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PROFLINE 2100

HARMONICS & FLICKER, CONDUCTED IMMUNITY TEST SYSTEMS



Advanced Test Solutions for EMC

Cost effective, complete and compliant

- Variable output power configuration from 3 kVA to 45 kVA
(90 kVA and 145 kVA sources comprise multiple 45 kVA units)
- Easily upgradeable PC based measurement system
- Immunity test system
- Simple and easy to use control interface
- Key "Equipment Under Test" electrical parameters updated continuously
- User selectable test parameters and data display option
- Test report customisation capability

PROFLINE 2100

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PROFLINE 2100 OVERVIEW

The ProfLine 2100 system is a complete and cost effective harmonics and flicker measurement test system to the latest IEC/EN standards. The programmable power generation capability of up to 45 kVA (90 kVA and 145 kVA sources comprise multiple 45 kVA units) provides more than ample power to cater for a wide range of Equipment Under Test (EUT). In addition to harmonics and flicker testing capability the AC/DC power source used in the system is capable of testing to a wide range of power quality immunity tests. In short, this system is a one stop power quality testing station that will help you meet your EMC responsibilities for compliance testing.

Harmonics standard:

IEC 61000-3-2 < 16 A per phase
IEC 61000-3-12 > 16 to 75 A per phase

Flicker standard:

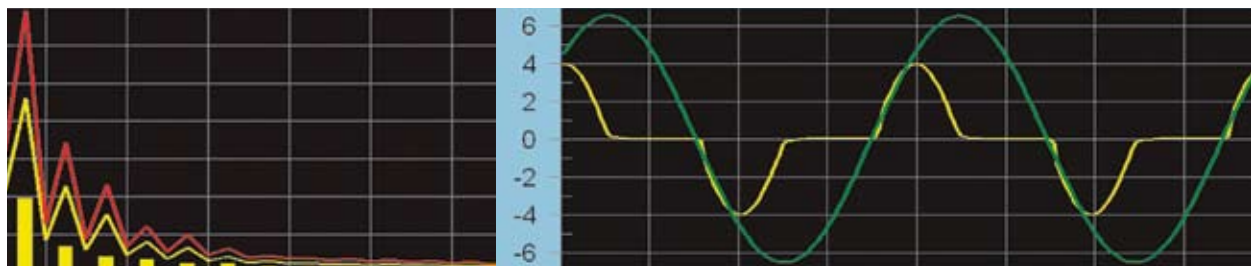
IEC 61000-3-3 < 16 A per phase
IEC 61000-3-11 < 75 A per phase

Voltage Dip, interruption & variation:

IEC 61000-4-11 < 16 A per phase
IEC 61000-4-34 > 16 A per phase

Other immunity tests:

IEC 61000-4-8 Power line magnetic field
IEC 61000-4-13 Immunity to harmonics & inter-harmonics
IEC 61000-4-14 Repetitive voltage variations
IEC 61000-4-17 Ripple on DC input power ports
IEC 61000-4-27 Voltage & Phase unbalance immunity
IEC 61000-4-28 Frequency variations
IEC 61000-4-29 DC dips, variation and short interruption



ALL THE POWER LEVELS YOU NEED

Designed and widely used for compliance testing of equipment up to 45 kVA (90 kVA and 145 kVA sources comprise multiple 45 kVA units), Teseq's ProfLine 2100 system is ideal for:

- Test houses requiring high precision tools for compliance and pre-compliance testing
- Manufacturers requiring AC & DC test tools for both in-house/self certification and product development
- Rental companies requiring precise, reliable, portable harmonics & flicker systems for on-site customer testing

ProfLine 2100: highly modular compliance test power capability

- Programmable IEC compliant AC power sources accommodate wide range of 1- and 3-phase power levels
- Ultra-fast digital power analyzer provides high resolution acquisition for accurate measurement
- IEC 60725-compliant reference impedance ensures accurate flicker measurement
- All electrical data is stored for complete evaluation and test replay analysis
- Windows-based operation speeds set-up, analysis, display and reporting
- Continuous pass/fail status monitoring





It is no longer necessary to invest in more test equipment than you need. Teseq's ProfLine 2100 system offers extensive programmable power solutions from 3 kVA to 45 kVA (90 kVA and 145 kVA sources comprise multiple 45 kVA units) or higher if needed.

The high repetitive peak current. AC power source is designed for demanding non-linear load applications such as white goods, air-conditioners and other products with inductive or capacitive loads. The 45 kVA (90 kVA and 145 kVA sources comprise multiple 45 kVA units) source is specially designed with regenerative load withstand capability. It can handle power generated back to the source which is common in AC motor and motor control applications.

3 kVA test system. Ideal for manufacturer not requiring the full 16 amps of the standard requirements.

5 kVA to 15 kVA test systems. Cater for manufacturers, test houses and rental companies requiring the full 16 amp range.

1- and 3-phase configuration up to 45 kVA. This power house is ideal for the manufacturer and test houses that require the full range of low and high current testing such as required for compressors, air conditioners and machine tools.



Fully featured 3x5 kVA harmonics and flicker system including 3 phase power quality testing

- AC switch for compliant IEC 61000-4-11 testing
- DC to 500 Hz fundamental frequency
- Low output impedance
- Supports power magnetics applications
- IEC 61000-4-13 testing

HIGH ACCURACY MEASUREMENT VERIFIED

At the heart of the ProfLine 2100 system is a fully compliant harmonics analyzer and flickermeter. DSP-based 1 M sample per second, no-gap/no overlap 200 mS data acquisition and powerful FFT analysis ensures full compliance harmonics testing based on IEC 61000-4-7. Direct PC bus access ensures higher data throughput than is found on most single box IEEE-488-based test system. Streaming real-time data display and storage allows measured data to be replayed and analyzed in complete confidence, speeding up fault detection.

All EUT electrical parameters are monitored and stored continuously. Distortion, current harmonics and power consumption are checked against relevant IEC class test limits for pass/fail detection and dynamic class C and D test limit calculation.

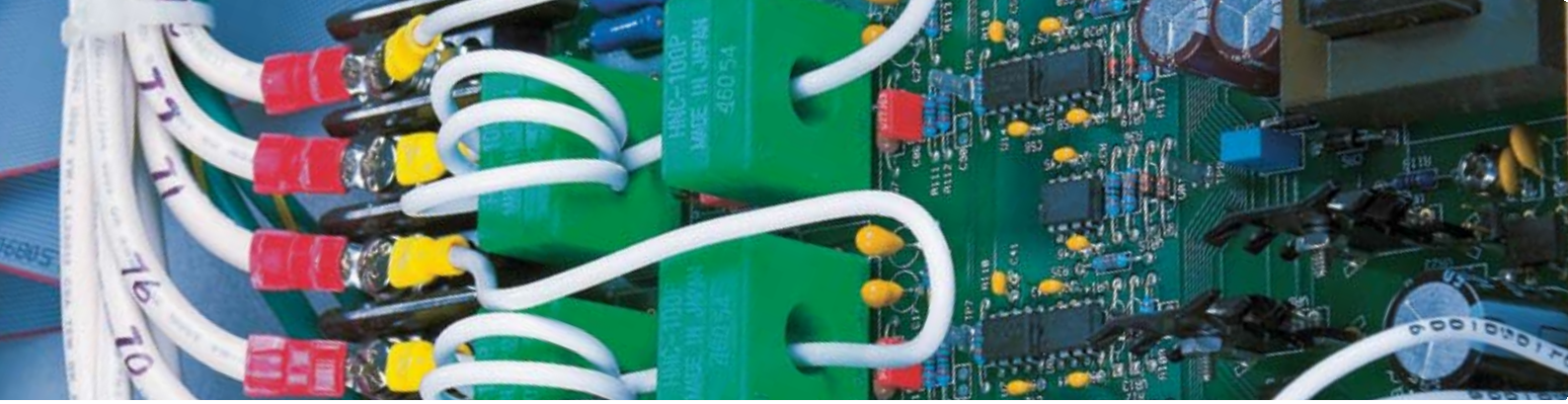
Independent verification has confirmed the following is correctly implemented:

- Measurement accuracy for electrical parameters such as voltage, current, harmonics and flickermeter is as per IEC requirement
- Software applies relaxation as and when the situation warrants it for pass/fail decision
- Compliance to all test equipment requirements as per IEC 61000-4-7 and IEC 61000-4-15

A true measure of class. The unique concept for the ProfLine 2100 system measurement section is a cutting edge PC based analyzer. The measurement section is split into two parts, one being the advanced coupling unit CCN 1000 whilst the PC provides the digitization of the analogue signals, data processing and analysis. This approach has been extremely successful in keeping up with changes to the standards that demanded major increase in data processing and analysis capability.

CCN 1000. This advanced coupling unit provides quick and easy single cable connection between the AC power source output and the EUT, plus the required isolation and signal conditioning. Precision, no-burden, active hall-effect current transformers ensure accurate current sensing over 4 A, 16 A and 40 A ranges simultaneously with 200 A peak capability for maximum resolution.





Data Acquisition Unit Input Channels

Selectable	
1 Phase	4 (3 x current 10, 40, 200 Apk, 1 x voltage)
3 Phase	12 (3 x current, 1 x voltage per phase)
Sampling rates	>200 kHz (4000 times fundamental) per phase
Filtered Sampling Rate	>30 kHz per channel
A/D converter	16 Bit, 250 ks/s (1 phase)
	16 Bit, 1.25 Ms/s (3 phase)

All harmonics tests can be accessed from the ProfLine 2100's single control and data display window on the PC. With a few mouse clicks the test can be set up and run quickly and easily.

The operator is presented with a simple screen that shows the type of test to be run and the test duration, with clearly labelled buttons for the test to start or stop. Voltage and current time domain waveform displays are updated in real time during the test. All power analyzer parameters such as V_{rms} , I_{rms} , $I_{fundamental}$, I_{peak} , crest factor, real power, apparent power and power factor are clearly displayed throughout the test and updated in real time.

The harmonics window displays instantaneous current harmonics and a line marking the applicable test limits. AC source voltage and EUT power are also monitored continuously throughout the entire test. Voltage distortion and current harmonics are checked against the IEC class limits for preliminary pass/fail detection. The continuous monitoring of EUT power consumption allows class C and D limits to be calculated dynamically.

Harmonics analysis is implemented using the high performance DSP based plug-in A/D card connected directly to the CCN 1000 signal conditioning unit through a shielded cable. Each Power phase has four dedicated measurement channels- a total of 12 in 3-phase systems – ensuring accurate full compliance to the harmonics standard.

The software will also automatically apply any relaxation of limits (e.g. POHC) should the situation warrant it and will indicate this in the test report.



HARMONICS TEST SOFTWARE WIN 2100

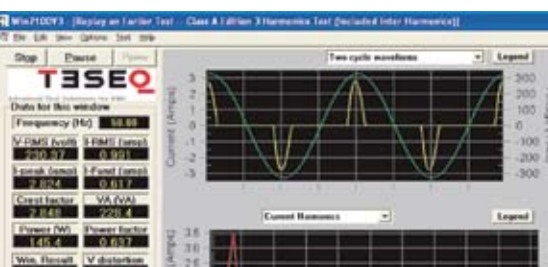


All IEC harmonics tests can be accessed from ProfLine 2100's single control and data display window on the PC. Steady state harmonic, transitory harmonic and inter-harmonic tests can be set up and run quickly and easily.

- Simple buttons start and stop automated test
- Key EUT electrical parameters updated continuously
- User selectable test limits
- Test progress clearly indicated, with preliminary pass/fail indication throughout
- AC voltage distortion continuously monitored
- Complete test documentation including Word™ and Excel™ compatible data files
- Voltage and current waveform shown together in real time
- User-selectable real time display of individual current harmonics
- EUT description and operator identification can be added to the test report
- User selectable measurement of inter-harmonics per IEC 61000-4-7

Harmonics Analysis

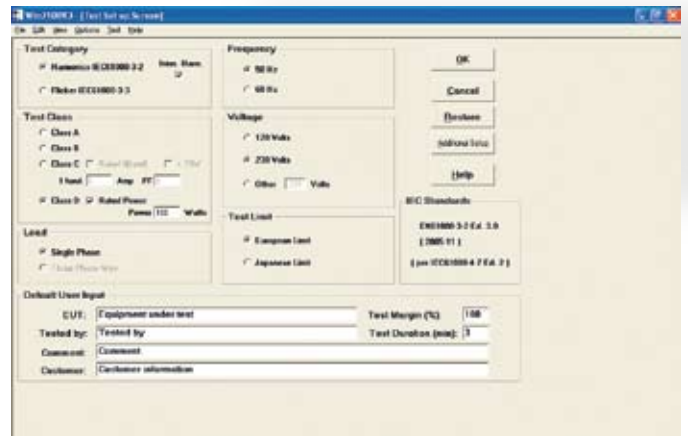
Range	Fundamental to 40th harmonic
Accuracy	
Fundamental	±0.05% FS ±0.05% / kHz
Harmonics	±0.1% ±0.1% / kHz
Measurement window	Real time FFT of 200 msec
Smoothing	1.5 sec



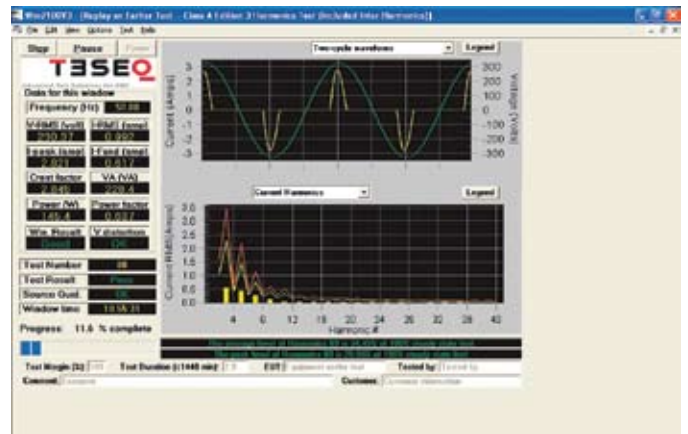
Seven simple steps to configure a harmonic test, configuration can be saved for single step test start.

Parameters required:

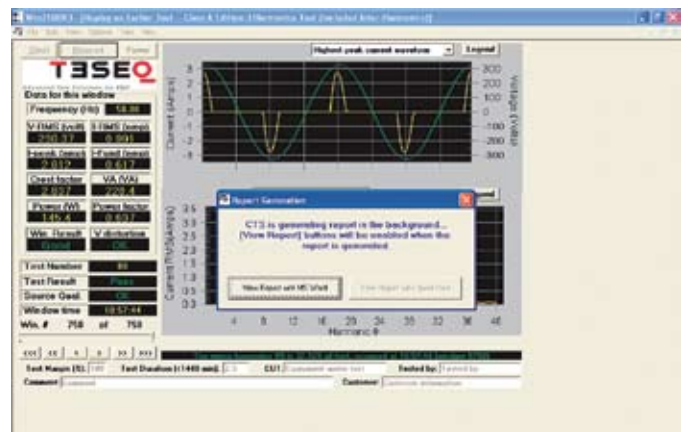
- 1 Select harmonic test
- 2 Select class A, B, C, D
- 3 Select frequency 50/60 Hz
- 4 Select test voltage
- 5 Select limit, European or Japanese
- 6 Select single or three phase
- 7 Select test duration



All test parameters are displayed in real time, including harmonic spectrum viewed against limit, test progress, voltage and current waveforms.



Report can be viewed in Word™ format using inbuilt standard template. Data files can be viewed with Excel™.

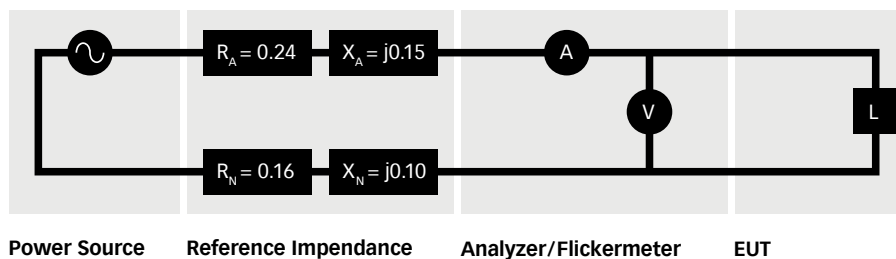


FLICKER TEST MADE EASY

Flicker tests are run from the same user interface as the harmonics module, making it familiar to the user. Set up is minimal and tests run can be started quickly.

During each test run two graphical windows are displayed and updated continuously. One window will display the V_{rms} whilst the other can be user selected to display absolute voltage deviation or percentage, d_t , d_{max} , d_c , instantaneous Pst or Plt against their respective limits. At the end of the test sequence, both short-term flicker (Pst) and long-term (Plt) are calculated and a clear pass/fail indication is provided.

Embedded in the ProfLine 2100 software is an IEC 61000-4-15 compliant single/three-channel flickermeter for 1- and 3-phase application. Single phase output configuration can use both the programmable and real IEC 60725-compliant output impedance to perform flicker measurement. Lumped reference impedance for 1- and 3-phase system impedances with varying current carrying capacity are available as an option.



Flicker Test Software

- Start and stop flicker tests with a single mouse click
- Test progress clearly indicated with pass/fail indication throughout
- Peak values displayed and updated in real time
- User-selectable test time
- User selectable parameters and data display option
- Customizable test limits for pre-compliance application
- Real time display of V_{rms} and one user selectable parameter
- EUT description and operator identification can be entered for inclusion in the test report
- 24 d_{max} and inrush current test



Flicker Analysis

P_{st}	
Range	0.4 – 5 Pst
Accuracy	3%
Resolution	0.01
Integration time	10 mins
Other Ranges	
Plt	0.4 – 5
dmax	0.1 – 100%
dc	0.1 – 100%
dt	0.1 – 100%
dt over 3.3%	10 – 5000 ms

Reference impedance. For single phase systems the impedance is programmed into the source, therefore no physical impedance is required thus making the system more simple and lower costs. This approach is not possible in the three phase systems as it is not possible to separate the line and neutral impedances. Therefore the appropriate three phase impedance unit is supplied as part of the system.

Test Reports and Data Logging. Reports can be printed at the end of each test report or retrospectively to support CE approval or for inclusion in a Technical Report File. The results file includes voltage and current waveform graphs, current harmonics spectrum and class limits and a complete flicker test analysis. The graph can be printed or stored in ASCII format on disc along with timing waveform data for use in detailed reporting or for further analysis using applications such as Excel.



AC SWITCHING UNIT

NSG 2200 AC Switch unit for complaint -4-11 and -4-34 testing. Available as either single or three phase, these units use solid state IGBTs to rapidly switch between two sources of AC supply. Typically this will be between the mains supply and a programmable AC source. The AC source will be set at the lower voltage required for the test with the mains supplying the higher.

Controlled by Teseq WIN 2120 software and able to switch within the required 5 μ s this device enables the standard to be fully met. Since the higher voltage level is supplied by the users mains system, the inrush current is limited only by the mains supply and not by the equipment. The NSG 2200 is able to handle 50 amps rms current continuously and up to 500 amps inrush current.

AC Switch

	NSG 2200-1	NSG 2200-3
Maximum current	50 A _{rms}	50 A _{rms} / phase
Peak inrush current	500 A	500 A / phase
Voltage rise/fall	1 μ sec to 5 μ sec	
Dropout time	500 μ sec to 5 seconds	



- AC fast switching unit for standards specified in the IEC 61000-4-11
- Unit has two inputs, AC source and AC Mains
- Allows for single- or three-phase mode testing

MAGNETIC FIELD IMMUNITY TEST COILS

Magnetic field immunity testing. The power sources in the ProfLine 2100 systems make an ideal source for mains frequency magnetic field testing. Used in conjunction with the Teseq INA 2170 test coil and interface unit the supplies can be controlled by the WIN 2120 software to generate the required fields and frequencies.

Use of the clean sinusoidal programmable supply ensures that tests can be performed with either 50 Hz or 60 Hz for different regions. Both the continuous and short duration tests can be easily programmed at levels up to 100 A/m continuous and 300 A/m short duration depending on the selection of source.

Magnetic coils

INA 2170

Standard square 1 metre by 1 metre coil, including calibration certificate, cable and interface unit.
Maximum field: 300 A / metre for 3 seconds,
100 A / metre continuous

Note: maximum and continuous coil field strengths can only be achieved using the correctly specified NSG 1007 AC/DC Power Source. INA 2170 coils can also be used for IEC 61000-4-9 testing in conjunction with Teseq's NSG 3060 generators.



- IEC 61000-4-8 power frequency field
- Automated test software
- Adjustable single loop antenna in 3 positions

PROFLINE 2100: MORE THAN JUST HARMONICS & FLICKER

ProfLine 2100 has the hardware and software flexibility to test to beyond harmonics and flicker emission. The fully programmable AC power source with arbitrary waveform generation capability can be used in standalone mode in various applications for IEC 61000-4-X testing at pre or full-compliance. The ProfLine system has built in IEC 61000-4-13 immunity testing to harmonics and inter-harmonics standard which sets this system apart as a fully equipped test station for power quality.

IEC 61000-4-8: Power frequency magnetic field immunity. Using the power source built into the ProfLine 2100 system the frequency and test level can be accurately controlled. This is ideal if your target market uses a different mains system to your local supply.

Loop antenna, interface unit and control software (WIN 2120) are available as options.

IEC 61000-4-11: AC Voltage dips, short interruptions and variations. The 1–5 μ s rise and fall time and the 500 amp inrush current requirements of the standard for voltage dips and interruptions mean that a power source alone cannot meet the standard.

The NSG 2200 AC switch can switch between a power source and the mains supply within the required time enabling the user to meet both requirements.

IEC 61000-4-13: Immunity to harmonics and inter-harmonics. ProfLine 2100's built in sweep generator provides full compliance testing to IEC 61000-4-13. Simple pre-programmed test levels at various test classes makes testing simple. At a click of the start button the two digitally controlled generators superimpose harmonics and inter-harmonics up to the 40th harmonics order (2 kHz for 50 Hz and 2.4 kHz for 60 Hz). The programmable AC power source generates combination waveforms better known as the flat top, overswing and meier curve, tests individual harmonics, and does a sweep to check for resonance points. The user can then go back to those resonance frequencies and test again. The operator can record any unusual behaviour at the observation section which will be included in the report. Pass/fail decision will be determined by the user based on the evaluation of the EUT during the test.





IEC 61000-4-14: Voltage Fluctuation. A simple screen allows the operator to select the level of severity of test to be run and the desired nominal test voltage and frequency. All voltage fluctuation test parameters can be customized by the user as required, ensuring the ProfLine 2100 fully meets the standard. During testing, the EUT load current is measured continuously to help the operator observe and diagnose potential unit failures.

IEC 61000-4-17: Ripple on DC input power ports. The test sequence implemented by this test consists of the application of an AC ripple of specified peak to peak value as a percentage of the DC voltage and at a frequency determined as a multiple of the AC Line frequency. The ripple waveform consists of a sinusoidal linear waveshape. The user selectable severity levels can easily meet the multiple of the power frequency of 1, 2, 3, 6 and at the user specified level up to a staggering 20 times the power frequency at 25% Vdc-peak-peak.

IEC 61000-4-27: Voltage and phase unbalance. This test is only for three-phase systems as it involves voltage and phase unbalance between phases of a three phase supply network. Voltage unbalances are applied at different levels depending on product categories. The user must determine the product class and select the appropriate test level. During the test run, voltage and phase changes are applied. The voltage levels and phase shifts are determined by the values set in the data entry grid. Predefined test level are also provided to help the operator with the settings.

Note: The ProfLine 2100 does not fully meet the IEC 61000-4-27 in respect of this particular test, 1–5 μ s rise fall rate not achievable and maximum output voltage is 300 V. So whilst it can meet the 110% of U_{nom} required by the product standards (110% of 230 V is 253 V) it does not reach the 150% of U_{nom} mentioned in the equipment standard (150% of 230 V is 345 V). 45 kVA units have a 400 Volt option.



IEC 61000-4-28: Frequency variation. The system provides an open field for the operator to enter the amount of frequency variation or simply load and amend the predefined tests level provided. Test parameters for the duration and frequency deviation can be easily customized, enabling ProfLine 2100 to meet this standard should there be changes to it in the future.

IEC 61000-4-29: DC dips, variations and short interruptions. Pre-compliance test for DC voltage dips can be set up quickly using the software. The test sequence implemented by this test consists of a series of DC voltage dips (to less than DC nominal) or interruptions (dip to 0 V). It is also possible to select voltage variations which cause the DC voltage to change at a programmed rate to a specified level and then return at the same or a different rate to the nominal DC level. These dips and variations can be applied at different levels and durations for different product categories. The user must determine the product class and select the appropriate test file. The selected levels and durations are visible on screen and can be edited and saved to a new setup file if needed. This allows a library of test files for specific product categories to be created. According to the standard, the use of a test generator with higher or lower voltage or current capability is allowed provided that the other specifications are preserved. The test generator steady state power/current capability shall be at least 20% greater than the EUT power/current ratings.

This means that for many EUT's a 25 A capable generator is not needed. However, since the rise and fall time requirements may not be met under all circumstances, this is a pre-compliance test only.

IEC 61000-4-34: AC Voltage dips, short interruptions and variations. Similar to IEC 61000-4-11 but applying to equipment requiring greater than 16 amps per phase, this standard can be met by the higher power models in the range. Teseq is ready to advise you on the ideal configuration and to discuss the limitations on the maximum current due to the selection of the various units in the system.

SYSTEM SELECTION CHART

	Total Power [kVA]	Output Phases	Maximum Output current per phase*		IEC 61000-3-2	IEC 61000-3-3	IEC 61000-3-11	IEC 61000-3-12	IEC 61000-4-8	IEC 61000-4-11	IEC 61000-4-13	IEC 61000-4-14	IEC 61000-4-17	IEC 61000-4-27	IEC 61000-4-28	IEC 61000-4-29	IEC 61000-4-34
			Low Voltage Range [A]	High Voltage Range [A]													
ProfLine 2103-240	3	1	22	11	■	■			■ ⁴	■ ⁶	■	■	■		■	■ ⁷	
ProfLine 2105-208	5	1	37	18.5	■	■			■ ⁵	■ ⁶	■	■	■		■	■ ⁷	
ProfLine 2105-400	5	1	37	18.5	■	■			■ ⁵	■ ⁶	■	■	■		■	■ ⁷	
ProfLine 2115-208	15	3	37	18.5	■	■			■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	
ProfLine 2115-400	15	3	37	18.5	■	■			■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	
ProfLine 2130-208	30	3	37	37	■	■	■ ²	■ ²	■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	■ ⁸
ProfLine 2130-400	30	3	37	37	■	■	■ ²	■ ²	■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	■ ⁸
ProfLine 2145-208	45	3	75	62	■ ¹	■ ¹	■ ³	■ ³	■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	■ ⁹
ProfLine 2145-400	45	3	75	62	■ ¹	■ ¹	■ ³	■ ³	■ ⁵	■ ⁶	■	■	■	■ ⁷	■	■ ⁷	■ ⁹

* Figures quoted are the maximum current available from the system. The current limit is in some cases due to the source and in some cases due to other equipment in the system. For information on the maximum power available from the sources please contact your local Teseq office.

- ¹ Requires option 2/3
- ² Current limited by source to 37 amps at 230 volts
- ³ Current limited by source to 62 amps at 230 volts
- ⁴ Requires option 8 (100 A/m continuous field)
- ⁵ Requires option 8 (100 A/m continuous field and 300 a/m for 3 seconds)
- ⁶ Requires option 11
- ⁷ Pre-Compliance only, generator is not fully compliant with all aspects of the standard
- ⁸ 16 to 37 amps at 230 volts
- ⁹ 16 to 62 amps at 230 volts

PL 2103/PL 2105



PL 2115 plus
Option 11-3



CALIBRATION SERVICES

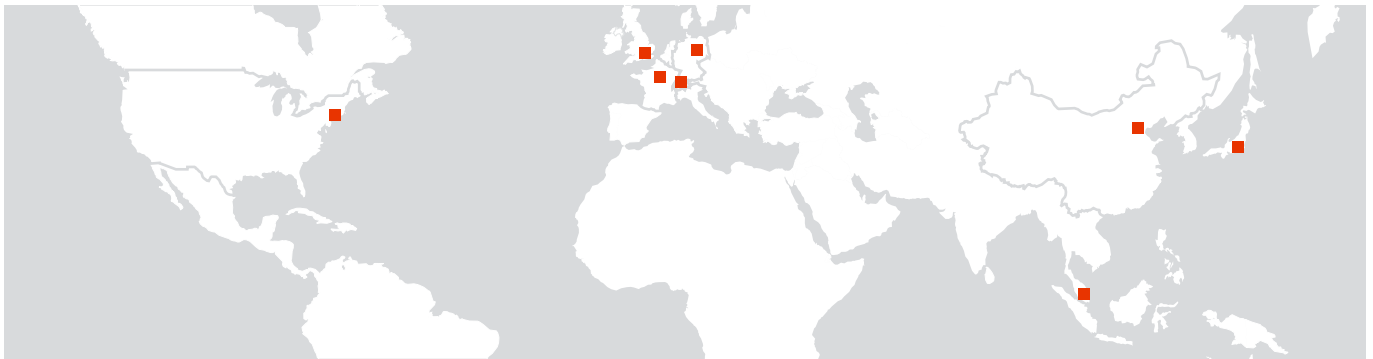
Teseq UK calibration and repair laboratory has developed to its capabilities to provide users with a comprehensive service to both maintain and calibrate the products supplied by Teseq. The capability to calibrate the ProfLine 2100 harmonics and flicker systems has grown and continues to expand. Many standards can now be met either traceable or UKAS accredited many of which can be completed on the customer's site depending on location. As an ongoing process further accreditations are being sought, the table below shows the position at the time of publication, please contact your local Teseq office for the latest information or check our web site at www.teseq.com.

Standard	Description	Laboratory UKAS	Laboratory (Traceable)	On-Site UKAS	On-Site (Traceable)
IEC 61000-4-7	Harmonics instrumentation	■	■	■	■
IEC 61000-3-2	Harmonics	■	■	■	■
IEC 61000-3-3	Flicker	■	■	■	■
IEC 61000-3-11	Flicker				
IEC 61000-3-12	Harmonics				
IEC 61000-4-8	Power Frequency Magnetics		■		■
IEC 61000-4-9	Pulsed Magnetics	■	■	■	■
IEC 61000-4-11	Voltage dips, interrupts and variations on AC supply	■	■	■	■
IEC 61000-4-12	Ringwaves	■	■	■	■
IEC 61000-4-13	Immunity to harmonics		■		■
IEC 61000-4-14	Voltage fluctuation	■	■	■	■
IEC 61000-4-15	Flicker meter calibration		■		■
IEC 61000-4-17	Ripple on DC				
IEC 61000-4-27	Voltage and phase imbalance				
IEC 61000-4-28	Variation of power frequency				
IEC 61000-4-29	Voltage dips, interrupts and variations on DC supply	■	■	■	■
IEC 61000-4-34	Voltage dips, interrupts and variations on AC supply >16 amps	■	■	■	■

EMC INSTRUMENTATION AND SYSTEMS TO SUIT ANY BUDGET.

Teseq offers the world's most comprehensive range of EMC systems for immunity and emission testing. We boast a world class research and development program, backed by state-of-the-art global manufacturing. Our membership in the relevant international committees demonstrates our commitment to the industry. Our network of agents and distributors offers market leading EMC expertise tailored to local needs in more than 30 different countries.

Our unique modular approach to EMC is focused on our customers' business needs. By breaking down the barriers between traditionally separate test functions Teseq helps to optimize test processes and to bring products to market quicker.



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