



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

(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्)

(Council of Scientific and Industrial Research)

राष्ट्रीय मापिकी संस्थान (एनएमआई), सदस्य बीआईपीएम एवं हस्ताक्षरकर्ता सीआईपीएम - एमआरए
(National Metrology Institute (NMI), Member BIPM and Signatory CIPM - MRA)

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

Dr. K. S. Krishnan Marg, New Delhi-110012, INDIA

दूरभाष/Phone : 91-11- 4560 8441, 8589, 8610, 9447, फैक्स/ Fax : 91-11- 4560 8448

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अंशांकन प्रमाण पत्र

CALIBRATION CERTIFICATE

FORCE PROVING INSTRUMENT

प्रमाण पत्र संख्या/ Certificate No.

22021420/D1.05/C-472

दिनांक/Date 03.03.2022	अगले अंशांकन हेतु अनुशंसित तिथि Recommended date for the next calibration 03.05.2024	पृष्ठ /Page 1	पृष्ठों की संख्या /No. of Pages 2
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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.

Customer's Ref. No.: Letter dated nil

2. Description & identification of instrument

Type: Load Cell
Capacity: 10 kN
Sl. No. 14625
Connector Type: 5 Pin
Digital Indicator Sr. No.: 14625
Manufacturer: Star Embedded Systems
Model: LED-SD1
Resolution: 1 div
Cable Length: 4.9 mtr

3. Environmental conditions:

Accessories: Self-aligning tension shackles.
Temperature: $(23 \pm 1)^\circ \text{C}$ Relative humidity: $(50 \pm 10) \%$

4. Standards used
Associated uncertainty

50kN Dead Weight Force Machine
 $\pm 0.007\% (k=2)$

5. Traceability of standard used:

The standard(s) used for calibration is (are) traceable to the National Standard, which realize the units of quantities according to the International System of Units (SI).

6. Principle/Methodology of calibration and Calibration procedure No.:

Sub-Div.#D1.05/Doc.#3/CP#FT/F-02 broadly based on IS 4169-2014.

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.

अंशांकनकर्ता

Calibrated by:

Valid up to 03-05-2024
Reviewed

जांचकर्ता:

Checked by:

Dr. RAJESH KUMAR

जारीकर्ता:

Issued by:

प्रभारी वैज्ञानिक:

Scientist-in-charge:

Dr. S.S.K.TITUS

MANIKANDAN RM



Dr. Srinivasa Rao Regam System Certificate No. 144



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7. Results:

Table:- Tension

The calibration data obtained in tension is valid for the following digital Indicator setting only:
Calibration Signal: NIL No Load Output: 0 Div
(Digital Indicator Reading in Div)

Applied Force N	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	---
500	9970	9969	9962	9980	9971
1000	19942	19944	19936	19953	19944
2000	39902	39901	39880	39916	39899
3000	59860	59853	59836	59865	59854
4000	79812	79814	79769	79835	79805
5000	99765	99764	99681	99766	99737
6000	119712	119713	119603	119711	119675
7000	139657	139655	139528	139635	139607
8000	159595	159589	159460	159571	159542
10000	199480	199485	199323	199416	199406
0	0	0	0	1	---

Interpolation Equation: (Tension)

$$F = -9.7639 \times 10^{-16} \cdot X^3 + 5.1208 \times 10^{-10} \cdot X^2 + 5.0082 \times 10^{-2} \cdot X + 0.7977$$

$$X = 1.5465 \times 10^{-10} \cdot F^3 - 4.0645 \times 10^{-6} \cdot F^2 + 19.9673 \cdot F - 15.9133$$

Where F = Force in N

X = Digital Indicator reading in Div

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

Class	Mode	From	To	Uncertainty of Measurement
Class 0.5	Tension	10000 N	1000 N	± 0.07%
Class 1	Tension	10000 N	500 N	± 0.13%

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: 02.03.2022

9. Remarks: NIL

अंशांकनकर्ता:

Calibrated by :

Manikandan RM

MANIKANDAN RM

जाँचकर्ता:

Checked by :

Dr. RAJESH KUMAR

जारीकर्ता:

Issued by:

Rajesh Kumar

RSK

प्रभारी वैज्ञानिक:

Scientist-in-charge:

S.S.K. Titus

Dr. S.S.K.TITUS



डॉ. श्रीनिवास राव रायम
Dr. Srinivasa Rao Radam