ZES ZIMMER

LMG670

Precision Power Analyzer

Power Analysis²

Two Bandwidths Simultaneously

Single-shot results for narrowband, broadband & harmonics measurements

Powerful

7 channels, DualPath, accuracy 0.025 %, DC – 10 MHz, excellent dynamic range µA to kA and mV to kV

Convenient

Touchscreen, 8,9“ WSVGA display (1024x600), remote control via PC, Gbit Ethernet, DVI/VGA interface

Flexible

Measuring frequency converters, e-machines, transformers, power electronics, power supplies

A New Generation of Power Analyzers

For decades, the letters “LMG“ have been synonymous with precision power analysis technology developed and manufactured by ZES ZIMMER. The LMG series has conquered a leading market position thanks to its precision and reliability. It has spread throughout the most diverse areas of the electric and electronic industry – in R&D, quality assurance and compliance test labs – and serves universities and academies to train future scientists and engineers.
With our new LMG670 we not only enable you to cope with increased requirements and latest power electronics innovations – we allow you to put yourself and your products squarely in front of the competition.
In times of beginning scarcity of conventional fuels, power analysis plays an important and growing role, especially when it comes to increasing efficiency and minimizing consumption. Wherever electrical energy is turned into motion, losses get scrutinized ever more critically. Inefficient means of speed control are replaced by variable frequency drives (VFD), and electro mobility in all its varieties is gaining momentum. ZES ZIMMER has attended to typical questions in this area und came up with a groundbreaking innovation: our DualPath architecture makes possible – for the first time in history – concurrent and precise analysis of both the torque-relevant fundamental and the full spectrum for optimization of overall efficiency.

Besides this spectacular innovation we have also implemented numerous other improvements – some obvious, some rather inconspicuous. We have been exclusively dedicated to precision power analysis and sophisticated measurements for decades and have incorporated the resulting treasure trove of experience into the design of the LMG670. It is our ambition to provide you with precise and reliable results fast so you can carry out your measurement tasks in an efficient manner!

Dipl.-Ing. Georg Zimmer and Dr. Conrad Zimmer
Managing Directors
ZES ZIMMER Electronic Systems GmbH

With the highest density of power measurement channels per chassis and an unsurpassed combination of precision and bandwidth the LMG670 is the instrument of choice for sophisticated efficiency measurements in complex electrical systems.

Technical Data (Summary)

Accuracy A1 channel	± (% of measured value + % of maximum peak value)									
	DC	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	0.015+0.03	0.01+0.02	0.03+0.06	0.2+0.4		0.5+1.0	0.5+1.0	f/1 MHz*1.5 + f/1 MHz*1.5	
Voltage U_{SENSOR}	0.02+0.08	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 MHz*0.7 + f/1 MHz*1.5	
Current I* 5 mA...5 A	0.02+0.08	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 MHz*1.0 + f/1 MHz*2.0	-
Current I* 10 A...32 A	0.02+0.08[1)]	0.015+0.03[3)]	0.01+0.02[3)]	0.1+0.2[3)]	0.3+0.6[3)]	f/100 kHz*0.8 + f/100 kHz*1.2[3)]		-	-	-
Current I_{SENSOR}	0.02+0.08	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 MHz*0.7 + f/1 MHz*1.5	
Power U*/ I* 5 mA...5 A	0.032+0.08	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 MHz*2.0 + f/1 MHz*1.8	-
Power U*/ I* 10 A...32 A	0.032+0.08[2)]	0.024+0.03[4)]	0.015+0.01[4)]	0.104+0.13[4)]	0.4+0.5[4)]	f/100 kHz*0.8 + f/100 kHz*0.8[4)]	f/100 kHz*1.0 + f/100 kHz*1.1[4)]	-	-	-
Power U*/ I_{SENSOR}	0.032+0.08	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 MHz*1.8 + f/1 MHz*1.5	
Power U_{SENSOR} / I* 5 mA...5 A	0.032+0.08	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 MHz*1.4 + f/1 MHz*1.8	-
Power U_{SENSOR} / I* 10 A...32 A	0,.032+0.08[2)]	0.024+0.03[4)]	0.015+0.01[4)]	0.104+0.13[4)]	0.4+0.5[4)]	f/100 kHz*0.8 + f/100 kHz*0.8[4)]	f/100 kHz*1.0 + f/100 kHz*1.0[4)]	-	-	-
Power U_{SENSOR} / I_{SENSOR}	0.032+0.08	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 MHz*1.1 + f/1 MHz*1.5	

Accuracy B1 channel	± (% 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	0.05+0.05	0.2+0.2	0.3+0.4	0.4+0.8	f/100 kHz*0.8 + f/100 kHz*1.2
Current I* 5 mA...5 A Current I_{SENSOR}	0.1+0.1	0,.1+0.1	0.05+0.05	0.2+0.2	0.3+0.4	0.4+0.8	f/100 kHz*0.8 + f/100 kHz*1.2
Current I* 10 A...32 A Bereich	0.1+0.1[1)]	0.1+0.1[3)]	0.05+0.05[3)]	0.2+0.2[3)]	0.6+1.2[3)]	1.5+1.5[3)]	f/100 kHz*2.0 + f/100 kHz*2.0[3)]
Power U*/ I* 5 mA...5 A Power U*/ I_{SENSOR}	0.16+0.1	0.16+0.1	0.07+0.04	0.32+0.2	0.48+0.4	0.64+0.8	f/100 kHz*1.28 + f/100 kHz*1.2
Power U*/ I* 10 A...32 A	0.16+0.1[2)]	0.16+0.1[4)]	0.07+0.04[4)]	0.32+0.2[4)]	0.72+0.8[4)]	1.52+1.15[4)]	f/100 kHz*2.24 + f/100 kHz*1.6[4)]

Accuracy C1 channel	± (% 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 kHz*1.0 + f/1 kHz*1.0
Current I*	0.1+0.1[1)]	0.02+0.05[3)]	0.02+0.02[3)]	0.05+0.05[3)]	0.2+0.1[3)]	1.0+0.5[3)]	f/1 kHz*1.0 + f/1 kHz*1.0[3)]
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 kHz*1.0 + f/1 kHz*1.0
Power	0.16+0.1[2)]	0.032+0.05[4)]	0.03+0.01[4)]	0.08+0.05[4)]	0.32+0.1[4)]	1.6+0.5[4)]	f/1 kHz*1.6 + f/1 kHz*1.0[4)]

Accuracies valid for:	1. Sinusoidal voltages and currents 2. Ambient temperature (23±3) °C 3. Warm-up time 1 h 4. The upper range value is defined by the maximum peak value. 5. The upper power range value is the product of upper voltage range value and upper current range value.	6. 0 ≤ |λ| ≤ 1 (power factor) 7. Current and voltage 10 % ... 110 % of nominal value 8. Adjustment carried out at 23 °C 9. Calibration interval 12 months
Other values	All other values are calculated from current, voltage and power. Accuracy resp. error limits are derivated according to context (e.g. $S = I * U$, $\Delta S / S = \Delta I / I + \Delta U / U$).	

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

[1)] additional uncertainty ± $\frac{50\,\mu A}{A^2} * I_{trms}^2$ [2)] additional uncertainty ± $\frac{50\,\mu A}{A^2} * I_{trms}^2 * U_{trms}$ [3)] additional uncertainty ± $\frac{30\,\mu A}{A^2} * I_{trms}^2$ [4)] additional uncertainty ± $\frac{30\,\mu A}{A^2} * I_{trms}^2 * U_{trms}$

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	1000 V + 10 % permanently, 1500 V for 1 s									
Input impedance	4.59 MΩ, 3 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	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 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	100 V permanently, 250 V for 1 s							
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 „line“, „external“, u(t) or i(t), in combination with configurable filters. Therefore very stable readings, especially with PWM controlled frequency converters and amplitude modulated electronic loads.
Scope function	Graphical display of sample values over time
Plot function	Two time (trend-) diagrams of max. 8 parameters, max. resolution 30 ms
External graphics interface (L6-OPT-DVI)	VGA/DVI interface for external screen output
Process signal interface (L6-OPT-PSI)	2 fast analog inputs (150 kS/s, 16 bit, BNC) 8 analog inputs (100 S/s, 16 bit, D-Sub:DE-09) 32 analog outputs (output per cycle, 14 bit, D-Sub: DA-15 & DB-25) 8 switching outputs (6 switches with 2 connections each and 2 switching outputs with common negative, D-Sub: DB-25) 8 switching inputs (150 kS / s, in two groups 4 inputs each with common ground, D-Sub: DB-25) Speed-/torque-/frequency inputs (150 kS/s, D-Sub: DA-15)
Star-delta conversion (L6-OPT-SDC)	Conversion of line voltages to phase voltages and computation of resulting power
Harmonics at device level (L6-OPT-HRM)	Harmonics and interharmonics up to max. 400. order (2,000. order with interharmonics)
Flicker (L6-OPT-FLK)	According to EN 61000-4-15
LMG-Control	LMG600 expansion software, basic module for remote configuration and operation via PC
TEST-CE61K	LMG600 software for conformity tests according to EN61000 for harmonics and flicker
Miscellaneous Dimensions Weight Protection class Electromagnetic compatibility Temperature Climatic category Line input	 Table-top version for 7 slots: (WxHxD) 433 mm x 177 mm x 590 mm, 19” version for 7 slots: (WxHxD) 84 HP x 4 RU x 590 mm Depending on installed options: max. 18.5 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 ... 230 V, 47 ... 63 Hz, max. 400 W

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