



KALIBROINTITODISTUS

KALIBRERINGSBEVIS

CERTIFICATE OF CALIBRATION

Nro nro • no.	M-15K204 30%	
Tilaja Uppdragsgivare • Customer	Teknoscale Oy Kiitoradantie 11 01530 VANTAA	
Kalibroitu laite Kalibrerat instrument • Calibrated instrument	Wheel load scale, max. 37 t	
Valmistaja Tillverkare • Manufactured by	Teknoscale Oy	
Tyyppi Typ • Model	Evocar 2000	
Sarjanumero Serienummer • Serial number	35000	
Kalibrointipäivä Kalibreringsdatum • Date of calibration	6.7.2015	
Päiväys Datum • Date	6.7.2015	
Allekirjoitukset Underskrifter • Signatures	 Petri Koponen Research Team Leader	 Jani Korhonen Research Engineer
Sivu Sida • Page	1/5	
Liitteitä Bilagor • Appendices	-	



Kansallinen mittanormaalilaboratorio
National Standards Laboratory

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Kalibroitu laite Kalibrerat instrument • Calibrated instrument

4 load cells, without indicator

Nominal force	350 kN	compression
Calibration range	100 kN	compression
Manufacturer	Precia Molen	
Type	CSP-M-10t-C3-SC-CC	
Serial numbers	8778574_7, 8778614_7, 8778624_7 and 8778628_7	

Amplifier / indicator

Manufacturer	Teknoscale Oy
Type	Evocar 2000
Serial number	35000
Measurement range	0 ... 37000 kg
Resolution	0,5 kg
Fluctuation	±0,5 kg

Load transmitting parts

Calibration laboratory's compression transmitting parts.

Kalibroidun laitteen kunto Kondition av kalibrerat instrument • Condition of calibrated instrument

No remarks.

Kalibrointimenetelmä Kalibreringsmetod • Calibraton method

Adapted EN ISO 376 calibration. Partial calibration.

Kalibroinnissa käytetyt mittanormaalit ja jäljitettävyys Mätnormalerna som använts i kalibrering och spårbarhet • Measurements standards used in calibration and traceability

Force standard

Force standard no. 3 Stack of masses 100 kN

Traceability

The traceability: Calibration of the masses. The traceability of masses via MIKES and PTB to national standards of Finland and Germany. The force scale is compared against PTB's scale with laboratory's transferrnormals.

MIKES =Center for Metrology and Accreditation (Mittatekniikan keskus), Finland.

PTB = Physikalisch Technische Bundesanstalt, Germany.

Kalibroihtiolosuhteet Kalibreringsförhållanden • Calibration conditions

Instrument was calibrated at MIKES Metrology, VTT Technical Research Centre of Finland force and torque laboratory in Kajaani. Local value for gravity in laboratory is $9,821725 \text{ m/s}^2$.

Meanvalue of the temperature: $20,5 \pm 0,2 \text{ }^\circ\text{C}$
Meanvalue of the atmospheric pressure: $1003 \pm 1 \text{ hPa}$
Meanvalue of the air humidity: $26 \pm 3 \text{ \% R.H.}$

Date: 6.7.2015

Measured by: Jani Korhonen

Kalibrointitulokset ja mittausepävarmuus Kalibreringsresultat och mätosäkerhet • Calibration results and measurement uncertainty

The results of the calibration are given in tables 1 ... 4. The given results are readings of the indicators display subtracted by zero reading.

Contents of the tables:

Table 1: Readings of the indicator with increasing test force, series 1 of the measurement.

Table 2: Readings on the indicator with increasing test force, series 2 of the measurement.
Readings on the indicator with decreasing test force, series 2' of the measurement.

Table 3: Relative zero error.

Table 4: Masses calculated from force. Applied value for gravity for mass calculations is $9,81950 \text{ m/s}^2$.
The effect of air buoyancy was not taken in to account in mass calculations.
Arithmetical mean values with increasing test force, series 1 and 2 of the measurement.
Relative deviation, series 1 and 2 of the measurement.
Relative reversibility, series 2 and 2' of the measurement.

The reported expanded relative uncertainty of the measurement is calculated according JCGM 100:2008, given by the coverage factor $k = 2$
Effect of zero error, repeatability, rotation and reversibility has been taken into account in measurement uncertainty calculation.

The zero reading of the instrument: $0,0 \text{ kg}$

The zero reading is taken before the first loading series without any correction.

Table 1:

Readings on the indicator with increasing test force, series 1 of the measurement, without rotation.

Force	Series
	1
	0°
kN	kg
0	0,0
10	1018,5
20	2038,5
30	3055,5
40	4073,5
50	5092,0
60	6110,5
70	7129,0
80	8147,0
90	9165,5
100	10184,0
0	-0,5

Table 2:

Readings on the indicator with increasing, series 2 of the measurement, and decreasing test force, series 2' of the measurement, with rotation.

Force	Series	Series
	2	2'
	180°	180°
kN	kg	kg
0	0,0	0,0
10	1018,5	1018,0
20	2038,5	2038,0
30	3056,0	3055,0
40	4073,5	4072,5
50	5092,0	5091,0
60	6110,5	6109,5
70	7129,0	7128,0
80	8147,0	8146,5
90	9165,5	9165,0
100	10184,0	

Table 3:

Relative zero error to NF.

Series of the measurement:	1	2
Relative change of zero %:	0,00	0,00

Table 4:

Arithmetical mean values, relative deviations and relative reversibility:

Force F	Mass calculated from force	Series 1 and 2 posit. 0° and 180°		Rel. revers.	Rel. uncert.
		Arithmetical mean value	Rel. dev.		
kN	kg	kg	%	%	%
0	0,00	0,0			
10	1018,38	1018,5	0,00	-0,05	0,06
20	2036,76	2038,5	0,00	-0,02	0,03
30	3055,15	3055,8	0,02	-0,03	0,03
40	4073,53	4073,5	0,00	-0,02	0,02
50	5091,91	5092,0	0,00	-0,02	0,02
60	6110,29	6110,5	0,00	-0,02	0,02
70	7128,67	7129,0	0,00	-0,01	0,02
80	8147,05	8147,0	0,00	-0,01	0,01
90	9165,44	9165,5	0,00	-0,01	0,01
100	10183,82	10184,0	0,00		0,01

Huomautukset Anmärkningar • Remarks

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Mittatekniikan keskus, MIKES, on kansallinen metrologialaitos, joka nimeää kansalliset mittanormaali-laboratoriot ja valvoo niiden toimintaa. Kansallisen mittanormaali-laboratorion tehtävänä on pitää yllä kansallisia mittanormaaleja ja niiden jäljitettävyyttä SI-järjestelmän yksiköihin. Kansallinen mittanormaali-järjestelmä perustuu lakiin nro 1156/1993 ja asetukseen nro 972/1994. MIKES on osa Teknologian tutkimuskeskus VTT Oy:tä.

Mätteknikcentralen, MIKES, är det nationella metrologiinstitutet, som utser de nationella mätnormallaboratorierna och övervakar deras verksamhet. Det nationella mätnormallaboratoriet har som uppgift att upprätthålla nationella mätnormaler och deras spårbarhet till SI-systems enheter. Det nationella mätnormalsystemet är stadgat i lag nr 1156/1993 och förordning nr 972/1994. MIKES är en del av Teknologiska forskningscentralen VTT Ab.

Centre for Metrology and Accreditation, MIKES, is the National Metrology Institute of Finland which designates the National Standards Laboratories and supervises their activities. The National Standards Laboratory is responsible for the maintaining of national standards and their traceability to SI units. The Finnish national standards system is based on the Law No. 1156/1993, and the Decree No. 972/1994. MIKES is a part of VTT Technical Research

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