

(equivalent to esi model RS 925D)

Laboratory Standard Decade Resistance Substituter

HARS-LX Series

p. 1 of 3

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.

- 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:

- For more economical version see **HARS-X**
- For higher power see **HPRS Series**
- For higher resistance see **HRRS Series**
- For higher voltage **HRRS-5kV** and **HRRS-10kV Series**
- For RTD simulators see **RTD Series**
- For programmable models see **PRS Series**

MODELS

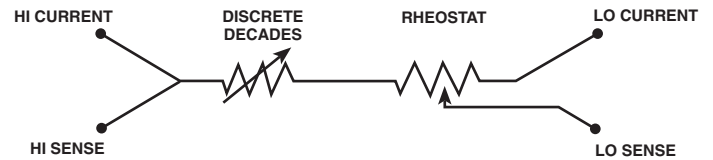


Nine-decade Model with 1 mΩ resolution

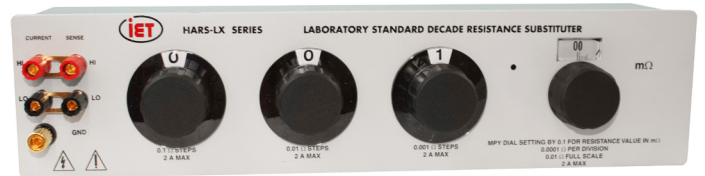
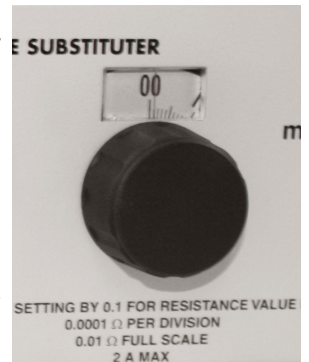


Eleven-decade model with 1 mΩ resolution, offering wide range and high resolution

RHEOSTAT

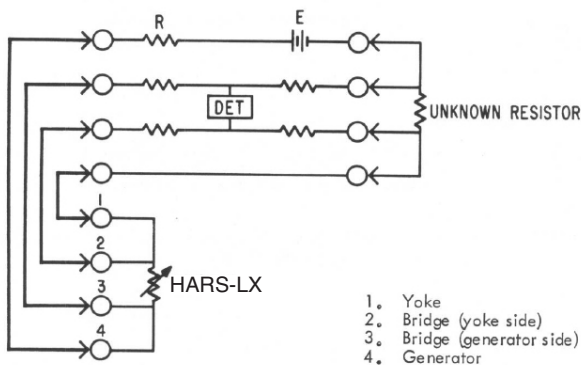


For high-resolution applications, a 10 mΩ rheostat may be added for the lowest step. It is a 20 μΩ resolution “decade”. In order to eliminate contact resistance and thermal emf, the **HARS-LX** integrates the rheostat as shown. In this way, the wiper is in the low potential circuit, which is the high 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



Many models and combinations are available; see **ORDERING INFORMATION**



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IET cat/HARS-LX/11-09

SPECIFICATIONS

Resistance per step	Total decade resistance	Max current	Max power	Temperature coefficient (\pm ppm/ $^{\circ}$ C)	Power coefficient (\pm ppm/mW)	Accuracy*	Stability (\pm ppm/yr)	Decade positions	Resistor type
		whichever applies first							
20 $\mu\Omega$ Rheostat	10 m Ω	2 A	NA	20	1	$\pm(20 \text{ ppm} + 0.5 \text{ m}\Omega)$	20 ppm+0.5 m Ω	Continuous	Resistance wire
1 m Ω	10 m Ω	2 A	NA	20	1			11 positions "0"-"10"	
10 m Ω	100 m Ω	2 A	NA	20	1			10 positions "1"-"10" (10 m Ω minimum reading)	
100 m Ω	1 Ω	2 A	NA	20	1			11 positions "0"-"10" (12 positions "0"-"11" for highest decade)	
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 k Ω	0.1 A	5 W	3	0.1				
1 k Ω	10 k Ω	33 mA	5 W	3	0.1				
10 k Ω	100 k Ω	10 mA	5 W	3	0.1			Wirewound hermetically sealed low-inductance	
100 k Ω	1.1 M Ω	3 mA	5 W	3	0.1				
1 M Ω	11 M Ω	1 mA	1,500 V peak	3	0.1				
10 M Ω	110 M Ω	1,500 V peak		15	0.2	$\pm 0.02\%$	50 ppm	Metal oxide	
Wiring and switch resistance		NA		50 $\mu\Omega$ / $^{\circ}$ C	0.2 $\mu\Omega$ /W	NA			

*At 23 $^{\circ}$ C "true ohm" measurement, 30-70% RH, absolute reading, SI traceable
No zero subtraction required

Minimum resistance:

10 m Ω \pm 0.5 m Ω ; determined by the lowest settable position, "1", of the 10 m Ω /step decade

Resistance repeatability:

Better than 100 $\mu\Omega$, short-term, average value

Leakage Resistance:

>10 G Ω

Environmental Conditions:

Operating Temperature: 0 $^{\circ}$ C to 55 $^{\circ}$ C

Storage Temperature: -40 $^{\circ}$ C to 70 $^{\circ}$ 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	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)
2-5 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)
6-7 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)
8-10 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)



ORDERING INFORMATION

Model	Total Resistance	Number of Decades	Resolution
HARS-LX-1-0.001	11 mΩ	1	1 mΩ
HARS-LX-1-0.01	110 mΩ	1	10 mΩ
HARS-LX-1-0.1	1.1 Ω	1	100 mΩ
HARS-LX-1-1	11 Ω	1	1 Ω
HARS-LX-1-10	110 Ω	1	10 Ω
HARS-LX-1-100	1.1 kΩ	1	100 Ω
HARS-LX-1-1k	11 kΩ	1	1 kΩ
HARS-LX-1-10k	110 kΩ	1	10 kΩ
HARS-LX-1-100k	1.1 MΩ	1	100 kΩ
HARS-LX-1-1M	11 MΩ	1	1 MΩ
HARS-LX-2-0.001	120 mΩ	2	1 mΩ
HARS-LX-2-0.01	1.2 Ω	2	10 mΩ
HARS-LX-2-0.1	12 Ω	2	100 mΩ
HARS-LX-2-1	120 Ω	2	1 Ω
HARS-LX-2-10	1.2 kΩ	2	10 Ω
HARS-LX-2-100	12 kΩ	2	100 Ω
HARS-LX-2-1k	120 kΩ	2	1 kΩ
HARS-LX-2-10k	1.2 MΩ	2	10 kΩ
HARS-LX-2-100k	12 MΩ	2	100 kΩ
HARS-LX-3-0.001	1.21 Ω	3	1 mΩ
HARS-LX-3-0.01	12.1 Ω	3	10 mΩ
HARS-LX-3-0.1	121 Ω	3	100 mΩ
HARS-LX-3-1	1.21 kΩ	3	1 Ω
HARS-LX-3-10	12.1 kΩ	3	10 Ω
HARS-LX-3-100	121 kΩ	3	100 Ω
HARS-LX-3-1k	1.21 MΩ	3	1 kΩ
HARS-LX-3-10k	12.1 MΩ	3	10 kΩ
HARS-LX-4-0.001	12.11 Ω	4	1 mΩ
HARS-LX-4-0.01	121.1 Ω	4	10 mΩ
HARS-LX-4-0.1	1.211 kΩ	4	100 mΩ
HARS-LX-4-1	12.11 kΩ	4	1 Ω
HARS-LX-4-10	121.1 kΩ	4	10 Ω
HARS-LX-4-100	1.211 MΩ	4	100 Ω
HARS-LX-4-1k	12.11 MΩ	4	1 kΩ

Model	Total Resistance	Number of Decades	Resolution
HARS-LX-5-0.001	121.11 Ω	5	1 mΩ
HARS-LX-5-0.01	1.211 1 kΩ	5	10 mΩ
HARS-LX-5-0.1	12.111 kΩ	5	100 mΩ
HARS-LX-5-1	121.11 kΩ	5	1 Ω
HARS-LX-5-10	1.211 1 MΩ	5	10 Ω
HARS-LX-5-100	12.111 MΩ	5	100 Ω
HARS-LX-6-0.001	1.211 11 kΩ	6	1 mΩ
HARS-LX-6-0.01	12.111 1 kΩ	6	10 mΩ
HARS-LX-6-0.1	121.111 kΩ	6	100 mΩ
HARS-LX-6-1	1.211 11 MΩ	6	1 Ω
HARS-LX-6-10	12.111 1 MΩ	6	10 Ω
HARS-LX-7-0.001	12.111 11 kΩ	7	1 mΩ
HARS-LX-7-0.01	121.111 1 kΩ	7	10 mΩ
HARS-LX-7-0.1	1.211 111 MΩ	7	100 mΩ
HARS-LX-7-1	12.111 11 MΩ	7	1 Ω
HARS-LX-8-0.001	121.111 11 kΩ	8	1 mΩ
HARS-LX-8-0.01	1.211 111 1 MΩ	8	10 mΩ
HARS-LX-8-0.1	12.111 111 MΩ	8	100 mΩ
HARS-LX-8-1	121.111 11 MΩ	8	1 Ω
HARS-LX-9-0.001	1.211 111 11 kΩ	9	1 mΩ
HARS-LX-9-0.01	12.111 111 1 MΩ	9	10 mΩ
HARS-LX-9-0.1	121.111 111 MΩ	9	100 mΩ
HARS-LX-10-0.001	12.111 111 11 MΩ	10	1 mΩ
HARS-LX-10-0.01	121.111 111 1 MΩ	10	10 mΩ
HARS-LX-11-0.001	121.111 111 11 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

