6623A-PCS Series

DC Precision High Current Sources

World's First **Modular and Expandable** Family of DC High Current Sources with **World's Best Uncertainty** and **Electronic Polarity Switching**

6623A-PCS Series Features

- Unique PATENTED Design!
- Precision DC currents up to 10,000 A!
- Output Current Stability < 50 ppm for 1000A and higher, Typically < 5 ppm!
- Programmable from 66259 USB Controller, or from 6622A Series Bridges!
- Modular Design, Expandable Capabilities in 150A Increments - Investment Protection!
- Built-in Electronically Controlled Positive and Negative Output Currents of Equal Magnitude with Electronic Polarity Switching!
- Eliminates Need for Mechanical Polarity Reversing Switches and Compressed Gas!
- Linearity: ± 0.01 ppm of Full Scale!
- Safety (Fault) Protections in Place!
- Complete Measurement Systems Available!

Guildline Instruments 6623A-PCS Series of DC Precision High Current Systems introduces new patented designs to provide the best uncertainties of any DC high current sources (i.e. typically < 5 ppm at 1000A) and the best in modularity. The 6623A-PCS Series consists of a family of current sources, with available current outputs from 5 ampere to 10,000 ampere.

Designed to operate with a 66259 Stand-Alone Controller, or our widely fielded 6622A Series of Resistance Bridges, these Current Sources provide customers with unique and individualized workload solutions. Real solutions that address not only existing and future workload requirements, but also deal with ever tightening budget constraints!

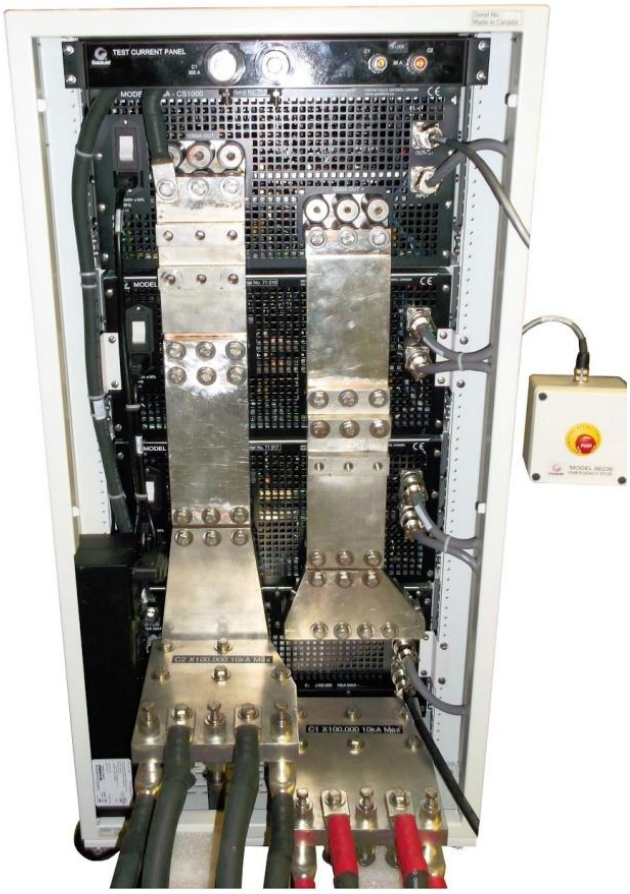
As with many Guildline products, the 6623A-PCS Series modular design allows you to buy what is required today with existing budgets, and when current requirements change, expand your output current in 150 ampere increments to meet your future needs without any loss of your original investment!

The 6623A-PCS Series Provides Widest Range of Expandable DC Output Currents with the Best Uncertainty / Accuracy!

Guildline's newly designed and innovative internal supply used in the 6623A-PCS Series eliminates the costly requirements for purchasing external power supplies, use of compressed gas, mechanical switches and even the software programming pains associated with automating these external components which are provided by multiple manufacturers.

A procedure developed for a Guildline 150 A Model will work the same as on our 300 A, 1000 A or even 10,000 ampere models or any increment in between.

6623A- PCS Series DC Precision Current Sources



Using patented and proprietary technologies, Guildline engineers have again provided our customers with the most value and flexibility in **generating DC currents** and in expanding their **shunt measurement** capability. Unlike many existing DC current source or range extender products, the 6623A-PCS Series uses a modern design. This has allowed Guildline to dramatically **improve uncertainties, measurement functionality**, size, power handling as well as addressing budget considerations. For example, the 6623A-PCS System on the left generates 3000A of output current from a standard 19 inch cabinet that is less than 1 meter high (i.e. about 35 inches).

Compare to competitive products like those provided by Keysight and Measurements International where best uncertainty is 0.1% or 1000 ppm versus as low as < 5 ppm for Guildline's 6623A-PCS. Note that these competitive products are restricted to a maximum of 3000A output current (i.e. a maximum of three external current sources can be placed in parallel) versus Guildline's 6623A-PCS which comes in standard configurations up to 10,000 A.

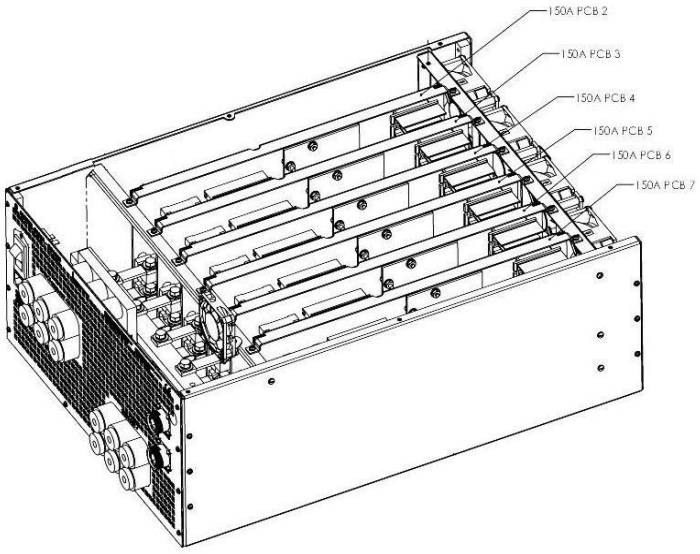
You can run any Guildline 6623A-PCS model manually or fully automated. These highly precise DC Current Sources are controlled via a 66259 Programmable Controller or a 6622A Resistance Bridge. The required output current is entered via the touch screen of the 66259 Controller or via the control panel of the 6622A Bridge. The 66259 Controller also has a USB connection so full automation is provided by using a connected computer. You now have a USB Programmable Precision Source with full control of all measurement parameters such as Output Current, Current Polarity, Polarity Reversal Rates and other parameters. No need to manually set or adjust third-party power supplies, mechanical switches, and associated wiring. This completely self-contained precision current source allows you to fully automate calibration procedures.

All 6623A-PCS Models are completely upgradeable with no loss of your initial investment. For example, if you started with the 300 ampere unit shown on the following pages, and now require 3000 ampere, don't worry! Simply send back your 300 ampere unit, pay the difference from what you spent on the 300 A unit with respect to the new unit you want, and Guildline will send back a new 3000 ampere unit. Plug it into your 66259 Controller and you are ready to go! No need to rewrite already developed procedures, no need to provided additional training; the 3000 ampere unit operates exactly the same as the 300 ampere unit.

NEW PATENTED DESIGN AND TECHNOLOGY

The heart of the 6623A-PCS design is our 150 ampere precision current source pictured to the right. This is an electronically programmed precision current source that provides both positive and negative test currents of equal magnitude via electronic polarity switching! Guildline's newly designed and innovative internal current source used in the 6623A-PCS Series eliminates the costly requirements for purchasing external power supplies, use of external mechanical switches and compressed gas, and even the software programming difficulties associated with implementing these external components. This means the 6623A-PCS can provide the required current with automatic polarity reversal at user selected intervals, without using mechanical switches or specialized external computer controls.

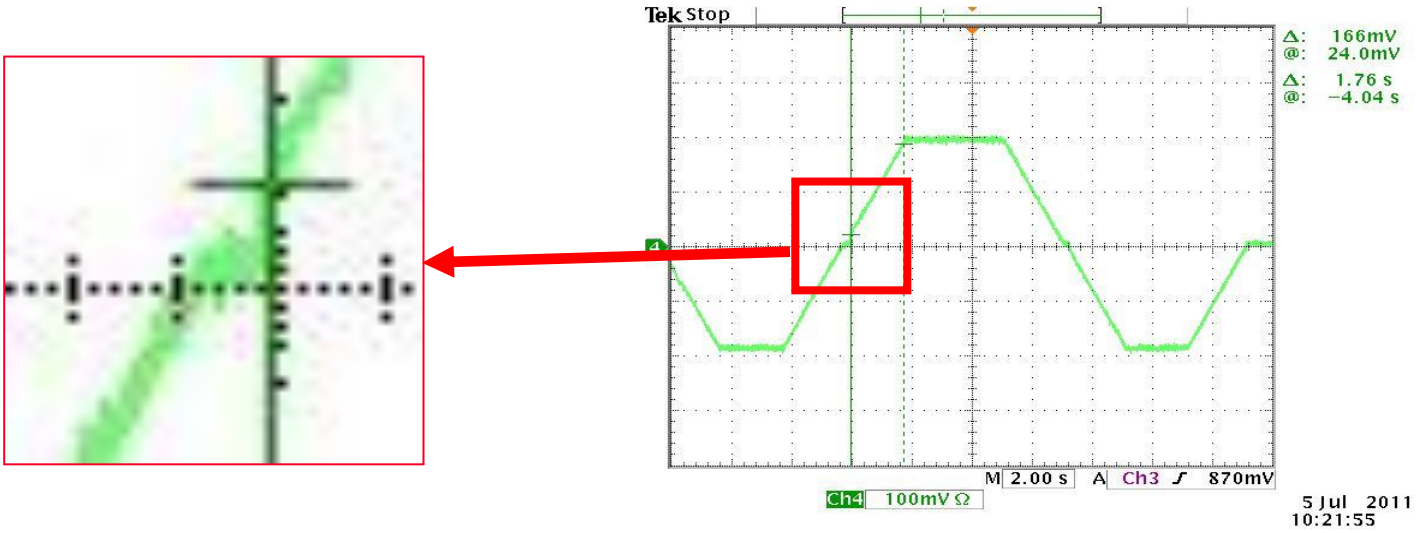
Guildline's patented 6623A-PCS 150 ampere board's modularity and integration is best shown using a 6623A-PCS-1000A picture and diagram. This 1000 A Precision Current Source contains seven (7) 150 A PCBs to provide current outputs of up to 1050 amperes in a 5U high chassis (i.e. 22.23 cm or 8.75 inches). A picture of the interior of a standard 6623A-PCS-1000A model is below left and below right is the engineering drawing of the same model. You can see the seven 150A PCB current sources in both the picture and drawing.



Each board has "smart" technology incorporated into the design that allows command control in terms of operation, switching and even board protection. For example, if a board was to fail, your system is not down. You simply operate at a reduced current. If you had a 1000 A unit and a board fails, your system would continue to operate at 900 A. Send the board back for repair and when it is returned, simply insert it back in. The status of all boards is monitored and displayed visually via a LED bank.

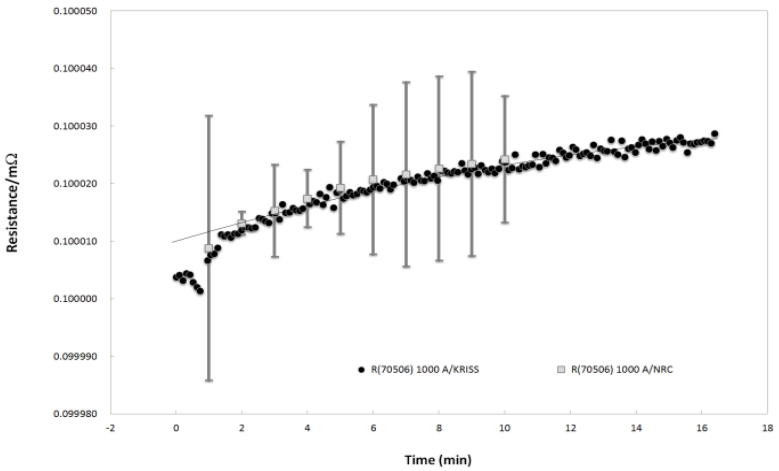
This modularity extends to higher currents. As an example, to build a 4000 A System, we use four 6623A-PCS 1000A modules and place them into a single 19 inch equipment rack as per the picture on the preceding page.

With electronic polarity switching, the output current is ramped up or down continuously and polarity reversal is executed as the current passes through zero to minimize transients and inductive spikes. The offset during polarity switching is less than 1 ppm as can be seen in the following pictures. In competitive products the current source must be turned off, then compressed gas used to drive an external mechanical switch to change the polarity, then the current source must be turned back on; all of which result in a material contribution to increased uncertainties.



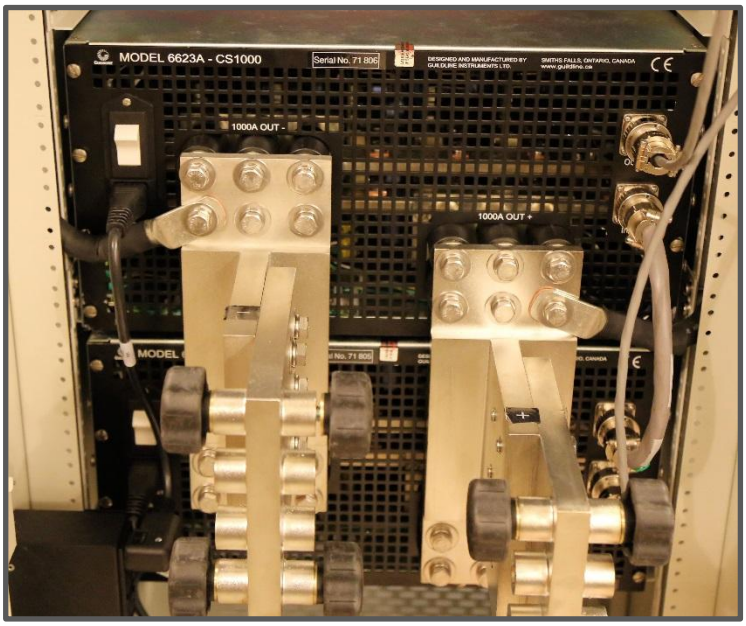
What differentiates the 6623A-PCS series from any other manufacturer's products is the phenomenal stability that the patented 150 Ampere boards provide. This stability is available all the way through to the 10,000 Ampere offering. A high end power supply may provide 0.1% stability at its best but as the unit heats up, the output current will drift and affect stability. This drift makes it impossible to use these supplies as a precision high current source. However, the design of the 150A PCB in the 6623A-PCS results in a drift rate in the part per million area. This ultra low drift means that users only have to determine absolute accuracy of the output and this is easily accomplished by one of three techniques and offerings discussed further in this Datasheet.

How good is the 6623A-PCS? Measurement results from a 1000 Ampere Inter-comparison of two NMIs (Test Results shown to the right) came within 5 ppm of each other.



One setup was a Guildline 6623A-PCS/4000A System with our 66259 Controller.

The Inter-comparison also included two Guildline 9230A DC Shunts and Guildline's new 6624CT-3000 Current Transformer. It took the 6624CT-3000 DC Transformer to measure the ultra-low stability of a Guildline 6623A-PCS. With this Guildline designed DC Current Transformer, current Stabilities as low as 5 ppm were measured. The upward drift noted in the chart is the self-heating effects of the shunts.



With the high stability provided by Guildline's current sources, the ability to read the current accurately is the next consideration. The 6623A-PCS Series is offered in several configurations. Each configuration allows for an increase in resolution and accuracy. Precision Current Sources from 5 Amperes to 10,000 Amperes is available in each of the configurations.

6623A-PCS - In this configuration you receive the base current source at the amperage requested. This is the most common configuration when with a Guildline 6622A Bridge for control. The following currents are available as Standard Models 5A, 10A, 150A, 300A, 450A, 600A, and from 1kA to 10kA in 1000 Ampere increments. Of course, with the modularity provided by the patented PCB boards, any customer specified value in 150 Ampere increments from 150 Amperes to 10,000 amperes can be provided. For example, 1200A, 2550A, 3300A, etc. are available outputs as is any value that is in 150 Ampere increments starting from 150A.

6623A-PCS-Current/66259 - This configuration pairs the 6623A-PCS with customer specified amperage, and the 66259 Controller. This configuration allows the PCS to be used either manually or via USB control. Specifications are the same as in the Base configuration above.

6623A-PCS-Current/SHNT - This series uses the 66259 Controller and matches the required current output to a Guildline high performance 9230A Series DC Shunt. When using a Guildline 9230A Shunt, customers can expect short term uncertainties in the area from 10 to 100 ppm, and long term uncertainties of 100 to 250 ppm for currents up to 1500 amperes and from 250 ppm to 1000 ppm for currents up to 10,000 amperes. Guildline has five NEW models of DC Current Shunts for these precision High Current measurements (i.e. 1000A, 1500A, 3000A, 5000A and 10,000A). In addition Guildline has lower value 9230A Shunts ranging from 10A to 500A. Guildline's 9230A Current Shunts are the best performing models that are commercially available. The 9230A features are the reason why major test equipment manufacturers (e.g. Keysight (Agilent), Ametek, Tektronix) explicitly reference Guildline's 9230A Shunts to calibrate their power supplies. These Shunts are the result of over 58 years of Guildline research and design in building precision shunts and incorporate many unique design features. For more information refer to the 9230A Precision DC Shunt Datasheet.

6623A-PCS/DCCT - For the best in DC uncertainties for currents from 300 to 3000 Amperes, this Precision DC Current Source and Measurement System includes a customer specified PCS Precision Current Source, a 66259 for control and adds a 6624CT (Current Transformer) as the measurement standard. Not only is this the best in accuracy with uncertainties at 5 to 10 ppm to 3000 Amperes, but it also provides superb linear performance < 0.01 ppm!

1 Year Specifications

Accuracy specification include short term stability of the current source, and long term stability of the selected model (e.g. 1 year Specifications for 66259, shunt, or DCCT) and at 23°C ±1°C Temperature Variation.

150A to 300A Models		12 Month Accuracy		
Compliance	Output Current	6623A-PCS/66259	6623A-PCS/SHNT[2]	6623A-PCS/DCCT
± 5 Volts	± 0.1 A to ± 3 A	±0.1%	±100 ppm	±10 ppm
± 7.5 Volts	± 3 A to ± 15 A	±0.3%	±100 ppm	±10 ppm
± 1.5 Volts	± 15 A to ± 300 A[1]	± 0.3%	±100 ppm	±10 ppm

Note 1 - Maximum current output is either 150A or 300A depending on model selected.
Note 2- Using a 9230A-150 or 9230A-300 Shunt to maximum rating of 9230A shunt selected.

450A to 600A Models		12 Month Accuracy		
Compliance	Output Current	6623A-PCS/66259	6623A-PCS/SHNT	6623A-PCS/DCCT
± 5 Volts	± 0.1 A to ± 3 A	±0.1%	±100 ppm [2]	±10 ppm
± 7.5 Volts	± 3 A to ± 30 A	±0.3%	±100 ppm [2]	±10 ppm
± 1.5 Volts	± 30 A to ± 600 A[1]	± 0.3%	±100 ppm [3]	±10 ppm

Note 1 - Maximum current output is either 450A or 600A depending on model selected.
Note 2- Using a 9230A-500 or 9230A-1000 to maximum rating of 9230A shunt selected.
Note 3 - If using a 9230A-1000 Shunt for this range, accuracy is ±250 ppm.

1kA to 3kA Models		12 Month Accuracy		
Compliance	Output Current	6623A-PCS/66259	6623A-PCS/SHNT	6623A-PCS/DCCT
± 5 Volts	± 3 A to ± 30 A	±0.3%	±250 ppm [2,3]	±10 ppm
± 1.5 Volts	± 30 A to ± 150 A	±0.3%	±250 ppm [2,3]	±10 ppm
± 1.5 Volts	± 150 A to ± 1500 A	±0.35%	±250 ppm [2]	±10 ppm
± 1.5 Volts	± 150 A to ± 3000 A[1]	±0.35%	±500 ppm [4]	±10 ppm

Note 1 - Maximum standard models current output is 1000A, 2000A or 3000A depending on model selected.
Note 2- Using a 9230A-1000 or 9230A-1500 to maximum rating of 9230A shunt selected. If using a 9230A-3000 for these ranges, accuracy is ±500 ppm.
Note 3 - Lower uncertainties can be achieved by using a 9230A-500 or below for these ranges.
Note 4 - When using a 9230A-3000 Shunt or 9230-5000 Shunt for this range.

4kA to 6kA Models		12 Month Accuracy		
Compliance	Output Current	6623A-PCS/66259	6623A-PCS/SHNT	6623A-PCS/DCCT[5]
± 7.5 Volts	± 10 A to ± 30 A	±0.3%	±500 ppm [2]	±10 ppm
± 1.5 Volts	± 30 A to ± 300 A	±0.3%	±500 ppm [2]	±10 ppm
± 1.5 Volts	±300 A to ± 3000 A[1]	±0.35%	±500 ppm [2]	±10 ppm
± 1.5 Volts	±4000 A to ± 5000 A[1]	±0.35%	±600 ppm [3]	N/A
± 1.5 Volts	±5000 A to ± 6000 A[1]	±0.35%	±1000 ppm [4]	N/A

Note 1 - Maximum standard models current output is either 4000A, 5000A or 6000A depending on model selected.
Note 2- Using a 9230A-3000 to maximum rating of 9230A shunt selected. If using a 9230A-5000 for these ranges, accuracy is ±600 ppm. Lower uncertainties can be achieved by using a 9230A 1k or below for these ranges.
Note 3- Using a 9230A-5000 to maximum rating of 9230A shunt selected. If using a 9230A-5000 for these ranges, accuracy is ±1000 ppm.
Note 4- Using a 9230A-10000 to maximum rating of 9230A shunt selected.
Note 5 - Maximum range of the DCCT is 3000 Amperes. Higher currents are Not Available (N/A) at this time.

7kA to 10kA Models		12 Month Accuracy		
Compliance	Output Current	6623A-PCS/66259	6623A-PCS/SHNT	6623A-PCS/DCCT[3]
± 7.5 Volts	± 10 A to ± 30 A	±0.3%	±1000 ppm [2]	N/A
± 1.5 Volts	± 30 A to ± 300 A	±0.3%	±1000 ppm [2]	N/A
± 1.5 Volts	±300 A to ± 10000 A[1]	±0.35%	±1000 ppm	N/A

Note 1 - Maximum standard models current output is 7000A, 8000A, 9000A or 10000A depending on model selected.
Note 2- Using a 9230A-10000 to maximum rating of 9230A shunt selected. Lower uncertainties can be achieved by using a 9230A Series 1.5k or below for these ranges.
Note 3 - Maximum range of the DCCT is 3000 Amperes.
N/A means Not Available at this time.

General Specifications (All Models)			
Temperature Coefficient ▶	±0.01 ppm/°C		
Linearity ▶	±0.01 ppm of Full Scale Ratio		
Test Current Resolution ▶	± 18 bits with 66259 Controller		
Communications	Via 6622A Bridge - IEEE 488.2 (SCPI Based Instructions)		Via 66259 - USB
Operating Temperature to Full Specifications ▶		23°C ± 3°C	73°F ± 5.4°F
Maximum Operating Range (<50% RH) ▶		+18°C to +28°C	+64.4°F to +82.4°F
Temperature Storage Range ▶		-20°C to +60°C	-4°F to +140°F
Operating Humidity	20% to 70% RH	Storage Humidity	15% to 80% RH

6623A-PCS Series Models Dimensions

Standard Models[1]	6623A-PCS Dimensions (Height x Width x Depth)			
	Rack		Bench	
6623A-5/10	5.2" x 20.7" x 20.3"	132 x 526 x 516 mm	5.7" x 17.3" x 20.3"	145 x 440 x 516 mm
6623A-150	5.2" x 20.7" x 27.1"	132 x 526 x 693 mm	5.7" x 17.5" x 27.1"	145 x 445 x 693 mm
6623A-300	7.0" x 20.7" x 27.1"	178 x 526 x 693 mm	7.5" x 17.5" x 27.1"	145 x 445 x 693 mm
6623A-PCS-450/600/1000	8.75" x 20.7" x 29.1"	222 x 526 x 739 mm	10" x 17.5" x 29.4"	254 x 445 x 747 mm
6623A-PCS-1k/2k/3k/4k	44.7" x 21.8" x 36.7"	1135 x 552 x 932 mm		
6623A-PCS-5k/6k/7k/8k	44.7" x 44.1" x 36.7"	1135 x 1120 x 932 mm		
6623A-PCS-9k/10k	44.7" x 66.2" x 36.7"	1135 x 1682 x 932 mm		

6623A-PCS Series Models Power and Weight Requirements

Standard Models[1]	6623A-PCS Power Requirements and Weight						
	Power			Rack Model Weight		Bench Unit Weight	
	Voltage	Frequency	VA (max) **	lbs	kg	lbs	kg
6623A-PCS-5	100 VAC to 240 VAC ± 10 %	50/60 Hz ± 5 %	100	23	10.5	28	12.7
6623A-PCS-10			400	25	11.4	30	13.7
6623A-PCS-150			800	46	21	50	22.7
6623A-PCS-300			1000	62	28.2	70	31.8
6623A-PCS-450			1250	67	30.5	86	39.1
6623A-PCS-600	208 VAC to 240 VAC ± 10 %	50/60 Hz ± 5 %	1900	76	34.5	95	43.2
6623A-PCS-1000			2600	360	164		
6623A-PCS-2000			4700	490	223		
6623A-PCS-3000			6800	620	282		
6623A-PCS-4000	208 VAC to 240 VAC ± 10 %	50/60 Hz ± 5 %	9200	930	423		
6623A-PCS-5000			11400	1070	486		
6623A-PCS-6000			13600	1210	550		
6623A-PCS-7000			16100	2030	923		
6623A-PCS-8000			18400	2170	986		
6623A-PCS-9000			20700	2310	1050		
6623A-PCS-10000			23000	2450	1114		

1 - Any model in increments of 150 A from 150 A to 10,000 A is available. Please contact Guildline for specifications. As a general rule, the specifications are typically close to the next higher model (eg an 1100 A to 1850 A models would have the same specifications as the 2000 A model).

BridgeWorks Software™

Guildline's PC based BridgeWorks Software can be used to automate measurements when a 66259 Controller or 6622A Series Bridge is used with a 6623A-PCS Precision Current Source.

Complete Measurement System - Right Down to the Cables and Lead Sets!

All 6623A-PCS Models come with one set of output Cables covering the current range for each model. These are the best High Current Cables available today to work with your 6623A Series. Incorporating a unique, high compression connection that eliminates thermals at the terminals, these cables are available in current ratings of 3A, 30A, 100A, 300A, and 500A values. For higher current cables the compression used on the cable lugs is greater than 30,000 psi making them the best high current cables that are commercially available. Standard length is 1.5 meters and Guildline can make them in any length and with many different terminations. Guildline also provides precision low thermal leads for the voltage measurement.

6623A –PCS Series DC Precision Current Sources

For ordering just select the Current output of the PCS series. All PCS Models come with properly sized lead set.

6623A-PCS-XXX – This specifies the model and maximum nominal current output of the unit. For example a 6623A-PCS-300 would allow a maximum current of up to 300 Amperes to be output. There are several interface methods to control the current output. They can be controlled via any 6622A Series Bridges or the 66259 Programmable Controller. The 66259 is an option for the PCS Series and must be added as shown below:

/66259 - This will include the 66259 Programmable Controller to the PCS Model.

If you want improved accuracy, select from one of two options below. This number is added after the PCS Series. Note that for either of these options, the 66259 Controller comes standard with the model selected. For example 6623A-300/SHNT would add a 66259 Controller and a 9230A-300 Ampere Shunt to the PCS model.

Or for the highest accuracy:

6623A-PCS-3000/DCCT – Would add the 66259 Controller and a 6624CT-3000 to the PCS System.

Ordering Information

5A to 1000 A Models Available in Bench Configuration.
1kA to 10,000 kA Available in Rack Configuration.

6623A-PCS-5	5 A Precision Current Source
6623A-PCS -10	10 A Precision Current Source
6623A-PCS -150	150 A Precision Current Source
6623A-PCS-300	300 A Precision Current Source
6623A-PCS-450	450 A Precision Current Source
6623A-PCS-600	600 A Precision Current Source
6623A-PCS-1000	1000 A Precision Current Source
6623A-PCS-2000	2000 A Precision Current Source
6623A-PCS-3000	3000 A Precision Current Source
6623A-PCS-4000	4000 A Precision Current Source
6623A-PCS-5000	5000 A Precision Current Source
6623A-PCS-6000	6000 A Precision Current Source
6623A-PCS-7000	7000 A Precision Current Source
6623A-PCS-8000	8000 A Precision Current Source
6623A-PCS-9000	9000 A Precision Current Source
6623A-PCS-10000	10000 A Precision Current Source
6623A-PCS-XXX	Other Value - Maximum Current in 150 A Increments
SM6623A-PCS	Service Manual (Extra Charge)
/66259	Programmable Controller
/SHNT	9230A Shunt and 66259 Controller
/DCCT	6624 3000A CT

Many other types of test and communication leads and accessories are available

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