

LMG611

Precision Power Analyzer with



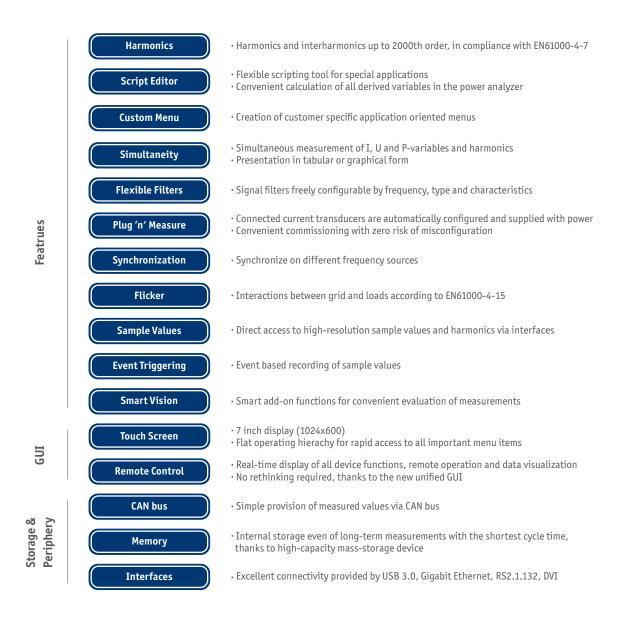


The Most Precise in its Class

As Compact Desktop Device with Touch Screen

LMG611 - powerful, convenient, flexible





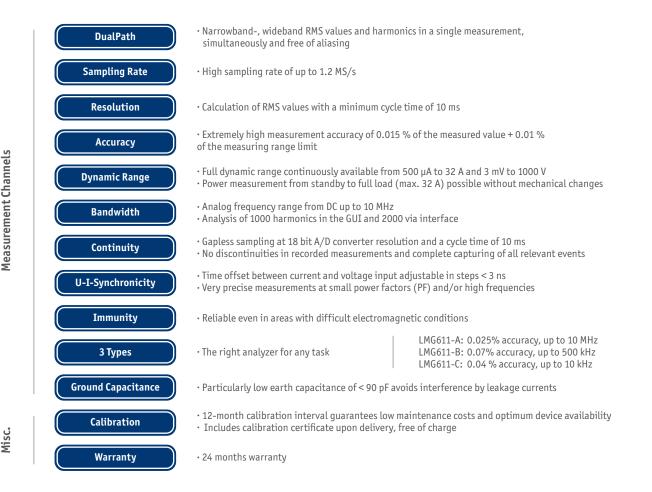
Setting the bar in power analysis

For more than three decades, ZES ZIMMER has been focused solely on high-precision power measurement technology – so we know there is more to it than simply measuring current and voltage. Anyone who has tried to use generic systems for power measurement will have rapidly run up against their limits. What's the situation with com-

mon-mode rejection? Is the measurement result still reliable for power factors in the range of 0.01? Is the earth capacitance low enough to avoid interference by leakage currents? In what frequency ranges does the manufacturer guarantee the stated measuring accuracy? It quickly becomes clear that only a device designed speci-

fically for power measurement can really satisfy these ambitious requirements. The ZES ZIMMER LMG611 stands out in the market for its extreme reliability, best-in-class accuracy, and maximum frequency range – the ideal prerequisites for excellent results.



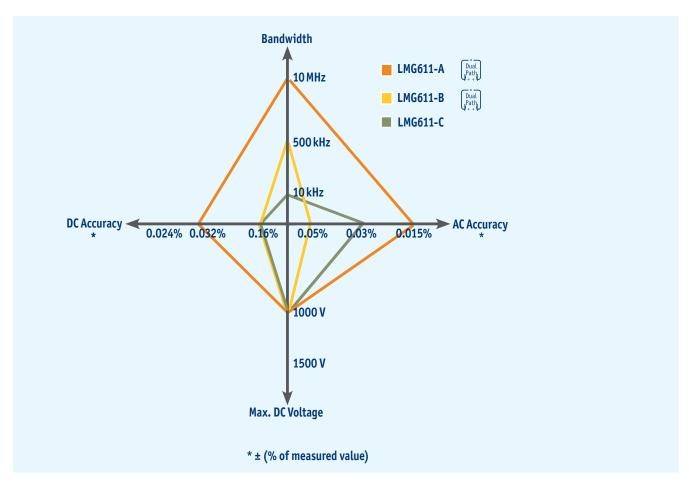


For every application the adequate combination of bandwidth, accuracy and costs

Power analyzers are available in different accuracy classes to allow the user to choose the right tool for the job at hand. After all, not all applications require maximum precision; often lower resolutions and frequency ranges are sufficient. Unfortunately, not all measuring applications observe this distin-

ction. It is entirely possible, for instance, to have need of different frequency ranges and accuracy levels at different points in the same measurement configuration. This is why the LMG611 is offered in three different types, which ensures that you always have a measuring device tailored

to your needs for your particular application, without having to accept trade-offs in accuracy or take a sledgehammer to crack a nut, if a lower price solution could have served your purposes equally well.



Gapless/zero-blind measurement

In the course of stricter monitoring of the consumption and efficiency of electrical devices, new standards and procedures are continuously being introduced (e.g. SPECpower_ssj2008, IEC 62301, EN 50564), in order to enable an impartial comparison of products from different manufacturers. Be it an office computer, server or household appliance, the same principle applies:

the procedure always requires long term analysis of the power consumption, taking into account all relevant operating conditions. The differences between minimum load - e.g. in standby - and full load can be of a significant magnitude, which makes precise measurement very challenging (see also application report no. 102 "Measurement of standby power and energy

efficiency" at www.zes.com). Some of the measurements required must be performed over several hours, yet without gaps. By selecting a sufficiently high measurement range, changing ranges and the inevitably associated losses in data can be avoided. The high basic accuracy of the LMG611 ensures precise measurement results, even near the lower limit of a range.

Measuring in two bandwidths at the same time, thanks to DualPath - no compromises, no doubts

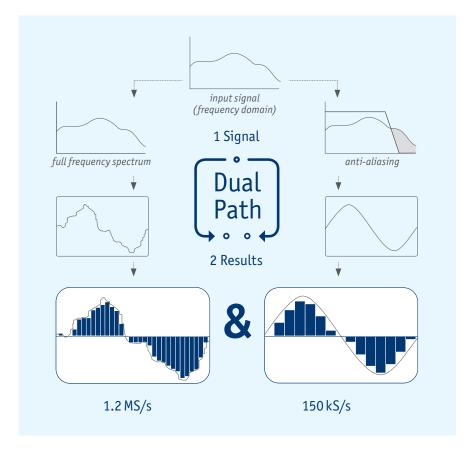
On conventional power analyzers, a signal first undergoes analog conditioning, followed by optional anti-aliasing filters, to then be fed into an A/D converter. The resulting signal can afterwards be used for the calculation of cycle-based rms values, or alternatively serve as the base for an FFT or further digital filtering. Due to the limitation to a single A/D converter, there are inherently some downsides to be factored in with conventional devices. If measurements are

carried out with filters active, in order to avoid aliasing with FFTs, then the wide-band values are lost. With the filters switched off, strictly speaking, FFTs should not be used. If, in spite of this, FFTs are used without an anti-aliasing filter for measurements across the full frequency range, then the quality of the calculated values is questionable. An aliasing error of 50%, for instance, is easily detected, however a deviation of 0.5% could go unnoticed. Ultimately, when you

alternate filtered and non-filtered measurements, the validity of the results is equally in question, as this involves the assumption that the signal does not change over time, which is in practice hardly ever the case. In addition, this procedure is especially time consuming.



In the end, this makes all of the measurement methods presented an unsatisfactory compromise. This is why ZES ZIMMER has fundamentally redesigned signal processing and developed the DualPath architecture. The analog side is the same as in conventional measuring devices, however the subsequent digital processing has been revolutionized. The LMG611 is the first power analyzer to have two A/D converters in two independent signal paths; One, for the filterless measurement of the wideband signal, and another, for the narrow-band signal at the output of the anti-aliasing filter. The parallel processing of the digitized sample values gives the user access to both measurements of the same signal, without risking aliasing effects. This unique procedure avoids all of the downsides of previous approaches and quarantees the most precise result in the shortest time possible.



Precise measurements thanks to minimal delay differences

The fast-switching semiconductors used in modern frequency converters to improve efficiency produce extremely steep voltage edges. The resulting capacitive currents put strain on the bearings and the insulation of the motors – this can lead to premature failure.

Motor filters (e.g. dU/dt filters) attenuate the steep voltage gradient, although they generate power losses themselves due to the transient oscillation with the filter's own frequencies (typically > 100 kHz).

The broad frequency range and the minimal delay between current and voltage on the LMG611 allow extremely precise power loss measurements on the filters at these frequencies, including longitudinal measurements at low power factors. This also applies to power measurements with high frequency ranges of up to 10 MHz, which require the current and voltage channels to be designed for the smallest delay differences. On the LMG611 the offset is less than 3 ns, corresponding to a phase error <1 µrad at

50 Hz. This makes the devices best suited to measure the power losses at low phase angles for transformers, chokes, capacitors and ultrasonic generators. No additional options or adjustments are required; the LMG611 is already fully capable of this measurement task with the standard factory settings. Usually current and voltage transducers are used for measurements on high-power circuits. The phase angle of these transducers can be corrected to improve measurement accuracy.

Easy to use - with or without touchscreen

To ensure that the LMG611 can be used in all conditions, particular attention has been paid to universal operability. All display modes and setting options can be operated both with the touchscreen or the keypad, without exception. The optimized design consistently produces a direct reference between the keypad and the associated views and setting options on the screen. To use the device effectively requires practically no familiarization. The graphical user interface directs the user precisely to the required results, without detours. Be it effective values

for voltage or current, associated harmonics or cumulative values, they are only a single press of a button away. In addition, user-defined views allow to group together measured values of one's choice, so that all the parameters that are important are always available at a glance. This ergonomic means of operation and the associated time savings contribute directly to the productive use of the LMG611. The eight context-specific double softkeys to the right of the display, whose function always corresponds to their onscreen counterparts on the right-hand side

of the screen, are especially important for ease-of-use. One can determine the function assigned to a given softkey at a glance. The double softkey design enables the respective parameter to be rapidly configurable; switching through views that are not relevant is no longer necessary. Should there be questions as to function and control while operating the device, the relevant sections of the manual can be displayed at any time.



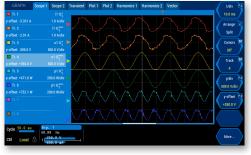
Simultaneous measurement of narrow and broadband



Display of measured RMS values



Superimposed help text from manual



Display of sampling values of 8 signals in two scopes

Range extension with sensors? Plug 'n' Measure!

Although the LMG611 offers unmatched dynamic range, both for voltage and current, there are always applications with extraordinary requirements in terms of measurement ranges. Whether you are dealing with currents of several hundred amps or voltages of several kilovolts, ZES ZIMMER has the right solution at the ready. We offer a wide range of current and voltage sensors, which work perfectly in unison with the LMG611 precision power analyzer and extend the measurement ranges of the device by the required amount. The sensors of our Plug 'n' Measure series are equipped with a bus system, which enables automatic configu-

ration of the LMG611. This allows for all of the important parameters, such as the precise scaling factor, the delay compensation variable, the last calibration date, and the sensor type, to be read and used automatically by the power analyzer. Moreover, the sensors are actively supplied with power by the LMG611, separate power supplies are no longer required.

With Plug 'n' Measure there is no need for fine tuning by the user to improve the results. There is no difference between direct and sensor-supported measurements. Of course, other commercially available sensors can also be used with the LMG611.



Sensor Type PCT

Everything important just a click away

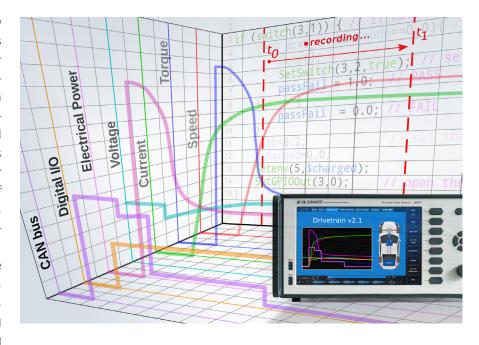


LMG600 series: Testing without disruption – five in one

In a typical test scenario, the way from raw signals to the final pass/fail indication is a long and winding path stretching over five distinct phases. Computing RMS power is only one piece of the puzzle, and data from other sources might need to be integrated into the calculations. This can lead to a complex assortment of data sources and processing tools with many handover points. The discontinuities in the flow of data may require manual intervention, which demands time and effort and increases the risk of introducing errors.

The LMG600 is designed to combine all five phases of testing into a single instrument, thus eliminating unnecessary complexity, streamlining the testing process, making test engineers' life easier and keeping cost down.

- 1. Signal acquisition: the LMG600 goes beyond voltage and power. The versatile Process Signal Interface (PSI) can read virtually any analog or digital signal source, thus allowing e.g. temperature, pressure, speed, torque and other data to be collected together with voltage and current. No need to reconcile data points from different sources later on, no issues with inconsistent timestamps between variables.
- 2. Timing control: for the test results to be meaningful, the DUT needs to be observed in specific, predefined modes of operation. The LMG600 can control beginning and end of the measurements via the versatile Event Trigger option. In addition, it can react to external trigger inputs or CANbus commands to start recording data. The LMG600 can also control external devices via a number of analog and digital outputs in the optional PSI.
- 3. **Integration**: to calculate RMS voltage, current and power as well as harmonic values, the samples need to be summed over entire signal periods - this is the traditional domain of power analysis. (Outsourcing the calculation to PC environments already at this step renders the



integrity of RMS values and harmonics vulnerable and makes calibration of the setup rather difficult.)

- 4. **Derivation**: in many applications, the measurement of electrical quantities is just a means to an end and not the final goal. An illustrative example is the qualification of inductive components: measuring voltage and current ultimately yields core losses and the peak values of magnetic field strength and flux density. Rather than exporting electric measurements to 3rd party applications for the calculation of the desired results, the LMG600 offers a powerful built-in programming language with a vast number of mathematical functions to carry out all required calculations in one fell swoop. No handover, no disruptions, no risk of additional errors.
- 5. Pass/fail decision: In case the DUT is tested against defined standards or previously established benchmarks, the pass/fail limits can be programmed into the LMG600 in order to allow the instrument to display the outcome of the test directly. Should there be different pass/ fail criteria for consecutive DUTs, applicable limits can even be adjusted on-screen by the test engineer use the touchscreen GUI's input boxes or arrow keys. Some tests

require additional information (like e.g. magnetic path length, core diameter etc.) on the DIJT that varies between tests and also needs to be considered for calculation. Also this kind of data can be entered and changed directly on-screen using a number of available input elements. These built-in decision-support features allow even less experienced or less well-trained users to reliably judge success or failure of the test.

avrP_{*1} 3.50207 3.4832 Limit: **Environment variables**

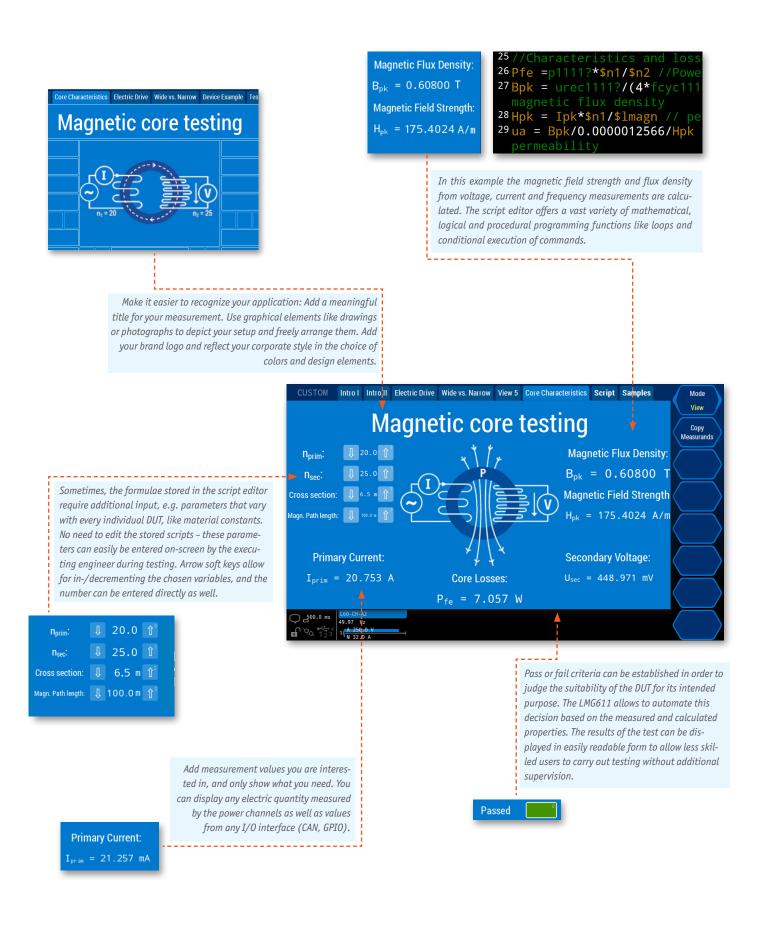
In the example above, power P1 is compared to environment variable 1, which can be adjusted on-screen using the depicted arrow softkeys.

The values assumed by environment variables can be color-coded to alert the user to the status of the DUT or to indicate the outcome of the measurement e.g. pass/fail.

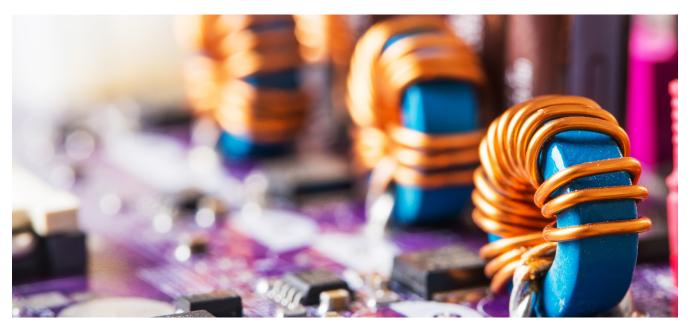
Switching keys

The status of the softkeys can be queried by the script. Those keys can act as push button, toggle or latching switches.

Five in one example: automated magnetic core testing









Application

Switched-mode power supplies

Already years ago, advances in power electronics have caused relatively large and heavy transformer power supplies to be replaced by smaller, lighter and more efficient switched mode power supplies. Today those can be found in practically all grid-powered electrical

devices. While avoiding many of the downsides of their predecessors, they also bring new challenges: for one, the conducted emissions due to harmonics are not insignificant and must be limited by standards (EN61000-3-2, EN61000-3-12). Secondly, the high switching frequen-

cies of up to several hundred kilohertz can lead to problems with electromagnetic compatibility, both on the grid side and on the consumers' part. The role of power measurement technology is to support the manufacturer in optimizing their products.

CHALLENGES Capless, standards-compliant measurement of harmonics High frequency range for analysis of conditions at pulse frequencies >300 kHz Quick and gapless sampling for measuring steep switching flanks Reliable measurement even at power factors λ < 0.01 High Bandwidth Continuity Flexible Filters High Sampling Rate U-I-Synchronicity Harmonics

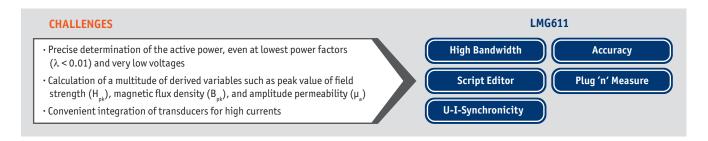
Application

Solid & laminated magnetic cores

Under the influence of changing fields, the ferromagnetic components of an electrical machine are subject to losses due to continuous remagnetization and eddy currents, which are ultimately converted into heat or vibrations. The total losses are frequency-dependent and should be minimized as far as possible, as they

have a significant effect (for example) on the range of the batteries in electric vehicles. The core power loss can be calculated directly from the excitation current of a test winding and the magnetization voltage of a sensor winding. The magnetic flux density in the core material can be derived from the rectified value

of the voltage induced in the sensor winding. The magnetic field strength is proportional to the current flowing in the test winding. While the high-frequency currents in solid cores can be measured directly, the high amp values occuring in laminated cores usually demand high-precision transducers.



Application

Batteries

With the significance of battery efficiency playing a dominant role in electrical vehicles and renewable energy systems, careful design as well as accurate monitoring of the electrical properties of a battery is crucial during their development. In addition to continuous monitoring and recording of the electrical characteristics during entire and consecutive charging/discharging cycles, the LMG611 allows for easy an integration in test benches, by

intuitive user defined control panels with the Custom Menu and direct control of the entire test bench using the Script Editor and the GPIO interface.

CHALLENGES LMG611 Highly precise DC measurement Monitoring and logging of long charge - discharge cycles Calculation of advanced parameters with custom formulas Full test bench automation LMG611 Accuracy Dynamic Range Continuity Interfaces Custom Menu Script Editor







Application

CE compliance testing for harmonics and flicker

Electrical equipment, systems and devices must satisfy the directives and ordinances of the EU on the permitted level of electromagnetic emissions and immunity to electromagnetic effects, if they are put on the market inside the European Union (EU). Two different types of grid emissions are tested: harmonics and flicker. Any electrical device with a non-linear load characteristic produces

current harmonics. Due to the impedance of the grid, these cause drops in voltage and resulting distortions. In addition, certain devices (e.g. continuous-flow heaters, heating furnaces, et cetera) control their power consumption by abruptly switching on and off, which destabilizes the voltage level due to the grid impedance. This produces fluctuations in voltage, which trigger variations in brightness in

the electric lighting ("flicker"). In combination with a suitable AC source and reference impedance, the LMG611 is the tool of choice for the qualified assessment of harmonics and flicker. The LMG Test Suite (see accessories) is providing a user-friendly software solution for this, which turns performing conformity tests for electromagnetic compatibility into child's play.

CHALLENGES LMG611 Verification of absence of distortions and voltage stability of the source Measurement of signals at significantly different levels Clearly organized management of a multitude of measured values Dynamic Range Test Suite

Application

Energy metering

The advancing proliferation of DC charging stations for electric vehicles - where the DC energy transferred needs to be accurately measured for accounting purposes - is driving the

demand for DC meters. To ensure proper verification, calibration and certification of the DC meter used (e.g. E-VDE-AR-E 2418-3-100), the LMG611 captures and synchronizes its mea-

suring cycle to the DC meter's pulse output to provide a meaningful conformity test, customizable to the requirements utilizing the in-built script editor.

CHALLENGES LMG611 - Highly precise DC energy measurement - Synchronization to the energy meter's pulse output - Customization of test settings and sequences - Provision and logging of meaningful results LMG611 A Channel A Channel Synchronization Custom Menu Script Editor Remote Control

Application

Lighting technology

In an effort to reduce energy consumption, light bulbs are being replaced with ever more efficient light sources all around the world. While on the consumer end all that is required is to insert a new product into the existing fitting, the differences on the electrical level are considerable – in contrast to convention-

al bulbs, LED lights and compact fluorescent lights ("low-energy light-bulbs") are controlled by special electronic ballasts. Some of these ballasts work with switching frequencies of up to 200 kHz and produce signal distortions at frequencies of up to 1 MHz. The manufacturers are required first and foremost to prevent

damaging circuit feedback, and secondly, to ensure optimum service life for their products. To achieve the aforementioned objectives, often a controlled warm start is performed, whose proper execution has to be verified by making appropriate measurements.

CHALLENGES Broad frequency range of the measurement, hand-in-hand with a high level of precision Verification of standby power of ballasts even for λ < 0.01 Minimal earth capacitance to avoid leakage currents during the measurement U-I-Synchronicity

Accuracy specification

LMG611-A	± (% of measured value + % of maximum peak value)													
Accuracy	DC	DC DC e)		45 Hz 65 Hz	3 kHz 10 kHz	10 kHz 50 kHz	50 kHz 100 kHz	100 kHz 500 kHz	500 kHz1 MHz	1 MHz 2 MHz	2 MHz 10 MH			
Voltage U*	0.02+0.08	0.02+0.06 e)	0.015+0.03	0.01+0.02	0.03+0.06	0.2+0.4		0.5+1.0	0.5+1.0	f/1MHz*1.5	f/1MHz*1.5+f/1MHz*1.5			
Voltage U _{SENSOR}	0.02+0.08	0.02+0.06 e)	0.015+0.03	0.01+0.02	0.03+0.06	0.2+0.4		0.4+0.8	0.4+0.8	f/1MHz*0.7	f/1 MHz*0.7 + f/1 MHz*1.5			
Current I* 5 mA5 A	0.02+0.1	0.02+0.06 e)	0.015+0.03	0.01+0.02	0.03+0.06	0.3	2+0.4	0.5+1.0	0.5+1.0	f/1 MHz*1.0 + f/1 MHz*2.0	-			
Current I* 10 A32 A	0.02+0.11)	-	0.015+0.03 ¹⁾	0.01+0.021)	0.1+0.21)	0.3+0.61)	f/100 kHz*0.8+	-f/100 kHz*1.2 ¹⁾	-	-	-			
Current I _{SENSOR}	0.02+0.08	0.02+0.06 e)	0.015+0.03	0.01+0.02	0.03+0.06	0.2+0.4		0.4+0.8	0.4+0.8	f/1MHz*0.7).7 + f/1 MHz*1.5			
Power U*/ I* 5 mA5 A	0.032+0.09	0.032+0.06 e)	0.024+0.03	0.015+0.01	0.048+0.06	0.32+0.4		0.8+1.0	0.8+1.0	f/1MHz*2.0+ f/1MHz*1.8	-			
Power U*/ I* 10 A32 A	0.032+0.092)	-	0.024+0.032)	0.015+0.012)	0.104+0.132)	0.4+0.52)	f/100 kHz*0.8+ f/100 kHz*0.8 ²⁾	f/100 kHz*1.0 + f/100 kHz*1.1 ²⁾	-	-	-			
Power U*/ I _{SENSOR}	0.032+0.08	0.032+0.06 e)	0.024+0.03	0.015+0.01	0.048+0.06	0.32+0.4		0.72+0.9	0.72+0.9	f/1MHz*1.8	f/1 MHz*1.8 + f/1 MHz*1.5			
Power U _{SENSOR} / I* 5 mA5 A	0.032+0.09	0.032+0.06 e)	0.024+0.03	0.015+0.01	0.048+0.06	0.32+0.4		0.72+0.9	0.72+0.9	f/1MHz*1.4+ f/1MHz*1.8	-			
Power U _{SENSOR} / I* 10 A32 A	0.032+0.092)	-	0.024+0.032)	0.015+0.012)	0.104+0.132)	0.4+0.52)	f/100 kHz*0.8+ f/100 kHz*0.8 ²⁾	f/100 kHz*1.0 + f/100 kHz*1.0 ²⁾	-	-	-			
Power U _{SENSOR} / I _{SENSOR}	0.032+0.08	0.032+0.06 e)	0.024+0.03	0.015+0.01	0.048+0.06	0.3	2+0.4	0.64+0.8	0.64+0.8	f/1MHz*1.1	+ f/1 MHz*1.5			
LMG611-B Accuracy	± (% of measured value + % of maximum peak value)													
	DC	DC 0,05 Hz 45		45 Hz 65 Hz		1 kHz 5 kHz 5 kHz		20 kHz	20 kHz 100 kH		100 kHz 500 kHz			
Voltage U*	0.1+0.1	0.1+0.1		0.03+	+0.03	0.2+0.2	0	.3+0.4	0.4+0.8		f/100kHz*0.8+ f/100kHz*1.2			
Current I* 5 mA5 A Current I _{SENSOR}	0.1+0.1		0.1+0.1	0.03+	+0.03	0.2+0.2	0	.3+0.4	0.4+0.8		f/100kHz*0.8+ f/100kHz*1.2			
Current I* 10 A32 A	0.1+0.1	0.1+0.11)		0.03+	0.031)	0.2+0.21)	0.	6+1.21)	1.5+1.5 ¹⁾		f/100kHz*2.0 + f/100kHz*2.0 ¹⁾			
Power U*/ I* 5 mA5 A Power U*/ I _{SENSOR}	0.16+0.:	0.16+0.1		0.05+	+0.02	0.32+0.2	0.	48+0.4	0.64+0.8	f/100kHz*1.28+ f/100kHz*1.2				
Power U*/ I* 10 A32 A	0.16+0.1	0.16+0.1²)		0.05+	0.022)	0.32+0.22)	0.3	72+0.8 ²⁾	1.52+1.15 ²⁾		f/100 kHz*2.24 + f/100 kHz*1.6 ²⁾			
LMG611-C Accuracy	± (% of measured value + % of maximum peak value)													
	1)(0,05 Hz 45 Hz 65 Hz 200 Hz	45 H7		200 Hz 500 H	Hz 500 F	Hz 1 kHz	1 kHz 2 kHz	2 kHz 10 kHz				
Voltage U*	0.1+0.1		0.02+0.05	0.02+	+0.02	0.05+0.05	0	.2+0.1	1.0+0.5		f/1 kHz*1.0 + f/1 kHz*1.0			
Current I*	0.1+0.1	i)	0.02+0.051)	0.02+	0.021)	0.05+0.051)	0.	2+0.11)	1.0+0.51)	f/1	f/1 kHz*1.0 + f/1 kHz*1.0 ¹			
Current I _{SENSOR}	0.1+0.1	0.1+0.1		.02+0.05 0.02+		0.05+0.05	0	.2+0.1	1.0+0.5	f/1	f/1kHz*1.0+ f/1kHz*1.0			
Power	0.16+0.1	0.032+0.05 ²		0.03+0.01 ²⁾		0.08+0.052)		32+0.1 ²⁾ 1.6+0.5 ²⁾		f/1 kHz*1.6 + f/1 kHz*1.0 ²⁾				
Accuracies valid for:	2. Am 3. Wai 4. The	1. Sinusoidal voltages and currents 2. Ambient temperature (23±3) °C 3. Warm-up time 1 h 4. The maximum peak value for power is the product of the maximum peak value for voltage and the maximum peak value for current.							5. $0 \le \lambda \le 1$ (power factor) 6. Current and voltage 10% 110% of nominal value 7. Adjustment carried out at 23 °C 8. Calibration interval 12 months					
Other values			All other values a	re calculated fro	om current, volta	ge and power. A	ccuracy resp. erro	r limits are derive	d according to com	text				

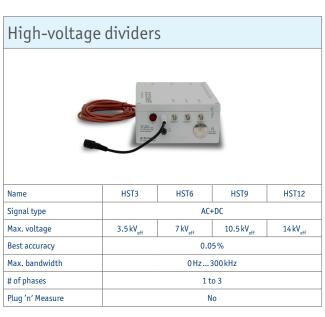
 $^{^{1)\,2)}}$ only valid in range 10 ... 32 A:

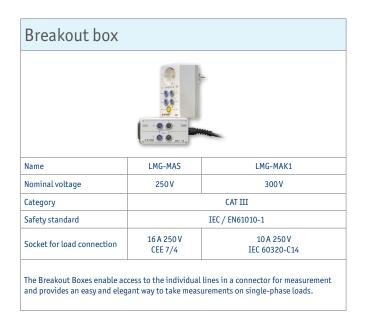
 $^{^{1)}} additional \ uncertainty \pm \frac{80 \ \mu A}{A^2} * I_{trms}^{2} \quad ^{2)} additional \ uncertainty \pm \frac{80 \ \mu A}{A^2} * I_{trms}^{2} * U_{trms}^{2}$ $^{e)} Accuracy specification \ after \ non-persistent \ zero \ adjustment, \ temperature \ change \ after \ zero \ adjustment \ max. \ \pm 1 ° C$

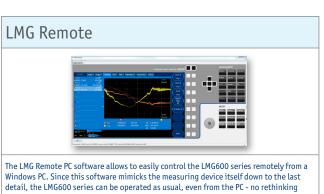
Voltage measuring ranges U*															
Nominal value (V)	3		6	12.5	25		60	130		250	400	60	0	1000	
Max. trms value (V)			6.6	13.8	27.		66	136		270	440	66		1000	
Max. peak value (V)	6	6 12		25	50		100	200		400	800			3200	
Overload protection					1000	V + 10 % co	ntinuously, 1	1500 V for 1 s	, 2500 V for	20 ms					
Input impedance							2.69 M	Ω 4pF							
Earth capacitance							< 9	0 pF							
Current measuring ranges I*															
Nominal value (A)	0.005	0.01	0.02	0.04	0.08	0.15	0.3	0.6	1.2	2.5	5	10	20	32	
Max. trms value (A)	0.0055	0.011	0.022	0.044	0.088	0.165	0.33	0.66	1.32	2.75	5.5	11	22	32	
Max. peak value (A)	0.014	0.028	0.056	0.112	0.224	0.469	0.938	1.875	3.75	7.5	15	30	60	120	
Input impedance	ca. 2.2	2Ω		ca. 600 n	ιΩ		ca. 80 mΩ			ca. 20 mΩ			ca. 10 mΩ		
Overload protection permanent (A)		LMG in operation 10 A LMG in operation 32 A													
Overload protection short-time (A)							150 A f	or 10 ms							
Earth capacitance		<90pF													
Sensor inputs U _{SENSOR} , I _{SENSOR}															
Nominal value (V)	0.03		0.06		0.12	0.25		0.5		1		2		4	
Max. trms value (V)	0.033 0.066		0.066		0.132		0.275		5 1.1			2.2	2.2		
Max. peak value (V)	0.0977 0.1953				0.3906	C	.7813	7813 1.563		3.125		6.25	6.25 12.		
Overload protection	100V continuously, 250V for 1s														
Input impedance	100 kΩ 34 pF														
Earth capacitance							< 9	0 pF							
Isolation	All current and voltage inputs are isolated against each other, against remaining electronics and against earth. Max. 1000 V / CAT III resp. 600 V / CAT III resp. 300 V / CAT IV														
Synchronization	Measurements are synchronized on the signal period. The period is determined based on "external", u(t) or i(t), in combination with configurable filters. Therefore readings are very stable, especially with PWM controlled frequency converters and amplitude modulated electronic loads.														
Scope function	Graphical dis	splay of sa	mple values	over time	in two scopes	with 8 sign	als each								
Plot function	Two time (tre	end-) diag	rams of max	k. 8 param	eters each, ma	x. resolutio	n 10 ms								
External graphics interface (L6X1-OPT-DVI)	DVI interface	e for exter	nal screen c	output											
Harmonics at device level (L6-OPT-HRM)	Harmonics and interharmonics up to 2000th order, independent and simultaneously														
CE Harmonics (L6-OPT-HRM)	According to IEC EN 61000-4-7														
Flicker (L6-0PT-FLK)	According to IEC EN 61000-4-15														
LMG Remote	LMG600 expa	ansion sof	tware, basi	c module f	or remote con	iguration a	nd operatio	n via PC							
LMG Test Suite	LMG600 expansion software, basic module for remote configuration and operation via PC LMG600 software for conformity tests according to: IEC EN 61000-3-2 & 61000-3-12 for harmonics (LMG-TEST-CE-HRM) IEC EN 61000-3-3 & 61000-3-11 for flicker (LMG-TEST-CE-FLK) IEC 62301 & EN 50564 for standby power (LMG-TEST-CE-STBY)														
Miscellaneous Touch screen Dimensions Weight Protection class Electromagnetic compatibility Temperature Climatic category Line input	7 inch display (1024x600) LMG611: Table-top version: (WxHxD) 433 mm x 177 mm x 200 mm Depending on installed options: max. 7.2 kg EN 61010 (IEC 61010, VDE 0411), protection class I / IP20 in accordance with EN 60529 EN 61326 5 40 °C (operation) / -20 50 °C (storage) Normal environmental conditions according to EN 61010 100 230 V, 47 63 Hz, max. 200 W														

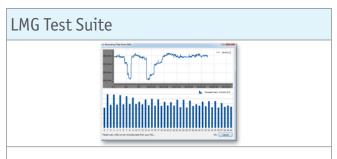
Accessories program (excerpt)

Current sensors											
Туре		R	Current	clamps	Shunt						
	Ø		DANIJENSE .	200 a rester.			0	1.00			
Name	PCT	Hallxxx-L6	DS	WCT	LMG-Z7XX	L60-Z406, L60-Z60/66	L60-Z68	LMG-SH (-P)			
Signal type		AC+DC			AC	AC	AC+DC	AC+DC			
Current ranges	2002000 A _{rms}	1002000 A _{rms}	507000 A _{rms}	100 1000 A _{rms}	750 A _{rms} 10 kA _{rm}	403 kA _{rms}	1 kA _{rms}	22mA _{rms} 1A _{rms}			
Best accuracy	0.01%	0.5%	0.01%	0.25%	0.02%	0.2%	2.0%	0.15%			
Max. bandwidth	DC1MHz	DC100 kHz	DC1MHz	30 Hz1 MHz	20 Hz 500 Hz	5 Hz50 kHz	DC2 kHz	DC 100 kHz			
Power supply by LMG611	PCT200/600/1200	Yes	No	Not	required	Y	Not required				
Plug 'n' Measure	PCT200/600/1200	Yes	No		No	Ye	No				









The tests performed by LMG Test Suite are in accordance with the currently valid edition of EN 61000-3-2/-12,EN 61000-3/-11, IEC 62301 and EN 50564. Measurements according to ECE R-10.4 Annex 11 (electromagnetic compatibility of vehicles), for example, are also possible.

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required, no familiarization time.