INSTRON

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The information contained in this booklet is believed to be accurate.

DUROMETERS BY

Shore

SHORE DUROMETER SELECTION GUIDE

TECHNICAL INFORMATION:

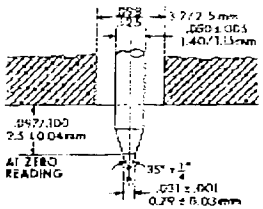
Spring Forces:

1. Force in Newtons = 0.55 + 0.075 Scale Reading, Maximum Load; 822 Grams

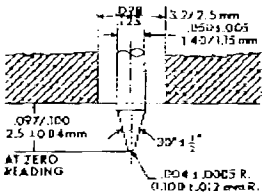
2. Force in Newtons = 0.4445 Scale Reading, Maximum Load: 4552 Grams

3. Force in Newtons = 0.203 + 0.00908 Scale Reading, Maximum Load; 113 Grams

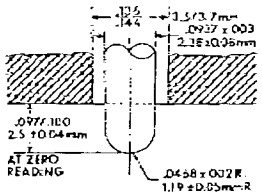
Indentor Geometry:



FRUSTRUM CONE



SHARP 30° ANGLE



3/32" SPHERE

PART NUMBER	DUROTRON C STYLE DUROMETERS	MODEL	MAIN SPRING	INDENTER	FOR USE ON MATERIALS BELOW
10020 10026 10028	ASTM D 2240 DIN 53505 JIS K 6301	A A A	822 Grams 822 Grams 855 Grams	Frustum Cone	Soft vulcanized rubber and all Elastomeric materials natural rubber, GR-S, GR-1 neoprene, nitrile rubbers, thiokol, flexible polyacrylic esters, etc. Also used on wax, felt, leather, etc
10021	ASTM D 2240	B	822 Grams	Sharp 30° Included Angle	Moderately hard rubber such as typewriter rollers, platens, etc
10022 10029	ASTM D 2240 JIS K 6301	C C	4550 Grams 4550 Grams	Frustum Cone	Medium hard rubber and plastics
10023 10027	ASTM D 2240 DIN 53505	D D	4550 Grams 4550 Grams	Sharp 30° Included Angle	Hard rubber and the harder grades of plastics such as rigid thermo-plastic sheet, plexiglas polystyrene, vinyl sheet, cellulose acetate and thermosetting laminates such as formica. Also paper filled calender rolls, calendar bowls, etc.
10024	ASTM D 2240	DO	4550 Grams	3/32" Sphere	Very dense textile windings, slasher beams, etc.
10025	ASTM D 2240	O	822 Grams	3/32" Sphere	Soft printers rollers, artgum, etc. Also medium density textile windings of rayon, orlon, nylon, etc.

PART NUMBER	ROUND STYLE DUROMETERS	MODEL	MAIN SPRING	INDENTER	FOR USE ON MATERIALS BELOW
70300 70400 70410 70411 70412 70413 70414	Standard Reading Maximum Reading Constant Load Constant Load Max. Tolerance Hand Half Inch Foot Maximum Reading	XA XAMX XACL XACLMX XATH XAHAF XAMXHAF	822 Grams	Frustum Cone	Soft vulcanized rubber and all Elastomeric materials natural rubber, GR-S, GR-1, neoprene, nitrile rubbers, thiokol, flexible polyacrylic esters, etc. Also used on wax, felt, leather, etc.
70301 SO* SO* SO*	Standard Reading Maximum Reading Half Inch Foot Maximum Reading	XB XBMX XBHAF XBMXHAF	822 Grams	Sharp 30° Included Angle	Moderately hard rubber such as typewriter rollers, platens, etc
70302 70402 SO* SO*	Standard Reading Maximum Reading Half Inch Foot Maximum Reading	XC XCMX XCHAF XCMXHAF	4550 Grams	Frustum Cone	Medium hard rubber and plastics
70303 70403 SO* 70429	Standard Reading Maximum Reading Half Inch Foot Maximum Reading	XD XDMX XDHAF XDMXHAF	4550 Grams	Sharp 30° Included Angle	Hard rubber and the harder grades of plastics such as rigid thermo-plastic sheet, plexiglas thermo-polystyrene, vinyl sheet, cellulose acetate and thermosetting laminates such as formica. Also paper filled calendar rolls, calendar bowls, etc
70304 70404 SO* SO*	Standard Reading Maximum Reading Half Inch Foot Maximum Reading	XDO XDOMX XDOHAF XDOMXHAF	4550 Grams	3/32" Sphere	Very dense textile windings, slasher beams, etc.
70305 70405 SO* SO*	Standard Reading Maximum Reading Half Inch Foot Maximum Reading	XO XOMX XOHAF XOMXHAF	822 Grams	3/32" Sphere	Soft printers rollers, artgum, etc. Also medium density textile windings of rayon, orlon, nylon, etc
70306 SO*	Standard Reading Half Inch Foot	XOO XOOHAF	113 Grams	3/32" Sphere	Sponge rubber and plastics. Also low density textile windings. Not for use on foamed latex
70307	Standard Reading	XT	822 Grams	3/32" Sphere	Medium density textile windings on spools and bobbins with a maximum diameter of 4". Note all XTs have a concave bottom plate to facilitate centering on cylindrical specimens

PART NUMBER	QUADRANT STYLE DUROMETERS	MODEL	MAIN SPRING	INDENTER	FOR USE ON MATERIALS BELOW
70100 70200	Standard Reading Maximum Reading	QA QAMX	822 Grams	Frustum Cone	Soft vulcanized rubber and all Elastomeric materials natural rubber, GR-S, GR-1, neoprene, nitrile rubbers, thiokol, flexible polyester, cast resins, polyacrylic esters, etc. Also used on wax, felt, leather, etc.
70101 70201	Standard Reading Maximum Reading	QB QBMX	822 Grams	Sharp 30° Included Angle	Moderately hard rubber such as typewriter rollers, platens, etc.
70102 70202	Standard Reading Maximum Reading	QC QCMX	4550 Grams	Frustum Cone	Medium hard rubber and plastics
70103 70203	Standard Reading Maximum Reading	QD QDMX	4550 Grams	Sharp 30° Included Angle	Hard rubber and the harder grades of plastics such as rigid thermo-plastic sheet, plexiglas, polystyrene, vinyl sheet, cellulose acetate and thermosetting laminates such as formica. Also paper rolls, calendar bowls, etc.
70104 70204	Standard Reading Maximum Reading	QDO QDOMX	4550 Grams	3/32" Sphere	Very dense textile windings, slasher beams, etc
70105 70205	Standard Reading Maximum Reading	QO QOMX	822 Grams	3/32" Sphere	Soft printers rollers, artgum, etc. Also medium density textile windings of rayon, orlon, nylon, etc
70106	Standard Reading	QOO	113 Grams	3/32" Sphere	Sponge rubber and plastics. Also low density textile windings. Not for use on foamed latex
70107 70207	Standard Reading Maximum Reading	QT QTMX	822 Grams	3/32" Sphere	Medium density textile windings on spools and bobbins with a maximum diameter of 4". Note all Model QTs have a concave bottom plate to facilitate centering on cylindrical specimens
70000	Vernier Scale	PA	822 Grams	Frustum Cone	Soft vulcanized rubber and all elastomeric materials.

*SO-Special Orders

GENERAL INFORMATION AND DUROMETER OPERATION

The Durometer is a precision instrument used since the early 1900's to measure the indentation hardness of rubber and rubber like materials. Basically the durometer is a precision dial indicator with a calibrated spring added to create a known preload on the indentor. The Shore Hardness (durometer hardness) is measured by determining the depth of penetration of the indenter in the material being tested. This measurement is then transmitted to a linear scale in increments of 0 to 100, one increment equaling one hardness point. Perhaps a better description of Shore Hardness is measuring the test materials resistance to the indentors penetration, the deeper the penetration the softer the material.

TECHNICAL NOTES

1. There are several types of durometers, each designed to be used on materials with differing hardness characteristics. When selecting a durometer, the material being tested should be taken into consideration and the correct type used. (See Durometer Selection Guide)
2. Test specimen should have a minimum thickness of 0.25in(6mm) unless it is known that identical results are obtained on thinner specimen. Thinner specimen may be plied to the minimum thickness to obtain indicative readings.
3. The temperature of the test specimen may have significant effect on the hardness readings, depending on the material involved. The specimen should be conditioned at a temperature of 23° ± 2°C before testing. Other temperatures should be noted in the test documentation.
4. Application pressure of the durometer to the test specimen is critical when reproducibility of readings is required. When the durometer is used hand held the recommended application pressure is 2 to 3 lbs. for type A, B, O and T and 10 to 12 lbs. for type C and D instruments. Better reproducibility will be obtained when the durometer is mounted on an operating stand. Constant load and constant load and velocity operating stands are available from Shore.
5. The use of test blocks, spring type or rubber, for calibration of durometers is not an acceptable practice. Test blocks are designed for day to day operational checks of durometers. Durometer calibration must be accomplished using a system of weights applying a force to the durometer spring.
6. Indenter protrusion and geometry are important to proper durometer operation. Frequent checks of these items should be done.

OPERATION

NOTE: *Although there are variations of durometer styles and types, the following are basic operating procedures that apply to most durometers.*

1. Grasp the durometer between the thumb and middle finger with the index finger resting on the mounting knob.
2. Apply the durometer to the test specimen with a steady even pressure until the presser foot is in firm contact with the specimen. The application pressures recommended in the TECHNICAL NOTES should not be exceeded.
3. The hardness reading should be taken one (1) second after the durometer is in firm contact with the test specimen. Readings may be taken at time intervals other than one second, these times should be specified locally and recorded with the test results.

NOTE: *When using durometers with maximum pointers a maximum reading and a time interval reading may be taken. It is recommended that a maximum reading durometer be used when the material being tested has excessive cold flow or creep characteristics. If a maximum reading durometer is being used the pointer must be returned to zero prior to taking readings.*

4. Three or more readings should be taken on each test specimen and the results averaged to attain the most accurate hardness value.

NOTE: *Operator inconsistencies reduce the reproducibility of test results. Increased accuracy will only be possible if the durometer is used with an operating stand.*

NOTE: *Durometers are in the same category as other precision measuring devices. Calibration should be accomplished at regular intervals.*

DUROMETER HARDNESS CONVERSION TABLE

The hardness values listed below are approximate and should only be used as a durometer selection guide.

DUROMETER TYPE	HARDNESS VALUE					
	A	B	C	D	O	OO
	100	85	77	58		
	95	81	70	46		
	90	76	59	39		
	85	71	52	33		
	80	66	47	29	84	98
	75	62	42	25	79	97
	70	56	37	22	75	95
	65	51	32	19	72	94
	60	47	28	16	69	93
	55	42	24	14	65	91
	50	37	20	12	61	90
	45	32	17	10	57	88
	40	27	14	8	53	86
	35	22	12	7	48	83
	30	17	9	6	42	80
	25	12			35	76
	20	6			28	70
	15				21	62
	10				14	55
	5				8	45