

Tight-tolerance, laboratory-grade decade substituters, for applications requiring a cost-effective, high-performance resistance decade box.



6 Decade HARS-X High Accuracy Resistance Substituter

Features:

- Resistance from 1 mΩ to 111 MΩ
- Available in double-power version: HARS-X2
- Wide choice: single through 11 decade units
- High-accuracy: 0.01% (100 ppm)
- Very low zero-resistance: <1 mΩ per decade
- High-performance solid silver-alloy switches
- Low temperature coefficient: 5 ppm/°C
- Non-inductive or low-inductance resistors
- Rack mounting available
- Special and custom configurations available

See also:

- Higher accuracy: [HARS-LX Series](#)
- Higher power: [HPRS Series](#)
- Higher resistance: [HRRS Series](#)
- Higher voltage: [HRRS-5kV](#) and [HRRS-10kV Series](#)
- RTD simulators: [RTD Series](#) -- without zero subtraction
- Programmable models: [PRS Series](#)

SPECIFICATIONS

Resistance per step	Total decade resistance	Stability (±ppm/yr)	Long-term stability (±ppm/3 yrs)	Temperature coefficient (±ppm/°C)	Resistor type	HARS-X			HARS-X2 New		
						Max current	Max voltage (per step)	Max power (per step)	Max current	Max voltage (per step)	Max power (per step)
1 mΩ	10 mΩ	50	75	50	Resistance wire	8.0 A	5 mV	0.04 W	9.0 A	9 mV	0.08 W
10 mΩ	100 mΩ	50	75	20		4.0 A	40 mV	0.16 W	6.3 A	63 mV	0.4 W
100 mΩ	1 Ω	50	75	20		1.6 A	0.16 V	0.25 W	2.2 A	0.3 V	0.5 W
1 Ω	10 Ω	20	25	20	Wirewound, non-inductive	0.8 A	0.8 V	0.6 W	1.1 A	1.1 V	1.2 W
10 Ω	100 Ω	20	25	15		0.25 A	2.5 V	0.6 W	0.35 A	3.5 V	1.2 W
100 Ω	1 kΩ	20	25	5		80 mA	8 V	0.6 W	110 mA	11 V	1.2 W
1 kΩ	10 kΩ	20	25	5		23 mA	23 V	0.5 W	35 mA	35 V	1.2 W
10 kΩ	100 kΩ	20	25	5		7 mA	70 V	0.5 W	11 mA	110 V	1.2 W
100 kΩ	1 MΩ	20	25	5		2.3 mA*	230 V*	0.5 W*	3 mA*	500 V*	1 W*
1 MΩ	10 MΩ	20	25	5		0.7 mA*	700 V*	0.5 W*	1 mA*	1000 V*	1 W*
10 MΩ	100 MΩ	50	100	10	Metal oxide film	0.1 mA*	1000 V*	0.1 W*	0.1 mA*	1000 V*	0.1 W*

*Subject to maximum of 2000 V to case

Accuracy:

≤1 MΩ decades: ±(0.01% + 2 mΩ)

10 MΩ decades: ±0.03%

after subtraction of zero resistance, at 23°C; traceable to SI

Zero resistance:

≤1 MΩ decades: <1 mΩ per decade at dc

10 MΩ decade: ≈3 mΩ at dc

Max voltage to case:

2000 V peak

Environmental conditions:

Operating: 10°C to 40°C; <80% RH

Storage: -40°C to 70°C

Switches:

Continuous rotation

11 positions marked "0"- "10"

Multiple solid silver-alloy contacts

Switch capacitance:

<1 pF between contacts

Terminals:

3 terminals, High, Low, and GND via gold-plated, 5-way, tellurium-copper binding posts with low thermal emf and low resistance.

-K option with 5 terminals for Kelvin connection is available as an option to reduce zero resistance.

-K option is not available for 1 decade housing.

-RO Rear outputs are available as an option.

Mechanical:

Model	Dimensions	Weight
1 decade	(9.5 cm W x 8.3 cm H x 11.0 cm D) 3.75" x 3.25" x 4.33"	0.45 kg 1 lb
2-3 decade	(31 cm W x 8.9 cm H x 10.2 cm D) 12.2" x 3.5" x 4"	1.7 kg 3.8 lb
4-5 decade	(37.6 cm W x 8.9 cm H x 10.2 cm D) 14.8" x 3.5" x 4"	2.0 kg 4.3 lb
6-7 decades	(43.9 cm W x 8.9 cm H x 10.2 cm D) 17.3" x 3.5" x 4"	2.4 kg 5.3 lb
8-9 decades	(48.3 cm W x 17.8 cm H x 17.8 cm D)	3.5 kg 7.7 lb
10-11 decades	19" x 7" x 7"	3.7 kg 8.1 lb



SINGLE DECADE UNITS

Single-decade units are available with resistance from as low as 1 mΩ per step to as high as 10 MΩ per step. These units satisfy many system applications requiring only a single decade while maintaining all the quality features of the HARS series.

Each decade is enclosed in an aluminum case which can serve as a shield.

It may be panel-mounted and combined with additional units to form potentiometer circuits or other configurations.

Each unit consists of low-inductance resistors in series, with a high performance solid silver alloy contact switch.



Single-Decade HARS-X Unit

ORDERING INFORMATION

Model*	Total resistance	Number of decades	Resolution
HARS-X-1-0.001	0.01 Ω	1	0.001 Ω
HARS-X-1-0.01	0.1 Ω	1	0.01 Ω
HARS-X-1-0.1	1 Ω	1	0.1 Ω
HARS-X-1-1	10 Ω	1	1 Ω
HARS-X-1-10	100 Ω	1	10 Ω
HARS-X-1-100	1 kΩ	1	100 Ω
HARS-X-1-1k	10 kΩ	1	1 kΩ
HARS-X-1-10k	100 kΩ	1	10 kΩ
HARS-X-1-100k	1 MΩ	1	100 kΩ
HARS-X-1-1M	10 MΩ	1	1 MΩ
HARS-X-1-10M	100 MΩ	1	10 MΩ
HARS-X-2-0.001	0.11 Ω	2	0.001 Ω
HARS-X-2-0.01	1.1 Ω	2	0.01 Ω
HARS-X-2-0.1	11 Ω	2	0.1 Ω
HARS-X-2-1	110 Ω	2	1 Ω
HARS-X-2-10	1.1 kΩ	2	10 Ω
HARS-X-2-100	11 kΩ	2	100 Ω
HARS-X-2-1k	110 kΩ	2	1 kΩ
HARS-X-2-10k	1.1 MΩ	2	10 kΩ
HARS-X-2-100k	11 MΩ	2	100 kΩ
HARS-X-2-1M	110 MΩ	2	1 MΩ
HARS-X-3-0.001	1.11 Ω	3	0.001 Ω
HARS-X-3-0.01	11.1 Ω	3	0.01 Ω
HARS-X-3-0.1	111 Ω	3	0.1 Ω
HARS-X-3-1	1.11 kΩ	3	1 Ω
HARS-X-3-10	11.1 kΩ	3	10 Ω
HARS-X-3-100	111 kΩ	3	100 Ω
HARS-X-3-1k	1.11 MΩ	3	1 kΩ
HARS-X-3-10k	11.1 MΩ	3	10 kΩ
HARS-X-3-100k	111 MΩ	3	100 kΩ
HARS-X-4-0.001	11.11 Ω	4	0.001 Ω
HARS-X-4-0.01	111.1 Ω	4	0.01 Ω
HARS-X-4-0.1	1.111 kΩ	4	0.1 Ω
HARS-X-4-1	11.11 kΩ	4	1 Ω
HARS-X-4-10	111.1 kΩ	4	10 Ω
HARS-X-4-100	1.111 MΩ	4	100 Ω
HARS-X-4-1k	11.11 MΩ	4	1 kΩ
HARS-X-4-10k	111.1 MΩ	4	10 kΩ

Model*	Total resistance	Number of decades	Resolution
HARS-X-5-0.001	111.11 Ω	5	0.001 Ω
HARS-X-5-0.01	1.1111 kΩ	5	0.01 Ω
HARS-X-5-0.1	11.111 kΩ	5	0.1 Ω
HARS-X-5-1	111.11 kΩ	5	1 Ω
HARS-X-5-10	1.1111 MΩ	5	10 Ω
HARS-X-5-100	11.111 MΩ	5	100 Ω
HARS-X-5-1k	111.11 MΩ	5	1 kΩ
HARS-X-6-0.001	1.111 11 kΩ	6	0.001 Ω
HARS-X-6-0.01	11.1111 kΩ	6	0.01 Ω
HARS-X-6-0.1	111.111 kΩ	6	0.1 Ω
HARS-X-6-1	1.111 11 MΩ	6	1 Ω
HARS-X-6-10	11.1111 MΩ	6	10 Ω
HARS-X-6-100	111.111 MΩ	6	100 Ω
HARS-X-7-0.001	11.111 11 kΩ	7	0.001 Ω
HARS-X-7-0.01	111.1111 kΩ	7	0.01 Ω
HARS-X-7-0.1	1.111 111 MΩ	7	0.1 Ω
HARS-X-7-1	11.111 11 MΩ	7	1 Ω
HARS-X-7-10	111.1111 MΩ	7	10 Ω
HARS-X-8-0.001	111.111 11 kΩ	8	0.001 Ω
HARS-X-8-0.01	1.111 111 1 MΩ	8	0.01 Ω
HARS-X-8-0.1	11.111 111 MΩ	8	0.1 Ω
HARS-X-8-1	111.111 11 MΩ	8	1 Ω
HARS-X-9-0.001	1.111 111 11 MΩ	9	0.001 Ω
HARS-X-9-0.01	11.111 111 1 MΩ	9	0.01 Ω
HARS-X-9-0.1	111.111 111 MΩ	9	0.1 Ω
HARS-X-10-0.001	11.111 111 11 MΩ	10	0.001 Ω
HARS-X-10-0.01	111.111 111 1 MΩ	10	0.01 Ω
HARS-X-11-0.001	111.111 111 11 MΩ	11	0.001 Ω

* Use "X2" for higher power model

Options:

- RM: Rack mountable front panel for standard 19" rack
- K: Kelvin-type 4-terminal binding posts + GND
(for reduced zero resistance)
not available for 1 decade housing
- RO: Rear output



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