Calibration certificate no. 03/2021

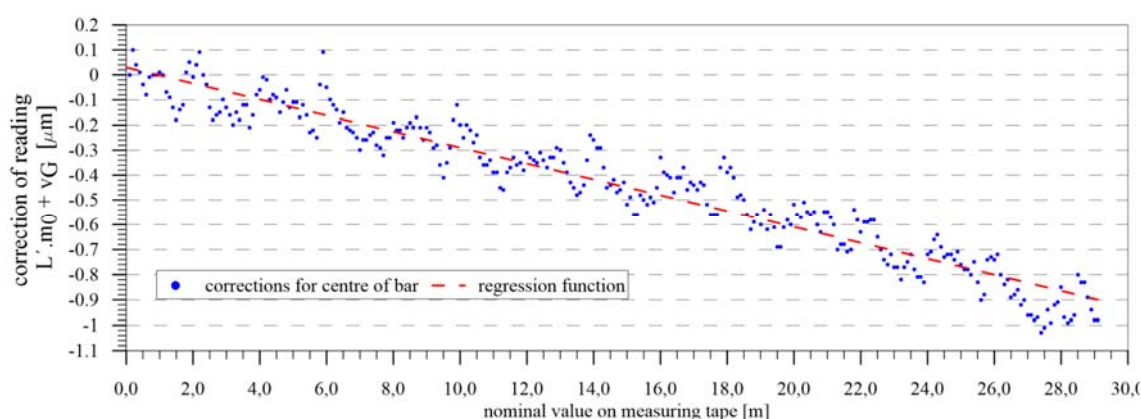|	
Calibrated measurer (type, no.): 30 m steel measuring band on metal - plastic fork, no. 3-S12-3005 U-1 **Calibration range [m]:** 0.1 - 29.1 **Comparator:** Horizontal comparator **Contract:** ██ **Date:** 8.3.2021	**Laboratory of metrology of short lengths** Slovak University of Technology in Bratislava Faculty of Civil Engineering Department of Surveying Radlinského 11 810 05 Bratislava ████████ email ████████
coefficient of expansion (standardized value for steel) $\alpha_{T_N} = 11\ ppm \cdot °C^{-1}$	**Position of the measuring tape during calibration:** horizontal

Determinaion of scale factor:

Legend: ● corrections for centre of bar — — regression function
x-axis: nominal value on measuring tape [m]
y-axis: correction of reading $L'·m_0 + vG$ [μm]

Scale factor:	$m_0 = -0,03 \pm 0,0014\ ppm$	$T_0 = 19,8°C$

Reading on the levelling staff after correction:

$$L = L' \cdot [1 + m_0 + \alpha_T \cdot (T - T_0) \cdot 10^{-6}]$$

$L'[m]$	measured value	m_0	scale factor
$T[°C]$	temperature during measurement	$\alpha_T[ppm \cdot °C^{-1}]$	coefficient of thermal expansion
$T_0[°C]$	temperature during calibration		of steel

Determination of scale factor:

1st measurement:

scale factor:		Average temperature	20,2 °C
-0.0250 ppm	± 0,001 ppm	Average atmospheric pressure:	1016.4 hPa
		Average deviation of measurement:	± 0.05 mm

2nd measurement:

scale factor:		Average temperature	19,4 °C
-0.0388 ppm	± 0,001 ppm	Average atmospheric pressure:	1016.0 hPa
		Average deviation of measurement:	± 0.05 mm

Average from both measurement:

scale factor:		Average temperature	19,8 °C
-0.032 ppm.	± 0,001 ppm	Average atmospheric pressure:	1016.2 hPa
		Average deviation of measurement:	± 0.05 mm

Calibration certificate no. 03/2021

Leveling staff (type, no.):	Contract:
30 m steel measuring band on metal - plastic fork, no. 3-S12-3005 U-1	⬛
Calibration range [m]:	**Date**
0.1-29.1	8.3.2021

Corrections for the centre of the bar from the measuring tape [mm]:

m\dm	0	1	2	3	4	5	6	7	8	9
0	-	0.00	0.10	0.04	0.01	-0.04	-0.08	-0.01	0.00	0.00
1	0.01	0.00	-0.07	-0.09	-0.13	-0.18	-0.14	-0.12	0.01	0.05
2	-0.01	0.04	0.09	0.00	-0.04	-0.13	-0.18	-0.16	-0.15	-0.10
3	-0.13	-0.16	-0.20	-0.15	-0.18	-0.12	-0.12	-0.21	-0.16	-0.08
4	-0.06	-0.01	-0.02	-0.10	-0.08	-0.09	-0.15	-0.11	-0.06	-0.13
5	-0.11	-0.11	-0.17	-0.12	-0.16	-0.23	-0.22	-0.25	-0.04	0.09
6	-0.05	-0.10	-0.12	-0.14	-0.19	-0.15	-0.21	-0.22	-0.23	-0.25
7	-0.30	-0.26	-0.26	-0.24	-0.23	-0.28	-0.29	-0.32	-0.25	-0.25
8	-0.19	-0.22	-0.22	-0.25	-0.21	-0.19	-0.21	-0.17	-0.21	-0.26
9	-0.21	-0.23	-0.29	-0.28	-0.36	-0.41	-0.35	-0.29	-0.18	-0.12
10	-0.20	-0.25	-0.20	-0.22	-0.27	-0.24	-0.33	-0.36	-0.36	-0.34
11	-0.39	-0.39	-0.45	-0.46	-0.39	-0.37	-0.33	-0.36	-0.35	-0.38
12	-0.31	-0.33	-0.34	-0.35	-0.31	-0.34	-0.37	-0.33	-0.33	-0.29
13	-0.30	-0.35	-0.39	-0.43	-0.45	-0.48	-0.47	-0.44	-0.34	-0.24
14	-0.26	-0.29	-0.29	-0.37	-0.45	-0.44	-0.42	-0.47	-0.46	-0.43
15	-0.52	-0.49	-0.56	-0.56	-0.48	-0.50	-0.52	-0.49	-0.51	-0.45
16	-0.33	-0.39	-0.40	-0.41	-0.47	-0.41	-0.41	-0.37	-0.46	-0.43
17	-0.44	-0.46	-0.43	-0.44	-0.52	-0.56	-0.56	-0.56	-0.37	-0.33
18	-0.39	-0.37	-0.41	-0.49	-0.48	-0.50	-0.56	-0.62	-0.59	-0.56
19	-0.60	-0.54	-0.62	-0.56	-0.61	-0.69	-0.69	-0.61	-0.58	-0.60
20	-0.52	-0.56	-0.57	-0.51	-0.55	-0.56	-0.55	-0.60	-0.63	-0.55
21	-0.55	-0.57	-0.60	-0.70	-0.68	-0.68	-0.71	-0.70	-0.54	-0.58
22	-0.63	-0.59	-0.59	-0.58	-0.58	-0.65	-0.70	-0.74	-0.76	-0.72
23	-0.77	-0.77	-0.82	-0.77	-0.75	-0.72	-0.78	-0.81	-0.81	-0.83
24	-0.72	-0.71	-0.66	-0.64	-0.69	-0.73	-0.72	-0.72	-0.74	-0.71
25	-0.76	-0.78	-0.78	-0.80	-0.75	-0.83	-0.90	-0.88	-0.74	-0.73
26	-0.74	-0.72	-0.80	-0.84	-0.82	-0.89	-0.88	-0.86	-0.92	-0.90
27	-0.96	-0.96	-0.98	-0.97	-1.03	-1.01	-0.94	-0.99	-0.92	-0.91
28	-0.85	-0.97	-0.99	-0.98	-0.96	-0.80	-0.83	-0.83	-0.89	-0.94
29	-0.98	-0.98	-	-	-	-	-	-	-	-

note: correction of the reading on the measuring tape can be realized in two ways, namely (1) using the relationship from the first page of this protocol or (2) adding a correction directly interpolated from the correction table mentioned above.

Technical specialist: Ing. Pavol Kajánek, PhD.	Bratislava, 8.3.2021
Laboratory director: doc. Ing. Ján Erdélyi, PhD.	Institute director: prof. Ing. Alojz Kopáčik, PhD.