

Charge/Discharge System

PFX2500 Series



Dimensions / Weight

PFX2511: 214.5(8.45")W×124(4.88")H×400(15.75")Dmm(inch)/7kg(15.43 lbs)
 PFX2512: 214.5(8.45")W×124(4.88")H×400(15.75")Dmm(inch)/7kg(15.43 lbs)
 PFX2532: 429.5(16.91")W×128(5.04")H×550(21.65")Dmm(inch)/17 kg (37.48 lbs)

Accessories

Power cord, 26-core/20-core flat cable, Sensing connector, Thermistor, Lock lever, Operation manual,
 PFX2511/PFX2512: Cable with crimp terminal, PFX2512: LAN cable(2m), PFX2511: Twisted-pair wire with TP-BUS connectors, TP-BUS core, BPChecker2000 setup guide, BPChecker2000 BASIC edition CD-ROM, PFX2532: I/O terminal cover set, I/O terminal M8 screw set, Load input terminal cover set, Ferrite core for 26-core/20-core flat cables, 26-core cable (with ferrite core) for PAT-T, Sensing connector cover set, LAN cable

Options

- Load cable
 TL08-PFX
 Max.50 A, length:5 m Load cable with voltage current, and temperatur sensing cable.
- Sensing cable set
 TL09-PFX (for OP01/02-PFX) approx. 5 m
 TL11-PFX (for OP03-PFX) approx. 5 m
 TL12-PFX* (for OP03-PFX) approx. 3 m
- Cable set
 TL10-PFX* (for PFX2532)
- Voltage/thermometer unit
 OP01-PFX* (for PFX2511)
 Up to 3 boards can be mounted
 OP02-PFX* (for PFX2512/2532)
 Up to 3 boards can be mounted
- Voltage unit
 OP03-PFX* (for SL01-PFX)
 Up to 8 boards can be mounted
- 8 slot unit
 SL01-PFX* (for PFX2512/2532)
- I/F cable
 SC05-PFX (for PLZ-5W)
 SC07-PFX (for PWR-01)
- Application software
 SD002 (for PFX2511)
 BPChecker2000 FULL Edition
 (The 2-channel version is supplied with PFX2511)
 SD007-PFX (for PFX2512/2532)
 BPChecker3000
- Rack mount frame
 KRB3-TOS(EIA) (for PFX2532)
 KRB150-TOS(JIS) (for PFX2532)
 KRA3 (EIA) KRA150 (JIS)



TL08-PFX



TL09-PFX



OP03-PFX



SL01-PFX



SC05-PFX

SC07-PFX

* The CE marked products

Fully support Charge and Discharge Measurement from Basic Test to Simulation Test

PFX2500 Series is a high performance Charge/Discharge system controller that takes measurements in combination with our DC power supply and electronic load in order to evaluate test sample (electric storage elements such as secondary batteries) characteristics. It is also capable to perform evaluation test with high-performance, large capacity and wide range of rating with the combination of DC power supply and electronic load.

Execution of the test is conducted by the exclusive application software. The test corresponds to long time continuous test and synchronization test with temperature chambers with the multiplexed protection performance. In addition, easy data editing is also capable with fulfilling graphic performance.

Features

- Capable of high-precision measurement of cumulative capacities and amount of power as well as voltage and current
- Pattern charging/discharging capabilities by 1000 steps are installed (for PFX2512, 2532)
- Supporting temperature measurement and capable of monitoring temperatures during charging/discharging
- Fully equipped with safety features of the overcharge protection using voltage, electric charge and temperature
- Battery deterioration is prevented by turning off the output after detecting wobbling and shock with vibration sensor
- Capable of seamless charging/discharging (high speed charging/discharging transfer control) (for PFX2512, 2532)
- High speed sampling with maximum 1 ms can be realized (for PFX2512, 2532)
- A 6 V range is newly installed and is capable of high-precision measurement (for PFX2512, 2532)
- LAN as standard interface (for PFX2512, 2532)

The comparison of PFX2500 Series

Item	PFX2511	PFX2512	PFX2532
Rating	60 V / 50 A	60 V / 50 A	60 V / 200 A
Communication interface	TP-BUS (PFX2121 is required for PC connection)	LAN	
Monitoring data minimum time interval	1 s (up to 30 channels), 2 s (more than 30 channels)	0.1 s	
High speed data sampling	-	✓ (Selected form 1 ms/10 ms/ 100 ms maximum 6000 points for every profile)	
Charge/discharge mode	6 modes Charging: CC, CC-CV Discharging: CC, CP, CC-Pulse, CP-Pulse	9 modes Charging: CC, CC-CV(Cell CV Voltage)*1 Discharging: CC, CP,CC-CV(Cell CV Voltage)*1, CP-CV(Cell CV Voltage)*1 Others: Pattern(CC, CP, Cell CV voltage*2), I-V, Pause	
Test condition configuration	Maximum 20 patterns are divided into individual loop setting and total repeat setting with charging and discharging as a pair.	Individual Profile Setting (unlimited) for Charging/Discharging, etc Conditional branching function from charge/discharge results is available.	
Seamless charge/discharge	- (Approx. 2 seconds for charge/discharge transfer time: Depending on the number of channels)	✓ (Response within 50 ms (TYP)*3)	
Rest time control	Fixed time	The time variable by cell temperature	

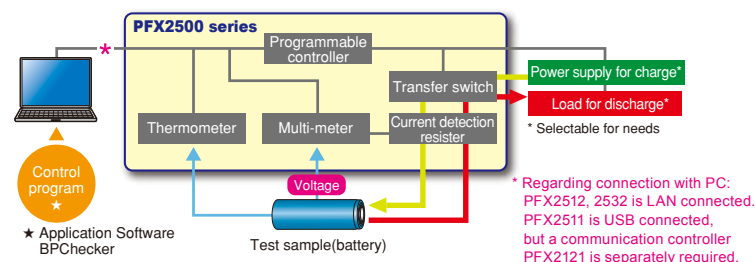
*1 Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed.
 *2 Can be set only when the optional OP02-PFX Volt/Thermometer Unit or OP03-PFX Voltmeter Unit is installed. Step time can be used in more than 500 ms.
 *3 It is defined as the time for the charge/discharge current to change from 10 % to 90 % of the preset value (ratedvalue).

Complicated Systems Integrated into One

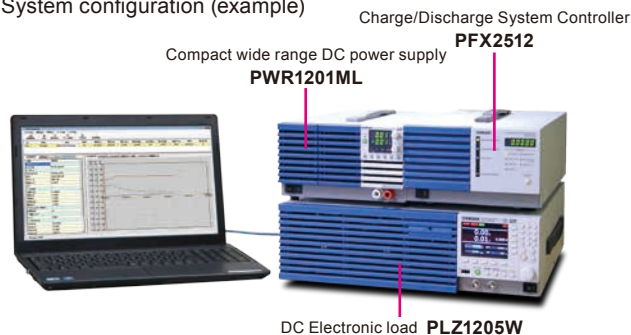
PFX2500 Series has integrated systems into one unit where battery evaluation is required. In addition, the series has high degrees of flexibility corresponding to wide range of rating since it is possible to combine our conventional DC power supply

(for charging) and our electronic load (for discharging) tailored to needs. Introduction cost is able to be reduced by selecting equipment which meets charge/discharge test condition required.

● System conceptual diagram



● System configuration (example)



[Applied configuration (model ID)]

Model ID is used for combination of the selected power supply and electronic load if you wish to have a combination that is not on the available model ID list, please consult with us. More model IDs will be added in future. The latest information for the system configuration is available on our website.

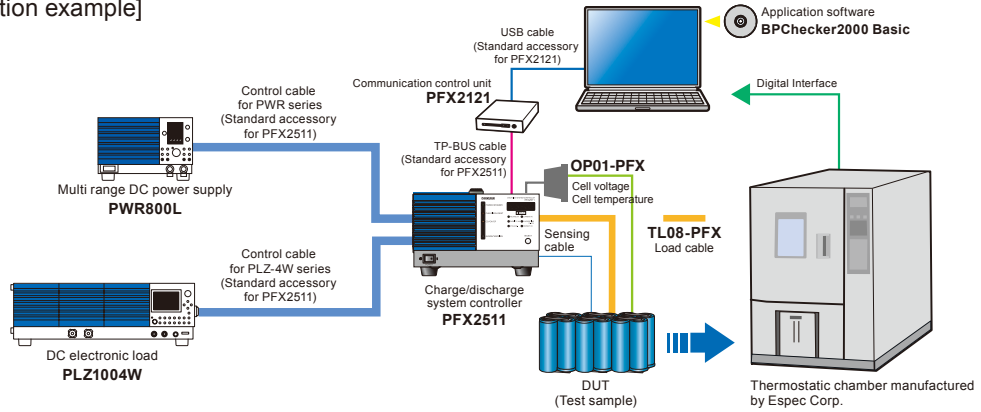
Model ID		Power supply for charge	Electronic load for discharge	Model ID		Power supply for charge	Electronic load for discharge
PFX2511	PFX2512			PFX2511	PFX2512		
5101	7101	PWR800L	PLZ1004W *2	7151		PWR401L	PLZ205W *2
5102	7102	PWR800L	PLZ1004W *1	7152		PWR401ML	PLZ205W *2
5103	7103	PWR1600L	PLZ1004W(2 units in parallel)*2	7153		PWR401L	PLZ405W *2
5104	7104	PWR800L	PLZ334W *2	7154		PWR401ML	PLZ405W *2
5105 *4	7105 *4	PAT60-67T	PLZ1004W+2000WB *1	7155		PWR801L	PLZ1205W *2
5106	7106	PWR1600L	PLZ1004W *2	7156		PWR801ML	PLZ1205W *2
5107	7107	PAS10-70	PLZ1004W *2	7157		PWR1201L	PLZ1205W *2
5108	7108	PAS20-36	PLZ1004W *2	7158		PWR1201ML	PLZ1205W *2
5109	7109	PAS20-54	PLZ1004W *2	7159		PWR1201ML	PLZ1205W(2 units in parallel)*2
5110	7110	PAS40-27	PLZ1004W *2	7160		PWR1201ML	PLZ1205W+2405WB *1
5111	7111	PWR800L	PLZ164W / WA *2	Model ID		Power supply for charge	Electronic load for discharge
5112	7112	PAS10-35	PLZ334W *2	PFX2532			
5113	7113	PWR400L	PLZ164W / WA *2	7301		PWR1600L (2 units in parallel)	PLZ1004W*2 + 2004WB
5114	7114	PWR400L	PLZ1004W *2	7302		PAT60-133T	PLZ1004W*2 + 2004WB x 2 (2 units in parallel)*3
5115	7115	PWR800L	PLZ1004W+2004WB *1	7303		PAT40-200T	PLZ1004W*2 + 2004WB x 2 (2 units in parallel)*3
5116	7116	PAS20-36	PLZ334W *2	7304		PAT40-200T	PLZ1004W*2 + 2004WB
5117		PAS40-9	PLZ334W *2	7305		PWR1600L	PLZ1004W*2
5118	7118	PWR800L	PLZ664WA *2	7306		PAT40-200T	PLZ1004W*2
5119	7119	PWR1600L	PLZ1004W+2004WB *1	7307		PWR1601L	PLZ1004W*2 x2 (2 units in parallel)
5120		PAS60-18	PLZ1004W *2	7351		PWR1201L	PLZ1205W *2
	7121	PWR400L	PLZ334W *2	7352		PWR1201L	PLZ1205W*2 x 2
5122		PAS60-12	PLZ1004W *2	7353		PAT60-133T	PLZ1205W*2 + 2405WB x 2
5123		PWR400L	PLZ664WA *2	7354		PAT40-200T	PLZ1205W *2
5124		PAS40-9	PLZ1004W *2	7355		PAT40-200T	PLZ1205W*2 + 2405WB
5125		PWR1600L	PLZ664WA *2	7356		PAT40-200T	PLZ1205W*2 + 2405WB x 2
	7122	PAS60-12	PLZ664WA *2	7357		PAT40-200T	PLZ1205W*2 + 2405WB x 3
	7123	PWR400L	PLZ664WA *2	7358		PAT40-200T	PLZ1205W*1 + 2405WB x 4
	7124	PAS40-9	PLZ1004W *2	7359		PAT80-100T	PLZ1205W*1 + 2405WB x 4
	7125	PWR1600L	PLZ664WA *2				
	7126	PWR801L	PLZ1004W *2				
	7127	PWR801ML	PLZ1004W *2				
	7128	PWR1201ML	PLZ1004W *2				

*1. M range
*2. H range
*3. Can be replaced with the Kikusui SR Large Capacity Electronic Load Smart Rack System PLZ5004W.
*4. A separate cable is required. For details, contact your Kikusui agent or distributor.

*A SC07-PFX (optional) is necessary to connect the PWR-01 series with the PFX2500 series.

*A SC05-PFX (optional) is necessary to connect the PLZ-5W series with the PFX2500 series.

[2511 System Configuration example]
(model ID : 5101)

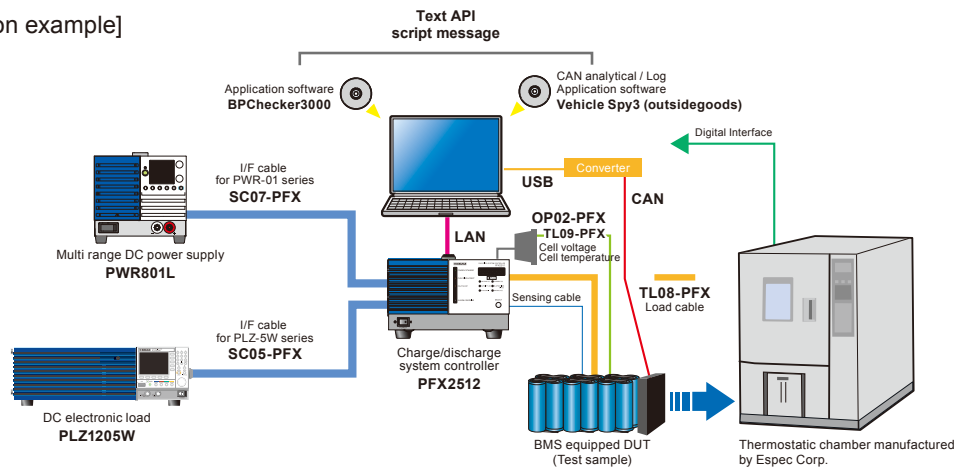


Comprehensive management from test condition setting to execution and data analysis on test results by PFX2511 exclusive application software, BPChecker2000 BASIC

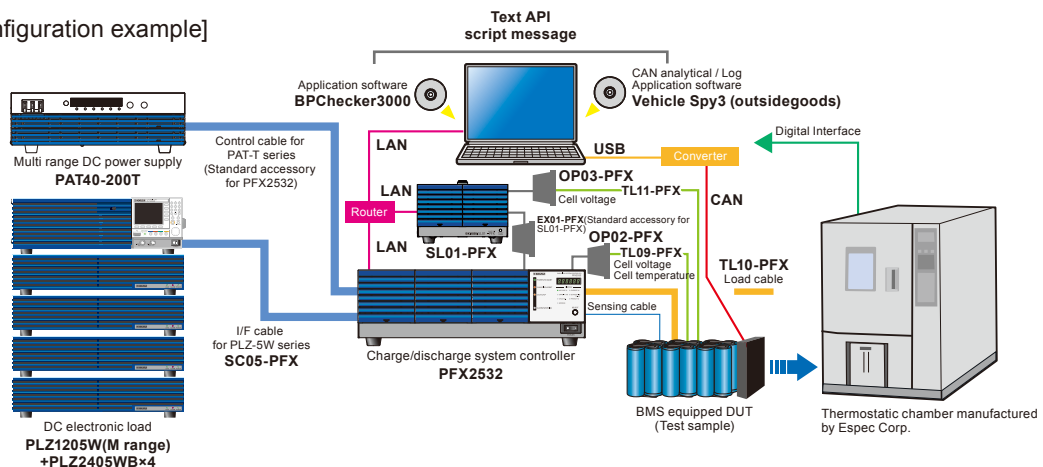
The application software, BPChecker2000, can manage all processes from creating the test condition file to output of the test result file. Setting and execution of conditions for battery charge and discharge characteristics test and an analysis of test results can be performed on the PC. In addition, in an environment where an RS485-USB (or RS232C) converter can be controlled, it can externally control the temperature chambers manufactured by ESPEC, and it allows to synchronize with the temperatures in the chamber.

* The control of BPChecker2000 Basic supplied with PFX2511 is limited to 2 channels. BPChecker2000 FULL Edition with no function limit is sold separately.

[2512 System Configuration example]
(model ID : 7155)



[2532 System Configuration example]
(model ID : 7358)



Comprehensive management from test condition setting to execution and data analysis on test results by PFX2512, 2532 exclusive application software, BPChecker3000

The application software, BPChecker3000 (SD007-PFX), is the new capability of PFX2512, 2532 where test condition and graphical drawing function are emphasized on existing BPChecker2000. This is the PFX2512, 2532 exclusive application software which realized [Seamless Charge/Discharge] and [High Speed Data Sampling]. At the test condition setting, the test condition (project) is created from database compiled charge/discharge condition (profile). The test execution shows that graphical display function is emphasized in its extraction and overwriting functions for larger data integration. In addition, synchronization operation with temperature chambers is capable and the charge/discharge test is comprehensively controlled including temperature control under test environment. Further, correspondence will also be capable working together with [CAN Bus] for which demand will be increased accompanied by the technical development of battery management in future.

Unless otherwise specified, specifications should pursuant to the following settings and conditions.

- * Warm-up time should be 30 minutes.
- * TYP Value indicates typical values. Not assuring performance.

- * "reading" shows readout value.
- ** "set" indicates setting value.
- ** "rating" indicates rating.

PFX2500 Series Specifications

Rated Output	PFX2511	PFX2512	PFX2532
Number of output	1 ch	1 ch	1 ch
Charging current range *1	0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
Charging voltage range *1	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V
Discharge current range *1	0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
Discharge voltage range *1 *2	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V

*1 The range varies depending on factors such as the connected DC power supplies and electronic loads, the wiring configuration of the system, and the charge/discharge operation.

*2 The minimum voltage that can be discharged varies depending on factors such as the connected electronic load models and the wiring configuration.

Setting Accuracy	PFX2511	PFX2512	PFX2532	
Static				
Constant current charge/discharge	Range *3	0.000 A to 50.000 A	0.000 A to 50.000 A	0.000 A to 200.000 A
	Accuracy *4	*5	*5	*5
	Resolution	1 mA	1 mA	1 mA
Constant voltage charging	Range 60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V	0.000 V to 60.000 V
	6 V range	—	0.000 V to 6.000 V	0.000 V to 6.000 V
	Accuracy *4	*5	*5	*5
Constant power discharging	Range *3	0.10 W to 3000.00 W	0.10 W to 3000.00 W	1 W to 12000 W
	Accuracy *4 *6	*5	±(0.5% of set + 1 W) *9	±(0.5% of set + 10 W) *9
	Resolution *7	100 mW	10 mW	1 W

Pulse				
Constant current discharging	Range *3	0.000 A to 50.000 A	—	—
	Accuracy *4	*5	—	—
	Resolution	1 mA	—	—
Time width	Range	5.0 ms to 65000.0 ms	—	—
	Accuracy *4 *8	±(0.05% of set + 0.05 ms)	—	—
	Resolution	100 µs	—	—
Constant power discharging	Range 60 V range	0.1 W to 3000.0 W	—	—
	6 V range	—	—	—
	Accuracy *4 *6	*5	—	—
Time width	Range	5.0 ms to 65000.0 ms	—	—
	Accuracy *4 *8	±(0.05% of set + 0.05 ms)	—	—
	Resolution	100 µs	—	—

Pattern *10				
Pattern constant current	Range *3	—	-50.000 A to 50.000 A	-200.000 A to 200.000 A
	Accuracy *4	—	*5	*5
	Resolution	—	1 mA	1 mA
Time width	Range	—	10000 values (Maximum number of steps)	10000 values (Maximum number of steps)
	Accuracy *4	—	±(0.05% of set + 10 ms)	±(0.05% of set + 10 ms)
	Resolution	—	100 ms	100 ms
Pattern constant power	Range *3	—	-3000.00 W to 3000.00 W	-12000 W to 12000 W
	Accuracy *4	—	±(0.5% of set + 1 W) *9	±(0.5% of set + 10 W) *9
	Resolution	—	10 mW	1 W
Time width	Range	—	10000 values (Maximum number of steps)	10000 values (Maximum number of steps)
	Accuracy *4	—	±(0.05% of set + 10 ms)	±(0.05% of set + 10 ms)
	Resolution	—	100 ms	100 ms

*3 Range might be different depending on DC power supply to be connected, model of electronic load, wiring situation, etc.

*4 Ambient temperature at 18 °C to 28 °C

*5 External equipment is controlled so as to Measurement Value being equal to Set Value by the software control.

*6 60 V range = At battery voltage above 5 V, 6 V range = at above 0.5 V

*7 Voltage activation range for constant power discharge: 5 V to 60 V (assured value)

*8 Measure time after setting trigger at the half position (1/2) of pulse width (current amplitude)

*9 With battery voltage of 2 V or more. The battery voltage is measured, and the control current (constant current control) is calculated from the set power value through software calculation. The time required to process one calculation (from the voltage measurement to the output setting) is approximately 1 ms.

*10 The operating voltage range is 1 V or more (when the TL08-PFX is being used; regardless of whether a bias power supply is being used).

Measurement Accuracy	PFX2511	PFX2512	PFX2532	
Static				
Charge / discharge current measurement	Range *11	0.0000 A to 50.0000 A	0.0000 A to 50.0000 A	0.000 A to 200.000 A
	Accuracy *12 *13	±(0.15% of reading + 0.02% of rating)	±(0.15% of reading + 0.02% of rating)	±(0.2% of reading + 0.1% of rating)
	Resolution	0.1 mA	0.1 mA	1 mA
Voltage measurement	Range 60 V range	-6.0000 V to 60.0000 V	-6.0000 V to 60.0000 V *14	-6.0000 V to 60.0000 V *14
	6 V range	—	-1.0000 V to 6.0000 V *15	-1.0000 V to 6.0000 V *15
	Accuracy *12 *13 *16	±(0.05% of reading + 0.02% of rating)	±(0.05% of reading + 0.02% of rating)	±(0.05% of reading + 0.02% of rating)
Resolution *16	0.1 mV	0.1 mV	0.1 mV	

Measurement Accuracy	PFX2511	PFX2512	PFX2532	
Static				
Power measurement	Range	—	0.000 W to 3000.000 W	0.0 W to 12000.0 W
	Accuracy	—	Software calculation (Voltage measurement × current measurement)	
	Resolution	—	1 mW	100 mW
Capacity calculation	Range	0.000 Ah to 2000.000 Ah	0.000 Ah to 2000.000 Ah	0.000 Ah to 2000.000 Ah
	Accuracy *12 *13	Rely on the current measuring accuracy and the time accuracy		
	Resolution	0.1 mAh	1 mAh	1 mAh
Time *17	Accuracy *12 *18	±10 ppm (TYP)	±10 ppm (TYP)	±10 ppm (TYP)

Pulse				
Charge / discharge current	Range	0.0000 A to 50.0000 A	—	—
	Accuracy *12 *13	±(0.2% of reading + 0.03% of rating)	—	—
	Resolution	0.1 mA	—	—
Battery voltage	Range	0.0000 V to 60.0000 V	—	—
	Accuracy *12 *13	±(0.05% of reading + 0.02% of rating)	—	—
	Resolution	0.1 mV	—	—
Measurement	High voltage	Indicates the maximum battery voltage in one cycle of the pulse setting.	—	—
	Low voltage	Indicates the minimum battery voltage in one cycle of the pulse setting.	—	—
	Arbitrary	At the specified pulse point	—	—
Capacity calculation	Range	0.0000 Ah to 2000.0000 Ah	—	—
	Accuracy *12 *13	Rely on the current measuring accuracy and the time accuracy		
	Resolution	0.1 mAh	—	—
Time *17	Accuracy *12 *18	±10 ppm (TYP values)	—	—

Pattern				
Charge / discharge current	Range *11	—	-50.0000 A to 50.0000 A	-200.000 A to 200.000 A
	Accuracy *12	—	±(0.2% of reading + 0.03% of rating)	±(0.2% of reading + 0.1% of rating)
	Resolution	—	0.1 mA	1 mA
Voltage measurement	Range 60 V range	—	-6.0000 V to 60.0000 V *14	-6.0000 V to 60.0000 V *14
	6 V range	—	-1.0000 V to 6.0000 V *15	-1.0000 V to 6.0000 V *15
	Accuracy *12	—	±(0.05% of reading + 0.02% of rating)	±(0.05% of reading + 0.02% of rating)
Power measurement	Range	—	-3000.000 W to 3000.000 W	-12000.00 W to 12000.00 W
	Accuracy *12	—	Software calculation (Voltage measurement × current measurement)	
	Resolution	—	1 mW	10 mW
Capacity calculation	Range	—	-2000.000 Ah to 2000.000 Ah	-2000.000 Ah to 2000.000 Ah
	Accuracy *12	—	Rely on the current measuring accuracy and the time accuracy	
	Resolution	—	1 mAh	1 mAh
Time *17	Accuracy *12 *18	—	±10 ppm (TYP)	±10 ppm (TYP)

High speed sampling				
Current measurement	Range *19	—	-50.0000 A to 50.0000 A	-200.000 A to 200.000 A
	Accuracy *12 *19 *20	—	±(0.2% of reading + 0.5% of rating)	±(0.4% of reading + 0.5% of rating)
	Resolution	—	0.1 mA	1 mA
Voltage measurement	Range 60 V range	—	-6.0000 V to 60.0000 V	-6.0000 V to 60.0000 V
	6 V range	—	-1.0000 V to 6.0000 V	-1.0000 V to 6.0000 V
	Accuracy *12 *19 *20	—	±(0.1% of reading + 0.1% of rating)	±(0.1% of reading + 0.1% of rating)
Resolution *16	1 ms sampling	—	±(0.1% of reading + 0.05% of rating)	±(0.1% of reading + 0.05% of rating)
	10 ms sampling	—	±(0.05% of reading + 0.02% of rating)	±(0.05% of reading + 0.02% of rating)
	100 ms sampling	—	±(0.05% of reading + 0.04% of rating)	±(0.05% of reading + 0.04% of rating)

*11 Measurable range: PFX2512/-52.500 A to 52.500 A (TYP value) However, accuracy outside of the range is not assured. PFX2532/-210.000 A to 210.000 A (TYP value) However, accuracy outside of the range is not assured.

*12 Ambient temperature at 18 °C to 28 °C

*13 Measurable range: Within the above listed range

*14 Measurable range: -6.500 V to 65.000 V (TYP value) However, accuracy outside of the range is not assured.

*15 Measurable range: -6.500 V to 6.500 V (TYP value) However, accuracy outside of the range is not assured.

*16 Common with 6 V/60 V ranges

*17 Accuracy of the elapsed time (Cutoff condition) when charging / discharging or resting.

*18 Monthly error: approximately 30 seconds

*19 Accuracy outside of the rating output range is not assured.

*20 Fluctuation due to ripple noise of power supply and AC line noise (50 Hz/60 Hz) are not included.

PFX2500 Series Specifications

*Thermistor 103AT-2 (by SEMITEC Corporation) is used for the temperature detector.

Temperature measurement	PFX2511	PFX2512	PFX2532
Resistor (temperature) measuring section *1			
Measurement range		-40.0 °C to 100.0 °C	
Measurement resolution		0.1 °C	
Measurement accuracy *2 *3		± 0.5 °C (measurement temperature at 0 °C to 40.0 °C) ± 1 °C (measurement temperature at -20 °C to 80 °C)	
Reference (thermistor 103AT-2)			
Part name		Thermistor (103AT-2, SEMITEC Corporation)	
R25		10.0 kΩ, Nominal zero-power resistor value at 25 °C	
Operating temperature range		-50.0 °C to 110.0 °C	
Temperature accuracy *3		± 0.5 °C (measurement temperature at 0 °C to 40.0 °C)	
Tolerance		± 1 %	
Constant-B		3435 K ± 1 % (measurement temperature at 25 °C)	

*1 The temperature measurement does not mean tracing absolute temperature. Resistor to temperature conversion value

*2 Error of temperature detecting element is excluded.

*3 Ambient temperature at 18 °C to 28 °C

Protection Functions	PFX2511	PFX2512	PFX2532
Overvoltage (overcharge) protection		Software OVP, Hardware OVP	
Undervoltage (overdischarge) protection		Software UVP, Hardware UVP	
Overcurrent protection	Software OCP *1, Hardware OCP		Load shorting protection
Capacity (overcharge/overdischarge) protection		Software OAH *2	
Overtemperature (DUT) protection		Software OTP	
Vibration alarm			

*1 For the software OCP, the application software automatically sets a value obtained by adding 5 A to the preset current.

*2 The application software calculates the value by multiplying the nominal capacity by the preset percentage and sets the capacity.

General Specifications	PFX2511	PFX2512	PFX2532
Nominal input rating	100 Vac to 240 Vac, 50 Hz/60 Hz		
Input voltage range	90 Vac to 250 Vac		
Power consumption	60 VAm _{ax} OP01-PFX 3 boards installed: 80 VAm _{ax}	60 VAm _{ax} OP02-PFX 3 boards installed: 80 VAm _{ax}	60 VAm _{ax} OP02-PFX 3 boards installed: 80 VAm _{ax}
Operating temperature/humidity range	0 °C to 40 °C, 20 % rh to 85 % rh (No condensation)		
Storage temperature/humidity range	-10 °C to 60 °C, 0 % rh to 90 % rh (No condensation)		
Operating environment	Indoors, Overvoltage category II		
Altitude	Up to 2000 m		
Isolation voltage	Across the I/O terminals and chassis ± 70 V _{max}		
Insulation resistance	Primary and chassis 500 Vdc, 30 MΩ or greater, 70 % rh or less		
Withstand voltage	Primary and chassis 1500 Vac, No abnormalities over 1 minute		
Safety *1	Compliant with the requirements in the following standard. Low voltage directive 2014/35/EU EN61010-1 (Class I *2, Pollution degree 2)		
Electromagnetic compatibility(EMC) *1	Compliant with the requirements in the following standard. EMC Directive 2014/30/EU EN61326-1 (Class A *3), EN55011 (Class A *3, Group 1 *4), EN61000-3-2, EN61000-3-3		

Accessories	Power cord		
	1 pc		
	Cable with crimp terminal	4 pcs. (Red: 2 pcs, White: 2 pcs) 45 cm each (17.72 inch)	-
	I/O terminal cover set	-	Three terminal covers, six cable ties for locking
	I/O terminal M8 screw set	-	6 sets
	Load input terminal cover set	-	Cover, four auxiliary bands
	26-core flat cable	1 pc	
	20-core flat cable	1 pc	
	26-core cable (for PAT-T)	-	1 pc
	Twisted pair cable with TP-BUS connector	1 pc (1 m)	-
	Sensing connector	1 pc	
	Sensing connector cover set	-	One cover set, one cable tie for locking
	Thermistor	1 pc	
	Lock lever	2 pcs	
	LAN cable	-	1 pc (2 m)
	Operation manual	1 copy	
	BPChecker2000 Setup guide	1 copy	-
	BPChecker2000 Basic Edition CD-ROM	1 pc	-

*1 Limited to the product with CE marking on panel. Not applied to specially ordered or modified articles.

*2 This product is the Class I equipment. Please be sure to connect the protection conductor terminal of product to ground. If not correctly connected to ground, safety is not guaranteed.

*3 This product is the Class A equipment. It is aimed to use the product under the industrial environment. If this product is used in housing area, it might be the cause of interference. If it is the case, special action to reduce electromagnetic radiation might be required for users in order to prevent receiving interference.

*4 This product is the Group 1 equipment. The product does not generate/use radio frequency energy in the form of electromagnetic radiation, induction and/or static coupling intentionally for material processing or inspection/analysis.

Voltage/thermometer unit OP01-PFX / OP02-PFX

Cell Voltage measurement	OP01	OP02
Static		
Number of measurement terminals	4	
Measurable range *1	-2.0000 V to 20.0000 V	
Accuracy	±(0.05% of rdng + 0.02% of f.s)	
Measurement resolution *2	0.1 mV	
Measurement value	Average voltage of the every 500 ms	Average voltage of the every 100 ms
Measurement interval	500 ms	100 ms
Pulse		
Number of measurement terminals	4	
Measurable range *1	-2.0000 V to 20.0000 V	
Accuracy	±(0.05% of rdng + 0.02% of f.s)	
Measurement resolution *2	0.1 mV	
Measurement value *3	High voltage	Maximum voltage in one cycle
	Low voltage	Minimum voltage in one cycle
	user-specified	-
Measurement interval *4	1 ms	
Cell Temperature measurement *5		
Number of measurement terminals	4	
Thermocouple type	K type	
Measurable range *6	-100.0 °C to 400.0 °C	
Measurement resolution *7 *8	±1.5 °C (TYP values)	
Reference junction compensation *7 *9	±0.5 °C (TYP values)	
Accuracy	0.1 °C	

*1 You can apply a voltage from -20 V to 22 V.

*2 Ambient temperature at 18 °C to 28 °C

*3 Automatically synchronized with the BPChecker2000 pulse setting (specify two points from high voltage, low voltage, and user-specified).

*4 The application software records data every second.

*5 The temperature scale conforms to JIS C 1602-1995 (ITS-90). (ITS-90 is an international temperature scale.)

*6 Depending on your thermocouple's specifications (thermocouple class, wire diameter and insulation), the usable temperature range will vary.

*7 Ambient temperature at 18 °C to 28 °C.

*8 When the voltage that the thermocouple calibrator produces is measured.

*9 This shows the internal sensor performance. This indicates the temperature measurement accuracy of the thermocouple connector. Thermometer accuracy = Measurement accuracy + reference junction compensation + thermocouple tolerance

Voltmeter unit OP03-PFX

Cell voltage measurement	
Number of measured terminals	8
Measurement range *1	-2.0000 V to 20.0000 V
Measurement accuracy *2	±(0.05 % of reading + 0.02 % of rating)
Resolution	0.1 mV
Measured value	Average voltage every 100 ms
Measurement interval	100 ms

*1 You can apply a voltage from -20 V to 22 V.

*2 Ambient temperature at 18 °C to 28 °C.

8Slot unit SL01-PFX

Number of slots	8	
Compatible boards *1	Voltmeter Unit OP03-PFX	
Interface	LAN(Ethernet) PC connection	Sync connector EX01-PFX connection
Input voltage range	90 Vac to 250 Vac, 50 Hz/60 Hz	
Power consumption	when 8 OP03-PFXs are installed: 80 VAm _{ax}	
Operating temperature and humidity range	0 °C to 40 °C, 20 %rh to 85 %rh (no condensation)	
Dimensions (mm (inch))	214.5(8.44) W × 155(6.10) H × 410(16.14) Dmm	
weight	Approx. 5 kg (11.02 lb)	
Accessories	Power cord/100 V System (1 pc.)	
	Power cord/200 V System (1 pc.)	
	EX01-PFX (1 pc.) extension board (for installing in a PFX2512/2532 slot)	
	LAN cable (1 pc.) 2m Straight type	
	14-core flat cable (1 pc.)	
	Ferrite core for 14-core flat cable (1 pc.)	
	Lock lever (2 pcs.)	
	Handling of the product (1 copy)	

*1 OP02-PFX cannot be installed.