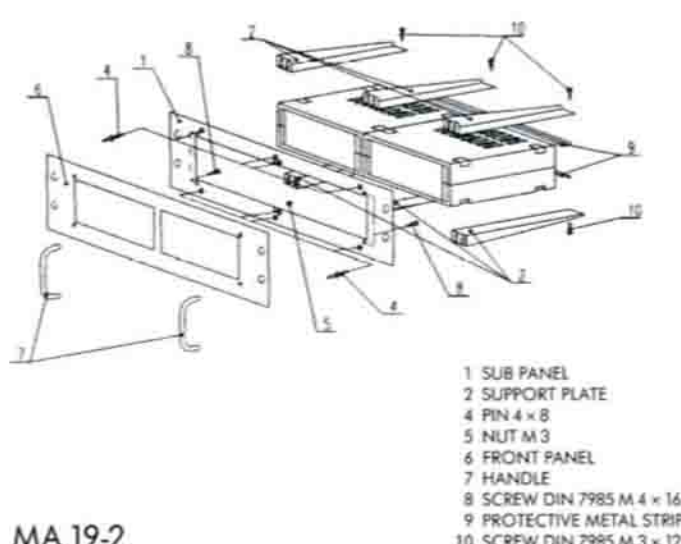


MA 19-1

1 SUB-PANEL	1
2 SIDE SUPPORT	1
3 SIDE SUPPORT	1
4 PIN 4 × 8	8
5 NUT M 3	2
6 FRONT PANEL	1
7 HANDLE	2
8 SCREW DIN 7985 M 4 × 16	4
9 PROTECTIVE METAL STRIP	1
10 SCREW DIN 7985 M 3 × 12	2

Technical Data MA 19-2

Scope of supply	19" frame including all retaining elements for fitting two digimess® compact units, two front handles.
Supply condition	complete, pre-assembled
Colour of front plate	industrial grey RAL 7035
Colour of front handles	royal blue RAL 5010
Retaining elements	fine metal passivated
Dimensions (in mm)	483 × 133.35 × 275 (W × H × D) without front handles and power supply cable
Installation depth	approx. 270 mm incl. power supply cable
Weight	approx. 1.5 kg



MA 19-2

1 SUB PANEL	1
2 SUPPORT PLATE	6
4 PIN 4 × 8	8
5 NUT M 3	2
6 FRONT PANEL	1
7 HANDLE	2
8 SCREW DIN 7985 M 4 × 16	4
9 PROTECTIVE METAL STRIP	2
10 SCREW DIN 7985 M 3 × 12	6

Systemcontroller SC 600

digimess® compact

Order No.: H.UC 80-00



Do you wish to set up a wide array of automatic test systems? Do you need PC-based measuring technology without having to dismantle your tower PC? Do you require readily available slots and PC-based measuring technology on a laptop as well? Do you want to use up to six test and measuring instruments with one RS 232 interface, have cascading options and complete optical isolation of every RS 232 input/output? This is absolutely essential for sophisticated test and measuring systems without distorting ground loops, as every test technician will readily confirm. All these are features of the **digimess®** system controller SC 600 which allows you to carry out PC-assisted test and measuring in the very simplest manner. Designed as a **digimess®** system accessory the SC 600 can also be used as an "interface switcher", for interaction with other suppliers' equipment. This is made possible by a universal set of commands. However, it is only

when combined with test and measuring instruments of the **digimess®** range and the "Soft Workshop" system software that the SC 600's additional features are revealed. These include automatic recognition of the other connected instrument(s), automatic recognition of the individually set baud rate and time-optimized data transfer. Plug and play is not just an empty promise. The SC 600 has been designed on the basis of PLD technology and, like all the instruments of the Grundig **digimess®** range, it is controlled by a microprocessor, resulting in a compact design, self-diagnosis and complete remote control capabilities via the standard RS 232 C interface. The SC 600 is the answer to many of the requirements which industry has had for a long time. Its excellent value for money ensures that the SC 600 will find wide application in the fields of development, production, service and training. The SC 600 system controller is a must for every test bench.

Technical Data

General Data

Nominal temperature	+23 °C ± 2 °C
Operating temperature	+5 °C ... +40 °C
Relative humidity	20% ... 80%
Atmospheric pressure	70,000 Pa ... 106,000 Pa
Operating position	horizontal or inclined by ± 15°
Operating voltage	sinusoidal alternating voltage (harmonic distortion < 5%) 230 V or 115 V (+10%, -15%), internal switchable 47 ... 63 Hz
Power consumption	15 VA (max. 15 W)
Fuses	T 80 L 250 V – (230) V T 160 L 250 V – (115) V
Safety class	I according to EN 61010-1 (DIN VDE 0411 Part 1 11/93)
Radio interference suppression	EN 55011 Class B, VDE 0871 Class B
Dimensions (in mm)	225 x 85 x 200 (L x H x D)
Dimensions of packing (in mm)	315 x 115 x 270 (W x H x D)
Weight of SC 600	approx. 1.5 kg
Weight of SC 600 incl. packaging	approx. 2.5 kg

Specifications

Serial Interface COM 0

Interface-Connector male	25-Pin D-Sub
Data transmission rate	1200, 2400, 4800, 9600, 19200, 28800 or 38400 Bd
Length of data character	8 Bit
Number of STOP bits	1
Parity	none
Protocol	RTS/CTS or NONE
End characters on receiving	'LF' (10 dec.)
End characters on transmission	'CR' + 'LF' (13 dec. + 10 dec.)
Length of input buffer	4 kB
Length of output buffer	4 kB

Serial Interfaces COM 1 ... COM 6

Interface connector male	9-Pin D-Sub
Data transmission rate	110, 150, 300, 600, 1200, 2400, 4800, 9600 oder 19200 Bd
Length of data character	5, 6, 7 or 8 Bit
Number of STOP bits	1, 2 (1.5)
Parity	none, odd, even
Protocoll	RTS/CTS or NONE
Length of input buffer	4 kB
Length of output buffer	4 kB

Interface/Remote control

All serial Communication Ports are optical isolated!

UZ 2400 Universal Counter

digimess® compact

Order No. H.UC 10-00



The UZ 2400 universal counter is a compact counter for up to 2.4 GHz. It features two counter channels (channel A: 10 Hz to 100 MHz and channel C: 50 MHz to 2400 MHz).

The measured values are displayed in a 16-character line on a large, backlit alphanumeric LCD.

A maximum of 8 places and one decimal point are used to display the measured values. The format depends on the measuring mode.

Full remote control (without trigger level at channel A) of the counter is possible via an RS-232 interface.

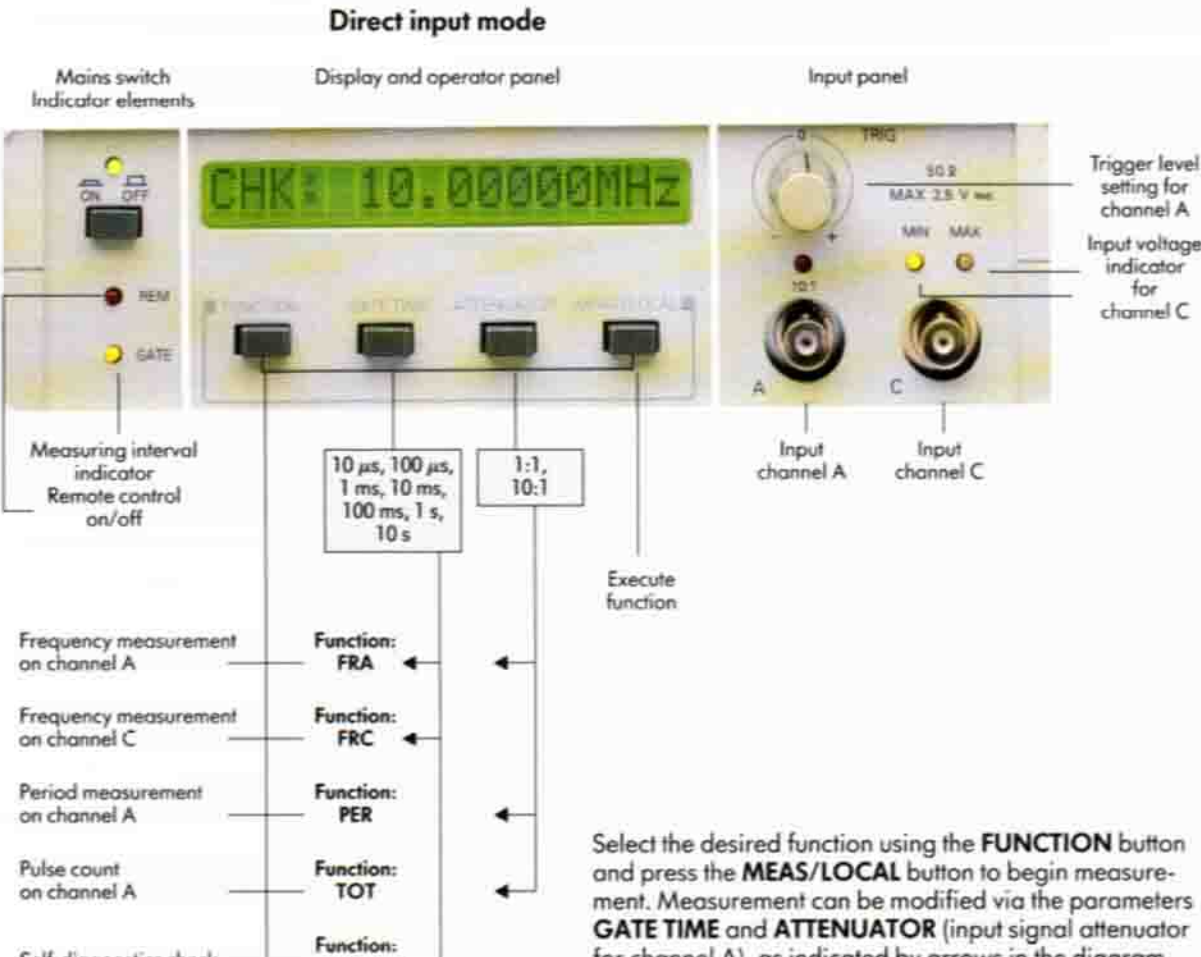
Special features of the UZ 2400 include a high basic accuracy of 10^{-10} (short-term) due to the quartz oven oscillator, and a long-term stability of 10^{-8} over 24 hours.

The built-in microprocessor carries out a self-diagnostics check and makes operation extremely simple.

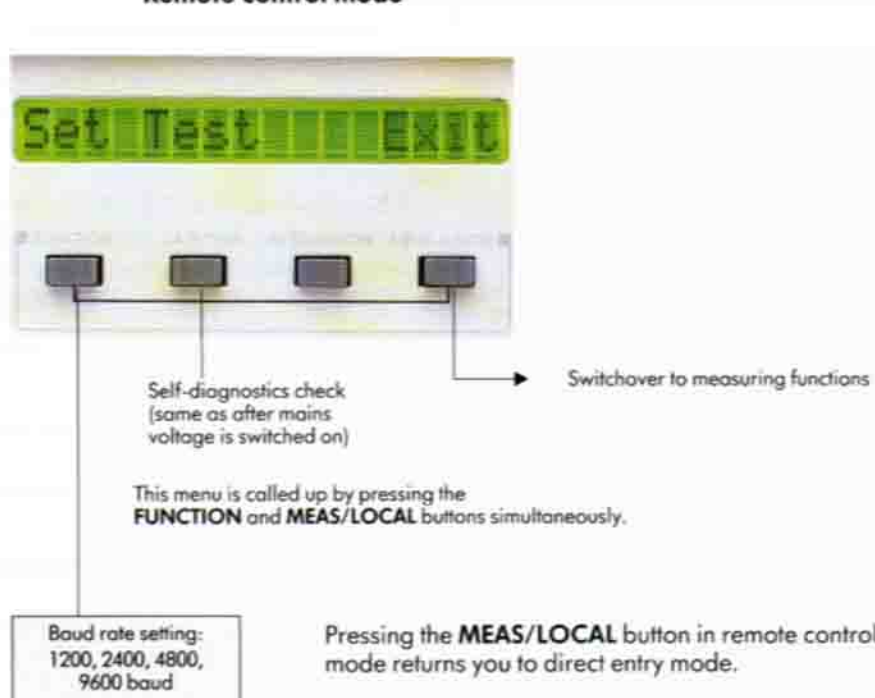
The many outstanding features of the UZ 2400 allow it to set new standards in its class.

Measuring is easy with the UZ 2400!

Direct input mode



Remote control mode



Technical data

Characteristics of channel A

Frequency range	10 Hz ... 100 MHz
Basic sensitivity (voltage divider 1:1)	$V_{rms} = 25 \text{ mV}$ – sine signal $V_{pp} = 75 \text{ mV}$ with pulses (minimum width 10 ns)
Input voltage	AC voltage
Input impedance	$1 \text{ M}\Omega$ ($< 20 \text{ pF}$)
Input divider	1:1 or 10:1
Dynamic range with divider 10:1	$V_{pp} = 75 \text{ mV} \dots V_{pp} = 5 \text{ V}$ $V_{pp} = 750 \text{ mV} \dots V_{pp} = 50 \text{ V}$
Maximum input voltage	50 V ($V_{\infty} + V_{pp}$ with divider 10:1)
Range of trigger level adjustment	Adjustable via potentiometer
Voltage divider 1:1	+0.5 V ... -0.5 V
Voltage divider 10:1	+5 V ... -5 V

Characteristics of channel C

Frequency range	50 MHz ... 2400 MHz
Division ratio	100:1
Sensitivity	$V_{rms} = 25 \text{ mV}$ where $f = 100 \text{ MHz} \dots 2 \text{ GHz}$ $V_{rms} = 50 \text{ mV}$ where $f = 50 \text{ MHz} \dots 100 \text{ MHz}$ and where $f = 2 \text{ GHz} \dots 2.4 \text{ GHz}$
Input impedance	50 Ω
Standing wave ratio	≤ 2.5
Input voltage	AC voltage
Maximum input voltage	$V_{rms} = 2.5 \text{ V}$ (sine signal) $\pm 40 \text{ V}$ DC voltage content
Optimal input voltage	"MIN" and "MAX" LEDs are both off

Functions

Self-diagnostics check (CHK)

Measuring frequency	10 MHz (internal)
Gate time	10 μs , 100 μs , 1 ms, 10 ms, 100 ms, 1 s, 10 s
Accuracy	$\pm 1 \text{ LSD}^{1)}$
Display of result	MHz with decimal point

Frequency measurement on channel A (FRA)

Measurement range	10 Hz ... 100 MHz
Gate time	$t_{gate} = 10 \mu\text{s}, 100 \mu\text{s}, 1 \text{ ms}, 10 \text{ ms}, 100 \text{ ms}, 1 \text{ s}, 10 \text{ s}$
Frequency resolution	$f = 1 / t_{gate}$ (max. 8 digits)
Accuracy	$\pm 1 \text{ LSD}^{1)} \pm \text{time base error}$
Results display	Hz, kHz, MHz with decimal point

Frequency measurement on channel C (FRC)

Measurement range	50 MHz ... 2.4 GHz
Gate time	$t_{gate} = 10 \mu\text{s}, 100 \mu\text{s}, 1 \text{ ms}, 10 \text{ ms}, 100 \text{ ms}, 1 \text{ s}, 10 \text{ s}$
Input voltage	$25 \text{ mV} \leq V_{rms} \leq 2.5 \text{ V}$
Frequency resolution	$f = 100 / t_{gate}$ (max. 8 digits)
Accuracy	$\pm 1 \text{ LSD}^{1)} \pm \text{time base error}$
Results display	MHz, GHz with decimal point

Period measurement on channel A (PER)

Measurement range	100 μs ... 100 ms
Sensitivity	$V_{rms} = 100 \text{ mV}$
Resolution	100 ns
Accuracy	$\pm 1 \text{ LSD}^{1)} \pm \text{time base error} \pm \text{trigger error}^{2)}$
Results display	$\mu\text{s}, \text{ms}, \text{s}$ with decimal point

Pulse count on channel A (TOT)

Measurement range	1 ... 10^9 events
Frequency range	0 ... 100 MHz
Accuracy	$\pm 1 \text{ LSD}^{1)}$
Results display	without unit of measurement and decimal point

Time base

Warm-up time	15 min.
Nominal frequency of crystal	10 MHz
Accuracy of frequency setting	$\pm 5 \cdot 10^{-9}$
Short-term stability	$1 \cdot 10^{-10}/\text{s}$
Frequency deviation after 24 hours	$\leq \pm 10^{-8}$
Temperature effect	$< 5 \cdot 10^{-9}/^\circ\text{C}$

Display: 16-digit alphanumeric LCD-matrix, backlit

RS-232 C interface

Full remote control (without trigger level at channel A) of the counter is possible via the integrated RS 232 C serial interface.

Possible baud rates: 1200 baud, 2400 baud, 4800 baud, 9600 baud

Environmental conditions

Nominal temperature	$+23^\circ\text{C} \pm 2^\circ\text{C}$
Operating temperature	$+5^\circ\text{C} \dots +40^\circ\text{C}$
Relative atmospheric humidity	20% ... 80%
Atmospheric pressure	86000 ... 106000 Pa
Interference suppression	in accordance with Vfg. 1046/1984, VDE 0871 Category B
Dimensions (W x H x D)	225 mm x 85 mm x 200 mm
Dimensions (W x H x D) incl. packaging	310 mm x 110 mm x 265 mm
Weight	approx. 1.8 kg
Weight incl. accessories and packing	approx. 2.6 kg

Power supply

Operating voltage	220 V/110 V $\pm 10\%$ (internally switchable) 50 Hz ... 60 Hz $\pm 5\%$
Power consumption	20 VA
Fuses	Mains fuse T 100 mA/250 V (220 V), T 200 mA 250 V (110 V)
Protection class	Protection class I in accordance with IEC 348 \equiv DIN VDE 0411 Part 1 E 81

Accessories included in packing:

- Mains cable
- Operating instructions
- BNC-BNC-cable
- Replacement fuse 100 mA

Note:

The adjustment of the gate time has no effect on the functions period measurement and pulse count. The repetition rate of the measurement during automatic operation is approx. 200 ms.

1) LSD: the last significant digit is the smallest possible value to be displayed and corresponds to the resolution of the current measurement range.

2) The trigger error (RMS value) is computed as follows:

$$\Delta T_s = \sqrt{\frac{(V_{noise}^2 + V_{in-noise}^2)}{S}}$$

V_{noise} = noise voltage in signal

$V_{in-noise}$ = internal noise voltage in amplifier

$S(V/s)$ = pulserate-off-rise of the measured signal content at the trigger point

UZ 2500 Universal Counter

digimess® expert

Order no.: H.UC 15-00



The UZ 2500 universal counter is yet another addition to GRUNDIG electronics range of innovative service measuring instruments. Like the others in the range, UZ 2500 is based on a sophisticated microprocessor-controlled operating concept and operation takes place over an LCD.

All the settings are carried out using only a few keys. This operating concept is in line with GRUNDIG electronics objective of allowing the user to work with the instrument after just a few minutes without having to refer to written documentation.

UZ 2500 is the big brother of UZ 2400, which has already been favourably received on the market. It features two counting channels for the range 10 Hz - 100 MHz and one for the range 50 MHz - 2.4 GHz.

Outstanding features of the instrument include a high input sensitivity of ≥ 25 mV and a time base accuracy of 10^{-8} over 24 hours.

In addition to frequency measurement and counting, periods and various frequency response ratios can be determined and pulse widths measured.

All the functions of the instrument can also be controlled over the combined RS-232 C/IEEE 488.2 interface with the exception of the trigger level settings for channels A and B.

Instrument settings can be saved and loaded as required.

UZ 2500 is suitable for a wide range of applications in the fields of research, production, training and service on the basis of its performance data and its unbeatable price/performance ratio.

Technical data

Characteristics of channels A and B

Frequency range	10 Hz to 100 MHz
Basic sensitivity	$V_{rms} = 25$ mV (sinusoidal signal) $V_{pp} = 75$ mV with pulses of a minimal width ≥ 10 ns
Input coupling	AC
Input impedance	1 M Ω (< 40 pF)
Input divider	1:1 or 10:1
Dynamic range with divider 10:1	75 mV $\leq V_{pp} \leq 5$ V 750 mV $\leq V_{pp} \leq 50$ V
Maximum input voltage	50 V (DC + AC _{peak}) with divider 10:1, 8 V (V_{rms}) with divider 1:1, $f > 100$ kHz
Triggering edge	rising or falling
Trigger level setting	Adjustable via potentiometer
Voltage divider 1:1	-1.5 V to +1.5 V
Voltage divider 10:1	-15 V to +15 V

Characteristics of channel C

Frequency range	50 MHz to 2400 MHz
Division ratio	100:1
Sensitivity where: $f = 50 - 100$ MHz $f = 100$ MHz - 2 GHz $f = 2 - 2.4$ GHz	$V_{rms} = 50$ mV $V_{rms} = 25$ mV $V_{rms} = 50$ mV
Input impedance	50 Ω
Input coupling	AC
Maximum input voltage	$V_{rms} = 2.5$ V (sinusoidal signal) ± 40 V DC voltage content

Measuring functions

Self-diagnostics check (CHECK)

Measuring range	10 MHz (frequency standard)
Gate times	$t_{gate} = 10$ μ s, 100 μ s, 1 ms, 10 ms, 100 ms, 1 s, 10 s
Accuracy	± 1 LSD ¹⁾
Display of results	MHz with decimal point

Frequency measurement over channel A or B (FREQ A, FREQ B)

Measuring range	10 Hz to 100 MHz
Gate times	$t_{gate} = 10$ μ s, 100 μ s, 1 ms, 10 ms, 100 ms, 1 s, 10 s
Frequency resolution	$f = 1/t_{gate}$ (maximum of 9 digits)
Accuracy	± 1 LSD ¹⁾ \pm time base error
Display of results	Hz, kHz, MHz with decimal point

Frequency measurement over channel C (FRC)

Measuring range	50 MHz to 2.4 GHz
Gate times	$t_{gate} = 10$ μ s, 100 μ s, 1 ms, 10 ms, 100 ms, 1 s, 10 s
Frequency resolution	$f = 100/t_{gate}$ (maximum of 9 digits)
Accuracy	± 1 LSD ¹⁾ \pm time base error
Display of results	MHz, GHz with decimal point

Measurement of frequency response ratios over channels A and B (RAT A/B)

Inputs	Channels A and B ($V_{rms} \geq 100$ mV for channel B)
Measuring range	10^{-7} to 10^7
Gate time n	10^2 to 10^8 times the period of the input signal of channel B
Frequency resolution	1/n
Accuracy	± 1 LSD ¹⁾ \pm trigger error of channel B
Display of results	without unit of measurement, with decimal point

Measurement of frequency response ratios over channels A and C (RAT A/C)

Inputs	Channels C and B ($V_{rms} \geq 100$ mV for channel B)
Measuring range	$0.5 - 2.4 \times 10^8$
Gate time n	10^2 to 10^8 times the period of the input signal of channel B
Frequency resolution	100/n
Accuracy	± 1 LSD ¹⁾ \pm trigger error of channel C
Display of results	without unit of measurement, with decimal point

Period measurement over channel A or B (PER A, PER B)

Measuring range	1 μ s to 100 ms
Sensitivity	$V_{rms} = 100$ mV
Unit of measurement (resolution)	100 ns
Accuracy	± 1 LSD ¹⁾ \pm trigger error \pm time base error
Display of results	μ s, ms with decimal point

Measurement of time interval over channels A and B (TIME AB)

Measuring range	1 μ s to 100 s
Signal rise	> 6 V/s
Unit of measurement (resolution)	100 ns
Accuracy	± 1 LSD ¹⁾ \pm trigger error \pm time base error
Display of results	μ s, ms, s with decimal point

Pulse count over channel A or B (TOT A, TOT B)

Measuring range	1 to 10^9 events
Sensitivity	$V_{rms} = 100$ mV (in the case of external trigger)
Signal rise	> 6 V/s
Accuracy of the external control	
Counting error	± 1 LSD ¹⁾
Measuring interval error	\pm trigger error
Display of results	

Time base

Warm-up time	15 min
Nominal frequency of quartz crystal	10 MHz
Frequency setting accuracy	$\pm 5 \times 10^{-9}$
Frequency deviation after 24 hours	$\leq \pm 10^{-8}$
Influence of temperature	$< \pm 5 \times 10^{-9}/^{\circ}\text{C}$

Display

The instrument features an illuminated alphanumeric LCD display with two lines and 16 digits each. The first line displays the measured value, the unit of measurement and the decimal point. The second line displays the current measuring function and parameters such as the length of the measuring interval,

the multiplication coefficient etc. During parameter input, the first line on the display contains the name of the function group and the second line the names of the function keys "F1" to "F4".

Interfaces

Full remote control of the instrument is possible over the standard interfaces RS-232 C and IEEE 488.2 with the exception of the trigger level settings for channels A and B.

Interface function settings:

- RS 232:
Baud rates 1200 baud, 2400 baud, 4800 baud, 9600 baud, RTS/CTS protocol and no protocol
- IEEE 488.2:
Address, Talk only on/off

Environmental conditions

Nominal temperature	$+23^{\circ}\text{C} \pm 2^{\circ}\text{C}$
Operating temperature	$+5^{\circ}\text{C} \dots +40^{\circ}\text{C}$
Relative humidity	20 to 80%
Atmospheric pressure	86 to 106 kPa
Interference suppression	Vfg. 1046/1984, VDE 0871 Category B

Power supply

Operating voltage	Sinusoidal AC voltage (distortion factor $< 5\%$) 115/230 V ($+10\%/-15\%$), switchable internally, 47 to 63 Hz
Power consumption	40 VA
Fuses	T 200 L/250 V (230 V~) T 400 L/250 V (115 V~)
Protection class	I to EN 61010, corresponds to DIN VDE 0411 Part 1 1993

Dimensions and weights

Dimensions (W \times H \times D)	290 mm \times 120 mm \times 260 mm
Dimensions of packaging (W \times H \times D)	335 mm \times 125 mm \times 385 mm
Weight of the universal counter	approx. 3.8 kg
Weight inc. packaging and accessories	approx. 6.0 kg

Accessories supplied with the package

- Mains cable
- Operating instructions
- 2 \times BNC-BNC cables
- Spare fuses

Note:

The gate time settings have no effect on the period measurement and pulse count functions. The measurement repetition rate during automatic operation is approx. 250 ms.

- 1) LSD (least significant digit): The smallest possible value displayed, corresponds to the resolution of the measuring range in question.