Length, Poland, GUM (Glowny Urzad Miar, Central Office of Measures)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						
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?**	**NMI Internal Service Identifier**	**Comments**
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	Other stabilized laser: vacuum wavelength, λ_0	Optical beat frequency	633	633	nm			1E-09 λ_0	nm	2	95%	No	2	
Length instruments	Laser interferometer: error of indicated displacement *L*	Comparison to master laser interferometer	0	30	m			Q[0.08, 0.06*L*], *L* in m	µm	2	95%	No	3	Approved on 04 May 2006
Length instruments	Laser interferometer: wavelength compensation *n*	Calibration of pressure, temperature and humidity transducers				Pressure	970 hPa to 1030 hPa	1.5E-07*n*		2	95%	No	4	
						Temperature	(20 ± 1) °C							
						Humidity	(50 ± 5) %							
Length instruments	1-D measuring machine: error of indicated displacement *L*	Gauge blocks, laser interferometer	0	3	m			Q[1.06, 0.93*L*], *L* in m	µm	2	95%	No	5	Approved on 04 May 2006
End standards	Gauge block: central length *L*	Interferometry, exact fractions	0.5	100	mm			Q[34, 0.44*L*], *L* in mm	nm	2	95%	No	6	
End standards	Gauge block: central length *L*	Mechanical comparison	0.5	100	mm			Q[49, 0.6*L*], *L* in mm	nm	2	95%	No	7	
End standards	Length bar (long gauge block): central length *L*	1-D comparator and mechanical probe	125	3000	mm			Q[112, 0.59*L*], *L* in mm	nm	2	95%	No	8	Approved on 19 May 2007

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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?**	**NMI Internal Service Identifier**	**Comments**
End standards	Step gauge: face spacing *L*	CMM	0.01	0.7	m			Q[0.5, 1.4*L*], *L* in m	µm	2	95%	No	9	
Line standards	Precision line scale: line spacing *L*	1-D comparator and CCD microscope	1	500	mm			Q[198, 0.41*L*], *L* in mm	nm	2	95%	No	10	
Diameter standards	External cylinder (plug): diameter	1-D comparator and flat probe	2	100	mm			0.2	µm	2	95%	No	11	
Diameter standards	Internal cylinder (ring): diameter	1-D comparator and hooked feelers	10	200	mm			0.5	µm	2	95%	No	12	
Diameter standards	Internal cylinder (ring): diameter	1-D comparator and feeler ball 2 mm of diameter	2.5	10	mm			0.8	µm	2	95%	No	13	
Angle by circle dividers	Optical polygon: face angle	Two autocollimators and rotary table	10	120	°	Number of faces	3 to 36	0.36	"	2	95%	No	14	
Angle by circle dividers	Rotary or optical table: position angle	Optical polygon and autocollimator	1/3600	360	°			1.1	"	2	95%	No	15	
Angle instruments	Autocollimator: error of indicated angle	Generator for small angles	0	40	'	Orientation	both axis	0.3	"	2	95%	No	16	
Angle artefacts	Angle block: included angle	Goniometer	0	180	°			2.2	"	2	95%	No	17	
Angle artefacts	90 ° (steel, granite, try) square: squareness	CMM	90	90	°	Length	up to 500 mm	0.5	"	2	95%	No	18	
Angle artefacts	90 ° cylinder square: squareness	CMM	90	90	°	Height	up to 500 mm	0.5	"	2	95%	No	19	
Flatness standards	Surface plate: flatness	Autocollimator	0	70	µm	Length *L*	up to 2500 mm	Q[0.5, 5E-01*L*], *L* in m	µm	2	95%	No	20	

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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?**	**NMI Internal Service Identifier**	**Comments**
Roundness standards	External cylinder: roundness	Roundness instrument	0	400	µm	Diameter	up to 300 mm	0.1	µm	2	95%	No	21	
Roundness standards	Internal cylinder: roundness	Roundness instrument	0	400	µm	Diameter	up to 300 mm	0.1	µm	2	95%	No	22	
Roundness standards	Magnification standard (e.g. flick standard): roundness, amplitude and phase harmonic content	Stylus instrument and roundness instrument	0	300	µm			0.25	µm	2	95%	No	23	
Straightness standards	Straight edge: straightness	Autocollimator	0	40	µm	Length	up to 1000 mm	0.5	µm	2	95%	No	24	
Surface texture	(groove) depth (step height) standard (ISO 5436-1 type A): step height, (groove) depth *d*	Interference microscope	0.03	1	µm			Q[10, 2*d*], *d* in µm	nm	2	95%	No	25	
Surface texture	(groove) depth (step height) standard (ISO 5436-1 type A): step height, (groove) depth *d*	Stylus instrument	0.1	100	µm			Q[30, 0.5*d*], *d* in µm	nm	2	95%	No	26	
Surface texture	Wavelength standard (ISO 5436-1 type C): amplitude parameters	Stylus instrument	0.05	30	µm	Parameters	*Ra*, *Rq*	Q[15, 25*Ra*], *Ra* in µm	nm	2	95%	No	27	
Surface texture	Wavelength standard (ISO 5436-1 type C): amplitude parameters	Stylus instrument	0.05	30	µm	Parameters	*Rp*, *Rv*, *Rz*, *Rt*	Q[40, 50*Rp*], *Rp* in µm	nm	2	95%	No	27	
Surface texture	Roughness standard (ISO 5436-1 type D): ISO roughness parameters	Stylus instrument	0.05	30	µm	Parameters	*Ra*, *Rq*	Q[15, 30*Ra*], *Ra* in µm	nm	2	95%	No	28	

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Surface texture	Roughness standard (ISO 5436-1 type D): ISO roughness parameters	Stylus instrument	0.05	30	µm	Parameters	*Rp* , *Rv* , *Rz* , *Rt*	Q[40, 60*Rp*], *Rp* in µm	nm	2	95%	No	28	
CMM artefacts	Ball/hole plate: centre coordinates	Contacting probe, reversal method	(75x75)	(332x332)	mm^2			Q[0.8, 0.004*L*], *L* center distance in mm	µm	2	95%	No	29	
Line standards	Tape: line spacing *L*	50 m laser bench and CCD microscope	0	50	m	Support	catenary	Q[20, 5.5*L*], *L* in m	µm	2	95%	No	30	Approved on 04 May 2006
Refractive index of materials measuring instruments	Refractometers: refractive index, *n*	Light refraction or total internal reflection of light	1.32	1.7		Temperature	(20 ± 2) °C	0.00002		2	95%	No	31	Approved on 04 May 2006