Dead Weight Force Machine

The ever-increasing requirements for improved accuracy in measuring tensile forces as well as machines of all kinds used in strength testing make it necessary for the national metrological laboratories to pay special attention to improve upon the accuracy and standardization of force measurement. Accurate measurement of forces has become increasingly important in designing safe buildings, evaluating the strength of materials, controlling production process, thrust measurement of jet engines, rocket aircraft gas turbine engines, load cell weigh bridges, weighing of aircraft and for comparing large weights. Some areas that cannot be ignored include field of automobiles, and in the medical research for the measurement of forces in bone joints of human body, though the precision required may vary from a few per cent to a few parts per million.

The primary method to realize / generate forces from a few Newton to a few mega Newton has traditionally been done by direct application of the dead weights which is generally regarded as first principle instrument.

Salient Features of Dead Weight Force Machine:

The machine can be used for calibration of force instruments as it can generate, measure and calibrate force with an expended uncertainty of ± 0.01 % over the force range from 1 to 50 kN. The device is reliable, easy to use and economical which will find its use in many industries for upgradation and quality control of their products.

The device uses the pneumatic loading and unloading of the dead weights, which has an edge over the electromechanical system as the vibration and oscillation are minimized and hence low stabilization time is achieved.

The machine is capable to carry out the calibration of 10 kN, 20 kN and 50 kN force transducers as per the international standards used for the calibration of the force transducers, which in turn are used for the verification of the tensile testing machines.

Accuracy:

The dead weight force machine has repeatability better than 5 ppm from 10% to 100% of its maximum force. Considering the uncertainty in the load adjustment when combined with hysteresis, machine interaction and parasitic components of force, a total expanded uncertainty of the vertical components of force applied over the whole range of the machine on conservative basis is + 0.01%. The uncertainty in the application of the load can further be lowered to better than ± 0.007% by taking into account the corrections in the nominal value of air density by measuring the air pressure, temperature, humidity and the actual adjusted mass of each weight.

Procedure for Technology Transfer Technology Request Form

Contact:

Head, Industrial Liaison Group (ILG)

Room No. 46-A, Main Building
CSIR-National Physical Laboratory
Dr. K.S. Krishnan Marg
New Delhi 110012, INDIA.

Email: headilg@nplindia.org

Tel: +91-11-4560-8247/9385
Fax: +91-11-4560-9310