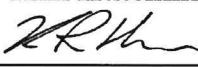


## CERTIFICATE OF CALIBRATION

|                                    |   |
|------------------------------------|---|
| Issue:-<br>93916_10                | Certificate Number:<br>93916<br>Date of Issue:<br>03-Jan-20   |
| Approved Signatory:<br>Page 1 of 4 | Kim Hutchins<br>Signed:  |



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### Submitter:-

Mecmesin Limited  
Newton House  
Spring Copse Business Park  
Slinfold  
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RH13 0SZ

### Issued by:-

Kent Scientific Services  
8 Abbey Wood Road  
Kings Hill  
West Malling  
Kent  
ME19 4YT  
Tel: 03000 415 100  
Fax: 01732 220006

**EQUIPMENT:** Weights

**SERIAL NUMBER:** MC3

**MAKE/TYPE:** N/A

**STANDARDS USED:** Set 12412

**DATE RECEIVED:** 20 December 2019

**DATE CALIBRATED:** 24 December 2019

**DETAILS:** 112 Cast Iron

### MEASUREMENTS:

Kent Scientific Services method used: CAL-M2, Calibration of Small Masses.

The calibrations took place in a controlled environment with the temperature held between 18°C and 22°C, and with the relative humidity held between 40% and 60%.

The measurement results obtained in the table, where each measured value given represents not the true mass, but the mass of a hypothetical weight of density  $8,000 \text{ kg.m}^{-3}$ , which in air of density  $1.2 \text{ kg.m}^{-3}$  would balance the corresponding weight identified in the first column at 20°C.

The method of weighing was by substitution (Borda's method). In each instance the standard weight used had been calibrated by UKAS Calibration Laboratory number 0474 or 0352 within the previous three years.

The uncertainty of measurements for each of the different denominations is listed in the last column of the table. Duplicate weights, where present, are indicated by a dot or dots.

Customer supplied information is notated with a ~, and results relate to the item calibrated.

Unless otherwise notated, samples are tested in as received condition at Kent Scientific Services.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

**TABLE OF MEASUREMENT RESULTS**

| Identity Mark | Nominal Force | Measured Value | Error from Nominal | Estimated Uncertainty |
|---------------|---------------|----------------|--------------------|-----------------------|
| 1957          | 100 N         | 10,191.70 g    | - 470 mg           | ± 110 mg              |
| 1958          | 100 N         | 10,191.94 g    | - 220 mg           | ± 110 mg              |
| 1959          | 50 N          | 5,095.829 g    | - 253 mg           | ± 51 mg               |
| 1960          | 20 N          | 2,038.453 g    | + 21 mg            | ± 21 mg               |
| 1961          | 20 N          | 2,038.428 g    | - 4 mg             | ± 21 mg               |
| 1962          | 10 N          | 1,019.171 g    | - 45 mg            | ± 11 mg               |
| 1963          | 10 N          | 1,019.164 g    | - 52 mg            | ± 11 mg               |
| 1964          | 10 N          | 1,019.157 g    | - 59 mg            | ± 11 mg               |
| 2001          | 1 N           | 101.919 6 g    | - 2.0 mg           | ± 1.1 mg              |
| 2002          | 1 N           | 101.918 7 g    | - 2.9 mg           | ± 1.1 mg              |
| 2003          | 1 N           | 101.919 3 g    | - 2.4 mg           | ± 1.1 mg              |
| 2004          | 1 N           | 101.920 8 g    | - 0.8 mg           | ± 1.1 mg              |
| 2005          | 1 N           | 101.917 8 g    | - 3.8 mg           | ± 1.1 mg              |
| 2006          | 1 N           | 101.916 1 g    | - 5.5 mg           | ± 1.1 mg              |
| 2007          | 1 N           | 101.917 3 g    | - 4.4 mg           | ± 1.1 mg              |
| 2008          | 1 N           | 101.917 7 g    | - 3.9 mg           | ± 1.1 mg              |
| 2009          | 1 N           | 101.920 0 g    | - 1.6 mg           | ± 1.1 mg              |
| 2010          | 1 N           | 101.922 5 g    | + 0.8 mg           | ± 1.1 mg              |
| 2011          | 1 N           | 101.922 5 g    | + 0.9 mg           | ± 1.1 mg              |
| 2012          | 1 N           | 101.922 8 g    | + 1.2 mg           | ± 1.1 mg              |
| 2013          | 1 N           | 101.918 3 g    | - 3.3 mg           | ± 1.1 mg              |
| 2014          | 1 N           | 101.920 5 g    | - 1.1 mg           | ± 1.1 mg              |
| 2015          | 1 N           | 101.921 2 g    | - 0.4 mg           | ± 1.1 mg              |
| 2016          | 1 N           | 101.924 1 g    | + 2.5 mg           | ± 1.1 mg              |
| 2017          | 1 N           | 101.923 4 g    | + 1.8 mg           | ± 1.1 mg              |
| 2018          | 1 N           | 101.921 5 g    | - 0.2 mg           | ± 1.1 mg              |
| 2019          | 1 N           | 101.918 7 g    | - 2.9 mg           | ± 1.1 mg              |
| 2020          | 1 N           | 101.921 0 g    | - 0.6 mg           | ± 1.1 mg              |
| 2021          | 5 N           | 509.585 3 g    | - 22.8 mg          | ± 5.1 mg              |
| 2022          | 5 N           | 509.609 5 g    | + 1.3 mg           | ± 5.1 mg              |
| 2023          | 5 N           | 509.587 0 g    | - 21.2 mg          | ± 5.1 mg              |
| 2024          | 5 N           | 509.604 3 g    | - 3.8 mg           | ± 5.1 mg              |
| 2025          | 5 N           | 509.605 7 g    | - 2.5 mg           | ± 5.1 mg              |
| 2026          | 5 N           | 509.615 8 g    | + 7.6 mg           | ± 5.1 mg              |
| 2027          | 5 N           | 509.616 6 g    | + 8.5 mg           | ± 5.1 mg              |
| 2028          | 5 N           | 509.593 2 g    | - 15.0 mg          | ± 5.1 mg              |
| 2029          | 5 N           | 509.603 8 g    | - 4.4 mg           | ± 5.1 mg              |
| 2030          | 5 N           | 509.656 6 g    | + 48.4 mg          | ± 5.1 mg              |
| 2031          | 10 N          | 1,019.217 g    | + 1 mg             | ± 11 mg               |
| 2032          | 10 N          | 1,019.198 g    | - 18 mg            | ± 11 mg               |
| 2033          | 10 N          | 1,019.192 g    | - 24 mg            | ± 11 mg               |
| 2034          | 10 N          | 1,019.204 g    | - 12 mg            | ± 11 mg               |
| 2035          | 10 N          | 1,019.228 g    | + 11 mg            | ± 11 mg               |
| 2036          | 10 N          | 1,019.160 g    | - 56 mg            | ± 11 mg               |
| 2037          | 10 N          | 1,019.204 g    | - 12 mg            | ± 11 mg               |
| 2038          | 10 N          | 1,019.238 g    | + 22 mg            | ± 11 mg               |
| 2039          | 20 N          | 2,038.437 g    | + 4 mg             | ± 21 mg               |
| 2040          | 20 N          | 2,038.525 g    | + 92 mg            | ± 21 mg               |
| 2041          | 20 N          | 2,038.424 g    | - 9 mg             | ± 21 mg               |
| 2042          | 20 N          | 2,038.454 g    | + 21 mg            | ± 21 mg               |
| 2043          | 20 N          | 2,038.488 g    | + 55 mg            | ± 21 mg               |
| 2044          | 20 N          | 2,038.427 g    | - 6 mg             | ± 21 mg               |
| 2045          | 20 N          | 2,038.448 g    | + 15 mg            | ± 21 mg               |
| 2046          | 20 N          | 2,038.398 g    | - 35 mg            | ± 21 mg               |

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

**TABLE OF MEASUREMENT RESULTS contd.**

| <b>Identity<br/>Mark</b> | <b>Nominal<br/>Force</b> | <b>Measured<br/>Value</b> | <b>Error from<br/>Nominal</b> | <b>Estimated<br/>Uncertainty</b> |
|--------------------------|--------------------------|---------------------------|-------------------------------|----------------------------------|
| 2047                     | 50 N                     | 5,096.303 g               | + 222 mg                      | ± 51 mg                          |
| 2048                     | 50 N                     | 5,096.294 g               | + 212 mg                      | ± 51 mg                          |
| 2049                     | 50 N                     | 5,096.280 g               | + 198 mg                      | ± 51 mg                          |
| 2050                     | 50 N                     | 5,096.153 g               | + 71 mg                       | ± 51 mg                          |
| 2051                     | 50 N                     | 5,096.206 g               | + 125 mg                      | ± 51 mg                          |
| 2052                     | 50 N                     | 5,096.276 g               | + 194 mg                      | ± 51 mg                          |
| 2053                     | 50 N                     | 5,096.170 g               | + 88 mg                       | ± 51 mg                          |
| 2054                     | 50 N                     | 5,096.001 g               | - 81 mg                       | ± 51 mg                          |
| 2055                     | 100 N                    | 10,192.49 g               | + 330 mg                      | ± 110 mg                         |
| 2056                     | 100 N                    | 10,192.42 g               | + 260 mg                      | ± 110 mg                         |
| 2057                     | 100 N                    | 10,192.59 g               | + 420 mg                      | ± 110 mg                         |
| 2058                     | 100 N                    | 10,192.46 g               | + 290 mg                      | ± 110 mg                         |
| 2059                     | 100 N                    | 10,192.33 g               | + 160 mg                      | ± 110 mg                         |
| 2060                     | 100 N                    | 10,192.54 g               | + 380 mg                      | ± 110 mg                         |
| 2061                     | 100 N                    | 10,192.23 g               | + 70 mg                       | ± 110 mg                         |
| 2062                     | 100 N                    | 10,192.39 g               | + 230 mg                      | ± 110 mg                         |
| 3020                     | 100 N                    | 10,192.03 g               | - 140 mg                      | ± 110 mg                         |
| 3021                     | 50 N                     | 5,096.225 g               | + 143 mg                      | ± 51 mg                          |
| 3022                     | 20 N                     | 2,038.438 g               | + 5 mg                        | ± 21 mg                          |
| 3023                     | 20 N                     | 2,038.451 g               | + 18 mg                       | ± 21 mg                          |
| 3024                     | 10 N                     | 1,019.204 g               | - 12 mg                       | ± 11 mg                          |
| 3025                     | 10 N                     | 1,019.156 g               | - 61 mg                       | ± 11 mg                          |
| 3026                     | 5 N                      | 509.595 7 g               | - 12.5 mg                     | ± 5.1 mg                         |
| 3362A                    | 20 N                     | 2,038.487 g               | + 54 mg                       | ± 21 mg                          |
| 3362B                    | 20 N                     | 2,038.458 g               | + 25 mg                       | ± 21 mg                          |
| 3362C                    | 20 N                     | 2,038.438 g               | + 5 mg                        | ± 21 mg                          |
| 3362D                    | 20 N                     | 2,038.473 g               | + 41 mg                       | ± 21 mg                          |
| 3362E                    | 10 N                     | 1,019.219 g               | + 2 mg                        | ± 11 mg                          |
| 3362F                    | 50 N                     | 5,096.230 g               | + 148 mg                      | ± 51 mg                          |
| 3362G                    | 50 N                     | 5,096.236 g               | + 154 mg                      | ± 51 mg                          |
| 3362H                    | 100 N                    | 1,0191.86 g               | - 300 mg                      | ± 110 mg                         |
| 3362I                    | 5 N                      | 509.595 8 g               | - 12.4 mg                     | ± 5.1 mg                         |
| 3362J                    | 10 N                     | 1,019.116 g               | - 100 mg                      | ± 11 mg                          |
| 3362K                    | 10 N                     | 1,019.177 g               | - 39 mg                       | ± 11 mg                          |
| 3362L                    | 5 N                      | 509.589 9 g               | - 18.3 mg                     | ± 5.1 mg                         |
| 3362M                    | 20 N                     | 2,038.443 g               | + 10 mg                       | ± 21 mg                          |
| 3500                     | 5 N                      | 509.592 9 g               | - 15.3 mg                     | ± 5.1 mg                         |
| 3501                     | 5 N                      | 509.595 7 g               | - 12.4 mg                     | ± 5.1 mg                         |
| 3502                     | 5 N                      | 509.596 8 g               | - 11.4 mg                     | ± 5.1 mg                         |
| 3503                     | 5 N                      | 509.599 0 g               | - 9.1 mg                      | ± 5.1 mg                         |
| 3504                     | 5 N                      | 509.593 7 g               | - 14.4 mg                     | ± 5.1 mg                         |
| TB4                      | 1 N                      | 101.920 8 g               | - 0.9 mg                      | ± 1.1 mg                         |
| 3506                     | 1 N                      | 101.917 9 g               | - 3.7 mg                      | ± 1.1 mg                         |
| 3507                     | 1 N                      | 101.919 7 g               | - 1.9 mg                      | ± 1.1 mg                         |
| 3508                     | 1 N                      | 101.919 4 g               | - 2.2 mg                      | ± 1.1 mg                         |
| 3509                     | 1 N                      | 101.917 5 g               | - 4.1 mg                      | ± 1.1 mg                         |
| 3510                     | 1 N                      | 101.919 2 g               | - 2.5 mg                      | ± 1.1 mg                         |
| 3511                     | 1 N                      | 101.920 5 g               | - 1.1 mg                      | ± 1.1 mg                         |
| 3512                     | 1 N                      | 101.913 6 g               | - 8.0 mg                      | ± 1.1 mg                         |
| 3513                     | 1 N                      | 101.918 5 g               | - 3.2 mg                      | ± 1.1 mg                         |
| 3514                     | 1 N                      | 101.920 3 g               | - 1.3 mg                      | ± 1.1 mg                         |
| 3515                     | 20 N                     | 2,038.489 g               | + 57 mg                       | ± 21 mg                          |
| 3516                     | 20 N                     | 2,038.404 g               | - 29 mg                       | ± 21 mg                          |
| 3517                     | 20 N                     | 2,038.392 g               | - 41 mg                       | ± 21 mg                          |

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

**TABLE OF MEASUREMENT RESULTS contd.**

| <b>Identity Mark</b> | <b>Nominal Force</b> | <b>Measured Value</b> | <b>Error from Nominal</b> | <b>Estimated Uncertainty</b> |
|----------------------|----------------------|-----------------------|---------------------------|------------------------------|
| 3518                 | 20 N                 | 2,038.463 g           | + 31 mg                   | ± 21 mg                      |
| 3519                 | 20 N                 | 2,038.429 g           | - 3 mg                    | ± 21 mg                      |
| 3520                 | 20 N                 | 2,038.397 g           | - 36 mg                   | ± 21 mg                      |
| 3521                 | 20 N                 | 2,038.388 g           | - 44 mg                   | ± 21 mg                      |
| 1957                 | * 100 N              | 10,192.29 g           | + 120 mg                  | ± 110 mg                     |
| 1963                 | * 10 N               | 1,019.219 g           | + 3 mg                    | ± 11 mg                      |
| 1964                 | * 10 N               | 1,019.233 g           | + 17 mg                   | ± 11 mg                      |
| 2006                 | * 1 N                | 101.923 0 g           | + 1.4 mg                  | ± 1.1 mg                     |
| 2007                 | * 1 N                | 101.921 9 g           | + 0.3 mg                  | ± 1.1 mg                     |
| 2021                 | * 5 N                | 509.614 2 g           | + 6.1 mg                  | ± 5.1 mg                     |
| 2023                 | * 5 N                | 509.616 6 g           | + 8.4 mg                  | ± 5.1 mg                     |
| 2030                 | * 5 N                | 509.620 3 g           | + 12.2 mg                 | ± 5.1 mg                     |
| 2036                 | * 10 N               | 1,019.219 g           | + 3 mg                    | ± 11 mg                      |
| 2040                 | * 20 N               | 2,038.495 g           | + 62 mg                   | ± 21 mg                      |
| 2047                 | * 50 N               | 5,096.205 g           | + 124 mg                  | ± 51 mg                      |
| 2048                 | * 50 N               | 5,096.161 g           | + 79 mg                   | ± 51 mg                      |
| 2049                 | * 50 N               | 5,096.225 g           | + 143 mg                  | ± 51 mg                      |
| 2057                 | * 100 N              | 10,192.37 g           | + 200 mg                  | ± 110 mg                     |
| 3025                 | * 10 N               | 1,019.229 g           | + 13 mg                   | ± 11 mg                      |
| 3362J                | * 10 N               | 1,019.215 g           | - 1 mg                    | ± 11 mg                      |
| 3362K                | * 10 N               | 1,019.221 g           | + 4 mg                    | ± 11 mg                      |
| 3509                 | * 1 N                | 101.925 1 g           | + 3.4 mg                  | ± 1.1 mg                     |
| 3512                 | * 1 N                | 101.921 6 g           | 0.0 mg                    | ± 1.1 mg                     |

\* Denotes post adjustment calibration

The basis for conversion between force units and mass units is that a 1kg mass will experience a force of g newtons where g is the strength of the local gravitational field. At Kent Scientific Services the estimated local  $g = 9.81146 \text{ ms}^{-2}$ .

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