November 29th, 2021 Ver. 20211202-1

CIPM Key Comparison CCM.T-K2.1 between NMISA and NMIJ/AIST

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- Transfer devices

(1) TB2/10kNm (#204130007): 10 kN·m torque transducer (Air transport)

(2) BN100A (#001): Bridge calibrator (Air transport)

DMP40(S2) as an Indicator/Amplifier at each Lab. (No transpotation)

(3) DMP41(T2) (#831891701) – NMISA

(4) DMP40S2 (#091620073) – NMIJ/AIST

- Cargoes

(a) Transfer devices and others

(1) TB2/10kNm (Pure torque transducer) including adapter flanges and a connecting cable (5 meters long)

- Cargo dimensions and weight: 740 mm × 500 mm × 600 mm, approx. 42 kg

(b) BN100A and others

(1) BN100A (Bridge calibrator) including a power cable and a connecting cable (3 m long)

- Cargo dimensions and weight: 530 mm × 240 mm × 310 mm, approx. 7 kg

- Procedure

Basically, according to the CIPM Key comparison, CCM.T-K2: 2008[1]

A detailed timetable is shown in Fig. 1.

For the TB2/10kNm transducer:

- Clockwise and counterclockwise torque, separately.
- Three rotational positions of 0, 120, and 240 deg., and two rotations.
  For 0 deg., initial pre-loading of three times, one pre-loading, and three measurement cycles.
  For 120, 240, 360, 480, 600, and 720 deg., one pre-loading and one measurement cycle.
- Two torque steps of 50 % and 100 % of the maximum torque (20 kN·m).

Other procedure:

- Bridge calibration of each DMP40(S2) is calibrated by BN100A(#001) as follows:

(1) Supply voltage for BN100A is 220 V – 230 V. Each DMP40(S2) may use each usual supply

voltage. BN100A and DMP40(S2) should be energized at least 12 hours before calibration.

(2) On first day, before starting torque calibration, indication of DMP40(S2) is recorded at the following steps: +0.0, +0.1, +0.2, +0.4, +0.6, +0.8, +1.0, +1.2, +1.6, +2.0, then -0.0, -0.1, -0.2, -0.4, -0.6, -0.8, -1.0, -1.2, -1.6, -2.0, finally, +0.0 mV/V.

(3) Internal Cal. of DMP40(S2) is conducted until being stabilized between "zero" and "cal" signals.

(4) On the last day, after final torque calibration, "Internal Cal." is conducted as (3).

(5) Then, DMP40(S2) calibration by BN100A is carried out like as (2).

- Mandatory environmental conditions are as follows.

Temperature: 20 degree Celsius ± 0.2 degree Celsius

Relative humidity: 40 % ± 2 %

Atmospheric pressure: 990 hPa - 1030 hPa

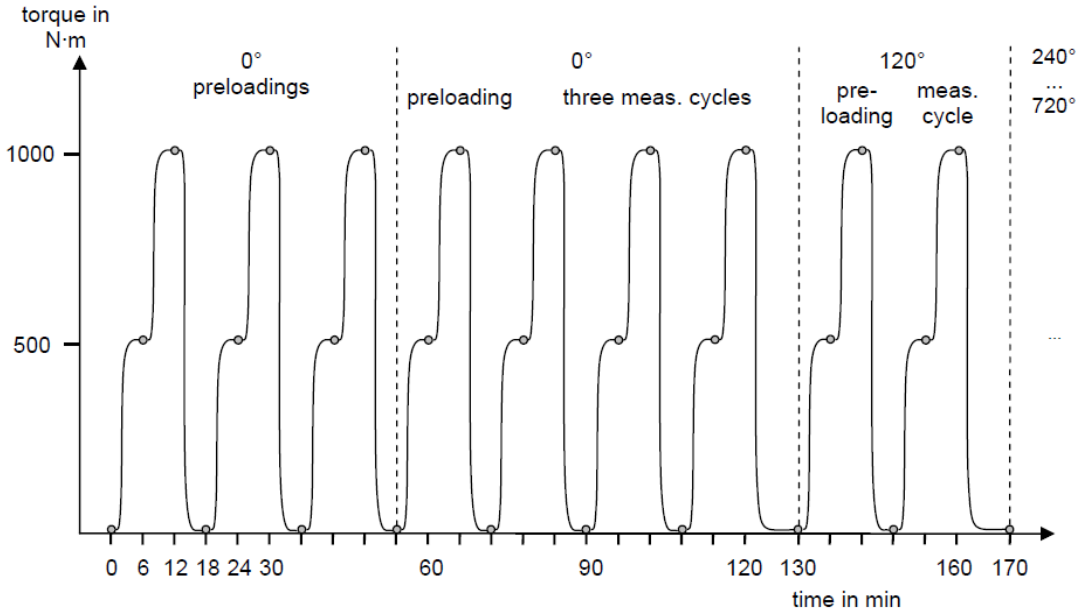

Fig. 1 Timetable of the KC (according to CCM.T-K2: 2008)[1]

- Date and period (not firm)

December 1st – 31st (2021), Pre-calibration at NMISA

January 2nd to 16th (2022), Transportation

January 24th – February 23rd, Calibration at NMIJ/AIST

February 24th – March 10th, Transportation

March 11th – April 10th, Post-calibration at NMISA

- Contact person

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- **References**

[1] Dirk Roeske, and Koji Ogushi, "Final Report on the Torque Key Comparison CCM. T-K2, Measurand Torque: 0 kN·m, 10 kN·m, 20 kN·m." *Metrologia* **53**.1A (2016): 07008.

The end of the protocol.