VISHAY
PRECISION
GROUP

Standard Resistors Series

Alpha Electronics

Data Book

Standard Resistors
Resistance Boxes
Custom Products

www.alpha-elec.co.jp

Worldwide Contacts

www.alpha-elec.co.jp

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Standard Resistors

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Table of Contents

Ultra Stable Primary Standard Resistor

FEATURES

- Excellent long-term stability of resistance, less than 1 ppm/year
- Low temperature coefficient, less than 0.1 ppm/°C with predictable linear characteristics
- The resistance values are available at 1Ω, 100Ω, 10 kΩ, suitable for reference of measurement system
- Excellent AC characteristics due to non-wirewound technology
- Compact and sturdy construction designed for easy operation and storage
- Certificate of Calibration and Inspection sheets traceable to NMIJ* are provided at shipment
  *NMIJ: National Metrology Institute of Japan

MASS

Approx. 2.5 kg (5.5 lbs)

DESCRIPTION

The USR series is an ultra stable standard resistor which is an enhanced ASR series developed by our long-term technology experience and further pursuing superior stability.

The ultra stable resistive element utilizes Bulk Metal® Foil technology developed by Alpha Electronics and is based on using a proprietary Ni/Cr alloy. This results in extremely low temperature coefficients of (α)±0.1 ppm/°C and (β)±0.01 ppm/°C² or smaller for the primary and secondary, respectively over the temperature range of 23°C ±5°C. This performance is unique to Alpha Electronics throughout the world.

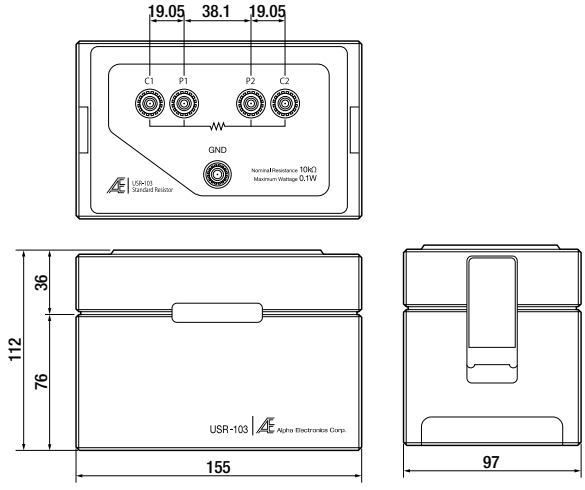
The resistive element is hermetically sealed, designed to protect from humidity so that a typical stability is realized at less than 0.5 ppm/year.

Furthermore, Alpha's non-wirewound construction Bulk Metal® Foil technology provides better AC characteristics performance than other standard resistors.

The USR, with its extreme long-term stability and low temperature coefficient, can be used in air without oil bath or critical environmental temperature control eliminating added expense and maintenance problems.

The resistive elements are mounted in a compact sturdy box with cover whose construction is designed to protect the resistor and terminals from any damages.

CONFIGURATION in millimeters



SPECIFICATIONS

Series	Nominal Value	Accuracy	Uncertainty of Calibration	Temp. Coefficient	Temp. Retrace	Stability	Power Rating	Power Coefficient	Max. Working Temp.	Max. Working Current	Max. Working Voltage	Operating Temp. Range	Storage Temp. Range	Number of Terminals
		ppm	ppm	ppm/°C	ppm	ppm/yr	W	ppm/ power*	°C	mA	V	°C	°C	
USR-1R0	1Ω	±2	±2.5 @ 23°C	±0.1@ 23±5°C	±1 @ 23±5°C	±1	0.5	±5	50	707	0.70	18~28	0~50	5
USR-101	100Ω						0.1	±1		31.6	31.6			
USR-103	10kΩ									31.6	31.6			

* Power=Power rating

Primary Standard Resistor

FEATURES

- Excellent long-term stability of resistance, less than 3 ppm/year
- Low temperature coefficient, less than 0.2 ppm/°C
- The resistance value may be specified from 1Ω to 10 MΩ
- Excellent AC characteristics due to non-wirewound technology
- Compact and sturdy construction designed for easy operation and storage
- Certificate of Calibration and Inspection sheets traceable to NMIJ* are provided at shipment.
  *NMIJ: National Metrology Institute of Japan

MASS

Approx. 2.5 kg (5.5 lbs)

DESCRIPTION

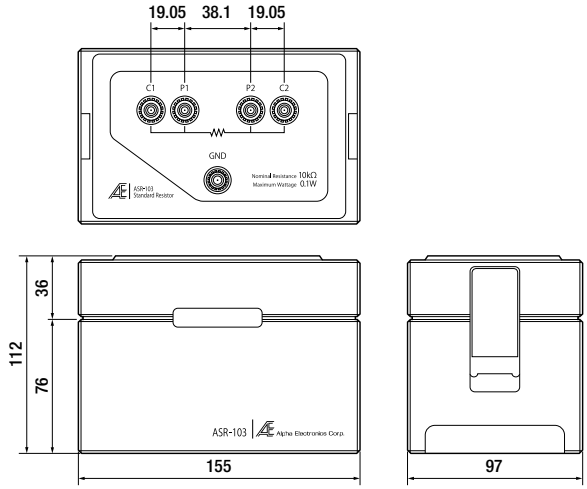
The ASR series is an extremely stable standard resistor. Alpha's Ni/Cr alloy Bulk Metal® Foil technology is used as the resistive element, providing high stability and low temperature coefficient. The process of building a standard resistor requires significant experience and a great degree of skill. Due to our long-term experience in developing and enhancing ultra stable Bulk Metal® Foil technology, we are able to provide products with consistency of performance under strict quality control.

With the extreme stability of this resistor relative to temperature change, the ASR can be used in air without oil bath or critical environmental temperature control eliminating added expense and maintenance problems.

The ASR is designed to be used in a broad range of environments—from a production floor for making precise measurements, to a corporate traceability system as a calibration and reference standard.

The resistors are mounted in a compact sturdy box with cover whose construction is designed to protect the resistor and terminals from any damages.

CONFIGURATION in millimeters



SPECIFICATIONS

Series	Nominal Value	Accuracy	Uncertainty of Calibration	Temp. Coefficient	Temp. Retrace	Stability	Power Rating	Power Coefficient	Max. Working Temp.	Max. Working Current	Max. Working Voltage	Operating Temp. Range	Storage Temp. Range	Number of Terminals
		ppm	ppm	ppm/°C	ppm	ppm/yr	W	ppm/power*	°C	mA	V	°C	°C	
ASR-1R0	1Ω	±5	±2.5 @ 23°C	±0.2 @ 0~23°C 23~50°C	±2 @ 23~0°C ~23°C 23~50°C ~23°C	±3	0.5	±5	50	707	0.70	0~50	–10~60	5
ASR-100	10Ω						0.1	±1		100	1.00			
ASR-101	100Ω									31.6	3.16			
ASR-102	1kΩ									10.0	10.0			
ASR-103	10kΩ									3.16	31.6			
ASR-104	100kΩ									1.00	100			3
ASR-105	1MΩ									0.31	316			
ASR-106	10MΩ	±10	±5	±0.5		±6		±3		0.10	1000			

* Power=Power rating

Working Standard Resistor

FEATURES

- Usable in air without oil bath
- Wide resistance range available from 1 mΩ to 100 MΩ
- Excellent performance versus cost
- Terminals aligned in a single row for easier wiring and placement
- Certificate of Calibration and Inspection sheets traceable to NMIJ* are provided at shipment.
  *NMIJ: National Metrology Institute of Japan

MASS

Approx. 300g (0.66 lbs)

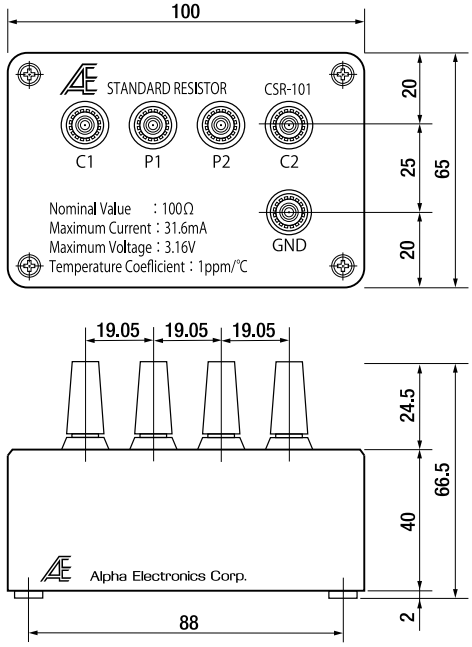
DESCRIPTION

The CSR series has Bulk Metal® Foil resistance elements, which have the same excellent stability and low temperature coefficient of resistance as the ASR series—a precision level that cannot be provided by any other resistance material. In addition, the CSR is designed for equal ease of use in the laboratory or on the production floor. It's construction is designed to give priority for portability and workability, being used in air without an oil bath.

CUSTOMIZED SPECIFICATIONS

Available for any customized resistance value.
Contact to our sales department for more details.

CONFIGURATION in millimeters



SPECIFICATIONS

Series	Nominal value	Accuracy	Temp. Coefficient	Stability	Power Rating	Power Coefficient	Storage Temp. Range	Max. Working Current	Max. Working Voltage	Working Temp. Range	Number of Terminals
		ppm	ppm/°C	ppm/year	W	ppm/mW	°C	A	V	°C	
CSR-1N0	1 mΩ	±100	±10	±20	0.5	±0.05	0~50	22.3	0.02	18~28	5
CSR-10N	10 mΩ	±50	±5	±15				7.07	0.07		
CSR-R10	100 mΩ	±25	±2.5	±10				2.23	0.22		
CSR-1R0	1Ω	±5	±1	±5	0.1	±0.01		0.31	0.31		
CSR-100	10Ω							0.10	1.00		
CSR-101	100Ω							0.03	3.16		
CSR-102	1 kΩ							0.01	10.0		
CSR-103	10 kΩ							0.003	31.6		
CSR-104	100 kΩ							0.001	100		3
CSR-105	1 MΩ							0.0003	316		
CSR-106	10 MΩ	±10		±10	0.1			0.0001	1000		
CSR-107	100 MΩ	±25	±5	±25	0.01			0.00001	1000		

High Power Standard Resistor

FEATURES

- For high power measurement
- Excellent long-term stability
- Compact size. Usable in air. Low temperature coefficient for small resistance values
- Temperature efficient design to control self-heating
- Certificate of Calibration and Inspection sheets traceable to NMIJ* are provided at shipment.
  *NMIJ: National Metrology Institute of Japan

MASS

Approx. 600g (1.3 lbs)

DESCRIPTION

The LSR series is developed to meet the requirements of high current / low resistance applications. Bulk Metal® Foil resistive elements are used to ensure the best long-term stability and lowest temperature coefficient is achieved.

The enclosure is made of perforated aluminum to allow effective temperature dissipation, especially under conditions of high electrical power.

The LSR can be used in air without oil bath or cooling unit, it is suitable for a wide range of applications, such as high precision measurements, calibration in corporate metrology labs, and a reference for precision power supplies, etc.

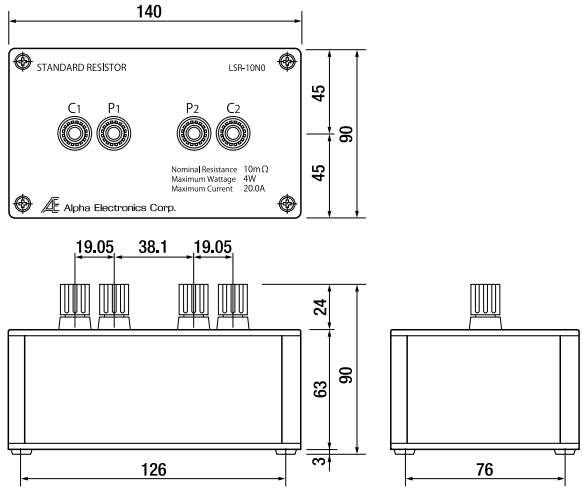
HIGH CURRENT OPTION

Ability to change terminal knobs for measuring the power up to 4W (63A) for 1 mΩ type (see the picture). Add P to the end of model number, when ordering.

Type: LSR-1N0P
The spacing between voltage terminals is 19.05 mm.

High Current Option

CONFIGURATION in millimeters



SPECIFICATIONS

Series	Nominal Value	Accuracy	Temp. Coefficient	Stability	Power Rating	Power Coefficient	Storage Temp. Range	Max. Working Current	Max. Working Voltage	Working Temp. Range	Number of Terminals
		ppm	ppm/°C	ppm	W	ppm/mW	°C	A	mV	°C	
LSR-1N0	1 mΩ	±100	±2.5	±20	1	±0.025	0~50	31.6	31.6	18~28	4
LSR-10N	10 mΩ	±50		±10	4			20.0	200		
LSR-R10	100 mΩ	±25						6.32	632		

Milliohm Meter Calibration Resistor

FEATURES

- Compact, lightweight, portable and easy to operate
- Excellent performance versus cost
- Resistive pattern designed to minimize difference performance between AC and DC
- Certificate of Calibration and Inspection sheets traceable to NMIJ* are provided only for DC operation at shipment
  *NMIJ: National Metrology Institute of Japan

MASS AND SIZE

- Mass: 150g (0.33 lbs)
- Size: 50 D × 44 H × 65 W mm

CUSTOMIZED SPECIFICATIONS

Available for any customized resistance value. Contact to our sales for more details.

DESCRIPTION

The MSR series is a standard resistor whose internal construction and terminals are designed to optimize AC characteristics and minimize the effect of thermo-electromotive force, respectively. The MSR is a compact suitable standard resistor for daily calibration of milliohm meters, etc. Although the MSR series is a low cost, easy to use product, it offers both high stability and low temperature coefficient. The MSR is most suitable as a standard resistor to be used on the job site.

SPECIFICATIONS

Series	Nominal Value	Accuracy	Temp. Coefficient	AC Characteristics 1kHz (Ref. Value)	Stability	Power Rating	Max. Working Temp.	Max. Working Current	Max. Working Voltage	Working Temp. Range
		ppm	ppm/°C	%	ppm	W	°C	A	mV	°C
MSR-1N0	1 mΩ	500	±15	±0.3	±25	0.1	50	10.0	10.0	0~50
MSR-10N	10 mΩ	200	±10	±0.1				3.16	3.16	
MSR-R10	100 mΩ		±5					1.00	100	

I/V Converter

FEATURES

- Lightweight, compact size
- Full resistance range available from 1Ω to 100 kΩ

DESCRIPTION

The ATV series is a current / voltage conversion adaptor to measure a current by using a voltage meter.

It is small, lightweight, and attached directly to a voltage meter for ease of operation.

SPECIFICATIONS

Series	Nominal Value	Accuracy	Temperature Coefficient	Max.Working Current	Power Rating
		%	ppm/°C	mA	W
ATV-1R0	1Ω	±0.1	±2.5	500	0.25
ATV-100	10Ω			100	0.1
ATV-101	100Ω			31.6	
ATV-102	1 kΩ			10.0	
ATV-103	10 kΩ			3.16	
ATV-104	100 kΩ			1.00	

Precision Programmable Resistance Box

Will be Released in 2014

FEATURES

- Controllable by PC with GB-IB and RS232C interfaces
- Compact design
- Utilizing ultra precision Bulk Metal® Foil resistor
- Quick response capable of setting desired resistance in as fast as 100 ms
- Accuracy ≤0.01% +2 mΩ in 6½ digit readings
- Temperature coefficient of resistance ≤5 ppm/°C (>100Ω)
- Double electrical shielding protection against noise
- Interface specification open to users

MASS

Approx. 5 kg (11 lbs)

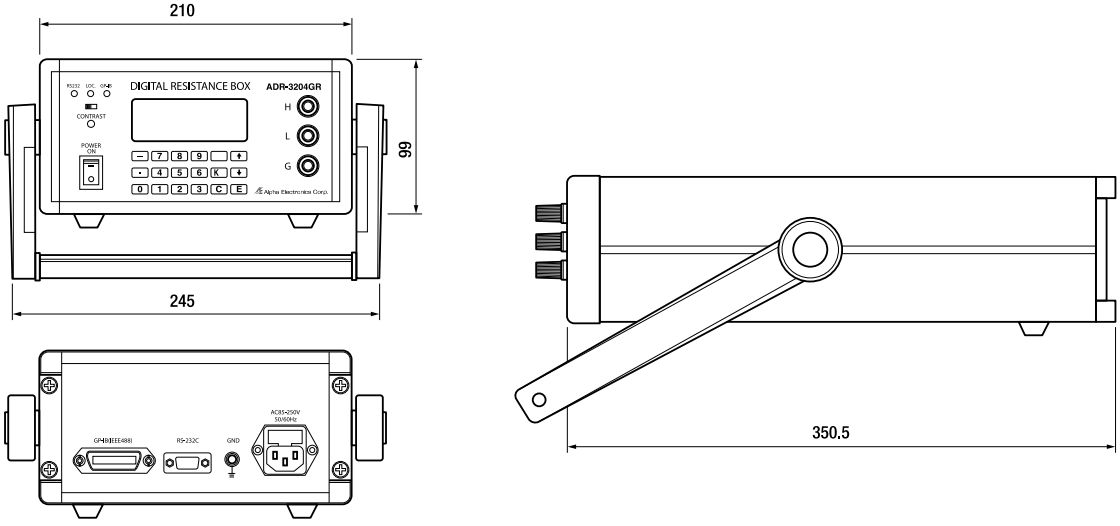
DESCRIPTION

The ADR Digital box is easy to set to any desired resistance value using a PC. The ADR Digital box realizes automated inspection to minimize inspection time while avoiding human error. The ADR Digital is the most efficient product for simulating input resistance values, and panel keys allow local-mode resistance value input. The JIS C1604/IEC60751 Pt thermometer table is stored in memory to facilitate entry of specific temperatures for specific resistance values in the Pt standard table.

Utilizing ultra precision Bulk Metal® Foil technology with very low Resistance Temperature Characteristics and excellent long-term stability assures high accuracy and high stability.

AVAILABLE PT STD OF TEMP INPUT					
IEC60751	Pt100	Pt200	Pt300	Pt500	Pt1000

CONFIGURATION in millimeters



SPECIFICATIONS

Model	Min. Resistance Value	Max. Resistance Value	Resolution (Ω)	Accuracy	Max. Wattage
ADR-3204GR	5.000Ω	1.999999 kΩ	0.001	±(0.01% +2 mΩ)	0.5W
	2.00 kΩ	19.99999 kΩ	0.01		
	20.0 kΩ	199.9999 kΩ	0.1		

6-Dial Decade Resistance Box

FEATURES

- Accuracy ≤0.005% +2 mΩ
- Temperature coefficient of resistance ≤ 5 ppm/°C
- Long-term stability in resistance ≤50 ppm/year (storage life)
- Low contact resistance switch and three clip-typed contacts in parallel
- Low thermal EMF terminal
- Double electrical shielding protective against noise

MASS

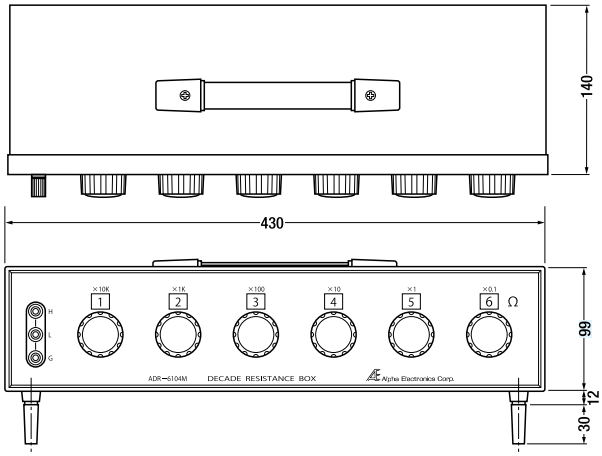
Approx. 4.5 kg (10 lbs)

DESCRIPTION

The ultra precision resistors, the rotary switches, the output terminals and the double shielded construction are all features of the 6-Dial Decade Resistance Box with 6½ digit readings.

Resistors used in the 6-Dial Decade Resistance Box are ultra precision Bulk Metal® Foil resistors manufactured by Alpha Electronics Corp., assuring high stability over time and environment change. Rotary switches have very low contact resistance as three clip-typed contacts are connected in parallel. The three contacts assure higher mechanical reliability mechanically. Output terminals have very low thermal EMF, using rectangular wires of low thermal resistance material in a well-designed circuit configuration. Double shielded construction inhibits interference of environmental noise.

CONFIGURATION in millimeters



SPECIFICATIONS

Series	Min. Resistance Value	Max. Resistance Value	Resolution	Dial Resistance Value/Step (Ω)						Accuracy	Max. Wattage
				Dial 1	Dial 2	Dial 3	Dial 4	Dial 5	Dial 6		
ADR-6102M	0.100Ω	1.111210 kΩ	0.001	100	10	1	0.1	0.01	0.001	±(0.005% ±2 mΩ)	0.5W
ADR-6103M	0.10Ω	11.11110 kΩ	0.01	1k	100	10	1	0.1	0.01		
ADR-6104M	0.1Ω	111.1110 kΩ	0.1	10k	1k	100	10	1	0.1		
ADR-6105M	1Ω	1.111110 MΩ	1	100k	10k	1k	100	10	1		
ADR-6106M	10Ω	11.11110 MΩ	10	1M	100k	10k	1k	100	10	<1 MΩ ±(0.01% +50 mΩ) ≥1 MΩ ±0.1%	0.5W

1-Dial Resistance Box

FEATURES

- Up to 5-digit resistance values on switching contacts may be specified
- Improved work efficiency and elimination of careless mistakes
- Lightweight, compact size
- High precision, high stability

MASS

Approx. 1 kg (2.2 lbs)

TERMINALS AND CONTACTS

- Contacts: Max. 24
- Terminals: 2 to 5

DESCRIPTION

The ADR-1000 series is a standard resistor which is ideally suited for repetitive daily work, the resistance is easily switched from one value to another. This greatly improves work efficiency and helps to avoid careless mistakes, as compared with using a decade standard resistor (6-dial type).

Also suitable for the inspections of Pt related products and conductive meters.

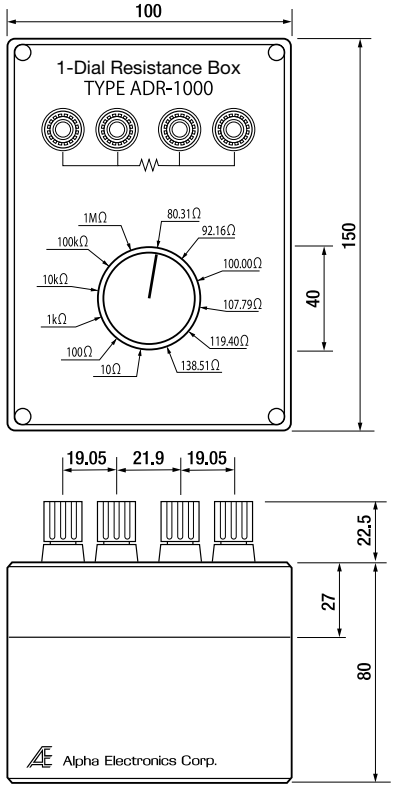
The resistance elements utilize Bulk Metal® Foil technology and the connections to a rotary switch are made by using 4-terminal junctions. This ensures that high precision, high stability and low temperature coefficient are achieved.

PRODUCT MODEL NUMBER

ADR - *1xxx

*1xxx is our internal code which is determined at order receipt

CONFIGURATION in millimeters



NOMINAL VALUE, TOLERANCE, TEMPERATURE COEFFICIENT

Resistance Value Range (Ω)	Tolerance (%)	Temperature Coefficient (ppm/°C)
1~1M	±0.02 ±0.05 ±0.1	0±2.5 0±5

Tolerance and temperature coefficient varies with resistance values.

For detailed specifications, contact our sales office.

Resistance Transfer Standard

FEATURES

- Using Bulk Metal® Foil as a resistive element
- Usable in air without oil bath due to superior temperature coefficient
- Very tight matching accuracy
- Excellent long-term stability and usable as a standard resistor

MASS AND SIZE

- Weight: Approx. 3 kg (6.67 lbs)
- Size: 180 D × 70 H × 332 W mm

OPTIONS

- ATS-LC Lead Compensator
- ATS-SB Shorting Bar

DESCRIPTION

The ATS series is a resistance transfer standard to calibrate working standard resistors by using a primary standard.

The ATS consists of the same 10 nominal value resistors connected in series known as Haymon bridge construction.

A maximum resistance ratio if 1:100 is obtainable in high precision, using either a lead compensator or a shorting bar. Configurations consist of from “10 resistors connected in parallel (1/10R)” to “10 resistors connected in series (10R)”.

The ATS uses Bulk Metal® Foil technology as a resistive element, ensuring very tight matching accuracy.

The ATS can be used as a standard resistor due to the special features of Bulk Metal® Foil technology (low temperature coefficient and high stability).

ATS-LC Option

ATS-SB Option

SPECIFICATIONS

Series	Rsistance Range	Step	Accuracy		Temperature Coefficient		Stability	Power Rating	Power Coeffi-ciency	Working Temperature Range	Terminal Junctions
			Absolute	Matching	Absolute	Tracking					
	Ω	Ω/step	ppm	ppm	ppm/ °C	ppm/ °C	ppm/yr	mW	ppm/mW	°C	
ATS-1E1	1~100	10	±20	±5	±5	±2.5	±10	10/ element 100/unit	±0.1/ element	23 ±10	4 terminals
ATS-1E2	10~1k	100	±10		±1	±1					
ATS-1E3	100~10k	1k									
ATS-1E4	1k~100k	10k									
ATS-1E5	10k~1M	100k									
ATS-1E6	100k~10M	1M					±50				2 terminals
ATS-1E7	1M~100M	10M	±50	±10	±10	±5					

ADR-7102KS

Dial Resistor with following functions

- 5-Dial, ultra low resistance (0Ω~111 mΩ, 0.01Ω~1 mΩ/step)
- 5-Dial variable shunt resistor (30A)
- 7-Dial variable shunt resistor (100 mΩ~11.111 mΩ, 1 mΩ/step)

ADS SERIES

National Standard Laboratory Level AC Shunt Standard Resistor

- Maxum ±5 ppm difference between AC operations @ 10 kHz and DC operations
  (Joint development with JEMIC: Japan Electric Meter Inspection Corp.)

AVR SERIES

DC Voltage Divider

- DC voltage divider which calibrates low range of a digital voltage meter
- Divide 50V by 1/1000 or 1/100 in ±0.001% accuracy

ATB SERIES

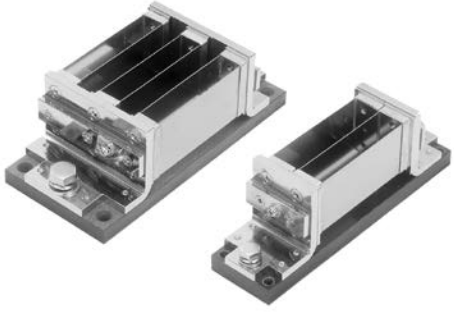
- Various custom resistance boxes
- Resistance box to calibrate ohm meters
- Linearity checker for resistance temperature meters
- Available any resistance value, specification

APS SERIES
High Power Shunt Resistor

- Available for any current and resistance value
- Usable in air without any cooling system
- Max. working current available up to 1000A)

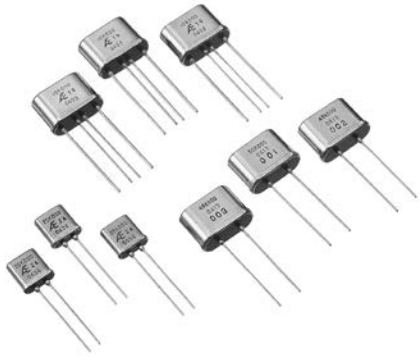
TYPE PZ
AC Coaxial Shunt Resistor

- Coaxial construction for frequency characteristics
- Case has built-in heat sink for heat radiation



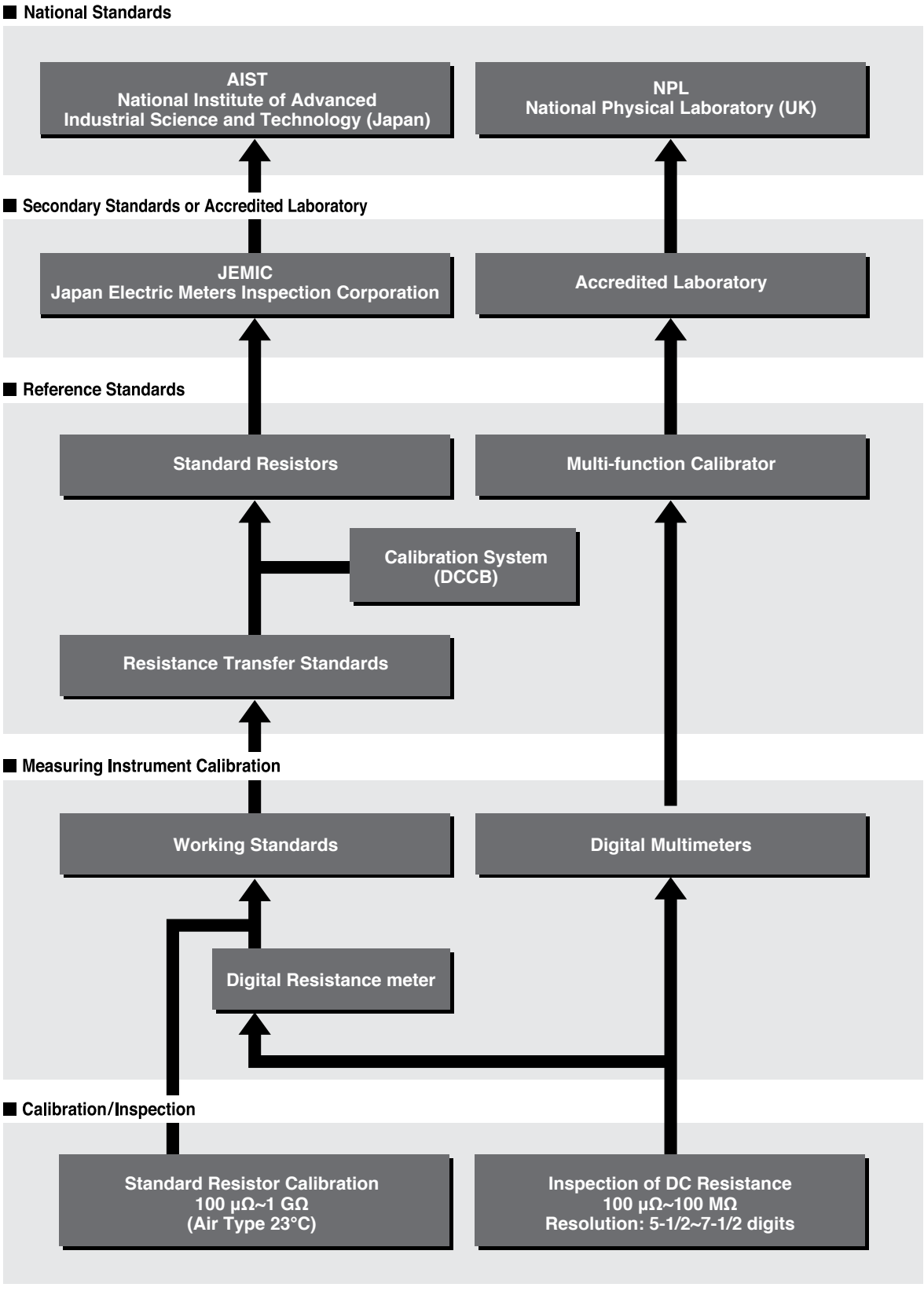
TYPE PKA, PKB
High Accuracy, High Power Shunt Resistor

- Shunt resistor with superior temperature coefficient
- Very low drift under high power usage



TYPE HC, HD, HG
Resistive Element

- Ultra precision/stable Bulk Metal® Foil hermetically sealed resistor
  * Calibration for resistance element is not available


National Standards
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Industrial Science and Technology (Japan)
NPL
National Physical Laboratory (UK)
Secondary Standards or Accredited Laboratory
JEMIC
Japan Electric Meters Inspection Corporation
Accredited Laboratory
Reference Standards
Standard Resistors
Multi-function Calibrator
Calibration System
(DCCB)
Resistance Transfer Standards
Measuring Instrument Calibration
Working Standards
Digital Multimeters
Digital Resistance meter
Calibration/Inspection
Standard Resistor Calibration
100 µΩ~1 GΩ
(Air Type 23°C)
Inspection of DC Resistance
100 µΩ~100 MΩ
Resolution: 5-1/2~7-1/2 digits

Calibration/Calibration Room/Options

CALIBRATION

- Traceability chart
- Certificate of calibration
- Inspection sheet

CALIBRATION ROOM

OPTIONS

TYPE AND APPLICATIONS		
	Type	**Applications**
Carrying Case	CC-2000	Two ASR's
	CC-3200GR	ADR Digital type
	CC-6100	ADR 6-Dial type
	CC-8000	Eight CSR's
Rack Mount Adapter	AM-3200	ADR Digital type
	AM-6100	ADR 6-Dial type

CC-8000

CC-6100

Product and Contact Information

PRODUCT LISTING

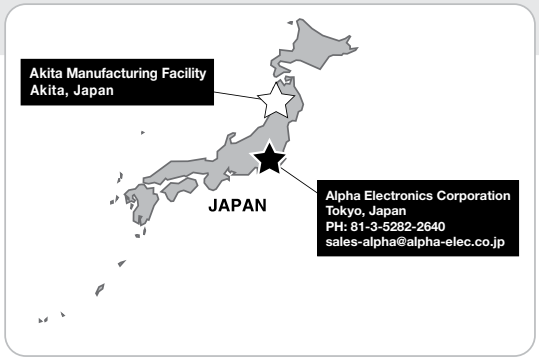
Bulk Metal® Foil Ultra Precision Resistors

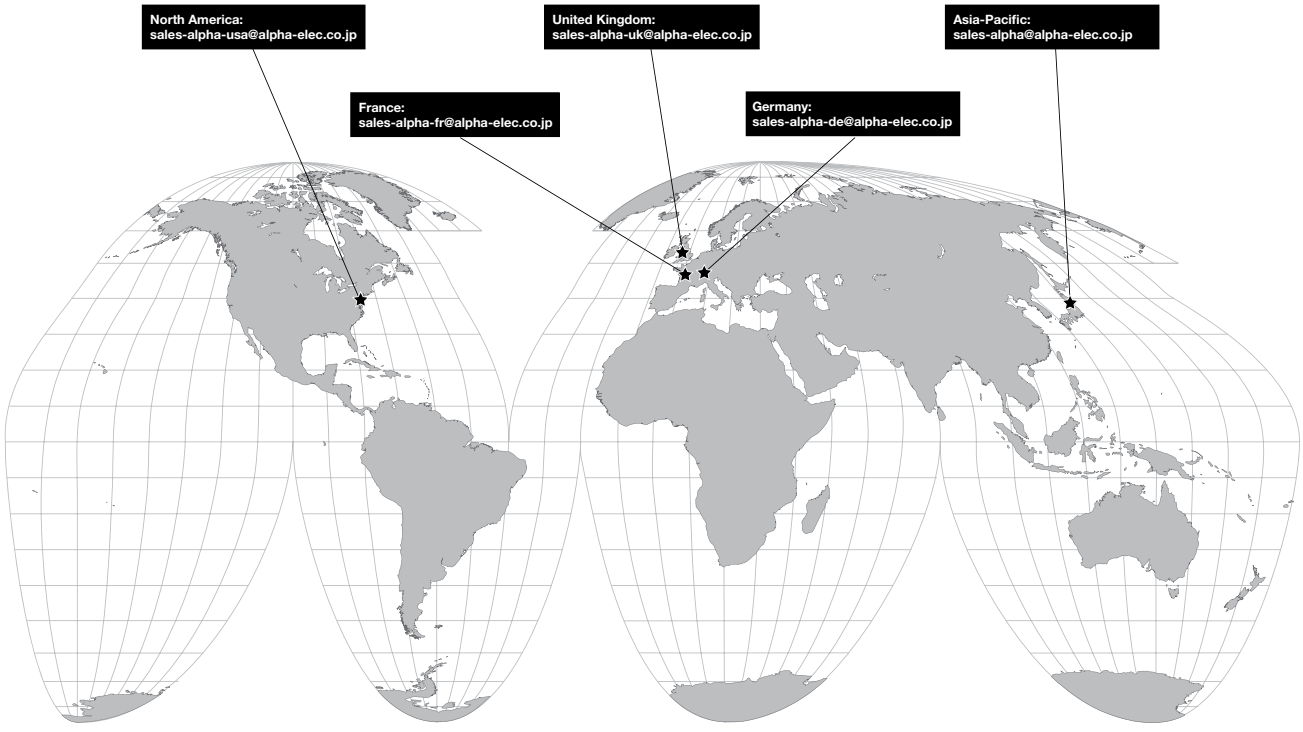
Precision Thin Film Resistors

Thermosensitive Resistors

Standard Resistors

CONTACT US





VISHAY PRECISION GROUP

Product Listing

Foil Technology Products

■ Bulk Metal® Foil Precision Resistors

■ Transducer-Class® Strain Gages ■ Stress Analysis Strain Gages ■ Miniature Strain Gages

■ Accessories ■ PhotoStress® ■ Instruments ■ Data Acquisition Systems

Force Sensor Products

■ Load Cells ■ Weigh Modules ■ Force/Weight Indicators

Weighing and Control Systems

■ Process Weighing Systems ■ Web Tension Systems

■ On-Board Weighing and Overload Monitoring Systems

Brands

Foil Technology Products

■ Micro-Measurements ■ Vishay Foil Resistors ■ Alpha Electronics ■ Powertron

Force Sensors

■ Celtron ■ Revere ■ Sensortronics ■ Tedea-Huntleigh

Weighing and Control Systems

■ BLH ■ KELK ■ Nobel Weighing Systems ■ PM Onboard ■ SI Onboard

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VISHAY PRECISION GROUP

Data Book

Standard Resistors Series

Alpha Electronics

www.alpha-elec.co.jp

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