

# High Accuracy Decade Resistance Substituter

## HARS-X Series p. 1 of 2

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

- 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



6 Decade **HARS-X** High Accuracy Resistance Substituter

### 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](#)
- 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 <span style="color: red; font-weight: bold;">New</span>		
						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 A	5 mV	0.04 W	9 A	9 mV	0.08 W
10 mΩ	100 mΩ	50	75	20		4 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	10		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*

\*Subject to maximum of 2000 V to case.

### Accuracy:

≤1 MΩ steps: ±(0.01% + 2 mΩ)  
 10 MΩ steps: ±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

### Maximum Voltage to Case:

2000 V peak

### Environment:

Operating: +10 to +40°C, <80% RH  
 Storage: -20 to +65°C

### Switches:

Continuous rotation  
 11 positions marked "0"- "10"  
 Multiple solid silver-alloy contacts

### Switch Capacitance:

<1 pF between contacts

### Terminals:

Gold-plated, tellurium-copper, low-thermal-emf binding posts on standard 3/4 inch spacing; shield terminal provided.

### 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 decades	43.9 cm W x 8.9 cm H x 10.2 cm D (17.3" x 3.5" x 4")	2.2 kg (4.8 lb)
7 decades		2.4 kg (5.3 lb)
8 decades	48.3 cm W x 17.8 cm H x 17.8 cm D (19" x 7" x 7")	3.4 kg (7.5 lb)
9 decades		3.5 kg (7.7 lb)
10 decades		3.6 kg (7.9 lb)
11 decades		3.7 kg (8.1 lb)



**IET LABS, INC.** in the **GenRad** Tradition  
 534 Main Street, Westbury, NY 11590

www.ietlabs.com  
 TEL: (516) 334-5959 • (800) 899-8438 • FAX: (516) 334-5988

# High Accuracy Decade Resistance Substituter

## HARS-X Series p. 2 of 2

### 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 (Ω)	No of Dials	Resolution (Ω)
HARS-X-1-0.001	0.01	1	0.001
HARS-X-1-0.01	0.1	1	0.01
HARS-X-1-0.1	1	1	0.1
HARS-X-1-1	10	1	1
HARS-X-1-10	100	1	10
HARS-X-1-100	1 k	1	100
HARS-X-1-1K	10 k	1	1 k
HARS-X-1-10K	100 k	1	10 k
HARS-X-1-100K	1 M	1	100 k
HARS-X-1-1M	10 M	1	1 M
HARS-X-1-10M	100 M	1	10 M
HARS-X-2-0.001	0.11	2	0.001
HARS-X-2-0.01	1.1	2	0.01
HARS-X-2-0.1	11	2	0.1
HARS-X-2-1	110	2	1
HARS-X-2-10	1.1 k	2	10
HARS-X-2-100	11 k	2	100
HARS-X-2-1K	110 k	2	1 k
HARS-X-2-10K	1.1 M	2	10 k
HARS-X-2-100K	11 M	2	100 k
HARS-X-2-1M	110 M	2	1 M
HARS-X-3-0.001	1.11	3	0.001
HARS-X-3-0.01	11.1	3	0.01
HARS-X-3-0.1	111	3	0.1
HARS-X-3-1	1.11 k	3	1
HARS-X-3-10	11.1 k	3	10
HARS-X-3-100	111 k	3	100
HARS-X-3-1K	1.11 M	3	1 k
HARS-X-3-10K	11.1 M	3	10 k
HARS-X-3-100K	111 M	3	100 k
HARS-X-4-0.001	11.11	4	0.001
HARS-X-4-0.01	111.1	4	0.01
HARS-X-4-0.1	1.111 k	4	0.1
HARS-X-4-1	11.11 k	4	1
HARS-X-4-10	111.1 k	4	10
HARS-X-4-100	1.111 M	4	100
HARS-X-4-1K	11.11 M	4	1 k
HARS-X-4-10K	111.1 M	4	10 k

Model*	Total resistance (Ω)	No of Dials	Resolution (Ω)
HARS-X-5-0.001	111.11	5	0.001
HARS-X-5-0.01	1.1111 k	5	0.01
HARS-X-5-0.1	11.111 k	5	0.1
HARS-X-5-1	111.11 k	5	1
HARS-X-5-10	1.1111 M	5	10
HARS-X-5-100	11.111 M	5	100
HARS-X-5-1K	111.11 M	5	1 k
HARS-X-6-0.001	1.111 11 k	6	0.001
HARS-X-6-0.01	11.1111 k	6	0.01
HARS-X-6-0.1	111.111 k	6	0.1
HARS-X-6-1	1.111 11 M	6	1
HARS-X-6-10	11.1111 M	6	10
HARS-X-6-100	111.111 M	6	100
HARS-X-7-0.001	11.111 11 k	7	0.001
HARS-X-7-0.01	111.1111 k	7	0.01
HARS-X-7-0.1	1.111 111 M	7	0.1
HARS-X-7-1	11.111 11 M	7	1
HARS-X-7-10	111.1111 M	7	10
HARS-X-8-0.001	111.111 11 k	8	0.001
HARS-X-8-0.01	1.111 111 1 M	8	0.01
HARS-X-8-0.1	11.111 111 M	8	0.1
HARS-X-8-1	111.111 11 M	8	1
HARS-X-9-0.001	1.111 111 11 M	9	0.001
HARS-X-9-0.01	11.111 111 1 M	9	0.01
HARS-X-9-0.1	111.111 111 M	9	0.1
HARS-X-10-0.001	11.111 111 11 M	10	0.001
HARS-X-10-0.01	111.111 111 1 M	10	0.01
HARS-X-11-0.001	111.111 111 11 M	11	0.001

\* Use "X2" for higher power model

#### OPTIONS

- RM Rack mountable case for standard 19" rack
- K Kelvin type 4-terminal binding posts
- RO Rear output binding posts



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