

Length, France, LNE (Laboratoire national de métrologie et d'essais)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					Service provider	NMI Internal Service Identifier
Class	Instrument or Artifact: Measurand	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?		
Laser radiations	Frequency stabilized laser: vacuum wavelength	Optical beat frequency	633	633	nm			0.04	fm	2	95%	No	LNE-INM	1
Laser radiations	Frequency stabilized laser: absolute frequency	Optical beat frequency	474	474	THz			24	kHz	2	95%	No	LNE-INM	1
Laser radiations	Frequency stabilized laser: vacuum wavelength	Optical beat frequency	532	532	nm			0.08	fm	2	95%	No	LNE-INM	2
Laser radiations	Frequency stabilized laser: absolute frequency	Optical beat frequency	563	563	THz			0.08	MHz	2	95%	No	LNE-INM	2
Laser radiations	Frequency stabilized laser: vacuum wavelength	Optical beat frequency	633	633	nm			3	fm	2	95%	No	LNE-INM	3
End standards	Gauge block: central length $L$	Interferometry, exact fractions	0.1	100	mm	Orientation	vertical	Q[17, 0.23L], $L$ in mm	nm	2	95%	No	LNE	4
End standards	Gauge block: central length $L$	Interferometry, exact fractions	100	300	mm	Orientation	vertical	Q[23, 0.29L], $L$ in mm	nm	2	95%	No	LNE	5
End standards	Gauge block, length bar: central length $L$	Comparison to gauge block with laser interferometer	100	1000	mm	Orientation	horizontal	Q[300, 0.8L], $L$ in mm	nm	2	95%	No	LNE	6
Line standards	Precision line scale: line spacing $L$	Photoelectric microscope and 1-D comparator	0.01	3000	mm			Q[50, 0.8L], $L$ in mm	nm	2	95%	No	LNE	8
Line standards	Stage micrometer: line spacing $L$	Photoelectric microscope and 1-D comparator	0.01	50	mm			Q[50, 1L], $L$ in mm	nm	2	95%	No	LNE	9



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Diameter standards	Plug: external cylinder diameter $D$	1-D stylus comparator, gauge substitution	1	100	mm			$Q[100, 0.45D]$ , $D$ in mm	nm	2	95%	No	LNE	16
Diameter standards	Pin or wire: external cylinder diameter	Interferometry, exact fractions with gauge blocks	0.1	5	mm			100	nm	2	95%	No	LNE	17
Diameter standards	Ring: internal cylinder diameter $D$	1-D stylus comparator, gauge bridge substitution	3	100	mm			$Q[100, 0.45D]$ , $D$ in mm	nm	2	95%	No	LNE	18
Diameter standards	Ball or sphere: external diameter $D$	1-D stylus comparator, gauge substitution	1	100	mm			$Q[100, 0.45D]$ , $D$ in mm	nm	2	95%	No	LNE	19
Angle by circle dividers	Optical polygon: face angles	Rotary table and autocollimator	3	n	faces			0.1	"	2	95%	No	LNE	10
Angle by circle dividers	Index table	Rotary table and autocollimator			full-circle divisions			0.1	"	2	95%	No	LNE	11
Angle by circle dividers	Rotary table, rotary encoder: position angle	Rotary table and autocollimator	0.25	360	°			0.1	"	2	95%	No	LNE	12
Angle instrument	Autocollimator	Rotary table and autocollimator	0	according to the autocollimator	"			0.1	"	2	95%	No	LNE	13
Angle instrument	Electronic level	Angle option of laser interferometer	0	10	°			0.2	"	2	95%	No	LNE	14
Angle artefact	Angle block: included angle	Rotary table and autocollimator	1	90	°			0.1	"	2	95%	No	LNE	15

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Roundness standards	External cylinder: roundness	Stylus-on-spindle roundness instrument	0.01	50	µm	Diameter	5 mm to 300 mm	50	nm	2	95%	No	LNE	20
Roundness standards	Internal cylinder: roundness	Stylus-on-spindle roundness instrument	0.01	50	µm	Diameter	5 mm to 300 mm	50	nm	2	95%	No	LNE	21
Roundness standards	Sphere or hemisphere: external roundness	Stylus-on-spindle roundness instrument	0.01	100	µm	Diameter	1 mm to 100 mm	50	nm	2	95%	No	LNE	23
Roundness standards	Magnification standard	Stylus-on-spindle roundness instrument	0	20	µm			50	nm	2	95%	No	LNE	24
Straightness standards	Straightness standard: straightness	Stylus-on-straightness reference instrument	0.01	100	µm	Length	1 mm to 100 mm	110	nm	2	95%	No	LNE	22
CMM artefacts	Step gauge: face spacing	3D comparator and stylus, with GB substitution	0	800	mm			Q[275, 1.2L], L length in mm	nm	2	95%	No	LNE	25
CMM artefacts	Ball plate: 2-D centre coordinates	CMM and contacting probe, reversal method					(50x50) mm <sup>2</sup> to (500x500) mm <sup>2</sup>	Q[1, 3L], L is length in m	µm	2	95%	No	LNE	26