

## HARS-LX Series

Highest-accuracy version of the IET Labs resistance substituters for the most exacting calibration and test applications. The HARS-LX Series features a continuous rheostat as an option.

- No zero subtraction required - Absolute accuracy applies for every setting\*
- High accuracy - 20 ppm
- High stability - 5 ppm/yr
- Low temperature coefficient - as low as 3 ppm/°C
- High-performance, solid silver contact switches
- Resistance from 10 mΩ to over 121 MΩ
- 1 mΩ or optional 20 μΩ resolution
- Hermetically sealed, low inductance resistors
- Precise fixed minimum resistance

**See also:**

- More economical: **HARS-X** or **RS 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**

### MODELS

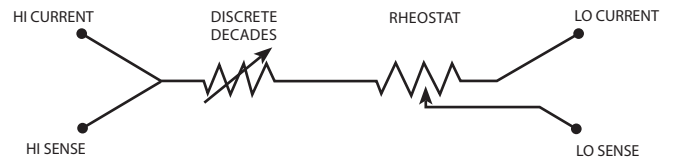


Nine-decade Model with 1 mΩ resolution

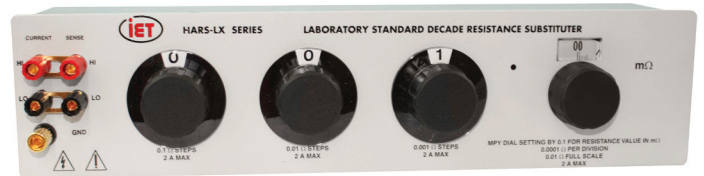
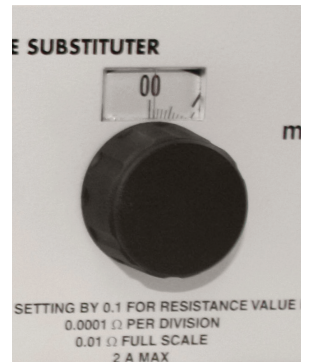


Eleven-decade model with 1 mΩ resolution, offering wide range and high resolution

### RHEOSTAT

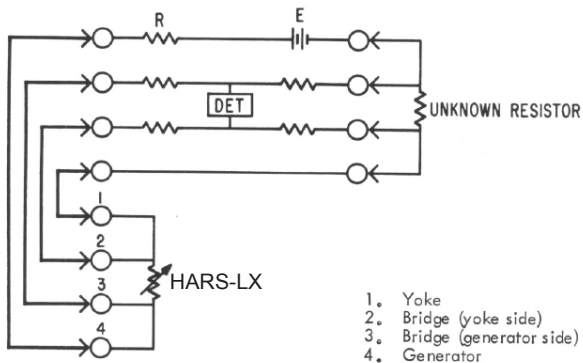


For high-resolution applications, a 10 mΩ rheostat may be added for the lowest step. It is a 0.20 μΩ resolution "decade". In order to eliminate contact resistance and thermal emf, the HARS-LX integrates the rheostat as shown. In this way, the wiper is in the low potential circuit, which is the high impedance lead. As a result, voltage and contact resistance effects are removed by being effectively added to the input impedance of the measuring instrument.



Three-decade HARS-LX with optional rheostat

### KELVIN BRIDGE MEASUREMENT



\*Absolute accuracy is accomplished by having a minimum resistance, which includes all contact resistances. No zero subtraction required. Absolute accuracy applies for every setting.

Many models and combinations are available; see ORDERING INFORMATION

# HARS-LX Series

## SPECIFICATIONS

Resistance per step	Total decade resistance	Max current	Max power	Temperature coefficient (±ppm/°C)	Power coefficient (±ppm/mW)	Accuracy*	Stability (±ppm/yr)	Decade positions	Resistor type
		whichever applies first							
100 μΩ division 20 μΩ resolution	10 mΩ	2 A	NA	20	1	±(20 ppm+0.5 mΩ)	20 ppm+0.5 mΩ	Continuous	Rheostat
1 mΩ	10 mΩ	2 A	NA	20	1			11 positions "0"- "10"	Resistance wire
10 mΩ	100 mΩ	2 A	NA	20	1			10 positions "1"- "10" (10 mΩ minimum reading)	
100 mΩ	1 Ω	2 A	NA	20	1			11 positions "0"- "10" (12 positions "0"- "11" for highest decade, where highest decade steps are 1 Ω, 10 Ω, 10 kΩ, 100 kΩ, 1 MΩ, and 10 MΩ.) See Ordering Information section below.	Wirewound hermetically sealed low-inductance
1 Ω	10 Ω	1 A	5 W	20	0.4				
10 Ω	100 Ω	0.33 A	5 W	10	0.3				
100 Ω	1 kΩ	0.1 A	5 W	3	0.1				
1 kΩ	10 kΩ	33 mA	5 W	3	0.1				
10 kΩ	100 kΩ	10 mA	5 W	3	0.1				
100 kΩ	1 MΩ	3 mA	2,000 V peak	3	0.1				
1 MΩ	10 MΩ	1 mA	2,000 V peak	3	0.1				
10 MΩ	100 MΩ	2,000 V peak		15	0.2	±0.02%	50 ppm	Metal oxide	
Wiring and switch resistance		NA		50 μΩ/°C	0.2 μΩ/W	NA			

\*At 23°C "true ohm" measurement, 30-70% RH, absolute reading, SI traceable  
 No zero subtraction required

### Minimum settable resistance:

With this design, absolute accuracy, *without* zero subtraction, is accomplished by having a minimum settable resistance, *which includes all contact and wiring resistances*. Absolute accuracy applies for every setting. The minimum resistance is determined by the lowest resolution of the unit and by internal resistance. See **Ordering Information** for the minimum settable resistance for any model. Minimum settable resistance is implemented by a mechanical stop on one of the decades.

### Resistance repeatability:

Better than 100 μΩ, short-term, average value

### Leakage Resistance:

>10 GΩ

### Environmental Conditions:

**Operating Temperature:** 0°C to 55°C

**Storage Temperature:** -40°C to 70°C

### Switch Type:

Multiple solid silver contacts; dust-tight diallyl-phthalate body. To allow continuous rotation, a blank position is added on most decades.

### Terminals:

Four, 5-way, gold-plated, tellurium-copper binding posts with low thermal emf and low resistance, for four-terminal Kelvin measurements, plus one binding post connected to case for shielding. Rear outputs are available as an option.

### Mechanical Information:

Model	Dimensions	Nominal Weight
1 decade	7.7 cm W x 7.7 cm H x 8.4 cm D (3" W x 3" H x 3.3" D)	0.45 kg (1.0 lb)
3 decades	37.5 cm W x 8.9 cm H x 10.2 cm D (14.8" W x 3.5" H x 4" D)	2.0 kg (4.3 lb)
4-5 decades	43.9 cm W x 8.9 cm H x 10.2 cm D (17.3" W x 3.5" H x 4.0" D)	2.2 kg (4.8 lb)
6-10 decades	48.3 cm W x 17.8 cm H x 19.7 cm D (19" W x 7" H x 7.8" D)	5.1 kg (11 lb)
11 decades	48.3 cm W x 31 cm H x 19.7 cm D (19" W x 12.3" H x 7.8" D)	6.6 kg (14 lb)

## HARS-LX Series

### ORDERING INFORMATION

Model	Nominal total resistance	No. of decades	Resolution	Minimum settable resistance**
HARS-LX-1-0.001	10 mΩ	1	1 mΩ	1 mΩ
HARS-LX-1-0.01	100 mΩ	1	10 mΩ	10 mΩ
HARS-LX-1-0.1	1 Ω	1	100 mΩ	100 mΩ
HARS-LX-1-1	11 Ω	1	1 Ω	1 Ω
HARS-LX-1-10	110 Ω	1	10 Ω	10 Ω
HARS-LX-1-100	1.0 kΩ	1	100 Ω	100 Ω
HARS-LX-1-1k	10 kΩ	1	1 kΩ	1 kΩ
HARS-LX-1-10k	110 kΩ	1	10 kΩ	none
HARS-LX-1-100k	1.1 MΩ	1	100 kΩ	none
HARS-LX-1-1M	11 MΩ	1	1 MΩ	none
HARS-LX-1-10M	110 MΩ	1	10 MΩ	none
HARS-LX-2-0.001	110 mΩ	2	1 mΩ	2 mΩ
HARS-LX-2-0.01	1.10 Ω	2	10 mΩ	10 mΩ
HARS-LX-2-0.1	12.0 Ω	2	100 mΩ	100 mΩ
HARS-LX-2-1	120 Ω	2	1 Ω	1 Ω
HARS-LX-2-10	1.10 kΩ	2	10 Ω	10 Ω
HARS-LX-2-100	11.0 kΩ	2	100 Ω	100 Ω
HARS-LX-2-1k	120 kΩ	2	1 kΩ	1 kΩ
HARS-LX-2-10k	1.20 MΩ	2	10 kΩ	none
HARS-LX-2-100k	12.0 MΩ	2	100 kΩ	none
HARS-LX-2-1M	120 MΩ	2	1 MΩ	none
HARS-LX-3-0.001	1.110 Ω	3	1 mΩ	*
HARS-LX-3-0.01	12.10 Ω	3	10 mΩ	10 mΩ
HARS-LX-3-0.1	121.0 Ω	3	100 mΩ	100 mΩ
HARS-LX-3-1	1.110 kΩ	3	1 Ω	1 Ω
HARS-LX-3-10	11.10 kΩ	3	10 Ω	10 Ω
HARS-LX-3-100	121.0 kΩ	3	100 Ω	100 Ω
HARS-LX-3-1k	1.210 MΩ	3	1 kΩ	1 kΩ
HARS-LX-3-10k	12.10 MΩ	3	10 kΩ	none
HARS-LX-3-100k	121.0 MΩ	3	100 KΩ	none
HARS-LX-4-0.001	12.110 Ω	4	1 mΩ	*
HARS-LX-4-0.01	121.10 Ω	4	10 mΩ	10 mΩ
HARS-LX-4-0.1	1.111 0 kΩ	4	100 mΩ	100 mΩ
HARS-LX-4-1	11.110 kΩ	4	1 Ω	1 Ω
HARS-LX-4-10	121.10 kΩ	4	10 Ω	10 Ω
HARS-LX-4-100	1.211 0 MΩ	4	100 Ω	100 Ω
HARS-LX-4-1k	12.110 MΩ	4	1 kΩ	1 kΩ
HARS-LX-4-10k	121.10 MΩ	4	10 kΩ	none

Model	Nominal total resistance	No. of decades	Resolution	Minimum settable resistance**
HARS-LX-5-0.001	121.110 Ω	5	1 mΩ	*
HARS-LX-5-0.01	1.111 10 kΩ	5	10 mΩ	10 mΩ
HARS-LX-5-0.1	11.111 0 kΩ	5	100 mΩ	100 mΩ
HARS-LX-5-1	121.110 kΩ	5	1 Ω	1 Ω
HARS-LX-5-10	1.211 10 MΩ	5	10 Ω	10 Ω
HARS-LX-5-100	12.111 0 MΩ	5	100 Ω	100 Ω
HARS-LX-5-1k	121.110 MΩ	5	1 kΩ	1 kΩ
HARS-LX-6-0.001	1.111 110 kΩ	6	1 mΩ	*
HARS-LX-6-0.01	11.111 10 kΩ	6	10 mΩ	10 mΩ
HARS-LX-6-0.1	121.111 0 kΩ	6	100 mΩ	100 mΩ
HARS-LX-6-1	1.211 110 MΩ	6	1 Ω	1 Ω
HARS-LX-6-10	12.111 10 MΩ	6	10 Ω	10 Ω
HARS-LX-6-100	121.111 0 MΩ	6	100 Ω	100 Ω
HARS-LX-7-0.001	11.111 110 kΩ	7	1 mΩ	*
HARS-LX-7-0.01	121.111 10 kΩ	7	10 mΩ	10 mΩ
HARS-LX-7-0.1	1.211 111 0 MΩ	7	100 mΩ	100 mΩ
HARS-LX-7-1	12.111 110 MΩ	7	1 Ω	1 Ω
HARS-LX-7-10	121.111 10 MΩ	7	10 Ω	10 Ω
HARS-LX-8-0.001	121.111 110 kΩ	8	1 mΩ	*
HARS-LX-8-0.01	1.211 111 10 MΩ	8	10 mΩ	10 mΩ
HARS-LX-8-0.1	12.111 111 0 MΩ	8	100 mΩ	100 mΩ
HARS-LX-8-1	121.111 110 MΩ	8	1 Ω	1 Ω
HARS-LX-9-0.001	1.211 111 110 MΩ	9	1 mΩ	*
HARS-LX-9-0.01	12.111 111 10 MΩ	9	10 mΩ	10 mΩ
HARS-LX-9-0.1	121.111 111 0 MΩ	9	100 mΩ	100 mΩ
HARS-LX-10-0.001	12.111 111 110 MΩ	10	1 mΩ	*
HARS-LX-10-0.01	121.111 111 10 MΩ	10	10 mΩ	10 mΩ
HARS-LX-11-0.001	121.111 111 110 MΩ	11	1 mΩ	*

**Options:**

- RH: 10 mΩ rheostat for lowest decades, 20 μΩ resolution
- RO: Rear output binding posts
- RM: Rack-mountable case for standard 19" rack

\*Customer Selection

\*\*Minimum settable resistance is determined by a mechanical stop on one of the decades. Absolute accuracy, without zero subtraction, is accomplished by having this minimum resistance, which includes all contact resistances. No zero subtraction required. Absolute accuracy applies for every setting.