RS1

Precision Resistance Standard

Includes 7 Resistances
10Ω to 10MΩ in decade steps; others on request

Calibration Data
Comes with calibration data; different accuracy levels available

4-Wire Binding Posts
Uses gold plated copper (low EMF) or nickel brass binding posts with 4-wire connections

Low Temperature Drift
Low temperature coefficients, different versions available

Low Aging Rates
Different aging rate versions available

Temperature Sensor
PT100 temperature sensor included

Sealed Case
Prevents ingress of moisture by sealed case and special dissicant

ROHS
ROHS-compliant versions available

Optional Versions
Optionally possible are versions with other terminals, other resistances or other deviations from nominal; contact us

The RS1 is a cost efficient resistance Standard, intended e.g. for use in laboratory, research, metrology and educational applications where a precise yet economical resistance Standard is needed.

It comes in two basic versions, calibrated to different accuracy levels, both compliant to ROHS. The resistors used are high accuracy types in different precision and drift grades, depending on the version selected. The advanced version (-A) uses wirewound and film resistors, allowing for lower thermal and aging drift, and are e.g. intended for 6.5 and 7.5 digit DMMs. The highest precision (-H) version is based on hermetic, oil filled metal foil and film resistors with extremely low aging and temperature drift, for use as a Calibration Standard together with the most precise DMMs. The -H comes with low EMF gold plated Tellurium-Copper binding posts.
The case of the RS1 is sealed and uses a special dissicant to achieve a low internal humidity level, resulting in reduced humidity-induced drifts. Calibration is based on highly precise 8.5 digit DMMs, either used in absolute or in relative mode, using precision temperature-controlled resistance Standards with low uncertainties as reference. Calibration data is shipped with every item, attached to the Standard.

Besides the standard versions, custom resistance values can be made available, as well as versions with other binding posts.
Please contact us through our website **ab-precision.com**.

Parameter	Details
Resistance	7 Decade Values, 10Ω to 10MΩ
Operating Voltage	42V DC peak max. (SELV voltages only!)
Operating Temp.	18 – 28 °C (specified)
Connectors	4 binding posts per resistance up to 100kΩ (3 posts for 1MΩ, 2 posts for 10MΩ); for 1MΩ and 10MΩ use combination of spade and banana cable terminals to achieve a 4-wire measurement
Order Code	RS1-A-R: Enhanced accuracy, ROHS RS1-H-R: Highest Accuracy, ROHS

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Parameter	Details
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Operating Voltage	42V DC peak max. (SELV voltages only!)
Operating Temp.	18 – 28 °C (specified)
Connectors	4 binding posts per resistance (4-wire measurement) up to 1MΩ, 2-wire for 10MΩ
Order Code	RS1-A-R: Enhanced accuracy, ROHS RS1-H-R: Highest Accuracy, ROHS

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Datasheet

Maximum Specifications at 23°C, K=2, unless otherwise specified:

Parameter	Condition	Specification
Ambient Conditions	Operation, per specification Operation, no damage Storage	18 – 28 °C 5 – 40 °C 5 – 50 °C
Deviation from Nominal *)1 *)2 *)5	RS1-A-R RS1-H-R	< 0,1% max. (10Ω: 0,2%) < 0.01% max. (10Ω: 0,1%)
PT100 Sensor Accuracy *2) *3)	18 - 28°C	< 0.25K max.
Maximum Power rating *)4	Per resistor	10mW
Resistor Material	RS1-A-R RS1-H-R	Wirewound (1MΩ/10MΩ: film) Hermetic foil (1MΩ, 10MΩ: film)
Working Voltage	All resistances	42V peak max. (SELV voltages!)
I/O Connectors	RS1-A-R RS1-H-R	Nickel plated brass Gold plated tellurium-copper
Weight	Average	Appr. 0.7kg

Notes:
*)1: relative to German national standards.
*)2: relative to time and temperature of calibration and P < 10mW at all times; for temperature value see calibration data
*)3: within specified operating temperature range
*)4: although a higher load of up to 0,25W will not destroy the resistors, it will permanently degrade stability/drift.
*)5: for smaller deviations from nominal please contact us.
Please note that all specifications are typical values related to 23°C, unless otherwise specified.
For specified values, ambient temperature gradient shall be < 1K/h. Allow for sufficient stabilization time after high temperature changes.
To calculate total uncertainties, add calibration uncertainty, aging drift and temperature drift

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Datasheet

Typical Specifications at 23°C, K=2, unless otherwise specified:

Maximum Calibration Uncertainty in ppm *)1 *)2	10Ω	100Ω	1kΩ	10kΩ	100kΩ	1MΩ	10MΩ
RS1-A	25	20	15	15	15	20	65
RS1-H	9	6	3	3	3	7	20

Maximum Temperature Coefficient in ppm/K *)3	10Ω	100Ω	1kΩ	10kΩ	100kΩ	1MΩ	10MΩ
RS1-A *)6	3/5	3/5	3/5	3/5	3/5	5	5
RS1-H	3	1	1	1	1	5	5

Aging Drift in ppm/a *)1 *)2 *)4	10Ω	100Ω	1kΩ	10kΩ	100kΩ	1MΩ	10MΩ
RS1-A	5	5	5	5	5	10	20 *)5
RS1-H	2	1	1	1	1	10	20 *)5

Notes:
*)1: relative to German national standards. Actual calibration uncertainties will be given in the calibration data.
for tighter calibration uncertainties contact factory
*)2: relative to time and temperature of calibration and P < 10mW at all times; for temperature value see calibration data
*)3: within the specified operating temperature range
*)4: although a higher load of up to 0,25W will not destroy the resistors, it will permanently degrade stability/drift. Apply 10mW maximum!
*)5: <=50 ppm/a in the first year for 10M
*)6: from 10Ω to 100kΩ TC is <=3ppm/K typical within the specified operating range, <=5 ppm/K max over the full operating range

Please note that all specifications are typical values related to 23°C, unless otherwise specified.
For specified values, ambient temperature gradient shall be < 1K/h. Allow for sufficient stabilization time after higher temperature changes and fast temperature gradients to limit hysteresis effects.
To calculate maximum total uncertainties, add calibration uncertainty, aging drift and temperature drift contributions

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Datasheet

Description:

The RS1 resistance standard consists of 7 precision, low temperature-drift decade resistors from 10Ω to 10MΩ, mounted in a sealed metal enclosure. Four-wire measurement terminals (2 wire for 10MΩ; but can be used in 4-terminal mode by using spade and banana connectors) are supported, eliminating the resistance of the measurement cable and binding posts. The sealed metal enclosure with guard connection reduces environmental electrical noise. The impact of humidity on the aging of the resistors is reduced by using a special dissicant that keeps the internal humidity at a very low level. This improves aging especially for the -A version. Also, internal humidity-driven leakage currents are reduced. Enough dissicant is included to support long term operation over many years, even assuming ingress of certain amounts of air (which can never be totally eleminated even with a sealing gasket) caused by air pressure changes.

The RS1 standard is available in four basic versions. The -A version uses wirewound resistors in lower ranges and special metal film resistors in high ranges. The -H version is based on hermetic, ultra low drift, oil filled metail foil resistors from 10Ω to 100kΩ and special metal film resistor above. In addition, two different methods of calibration are used, resulting in different uncertainty levels. Calibration of the -A version is based on a precision 8.5 digit DMM. For the -H version calibration is performed in transfer mode, using a high precision 8.5 digit DMMs with specified low transfer uncertainties in conjunction with temperature-controlled resistance standards to achieve high calibration accuracies, resulting in the conservatively specified parameters indicated in the specification section above.
A PT100 is included for measuring the temperature of the resistors during calibration. The metal enclosure and low power operation results in a nearly zero temperature gradient between resistors and PT100, ensuring a precise temperature measurement (using 4-wire mode). Although the unit uses higher voltage components, because of its intended use and construction, it is specified for use with SELV (Safety Extra Low Voltage) voltages up to 40V DC maximum only and a 10mW power rating per resistance to ensure low drift rates.

Operation Precautions:

This product is a precision device and special care should be taken when operating it to achieve optimum performance. Always use 4-wire measurement techniques (up to 1MΩ), and also for the PT100 temperature sensor, to avoid impacts of measurement cable resistance. Do not drop, handle carefully and ensure a temperature stabilized environment. Avoid any direct air drafts accross the item and high/fast thermal gradients (allow for sufficient stabilization time thereafter). Direct infrared radiation or other heat sources in close proximity to the unit should be avoided and will impact accurcy. Use short, shielded/twisted cables and avoid EMI-generating devices in close proximity to limit electrical interference and achieve maximum accuracy. Avoid temperature extremes whenever possible. Do not exceed the specified operating and storage conditions, otherwise damage may occure. Never apply a power greater than 10mW per resistor. Do not open item in order to avoid ingress of humidity. Use low EMF cables for the for the H version and switch on thermal (EMF) voltage compensation on meters supporting this.

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