



Organisme belge d'Accréditation  
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Bijlage bij accreditatie-certificaat  
 Annexe au certificat d'accréditation  
 Annex to the accreditation certificate  
 Beilage zur Akkreditierungszertifikat

# 001-CAL

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## Maureen Logghe

Voorzitster van het Accreditatiebureau  
 La Présidente du Bureau d'Accréditation  
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 Vorsitzende des Akkreditierungsbüro

De accreditatie werd uitgereikt aan / L'accréditation est délivrée à /  
 The accreditation is granted to / Die akkreditierung wurde erteilt für:

**TRESCAL nv**  
**Vosstraat, 200**  
**2600 Antwerpen**

Activiteitencentra / Sites d'activités / Sites of activities / Standorte mit aktivitäten:

Locatie 1: BERCHEM	Vosstraat 200 2600 Antwerpen
Locatie 2: WELLIN	Rue Jean Meunier, 2 6922 Wellin
Locatie 3: LOUVAIN-LA-NEUVE	Rue du Bosquet, 7 1348 Ottignies-Louvain-la-Neuve

**Dimensional Quantities Berchem**  
**Calibration and Measurement Capabilities**

Length gauges

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Central length steel	0,5 mm to 100 mm 0,02 inch to 4 inch	$0,060 \mu\text{m} + 0,90 \times 10^{-6} \times l$	fixed sizes	P2-02-G.001
Central length tungsten carbide		$0,060 \mu\text{m} + 0,70 \times 10^{-6} \times l$		
Central length ceramic		$0,060 \mu\text{m} + 0,80 \times 10^{-6} \times l$	reference steel	
		$0,060 \mu\text{m} + 1,2 \times 10^{-6} \times l$		
Central length steel, tungsten carbide, ceramic	0,05 mm to 500 mm 0,005 inch to 20 inch	$0,10 \mu\text{m} + 2,0 \times 10^{-6} \times l$	all sizes	P2-02-G.003
Lengthvariation steel, tungsten carbide, ceramic	0,5 mm to 100 mm 0,02 inch to 4 inch	0,050 $\mu\text{m}$		P2-02-G.002
Step gauge	to 1200 mm	$0,80 \mu\text{m} + 3,0 \times 10^{-6} \times l$		P2-02-G.011

Clinometers

See 1.5.13

Line scales, distances

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Ruler (all models)	to 200 mm	$1,5 \mu\text{m} + 3,0 \times 10^{-6} \times l$	e.g. spring rule	P2-02-G.094 P2-02-G.100
	to 400 mm	$2,0 \mu\text{m} + 3,0 \times 10^{-6} \times l$		
	to 3000 mm	$12 \mu\text{m} + 3,0 \times 10^{-6} \times l$		P2-02-G.143
	to 100 m	$6,0 \mu\text{m} + 5,0 \times 10^{-6} \times l$		
Feeler gauges	to 5 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.011 P2-02-G.041 P2-02-G.068 P2-02-G.070 P2-02-G.127
Setting standard for external micrometers	to 300 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.011 P2-02-G.012 P2-02-G.041 P2-02-G.068 P2-02-G.070 P2-02-G.127
	300 to 500 mm	$0,90 \mu\text{m} + 0,60 \times 10^{-6} \times l$		
	500 to 3000 mm	$3,0 \mu\text{m} + 3,0 \times 10^{-6} \times l$		
Other distance of 2 parallel planes	to 300 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.011 P2-02-G.012 P2-02-G.041 P2-02-G.068 P2-02-G.070 P2-02-G.127
	300 to 500 mm	$0,90 \mu\text{m} + 0,60 \times 10^{-6} \times l$		
	500 to 3000 mm	$3,0 \mu\text{m} + 3,0 \times 10^{-6} \times l$		

Length measuring instruments

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Hand held tools for external measurements	0 mm to 200 mm	$0,45 \mu\text{m} + 0,50 \times R + 25 \times 10^{-6} \times l$	(1) e.g. vernier, micrometer, ...	P2-02-G.050
	200 mm to 3000 mm	$4,0 \mu\text{m} + 0,50 \times R + 5,0 \times 10^{-6} \times l$		P2-02-G.050
Hand held tools for internal measurements			(1) e.g. internal micrometers	---
2-point	0 mm to 200 mm	$0,70 \mu\text{m} + 0,50 \times R + 25 \times 10^{-6} \times l$		P2-02-G.051
	200 mm to 400 mm	$5,0 \mu\text{m} + 0,50 \times R + 4,0 \times 10^{-6} \times l$		P2-02-G.055
2- and 3-point	0 mm to 250 mm	$1,5 \mu\text{m} + 0,50 \times R + 25 \times 10^{-6} \times l$	P2-02-G.055	
Hand held tools for height and depth measurements	0 mm to 500 mm	$0,70 \mu\text{m} + 0,50 \times R + 25 \times 10^{-6} \times l$	(1)	P2-02-G.052 P2-02-G.097
Linear displacement sensor	to 200 mm	$0,050 \mu\text{m} + 2,5 \times 10^{-6} \times l + 0,80 \times R$	to 50 mm (1)	P2-02-G.042 P2-02-G.050
Height gauge	to 1500 mm	$0,80 \mu\text{m} + 0,70 \times R + 2,5 \times 10^{-6} \times l$	(1)	P2-02-G.052 P2-02-G.098
Film thickness gauge	to 2 mm	$1,0 \mu\text{m} + 2,0 \times 10^{-3} \times l$	(1)	P2-02-G.099
Laser distance meter	to 25 m	$0,50 \text{ mm} + 40 \times 10^{-6} \times l + 0,60 \times R$		P2-02-G.045 P2-02-G.126

Diameter

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Setting rings and ring gauges	Ø 1 mm to Ø 250 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.039 P2-02-G.043 P2-02-G.121
Cylindrical setting pins	to 200 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.071
Plain plug gauges	to 200 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$		P2-02-G.121 P2-02-G.127
Thread wires	to 20 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.071 P2-02-G.121 P2-02-G.127
Radius gauge	to Ø 200 mm	$3,0 \mu\text{m} + 5,0 \times 10^{-6} \times l$		P2-02-G.121 P2-02-G.136
Other internal diameters	Ø 1 mm to Ø 250 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.039 P2-02-G.043 P2-02-G.121
Other external diameters	Ø 0,05 mm to Ø 300 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.071 P2-02-G.121 P2-02-G.127
	Ø 300 mm to Ø 500 mm	$0,90 \mu\text{m} + 0,60 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.071 P2-02-G.121 P2-02-G.127

## Form error

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Knife edge straight edge	to 300 mm	0,30 $\mu\text{m}$		P2-02-G.028 P2-02-G.101 P2-02-G.111 P2-02-G.113 P2-02-G.128 P2-02-G.133
Straight edge	to 6000 mm	0,50 $\mu\text{m}$ + 0,50 $\times 10^{-6} \times l$	(1)	P2-02-G.028 P2-02-G.101 P2-02-G.113 P2-02-G.128 P2-02-G.133
Surface plate	to 6 000 mm x 10 000 mm	0,30 $\mu\text{m}$ + 1,6 $\times 10^{-6} \times l$	(1) $l$ = longest side of the surface plate	P2-02-G.038
Roundness tester	to 300 $\mu\text{m}$	0,050 $\mu\text{m}$ + 0,50 $\times R$	(1)	P2-02-G.056
Roundness standard	to $\varnothing$ 300 mm	0,050 $\mu\text{m}$ + 0,020 $\times A$	$A$ = measured roundness	P2-02-G.027
Flick standard (roundness standard)	to 1 mm	0,25 $\mu\text{m}$		P2-02-G.074

## Roughness

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Surface texture measuring instruments	Ra: 0,05 $\mu\text{m}$ to 5 $\mu\text{m}$	0,040 $\times A$ + 0,50 $\times R$ (minimum 0,030 $\mu\text{m}$ )	(1) $A$ = Ra-value of reference	P2-02-G.059
	Rz: 0,1 $\mu\text{m}$ to 10 $\mu\text{m}$	0,060 $\times A$ + 0,50 $\times R$ (minimum 0,050 $\mu\text{m}$ )	(1) $A$ = Rz-value of reference	
	Rmax: 0,1 $\mu\text{m}$ to 10 $\mu\text{m}$	0,060 $\times A$ + 0,50 $\times R$ (minimum 0,050 $\mu\text{m}$ )	(1) $A$ = Rmax-value of reference	
Roughness standards	Ra: to 10 $\mu\text{m}$	0,025 $\mu\text{m}$ + 0,060 $\times A$	$A$ = measured Ra-value	P2-02-G.025
	Rz: to 15 $\mu\text{m}$	0,030 $\mu\text{m}$ + 0,090 $\times A$	$A$ = measured Rz-value	
	Rmax: to 15 $\mu\text{m}$	0,030 $\mu\text{m}$ + 0,090 $\times A$	$A$ = measured Rmax-value	

## Thread quantities

Thread external				
Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Pitch	to 10 mm	2 $\mu\text{m}$		P2-02-G.011 P2-02-G.045
Profile angle	to 180°	(0,50 + 12/ $l$ ) bgmin	$l$ = leg length in mm	P2-02-G.040
Simple pitch diameter	$\varnothing$ 1 mm to $\varnothing$ 300 mm	$\alpha = 30^\circ$ : (6,0 $\mu\text{m}$ to 9,7 $\mu\text{m}$ )	Acc. to Euramet/CG-10, method 1a or 1b	P2-02-G.102
		$\alpha = 60^\circ$ : (3,2 $\mu\text{m}$ to 5,9 $\mu\text{m}$ )		
		$\alpha = 90^\circ$ : (2,6 $\mu\text{m}$ to 5,5 $\mu\text{m}$ )		
Thread internal				
Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Pitch	to 10 mm	2 $\mu\text{m}$		P2-02-G.011 P2-02-G.045
Profile angle	to 180°	(0,50 + 12/ $l$ ) bgmin	$l$ = leg length in mm	P2-02-G.040
Simple pitch diameter	$\varnothing$ 4 mm to $\varnothing$ 300 mm	$\alpha = 30^\circ$ : (9,0 $\mu\text{m}$ to 14 $\mu\text{m}$ )	Acc. to Euramet/CG-10, method 1a or 1b	P2-02-G.106
		$\alpha = 60^\circ$ : (3,6 $\mu\text{m}$ to 7,0 $\mu\text{m}$ )		
		$\alpha = 90^\circ$ : (3,1 $\mu\text{m}$ to 6,2 $\mu\text{m}$ )		

Coordinate measuring machines

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Deviation of nominal displacement	to 20 m		e.g. 1D/2D/3D Measuring machine with:	---
		$0,15 \mu\text{m} + 0,70 \times R + 1,0 \times 10^{-6} \times l$	Zerodur scales; (1)	P2-02-G.046
		$0,15 \mu\text{m} + 0,70 \times R + 1,3 \times 10^{-6} \times l$	Glass scales; (1)	P2-02-G.046
	$0,15 \mu\text{m} + 0,70 \times R + 1,6 \times 10^{-6} \times l$	Steel scales; (1)	P2-02-G.046	
	to 400 mm	$0,30 \mu\text{m} + 2,3 \times 10^{-6} \times l$	using reference glass scale; (1)	P2-02-G.073
Deviations transverse to the translation directions	to 0,5 mm	$0,30 \mu\text{m} + 3,0 \times 10^{-6} \times l + 5,0 \times 10^{-3} \times A$	A = measured deviation Measuring length to 3000 mm; (1)	P2-02-G.047
Rotational deviations around the translation direction	to 400 as	$0,50 \text{ as} + 3,5 \times 10^{-3} \times A$	A = measured angle; horizontal translation only; (1)	P2-02-G.048 P2-02-G.069 P2-02-G.124
Other rotational deviations	to 7200 as	$0,50 \text{ as} + 1,6 \times 10^{-3} \times A$	A = measured angle; measured length to 4500 mm; (1)	P2-02-G.048 P2-02-G.124

as = arcsecond

Angle gauges

Measured quantity, instrument or gauge	Range		Remarks	Calibration procedure
Angle gauge block	to 180°	$0,000 28^\circ + 10 \times 10^{-6} \times A$	A = measured angle	P2-02-G.120 P2-02-G.125
		$1,0'' + 10 \times 10^{-6} \times A$		
Cylindrical square	to Ø 300 mm to height 300 mm	$0,30 \mu\text{m} + 2,0 \times 10^{-6} \times l$	Squareness	P2-02-G.032 P2-02-G.122
Square	to 300 mm leg length	$0,30 \mu\text{m} + 2,0 \times 10^{-6} \times l$	Squareness	P2-02-G.032 P2-02-G.122
Angle plate	90°	0,50 as		P2-02-G.122
Polygon	to 360 °	0,50 as		P2-02-G.072
Pentagonprism	90 °	0,50 as		P2-02-G.075

as = arcsecond

Angle (measuring instruments)

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
Spirit level	to 12,5 mm/m	$0,50 \mu\text{m}/\text{m} + 1,0 \times 10^{-3} \times A + 0,7 \times R$	A = set angle	P2-02-G.091
	to 2600 as	$0,10 \text{ as} + 1,0 \times 10^{-3} \times A + 0,70 \times R$		
Autocollimator	to 12,5 mm/m	$0,50 \mu\text{m}/\text{m} + 1,0 \times 10^{-3} \times A + 0,70 \times R$	A = set angle	P2-02-G.091
	to 2600 as	$0,10 \text{ as} + 1,0 \times 10^{-3} \times A + 0,70 \times R$		
Angle meters	0° - 360°	0,50 amin	e.g. protractor; (1)	P2-02-G.120 P2-02-G.040
Angle sensor	0° - 360°	2,0 as	e.g. protractor; (1)	P2-02-G.064
Clinometers	0° - 360°	2,0 as		P2-02-G.084
Theodolites	180°	3,0 as	Rotation around vertical axis	P2-02-G.089
	180°	1,5 as	Defining horizontal plane	P2-02-G.138
	180°	1,8 as	Deviation of crosshairs to rotations	P2-02-G.090

as = arcsecond  
amin = arcminute

Product measurement

Measured quantity, instrument or gauge	Range	expanded uncertainty (*)	Remarks	Calibration procedure
<b>Form</b>				
Surface profile	to 10 mm x 100 mm	$1,0 \mu\text{m} + 0,010 \times A$	A = measured profile height	P2-02-G.112
Roughness value	Ra: to 10 μm	$0,025 \mu\text{m} + 0,060 \times A$	A = measured Ra-value	P2-02-G.025
	Rz: to 15 μm	$0,030 \mu\text{m} + 0,090 \times A$	A = measured Rz-value	P2-02-G.025
	Rmax: to 15 μm	$0,030 \mu\text{m} + 0,090 \times A$	A = measured Rmax-value	P2-02-G.025
Straightness	to 10 mm x 100 mm	$1,0 \mu\text{m} + 0,010 \times A$	A = measured profile height	P2-02-G.112
	to 300 mm	0,30 μm		P2-02-G.028 P2-02-G.101 P2-02-G.111 P2-02-G.113 P2-02-G.128 P2-02-G.133
	to 6000 mm	$0,50 \mu\text{m} + 0,50 \times 10^{-6} \times L$	(1)	P2-02-G.037
<b>Roundness</b>				
Roundness external	to Ø 300 mm	$0,050 \mu\text{m} + 0,020 \times A$	A = measured roundness	P2-02-G.027
Roundness internal	Ø 0,7 mm to Ø 300 mm	$0,050 \mu\text{m} + 0,020 \times A$	A = measured roundness	P2-02-G.027
<b>Cilindricity</b>				
Cilindricity external	to Ø 300 mm to height 300 mm	$0,40 \mu\text{m} + 0,040 \times A$	A = measured cilindricity	P2-02-G.030 P2-02-G.114
Cilindricity internal	Ø 0,7 mm to Ø 300 mm to height 300 mm	$0,40 \mu\text{m} + 0,040 \times A$	A = measured cilindricity	P2-02-G.030 P2-02-G.114
Coaxiality and concentricity	Ø 0,7 mm to Ø300 mm to height 300 mm	$0,10 \mu\text{m} + 0,040 \times A$	A = measured coaxiality / concentricity	P2-02-G.031 P2-02-G.115

Planes or sides				
Flatness	to Ø 55 mm	0,050 µm		P2-02-G.038
	to Ø 150 mm	0,060 µm		P2-02-G.060
	to Ø 290 mm	0,15 µm		P2-02-G.116
	to 6 000 mm x 10 000 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$	$l =$ longest side of surface plate; (1)	P2-02-G.060
Angle between sides or planes	to 180°	$(0,50 + 12/l)$ amin	$l =$ leg length in mm; leg length to 200 mm	P2-02-G.040 P2-02-G.049 P2-02-G.120
		3,0 as	optical surfaces	
Squareness	to 1200 x 550 mm	$2,1 \mu\text{m} + 4,0 \times 10^{-6} \times l$	$l =$ leg length ratio leg length : reference length = 1 : 1	P2-02-G.082 P2-02-G.122 P2-02-G.131
Parallelism	to 1200 mm	$1,0 \mu\text{m} + 2,0 \times 10^{-6} \times l$	$l =$ leg length	P2-02-G.132 P2-02-G.135
Diameter				
External	Ø 0,05 mm to Ø 300 mm	$0,50 \mu\text{m} + 1,5 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.071
	Ø 300 mm to Ø 500 mm	$0,90 \mu\text{m} + 0,60 \times 10^{-6} \times l$		P2-02-G.121 P2-02-G.127
	Ø 500 mm to Ø 3000 mm	$0,40 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.136
Internal	Ø 1 mm to Ø 250 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.039 P2-02-G.043
Distance of 2 parallel surfaces				
External	to 200 mm	$0,50 \mu\text{m} + 2,0 \times 10^{-6} \times l$		P2-02-G.011 P2-02-G.012
	to 3000 mm	$0,40 \mu\text{m} + 4,0 \times 10^{-6} \times l$		P2-02-G.041 P2-02-G.045 P2-02-G.068 P2-02-G.070
Internal	to 1200 mm	$1,2 \mu\text{m} + 4,0 \times 10^{-6} \times l$		P2-02-G.011 P2-02-G.012 P2-02-G.039
Thread external				
Pitch	to 10 mm	2,0 µm		P2-02-G.011 P2-02-G.045
Profile angle	to 180°	$(0,50 + 12/l)$ bgmin	$l =$ leg length in mm	P2-02-G.040
Simple pitch diameter	Ø 1 mm to Ø 300 mm	$\alpha = 30^\circ$ : (6,0 µm to 9,7 µm)	Acc. to Euramet/CG-10, method 1a or 1b	P2-02-G.102
		$\alpha = 60^\circ$ : (3,2 µm to 5,9 µm)		P2-02-G.102
		$\alpha = 90^\circ$ : (2,6 µm to 5,5 µm)		P2-02-G.102
Thread internal				
Pitch	to 10 mm	2,0 µm		P2-02-G.011 P2-02-G.045
Profile angle	to 180°	$(0,50 + 12/l)$ bgmin	$l =$ leg length in mm	P2-02-G.040
Simple pitch diameter	Ø 4 mm to Ø 300 mm	$\alpha = 30^\circ$ : (9,0 µm to 14 µm)	Acc. to Euramet/CG-10, method 1a or 1b	P2-02-G.106
		$\alpha = 60^\circ$ : (3,6 µm to 7,0 µm)		P2-02-G.106
		$\alpha = 90^\circ$ : (3,1 µm to 6,2 µm)		P2-02-G.106

(1): also on site, the CMC can be bigger on site

R: resolution of the instrument ;  $l$ : measured length

(\*) the smallest uncertainty of measurement the laboratory can provide to its customers, expressed as the expanded uncertainty having a coverage probability of approximately 95%.