

Metrology Standard & Calibration System

- Force
- Torque
- Hardness



Deadweight type Force Standard Machine
Hydraulic type Force Standard Machine
Deadweight type Torque Standard Machine
Torque Wrench Calibrator
Deadweight type Hardness Standard Machine

Force Standard Machine

- Deadweight type



▲ PDW-5kN



▲ PDW-20kN

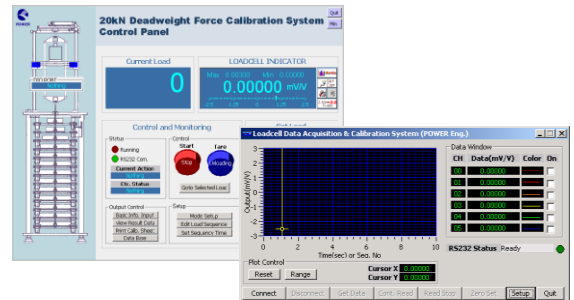
Deadweight type Force Standard Machine (Model no: PDW-Capacity) is capable performing both tension and compression test and/or calibration of Force Transducer with Primary class accuracy of National Standard. The gravitational loading/unloading by combination of mass pieces is automatically carried out by control of motorized lift table. This machine is manufactured under ISO-9001 certified quality program, following the traceability requirement of ISO 17025. The weights are made of corrosion protected and non-magnetic stainless steel and are adjusted to better than 0.002% of relative uncertainty. Certified accuracy of the weights is traceable to a national metrology standard Institute (KRISS or PTB).

OPERATING SOFTWARE

- Graphical user interface and visible test procedure.
- Test procedures according to EN 10001-3 and ASTM EN74-95.
- Start running all test procedure by touch button
- Automatic printing out of test report
- Evaluate combined error ; nonlinearity, hysteresis and repeatability characteristics.

CHARACTERISTICS

- The tare weight and the center of weight are located in lower part of the machine.
- Superior durability by corrosion protected frame.
- Calibration of the Deadweight considering the local gravity acceleration of the site.
- Fully automatic operation from start to print out of test report.
- Evaluation of non-linearity, hysteresis and repeatability characteristics.
- Rigid four-column frame supporting a lift table.
- Local control panel for easy operation.
- Accurate control of positioning of mass pieces using photo sensors
- Motorized lift table and work base
- The stabilizing devices to prevent shaking of yoke base



▲ Software for fully Automated System

SPECIFICATION

| Model | | PDW-1KN | PDW-2KN | PDW-5KN | PDW-10KN | PDW-20KN | PDW-50KN | PDW-100KN |
|-----------------------|-------------|-----------|---------|---------|----------|----------|----------|-----------|
| Nominal Load(KN) | | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
| Measurement Range(KN) | | 0.2/0.5/1 | 0.5/1/2 | 1/2/5 | 2/5/10 | 5/10/20 | 10/20/50 | 20/50/100 |
| Dimensions(mm) | | | | | | | | |
| Overall Size | Height | 2,000 | 2,000 | 2,500 | 3,000 | 4,000 | 4,500 | 5,000 |
| | Width | 600 | 600 | 1,000 | 1,000 | 1,000 | 1,200 | 1,500 |
| | Depth | 600 | 600 | 1,000 | 1,000 | 1,000 | 1,200 | 1,500 |
| Test Space | Compression | 0-250 | 0-250 | 0-250 | 0-250 | 0-300 | 0-300 | 0-350 |
| | Tension | 0-500 | 0-500 | 0-600 | 0-600 | 0-700 | 0-700 | 0-750 |
| Weight Approx.(kg) | | 600 | 700 | 1,000 | 1,500 | 5,000 | 8,000 | 15,000 |

* Various types of capacity can be supplied under customer's requirement

Force Standard Machine

- Hydraulic type

Hydraulic type Force Standard Machine is recommended for calibration of High capacity force transducer with compact size of the equipment/install space which can lessen the burden of cost for big size equipment in case of deadweight type construction of the equivalent Standard. It is composed of mechanical for direct load comparison, high precision reference force transducer, precision-controlled hydraulic unit and control cabinet rack.

Motorized load base moves up and down for the test of compression and tension automatically.

The patented Hydraulic control system has been applied for Monotonic up/down application of pressure with ultra-high precision accuracy[better than 0.02% by Hydraulic control only]. Control cabinet rack has industrial PC with operating software, hydraulic controller and highly precise load cell indicator. Operating software controls the movement of loading frame automatically and prints out calibration results under GUI environment.



▲ Hydraulic type Force Standard Machine

CHARACTERISTICS

- Endurable solid structure with high strength
- Easy operation under GUI environment
- Easy setting devices with visible display
- Selecting the variable moving speed of load base
- Motorized work base for easy adjustment
- Stabilizing devices to prevent from shaking of yoke base

SPECIFICATION

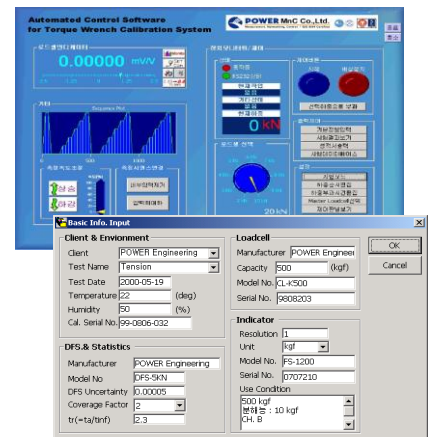
| CAPACITY | 100 kN | 200 kN | 500 kN | 2 MN |
|-------------------------------|--|-----------------------------|-----------------------------|---------------------------|
| ACCURACY OF REF. TRANSDUCER | Class 00 Load Cell 100 kN | Class 00 Loadcell 200 kN | Class 00 Loadcell 200 kN | Class 00 Loadcell 2 MN |
| OVERALL UNCERTAINTY | Better than 0.05% (Better than 0.02% by the loading system only) | | | |
| RESOLUTION | Up to 0.00001mV/V possible | | | |
| CLIBRATION MODE | Tension & Compression | | | |
| COMPRESSION TEST VOL. (WxDxH) | 130x130x230 | 150x150x260 | 200x200x350 | 250x250x250 |
| TENSION TEST VOL. (WxDxH) | 440x440x500 | 460x480x550 | 540x550x650 | 620x630x740 |
| FORCE CONTROL | Monotonically Up/Down Quasi-Static Control | | | |
| HYDRAULIC UNIT | Pressure : Max. 200 Bar Elec. Powe r : 1ph, 4p, AC220V, 1.5kW | | | |
| PRESSURE SENSOR | 2 Pressure Gauge 1 Pressure Transmitter, (200 bar Input : DC 24V, Output DC 0V ~ 10V) | | | |
| OPERATING PRESSURE | Under 150 bar | | | |
| MOTOR for cross head | 90W Φ3, AC220V | 120W Φ3, AC220V | 200W Φ3, AC220V | 200W Φ3, AC220V |
| MOTOR for load frame | 200W Φ3, AC220V | 200W Φ3, AC220V | 750W Φ3, AC220V | 1 kW Φ3, AC220V |
| MAIN CONTROLLER | PC(Pentium MMX 233) with Multifunction I/O Board | | | |
| IO BLOCK | Isolation voltage for input : Max. DC 27V For output : Max. AC250V, DC 150V | | | |
| OPERATION SW | OS : Windows 2000/XPGUI Environment Automatic print of calibration or Transfer Data to excel load sequence can be edited. | | | |
| CONTROL TYPE | FULL/SEMI Automatic, Manual | | | |
| POWER SOURCE | Electric : Φ3, AC220V, 60Hz, Pneumatic : 4 ~ 7 kgf/cm ² | | | |
| DIMENSION (W x D x H) | | | | |
| Loading Frame | 682x552x1820 | 730x590x2050 | 810x630x2250 | 890x690x2650 |
| Controller | 600x650x1820 | 600x650x1820 | 600x650x1820 | 600x650x1820 |
| Hydraulic Unit | 500x610x520 | 500x610x520 | 500x610x520 | 500x610x520 |

* Various types of capacity can be supplied under customer's requirement

* All the details can be updated without notice by manufacturer

CONTROL SOFTWARE

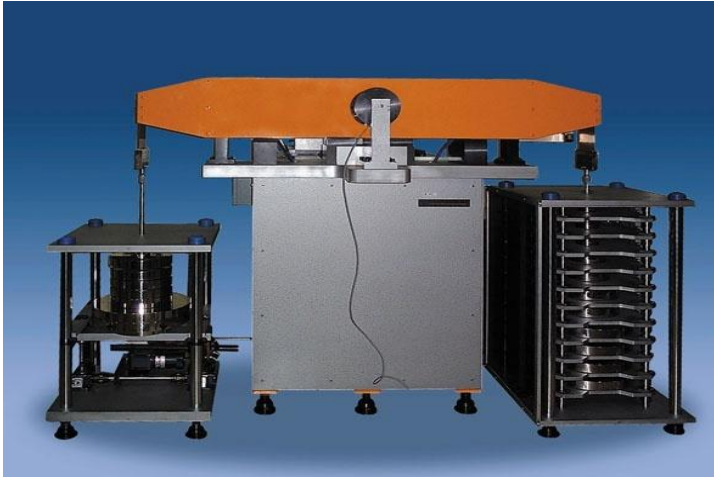
Monitoring and control panel is for automatic calibration and data analysis. The database of all calibrations are constructed so that you can manage the past calibration data easily. All controls offer user friendly GUI(Graphic User Interface) environment operating on MS-Windows. The calibration work is done automatically from loading and/or unloading to printing-out of calibration report.



▲ Software for fully Automated System

Torque Standard Machine

- Deadweight type



▲ Deadweight type Force Standard Machine



Deadweight type Torque Standard Machine is designed for high-precision test and/or calibration of the torque transducer. It applies torque to the sensor by using precision deadweight linked to the Torque Arm which transfer vertical load to Torque.

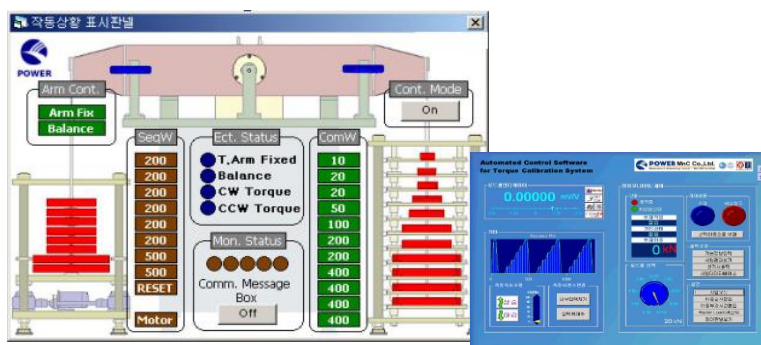
For primary class accuracy of national standard, securing total accuracy better than 0.01%, the air-bearing at the center pivot of torque arm minimize the friction. The automatic level control system keep the torque arm length constant preventing any kind of external disturbance.

The calibration process is carried out in fully automatic mode from start to print out of the calibration report.

This Standard Machine is designed to comply with ISO17025 and made under ISO9001 certified quality System.

FEATURE

- Low maintenance, no wear, infinite life expectation.
- The torque shunt into the frame is continuously measured and controlled to be zero.
- Less operation costs
- Large measuring range : up to 1:1000
- Measuring direction : CW and CCW
- Accuracy of deadweights : $\pm 0.002\%$ for all deadweight pieces
- Measuring uncertainty : Less then 0.01% over a range of 1 to 100% of capacity
- Capacity : 100, 200, 500, 1000, 2000, 5000, 10000 Nm



▲ Software for fully Automated System

Torque Wrench Calibrator

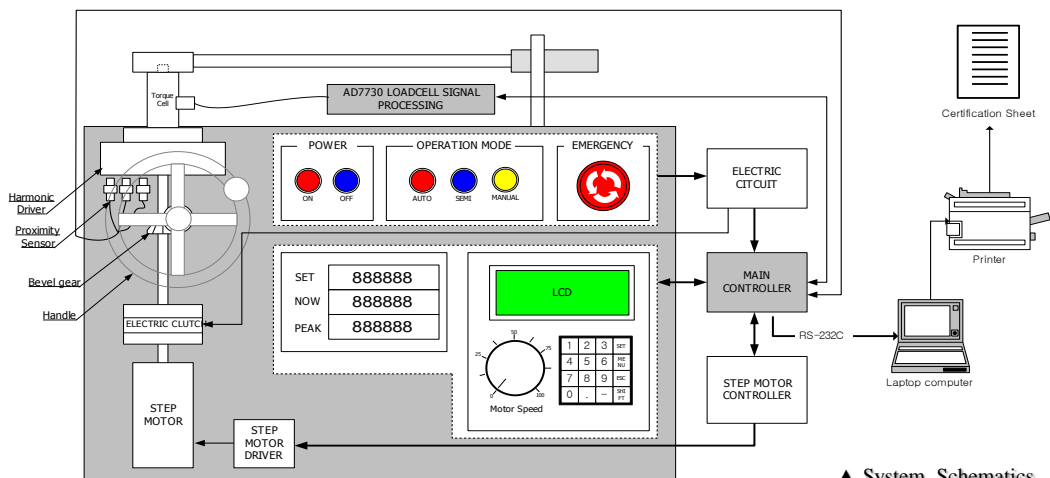
In order to obtain the high performance of a joint structure, it is very important to maintain the accuracy of torque wrench which is used to apply the proper torque to the fasteners to get the required clamping force.

There are two types of torque wrench calibration depending on the industrial applications. One is for the slip-type torque wrench, which need to be checked only the maximum torque value to be carried by the torque wrench. The other is for indicator-type Torque wrench, which measures several steps of torque values comparing between the indicated value and the reference one.

POWER Torque Wrench Calibrator has been designed to help easy, quick and error-free calibration in the industrial field. This has been designed to comply with ISO 6789 and manufactured under ISO9001 certified quality program.



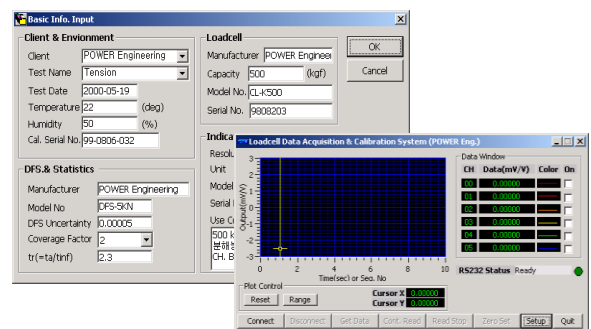
▲ Torque Wrench Calibrator



▲ System Schematics

SPECIFICATION

| | |
|--------------------|---|
| Equipment | Motor Driven Torque Wrench Calibrator |
| Calibration | Both clock / counter-clock wise for slip and indicator type |
| Capacity (Nm) | 500, 1000, 1500, 2000 |
| Accuracy | ±0.2% for the system uncertainty ±0.1% for torque transducer |
| Torque Transducer | Strain gauge bridge type Max. Torsion : 150% of Rated Torque Torsional deflection : Less than 1 degree Bridge Resistance : 350 Ohm ±1% |
| Torque Actuator | Motor Drive by precision stepping motor & drive Control Resolution : Less than 0.00045 deg/pulse |
| Transducer Readout | Signal resolution : Internally 210,000 count Measuring rate : 20 Hz Bridge excitation voltage : DC 5V |
| Test Procedure | According to ISO 6789 |
| Operation Mode | Fully-automatic by PC & software, Semi-automatic control by PLC, Manual Control |
| Control Software | Windows 2000/XP Based Graphical User Interface Fully automated test procedure control Data storage, Print out certification sheet |



▲ Fully Automated System

SYSTEM DESCRIPTION

- Measurement according to the standard procedure of ISO 6789
- Capable of wide range capacity up to 2,000 Nm
- Automatic control system, also convertible to manual operation
- Easy adjustable loading speed
- Using the high-precision indicator with high resolution
- Automatic generation of calibration report (by using optional S/W)

Hardness Standard Machine



Hardness is referred as a material's enduring capability resisting against scratching, abrasion, or cutting. It is the property of a metal, as a measure of materials property to resist being permanently deformed. Hardness is dependent on ductility, elastic stiffness, plasticity, strain, strength, toughness, viscoelasticity and viscosity.

Indentation hardness measures the resistance of a sample to permanent plastic deformation due to a constant compression load from a sharp object; they are primarily used in engineering and metallurgy fields. The tests work on the basic premise of measuring the critical dimensions of an indentation left by a specifically dimensioned and loaded indenter.

By combining certified accuracy mass pieces, the Dead Weight type Hardness Standard Machine provide ultra-high precision loading system for indentation hardness measuring by the Rockwell and Vickers hardness test.

Technical Capability

- Rockwell and Vickers Hardness Test
- Selecting weights automatically
- Indenting speed controlled within 1-500 $\mu\text{m}/\text{sec}$
- Indentation resolution is 0.001 micron
- Full automated operation from applying the indentation load to calculating hardness value

FEATURE

High Accuracy

Any possibility of lateral motion of the indenter, like as sway or shake, is eliminated by a pair of air-bearing at top and bottom of indenter frame shaft.

There is no affection by friction at the counter weight's fixed pulley because it is also supported by air bearing.

Automatic Selection of Weights

Selection of the weights according to hardness test is automatic by pneumatic device(cylinders, valves and so on), and the servo motor controls the speed of indentation.

High Precision Measuring Device

The measuring device of the indentation depth is high precision laser interferometer, the depth resolution is 0.01 micron.

Fully Automated Test

According to selected hardness test type and test condition, the load, depth and speed of indentation is monitored under test, and all procedure from acquiring test data to calculating hardness value is full automatic.

Rockwell and Vickers Test

This machine is designed to make the indentation on test block for Rockwell and Vickers Hardness Test.

By hanging deadweights on indenter, the indenting load is applied to the test block under high precision control of load and loading speed.

The **Rockwell test** determines the hardness by measuring the depth of penetration of an indenter under a large load compared to the penetration made by a preload. The result is a dimensionless number noted as HRA, where A is the scale letter. When testing metals, indentation hardness correlates linearly with tensile strength. This important relation permits economically important nondestructive testing of bulk metal deliveries with lightweight, even portable equipment, such as hand-held Rockwell hardness testers.

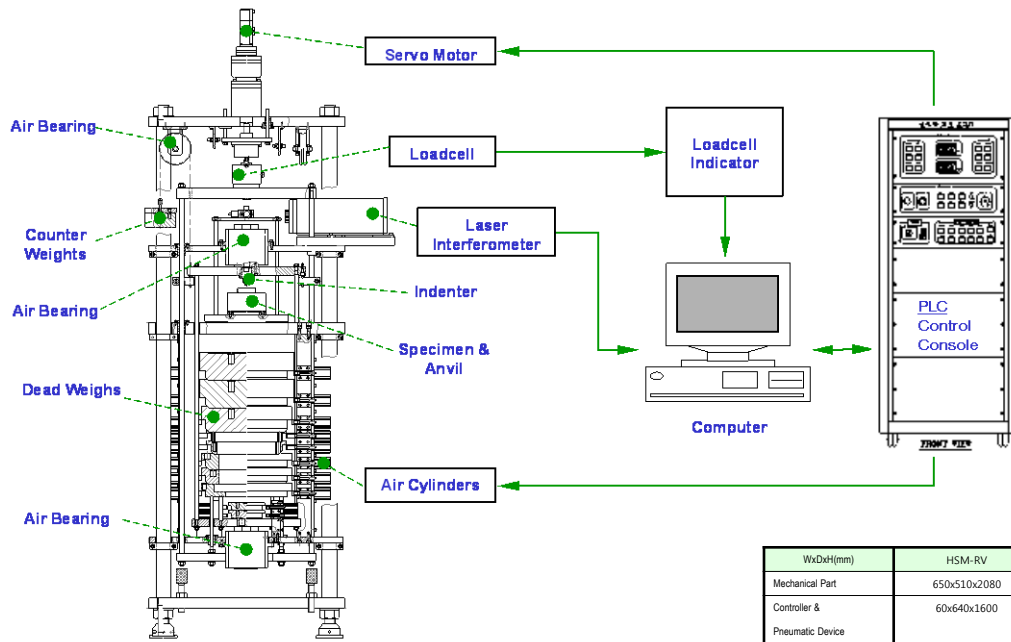
The **Vickers test** is often easier to use than other hardness tests since the required calculations are independent of the size of the indenter, and the indenter can be used for all materials irrespective of hardness. The unit of hardness given by the test is known as the **Vickers Pyramid Number (HV)** or **Diamond Pyramid Hardness (DPH)**. The hardness number is determined by the load over the surface area of the indentation.

The hardness number is not really a true property of the material and is an empirical value that should be seen in conjunction with the experimental methods and hardness scale used.

Hardness Standard Machine

SYSTEM SCHEMATICS

It is composed of Load Application Device, Laser Interferometer, Indenter frame, Loading Frame and Sequence Deadweight, etc. The precision dead weights can be applied or removed by automated control.

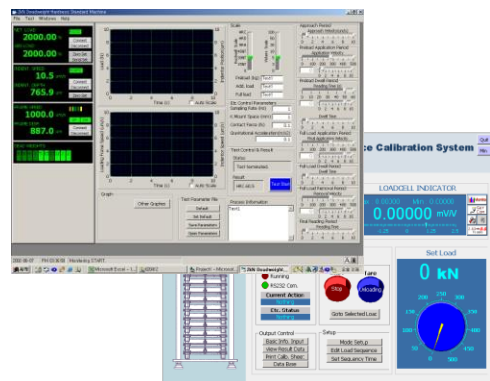


SPECIFICATION

| | |
|------------------------------|--|
| Equipment | Deadweight Rockwell Hardness Standard |
| Model | HSM-RV |
| Test | Superficial Rockwell Test (15NT, 30NT, 45NT) Standard Rockwell Test (HRA, HRD, HRC) Vickers Test (HV3, 5, 10, 30, 50, 100) |
| Accuracy | 0.002% |
| Deadweights | 100 N (Tare) 20 N x 2 ea 30 N x 1 ea 50 N x 1 ea 120 N x 2 ea 150 N x 2 ea 400 N x 1 ea 500 N x 2 ea |
| Counter Weights | 30 N x 3 ea 10 N x 3 ea |
| Indenting Speed | 1-500 $\mu\text{m}/\text{sec}$ |
| Indentation Depth Resolution | 0.01 micron (Laser Interferometer) |
| Control Device | Servo-motor, Pneumatic cylinders, Solenoid valve s, PLC |
| Indenter | Exchangeable |
| Power supply | AC220V-60Hz-3phases |
| Pneumatic | 4.5 ~ 7 bar |

SOFTWARE

- Graphic User Interface
- Operating System : MS-Windows
- Setting up arbitrary calibration and test condition.
- Selecting operation mode : Manual, Semi Automatic
- Monitoring all test procedure
- Data base of hardness test results



- Various types of capacity can be supplied under customer's requirement
- All the details can be updated without notice by manufacturer

