

Hydraulic Hand Dynamometer BL5001

Operating Manual



CE
2195

B&L Engineering

FEATURES

The **B&L Engineering** Hydraulic Hand Dynamometer offers numerous features for standard screening work, as well as for assessing hand trauma and disease.

Dual-Scale Readout - Displays grip force in pounds and kilograms (200 pounds or 90 kilograms maximum reading).

Peak-Hold Needle - For convenience and ease of recording, it automatically retains the highest reading on the peak-hold needle. That reading will remain on the gauge until it is reset.

Accurate and Reproducible - It is isometric in use, with almost no perceptible motion of the handles, regardless of grip strength. This ensures accurate, reproducible results.

Adjustable Handle - To accommodate various size hands, the handle adjusts to five grip positions: from 1 3/8"(3.5cm) to 3 3/8"(8.6cm), in half-inch increments.

Since grip strength may also vary in an individual patient, this feature allows therapists to quantify grip strength for different size hands.

BENEFITS

Some patients may be reluctant to exert maximum effort in grip force evaluation. Repeated tests after short rest periods will determine if a patient is exerting maximum effort.

1. Test grip in the usual manner taking readings with the hand grip in each position of the dynamometer.
2. Test the normal hand, followed by the injured hand. Allow the patient to see the readings.
3. After about five minutes, repeat the test.

Usually, if the patient has carried out the test with full effort, there will be less than 10% variation in results for various grip positions. However, if the patient has not exerted maximum effort, there will be a larger, inconsistent variation between the tests.

OPERATION

The **B&L Engineering** Hydraulic Hand Dynamometer is a precision instrument and its accuracy can be impaired by abuse. Have the patient use the wrist safety strap to minimize the chance of dropping the instrument accidentally.

To Use the Dynamometer :

1. Set the adjustable handle to the desired spacing. Make sure the handle clip is located at the lower (furthest) post from the gauge before moving the handle from one position to another. If you do not replace the handle in the correct position, inaccurate readings will result.
2. Rotate the red peak–hold needle counter–clockwise to 0.
3. Let the patient arrange the instrument so that it fits in the hand comfortably. Request that the patient squeeze with maximum strength. The peak–hold needle will automatically record the highest force exerted.
4. After the patient has used the instrument, record the reading.
5. Reset the peak–hold needle to zero before recording new readings.

Suggested Standard Procedures

1. Sit or stand comfortably
2. Keep shoulder adducted and neutrally rotated
3. Elbow should be flexed to 90 degrees
4. Forearm in neutral position
5. Wrist in neutral position
6. Repeat each test 3 times and record the average

Suggested Interfering Factors

The following factors have shown positive correlation with grip strength:

1. Weight
2. Hand width
3. Height
4. Mesomorph

OPERATION(Continued)

Average Grip - Strength vs. Age

MALES					FEMALES		
Age	Hand	Mean	SD	Range	Mean	SD	Range
6-7	R	32,5	4,8	21-42	28,6	4,4	20-39
	L	30,7	5,4	18-38	27,1	4,4	16-36
8-9	R	41,9	7,4	27-61	35,3	8,3	18-55
	L	39,0	9,3	19-63	33,0	6,9	16-49
10-11	R	53,9	9,7	35-79	49,7	8,1	37-82
	L	48,4	10,8	26-73	45,2	6,8	32-59
12-13	R	58,7	15,5	33-98	56,8	10,6	39-79
	L	55,4	16,9	22-107	50,9	11,9	25-76
14-15	R	77,3	15,4	49-108	58,1	12,3	30-93
	L	64,4	14,9	41-94	49,3	11,9	26-73
16-17	R	94,0	19,4	64-149	67,3	16,5	23-126
	L	78,5	19,1	41-123	56,9	14,0	23-87
18-19	R	108,0	24,6	64-172	71,6	12,3	46-90
	L	93,0	27,8	54-149	61,7	12,5	41-86

Note: The mean scores for individuals, aged 14-19 years, may be slightly low (0-10 lb. lower than they should be) due to instrument error detected after the study.

- (1) Gill D., Reddon J., Renny C., Stefanyk W. "Hand Dynamometer: Effects of Trials and Sessions." *Perceptual and Motor Skills* 61: 195-8, 1985
- (2) Everett P., Sils F., "The Relationship of Grip Strength to Stature, Somatotype Components, and Anthropometric Measurements of The Hand." *The Research Quarterly* 23: 161-6, 1952.
- (3) Mathiowetz V., Federman S., Wiemer D. "Grip and Pinch Strength: Norms for 6 to 19 Year Olds." *The American Journal of Occupational Therapy* 40:705-11,1986 .

OPERATION(Continued)

Average Performance of All Subjects on Grip Strength

			Men					Women				
Age	Hand		Mean	Std Dev	Std Error	Low	High	Mean	Std Dev	Std Error	Low	High
20-24	R	lb.	121.0	20.6	3.8	91	167	70.4	14.5	2.8	46	95
		kg	54.89	9.34	1.72	41.28	75.75	31.93	6.58	1.27	20.87	43.09
	L	lb.	104.5	21.8	4.0	71	150	61.0	13.1	2.6	33	88
		kg	47.40	9.89	1.81	33.21	68.04	17.67	5.94	1.18	14.97	39.92
25-29	R	lb.	120.8	23.0	4.4	78	158	74.5	13.9	2.7	48	97
		kg	54.79	10.43	2.0	35.38	71.67	33.79	6.31	1.22	21.77	44.00
	L	lb.	110.5	16.2	4.4	77	139	63.5	12.2	2.4	48	97
		kg	50.12	7.35	2.0	34.93	63.05	28.80	5.53	1.09	21.77	44.00
30-34	R	lb.	121.8	22.4	4.3	70	170	78.7	19.2	3.8	46	137
		kg	55.25	10.16	1.95	31.75	77.11	35.70	8.71	1.72	20.87	62.14
	L	lb.	110.4	21.7	4.2	64	145	68.0	17.7	3.5	36	115
		kg	50.08	9.84	1.91	29.03	65.77	30.84	8.03	1.59	16.33	52.16
35-39	R	lb.	119.7	24.0	4.8	76	176	74.1	10.8	2.2	50	99
		kg	54.30	10.89	2.18	34.47	79.83	33.61	4.90	1.00	22.68	44.91
	L	lb.	112.9	21.7	4.2	73	157	66.3	11.7	2.3	49	91
		kg	51.21	9.84	1.91	33.11	71.22	30.07	5.31	1.04	22.23	41.28
40-44	R	lb.	116.8	20.7	4.1	84	165	70.4	13.5	2.4	38	103
		kg	52.98	9.39	1.86	38.10	74.84	31.93	6.12	1.09	17.24	46.72
	L	lb.	112.8	18.7	3.7	73	157	62.3	13.8	2.5	35	94
		kg	51.17	8.48	1.68	33.11	71.22	28.26	6.26	1.13	15.88	42.64
45-49	R	lb.	109.9	23.0	4.3	65	155	62.2	15.1	3.0	39	100
		kg	49.85	10.43	1.95	29.48	70.31	28.21	6.85	1.36	17.69	45.36
	L	lb.	100.8	22.8	4.3	58	160	56.0	12.7	2.5	37	83
		kg	45.72	10.34	1.95	26.31	72.58	25.40	5.76	1.13	16.78	37.65
50-54	R	lb.	113.6	18.1	3.6	79	151	65.8	11.6	2.3	38	87
		kg	51.53	8.21	1.63	35.83	68.49	29.85	5.26	1.04	17.24	39.46
	L	lb.	101.9	17.0	3.4	70	143	57.3	10.7	2.1	35	76
		kg	46.22	7.71	1.54	31.75	64.86	25.99	4.85	0.95	15.88	34.47
55-59	R	lb.	101.1	26.7	5.8	59	154	57.3	12.5	2.5	33	86
		kg	45.86	12.11	2.63	26.76	69.85	25.99	5.67	1.13	14.97	39.01
	L	lb.	83.2	23.4	5.1	43	128	47.3	11.9	2.4	31	76
		kg	37.74	10.61	2.31	19.50	58.06	21.46	5.40	1.09	14.06	35.83
60-64	R	lb.	89.7	20.4	4.2	51	137	55.1	10.1	2.0	37	77
		kg	40.69	9.25	1.91	23.13	62.14	24.99	4.58	0.91	16.78	34.93
	L	lb.	76.8	20.3	4.1	27	116	45.7	10.1	2.0	29	66
		kg	34.84	9.21	1.86	12.25	52.62	20.73	4.58	0.91	7.71	29.94
65-69	R	lb.	91.1	20.6	4.0	56	131	49.6	9.7	1.8	35	74
		kg	41.32	9.34	1.81	25.40	59.42	22.50	4.40	0.82	15.88	33.57
	L	lb.	76.8	19.8	3.8	43	117	41.0	8.2	1.5	29	63
		kg	34.84	8.98	1.72	19.50	53.07	18.60	3.72	0.68	13.15	28.58
70-74	R	lb.	75.3	21.5	4.2	32	108	49.6	11.7	2.2	33	78
		kg	34.16	9.75	1.91	14.52	48.99	22.50	5.31	1.00	14.97	35.38
	L	lb.	64.8	18.1	3.7	32	93	41.5	10.2	1.9	23	67
		kg	29.39	8.21	1.68	14.52	42.18	18.82	4.63	0.86	10.43	30.39
75+	R	lb.	65.7	21.0	4.2	40	135	42.6	11.0	2.2	25	65
		kg	29.80	9.53	1.91	18.14	61.24	19.32	4.99	1.00	11.34	29.48
	L	lb.	55.0	17.0	3.4	31	119	37.6	8.9	1.7	24	61
		kg	24.95	7.71	1.54	14.06	53.98	17.06	4.04	0.77	10.89	27.67
All Subjects ^a	R	lb.	104.3	28.3	1.6	32	176	62.8	17.0	0.96	25	137
		kg	47.31	12.84	0.73	14.52	79.83	28.49	7.71	0.44	11.34	62.14
	L	lb.	93.1	27.6	1.6	27	160	53.9	15.7	0.88	23	115
		kg	42.23	12.52	0.73	12.25	72.58	24.45	7.12	0.40	10.43	52.16

The above norms are from Mathiowetz, V., Kashman, N., Volland, G., Weber, K., Dowe, M., Rogers, S.

SERVICE TIPS

The **B&L Engineering** Hydraulic Hand Dynamometer is designed to provide years of dependable service with minimal maintenance.

To make sure the instrument is reading accurately, we suggest occasionally making the few checks listed below. If you detect a problem, return the instrument to **B&L Engineering** for servicing.

POSTS

Remove the adjustable handle and check that each post moves up and down freely on its guide (the part that the post bears on), even when you exert pressure on the side of the post. If excessive friction exists between the posts and guide, return the dynamometer for service.

HYDRAULICS

To check the hydraulic mechanism, first remove the adjustable handle. While keeping an eye on the top post, push down on the bottom post. Generally, both posts should move about 1/8"(3.2mm), with top and bottom posts moving in opposite directions. Movements of less than 1/16"(1.6mm), indicates a probable leak in the hydraulic system, which requires service.

HANDLE

Hold the instrument normally and look carefully at the way the forks of the adjustable handle are supported on the posts. Each fork should touch the post close to its center. If they do not, return the instrument to **B&L Engineering** for adjustment.

SERVICE TIPS(Continued)

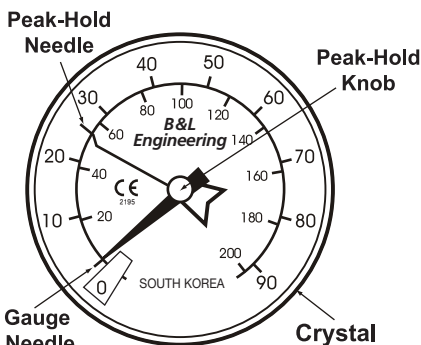
PEAK-HOLD NEEDLE

Check for excessive friction in the peak-hold assembly by turning the peak-hold knob counter-clockwise. If the peak-hold needle deflects the gauge needle, return the gauge for service.

If the peak-hold needle should disconnect from the support pin, it can easily be repositioned.

Unscrew the crystal and turn it upside down. Locate the brass pin in the center of the crystal (the pin

is part of the chrome knob on the outside of the crystal). Locate the slot on the brass pin and place the peak-hold needle into this slot.



CALIBRATION

This instrument was calibrated at the factory by loading it at the center with weight and making appropriate adjustments in the gauge. The calibration should be checked once a year. If the instrument has been dropped or there is some particular reason to suspect that the calibration is in error, the instrument should be serviced immediately. When the instrument is found to be in need of recalibration, return to **B&L Engineering** for service.

Customers that register with **B&L Engineering** will automatically be notified each year in advance of their calibration date.

SERVICE / RECALIBRATION

When preparing to ship the dynamometer, be certain it is packed in its carrying case and protective carton. Always insure the instrument with the postal service or other shipping service. Observe the following guidelines if you are requesting repair service:

1. Follow the service tips outlined in this manual to verify the malfunction.
2. If you determine that repair and or calibration is required, complete the Repair and Calibration Form at www.bleng.com and include the form with your instruments to **B&L Engineering** at the address below.
3. It is recommended that each Hand Dynamometer be sent to **B&L Engineering** annually for calibration.

LIMITED TWO-YEAR WARRANTY

B&L Engineering warrants this Hand Dynamometer to be free from defects in workmanship and materials for two years from the date of purchase. If this instrument is found to be defective during the two-year period, **B&L Engineering** will repair or replace the Hand Dynamometer at its discretion. Thereafter, if a defect occurs, there will be a service charge for repairs. This warranty gives you specific legal rights. You may also have other rights, which may vary by state.

Return to: **B&L Engineering**

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