

July 31, 2026

Pocket Penetrometer – Scale Conversion Card

For the 0 to 4.5 tsf / kg/cm² pocket penetrometer with 1 inch adapter foot. Readings are approximate unconfined compressive strength.

1 ton/ft² (tsf) = 95.76 kPa = 0.0958 MPa =
13.89 psi

1 kg/cm² = 98.07 kPa = 0.0981 MPa =
14.22 psi

1 inch adapter foot = divide reading by
16

Scale reading	Standard piston, no foot				With 1 inch adapter foot	
	tsf → kPa	tsf → MPa	kg/cm ² → kPa	kg/cm ² → MPa	kPa	MPa
0.25	23.9	0.024	24.5	0.025	1.50	0.0015
0.50	47.9	0.048	49.0	0.049	2.99	0.0030
0.75	71.8	0.072	73.5	0.074	4.49	0.0045
1.00	95.8	0.096	98.1	0.098	5.99	0.0060
1.25	119.7	0.120	122.6	0.123	7.48	0.0075
1.50	143.6	0.144	147.1	0.147	8.98	0.0090
1.75	167.6	0.168	171.6	0.172	10.47	0.0105
2.00	191.5	0.192	196.1	0.196	11.97	0.0120
2.25	215.5	0.215	220.6	0.221	13.47	0.0135
2.50	239.4	0.239	245.2	0.245	14.96	0.0150
2.75	263.3	0.263	269.7	0.270	16.46	0.0165
3.00	287.3	0.287	294.2	0.294	17.96	0.0180
3.25	311.2	0.311	318.7	0.319	19.45	0.0195
3.50	335.2	0.335	343.2	0.343	20.95	0.0209
3.75	359.1	0.359	367.7	0.368	22.44	0.0224
4.00	383.0	0.383	392.3	0.392	23.94	0.0239
4.25	407.0	0.407	416.8	0.417	25.44	0.0254
4.50 (max)	430.9	0.431	441.3	0.441	26.93	0.0269

Full scale and resolution

Full scale is 4.5 tsf = 0.431 MPa, or 4.5 kg/cm² = 0.441 MPa. The two engraved scales are not quite identical; they differ by about 2.4 percent. Catalogue figures quoting 0.5 MPa are this value rounded up.

Accuracy is about half a scale division, which is 0.125 tsf, roughly 0.012 MPa. Take several readings, discard obvious outliers, then average.

The foot lowers the range, it does not raise it

The 1 inch adapter foot is for very soft soils only. Fitting it drops the ceiling from 0.431 MPa to 0.027 MPa. No configuration of this instrument reads above about 0.44 MPa.

What the scale actually reports

The scale reads approximate unconfined compressive strength, q_u , established by correlation. It is not the contact pressure under the tip: at full scale the spring carries 17 lbf on 0.32 cm², which is about 2.4 MPa of contact pressure.

If a specification calls for penetration resistance or cone index in MPa, that is a different quantity and this instrument is not directly comparable.

Piston and shear strength

1/4 inch (6.35 mm) piston, tip area 0.32 cm², pushed to the calibration groove 1/4 inch from the tip. Undrained shear strength is roughly q_u divided by 2.

Spring check

A full-scale reading of 4.5 corresponds to 17 lbf (7.7 kg) applied to the piston. Check the spring against a good quality scale.

Conversions are exact arithmetic on the engraved scale values (1 short ton = 2000 lbf, 1 ft² = 144 in², standard gravity). They do not improve on the accuracy of the instrument, which remains about half a scale division. Pocket penetrometer readings are estimates and do not replace laboratory testing.