CERTIFICATE OF CALIBRATION

ISSUED BY:
SERCAL MATERIALS TESTING MACHINES SERVICES LTD
UKAS ACCREDITED CALIBRATION LABORATORY
CERTIFICATE NUMBER: 51969
DATE OF ISSUE: 02 October 2018

0375

SERCAL MTMS LTD.

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Approved Signatories
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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 Digital Display	**Software:**	LCM Systems Version 1.0
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:	**24 September 2018**	**Ambient Temperature:**	**19.8°C**
Sercal Quote Reference:	Q180834R	**Location:**	Test & Calibration Room
Previous certificate number:	50392	Issued:	06 December 2017

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) to minimum force
3000kN	Compression	As left	3000kN Class 1 down to 150kN

Detailed tabulated results are shown on the following pages.

Calibrated by: Jim Swann **Certified by:** DBSwann

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

Description	Capacity	Class	Serial Number	Certificate Number	Date Calibrated
Nobel DC Ratio meter	-	-	92-3880	0478/2016020453-3	29 March 2018
Load Cell	3000kN	1.0	3000/7C	2016120144-1	23 March 2017

With reference to clause 6 of BS EN ISO 7500-1 the proving equipment used has 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 Interval between verifications, clause 9 of the standards refers.

The time between verifications depends upon the type of testing machine, the standard of maintenance and the amount of use. Unless otherwise specified it is recommended that the verification be carried out at intervals not exceeding 12 months. The machine shall in any case be verified if it is moved to a new location necessitating dismantling or if it is subject to major repair or adjustment.

The Sercal Calibration Laboratory is accredited by UKAS to BS EN ISO 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

In the result tables which follow a negative relative error indicates that the machine indicator lags the true applied force. Where there are adjacent results at the same force increment, these are at the overlap point from the two proving devices used.

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

Ranges	Coefficient values	A	A1	A2	A3
3000kN		0.657743896	4966.679173	-53.81694636	25.86530721

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, temperature 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 6179.2kN
These results are:	As left following adjustments	
Nominal Force	Relative Error	Expanded Uncertainty
kN	%	%
150.00	-0.34	0.32
300.00	-0.18	0.32
600.00	-0.15	0.32
900.00	-0.12	0.32
1200.00	-0.11	0.32
1500.00	-0.08	0.32
1800.00	-0.07	0.32
2100.00	-0.04	0.32
2400.00	-0.06	0.32
2700.00	-0.06	0.32
3000.00	-0.07	0.32

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, temperature and alignment effects, the influences of these factors should be taken into account by the user.