

CERTIFICATE OF CALIBRATION

ISSUED BY: ZwickRoell Ltd.
UKAS ACCREDITED CALIBRATION LABORATORY
CERTIFICATE NUMBER: 2310-4769R
DATE OF ISSUE: 06 December 2023
This certificate replaces 2310-4769 due to discrepancies.



0167

Zwick / Roell

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Approved Signatories
Dr N.S.Wrigley
L. Smith
T.Arnett

Issued To: LCM Systems Ltd.

Address: Unit 15, Newport Business Park, Barry Way, Newport, Isle of Wight

Machine Description: Compression Testing Machine **Serial Number:** 28090

Manufacturer / Type: Denison T1A **Force Capacity:** 3000kN

Display System: A single range computer digital display **Software:** LCM Systems VisualLink Version 5.0

Force Transducer: Strain Gauged Columns **Serial Number:** 28090

Associated Equipment: Mantracourt Amplifier DSC **Serial Number:** 17038493

Associated Equipment: Asus Computer System **Serial Number:** D6PTBX005285

Date of Calibration: 02 October 2023 **Ambient Temperature:** 22.4°C

Zwick reference numbers: SC139524/ F116455 **Location:** Test & Calibration Room

Previous certificate number: 59319 Issued on: 22 September 2022

Method:

The testing machine identified above has been calibrated in accordance with the requirements of **BS EN ISO 7500-1:2018** over the ranges given below for increasing forces only. The calibration was performed using force proving devices and / or masses which meet the requirements of BS EN ISO 7500-1 and equipment which is calibrated in accordance with BS EN ISO 376:2011. The machine complied with the requirements of the standard for the following ranges and classifications with regard to the relative error, repeatability, resolution and zero return to which table 2 of the standard refers:

Range	Mode	Status	Classification of range(s)
3000kN	Compression	As found	3000kN Class 1 down to 100kN

Detailed tabulated results are shown on the following pages.

Calibrated by: Micah Sizen

Certified by:

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The following traceable force proving equipment was used for the calibration:

Description	Capacity	Class	Serial Number	Certificate Number	Date Calibrated
Load Cell	500kN	0.5	600/7U	2022010067-1	17 February 2022
Load Cell	3000kN	1.0	153	2021080150-1	23 September 2021

With reference to clause 6 of BS EN ISO 7500-1 the proving equipment used have been calibrated to BS EN ISO 376 and the class of the proving device(s) was equal to or exceeded the class to which the machine has been verified.

The expiry date of the certificates of calibration for the elastic proving devices used is 26 months and for masses 5 years from the dates given above.

Where masses are used, the value for gravity (g) used to calculate the forces exerted by the masses was 9.815m/s^2

When using elastic proving devices the constant indicated force method was used to effect the verification. When masses are used the constant true force method was used to effect the verification. Three verification runs were made on each range

The ZwickRoell Calibration Laboratory is accredited by UKAS to BS EN ISO/IEC 17025 (General requirements for the competence of testing and calibration laboratories) to perform the calibration which is reported on this certificate.

Prior to verification the machine was inspected for good working order and was found to satisfy the guidelines given in section 5 of BS EN ISO 7500-1

The calculation of the accuracy and repeatability errors and the classification of the testing machines performance was made in accordance with the method specified in BS EN ISO 7500-1:2018

Where there are adjacent results at the same force increment, these are at the overlap point from the two proving devices used.

The results only relate to the item calibrated, described above.

The decision rule of the classification does take into account the uncertainty as described in Section 7 of BS EN ISO 7500-1

The following settings were made in accordance with the manufacturers instructions.

Range	Coefficient values	A	A1	A2	A3
3000kN	No Adjustment	0.93072264	4933.22538	-24.9394433	-7.17645503

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainty stated above refer to values obtained during calibration and make no allowances for factors such as long term drift, and alignment effects, the influences of these factors should be taken into account by the user.

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Results:

Range 1 3000kN Compression		Shunt Cal 6100.00kNkN
These results are: As found - no adjustments were made		
Nominal Force	Relative Error	Relative Uncertainty
kN	%	%
100.00	-0.42	0.29
150.00	-0.33	0.43
300.00	-0.40	0.26
300.00	0.05	0.52
600.00	-0.32	0.50
900.00	-0.20	0.49
1200.00	-0.21	0.51
1500.00	-0.17	0.48
1800.00	-0.24	0.49
2100.00	-0.20	0.48
2400.00	-0.19	0.49
2700.00	-0.09	0.48
3000.00	-0.17	0.48

End of Certificate

In the result table(s) above a negative relative error indicates that the machine indicator lags the true applied force.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainty stated above refer to values obtained during calibration and make no allowances for factors such as long term drift, and alignment effects, the influences of these factors should be taken into account by the user.