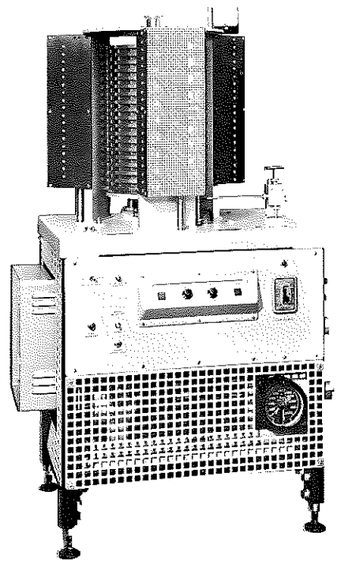
MODELS 2451, 2452, 2453 DEAD WEIGHT GAGES WITH WEIGHT LOADERS



DESCRIPTION

The Models 2451, 2452, 2453 dead weight gages (DWG) are master pressure standards for the precise generation and measurement of pressures to 40,000 psi. The gages are used as standards for the calibration of pressure gaging devices or as precise pressure balances to measure, maintain, or control hydraulic pressures.

Three pressure ranges are obtained by means of interchangeable piston-cylinder assemblies. The cylinders are of the re-entrant type in which the active portion of the cylinder is always subjected to the effect of the measured pressure at the external wall of the cylinder. The high degree of resolution obtained is achieved by precise machining and alignment of critical parts, dimensional limits of only a few microinches.

PRESSURE RANGES

High Range: 40,000 psi (280 MPa) in increments of 1.0 psi (0.01 MPa)
Mid Range: 20,000 psi (140 MPa) in increments of 0.5 psi (0.005 MPa)
Low Range: 4,000 psi (28 MPa) in increments of 0.1 psi (0.001 MPa)

(Kg/cm^2 units also available.)

INSTRUMENT BASES

The Model 2451 incorporates semi-automatic weight selection and does not require manual placement of weights onto the column. The Model 2451 requires the user to select the set of desired weights by activating the electric weight lifter. Once the weights are lifted, the series of weights desired are chosen by manually placing retaining pins into three holes in the side of the weight lifter assembly. When the pins are in place, only the weights below the pins are allowed to rest on the weight table assembly.

The Model 2452 incorporates automatic weight selection and operates as the Model 2451 but does not require the user to manually place the retaining pins in the holes. A front-panel selector performs the weight retention by way of electrically activated solenoids which eject the pins appropriately.

Model 2453 is designed for computer selection and maintenance of pressure values. See pages 13 & 14 for complete description.

ACCURACY

The gage is capable of measuring pressures to the accuracy indicated below. The claim for accuracy is valid only when the gage is operated according to the instructions provided with the equipment. In addition, the claim is valid when the value of gravity acting upon the weights is known to $\pm$ 0.001 cm sec^{-2}.

Accuracy is defined as the departure of the measured pressure from the true pressure. The value is based on a simple error analysis of the systematic errors and two standard deviations of the random variability of the comparison to the standard.

HIGH RANGE PISTON: 0.01% of reading or 0.1 psi, whichever is greater. Area = 0.013 in^2 (0.084 cm^2).
MID RANGE PISTON: 0.01% of reading or 0.05 psi, whichever is greater. Area = 0.026 in^2 (0.168 cm^2).
LOW RANGE PISTON: 0.01% of reading or 0.03 psi, whichever is greater. Area = 0.130 in^2 (0.839 cm^2).

For certain pressure ranges which are beyond the range of NBS traceability, Ruska's accuracy claims represent reproducibility rather than absolute accuracy.

For a discussion of calibration procedures, please see page 3.

RUSKA

WEIGHTS

The weights are machined completely from nonmagnetic stainless steel. They are adjusted for a nominal piston area operating at standard gravity. The adjustment is approximate and is intended to serve only as a convenient means of establishing a pressure. It is not intended to encourage use of the gage without application of corrections for the intrinsic variable. Each weight is engraved with the serial number of the set and an identifying sub-number.

Values of mass are tabulated in the test report according to the system "Apparent Mass vs. Brass Standards". Values of weights are obtained by correcting the reported mass for the effects of local gravity and air buoyancy.

The reported values of mass are traceable to the National Bureau of Standards in accordance with accepted procedures of quality assurance. Errors of calibration do not exceed the values given in the following table:

Mass Range (pounds)	Maximum Error
to 0.1	$\pm$ 0.000002 pounds
>0.1 to 1.0	$\pm$ 0.002% of indicated value
>1.0	$\pm$ 0.001% of indicated value

SPECIAL WEIGHT ADJUSTMENTS

The effects of local gravity and air buoyancy can be included in the weight adjustment at extra charge, but only for weights used with one piston area.

ENGLISH MEASURE

Qty	Designated	Nominal Value (PSI) High	Mid	Low
19	1-19	2000	1000	200
1	20	1000	500	100
2	21-22	400	200	40
1	23	200	100	20
1	24	100	50	10
2	25-26	40	20	4
1	27	20	10	2
1	28	10	5	1
2	29-30	4	2	0.4
1	31	2	1	0.2
1	32	1	0.5	0.1

METRIC MEASURE

Qty	Designation	Nominal Value (Kg/cm^2) High	Mid	Low
13	1-13	200	100	20
1	14	100	50	10
2	15-16	40	20	4
1	17	20	10	2
1	18	10	5	1
2	19-20	4	2	0.4
1	21	2	1	0.2
1	22	1	0.5	0.1
2	23-24	0.4	0.2	0.04
1	25	0.2	0.1	0.02
1	26	0.1	0.05	0.01

SYSTEM INTERNATIONAL UNITS (SI)

Qty	Designation	Nominal Value (MPa) High	Mid	Low
13	1-13	20	10	2
1	14	10	5	1
2	15-16	4	2	0.4
1	17	2	1	0.2
1	18	1	0.5	0.1
2	19-20	0.4	0.2	0.04
1	21	0.2	0.1	0.02
1	22	0.1	0.05	0.01
2	23-24	0.04	0.02	0.004
1	25	0.02	0.01	0.002
1	26	0.01	0.005	0.001