

# DC Voltage/Current Generators/Calibrators

*For Evaluating and Calibrating Precision Instruments and Circuits*

## R6144/6142

- Large Capacity of Up To 32 V/160 mA
- High Accuracy (0.03%), High Stability
- Low Noise (3 mVp-p)
- 50 ms Settling Time



(Photo is R6144)

## R6144/6142

### Programmable DC Voltage/Current Generators

The R6144/6142 are precision voltage and current generators ideal for evaluation of precision circuits and parts as well as calibration of temperature controllers.

The units use a time-sharing D/A conversion circuit which provides excellent linearity and stability. Settling time and output noise are greatly reduced for higher reliability, allowing construction of a high throughput measurement system.

GPIB and BCD parallel interfaces are provided as standard features, enabling compatibility with a wide range of host devices such as personal computers, sequencers or general purpose I/O interfaces.

- Up to 32 V/160 mA (R6144) Voltage, Current Output
- High Resolution (1  $\mu$ V/100 nA steps)
- High Accuracy Guaranteed For 6 Months: 0.03% (Voltage), 0.035% (Current)
- Low Noise Increases Measurement Reliability: 3 mVp-p, One-Fifth of Previous Models' Noise Level
- Reduced Settling Time Enables Improvements In Throughput: 50 ms, One-Third of Previous Models' Time
- Built-In 160-Step Memory
- All-Digit Continuous Variable Sweep Function Enables Wider Range of Measurement Applications
- Programs Written For Previous Model (TR6142) Can Be Used Without Modifications

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## Specifications

### Voltage/Current Generation

#### Voltage generation range:

Range	Voltage generating/range (R6144/6142)	Setting resolution
10 mV	0 to ± 16.000 mV/± 11.999 mV	1 μV
100 mV	0 to ± 160.00 mV/± 119.99 mV	10 μV
1 V	0 to ± 1.6000 V/± 1.1999 V	100 μV
10 V	0 to ± 16.000 V/± 11.999 V	1 mV
30 V (R6144 only)	0 to ± 32.000 V	2 mV

#### Current generation range:

Range	Voltage generating/range (R6144/6142)	Setting resolution
10 mA	0 to ± 1.6000 mA/1.1999 mA	100 nA
100 mA	0 to ± 16.000 mA/11.999 mA	1 μA
100 mA	0 to ± 160.00 mA/119.99 mA	10 μA

**Overall accuracy:** Guaranteed for 6 months (including linearity) at 23°C ± 5°C, RH 70% max., with constant power and load conditions.

Range	Generating accuracy ± (% of setting + range error)
10 mV	0.03 + 5 μV
100 mV	0.03 + 25 μV
1 V	0.03 + 200 μV
10 V	0.03 + 2 mV
30 V (R6144 only)	0.03 + 4 mV
1 mA	0.035 + 300 nA
10 mA	0.035 + 3 μA
100 mA	0.04 + 30 μA

**One-day stability:** Under temperatures of 23°C ± 5°C and relative humidity of 70% or less with constant power supply and load.

Range	Generating stability ± (% of setting + range error)
10 mV	0.01 + 5 μV
100 mV	0.01 + 10 μV
1 V	0.01 + 50 μV
10 V	0.01 + 200 μV
30 V (R6144 only)	0.01 + 300 μV
1 mA	0.01 + 20 nA
10 mA	0.01 + 200 nA
100 mA	0.01 + 2 μA

**Temperature coefficient:** From 0°C to +50°C, per 1°C

Range	Generating temperature coefficient ± (ppm/°C of set. ++ range error/°C)
10 mV	20 + 200 nV
100 mV	20 + 2 μV
1 V	20 + 10 μV
10 V	20 + 40 μV
30 V (R6144 only)	60 + 4 μV
1 mA	20 + 4 nA
10 mA	20 + 40 nA
100 mA	20 + 400 nA

**Maximum load and output resistance:** 4-wire resistance for 1 V, 10 V and 30 V ranges and 2-wire resistance for the other ranges

Range	Maximum load current/voltage	Output resistance
10 mV	0.8 μA (R6144), 0.6 μA (R6142)*	Approx. 2 Ω
100 mV	8 μA (R6144), 6 μA (R6142)*	
1 V	Source: 160 mA (R6144) 120 mA (R6142)	0.4 mΩ max.
10 V		4 mΩ max.
30 V (R6144 only)	Sink: 100 mA	8 mΩ max.
1 mA		100 MΩ min.
10 mA	28 V output follow-up voltage (R6144) 10 V output follow-up voltage (R6142)	10 MΩ min.
100 mA		1 MΩ min.

\* 20 kΩ load equivalent to 0.01% error

**Output noise:** At 1 kΩ load resistance for 1 mA, 10 mA and 100 mA ranges

Range	Frequency	100 Hz	10 kHz	20 Hz to 20 MHz
10 mA		5 μVp-p	10 μVp-p	3 mVp-p
100 mA		15 μVp-p	30 μVp-p	
1 V		80 μVp-p	150 μVp-p	
10 V		200 μVp-p	500 μVp-p	
30 V (R6144 only)		400 μVp-p	1 mVp-p	
1 mA		30 nAp-p	150 nAp-p	6 μAp-p
10 mA		300 nAp-p	400 nAp-p	
100 mA		3 μAp-p	4 μAp-p	

**Line regulation:** ±0.005% of range or less (R6144), ±0.007% of range

or less (R6142) at rated voltage - 15% to + 10%.

**Load regulation:** ±0.005 of range or less at maximum load when 4-wire connected (except for 10 mV and 100 mV ranges)

**Maximum load capacity and inductance:**

Range	Maximum load capacity	Maximum load inductance
1, 10, 30 V	1000 μF	500 μF
1, 10, 100 mV	100 μF	1 mH

\* The maximum load capacity for 1, 10, 100 mA and inductance for 1 V, 10 V and 30 V are measured when the limiter is activated at the maximum setting.

**Settling time:** Time for output to reach an expected value ± 0.1% when the limiter is activated at maximum setting from zero to full scale.

Range	Load requirement	Over/under shoot	Settling time
All ranges	Maximum load resistance	Expected value ± 0.1%	50 ms max.
1/10/30 V ranges	Load at 30 μF capacity		50 ms max.
	Load at 100 μF capacity		60 ms max.

\* Maximum load resistance in current ranges: Maximum load voltage/resistance value by full scale

**Operating conditions:** Ambient temperature 0°C to +50°C

Relative humidity 85% max. (no condensation)

**Storage conditions:** Ambient temperature -25°C to +70°C

**Power supply:** 90 VAC to 110 VAC, 48 to 66 Hz

**Options**

Option No.	Standard	32	42	44
Supply voltage	90 V to 110 V	103 V to 132 V	198 V to 242 V	207 V to 250 V

**Power consumption:** 27 VA max. (R6144), 26 VA max. (R6142)

**External dimensions:** Approx. 240 (W) × 88 (H) × 350 (D) mm

**Mass:** Approx. 4 kg

**Accessories**

Item	Model	Product code	Quantity
Power cable	A01402		1
100/120 V fuse	EAWK 0.315A		2
220/240 V fuse	EAWK 0.16A		2

**Accessories (Sold separately)**

Item	Model	Note
Connection cable	MI-49	2-wire cable with a banana-alligator clip (105 cm)
Connection cable	A01023	4-wire cable with a banana-alligator clip (100, 150 or 250 cm length must be specified)
Panel mount set	A02017	
Rack mount set	A02621-J	JIS standard
Rack mount set	A02621	EIA standard
Carrying case	TR16204A	