AC Digital Signal Generator Model DSG-8

Measure Up
WITH AEMC INSTRUMENTS®

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

Thank you for purchasing the **AC Digital Signal Generator Model DSG-8.**

For best results from your simulator:
- **Read** these operating instructions carefully
- **Comply** with the precautions for use

⚠	WARNING, risk of DANGER! The operator must refer to these instructions whenever this danger symbol appears.
⚡	WARNING, risk of electric shock. The voltage applied to parts marked with this symbol may be hazardous.
▫	Equipment protected by double insulation.
⏚	Earth.
▭	Battery.
♲	The product is recyclable in accordance with standard ISO14040.
ⓘ	Information or useful tip.
	This instrument exceeds regulatory requirements with respect to recycling and reuse.
♻	
CE	Indicates conformity with European directives, in particular LVD and EMC.
🗑	Indicates that, in the European Union, the instrument must undergo selective disposal in compliance with Directive WEEE 2002/96/EC. This instrument must not be treated as household waste.

Definition of measurement categories:
- **CAT IV** corresponds to measurements taken at the source of low-voltage installations.
  Example: power feeders and protection devices.

- **CAT III** corresponds to measurements on building installations.
  Example: distribution panel, circuit-breakers, machines or fixed industrial devices.

- **CAT II** corresponds to measurements taken on circuits directly connected to low-voltage installations.
  Example: power supply to electro-domestic devices and portable tools.

PRECAUTIONS FOR USE

Failure to observe the following safety instructions may result in electric shock, fire, explosion, and damage to the DSG-8 and installation.

- Carefully read and understand all precautions for use.

- Be aware of all electrical hazards when using this instrument.

- Using this instrument other than as specified may compromise its user protection features.

- The safety of any system in which this instrument is incorporated is the responsibility of the integrator of the system.

- Do not use the instrument if it appears damaged, incomplete, or poorly closed.

- Before each use, check the condition of the insulation on the leads, housing, and accessories. Any part on which the insulation is deteriorated (even partially) must be set aside for repair or scrapping.

- Using the instrument without its battery compartment cover may result in electric shock to the user.

- Before using your instrument, ensure it is completely dry.

- When handling the leads, keep your fingers behind the physical guards.

- Before removing the battery compartment cover, ensure all measurement leads and accessories are disconnected. Replace all batteries at once.

- Use personal protection equipment where appropriate.

- All troubleshooting must be done by competent, accredited personnel.

Contents

1. INTRODUCTION

1.1 Receiving Your Shipment

Upon receiving your product package, ensure the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, providing a detailed description. Save the damaged packing container to substantiate your claim.

Ordering Information:

AC Digital Signal Generator Model DSG-8……………………………………………………………………………….#6000.09

AC Digital Signal Generator Model DSG-8

USB Thumb Drive with
Simulator Software and User Manual

(Not shown)
C-cell alkaline batteries (3)
Type A to Type B USB cable (#2140.46)

*Cat. #2140.46 Discontinued - Replacement part
is Cat. #2136.80 Cable - 10 ft USB Type A to Type B*

1.2 Description

The AC Digital Signal Generator Model DSG-8 simulates waveforms for AEMC PowerPad, PowerPad III, and PEL series instruments. The DSG-8 can create simulations for any AC distribution system supported by these instruments, including capturing transients, inrush, and alarm events.

The simulator ships with seven preset simulations. These can be modified through the Simulator Software that comes with the product. You can also create, save, and load new waveform simulations with the Simulator Software (see §2). Presets can be selected from either a computer running the Simulator Software or through the DSG-8 front panel. In addition, custom simulations can be configured via the Simulator Software.

The DSG-8 is powered by USB or three C-cell alkaline batteries.

1.3 Front Panel
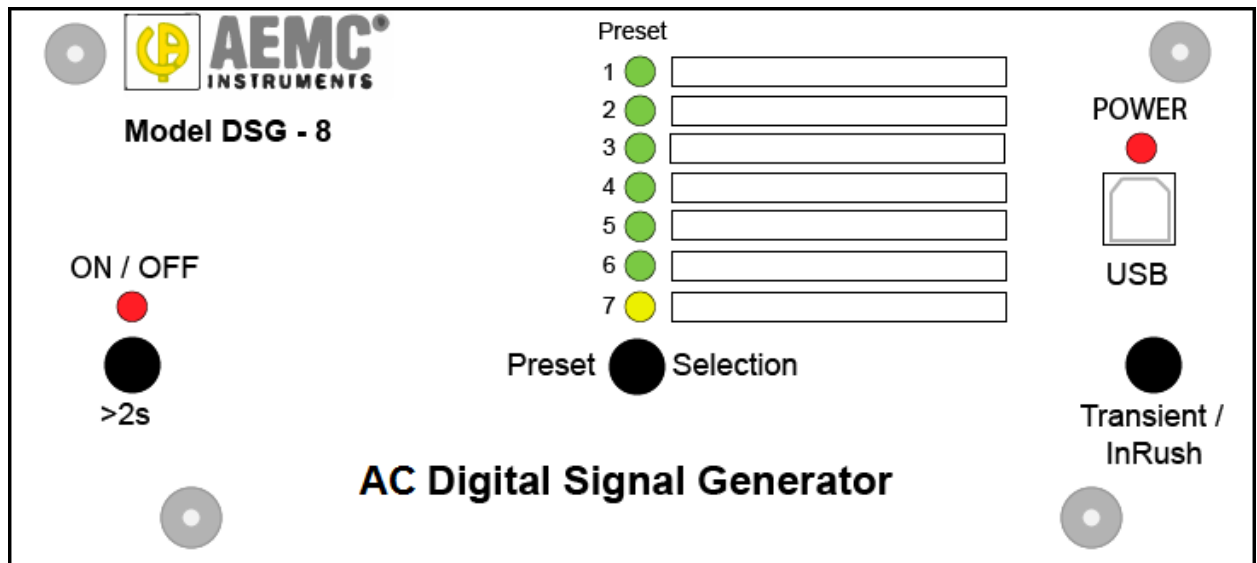
- **Preset** indicators identify which preset configuration (if any) is currently selected. The first six LEDs are green when selected. The seventh (used for inrush simulations) is yellow. To the right of the indicators are spaces onto which you can place labels (supplied with the product package) to identify each preset.

- **Preset Selection** button changes the preset. Holding the button down cycles through the seven preset options.

- **POWER** indicator glows red when the DSG-8 is running on USB power.

- **USB** Type B connection for connecting the simulator to a computer via a USB cable. The connection can also be used to power the simulator from the computer or another USB power source.

- **Transient/InRush** button simulates a transient (when preset 1 through 6 or a user-created simulation is selected) or inrush (when preset 7 is selected) on the connected instrument. The transient will run for as long as this button is pressed; the inrush will run for the duration of its preconfigured setting.

- **ON/OFF** button when pressed for longer than two seconds powers the simulator ON and OFF. The associated LED glows steady red when power is ON, and blinks when battery power is low (3.7V or below). When running on battery power, the DSG-8 automatically turns OFF after 2 hours without user activity.

1.4 Output Leads

The DSG-8 includes four current and five voltage 18" (45.7cm) captive output leads. Current outputs attach to the power instrument via AEMC/C.A-style connectors. Probe outputs are configured as SR193 probes. Each lead is labeled to indicate the instrument terminal to which it should be connected.

2. SIMULATOR SOFTWARE

The Simulator Software is used for setting up and running the DSG-8. The software enables you to:

- Connect to the DSG-8
- Manipulate the waveform by adding harmonics to any of the individual channels
- Define the amplitude of a waveform
- Set a secondary waveform for simulating a transient event
- Modify preset waveforms
- Create and save new waveforms
- Start a simulation

The Simulator Software allows you to create waveforms for many types of AC distributions systems. With both the Simulator Software and DataView running on your computer, you can configure and start a simulation, and then view real-time data from the instrument to see the results of the simulation.

Although it is possible to operate the DSG-8 from the simulator's front panel; the Simulator Software provides additional features, shown in the following table:

	Simulator Software	Front Panel
Presets	• Modify and save preset settings, including Normal and Transient/InRush waveforms. • Run a simulation with no preset selected.	• Use predefined presets. • Must have a preset selected.
Transients/Trigger	• Set duration with single-cycle accuracy. • Add a single-cycle subcycle transient.	Duration defined by how long the Transient/InRush button is pressed.
Frequency	Set specific frequency.	Use predefined frequency.
Save/Load	Save a modified preset to the computer, or load a previously saved preset.	N/A

In addition, the Simulator Software displays a graphic representation of the waveform as defined by the currently specified settings.

2.1 Installing the Simulator Software

The Simulator Software comes on the USB thumb drive that ships with the DSG-8. To load and run the software:

1. Insert the thumb drive in an available USB drive on your computer.

2. Open the Windows directory and go to the USB drive folder.

3. Locate the file setup.exe and click it. This opens the Simulator Software Installation Setup screen.
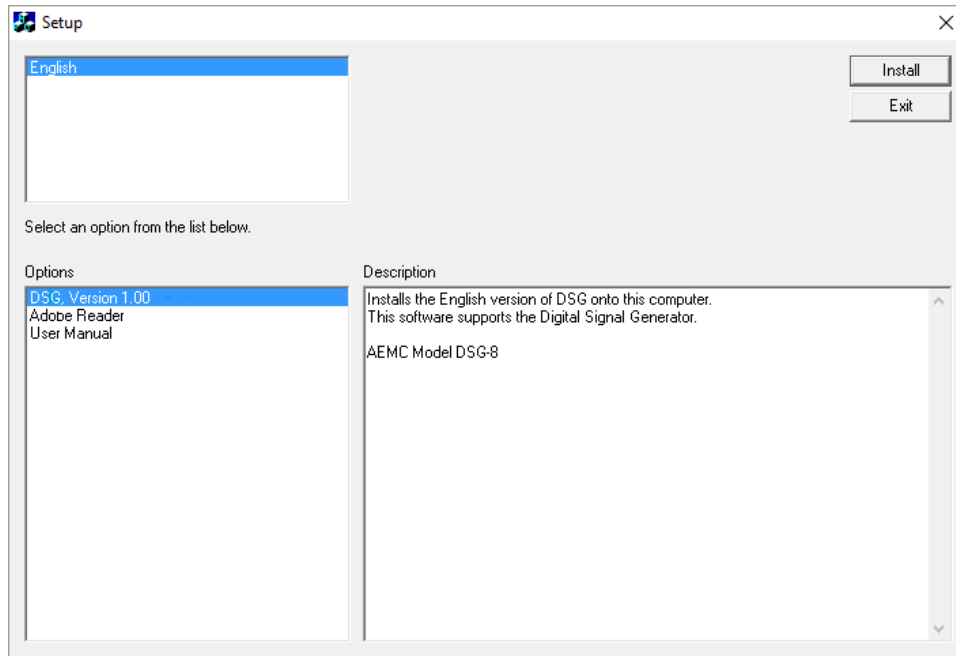
4. Select the language for the Simulator Software interface.

5. In the Options field, select the DSG software, then click Install. Depending on your operating system you may be prompted to confirm that you want to allow the setup program to make changes on your computer. If so, click Yes.

6. The DSG InstallShield Wizard appears.
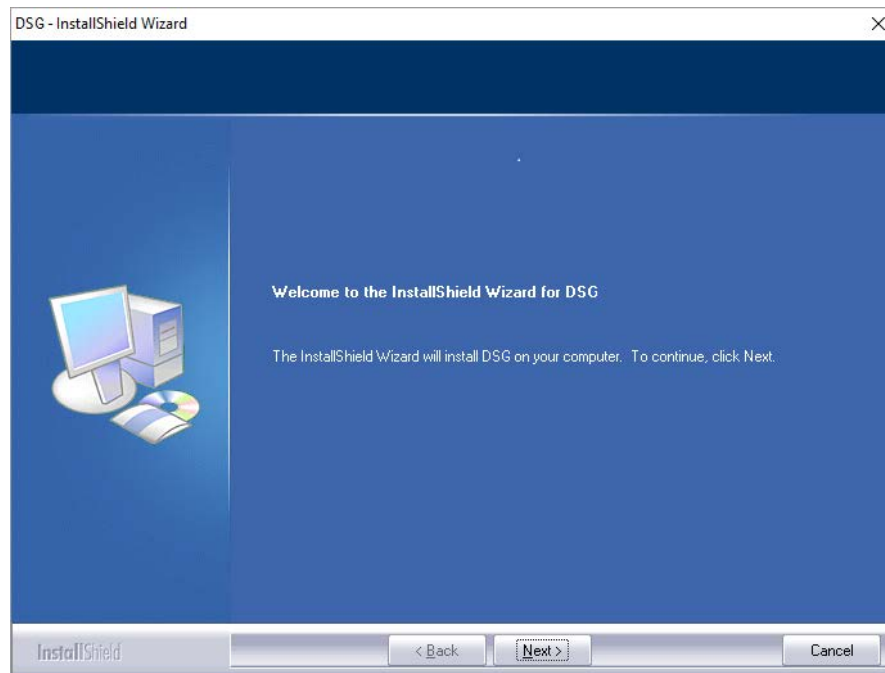
7. Click Next, then click Install. A status bar appears indicating the progress of the installation. When this is complete, a screen appears indicating installation is successful.

8. Click Finish to return to the Setup screen. You can now install Adobe Reader and/or the DSG-8 User Manual. (If your computer does not include a program for reading .pdf files, you will need Adobe Reader to view the User Manual online.) When you are finished, click Exit to leave the Setup screen.

9. Connect the DSG-8 to your computer using the USB cable. The first time you do this, the communication driver will install. A message appears when driver installation is complete.

10. Click the Simulator Software icon ![DSG] on your desktop to open the Simulator Software interface.
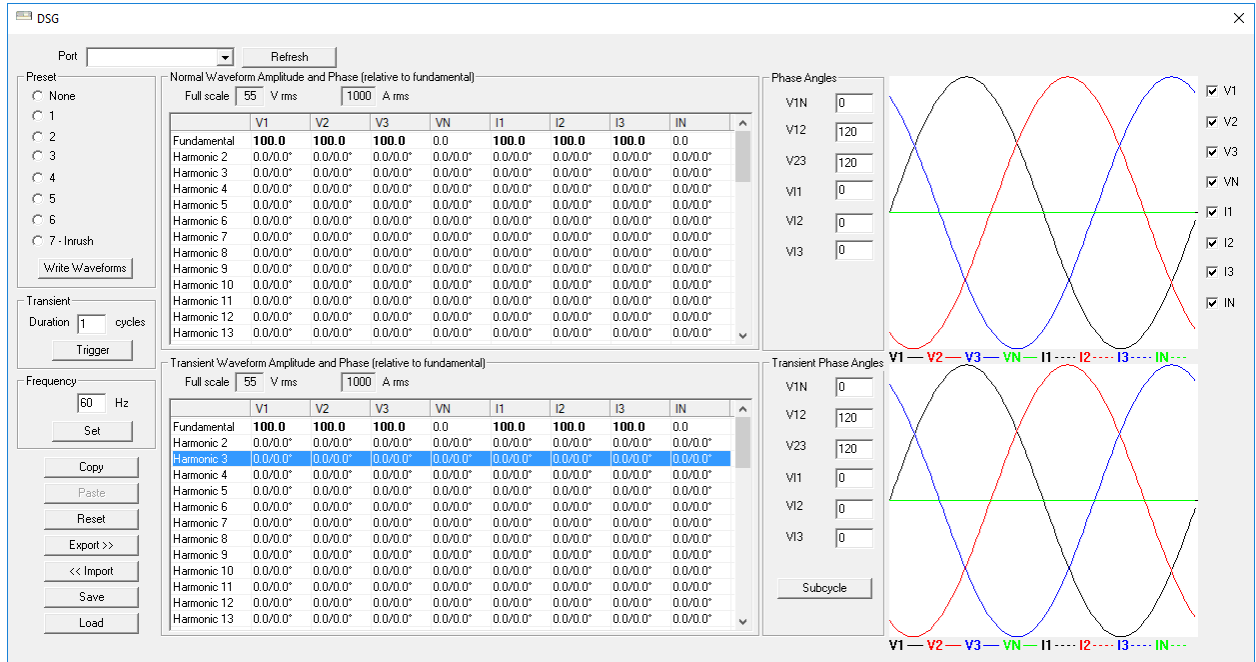
11. In the Simulator Software screen, ensure that the name of the DSG-8 appears in the Port field in the upper left corner. If not, click Refresh. If the name still does not appear, check the USB connections between the simulator and computer.

12. To ensure the Simulator Software is communicating with the DSG-8, change the setting in the Preset radio button field. The Preset Selection LED for the selected preset should light up on the DSG-8 front panel.

2.2 Simulator Software Interface

- **Port** displays the name of the DSG-8 simulator. This indicates the simulator is ready to communicate with the Simulator Software.

- **Preset** is a radio button field for selecting one of the seven available presets, or for selecting None. When you select a preset, the waveform it defines automatically starts running on the DSG-8. To simulate an inrush event (as opposed to a transient) select preset 7 – Inrush. To modify a preset's settings, select it and make the changes (see §2.3.1). Then click the Write Waveforms button. If you select None and then click Write Waveforms, the currently selected settings will run on the simulator. Note that when None is selected, all Preset LEDs on the simulator are OFF. To save these settings in a new simulation file, click Save (see below).

- **Normal Waveform Amplitude and Phase** enables you to define harmonics for each available channel. This section consists of three fields. Full scale is a pair of read-only fields; the first displays the full scale voltage of the voltage outputs (55 Vrms) and the second shows the full scale of the current outputs (1000A rms). The third field is a table of all available channels. You can set up to 50 harmonics settings (including fundamental) for each channel (see §2.3). Settings with non-zero values appear in bold.

- **Phase Angles** defines the phase angles between the voltage and current channels (V1 to VN, V1 to V2, and so on). As you enter each setting, the defined waveform is displayed, with colors representing the channels (black: V1 and I1, red: V2 and I2, blue: V3 and I3, green: VN and IN). To the right of the displayed waveform are checkboxes for selecting channels.

9

- **Transient Duration** sets the duration (in cycles) of the simulated transient. Use this field to define the duration of the transient more precisely than is possible by pressing the Transient/InRush button on the DSG-8. Allowable values are 1 through 65536. To define a transient shorter than one cycle, press the Subcycle button (see below).

- **Trigger** initiates a transient or (when preset 7 is selected) inrush event.

- **Transient Waveform Amplitude and Phase** is similar to Normal Waveform Amplitude and Phase. It sets amplitude (80% by default), harmonics, and phase angles for the simulated transient or inrush event.

- **Transient Phase Angles** is similar to Phase Angles. It includes the **Subcycle** button, which displays a dialog for adding transients with durations shorter than one cycle of the main transient waveform.

- **Frequency** sets the frequency for the simulation. Allowable values are 45 through 65Hz.

- **Export >>** saves all presets in the connected DSG-8 to a combined preset (.inx) file on the computer. When you click this button, the Windows Save As dialog box appears.

- **<< Import** loads the presets in an .inx file into the DSG-8. When you click this button, the Open dialog box appears for finding and selecting the desired .inx file.

- **Save** opens the Save As dialog box, allowing you to save the currently selected preset to an .ini file on the computer.

- **Load** displays the Open dialog box for selecting and loading a previously saved .ini preset file.

- **Copy** saves a copy of the current values in memory.

- **Paste** sets the current values to the values previously copied to memory.

- **Reset** restores the current values to the program defaults.

2.3 Configuring a Simulation

This section describes setting up a simulation. As explained in §2.2, you can create a new simulation, or modify an existing one including any of the seven presets.

> When configuring a simulation, ensure that the waveform amplitudes displayed in the Simulator Software interface do not exceed the display window. Also ensure that you enter realistic amplitude values for harmonics and the fundamental. Otherwise the simulated waveforms could become distorted.

2.3.1 Modifying a Preset

1. With the Simulator Software running, click the preset you want to change in the Preset field (1 through 6 for transient simulations, 7 for inrush simulation).

2. In the Normal Waveform Amplitude and Phase section, set the Full scale field.

3. Select a harmonic listed in the table and double-click it. This displays the Harmonic Amplitude and Phase dialog box.

Harmonic Amplitude and Phase

	V1	V2	V3	VN	I1	I2	I3	IN	
Amplitude	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0-100%)
Phase	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(degrees)

OK   Cancel
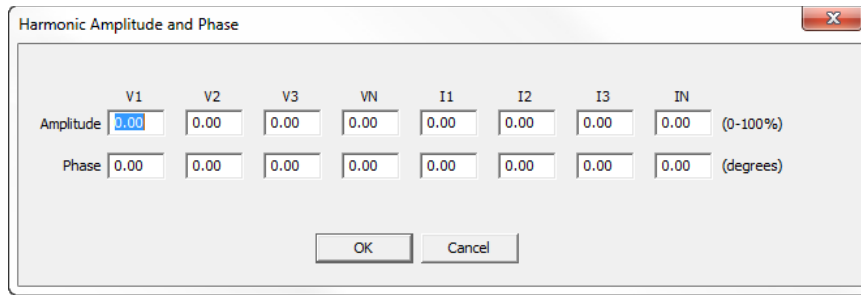
4. Enter the amplitude (in percent) and phase of the harmonic for each channel, then click OK. A color-coded graphic showing the Normal waveform appears.

5. In the Phase Angles section, select the phase angles between the channels. As you make selections the waveform displayed to the right of this section automatically updates. You can choose which channels to include in the displayed waveform by selecting/deselecting the check boxes to the right. (These selections do not affect the Phase Angles settings.)

6. In the Transient Waveform Amplitude and Phase section, set the values for a simulated transient/inrush event. The transient waveform appears in the display window to the right.

7. In the Frequency field, specify the desired frequency for the simulation.

8. If you are modifying preset 7 (inrush), skip the remainder of this step and go to step 9 below. If you are modifying a transient preset (presets 1 through 6), enter the duration of the transient in the Transient field. Then complete the Transient Phase Angles fields. To add a subcycle transient to the transient waveform, click Subcycle. This displays the Subcycle Transient dialog box.

Subcycle Transient

Frequency:	1000.0	Hz
Amplitude:	30.0	%
Duration:	1.000	cycles
Delay:	7.000	cycles
Decay:	0.000	cycles (0 = no decay)

☑ V1
☐ V2
☐ V3
☐ VN
☐ I1
☐ I2
☐ I3
☐ IN

OK   Cancel
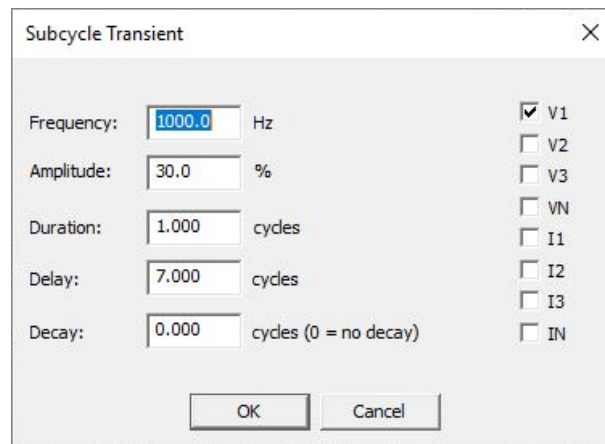
This dialog box enables you to add a transient with a duration shorter than one cycle of the transient waveform. Select the channel(s) on which the transient will appear by checking/unchecking the desired check boxes on the right. Then complete the remaining fields:

▪ Frequency is the transient frequency. This must be greater than the transient waveform's frequency (step 7).

▪ Amplitude defines the amplitude of the transient as a percentage of the transient waveform's full-scale value. For example, to define a transient with an amplitude 50% the transient waveform, enter 50.0.

▪ Duration is the number of cycles (defined by the Frequency field above) the transient will last.

11

- Delay defines when the transient begins, in terms of the transient's frequency. For example, in the preceding illustration the Frequency is set to 1000Hz. This results in 16.67 transient cycles over a single transient waveform's 60Hz cycle. With Duration set to 1 cycle and Delay set to 7 cycles, a single transient cycle appears on the transient waveform, 7 transient cycles after the beginning of the waveform.

- Decay enables you to gradually reduce the transient's amplitude with each cycle. For example, if the transient Duration is 10 cycles and the Decay is 10 cycles, the transient will begin with the full amplitude defined in the Amplitude field, and then incrementally decay to zero by the end of the 10-cycle transient. The Decay and Delay values can be used together to create a "ringing" effect by adding more cycles and "decaying" these cycles starting at the Delay point. You can also create a half-cycle bump or dip by setting Duration to 0.5 and Delay to a whole number (for a bump) or a number that ends in .5 (for a dip).

After you complete these fields, press OK.

9. Click Write Waveform. The modified preset is saved in the DSG-8. The instrument also displays the updated waveform.

10. To reset the preset back to its original settings, click Load. Then select the desired preset file. When the preset is displayed in the Simulator Software, click Write Waveforms to save it in the simulator.

2.3.2 Creating a New Simulation

1. With the Simulator Software running, click None in the Preset field.

2. In the Normal Waveform Amplitude and Phase section, set the Full scale field.

3. Select a harmonic listed in the table and double-click it. This displays the Harmonic Amplitude and Phase dialog box.

4. Enter the amplitude (in percent) and phase of the harmonic for each channel, then click OK.

5. In the Phase Angles section, select the phase angles between the channels. As you make selections the waveform displayed to the right of this section automatically updates.

6. Choose which channels to include in the displayed waveform by selecting/deselecting the check boxes to the right of the displayed waveform.

7. In the Frequency field, select the desired frequency for the simulation.

8. In the Transient Waveform Amplitude and Phase section, set the values for a simulated transient event.

9. In the Transient Phase Angles section, select the phase angles between the channels. As you make selections the waveform displayed to the right of this section automatically updates.

10. To add a subcycle transient to the transient waveform, click Subcycle. Then complete the Subcycle Transient dialog box.

11. Enter the duration of the transient in the Transient field.

12. To run the simulation on the DSG-8, click Write Waveform. (Note that this does not save the simulation.)

13. To save the simulation, click Save to display the Save As dialog box. This lets you enter a name and location for the simulation file, which by default includes the extension .ini.

14. To modify a previously saved simulation, click Load and select the simulation. Then change its settings as instructed above, and save it under its original name (or different name to create a new file).

3. OPERATION

	As a safety feature, the DSG-8 output voltage is limited to $55V_{RMS}$ (Earth/Ground to phase 1, 2, 3 and neutral). To simulate a higher voltage, you must set the scaling on your power instrument as instructed by its User Manual. For example, to simulate a 110V input, set the scaling on your instrument to 2:1.

You can operate the DSG-8 from its front panel interface, or through the Simulator Software. You must use the Simulator Software to do the following:

- Run a simulation other than one of the seven presets.
- Run a transient with single-cycle duration precision.

In addition, all simulation configuration (other than selecting a preset) must be performed through the Simulator Software (see §2).

Before beginning operation, connect the DSG-8 output leads to the instrument. Each lead is labeled to indicate the instrument terminal to which it should be connected.

3.1 Front Panel Operation

1. If you plan to run the simulator on USB power, plug in the USB cable.

2. Press the ON/OFF button for longer than two seconds. (The ON/OFF indicator will light up.)

3. Press and hold the Preset Selection button until the desired preset LED lights up. Available default presets are as follows:

   1 (Clean split-phase)
   2 (Clean three-phase (Load) 80% transient)
   3 (Clean three-phase (Source) 80% transient)
   4 (Three-phase 10% harmonic 3 (Load) 30% harmonic 3)
   5 (Three-phase 10% harmonic 3 through 11 (Load))
   6 (Three-phase 10% harmonics 2 through 10 (Load))
   7 (Three-phase 20% current amplitude (load): inrush waveform at 80%) used for inrush simulation

   If this simulation will include a transient event, select one of the first six presets. If it includes an inrush event, select preset 7. Note that these presets can be modified via the Simulator Software (see §2). The simulation begins immediately when the preset is selected.

4. To simulate a transient or inrush event, press the Transient/InRush button. Transients will run for as long as the button is pressed; inrush events will run for the predefined duration.

When the simulation is running, the simulated measurements appear in the real-time display on the instrument's LCD. If the instrument is connected to DataView, you can also view the simulation in the Real-Time Data frame in the instrument's Control Panel.

	If the DSG-8 is running on battery power, it turns OFF after two hours without user activity. To run a simulation for longer than two hours unattended, run the simulator on USB power.

3.2 Simulator Software Operation

1. Using the USB cable provided with the product package, connect the DSG-8 to the computer. Then press the ON/OFF button for longer than two seconds. (The ON/OFF indicator will light up.)

2. Launch the Simulator Software, if it is not already running.

3. Confirm the DSG-8 is connected by ensuring its name appears in the Port field (see §2.1).

4. In the Preset field, select one of the following:

   None (the simulation will be defined by the currently displayed settings, or you will load a previously saved simulation)
   1 (Clean split-phase)
   2 (Clean three-phase (Load) 80% transient)
   3 (Clean three-phase (Source) 80% transient)
   4 (Three-phase 10% harmonic 3 (Load) 30% harmonic 3)
   5 (Three-phase 10% harmonic 3 through 11i (Load))
   6 (Three-phase 10% harmonics 2 through 10 (Load))
   7 (Three-phase 20% current amplitude (load): inrush waveform at 80%) used for inrush simulation

   Note that presets can be modified. If this simulation will include an inrush event, select preset 7.

   To run a simulation you have previously created and saved, select None. Then press the Load button and select the desired simulation file.

   The simulation begins immediately when a preset is selected.

5. To change a simulation, edit the settings as instructed by §2.2. Then press Write Waveforms to write the new settings to the DSG-8. Note that doing this while a preset other than None is selected will save these setting in the DSG-8, overwriting the previous preset values.

6. To simulate a transient enter the duration (in cycles) in the Transient field. Then click Trigger to initiate the transient simulation.

7. To simulate an inrush, select preset 7. Then click Trigger.

When the simulation is running, the simulated measurements appear in the real-time display on the instrument's LCD. If the instrument is connected to DataView, you can also view the simulation in the Real-Time Data frame in the instrument's Control Panel.

4. SPECIFICATIONS

Reference conditions: 73.4° ± 5.4°F (23°C ± 3°C), 30 to 50% RH, 50/60Hz, battery voltage 4.5V ± 10%.

Channels	Eight
Output Termination	Five 4mm safety banana connectors Four AEMC/C.A connector
Output Voltage	0 to 55V_{RMS} (Earth/Ground to phase 1, 2, 3 and neutral) 0 to 1V_{RMS} AEMC/C.A connector
Accuracy	Unspecified (see graphs below)
Frequency Range	45 to 65Hz
Sample Rate	128 samples/cycle
Harmonics	Programmable harmonic content to the 50th harmonic
Inrush	14 cycle inrush simulation
Presets	Seven preset waveforms (six normal/transient, one normal/inrush)
Communication	USB 2.0
Power Consumption	70mA at max output all eight channels
Power Source	USB 5V Three 1.5V C-cell alkaline batteries
Battery Life	100 hours active mode (output ON) 60 days sleep mode (output OFF)

Typical Harmonic Accuracy

DSG-8 Harmonic Accuracy
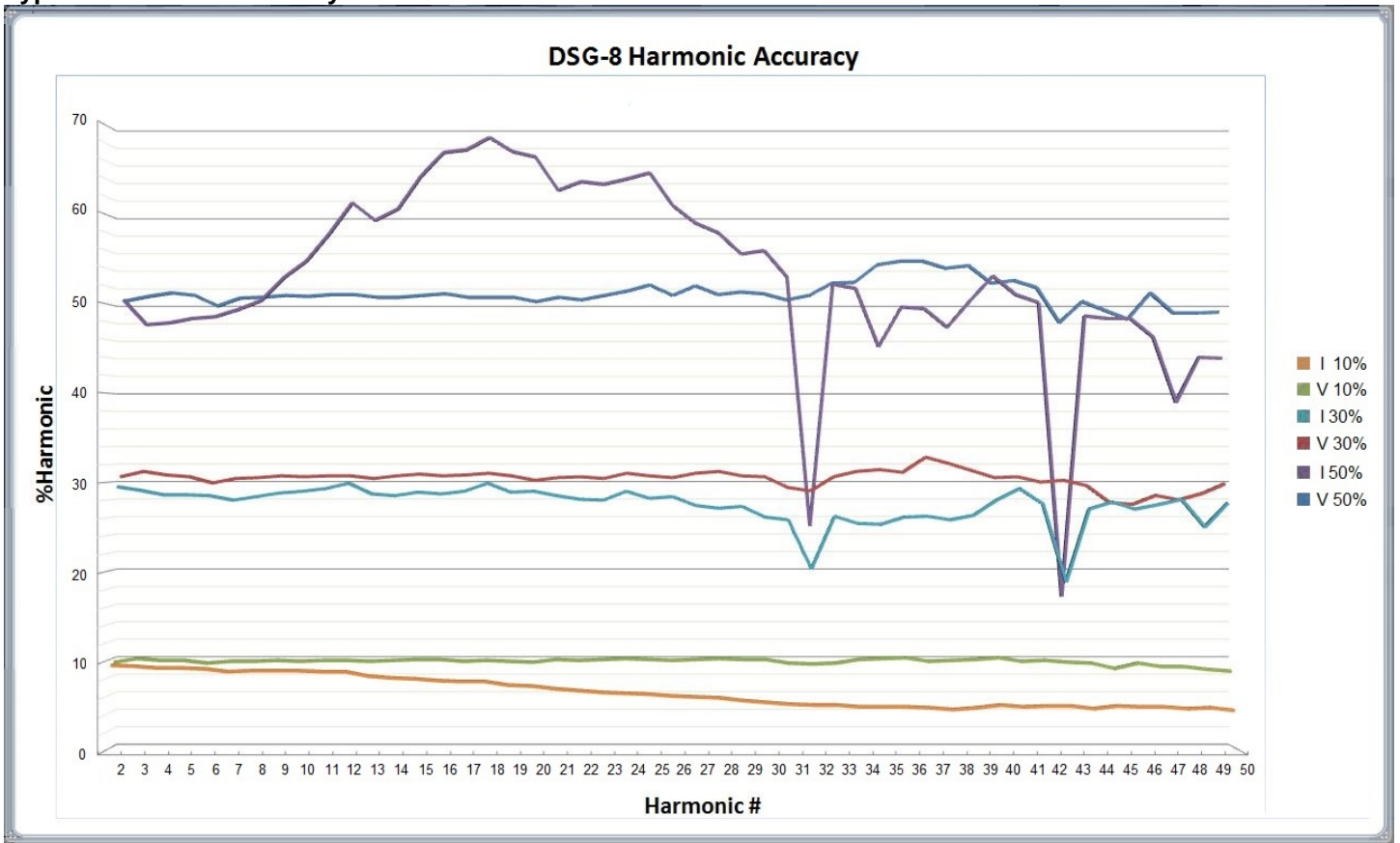
Typical Accuracy vs Amplitude of Fundamental
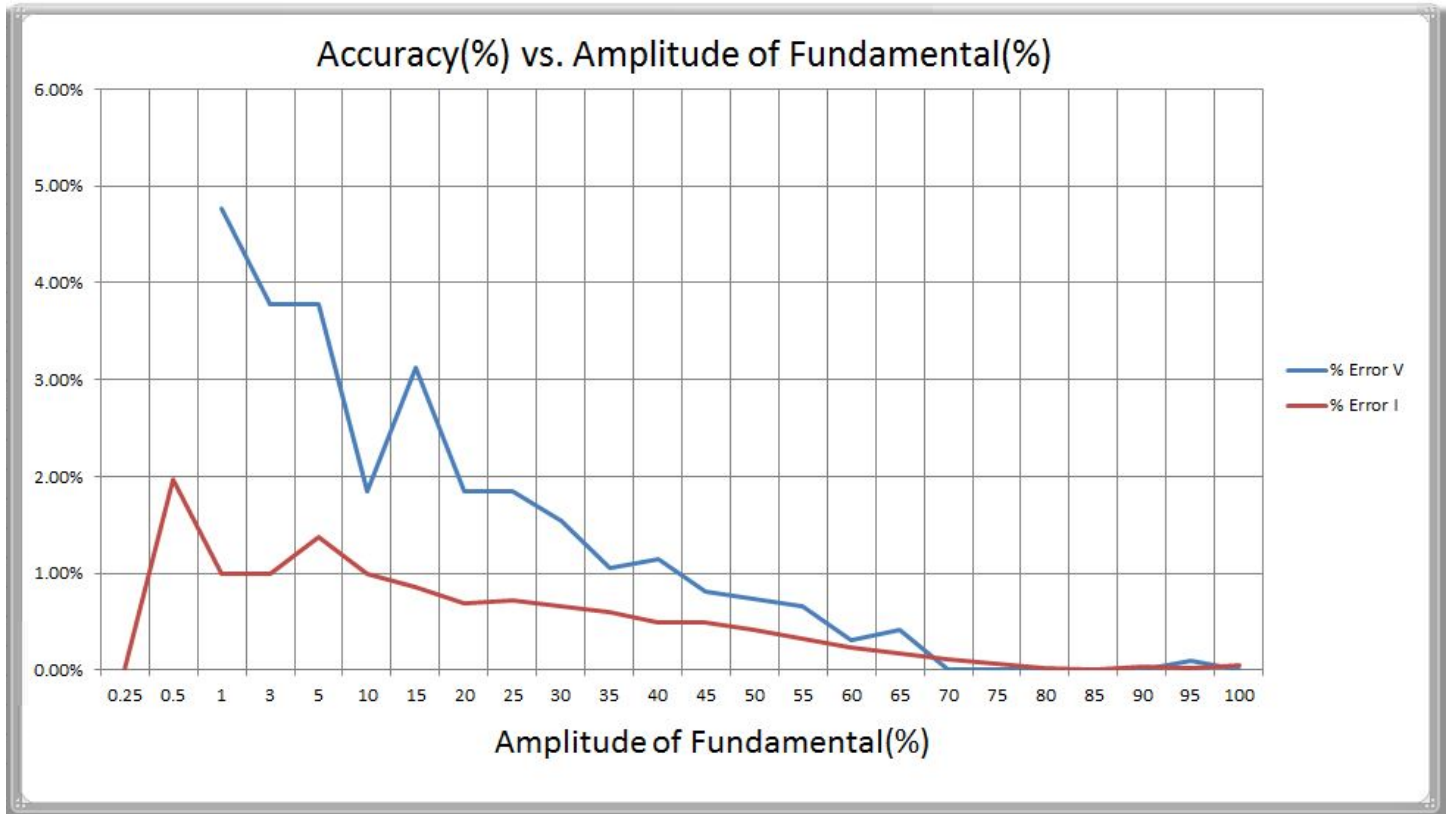
Repair

For instrument repair:
You must contact our Service Center for a Customer Service Authorization Number (CSA#). This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container.

Ship To:
> Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
> 15 Faraday Drive • Dover, NH 03820 USA
> Phone: (800) 945-2362 (Ext. 360)
>   (603) 749-6434 (Ext. 360)
> Fax: (603) 742-2346 or (603) 749-6309
> E-mail: repair@aemc.com

(Or contact your authorized distributor.) Costs for repair are available.

NOTE: You must obtain a CSA# before returning any instrument.

Technical and Sales Assistance
If you are experiencing any technical problems, or require any assistance with the proper operation or application of your instrument, please call, fax, or e-mail our technical support team:
> Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
> Phone: (800) 945-2362 (Ext. 351)
>   (603) 749-6434 (Ext. 351)
> Fax: (603) 742-2346
> E-mail: techsupport@aemc.com

Limited Warranty

The DSG-8 is warranted to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the instrument has been tampered with or abused, or if the defect is related to service not performed by AEMC® Instruments.

Full warranty coverage and product registration is available on our website at: www.aemc.com/warranty.html.

Please print the online Warranty Coverage Information for your records.

What AEMC® Instruments will do:
If a malfunction occurs within the two-year period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will, at its option, repair or replace the faulty material.

Warranty Repairs

What you must do to return an instrument for Warranty Repair:

First, request a Customer Service Authorization Number (CSA#) by phone or by fax from our Service Department (see address below), then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Ship To:
    Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
    15 Faraday Drive • Dover, NH 03820 USA
    Phone: (800) 945-2362 (Ext. 360)
            (603) 749-6434 (Ext. 360)
    Fax: (603) 742-2346 or (603) 749-6309
    E-mail: repair@aemc.com

Caution: To protect yourself against in-transit loss, we recommend you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

99-MAN 100437 v06
12/24