



## SIM MWG 7- MASS AND RELATED QUANTITIES

“CCM WG on Strategy and MRA coordination”

And 19th meeting

“Consultative Committee for Mass and Related Quantities”

**Wednesday 24 – Friday 26 May de 2023**

**SIM MWG 7. Mass and Related quantity's Internal structure and co-chairs (2023)**

|           |                     |                           |                |                        |
|-----------|---------------------|---------------------------|----------------|------------------------|
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# COMPARISON



## DENSITY COMPARISONS REGISTERED IN THE KCDB (CCM AND SIM Comparisons)

| Comparison Identifier | Metrology Area              | Sub-field | Description   | Parameters   | Measurement period | Pilot institute | Status                   |
|-----------------------|-----------------------------|-----------|---|--|--------------------|-----------------|--------------------------|
| CCM.D-K1              | Mass and related quantities | Density   | Density measurements of a silicon sphere  |  | 2001 - 2003        | NMIJ AIST       | Approved for equivalence |
| CCM.D-K1.2023         | Mass and related quantities | Density   | Density measurement of a silicon sphere   | Temperature: 20 °C<br>Pressure: 101325 Pa              | 2022 - 2023        | PTB             | Measurements in progress |
| CCM.D-K2              | Mass and related quantities | Density   | Density of liquids  | Temperature: 5 °C to 60 °C<br>Atmospheric pressure     | 2004               | PTB             | Approved for equivalence |
| CCM.D-K3              | Mass and related quantities | Density   | Solid density standards   |  | 2021 -             | NMIJ AIST       | Planned                  |
| CCM.D-K4              | Mass and related quantities | Density   | Calibration of high resolution hydrometers  | Temperature 20 °C<br>Pressure: 101325 Pa               | 2011 - 2012        | INRIM           | Approved for equivalence |
| CCM.D-K5              | Mass and related quantities | Density   | Density of liquids  | Temperature : 15 °C, 20 °C, 40 °C                      | 2018 - 2023        | BEV             | Measurements in progress |
| SIM.M.D-K3            | Mass and related quantities | Density   | Volume of solid weights   | Temperature: 20 °C                                     | 2009 - 2012        | INTI            | Approved for equivalence |
| SIM.M.D-K4            | Mass and related quantities | Density   | Comparison of the calibration of density hydrometers  |  | 2007 - 2008        | CENAM           | Approved for equivalence |
| SIM.M.D-S1            | Mass and related quantities | Density   | Comparison of the calibration of hydrometers for liquid density determination (bilateral CENAM - INRIM)   |  | 2007               | CENAM           | Approved                 |
| SIM.M.D-S2            | Mass and related quantities | Density   | Comparison of the calibration of hydrometers for liquid density determination (bilateral INMETRO - INRIM) |  | 2009 - 2010        | INMETRO         | Approved                 |
| SIM.M.D-S3            | Mass and related quantities | Density   | Comparison of volume of solids by hydrostatic weighing (bilateral INMETRO - CENAM)                        |  | 2006               | CENAM           | Approved                 |
| SIM.M.D-S4            | Mass and related quantities | Density   | Comparison of calibrations of hydrometers for liquid density determination                                |  | 2012               | INDECOPI        | Approved                 |
| SIM.M.D-S5            | Mass and related quantities | Density   | Determination of volume of weights  |  | 2012 - 2013        | INM (CO)        | Approved                 |
| SIM.M.D-S6            | Mass and related quantities | Density   | High-accuracy hydrometers   | Temperature at 20 °C                                   | 2017 - 2018        | CENAM           | Approved                 |
| SIM.M.D-S7            | Mass and related quantities | Density   | Liquid density using a hydrostatic weighing method  | Density of liquid at 20 °C and at atmospheric pressure | 2022               | CENAM           | Measurements in progress |

## MASS COMPARISONS REGISTERED IN THE KCDB (CCM AND SIM Comparisons)

| Comparison Identifier | Metrology Area              | Sub-field      | Description   | Parameters   | Measurement period | Pilot institute | Status                             |
|-----------------------|-----------------------------|----------------|---|--|--------------------|-----------------|------------------------------------|
| CCM.M-K1              | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 1995 - 1998        | BIPM            | Approved for equivalence           |
| CCM.M-K2              | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 1998 - 1999        | PTB             | Approved for equivalence           |
| CCM.M-K4              | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2011 - 2012        | BIPM            | Approved for equivalence           |
| CCM.M-K5              | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2000 - 2003        | NMIJ AIST       | Approved for equivalence           |
| CCM.M-K7              | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2014 - 2015        | KRISS           | Approved for equivalence           |
| CCM.M-K8.2019         | Mass and related quantities | Mass Standards | Realization of the kilogram                         | Measurement under vacuum   | 2019 - 2020        | BIPM            | Approved for equivalence           |
| CCM.M-K8.2021         | Mass and related quantities | Mass Standards | Realization of the kilogram                         | Measurement under vacuum or in air   | 2021 - 2022        | BIPM            | Approved for equivalence           |
| SIM.M.M-K4            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2009 - 2013        | INTI            | Approved for equivalence           |
| SIM.M.M-K4.1          | Mass and related quantities | Mass Standards | Comparison of mass standards                        | Stainless steel standards 1 kg   | 2022               | LATU            | <b>Measurements completed</b>      |
| SIM.M.M-K5            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2009 - 2013        | INTI            | Approved for equivalence           |
| SIM.M.M-K6            | Mass and related quantities | Mass Standards | Comparison of mass standards                        | Stainless steel standards 50 kg  | 2015 - 2017        | CENAM           | <b>Report in progress, draft B</b> |
| SIM.M.M-S1            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2004 - 2005        | CEM             | Approved                           |
| SIM.M.M-S2            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2005               | CENAM           | Approved                           |
| SIM.M.M-S3            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2007 - 2008        | CESMEC          | Approved                           |
| SIM.M.M-S4            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2009               | CENAM           | Approved                           |
| SIM.M.M-S5            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2005               | CENAM           | Approved                           |
| SIM.M.M-S6            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2009               | CESMEC          | Approved                           |
| SIM.M.M-S7            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2009 - 2010        | BSJ             | Approved                           |
| SIM.M.M-S8            | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2006               | CESMEC          | Approved                           |
| SIM.M.M-S9            | Mass and related quantities | Mass Standards | Susceptibility and magnetic polarization of weights |  | 2011 - 2012        | INDECOPI        | Approved                           |
| SIM.M.M-S10           | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2012               | INDECOPI        | Approved                           |
| SIM.M.M-S11           | Mass and related quantities | Mass Standards | Determination of mass of weights                    |  | 2012 - 2013        | INM (CO)        | Approved                           |
| SIM.M.M-S12           | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2012 - 2015        | CESMEC          | Approved                           |
| SIM.M.M-S13           | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2012               | INDECOPI        | Approved                           |
| SIM.M.M-S14           | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2013 - 2014        | CEM             | Approved                           |
| SIM.M.M-S15           | Mass and related quantities | Mass Standards | Comparison of mass standards of accuracy F1         | Nominal density: 7950 kg/m <sup>3</sup>  | 2015 - 2016        | INTI            | Approved                           |
| SIM.M.M-S16           | Mass and related quantities | Mass Standards | Comparison of mass standards                        |  | 2016               | CENAM           | Approved                           |
| SIM.M.M-S17           | Mass and related quantities | Mass Standards | Comparison of mass standards                        | Mass at 200 mg, 1 g, 50 g, 200 g, 1 kg, 2 kg                                       | 2017               | CENAM           | <b>Measurements completed</b>      |
| SIM.M.M-S18           | Mass and related quantities | Mass Standards | Comparison of mass standards                        | Mass standards 20 kg   | 2018               | CENAM           | <b>Measurements completed</b>      |
| SIM.M.M-S19           | Mass and related quantities | Mass Standards | Comparison of mass standards of accuracy E2         | Mass at 10 mg, 500 mg, 10 g, 100 g, 1 kg, 2 kg                                     | 2019               | CENAM           | <b>Report in progress, draft B</b> |
| SIM.M.M-S20           | Mass and related quantities | Mass Standards | COMPARISON OF MASS STANDARDS                        | Temperature and relative humidity according to OIML R111-1 Table C1 for F1 weights | 2022               | INACAL          | <b>Measurements in progress</b>    |

## PRESSURE COMPARISONS REGISTERED IN THE KCDB (CCM AND SIM Comparisons)

| Comparison Identifier | Metrology Area              | Sub-field | Description                                      | Parameters                  | Measurement period | Pilot institute | Status                   |
|-----------------------|-----------------------------|-----------|--|-----------------------------|--------------------|-----------------|--------------------------|
| CCM.P-K4.2012         | Mass and related quantities | Pressure  | Pressure measurements in gas (absolute mode)     |                             | 2012 - 2013        | NIST            | Approved for equivalence |
| CCM.P-K4.2012.1       | Mass and related quantities | Pressure  | Pressure measurements in gas (absolute mode)     | Nitrogen at 23 °C           | 2019               | NIST            | Protocol complete        |
| CCM.P-K16             | Mass and related quantities | Pressure  | Pressure 25 kPa to 350 kPa (Absolute mode)       | 20 °C                       | 2020 - 2022        | CENAM           | Measurements in progress |
| CCM.P-K17             | Mass and related quantities | Pressure  | Pressure 25 kPa to 350 kPa (gauge mode)          | 20 °C                       | 2020 - 2022        | CENAM           | Measurements in progress |
| CCM.P-K18             | Mass and related quantities | Pressure  | Pressure 0.7 MPa to 7 MPa (gauge mode)           | 20 °C                       | 2020 - 2022        | CENAM           | Measurements in progress |
| CCM.P-K13.1           | Mass and related quantities | Pressure  | HYDRAULIC GAUGE PRESSURE                         | Temperature                 | 2021               | CENAM           | Waiting for approval     |
| APMP.SIM.M.P-K1c.2023 | Mass and related quantities | Pressure  | Pressure measurements in gas (gauge mode)        | 0.4 MPa to 4.0 MPa          | 2023 - 2024        | NIST            | Planned                  |
| SIM.M.P-K2            | Mass and related quantities | Pressure  | Pressure measurements (absolute mode)            |                             | 2018 - 2020        | INTI            | Abandoned                |
| SIM.M.P-K6            | Mass and related quantities | Pressure  | Pneumatic pressure measurements (gauge mode)     | Pressure: 10 kPa to 120 kPa | 2008 - 2011        | CENAM           | Approved for equivalence |
| SIM.M.P-K6.1          | Mass and related quantities | Pressure  | Pressure measurements (gauge mode)               |                             | 2011 - 2013        | LACOMET         | Abandoned                |
| SIM.M.P-S2            | Mass and related quantities | Pressure  | Pressure measurements (gauge mode)               |                             | 2009 - 2011        | INMETRO         | Abandoned                |
| SIM.M.P-S7            | Mass and related quantities | Pressure  | Pressure measurements (hydraulic gauge pressure) |                             | 2011 - 2012        | CENAM           | Approved                 |



# COMPARISON



## FORCE COMPARISONS REGISTERED IN THE KCDB (CCM AND SIM Comparisons)

| Comparison Identifier | Metrology Area              | Sub-field | Description   | Parameters                            | Measurement period | Pilot institute | Status                      |
|-----------------------|-----------------------------|-----------|---|---------------------------------------|--------------------|-----------------|-----------------------------|
| CCM.F-K4.a            | Mass and related quantities | Force     | Very high force measurements  |                                       | 2002 - 2004        | NIST            | Approved for equivalence    |
| CCM.F-K4.b            | Mass and related quantities | Force     | Very high force measurements  |                                       | 2002 - 2005        | NIST            | Approved for equivalence    |
| SIM.M.F-S1            | Mass and related quantities | Force     | Calibration of force testing machines in compression                          |                                       | 2010               | IDIC            | Approved                    |
| SIM.M.F-S2            | Mass and related quantities | Force     | Calibration of a force testing machine in compression                         |                                       | 2012               | IDIC            | Report in progress, draft A |
| SIM.M.F-S3            | Mass and related quantities | Force     | Comparison of instrumented Charpy tests                                       |                                       | 2012 - 2013        | NIST            | Approved                    |
| SIM.M.F-S4            | Mass and related quantities | Force     | Calibration of a force transducer in compression                              |                                       | 2012 - 2013        | IDIC            | Approved                    |
| SIM.M.F-S5            | Mass and related quantities | Force     | Comparison of a force testing machine   |                                       | 2013               | CENAM           | Approved                    |
| SIM.M.F-S6            | Mass and related quantities | Force     | Force from 10 kN to 100 kN  |                                       | 2017               | IDIC            | Report in progress, draft A |
| SIM.M.F-S7            | Mass and related quantities | Force     | Force from 500 kN to 1000 kN  | Temperature 21 °C ± 1 °C              | 2018 - 2019        | IDIC            | Measurements completed      |
| SIM.M.F-S8            | Mass and related quantities | Force     | Calibration of a force testing machine (FTM) in tension and compression modes | Temperature 20 °C ± 2 °C              | 2018               | IDIC            | Measurements completed      |
| SIM.M.F-S9            | Mass and related quantities | Force     | Force calibration   | Temperature average: 21.0 °C +/- 2 °C | 2019               | IDIC            | Planned                     |
| SIM.M.F-S10           | Mass and related quantities | Force     | Comparison of force calibration machine in compression                        | Temperature average: 21.0 °C ± 2 °C   | 2020               | IDIC            | Report in progress, draft A |
| SIM.M.F-S11           | Mass and related quantities | Force     | Low force measurement   | Force steps in compression            | 2021 - 2022        | INTI            | Measurements in progress    |

# COMPARISON

## GRAVITY AND TORQUE COMPARISONS REGISTERED IN THE KCDB (CCM AND SIM Comparisons)

| Comparison Identifier | Metrology Area              | Sub-field | Description            | Measurement period | Pilot institute | Status                   |
|-----------------------|-----------------------------|-----------|------------------------|--------------------|-----------------|--------------------------|
| SIM.M.G-K1            | Mass and related quantities | Gravity   | Free-fall acceleration | 2016               | NIST            | Approved for equivalence |

| Comparison Identifier | Metrology Area              | Sub-field | Description               | Parameters              | Measurement period | Pilot institute | Status   |
|-----------------------|-----------------------------|-----------|---------------------------|-------------------------|--------------------|-----------------|----------|
| SIM.M.T-S1            | Mass and related quantities | Torque    | Torque measurements       |                         | 2016               | CENAM           | Approved |
| SIM.M.T-S2            | Mass and related quantities | Torque    | Torque wrench calibration | Temperature $\pm 1$ ° C | 2017               | CENAM           | Approved |

## MASS AND RELATED QUANTITIES REGISTERED IN THE KCDB DENSITY (2021/05 – 2023/05)

| Country code | Institute | Quantity        | Instrument or Artifact under study         | Instrument type or method applied | International standard | Parameters                          | Measurand Minimum value | Measurand Maximum value | Unit            | Expanded uncertainty Minimum value | Expanded uncertainty Maximum value | Unit            | Coverage factor | Level of Confidence in % | Type of uncertainty | Approval date |
|--------------|-----------|-----------------|--|-----------------------------------|------------------------|-------------------------------------|-------------------------|-------------------------|-----------------|------------------------------------|------------------------------------|-----------------|-----------------|--------------------------|---------------------|---------------|
| EC           | INEN      | Volume of solid | Estándar de masa: 1 g 10 g, muestra sólida | Pesaje hidrostático               | Density of water       | Temperatura de referencia : 20 °C   | 0.1218                  | 1.2804                  | cm <sup>3</sup> | 0.0013                             | 0.0027                             | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| EC           | INEN      | Volume of solid | Mass standard: 10 g to 0.1 kg              | Hydrostatic weighing              | Density of water       | Reference temperature : 20 °C       | 1.218                   | 12.804                  | (dimensionless) | 0.0027                             | 0.0066                             | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| EC           | INEN      | Volume of solid | Mass standard: 0.1 kg to 1 kg              | Hydrostatic weighing              | Density of water       | Reference temperature : 20 °C       | 12.1803                 | 128.041                 | cm <sup>3</sup> | 0.0066                             | 0.066                              | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| EC           | INEN      | Volume of solid | Mass standard: 1 kg to 10 kg               | Hydrostatic weighing              | Density of water       | Reference temperature : 20 °C       | 121.803                 | 1280.41                 | cm <sup>3</sup> | 0.066                              | 0.152                              | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| PE           | INACAL    | Volume of solid | volume of mass standard 1 g to 10 g        | Hydrostatic weighing              |                        |                                     | 0.063                   | 1.375                   | cm <sup>3</sup> | 8.0E-4                             | 7.0E-4                             | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2023-01-12    |
| PE           | INACAL    | Volume of solid | volume of mass standard 10 g to 100 g      | Hydrostatic weighing              |                        | Liquid temperature : 18 °C to 22 °C | 1.375                   | 12.804                  | cm <sup>3</sup> | 7.0E-4                             | 0.001                              | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2023-01-12    |
| PE           | INACAL    | Volume of solid | volume of mass standard 0.1 kg to 1 kg     | Hydrostatic weighing              |                        | Liquid temperature : 18 °C to 22 °C | 12.804                  | 128.041                 | cm <sup>3</sup> | 0.001                              | 0.01                               | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2023-01-12    |
| PE           | INACAL    | Volume of solid | volume of mass standard 1 kg to 5 kg       | Hydrostatic weighing              |                        | Liquid temperature : 18 °C to 22 °C | 128.041                 | 640.2                   | cm <sup>3</sup> | 0.01                               | 0.03                               | cm <sup>3</sup> | 2.0             | 95.0                     | Absolute            | 2023-01-12    |



## MASS AND RELATED QUANTITIES REGISTRED IN THE KCDB

### MASS (2021/05 – 2023/05)

| Institute | Quantity          | Instrument or Artifact under study | Instrument type or method applied | International standard | Parameters   | Measurand Minimum value | Measurand Maximum value | Unit | Expanded uncertainty Minimum value | Expanded uncertainty Maximum value | Unit | Coverage factor | Level of Confidence in % | Type of uncertainty | Approval date |
|-----------|-------------------|------------------------------------|-----------------------------------|------------------------|--|-------------------------|-------------------------|------|------------------------------------|------------------------------------|------|-----------------|--------------------------|---------------------|---------------|
| INACAL    | Conventional mass | Mass standards                     | mass standard                     | Mass standard          | Temperature : 18 °C to 27 °C<br>Humidity : 40% to 60 %               | 50.0                    | 50.0                    | kg   | 30.0                               | 30.0                               | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 0.1 g to 1 g        | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C<br>Relative humidity : 40 % to 60 %     | 0.1                     | 1.0                     | g    | 0.002                              | 0.003                              | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 1 g to 10 g         | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C<br>Relative humidity : 40 % to 60 %     | 1.0                     | 10.0                    | g    | 0.003                              | 0.006                              | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 10 g to 0.1 kg      | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C<br>Relative humidity : 40 % to 60 %     | 10.0                    | 100.0                   | g    | 0.006                              | 0.02                               | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 0.1 kg to 1 kg      | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C<br>Relative humidity : 40 % to 60 %     | 0.1                     | 1.0                     | kg   | 0.02                               | 0.17                               | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 2 kg to 10 kg       | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C;<br>Relative humidity : 40 % to 60 %    | 2.0                     | 10.0                    | kg   | 3.0                                | 16.0                               | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| INEN      | Mass              | Mass standard: 1 mg to 100 mg      | Subdivision method                | Mass standard          | Temperature : 18 °C to 27 °C<br>Relative humidity : 40 % to 60 %     | 1.0                     | 100.0                   | mg   | 0.001                              | 0.002                              | mg   | 2.0             | 95.0                     | Absolute            | 2022-12-15    |
| LATU      | Mass              | Mass standard                      | Direct comparison                 |                        | Temperature : ((20 to 22) ± 0.5) °C<br>Humidity : ((40 to 60) ± 3) % | 50.0                    | 50.0                    | kg   | 70.2                               | 70.2                               | mg   | 2.0             | 95.0                     | Absolute            | 2023-04-01    |

## MASS AND RELATED QUANTITIES REGISTRED IN THE KCDB PRESSURE (2021/05 – 2023/05)

| Institute | Quantity                   | Instrument or Artifact under study                                       | Instrument type or method applied | International standard  | Measurand Minimum value | Measurand Maximum value | Unit | Expanded uncertainty Minimum value | Expanded uncertainty Maximum value | Unit | Coverage factor | Level of Confidence in % | Type of uncertainty | Uncertainty Equation | Comment Uncertainty Equation | Approval date |
|-----------|----------------------------|--|-----------------------------------|-------------------------|-------------------------|-------------------------|------|------------------------------------|------------------------------------|------|-----------------|--------------------------|---------------------|----------------------|------------------------------|---------------|
| ENAER     | Gauge pressure, gas medium | Pressure measuring device, standard pressure generator, pressure balance | Direct comparison, crossfloat     | Euramet cg-3; DKD-R 6-1 | 1.5                     | 8.0                     | kPa  | 3.8E-4                             | 5.1E-4                             | kPa  | 2.0             | 95.0                     | Absolute            | $2.0E-5*Pe+3.5E-4$   | Pe in kPa                    | 2022-07-01    |
| ENAER     | Gauge pressure, gas medium | Pressure measuring device, standard pressure generator, pressure balance | Direct comparison, crossfloat     | Euramet cg-3; DKD-R 6-1 | 8.0                     | 700.0                   | kPa  | 5.2E-4                             | 0.0109                             | kPa  | 2.0             | 95.0                     | Absolute            | $1.5E-5*Pe+4E-4$     | Pe in kPa                    | 2022-07-01    |
| ENAER     | Gauge pressure, gas medium | Pressure measuring device, standard pressure generator, pressure balance | Direct comparison, crossfloat     | Euramet cg-3; DKD-R 6-1 | 700.0                   | 3500.0                  | kPa  | 0.0166                             | 0.0782                             | kPa  | 2.0             | 95.0                     | Absolute            | $2.2E-5*Pe+12E-4$    | Pe in kPa                    | 2022-07-01    |
| ENAER     | Gauge pressure, gas medium | Pressure measuring device, standard pressure generator, pressure balance | Direct comparison, crossfloat     | Euramet cg-3; DKD-R 6-1 | 3500.0                  | 7000.0                  | kPa  | 0.0795                             | 0.1565                             | kPa  | 2.0             | 95.0                     | Absolute            | $2.2E-5*Pe+25E-4$    | Pe in kPa                    | 2022-07-01    |

# NEWS CMC's

## MASS AND RELATED QUANTITIES REGISTRED IN THE KCDB FORCE(2021/05 – 2023/05)

| Institute | Quantity                       | Instrument or Artifact under study | Instrument type or method applied | Parameters  | Measurand Minimum value | Measurand Maximum | Unit | Expanded uncertainty Minimum value | Expanded uncertainty Maximum | Unit | Coverage factor | Level of Confidence in % | Type of uncertainty | Approval date |
|-----------|--------------------------------|------------------------------------|-----------------------------------|---|-------------------------|-------------------|------|------------------------------------|------------------------------|------|-----------------|--------------------------|---------------------|---------------|
| INM (CO)  | Force: Compression and tension | Force measuring device             | Direct loading, deadweight        | Temperature : 18 °C - 24 °C<br>Temperature variation: less than 1 °C, throughout a measurement series<br>Relative Humidity : 40 % to 60 % | 0.1                     | 100.0             | kN   | 0.003                              | 0.003                        | %    | 2.0             | 95.0                     | Relative            | 2022-03-05    |
| INM (CO)  | Force: Compression and tension | Force measuring device             | Direct comparison method          | Temperature : 18 °C - 24 °C<br>Temperature variation: less than 1 °C, throughout a measurement series<br>Relative Humidity : 40 % to 60 % | 100.0                   | 1000.0            | kN   | 0.02                               | 0.02                         | %    | 2.0             | 95.0                     | Relative            | 2022-03-05    |

# SCHEDULED ACTIVITIES

## MASS AND RELATED QUANTITIES

| Description  | Estimated start date      |
|--|---------------------------|
| Comparison of mass standards linked to CCM.M-K4.   | 2024                      |
| Comparison of mass standards linked to CCM.M-K7  | 2024                      |
| MASS COMPARISON WITHIN SIM CARIMET (From 200 mg to 10 kg)  | 2023 - 2024               |
| Comparison of Solid density standards to 20 g, 200 g and 1 kg  | 2024                      |
| International comparison in absolute pneumatic pressure from 25 kPa to 200 kPa   | July 2023 – March 2024    |
| Training in calibration and verification of static uniaxial testing machines according to the ISO 7500 standard, and Training of peer evaluators in the Force and Torsional Torque magnitude | October 2023              |
| comparison of testing machines in 500 kN and 1000 kN   | October 2023              |
| Comparison of a Force transducer calibration up to 1 MN  | July 2023 – December 2024 |