

HARS-L • HARS-LX • Series

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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



HARS-LX Laboratory Standard Decade Resistance Substituter (shown with optional rheostat)

STANDARD MODELS

Series	HARS-L	HARS-LX
Description	Tight tolerance versions of the IET labs HARS-X Series for applications requiring a cost effective high performance resistance decade standard suitable for laboratory and field calibrations.	Highest performance decade resistance substituter with the tightest tolerance, stability, repeatability, and temperature coefficient.
Resistor type	Resistance wire for 0.1 steps and under; hermetically sealed, wirewound non-inductive resistors for 1 Ω steps and over.	
Range	10 mΩ up to 12.1 MΩ in 1 to 10 decades; (minimum may be lower for units with fewer decades)	
Resolution	1 mΩ discrete steps; 20 μΩ continuous resolution rheostat; 10 mΩ full scale, option RH.	
Initial Accuracy (absolute)	<±(25 ppm + 0.5 mΩ); at 23°C, no zero subtraction required, 4-terminal, "true-ohm" measurement, SI traceable.	<±(20 ppm + 0.5 mΩ); at 23°C, no zero subtraction required, 4-terminal, "true-ohm" measurement, SI traceable
Initial Adjustment Accuracy	±1 ppm for 10 kΩ steps; ±1.5 ppm for 100 kΩ steps; ±3 ppm for 1 MΩ steps. (For increased accuracy of the 1 Ω to 1 MΩ decades, individual resistors for these decades are trimmable.)	
Temperature Coefficient	<±20 ppm/°C for 10 Ω steps and under; <±5 ppm/°C for 100 Ω steps and over. <±50 μΩ/°C for wiring and switch resistance.	<±20 ppm/°C for 1 Ω steps and under; <±15 ppm/°C for 10 Ω steps; <±3 ppm/°C for 100 Ω steps and over; <±50 μΩ/°C for wiring and switch resistance.
Stability	<±(20 ppm + 0.5 mΩ)/year; <±5 ppm/year, typical.	
Minimum Resistance	10 mΩ ± 0.5 mΩ; limited by the lowest settable position, "1", of the 10 mΩ/step decade.	
Power Maximum	0.5 W per step up to 3 W total or 2 A max.	1 W per step up to 5 W total or 2 A max.
Calibration Conditions	Four-terminal measurement, low power, at 23°C; 30% to 60% RH.	
Switch Type	11 positions, "0"- "10", multiple solid silver alloy contacts, with short term contact resistance repeatability of <100 μΩ.	
Breakdown Voltage	1500 V peak to case	
Power Coefficient	<±1000 ppm/W for 0.1 Ω steps and under; <±400 ppm/W for 1 Ω steps; <±300 ppm/W for 10 Ω steps; <±100 pm/W for 100 Ω steps and over. <+50 μΩ/W for wiring and switch resistance.	



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Terminals: Low thermal emf beryllium copper binding posts with standard 3/4 inch spacing plus shield terminal; connection from the rear of the instrument is available as option RO.

Model	Dimensions	Weight
1 decades	7.7 cm W x 7.7 cm H x 8.4 cm D (3" x 3" x 3.3")	0.45 kg (1.0 lb)
2 - 4 decades	37.5 cm W x 8.9 cm H x 10.2 cm D (14.8" x 3.5" x 4")	1.7 kg (3.8 lb)
5 decades		2.0 kg (4.3 lb)

Model	Dimensions	Weight
6 and 7 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)
8 decades	48.3 cm W x 17.8 cm H x 19.7 cm D (19.0" x 7.0" x 7.8")	5.1 kg (13.0 lb)
9 and 10 decades		5.1 kg (13.0 lb)
11 decades	48.3 cm W x 32.5 cm H x 27.0 cm D (19.0" x 12.8" x 10.5")	9.1 kg (20.0 lb)

OPTIONAL RHEOSTAT



HARS-LX with Optional Rheostat Configuration

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.

ORDERING INFORMATION

Model (Select L or LX accuracy grade)	Total Resistance (Ω)	No. of Decades	Resolution (Ω)
HARS-L(LX)-1-0.001	0.01	1	0.001
HARS-L(LX)-1-0.01	0.1	1	0.01
HARS-L(LX)-1-0.1	1	1	0.1
HARS-L(LX)-1-1	10	1	1
HARS-L(LX)-1-10	100	1	10
HARS-L(LX)-1-100	1 k	1	100
HARS-L(LX)-1-1K	10 k	1	1 k
HARS-L(LX)-1-10K	100 k	1	10 k
HARS-L(LX)-1-100K	1 M	1	100 k
HARS-L(LX)-1-1M	10 M	1	1 M
HARS-L(LX)-2-0.001	0.11	2	0.001
HARS-L(LX)-2-0.01	1.1	2	0.01
HARS-L(LX)-2-0.1	11	2	0.1
HARS-L(LX)-2-1	110	2	1
HARS-L(LX)-2-10	1.1 k	2	10
HARS-L(LX)-2-100	11 k	2	100
HARS-L(LX)-2-1K	110 k	2	1 k
HARS-L(LX)-2-10K	1.1 MΩ	2	10 k
HARS-L(LX)-2-100K	11 MΩ	2	100 k
HARS-L(LX)-3-0.001	1.11	3	0.001
HARS-L(LX)-3-0.01	11.1	3	0.01
HARS-L(LX)-3-0.1	111	3	0.1
HARS-L(LX)-3-1	1.11 k	3	1
HARS-L(LX)-3-10	11.1 k	3	10
HARS-L(LX)-3-100	111 k	3	100
HARS-L(LX)-3-1K	1.11 M	3	1 k
HARS-L(LX)-3-10K	11.1 M	3	10 k

Model (Select L or LX accuracy grade)	Total Resistance (Ω)	No. of Decades	Resolution (Ω)
HARS-L(LX)-4-0.001	11.11	4	0.001
HARS-L(LX)-4-0.01	111.1	4	0.01
HARS-L(LX)-4-0.1	1.111 k	4	0.1
HARS-L(LX)-4-1	11.11 k	4	1
HARS-L(LX)-4-10	111.1 k	4	10
HARS-L(LX)-4-100	1.111 M	4	100
HARS-L(LX)-4-1K	11.11 M	4	1 k
HARS-L(LX)-5-0.001	111.11	5	0.001
HARS-L(LX)-5-0.01	1.1111 k	5	0.01
HARS-L(LX)-5-0.1	11.111 k	5	0.1
HARS-L(LX)-5-1	111.11 k	5	1
HARS-L(LX)-5-10	1.1111 M	5	10
HARS-L(LX)-5-100	11.111 M	5	100
HARS-L(LX)-6-0.001	1.11111 k	6	0.001
HARS-L(LX)-6-0.01	11.1111 k	6	0.01
HARS-L(LX)-6-0.1	111.111 k	6	0.1
HARS-L(LX)-6-1	1.11111 M	6	1
HARS-L(LX)-6-10	11.1111 M	6	10
HARS-L(LX)-7-0.001	11.11111 k	7	0.001
HARS-L(LX)-7-0.01	111.1111 k	7	0.01
HARS-L(LX)-7-0.1	1.11111 M	7	0.1
HARS-L(LX)-7-1	11.1111 M	7	1
HARS-L(LX)-8-0.001	111.11111 k	8	0.001
HARS-L(LX)-8-0.01	1.211111 M	8	0.01
HARS-L(LX)-8-0.1	12.11111 M	8	0.1
HARS-L(LX)-9-0.001	1.211111 M	9	0.001
HARS-L(LX)-9-K-RM	1.211111 M	9	0.001
HARS-L(LX)-9-0.01	12.11111 M	9	0.01
HARS-L(LX)-10-0.001	12.11111 M	10	0.001
HARS-L(LX)-11-0.001	121.11111 M	11	0.001

OPTIONS

- RH 10 mΩ rheostat for lowest decades, 20 μΩ resolution.
- RO Rear output binding posts

