सी एस आई आर - राष्ट्रीय भौतिक प्रयोगशाला
CSIR-NATIONAL PHYSICAL LABORATORY
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद)
(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
ई-मेल/ E-mail: cfct@nplindia.org, वेबसाईट/ Website: www.nplindia.org

अंशांकन प्रमाण पत्र
CALIBRATION CERTIFICATE
FORCE PROVING INSTRUMENT

प्रमाण पत्र संख्या/ Certificate No.
22021420/D1.05/C-471

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

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

Accessories: Self -aligning compression pads.

3. Environmental conditions:

Temperature: (23 ± 1)° C **Relative humidity**: (50 ± 10) %

4. Standards used Associated uncertainty

50kN Dead Weight Force Machine
±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 compression 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 compression pads 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.

अंशांकनकर्त्ता: Calibrated by :	जाँचकर्त्ता: Checked by :	प्रभारी वैज्ञानिक: Scientist-in-charge:
MANIKANDAN RM	Dr. RAJESH KUMAR	Dr. S.S.K.TITUS
	जारीकर्त्ता: Issued by:	

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03.03.2022	03.05.2024	2	2

7. Results:

Table:- Compression

The calibration data obtained in compression 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	9960	9956	9968	9970	9966
1000	19935	19928	19950	19941	19942
2000	39871	39865	39908	39875	39885
3000	59845	59822	59836	59826	59836
4000	79793	79768	79781	79756	79777
5000	99734	99702	99714	99686	99711
6000	119669	119630	119688	119626	119661
7000	139607	139570	139602	139561	139590
8000	159544	159510	159536	159504	159528
10000	199431	199405	199426	199412	199423
0	0	0	0	0	---

Interpolation Equation: (Compression)

$F = -1.2437\times10^{-15}.X^3 + 4.2488\times10^{-10}.X^2 + 5.0106\times10^{-2}.X + 0.6612$

$X = 1.9674\times10^{-10}.F^3 - 3.3702\times10^{-6}.F^2 + 19.9575.F - 13.1884$

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	Compression	10000 N	500 N	± 0.08%

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: 28.02.2022

9. Remarks: NIL

NCQC System Certificate No.____

अंशांकनकर्ता:
Calibrated by :
MANIKANDAN RM

जाँचकर्ता:
Checked by :
Dr. RAJESH KUMAR

जारीकर्ता:
Issued by:
डॉ० श्रीनिवास राव गोंक

प्रभारी वैज्ञानिक:
Scientist-in-charge:
Dr. S.S.K.TITUS