



सी एस आई आर - राष्ट्रीय भौतिक प्रयोगशाला
CSIR-NATIONAL PHYSICAL LABORATORY

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्)

(Council of Scientific and Industrial Research)

(राष्ट्रीय मॉपिकी संस्थान (एनएमआई), सदस्य बीआईपीएस एवं हस्ताक्षरकर्ता सीआईपीएम - एमआरए)

(National Metrology Institute (NMI), Member BIPM and Signatory CIPM - MRA)

डॉ. के. एस. कृष्णन् मार्ग, नई दिल्ली-110012, भारत

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अंशांकन प्रमाण पत्र
CALIBRATION CERTIFICATE
FORCE PROVING INSTRUMENT

प्रमाण पत्र संख्या / Certificate No.

24050237/D 1.05/C-141

दिनांक/ Date	अगले अंशांकन हेतु अनुशंसित तिथि Recommended date for next calibration	पृष्ठ / Page	पृष्ठों की संख्या / No. of Pages
12.07.2024	12.09.2026	1	2

TRUE COPY

1. Calibrated for: M/s. National Centre for Quality Calibration
4, Abhishree Corporate Park, Nr. Swagat Bunglow BRTS,
Iskcon-Ambli Road, Ambli, Ahmedabad – 380 058.
2. Description & identification of instrument
Customer's Ref. No.: Letter Dated: Nil
Type: Load Cell Digital Indicator Sl. No.: 14625
Capacity: 10kN Manufacturer: Star Embedded Systems Pvt. Lt
Sl. No.: 14625 Model No.: LED-SD1
Connector Type: 4 Pin Resolution: 1 Div.
Cable length: 4.9 m.
3. Environmental conditions: Accessories: Self aligning tension shackles.
Temperature: $(23 \pm 1)^\circ\text{C}$ Relative humidity: $(50 \pm 10)\%$
4. Standards used with: 50 kN Dead Weight force machine
- Associated uncertainty: $\pm 0.009\%$ ($k=2$)
5. Traceability of standard used: The standard used for calibration is traceable to the National Standard, which realize the units of quantities according to the International System of Units (SI).
6. Principle/Methodology of calibration: NPL Calibration procedure No.: Sub-Div.//D1.05/Doc.//3/CP//FT/F-02
and calibration procedure number: broadly based on IS 4169-2014(ISO:376-2011).

No load output: The digital indicator was switched on for 30 minutes to warm up and stabilized for no load output before the start of calibration. The no load output was noted (before taring) and the calibration signal was noted.

Preloading: Before the application of the calibration forces, the instrument was preloaded thrice to its maximum capacity and kept at full load for about 90 seconds.

Calibration: The sequence of the applied calibration force in tension is given below:

At 0° : Two series of calibration forces in increasing values. At 120° and 240° positions: One series of calibration forces each in increasing values. Creep test is performed by calculating the difference in output i_{30} obtained at 30s and i_{300} obtained at 300s after the removal of the maximum calibration force and express this difference as percentage of maximum deflection.

The calibration was made by using Self-aligning tension shackles provided along with the instrument to ensure axial application of the force.

Between each series, the instrument was rotated along its axis so as to occupy during the calibration three positions (0° , 120° & 240°) and the instrument was subjected to the full load once for about 90 seconds each time before starting in a new position.

Between the loadings, readings corresponding to no load after waiting at least 30 seconds for the return to zero were noted.

NCQC System Certificate No. 241/4

अंशांकनकर्ता:
Calibrated by:

R.R.Meena

जाँचकर्ता:
Checked by:
Dr. Rajesh Kumar

जारीकर्ता:
Issued by:

प्रभारी वैज्ञानिक:
Scientist-in-charge:

Dr. Rajesh Kumar



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7. Results: Tension

The calibration data obtained is valid for the following digital indicator setting only					
Calibration Signal: NIL			No Load Output: 0 div		
(Digital Indicator Reading in Div.)					
Applied Force kN	Position 0° series 1	Position 0° series 2	Position 120° series 3	Position 240° series 4	Average 1,3,4
0	0	0	0	0	----
0.5	10018	10018	10038	10036	10031
1.0	20036	20037	20074	20063	20058
2.0	40078	40080	40135	40120	40111
3.0	60120	60120	60190	60165	60158
4.0	80162	80160	80240	80210	80204
5.0	100200	100200	100285	100250	100245
6.0	120235	120234	120328	120290	120284
7.0	140270	140268	140366	140330	140322
8.0	160295	160293	160400	160360	160352
10.0	200348	200346	200466	200435	200416
0	3	2	2	0	----

Interpolation Equation: (Tension)

$$F = -3.0543 \times 10^{-10} X^3 + 2.7269 \times 10^{-13} X^2 + 4.9854 \times 10^{-5} X - 1.0513 \times 10^{-1}$$

$$X = 4.9470 \times 10^{-2} F^3 - 2.1979 F^2 + 20058.3870 F + 2.1121$$

Where F = Force in kN

X = Indicator reading in Div.

Classification: The force proving instrument is found to comply with the requirements of IS: 4169-2014 (ISO:376-2011) in respect of interpolated forces and classified as follows:

Class	Mode	From	To	Uncertainty of Measurement
Class 0.5	Tension	10.0 kN	4.0 kN	± 0.07%
Class 1	Tension	10.0 kN	0.5 kN	± 0.14%

The reported uncertainty is at coverage factor $k=2$ which corresponds to a coverage probability of approximately 95% for a normal distribution, considering the relative deviation of different components such as zero, resolution, repeatability, reproducibility, interpolation, creep and combining with the uncertainty of the applied force.

8. Date of calibration: 10-07-2024

9. Remarks: Nil

अंशांकनकर्ता:
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R.R.Meena

जाँचकर्ता:
Checked by:
Dr. Rajesh Kumar

जारीकर्ता:
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प्रभारी वैज्ञानिक:
Scientist-in-Charge:

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