



6241A/6242 DC Voltage Current Source/Monitor

High performance DC Voltage/Current Source/Monitor with pulse generation down to 50 μ s pulse width

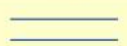

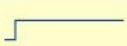
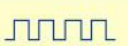


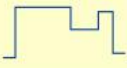

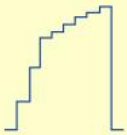

- Wide range of generation and measurement
6241A Voltage: ± 32 V Current: ± 500 mA
6242 Voltage: ± 6 V Current: ± 5 A
- High source/measurement resolution
Source: 10 μ V/1nA Measurement: 1 μ V/100pA
- Basic accuracy: $\pm 0.02\%$
- Minimal pulse width: 50 μ s with 1 μ s resolution
- Two-slope linear sweep function
- Sink enabled bipolar output
- GPIB/USB interfaces as a standard



Source Modes

6241A/42 is DC voltage and current source/monitor with high-performance features including source resolution of $4\frac{1}{2}$ digits, measuring resolution of $5\frac{1}{2}$ digits, and a basic accuracy of 0.02%. It has extensive pulse generation and measurement functions including sweep and pulsed sweep. 6241A/42 can generate pulse widths down to $50\mu\text{s}$ and can measure with a resolution down to $1\mu\text{V}/100\text{pA}$. So this product can be used for a wide range of applications, e.g. as a power source for evaluations in research and development of semiconductors and other electronic components, or as a power source for a production line characteristic test system. 6241A/42 is very well suited for the evaluation of solar cell characteristics. At the same time, the individual HI/LO limiter setting function demonstrates its power in evaluation of batteries and power source ICs. Its suspend function enables the selection of the optimal OFF state depending on the specific requirement of each application. 6241A/42 is equipped with GPIB and USB interface in standard.

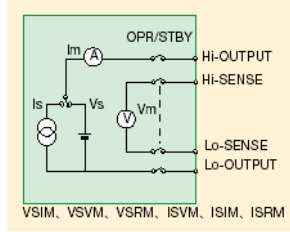
6241A/42 has four source modes – DC, Pulse, DC sweep and Pulse sweep. The sweep can be selected from three types: Fixed, Linear and Random. Using the Linear sweep mode enables the definition of two different step widths, so that a so called Two-slope Linear Sweep can be generated, which is useful for non-linear parameter tests. The device can generate minimal pulse widths down to $50\mu\text{s}$ and minimal periods down to $500\mu\text{s}$. If the measurement is enabled for the storage of the sampled data into the internal sample buffer, the minimum step width is 2ms.

	DC	PULSE
Continuous Spot		
Fixed Sweep		
Linear Sweep		
Random Sweep		
Two-slope Linear Sweep		



Source and Measurement Functions

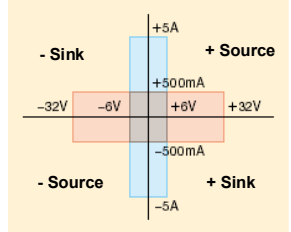
Current, voltage or resistance measurements can be made in voltage source mode as like as in current source mode.



Output range

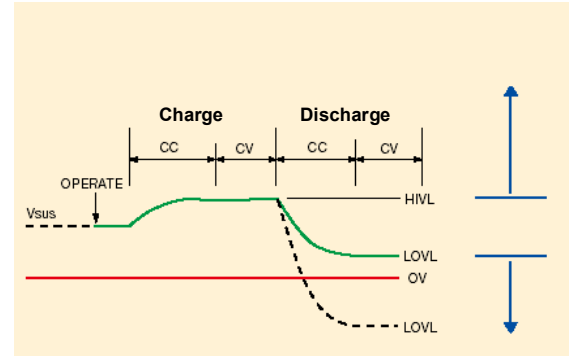
6241A: 0 to $\pm 32V$
0 to $\pm 500mA$

6242: 0 to $\pm 6V$
0 to $\pm 5A$



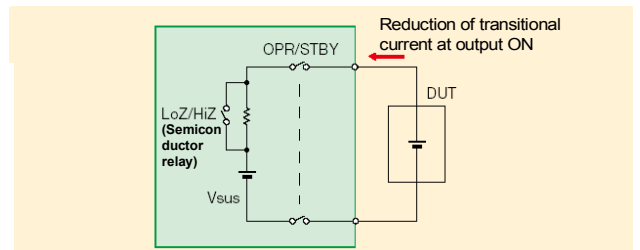
Individual HI/LO Limiter settings

During voltage and current generation, the HI / LO limiter setting is extremely important. When using as a current source the voltage limiter (compliance voltage) is more than a must. Further the voltage limiter protects against over voltages from outside. When a battery is charged in current source mode, the voltage limiter (HIVL) is applied to switch-over from CC to CV charge. During battery discharge in current source mode, the voltage limiter (LOVL) is applied at the same polarity to prevent excessive battery discharge. In case of setting the voltage limiter (LOVL) to a negative value the 6241A/6242 can be used for evaluations of Load Dump or reverse power capabilities.



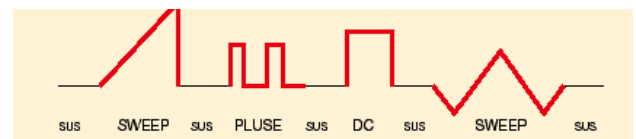
Suspend Function

6241A/6242 supports three output OFF states: STBY (output relay OFF), HiZ (output relay ON, high resistance state), LoZ (output relay ON, low resistance state). This eliminates the unnecessary ON/OFF operations of the relay, thereby solving the existing throughput deterioration problem by relay operation time. In addition, the setting of a specific suspend voltage (voltage at HiZ or LoZ state), which is different to 0V, prevents transitional current suction that could occur at connection of a voltage output device such as a battery.



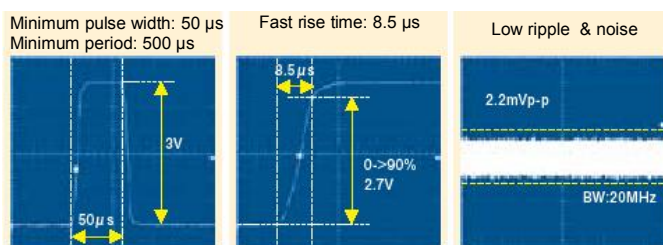
State at output OFF	Output relay	Output state	Current limiter setting value
LoZ	ON	V_{SUS} , low resistance	VS: set Current Limiter (IL) IS: 30 digits of the set current range
HiZ	ON	V_{SUS} , high resist.	30 μA
STBY	OFF	Open	-

V_{SUS} : Suspend setting voltage (default = 0V)



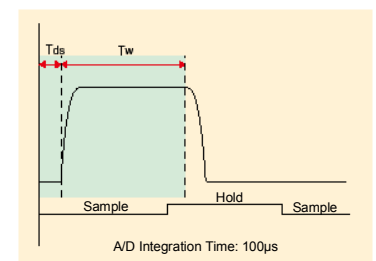
Fast response combined with low noise

6241A/42 has low noise combined with fast output response behaviour. A 0-3V voltage step can typical be realized within 8.5 μs (0 to 90% rise). The output noise is about 2.2mV_{pk-pk} at a measurement bandwidth of DC to 20MHz.



Measuring in Sample & Hold Mode

A special Sample & Hold mode can be selected within Pulse or Pulse Sweep mode. The measured sample is hold before pulse falling edge. The integration time of the A/D converter is set to 100 μs in this mode.

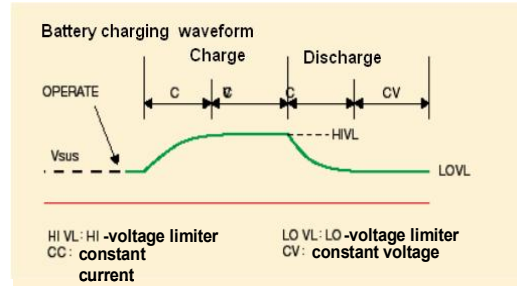
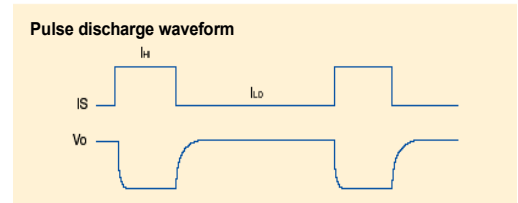
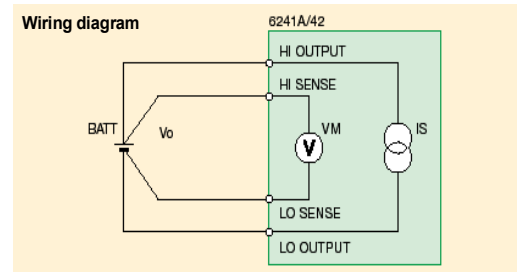


Applications

Battery charge and discharge test at evaluations of power supply devices

6241A/42 handles bipolar operation and is capable for \pm source and \pm sink operation. Therefore, this equipment can make 0V sink operation, which is not possible with usual electronic loads. With its pulse source function, the 6241A/42 can be used for evaluations of batteries and power supply devices, that are used for various portable devices, as pulse load.

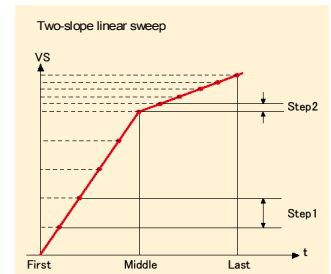
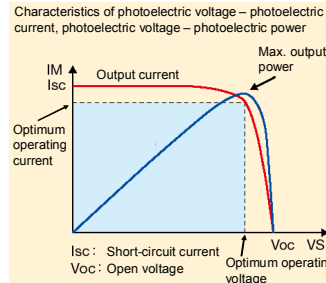
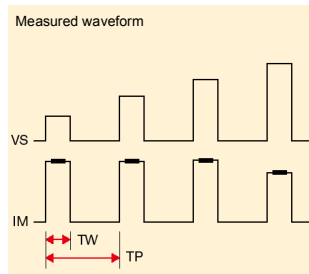
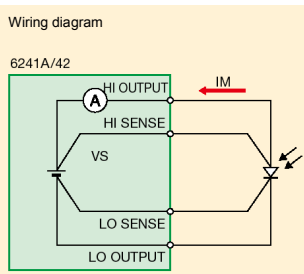
- Capable of handling pulses with minimum pulse width of $50\mu\text{s}$ and resolution of $1\mu\text{s}$, applicable for various of mobile devices
 - Capable of CV \Rightarrow CC operation for both charging and discharging due to its HI and LO voltage limiters
- Both the HI and LO voltage limiter allow the "+" setting (or "-" setting). For instance, if HI is set to +1.8V and LO is set to +1.2V, at charging, the constant voltage state is reached at +1.8V and at discharging, the constant discharge terminates at +1.2V (constant voltage state).
- Avoids unnecessary discharge at the output ON state by setting a Suspend voltage (V_{sus}). A usual power supply is 0V or at an open state when output is OFF and when output is ON, a low impedance state of 0V always occurs. In this case, the battery discharges instantaneously. However, for instance by setting the Suspend voltage to +1.2V, unnecessary discharge can be avoided since the voltage of the output terminals is the same as that of the battery, which is +1.2V, even in a temporary low impedance state that occurs when the output is ON. This function is useful for preventing FET from being set to ON instantaneously at the output ON state when it is used as a gate voltage of J-FET or GaAsFET.



For evaluation of solar cells

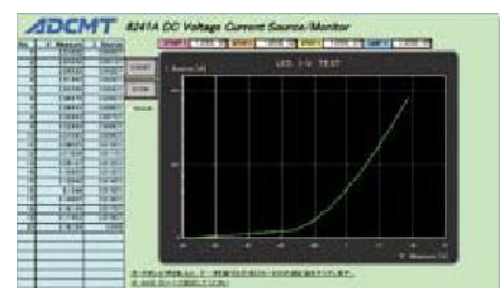
Since the conversion efficiency of solar cells is influenced by the bias application time, measurement by pulse application is effective for finding a true conversion efficiency. 6241A/42 pulse sweep function enables measuring of the characteristics of photoelectric voltage versus photoelectric current and photoelectric voltage versus photoelectric power at a high speed. By changing the pulse width, characteristic changes, that occur according to the application time, can be measured easily. Further, the step width can be changed during measuring near the optimum operation voltage, if two-slope linear sweep is selected. So more details can be seen.

- Minimum pulse width: $50\mu\text{s}$, Minimum period: 2ms in pulse measurement
- Minimum voltage step: $10\mu\text{V}$ (300mV range)
- Two-slope linear sweep: in between First to Middle \Rightarrow Step1; in between Middle to Last \Rightarrow Step2



Equipped with a standard USB interface

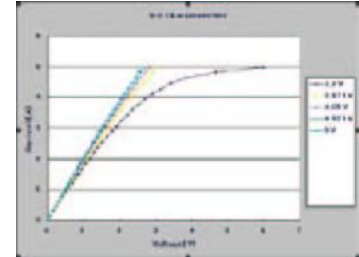
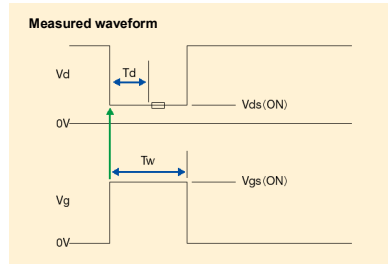
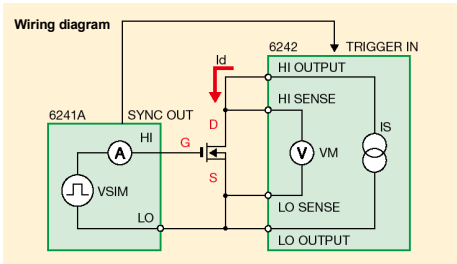
In addition to the standard GPIB interface an USB interface is built-in. So it can be easy connected to a PC, and the measurement data can be exported to Excel or to other software. An USB driver software with samples can be downloaded from the website.



For measuring the ON resistance of MOSFET and analog SW

An example for measuring the ON resistance of a MOSFET is shown below. On the drain side, by applying ISVM and 4-wire connection, the 6242 determines the current at the ON state with the current source (IS) and the drain voltage at the OFF state with the voltage limiter. On the gate side, by applying 6241A in VSIM operation, the SYNC OUT signal is input to TRIGGER IN of 6242 (ISVM pulse source) for synchronization of the two measurements. By using linear, pulse, or sweep function on the gate side, gate voltage versus ON resistance characteristics can be measured easily.

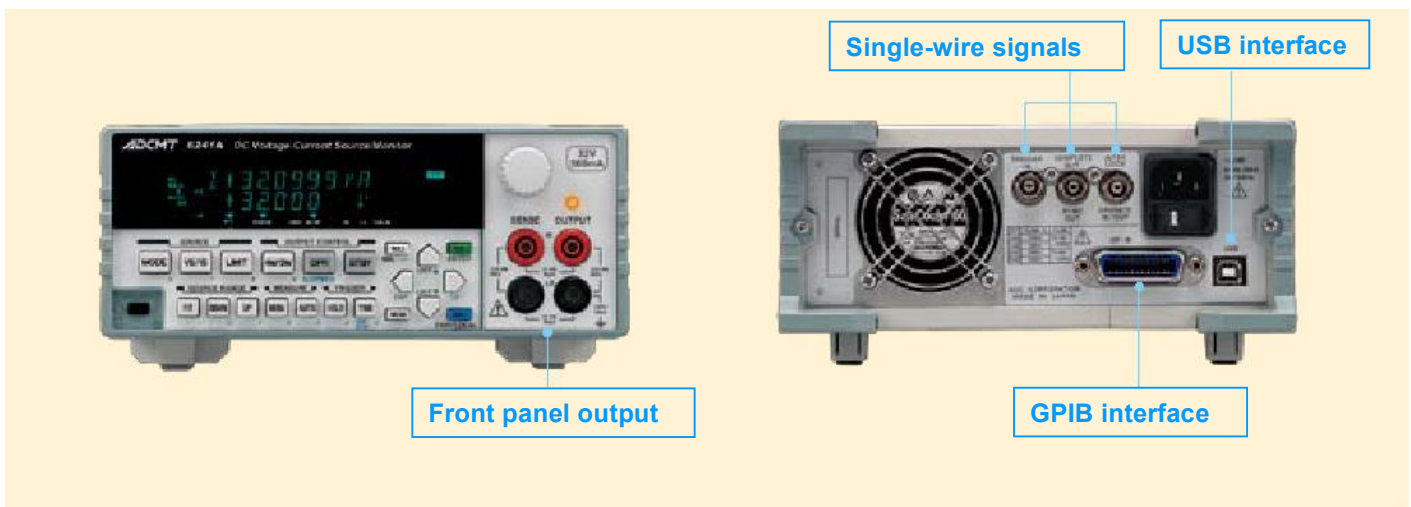
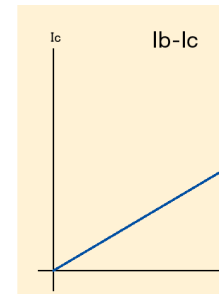
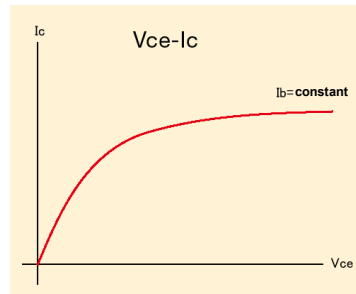
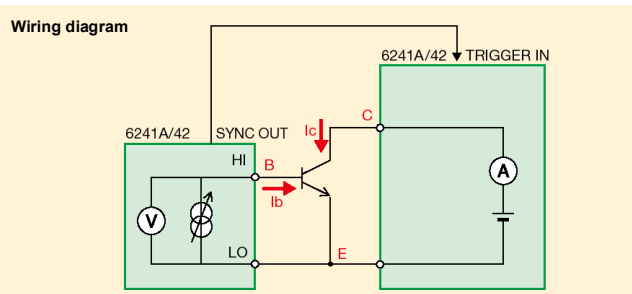
- Resistance range: 6241A : $2\mu\Omega$ to $1.6G\Omega$
6242: $0.2\mu\Omega$ to $304M\Omega$
 - Maximum current: 6241A: 500mA
6242: 5A
 - minimum pulse width: $50\mu s$, minimum period: 2ms in pulse measurement
 - current measurement resolution at gate: $100pA$
- In addition, the specifications of synchronous measurement is compatible with 6240A.



DC characteristics of transistor and FET

Two instruments are used to measure the DC characteristics of a transistor. Both units will be synchronized by using the SYNC OUT of the first unit which measures the base current (I_b) and the TRIGGER IN of the 2nd unit which supplies V_{ce} and measures collector current (I_c). In this mode (I_b) will be a sweep for getting the I_b - I_c characteristics. At $V_{ce} - I_c$ characteristics the base current is constant and V_{ce} will be a sweep of the 2nd unit.

- DC/ pulse sweep functions
- range up to $\pm 32V / \pm 500mA$
- measurement resolution $1\mu V/100pA$
- minimum pulse width: $50\mu s$, minimum period: 2ms in pulse measurement
- synchronous operation



Specifications

All accuracies are guaranteed for one year when used at temperatures of 23±5°C, relative humidity 85% or less.

6241A

Voltage Source/Measurement Range

Range	Source Range	Setting Resolution	Measurement Range	Measurement Resolution
300 mV	0 to ±320.00 mV	10 µV	0 to ±320.999 mV	1 µV
3 V	0 to ±3.2000 V	100 µV	0 to ±3.20999 V	10 µV
30 V	0 to ±32.000 V	1 mV	0 to ±32.0999 V	100 µV

Current Source/Measurement Range

Range	Source Range	Setting Resolution	Measurement Range	Measurement Resolution
30 µA	0 to ±32.000 µA	1 nA	0 to ±32.0999 µA	100 pA
300 µA	0 to ±320.00 µA	10 nA	0 to ±320.999 µA	1 nA
3 mA	0 to ±3.2000 mA	100 nA	0 to ±3.20999 mA	10 nA
30 mA	0 to ±32.000 mA	1 µA	0 to ±32.0999 mA	100 nA
300 mA	0 to ±320.00 mA	10 µA	0 to ±320.999 mA	1 µA
500 mA	0 to ±500.00 mA	20 µA	0 to ±500.999 mA	1 µA

How ever the measurement resolution under integration times 100µs, 500µs, S/H (Sample & Hold) is as following:

Integration Time	100 µs	500 µs	S/H (100µs)
Measurement Resolution (digits)	10	2	10

Resistance Measurement Range

Measurement Range	Measurement Resolution
Determined by the operation of Voltage range / Current range	0 Ω to 1.6 GΩ Minimum 2 µΩ

Voltage Limiter (compliance) Range:

Setting Range	Resolution ¹⁾
0V to 320 mV	100 µV
320.1mV to 3.2V	1mV
3.201V to 32V	10mV

¹⁾ Where, (Hi limiter value – Lo limiter value) ≥ 60 digits

Current Limiter (compliance) Range:

Setting Range	Resolution ¹⁾
100nA to 32µA	10nA
32.01µA to 320µA	100nA
320.1µA to 3.2mA	1µA
3.201mA to 32mA	10µA
32.01mA to 320mA	100µA
320.1mA to 500mA	100µA

¹⁾ Where, (Hi limiter value – Lo limiter value) ≥ 60 digits

Overall accuracy:

Includes calibration accuracy, 1-day stability, the temperature coefficient, and linearity.

1-day stability:

Temperature coefficient:

Voltage Source

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + V)		± (ppm of setting + V)/°C
300mV	0.02+150µV	0.01+70µV	15+15µV
3V	0.02+350µV	0.01+200µV	15+30µV
30V	0.02+3mV ²⁾	0.01+2mV	15+300µV

²⁾ 30V range adds 200µV per the remote sense voltage 0.1V

Voltage Limiter

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + V)		± (ppm of setting + V)/°C
300mV	0.1+500µV ³⁾	0.05+200µV	100+50µV
3V	0.05+3mV ³⁾	0.01+1mV	15+100µV
30V	0.05+30mV ³⁾	0.01+10mV	15+1mV

³⁾ Voltage limiter additional error: If Hi limiter is set to a negative value and Lo limiter is set to a positive value, add an error of ±0.1% of setting.

Current Source

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.03+10nA+300pA	0.01+5nA+100pA	20+1nA+10pA
300µA	0.03+80nA+3nA	0.01+40nA+1nA	20+10nA+100pA
3mA	0.03+800nA+30nA	0.01+400nA+10nA	20+100nA+1nA
30mA	0.03+8µA+300nA	0.01+4µA+100nA	20+1µA+10nA
300mA	0.045+80µA+3µA	0.01+40µA+1µA	20+10µA+100nA
500mA	0.05+160µA+6µA	0.02+80µA+1µA	20+12µA+200nA

Current Limiter

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting+ A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.045+35nA+300pA	0.01+10nA+100pA	20+8nA+10pA
300µA	0.045+350nA+3nA	0.01+100nA+1nA	20+20nA+100pA
3mA	0.045+3.5µA+30nA	0.01+1µA+10nA	20+200nA+1nA
30mA	0.045+35µA+300nA	0.01+10µA+100nA	20+2µA+10nA
300mA	0.055+350µA+3µA	0.01+100µA+1µA	20+20µA+100nA
500mA	0.055+500µA+6µA	0.02+100µA+1µA	40+20µA+200nA

Vo: Compliance Voltage (-32V to +32V)

Voltage Measurement

(Auto zero ON, Integration time: 1 PLC to 200ms)

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of reading + V)		± (ppm of reading + V)/°C
300mV	0.02+75µV	0.008+50µV	15+15µV
3V	0.02+120µV	0.008+60µV	15+15µV
30V	0.02+1.2mV ²⁾	0.008+400µV	15+150µV

²⁾ 30V range adds 200µV per remote sense voltage 0.1V

Current Measurement

(Auto zero ON, Integration time: 1 PLC to 200ms)

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.03+8nA+300pA	0.01+4nA+100pA	20+1nA+10pA
300µA	0.03+70nA+3nA	0.01+35nA+1nA	20+7nA+100pA
3mA	0.03+700nA+30nA	0.01+350nA+10nA	20+70nA+1nA
30mA	0.03+7µA+300nA	0.01+3.5µA+100nA	20+700nA+10nA
300mA	0.045+70µA+3µA	0.01+35µA+1µA	20+7µA+100nA
500mA	0.05+120µA+6µA	0.02+60µA+1µA	35+10µA+200nA

Resistance Measurement

(Auto zero ON, Integration time: 1 PLC to 200ms)

Condition	Total accuracy	1-day stability	Temperature coefficient
	± (% of reading) ± (digits+ digits+ digits)		± (ppm of reading) ± (digits+ digits+ digits)/°C
At Voltage Source	Reading item: (setting item of voltage source + reading item of current measurement) ³⁾ Full scale item: (digit value of the full scale item at voltage source + digit value of the full scale item of current measurement + digit value of the CMV item) ³⁾		
At Current Source	Reading item: (setting item of current source + reading item of voltage measurement) ³⁾ Full scale item: (digit value of the full scale item at current source + digit value of the full scale item of voltage measurement + digit value of the CMV item) ³⁾		

Vo: Compliance Voltage (-32V to +32V)

³⁾ CMV item = (A x Vo/1V); source or measurement current x source or measurement voltage/digit value of 1V

Integration Time: For measurement accuracy from 10ms to 100µs and 1-day stability the following error (full-scale item) is added.

Range	Integration time	Units: digits (in 5½ digit display)					
		10ms	5ms	1ms	500µs	100µs	S/H
Voltage Measurement	300mV	10	15	20	30	60	200
	3V, 30V	5	8	10	15	30	50
Current Measurement	30µA	200	300	300	300	300	300
	300µA	20	30	30	30	70	100
	3mA	10	30	30	30	50	80
	30mA	10	30	30	30	50	100
	300mA	10	15	15	15	50	100
	500mA	10	30	30	50	100	200

S/H: Measurement in sample & hold mode (Integration Time: 100µs)

When LO Output is grounded to the chassis, the additional error of integration time in 30µA range is the same as that in 300µA range.

Source Linearity:

±3 digits or less (500mA range is ±5 digits or less.)

Maximum Output Current:

±500mA at 0 to ±32V

Maximum Compliance Voltage:

0 to ±32V at up to 500 mA

6242A

Voltage Source/Measurement Range

Range	Source Range	Setting Resolution	Measurement Range	Measurement Resolution
300 mV	0 to ±32.00 mV	10 µV	0 to ±320.999 mV	1 µV
3 V	0 to ±3.2000 V	100 µV	0 to ±3.20999 V	10 µV
6 V	0 to ±6.000 V	1 mV	0 to ±6.0999 V	100 µV

Current Source/Measurement Range

Range	Source Range	Setting Resolution	Measurement Range	Measurement Resolution
30 µA	0 to ±32.000 µA	1 nA	0 to ±32.0999 µA	100 pA
300 µA	0 to ±320.00 µA	10 nA	0 to ±320.999 µA	1 nA
3 mA	0 to ±3.2000 mA	100 nA	0 to ±3.20999 mA	10 nA
30 mA	0 to ±32.000 mA	1 µA	0 to ±32.0999 mA	100 nA
300 mA	0 to ±320.00 mA	10 µA	0 to ±320.999 mA	1 µA
3 A	0 to ±3.000 A	100 µA	0 to ±3.00999 A	10 µA
5 A	0 to ±5.000 A	200 µA	0 to ±5.00999 A	10 µA

How ever the measurement resolution under integration times 100µs, 500µs, S/H (Sample & Hold) will be as following:

Integration Time	100 µs	500 µs	S/H (100µs)
Measurement Resolution (digits)	10	2	10

Resistance Measurement Range

	Measurement Range	Measurement Resolution
Determined by the operation of Voltage range / Current range	0 Ω to 304 MΩ	Minimum 0.2 µΩ

Voltage Limiter (compliance) Range:

Setting Range	Resolution ¹⁾
0V to 320 mV	100 µV
320.1mV to 3.2V	1mV
3.201V to 6V	10mV

¹⁾ Where, (Hi limiter value – Lo limiter value) ≥ 60 digits

Current Limiter (compliance) Range:

Setting Range	Resolution ¹⁾
100nA to 32µA	10nA
32.01µA to 320µA	100nA
320.1µA to 3.2mA	1µA
3.201mA to 32mA	10µA
32.01mA to 320mA	100µA
320.1mA to 3A	1mA
3.001A to 5A	1mA

¹⁾ Where, (Hi limiter value – Lo limiter value) ≥ 60 digits

Overall accuracy:

Includes calibration accuracy, 1-day stability, the temperature coefficient, and linearity. At Power and Load constant Temperature of 0° to 50°C

1-day stability:

Temperature coefficient:

Voltage Source

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + V)		± (ppm of setting + V)/°C
300mV	0.02+150µV	0.01+70µV	15+15µV
3V	0.02+350µV	0.01+200µV	15+30µV
6V	0.025+3mV ²⁾	0.01+2mV	15+300µV

²⁾ 30V range adds 200µV per the remote sense voltage 0.1V

Voltage Limiter

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting+V)		± (ppm of setting + V)/°C
300mV	0.1+500µV ³⁾	0.05+200µV	100+50µV
3V	0.05+3mV ³⁾	0.01+1mV	15+100µV
6V	0.16+30mV ³⁾	0.018+10mV	36+1mV

³⁾ Voltage limiter additional error: If Hi limiter is set to a negative value and Lo limiter is set to a positive value, add an error of ±0.1% of setting.

Current Source

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.03+10nA+300pA	0.01+5nA+100pA	20+1nA+10pA
300µA	0.03+80nA+3nA	0.01+40nA+1nA	20+10nA+100pA
3mA	0.03+800nA+30nA	0.01+400nA+10nA	20+100nA+1nA
30mA	0.03+8µA+300nA	0.01+4µA+100nA	20+1µA+10nA
300mA	0.045+80µA+3µA	0.01+40µA+1µA	20+10µA+100nA
3A	0.08+2.5mA+150µA	0.06+1.5mA+25µA	50+300µA+20µA
5A	0.15+2.5mA+150µA	0.12+1.5mA+25µA	50+300µA+20µA

Current Limiter

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.045+35nA+300pA	0.01+10nA+100pA	20+8nA+10pA
300µA	0.045+350nA+3nA	0.01+100nA+1nA	20+20nA+100pA
3mA	0.045+3.5µA+30nA	0.01+1µA+10nA	20+200nA+1nA
30mA	0.045+35µA+300nA	0.01+10µA+100nA	20+2µA+10nA
300mA	0.055+350µA+3µA	0.01+100µA+1µA	20+20µA+100nA
3A	0.1+4mA+150µA	0.06+2mA+25µA	80+500µA+20µA
5A	0.15+4mA+150µA	0.12+2mA+25µA	80+500µA+20µA

Vo: Compliance Voltage (-6V to +6V)

Voltage Measurement

(Auto zero ON, Integration time: 1 PLC to 200ms)

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of reading + V)		± (ppm of reading + V)/°C
300mV	0.02+75µV	0.008+50µV	15+15µV
3V	0.02+120µV	0.008+60µV	15+15µV
6V	0.02+1.2mV ²⁾	0.008+600µV	15+150µV

²⁾ 6V range adds 200µV per remote sense voltage 0.1V
(Auto zero ON, Integration time: 1 PLC to 200ms)

Range	Total accuracy	1-day stability	Temperature coefficient
	± (% of setting + A + A x Vo/1V)		± (ppm of setting + A + A x Vo/1V)/°C
30µA	0.03+8nA+300pA	0.01+4nA+100pA	20+1nA+10pA
300µA	0.03+70nA+3nA	0.01+35nA+1nA	20+7nA+100pA
3mA	0.03+700nA+30nA	0.01+350nA+10nA	20+70nA+1nA
30mA	0.03+7µA+300nA	0.01+3.5µA+100nA	20+700nA+10nA
300mA	0.045+70µA+3µA	0.01+35µA+1µA	20+7µA+100nA
3A	0.08+2.2mA+150µA	0.05+1.5mA+25µA	50+300µA+20µA
5A	0.15+2.2mA+150µA	0.12+1.5mA+25µA	50+300µA+20µA

Resistance Measurement

(Auto zero ON, Integration time: 1 PLC to 200ms)

Condition	Total accuracy	1-day stability	Temperature coefficient
	± (% of reading) ± (digits+ digits+ digits)		± (ppm of reading) ± (digits+ digits+ digits)/°C
At Voltage Source	Reading item: (setting item of voltage source + reading item of current measurement) ³⁾ Full scale item: (digit value of the full scale item at voltage source + digit value of the full scale item of current measurement + digit value of the CMV item) ³⁾		
At Current Source	Reading item: (setting item of current source + reading item of voltage measurement) ³⁾ Full scale item: (digit value of the full scale item at current source + digit value of the full scale item of voltage measurement + digit value of the CMV item) ³⁾		

Vo: Compliance Voltage (-6V to +6V)

³⁾ CMV item = (A x Vo/1V); source or measurement current x source or measurement voltage/digit value of 1V

Integration Time: For measurement accuracy from 10ms to 100µs and 1-day stability the following error (full-scale item) is added.

Range	Integration time					
	10ms	5ms	1ms	500µs	100µs	S/H
Voltage Measurement	300mV	10	15	20	30	200
	3V, 6V	5	8	10	15	50
Current Measurement	30µA	200	300	300	300	300
	300µA	20	30	30	30	100
	3mA	10	30	30	30	80
	30mA	10	30	30	30	100
	300mA	10	15	15	15	100
	3A	20	30	75	75	500
	5A	20	30	75	75	500

S/H: Measurement in sample & hold mode (Integration Time: 100µs)

When LO Output is grounded to the chassis, the additional error of integration time in 30µA range is the same as that in 300µA range.

Source Linearity: ±3 digits or less (5A range is ±5 digits or less.)

Maximum Output Current: ±5A at 0 to ±6V

Maximum Compliance Voltage: 0 to ±6V at up to 5

6241A/6242 Common Specifications

6241A/6242 Range Table

Range	6241A	6242
Voltage Source/ Voltage Limiter		
300mV	O	O
3V	O	O
6V	-	O
30V	O	-
Current Source/ Current Limiter		
30µA	O	O
300µA	O	O
3mA	O	O
30mA	O	O
300mA	O	O
500mA	O	-
3A	-	O
5A	-	O

Output Noise: For voltage source within the range from no load to maximum load [Vp-p]
For current source, at the following load resistance [Ap-p]

Voltage Source:

Range	Load resistance	Low Frequency Noise		High Frequency Noise
		DC to 100Hz	DC to 10kHz	DC to 20MHz
300 mV	-	50µV	200µV	3mV
3 V	-	50µV	300µV	3mV
30V/6V	-	500µV	2mV	4mV

Current Source:

Range	Load resistance	Low Frequency Noise		High Frequency Noise
		DC to 100Hz	DC to 10kHz	DC to 20MHz
30µA	10k Ω	10nA	60nA	500nA
300µA	10k Ω	30nA	150nA	600nA
3mA	1k Ω	200nA	2µA	6µA
30mA	1k Ω	2µA	15µA	20µA
300mA	1k Ω	20µA	100µA	150µA
500mA	1k Ω	20µA	100µA	150µA
3A	10 Ω	500µA	1mA	10mA
5A	10 Ω	500µA	1mA	10mA

Switching Noise:

		Typical value [p-p]	Load resistance
Output ON/OFF noise	Voltage source	600mV	at 100k Ω
	Current source	600mV	at 100k Ω
Range switching noise	Voltage source	50mV	-
	Current source	fast: 100 digits + 50mV ⁴	-
	Current limiter	slow: 300 digits + 50mV ⁴	-
	Voltage limiter	50 mV ⁵	-
Response switching noise	Voltage measurement	50 mV ⁵	-
	Current measurement	50 mV ⁵	-
Power OFF noise		80mV	
		600mV	100k Ω

⁴: „digits“ indicates current source 4½ digit values. Double these values in the 500mA range. In 3A and 5A ranges: fast: 300 digits + 50mV, slow: 600 digits + 50mV.
⁵: Limiter is not in operation. While the limiter is enabled, it is the same as the current source range switching noise.

Settling time:

The time it takes to settle to the final value ±0.1% when varying from zero to the full scale.
Setting conditions: Source values and limiter values are full-scale settings
Load conditions: Resistive load and 200pF max. load capacitance

	Source range	Limiter range	Settling time	
			Output response	
			FAST	SLOW
Voltage source Output current 6241A: 500mA 6242: 5A	300mV	500mA/5A	200µs/300µs or less	1ms or less
	3V		70µs/200µs or less	400µs/500µs or less
	30V	5A	400µs or less	800µs or less
		500mA	300µs or less	1.5ms or less
Current source Output voltage 6141A: 30V 6242: 6V	30µA	30V/6V	2ms or less	3.5ms/3ms or less
	300µA		600µs/200µs or less	2.5ms/600µs or less
	3mA			
	30mA	30V	700µs or less	3ms or less
	300mA			
	500mA			
3A	6V	700µs or less	1.5ms or less	
				5A

Typical value	Source range	Limiter range	Settling time	
			Output response	
			FAST	SLOW
Voltage source (Output current: with less than 20% of full scale load)	300mV	3mA to 300mA	35µs or less	300µs or less
	3V		30µs or less	200µs or less
	30V/6V	100µs/40µs or less	500µs/300µs or less	
Current source (Output voltage: 1V)	30µA	3V	800µs or less	1ms or less
	300µA		30µs or less	200µs or less
	3mA		50µs or less	250µs or less
	30mA			
	300mA			
	500mA	3A	100µs or less	300µs or less
3A				
5A				

Over shoot: ±0.1% or less, resistive load at the end of standard cable (except for 30µA, 300µA, 3A, 5A range)

Line regulation: ±0.003% of range or less
Load regulation: Voltage source: ±0.003% of range or less (at 4-wire connection with maximum load)
Current source: depending on the overall accuracy CMV item (A x Vo/1V) in 2-wire connection (output cable not included)

Output resistance: Maximum load capacity that does not generate oscillation while the voltage source or voltage limiter is active.

Current range	Output resistance (Ω)		Maximum load capacity
	Voltage source	Current source	
30µA	500mΩ or less	1000MΩ or higher	1µF
300µA	100mΩ or less	1000MΩ or higher	1µF
3mA	10mΩ or less	100MΩ or higher	100µF
30mA	10mΩ or less	10MΩ or higher	100µF
300mA/500mA	10mΩ or less	1MΩ or higher	2000µF
3A/5A	10mΩ or less	70kΩ or higher	2000µF

Standard attached cable resistance: 100mΩ or less

Maximum load inductance: Maximum load inductance that does not generate oscillation while current source or current limiter is active.

Current source range Current limiter range	Response	30µA	300µA	3mA to 5A
		Maximum Load inductance	FAST	100µH
	SLOW	500µH		1mH

Effective CMMR: At unbalanced impedance 1kΩ, when using DC and AC 50/60Hz ±0.8%

	Integration Time	
	100µs to 10ms	1PLC to 200ms
Voltage measurement and Current measurement	60dB	120dB

NMRR: At AC 50/60Hz ±0.8%

	Integration Time	
	100µs to 10ms	1PLC to 200ms
Voltage measurement and Current measurement	0dB	60dB

Source/Measurement Functions

DC Source/Measurement	Source/measurement of DC voltage/current
Pulse Source/Measurement	Source/measurement of pulse voltage/current (However, measurement auto range in pulse source is impossible.)
DC Sweep Source/Measurement	Source/measurement with linear, two-slope linear, random and fixed level.
Pulse Sweep Source/Measurement	Source/measurement with linear, two-slope linear, random and fixed level. (However, measurement auto range in pulse source is impossible.)
Integration Time	100µs, 500µs, 1ms, 5ms, 10ms, 1PLC, 100ms, 200ms, or S/H S/H: Measuring in Sample & Hold Mode (Integration time: 100µs). (Enabled only in pulse source and pulse sweep source modes.) PLC: Power Line Cycle: 50Hz:20ms 60Hz:16.66ms
Sweep Mode	Reverse ON/OFF (forward to backward / one way)
Sweep Repeat Time	1 to 1000 times, or infinite
Number of Sweep Maximum Step	8000 steps
Random Sweep Maximum Memory	8000 data
Measurement Data Memory	8000 data
Measurement Auto Range	Available only in VSIM or ISVM
Measurement Function Link Mode	Links the source function to the measurement function (VSIM or ISVM) ON/OFF available
Limiter	Possible to set separately at HI or LO sides (However, in case of current limiter, the same polarity can not be set)
Calculation Functions	NULL calculation Comparator calculation (HI/GO/LO) Scaling calculation MAX/MIN/AVE/TOTAL calculation
Trigger Style	Auto-Trigger, external Trigger
Output Terminal	Front; Safety sockets, HI OUTPUT, HI SENSE, LO OUTPUT, LO SENSE
Maximum Input Voltage between Terminals	R6241A: 32V peak MAX (between HI and LO) 2V peak MAX (between OUTPUT and SENSE) 250V MAX (between LO and chassis) R6242A: 6V peak MAX (between HI and LO)
Maximum Remote Sensing Voltage	± 1V MAX between HI OUTPUT and HI SENSE between LO OUTPUT and LO SENSE (The voltage between HI SENSE and LO SENSE must be within the maximum output voltage range)
Voltage Measurement Input Resistance	1GΩ or more
Voltage Measurement Input Leakage Current	±1nA or below
GPIB Interface	Compliant with IEEE-488.2-1987 Interface functions: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 Connector: Amphenol 24 pin
USB Interface	USB 2.0 Full-Speed; Connector Typ B
External Control Signal	TRIGGER IN, INTERLOCK, OPERATE IN/OUT, COMPLETE OUT, SYNC OUT, Connector: BNC

Setting Time

Minimum Pulse Width: 50µs

Minimum Step (repeat) Time: Under fixed source/measurement range; Integration time: 100µs; Measurement/source delay time: Minimum; Calculation: OFF; Voltage/current measurement: ON

Measurement	Memory Mode	Minimum Step Time
OFF	-	0.5 ms
ON	BURST	2ms
	NORMAL	10ms
	OFF	

Source Delay Time:

Setting Range	Setting Resolution	Accuracy
0.030ms to 60.000ms	1µs	± (0.1% + 10 µs)
60.01ms to 600.00ms	10µs	
600.1ms to 6000.0ms	100µs	
6001ms to 59998ms	1ms	

Period (Pulse Cycle):

Setting Range	Setting Resolution ^o	Accuracy
0.500ms to 60.000ms	1µs	± (0.1% + 10 µs)
60.01ms to 600.00ms	10µs	
600.1ms to 6000.0ms	100µs	
6001ms to 60000ms	1ms	

Pulse Width:

Setting Range	Setting Resolution ^o	Accuracy
0.050ms to 60.000ms	1µs	± (0.1% + 10 µs)
60.01ms to 600.00ms	10µs	
600.1ms to 6000.0ms	100µs	
6001ms to 59998ms	1ms	

Measure Delay Time:

Setting Range	Setting Resolution ^o	Accuracy
0.050ms to 60.000ms	1µs	± (0.1% + 10 µs)
60.01ms to 600.00ms	10µs	
600.1ms to 6000.0ms	100µs	
6001ms to 59998ms	1ms	

^oThe setting resolution is determined by the period time resolution.

Hold Time:

Setting Range	Setting Resolution	Accuracy
1 ms to 60000ms	1ms	± (2% + 3ms)

Auto Range Delay Time:

Setting Range	Setting Resolution	Accuracy
0 ms to 500ms	1ms	± (2% + 3ms)

General Specification

Operating environment:	Ambient temperature: 0°C to 50°C, Relative humidity: 85% or less (no condensation)
Storage environment:	Ambient temperature: -25°C to +70°C Relative humidity: 85% or less (no condensation)
Warmup:	60min or more (until the specified accuracy is reached)
Display:	16 segments x 12 digits fluorescent character display
Power Supply:	AC power 100V, 120V, 220V, 240V (switchable by user)

Option No.	Standard	OPT.32	OPT.42	OPT.44
Power source voltage	100V	120V	220V	240V

Line Frequency:	50Hz/60Hz
Power Consumption:	6241A: 95VA or less 6242: 180VA or less
Dimensions:	Approx. 212(W) x 88(H) x 400(D) mm
Mass:	6241A: 6kg or less 6242: 6.5kg or less
Safety:	IEC 61010-1
EMI:	EN61326 class A

Ordering information:

Name	Part Number	Quantity
DC Voltage Current Source/Monitor Voltage: ±32V Current: ±500mA	6241A	1
DC Voltage Current Source/Monitor Voltage: ±6V Current: ±5A	6242	1

Standard Accessories:

Name	Part Number	Quantity
Power cable	A01402	1
Input/output cable (Red and black safety cable, 1m)	A01044	1
Banana chip adapter (red, black, one each)	A08531	1
Alligator clip adapter (red, black, one each)	A08532	1

Optional Accessories:

BNC-BNC cable (1.5m)	A01036-1500
Test lead (1m)	A01041
Input/output cable (Red and black safety cable, 1m)	A01044
Input/output cable (4-wire shielded, Banana-banana, 0.5m)	A01047-01
Input/output cable (4-wire shielded, Banana-banana, 1m)	A01047-02
Input/output cable (4-wire shielded, Banana-banana, 1.5m)	A01047-03
Input/output cable (4-wire shielded, Banana-banana, 2m)	A01047-04
Test fixture	12701A
Banana chip adapter (red, black, one each)	A08531
Alligator clip adapter (red, black, one each)	A08532
Panel mounting set 2U	A02039
Panel mounting set 2U twin	A02040
Rack mounting set (JIS 2U)	A02263
Rack mounting set (JIS 2U twin)	A02264
Rack mounting set (EIA 2U)	A02463
Rack mounting set (EIA 2U twin)	A02464

• Please read the instruction manual before using this product for correct use.

• Specifications may be changed without prior notice.

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ROHDE & SCHWARZ International Operations GmbH · Mühlendorfstrasse 15 · D-81671 München · P.O.B. 801469 ·
Telephone 0049/180512 42 42 or 0049/ 89412913774 · Fax +49 89 4129 13777 · www.rohde-schwarz.com
e-mail: customersupport@rohde-schwarz.com

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