

LMG611

Precision Power Analyzer



Getting precise results does
not have to be complicated

Accuracy specification

A channel Accuracy	\pm (% of measured value + % of maximum peak value)													
	DC	DC ^{e)}	0.05 Hz ... 45 Hz 65 Hz ... 3 kHz	45 Hz ... 65 Hz	3 kHz ... 10 kHz	10 kHz ... 50 kHz	50 kHz ... 100 kHz	100 kHz ... 500 kHz	500 kHz ... 1 MHz	1 MHz ... 2 MHz	2 MHz ... 10 MHz			
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	$f/1\text{MHz}^*1.5 + f/1\text{MHz}^*1.5$				
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	$f/1\text{MHz}^*0.7 + f/1\text{MHz}^*1.5$				
Current I* 5 mA...5 A	0.02+0.1	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	$f/1\text{MHz}^*1.0 + f/1\text{MHz}^*2.0$				
Current I* 10 A...32 A	0.02+0.1 ^{j)}	-	0.015+0.03 ^{j)}	0.01+0.02 ^{j)}	0.1+0.2 ^{j)}	0.3+0.6 ^{j)}	$f/100\text{kHz}^*0.8 + f/100\text{kHz}^*1.2j)$		-	-	-			
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	$f/1\text{MHz}^*0.7 + f/1\text{MHz}^*1.5$				
Power U*/I* 5 mA...5 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	$f/1\text{MHz}^*2.0 + f/1\text{MHz}^*1.8$				
Power U*/I* 10 A...32 A	0.032+0.09 ^{j)}	-	0.024+0.03 ^{j)}	0.015+0.01 ^{j)}	0.104+0.13 ^{j)}	0.4+0.5 ^{j)}	$f/100\text{kHz}^*1.0 + f/100\text{kHz}^*1.1j)$		-	-	-			
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	$f/1\text{MHz}^*1.8 + f/1\text{MHz}^*1.5$				
Power U _{SENSOR} /I* 5 mA...5 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	$f/1\text{MHz}^*1.4 + f/1\text{MHz}^*1.8$				
Power U _{SENSOR} /I* 10 A...32 A	0.032+0.09 ^{j)}	-	0.024+0.03 ^{j)}	0.015+0.01 ^{j)}	0.104+0.13 ^{j)}	0.4+0.5 ^{j)}	$f/100\text{kHz}^*1.0 + f/100\text{kHz}^*1.0j)$		-	-	-			
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	0.32+0.4		0.64+0.8	0.64+0.8	$f/1\text{MHz}^*1.1 + f/1\text{MHz}^*1.5$				
B channel Accuracy	\pm (% of measured value + % of maximum peak value)													
	DC	0.05 Hz ... 45 Hz 65 Hz ... 1 kHz	45 Hz ... 65 Hz	1 kHz ... 5 kHz	5 kHz ... 20 kHz	20 kHz ... 100 kHz	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	$f/100\text{kHz}^*0.8 + f/100\text{kHz}^*1.2$							
Current I* 5 mA...5 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	$f/100\text{kHz}^*0.8 + f/100\text{kHz}^*1.2$							
Current I* 10 A...32 A	0.1+0.1 ^{j)}	0.1+0.1 ^{j)}	0.03+0.03 ^{j)}	0.2+0.2 ^{j)}	0.6+1.2 ^{j)}	1.5+1.5 ^{j)}	$f/100\text{kHz}^*2.0 + f/100\text{kHz}^*2.0j)$							
Power U*/I* 5 mA...5 A Power U*/I _{SENSOR}	0.16+0.1	0.16+0.1	0.05+0.02	0.32+0.2	0.48+0.4	0.64+0.8	$f/100\text{kHz}^*1.28 + f/100\text{kHz}^*1.2$							
Power U*/I* 10 A...32 A	0.16+0.1 ^{j)}	0.16+0.1 ^{j)}	0.05+0.02 ^{j)}	0.32+0.2 ^{j)}	0.72+0.8 ^{j)}	1.52+1.15 ^{j)}	$f/100\text{kHz}^*2.24 + f/100\text{kHz}^*1.6j)$							
C channel Accuracy	\pm (% of measured value + % of maximum peak value)													
	DC	0.05 Hz ... 45 Hz 65 Hz ... 200 Hz	45 Hz ... 65 Hz	200 Hz ... 500 Hz	500 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	$f/1\text{kHz}^*1.0 + f/1\text{kHz}^*1.0$							
Current I*	0.1+0.1 ^{j)}	0.02+0.05 ^{j)}	0.02+0.02 ^{j)}	0.05+0.05 ^{j)}	0.2+0.1 ^{j)}	1.0+0.5 ^{j)}	$f/1\text{kHz}^*1.0 + f/1\text{kHz}^*1.0j)$							
Current I _{SENSOR}	0.1+0.1	0.02+0.05	0.02+0.02	0.05+0.05	0.2+0.1	1.0+0.5	$f/1\text{kHz}^*1.0 + f/1\text{kHz}^*1.0$							
Power	0.16+0.1 ^{j)}	0.032+0.05 ^{j)}	0.03+0.01 ^{j)}	0.08+0.05 ^{j)}	0.32+0.1 ^{j)}	1.6+0.5 ^{j)}	$f/1\text{kHz}^*1.6 + f/1\text{kHz}^*1.0j)$							
Accuracies valid for:	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. $0 \leq \lambda \leq 1$ (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 are calculated from current, voltage and power. Accuracy resp. error limits are derived according to context (e.g. S = I * U, ΔS / S = ΔI / I + ΔU / U).													

¹⁾ ²⁾ ³⁾ ⁴⁾ only valid in range 10 ... 32 A:

¹⁾ additional uncertainty $\pm \frac{50\mu\text{A}}{\text{A}^2} * I_{\text{rms}}^2$ ²⁾ additional uncertainty $\pm \frac{50\mu\text{A}}{\text{A}^2} * I_{\text{rms}}^2 * U_{\text{rms}}$ ³⁾ additional uncertainty $\pm \frac{50\mu\text{A}}{\text{A}^2} * I_{\text{rms}}^2$ ⁴⁾ additional uncertainty $\pm \frac{50\mu\text{A}}{\text{A}^2} * I_{\text{rms}}^2 * U_{\text{rms}}$

^{e)} Accuracy specification after non-persistent zero adjustment, temperature change after zero adjustment max. ±1°C

Voltage measuring ranges U*																				
Nominal value (V)	3	6	12.5	25	60	130	250	400	600	1000										
Max. trms value (V)	3.3	6.6	13.8	27.5	66	136	270	440	660	1000										
Max. peak value (V)	6	12	25	50	100	200	400	800	1600	3200										
Overload protection	1000V + 10% continuously, 1500V for 1s, 2500V for 20ms																			
Input impedance	2.69 MΩ, 4 pF																			
Earth capacitance	< 90 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									
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									
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									
Input impedance	ca. 2.2 Ω		ca. 600 mΩ			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 for 10 ms																			
Earth capacitance	< 90 pF																			
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	0.132	0.275	0.55	1.1	2.2	4.4												
Max. peak value (V)	0.0977	0.1953	0.3906	0.7813	1.563	3.125	6.25	12.5												
Overload protection	100V continuously, 250V for 1s																			
Input impedance	100 kΩ, 34 pF																			
Earth capacitance	< 90 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 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 display of sample values over time in two scopes with 8 signals each																			
Plot function	Two time (trend-) diagrams of max. 8 parameters each, max. resolution 10 ms																			
External graphics interface (L6X1-OPT-DVI)	DVI interface for external screen output																			
Harmonics at device level (L6-OPT-HRM)	Harmonics and interharmonics up to 2,000th order, independent and simultaneously for each group																			
CE Harmonics (L6-OPT-HRM)	According to IEC EN 61000-4-7																			
Flicker (L6-OPT-FLK)	According to IEC EN 61000-4-15																			
LMG Remote	LMG600 expansion software, basic module for remote configuration and operation via PC																			
LMG Test Suite	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	LMG611: Table-top version: (WxHxD) 455 mm x 224 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 0 ... 40 °C (operation) / -20 ... 50 °C (storage) Normal environmental conditions according to EN 61010 100 ... 230V, 47 ... 63 Hz, max. 200 W																			

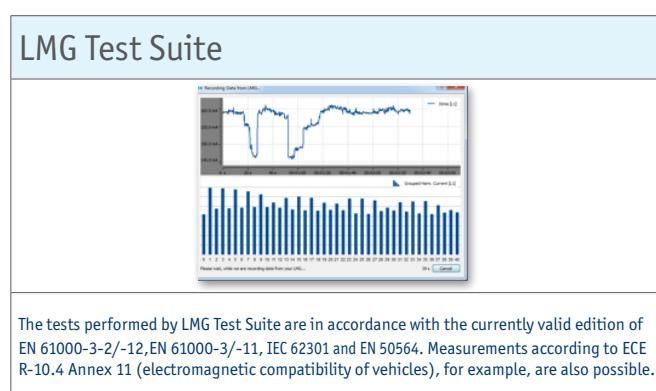
Accessories program (excerpt)

Current sensors								
Type	Ring-type transducers					Current clamps		Shunt
Name	PCT	Hallxxx-L6	DS	WCT	LMG-Z5XX	L60-Z406, L60-Z60/66	L60-Z68	LMG-SH (-P)
Signal type	AC+DC			AC		AC	AC+DC	AC+DC
Current ranges	200 ... 2000 A _{rms}	100 ... 2000 A _{rms}	50 ... 7000 A _{rms}	100 ... 1000 A _{rms}	750 A _{rms} ... 10 kA _{rms}	40 ... 3 kA _{rms}	1 kA _{rms}	22 mA _{rms} ... 1 A _{rms}
Best accuracy	0.01%	0.5%	0.01%	0.25%	0.02%	0.2%	2.0%	0.15 %
Max. bandwidth	DC ... 1 MHz	DC ... 100 kHz	DC ... 1 MHz	30 Hz ... 1 MHz	15 Hz ... 5 kHz	5 Hz ... 50 kHz	DC ... 2 kHz	DC ... 100 kHz
Power supply by LMG600	PCT200/600	Yes	No	Not required		Yes		Not required
Plug 'n' Measure	PCT200/600	Yes	No	No		Yes		No

High-voltage dividers				
Name	HST3	HST6	HST9	HST12
Signal type	AC+DC			
Max. voltage	4.2 kV _{eff}	8.4 kV _{eff}	12.6 kV _{eff}	16.8 kV _{eff}
Best accuracy	0.05%			
Max. bandwidth	0 Hz ... 300 kHz			
# of phases	1 to 3			
Plug 'n' Measure	No			

Breakout boxes				
Name	LMG-MAS	LMG-MAK1	BOB-CEE3-16	BOB-CEE3-32
Nominal voltage	250 V	250 V	230 / 400 V	
Category	CAT II		CAT II	
Safety standard	IEC / EN61010-1		IEC / EN61010-1	
Socket for load connection	16 A 250 V CEE 7/4	10 A 250 V IEC 60320-C14	16 A 400 V 3L+N+PE, 6 h IEC 60309	32 A 400 V 3L+N+PE, 6 h IEC 60309
The Breakout Boxes enable access to the individual lines in a connector for measurement, and provide an easy and elegant way to take measurements on single and three-phase consumers.				

LMG Remote	
The LMG Remote PC software allows to easily control the LMG600 remotely from a Windows PC. Since this software mimicks the measuring device itself down to the last detail, the LMG600 can be operated as usual, even from the PC - no rethinking required, no familiarization time.	



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