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| Name of Accreditation Program               | JCSS Accreditation Program   |
| Accreditation No.                           | JCSS0024   |
| Date of Initial Accreditation               | 1994-03-01   |
| Latest Date of Issue                        | 2018-10-18   |
| Name and Address of Accredited Organization | Calibration Engineering Department, CHINO CORPORATION<br>18 Kawarai-cho, Kuki-shi, Saitama, 346-0028, Japan<br>JCN 9011401004118 |
| Inquiry Point                               | Calibration Engineering Department,<br>Tel: +81-480-23-2511      FAX: +81-480-23-2514  |
| Accreditation Standards                     | ISO/IEC 17025:2005 (Calibration)   |
| Accreditation Scope                         | As attached  |

\*JCN : Japan Corporate Number

General Field of Calibration : Temperature

Date of Initial Accreditation of the Field : 1994-03-01

Permanent Laboratory/On-site Calibration : Permanent Laboratory

| Calibration Procedures# and Type of Instruments/Materials to be calibrated |  | Range   | CMC<br>(Level of Confidence Approximately 95 %) |                     |       |       |
|--|--|---|---|---------------------|-------|-------|
| Contact Type Thermometer   | Fixed point apparatus                            | Triple point of water                             | 0.6 mK  |                     |       |       |
|  |  | Triple point of Mercury                           | 2 mK  |                     |       |       |
|  |  | Freezing point of Indium                          | 3 mK  |                     |       |       |
|  |  | Freezing point of Tin                             | 4 mK  |                     |       |       |
|  |  | Freezing point of Zinc                            | 5 mK  |                     |       |       |
|  |  | Freezing point of Aluminum                        | 15 mK   |                     |       |       |
|  |  | Freezing point of Silver                          | 0.14 K  |                     |       |       |
|  |  | Freezing point of Copper                          | 0.15 K  |                     |       |       |
|  | Resistance thermometer (Fixed point calibration) | —   | $W(T_{90})$<br>(*1)                             | $R(T_{90})$<br>(*2) |       |       |
|  |  | Standard resistance thermometer (2.5 $\Omega$ )   | Freezing point of Aluminum                      | 20 mK               | -     |       |
|  |  | Standard resistance thermometer (25 $\Omega$ )    | Triple point of water                           | -                   | 2 mK  |       |
|  |  |   | Triple point of Mercury                         | 4 mK                | -     |       |
|  |  |   | Freezing point of Indium                        | 5 mK                | -     |       |
|  |  |   | Freezing point of Tin                           | 6 mK                | -     |       |
|  |  |   | Freezing point of Zinc                          | 7 mK                | -     |       |
|  |  |   | Freezing point of Aluminum                      | 17 mK               | -     |       |
|  |  | Standard resistance thermometer (100 $\Omega$ )   | Triple point of water                           | -                   | 4 mK  |       |
|  |  |   | Triple point of Mercury                         | 7 mK                | -     |       |
|  |  |   | Freezing point of Indium                        | 10 mK               | -     |       |
|  |  |   | Freezing point of Tin                           | 11 mK               | -     |       |
|  |  | Industrial resistance thermometer (100 $\Omega$ ) | Triple point of water                           | -                   | 5 mK  |       |
|  |  |   | Triple point of Mercury                         | 12 mK               | -     |       |
|  |  |   | Freezing point of Indium                        | 14 mK               | -     |       |
|  |  |   | Freezing point of Tin                           | 15 mK               | -     |       |
|  |  |   | Freezing point of Zinc                          | 16 mK               | -     |       |
|  |  | Resistance thermometer (Comparison calibration)   | 25 $\Omega$                                     | -196 °C             | -     | 17 mK |
|  |  |   |   | 0 °C                | -     | 9 mK  |
| From -60 °C up to 250 °C   |  |   |   | -                   | 29 mK |       |
| More than 250 °C up to 420 °C  | -  |   |   | 42 mK               |       |       |

#All Calibration Procedures are in-house procedures developed by this laboratory.

| Calibration Procedures# and Type of Instruments/Materials to be calibrated |   | Range   |   | CMC<br>(Level of Confidence Approximately 95 %) |       |
|--|---|---|---|---|-------|
| Contact Type<br>Thermometer  | Resistance thermometer<br>(Comparison calibration)    | 100 $\Omega$<br>(Four wires system)                             | -196 $^{\circ}\text{C}$                                       | -   | 28 mK |
|  |   |   | 0 $^{\circ}\text{C}$  | -   | 8 mK  |
|  |   |   | From -60 $^{\circ}\text{C}$ up to 250 $^{\circ}\text{C}$      | -   | 28 mK |
|  |   |   | More than 250 $^{\circ}\text{C}$ up to 420 $^{\circ}\text{C}$ | -   | 43 mK |
|  |   | 100 $\Omega$<br>(Three wires system)                            | 0 $^{\circ}\text{C}$  | -   | 10 mK |
|  |   |   | From -60 $^{\circ}\text{C}$ up to 250 $^{\circ}\text{C}$      | -   | 30 mK |
|  |   |   | More than 250 $^{\circ}\text{C}$ up to 420 $^{\circ}\text{C}$ | -   | 44 mK |
|  | Employing Dry-block thermometer calibration equipment | From -100 $^{\circ}\text{C}$ up to 50 $^{\circ}\text{C}$        | 0.08 $^{\circ}\text{C}$                                       |   |       |
|  | Thermocouple<br>(Fixed point calibration)             | R,S,Pt/Pd,Au/Pt   | Freezing point of Indium                                      | 0.11 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Tin   | 0.11 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Zinc  | 0.10 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Aluminum                                    | 0.11 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Silver                                      | 0.17 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Copper                                      | 0.20 $^{\circ}\text{C}$                         |       |
|  |   | R,S   | Melting point of Palladium                                    | 1.8 $^{\circ}\text{C}$                          |       |
|  |   | B   | Freezing point of Indium                                      | 0.58 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Tin   | 0.37 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Zinc  | 0.22 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Aluminum                                    | 0.16 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Silver                                      | 0.18 $^{\circ}\text{C}$                         |       |
|  |   |   | Freezing point of Copper                                      | 0.21 $^{\circ}\text{C}$                         |       |
| Melting point of Palladium   |   |   | 1.8 $^{\circ}\text{C}$  |   |       |
| Thermocouple<br>(Comparison calibration)(*3)                               | K,E,J,N   | From -60 $^{\circ}\text{C}$ up to 420 $^{\circ}\text{C}$        | 0.3 $^{\circ}\text{C}$  |   |       |
|  | T   | From -60 $^{\circ}\text{C}$ up to 350 $^{\circ}\text{C}$        | 0.3 $^{\circ}\text{C}$  |   |       |
|  | R   | From 0 $^{\circ}\text{C}$ up to 420 $^{\circ}\text{C}$          | 0.6 $^{\circ}\text{C}$  |   |       |
|  | Employing Dry-block thermometer calibration equipment | From -100 $^{\circ}\text{C}$ up to 50 $^{\circ}\text{C}$        | 0.2 $^{\circ}\text{C}$  |   |       |
| Thermocouple<br>(Comparison calibration)(*4)                               | R,S,K,N,E,J   | From 0 $^{\circ}\text{C}$ up to 1100 $^{\circ}\text{C}$         | 1.0 $^{\circ}\text{C}$  |   |       |
|  | K,N   | More than 1100 $^{\circ}\text{C}$ up to 1250 $^{\circ}\text{C}$ | 2.0 $^{\circ}\text{C}$  |   |       |
|  | R,S   | More than 1100 $^{\circ}\text{C}$ up to 1400 $^{\circ}\text{C}$ | 2.0 $^{\circ}\text{C}$  |   |       |
|  | B   | From 0 $^{\circ}\text{C}$ up to 1100 $^{\circ}\text{C}$         | 2.2 $^{\circ}\text{C}$  |   |       |
|  |   | More than 1100 $^{\circ}\text{C}$ up to 1400 $^{\circ}\text{C}$ | 2.1 $^{\circ}\text{C}$  |   |       |

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| Calibration Procedures# and Type of Instruments/Materials to be calibrated |   | Range   |                               | CMC<br>(Level of Confidence<br>Approximately 95 %) |          |
|--|---|---|-------------------------------|--|----------|
| Contact Type<br>Thermometer  | Liquid-in-glass thermometer                                       | 0 °C  |                               | 0.02 °C  |          |
|  |   | From -50 °C less than 0 °C  |                               | 0.04 °C  |          |
|  |   | More than 0 °C up to 50 °C  |                               | 0.03 °C  |          |
|  |   | More than 50 °C up to 100 °C                                      |                               | 0.04 °C  |          |
|  |   | More than 100 °C up to 150 °C                                     |                               | 0.04 °C  |          |
|  |   | More than 150 °C up to 200 °C                                     |                               | 0.04 °C  |          |
|  |   | More than 200 °C up to 250 °C                                     |                               | 0.06 °C  |          |
|  |   | More than 250 °C up to 300 °C                                     |                               | 0.06 °C  |          |
|  |   | More than 300 °C up to 350 °C                                     |                               | 0.07 °C  |          |
|  | Temperature sensor with display unit (Fixed point calibration)    | Standard resistance thermometer (25 Ω)                            | Triple point of water         |  | 0.007 °C |
|  |   |   | Triple point of Mercury       |  | 0.006 °C |
|  |   |   | Freezing point of Indium      |  | 0.009 °C |
|  |   |   | Freezing point of Tin         |  | 0.010 °C |
|  |   |   | Freezing point of Zinc        |  | 0.013 °C |
|  |   | Standard resistance thermometer (100 Ω)                           | Triple point of water         |  | 0.021 °C |
|  |   |   | Triple point of Mercury       |  | 0.021 °C |
|  |   |   | Freezing point of Indium      |  | 0.022 °C |
|  |   |   | Freezing point of Tin         |  | 0.023 °C |
|  |   |   | Freezing point of Zinc        |  | 0.024 °C |
|  | Temperature sensor with display unit (Comparison calibration)(*3) | Resistance thermometer  | 0 °C                          |  | 0.010 °C |
|  |   |   | From -60 °C up to 250 °C      |  | 0.028 °C |
|  |   |   | More than 250 °C up to 420 °C |  | 0.043 °C |
|  |   | Thermocouple  | From -60 °C up to 420 °C      |  | 0.3 °C   |
|  |   | Employing Dry-block thermometer calibration equipment             | From -100 °C up to 50 °C      |  | 0.08 °C  |
|  |   | Employing temperature controlled enclosure                        | From 10 °C up to 40 °C        |  | 0.2 °C   |
|  |   | Temperature sensor with display unit (Comparison calibration)(*4) | Thermocouple                  | From 0 °C up to 1100 °C                            |          |
|  | More than 1100 °C up to 1400 °C                                   |   |                               | 2.0 °C   |          |
|  | Thermometer calibration equipment                                 | From -100 °C up to 155 °C   |                               | 0.15 °C  |          |
|  |   | More than 155 °C up to 400 °C                                     |                               | 0.2 °C   |          |

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| Calibration Procedures# and Type of Instruments/Materials to be calibrated |   | Range                           |  | CMC<br>(Level of Confidence Approximately 95 %) |
|--|---|---------------------------------|--|---|
| Radiation Thermometer  | Fixed point apparatus   | Freezing point of Zinc          |  | 0.35 °C   |
|  |   | Freezing point of Aluminium     |  | 0.35 °C   |
|  |   | Freezing point of Silver        |  | 0.35 °C   |
|  |   | Freezing point of Copper        |  | 0.35 °C   |
|  | Near-infrared radiation thermometer / Visible radiation thermometer (Fixed-point calibration) | Freezing point of Zinc          |  | 0.4 °C  |
|  |   | Freezing point of Aluminium     |  | 0.4 °C  |
|  |   | Freezing point of Silver        |  | 0.4 °C  |
|  |   | Freezing point of Copper        |  | 0.4 °C  |
|  | Near-infrared radiation thermometer / Visible radiation thermometer (Comparison calibration)  | From 400 °C up to 1400 °C       |  | 2 °C  |
|  |   | More than 1400 °C up to 1600 °C |  | 3 °C  |
|  |   | More than 1600 °C up to 2500 °C |  | 4 °C  |
|  |   | More than 2500 °C up to 2800 °C |  | 6 °C  |

(\*1) Temperature converted from the ratio of the resistance  $R(T_{90})$  to  $R(273.16K)$ ,  $W(T_{90})$

(\*2) Temperature converted from resistance  $R(T_{90})$

(\*3) Calibration using working standard of platinum resistance thermometer

(\*4) Calibration using working standard of thermocouple

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#### Permanent Laboratory/On-site Calibration : On-site Calibration

| Calibration Procedures# and Type of Instruments/Materials to be calibrated |   | Range   |                          | CMC<br>(Level of Confidence Approximately 95 %) |
|--|---|---|--------------------------|---|
| Contact type thermometer   | Temperature sensor with display unit (Comparison calibration) | Resistance thermometer                            | From 0 °C up to 250 °C   | 0.40 °C   |
|  |   | Thermocouple                                      | From 0 °C up to 250 °C   | 0.50 °C   |
|  |   | Equipped within temperature controlled enclosures | From -40 °C up to 250 °C | 0.86 °C   |

#All Calibration Procedures are in-house procedures developed by this laboratory.

General Field of Calibration : Electricity(Direct Current & Low Frequency)

Date of Initial Accreditation of the Field : 2017-08-03

Permanent Laboratory/On-site Calibration : Permanent Laboratory and On-site Calibration

| Calibration Procedures# and Type of Instruments/Materials to be calibrated |  | Range                                |   | CMC<br>(Level of Confidence Approximately 95 %)                  |          |
|--|--|--------------------------------------|---|--|----------|
| Direct Current & Low Frequency Measuring Equipment, etc.                   | Temperature Indicator                  | Thermocouple with Reference Junction | K   | From -5.891 mV up to 54.819 mV<br>( From -200 °C up to 1370 °C ) | 0.038 mV |
|  |  |                                      | T   | From -6.258 mV up to 20.872 mV<br>( From -270 °C up to 400 °C )  | 0.040 mV |
|  |  |                                      | R   | From 0.000 mV up to 21.003 mV<br>( From 0 °C up to 1760 °C )     | 0.036 mV |
|  |  |                                      | E   | From -9.835 mV up to 76.373 mV<br>(From -270 °C up to 1000 °C)   | 0.046 mV |
|  |  |                                      | J   | From -7.890 mV up to 69.553 mV<br>(From -200 °C up to 1200 °C )  | 0.078 mV |
|  |  |                                      | N   | From -3.990 mV up to 47.513 mV<br>(From -200 °C up to 1300 °C )  | 0.048 mV |
|  | Platinum Resistance Thermometer Sensor | Pt100                                | From 18.52 Ω up to 390.48 Ω<br>(From -200 °C up to 850 °C ) | 0.14 Ω   |          |
|  |  | except for Pt100                     | From 17.14 Ω up to 284.02 Ω<br>(From -200 °C up to 500 °C ) | 0.14 Ω   |          |

#All Calibration Procedures are in-house procedures developed by this laboratory.

General Field of Calibration : HumidityDate of Initial Accreditation of the Field : 2005-07-07Permanent Laboratory/On-site Calibration : Permanent Laboratory

| Calibration Procedures# and Type of Instruments/Materials to be calibrated |                        | Range   |  | CMC<br>(Level of Confidence Approximately 95 %) |                            |
|--|------------------------|---|--|---|----------------------------|
| Humidity Measuring Instrument, etc.  | Dew point Hygrometers  | Frost Point<br>From -20 °C less than -10 °C             |  | Frost Point<br>0.14 °C                          |                            |
|  |                        | Dew Point<br>From -10 °C less than 0 °C                 |  | Dew Point<br>0.12 °C                            |                            |
|  |                        | Dew Point<br>From 0 °C less than 30 °C                  |  | Dew Point<br>0.08 °C                            |                            |
|  |                        | Dew Point<br>From 30 °C up to 40 °C                     |  | Dew Point<br>0.10 °C                            |                            |
|  | Electronic Hygrometers | Calibration temperatures<br>From 10 °C less than 20 °C  | Relative humidity<br>From 10 % up to 20 %      |   | Relative Humidity<br>1.4 % |
|  |                        |   | Relative humidity<br>More than 20 % up to 95 % |   | Relative Humidity<br>1.5 % |
|  |                        | Calibration temperatures<br>From 20 °C up to 30 °C      | Relative humidity<br>From 5 % up to 50 %       |   | Relative Humidity<br>1.1 % |
|  |                        |   | Relative humidity<br>More than 50 % up to 95 % |   | Relative Humidity<br>1.3 % |
|  |                        | Calibration temperatures<br>More than 30 °C up to 40 °C | Relative humidity<br>From 5 % up to 50 %       |   | Relative Humidity<br>1.2 % |
|  |                        |   | Relative humidity<br>More than 50 % up to 90 % |   | Relative Humidity<br>1.5 % |

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