

Length, Italy, INRIM (Istituto Nazionale di Ricerca Metrologica)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					NMI Internal Service Identifier	Comments
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	Stabilized laser of the mise en pratique: vacuum wavelength	Optical beat frequency	633	633	nm			0.04	fm	2	95%	No	1	
Laser radiations	Stabilized laser of the mise en pratique: absolute frequency	Optical beat frequency	474	474	THz			24	kHz	2	95%	No	1	
Laser radiations	Stabilized laser of the mise en pratique: vacuum wavelength	Optical beat frequency	532	532	nm			0.08	fm	2	95%	No	2	
Laser radiations	Stabilized laser of the mise en pratique: absolute frequency	Optical beat frequency	563	563	THz			0.08	MHz	2	95%	No	2	
Laser radiations	Other stabilized laser: vacuum wavelength	Optical beat frequency	633	633	nm			1E-09		2	95%	Yes	3	
End standards	Gauge block: central length L	Interferometry, exact fractions	0.5	100	mm			$Q[18, 0.34L]$, L in mm	nm	2	95%	No	4	
End standards	Long gauge block: central length L	Laser interferometer, fringe fraction	100	1000	mm			$Q[60, 0.26L]$, L in mm	nm	2	95%	No	6	
End standards	Step gauge: face spacing L	1-D comparator and mechanical probe	20	420	mm			$Q[0.2, 0.7E-03L]$, L in mm	μm	2	95%	No	7	
Line standards	Stage micrometer: line spacing	1-D comparator and video microscope	0.02	20	mm	Minimum pitch	10 μm	0.1	μm	2	95%	No	8	
Line standards	1-D grating: pitch p sinusoidal profile	Laser diffractometer	0.3	50	μm	Measurement area	1 mm ² to 70 mm ²	$0.09p^2$, p in μm	nm	2	95%	No	9	
Line standards	1-D grating: pitch p non-sinusoidal profile	Laser diffractometer	0.3	50	μm	Measurement area	1 mm ² to 70 mm ²	$0.05p$, p in μm	nm	2	95%	No	9	
Line standards	2-D grating: pitch p sinusoidal profile	Laser diffractometer	0.3	50	μm	Measurement area	1 mm ² to 70 mm ²	$0.09p^2$, p in μm	nm	2	95%	No	10	
Line standards	2-D grating: pitch p non-sinusoidal profile	Laser diffractometer	0.3	50	μm	Measurement area	1 mm ² to 70 mm ²	$0.05p$, p in μm	nm	2	95%	No	10	
Diameter standards	External cylinder (plug): diameter L	1-D comparator and mechanical probe	1	150	mm			$Q[0.1, 0.5E-03L]$, L in mm	μm	2	95%	No	11	
Diameter standards	Internal cylinder (ring): diameter L	1-D comparator and mechanical probe	1	150	mm			$Q[0.1, 0.5E-03L]$, L in mm	μm	2	95%	No	12	
Diameter standards	Sphere: diameter L	1-D comparator and mechanical probe	5	150	mm			$Q[0.1, 0.5E-03L]$, L in mm	μm	2	95%	No	13	

Length, Italy, INRIM (Istituto Nazionale di Ricerca Metrologica)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					NMI Internal Service Identifier	Comments
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?		
Angle by circle-dividers	Optical polygon: face angle	Index table and autocollimator, full closure	3	72	faces	Face dimension	minimum 10 x 10 mm ²	0.2	"	2	95%	No	14	Approved on 04 May 2006
Angle by circle-dividers	Index table: index angle	Index table and autocollimator, full closure	0	360	°			0.2	"	2	95%	No	15	Approved on 04 May 2006
Angle instruments	Autocollimator: error of indicated angle	Sine bar (SAG)	0	1000	"	Orientation	vertical	0.2	"	2	95%	No	16	Approved on 04 May 2006
Angle instruments	Electronic level: error of indicated inclination angle	Sine bar (SAG)	0	1000	"	Orientation	vertical	0.2	"	2	95%	No	17	Approved on 04 May 2006
Angle instrument	Clinometers	Index table	0	360	°			1	"	2	95%	No	35	Approved on 01 April 2010
Angle artifacts	Angle block	Comparison to index table, autocollimator	0	90	°			0.2	"	2	95%	No	18	
Angle prisms	Optical square (pentaprism): deflection angle	2-mirror method	90	90	°			0.5	"	2	95%	No	19	
Roundness standards	External cylinder (plug): roundness, <i>R</i>	Multi-step	0	20	µm	Diameter	4 mm to 150 mm	Q[7, 10 <i>R</i>], <i>R</i> in µm	nm	2	95%	No	20	Approved on 04 May 2006
Roundness standards	Internal cylinder (ring): roundness	Multi-step	0	20	µm	Diameter	4 mm to 150 mm	Q[7, 10 <i>R</i>], <i>R</i> in µm	nm	2	95%	No	21	Approved on 04 May 2006
Roundness standards	Sphere or hemisphere: roundness	Multi-step	0	20	µm	Diameter	4 mm to 150 mm	Q[7, 10 <i>R</i>], <i>R</i> in µm	nm	2	95%	No	22	Approved on 04 May 2006
Roundness standards	Magnification (flick) standard: roundness	Stylus instrument, 1-profile	0	20	µm	Diameter	4 mm to 150 mm	Q[100, 10 <i>R</i>], <i>R</i> in µm	nm	2	95%	No	23	Approved on 04 May 2006
Surface texture	Depth standard: (ISO 5436-1 type A), depth <i>d</i>	Stylus profilometry	0.01	15	µm			Q[1, 4.7 <i>d</i>], <i>d</i> in µm	nm	2	95%	No	24	
CMM artefacts	Ball bar: ball spacing	1-D comparator and mechanical probe	10	330	mm			0.4	µm	2	95%	No	25	
Length instruments	Displacement transducer: displacement <i>L</i>	Heterodyne interferometer with high-resolution phase meter	0	50	µm			Q[0.7, 0.5 <i>L</i>], <i>L</i> in µm	nm	2	95%	No	26	Approved on 22 March 2005

Length, Italy, INRIM (Istituto Nazionale di Ricerca Metrologica)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					NMI Internal Service Identifier	Comments
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?		
Length instruments	Displacement transducer: displacement L	1-D comparator	0	50	mm			$Q[0.1, 0.5E-03L]$, L in mm	μm	2	95%	No	28	Approved on 22 March 2005
Line standards	1D gratings: pitch p	Scanning Probe Microscope with interferometric and capacitance controls of displacements	0.1	5	μm			$Q[2, 1p]$, p in μm	nm	2	95%	No	29	Approved on 22 March 2005
Line standards	2D gratings: pitch p	Scanning Probe Microscope with interferometric and capacitance controls of displacements	0.1	5	μm			$Q[2, 1p]$, p in μm	nm	2	95%	No	30	Approved on 22 March 2005
Line standards	Precision line scales: line spacing L	1-D comparator with laser interferometer, CCD/optical microscope	0.1	280	mm			$Q[80, 0.87L]$, L in mm	nm	2	95%	No	32	Approved on 04 May 2006
Surface texture	Roughness standard (ISO 5436-1 type C): ISO roughness parameters	Stylus profilometry	0.01	20	μm	Parameters	R_a and R_q	$Q[10, 30 R_a]$, R_a in μm	nm	2	95%	No	33	Approved on 19 May 2007
Surface texture	Roughness standard (ISO 5436-1 type C): ISO roughness parameters	Stylus profilometry	0.01	20	μm	Parameters	R_z and R_p , R_v , R_t	$Q[20, 50 R_z]$, R_z in μm	nm	2	95%	No	33	Approved on 19 May 2007
Surface texture	Roughness standard (ISO 5436-1 type C): ISO roughness parameters	Stylus profilometry	50	500	μm	Parameter	R_{Sm}	0.5	μm	2	95%	No	33	Approved on 19 May 2007
Surface texture	Roughness standard (ISO 5436-1 type D): ISO roughness parameters	Stylus profilometry	0.01	20	μm	Parameters	R_a and R_q	$Q[10, 30 R_a]$, R_a in μm	nm	2	95%	No	34	Approved on 19 May 2007

Length, Italy, INRIM (Istituto Nazionale di Ricerca Metrologica)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty					NMI Internal Service Identifier	Comments
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?		
Surface texture	Roughness standard (ISO 5436-1 type D): ISO roughness parameters	Stylus profilometry	0.01	20	µm	Parameters	<i>Rz</i> and <i>Rp</i> , <i>Rv</i> , <i>Rt</i>	Q[20, 50 <i>Rz</i>], <i>Rz</i> in µm	nm	2	95%	No	34	Approved on 19 May 2007
Laser radiations	Other stabilized laser: absolute frequency	Optical femtosecond comb generator	282	564	THz			6.00E-13		2	95%	Yes	36	Approved on 03 August 2011
Laser radiations	Other stabilized laser: vacuum wavelength	Optical femtosecond comb generator	532	1064	nm			6.00E-13		2	95%	Yes	36	Approved on 03 August 2011
Surface texture	Depth standard (ISO5436-1 type A) depth <i>d</i>	Interference microscopy	0.01	20	µm			Q[2.2, 11 <i>d</i>], <i>d</i> in µm	nm	2	95%	No	37	Approved on 03 August 2011