1.3 DATA SHEET

HD Hysteresis Dynamometers ED Engine Dynamometers

HD FEATURES

- 16 Standard Models with Maximum Torque from 2.5 oz·in to 500 lb·in (18 mN·m to 56.5 N·m)
- Hysteresis Braking System: provides precise torque loading independent of shaft speed
- Motor Testing: from no load to locked rotor
- Standard Torque Units: English, Metric and SI
- Accuracy: $\pm 0.25\%$ to $\pm 0.5\%$ (full scale)
- Air Flow Sensor: For protection against overheating and operator error
- Base Plates: available in long or short versions
- Custom Dynamometers: for special torque and speed requirements
- Easy Calibration

HD DESCRIPTION

Hysteresis Brake Dynamometers (HD Series) are versatile and ideal for testing in the low to medium power range (maximum 14 kW intermittent duty). With a Hysteresis Braking system, the Dynamometers do not require speed to create torque, and therefore can provide a full motor ramp from free-run to locked rotor. Brake cooling is provided by convection (no external source), by compressed air or by dedicated blower, depending on the model. All Magtrol Hysteresis Dynamometers have accuracy ratings of $\pm 0.25\%$ to $\pm 0.5\%$ full scale — depending on size and system configuration.

To better integrate dynamometers into systems, Magtrol offers both long and short base plates. The shorter base plate facilitates easier motor mounting when used with T-slot tables and Magtrol Adjustable Motor Fixtures, where as the long base plates are better suited for table top testing.

Model HD-710 Hysteresis Dynamometer with long base plate

HD APPLICATIONS

Magtrol motor test systems can be found in test labs, at inspection stations, and on the manufacturing floors of most of the world's leading manufacturers, users and certifiers of small to medium sized electric, pneumatic and hydraulic motors, as well as internal combustion engines. Magtrol supplies motor test systems for a wide array of industries including: Appliance, Automotive, Aviation, Computer, HVAC, Lawn and Garden, Medical and Dental, Electric Motor, Office Equipment and Power Tools.

ED FEATURES

- Maximum Torque: from 55 lb·in to 250 lb·in (6.5 N·m to 28 N·m)
- Hysteresis Braking System
- Motor Testing: from no load to locked rotor
- Standard Torque Units: English, Metric & SI available
- Accuracy: ±0.25% (full scale)
- Blower Cooled: to maximize heat dissipation
- Air Flow Sensor: for protection against overheating and operator error
- Specially Reinforced Load Cell: stainless steel pin at contact point prevents premature wear from excess vibration
- Larger Shaft: for additional strength
- Gusseted Pillow Blocks: for additional front and rear support
- Easy Calibration

ED DESCRIPTION

With Magtrol's Engine Dynamometers, high performance motor testing is available to manufacturers and

users of small engines. Magtrol's Engine Dynamometers have been designed to address the severe, high vibration conditions inherent in internal combustion engine testing.

Magtrol's Engine Dynamometers are highly accurate ($\pm 0.25\%$ of full scale) and can be controlled either manually or via a PC based Controller. For a small engine test stand, Magtrol offers a full line of controllers, readouts and software.

As with all Magtrol Hysteresis Dynamometers, engine loading is provided by Magtrol's Hysteresis Brake, which provides: torque independent of speed, including full load at 0 rpm; excellent repeatability; frictionless torque with no wearing parts (other than bearings); and long operating life with low maintenance. Magtrol provides a NIST traceable certificate of calibration, and calibration beam with each Engine Dynamometer.

ED APPLICATIONS

The Engine Dynamometers are ideally suited for emissions testing as set forth in CARB and EPA Clean Air Regulations. The Dynamometers will offer superior performance on the production line, at incoming inspection or in the R&D lab.

HD/ED

Principles and Selection

OPERATING PRINCIPLES



Magtrol Hysteresis Dynamometers absorb power with a unique Hysteresis Braking System which provides frictionless torque loading independent of shaft speed. The Hysteresis Brake provides torque by the use of two basic components—a reticulated pole structure and a specialty steel rotor/shaft assembly—fitted together but not in physical contact. Until the pole structure is energized, the drag cup can spin freely on its shaft bearings. When a magnetizing force from the field coil is applied to the pole structure, the air gap becomes a flux field and the rotor is magnetically restrained, providing a braking action between the pole structure and rotor.

COMPLETE PC CONTROL

Magtrol's M-TEST 7 Software is a state-of-the-art motor testing program for Windows®-based data acquisition. Used with a Magtrol Programmable Dynamometer Controller, Magtrol M-TEST 7 Software provides the control of any Magtrol Dynamometer and runs test sequences in a manner best suited to the overall accuracy and efficiency of the Magtrol Motor Test System. The data that is generated by Magtrol's Motor Testing Software can be stored, displayed and printed in tabular or graphic formats, and can be easily imported into a spreadsheet.

Written in LabVIEWTM, M-TEST 7 has the flexibility to test a majority of motor types in a variety of ways. Because of LabVIEW's versatility, obtaining data from other sources (e.g. thermocouples), controlling motor power and providing audio/ visual indicators is relatively easy.

Magtrol's M-TEST 7 Software is ideal for simulating loads, cycling the unit under test and motor ramping. Because it is easy to gather data and duplicate tests, the software is ideal for use in engineering labs. Tests can be programmed to run on their own and saved for future use allowing for valuable time savings in production testing and incoming/outgoing inspection.

DYNAMOMETER SELECTION

Magtrol's Hysteresis Dynamometers cover a wide range of Torque, Speed and Mechanical Power ratings. To select the appropriate size Dynamometer for your motor testing needs, you will need to determine the **Maximum Torque**, Speed and Power applied to the Dynamometer.

Maximum Torque

The Magtrol Hysteresis Absorption Dynamometer will develop braking torque at any speed point, including low speed and stall conditions ("0" rpm). It is important to consider all torque points that are to be tested, not only rated torque, but also locked rotor and breakdown torque. Dynamometer selection should initially be based on the maximum torque requirement, subject to determining the maximum power requirements.

Maximum Speed

This rating is to be considered independent of torque and power requirements, and is the maximum speed at which the Dynamometer can be safely run under free-run or lightly loaded conditions. It is not to be considered as the maximum speed at which full braking torque can be applied.

Maximum Power Ratings

These ratings represent the maximum capability of the Dynamometer Braking System to absorb and dissipate heat generated when applying a braking load to the motor under test. The power absorbed and the heat generated by the Dynamometer is a function of the Torque (T) applied to the motor under test, and the resulting Speed (n) of the motor. This is expressed in these power (P) formulas:

SI: P (watts) = T (N·m) × n (rpm) × (1.047 × 10⁻¹) English: P (watts) = T (lb·in) × n (rpm) × (1.183 × 10⁻²) Metric: P (watts) = T (kg·cm) × n (rpm) × (1.027 × 10⁻²) All of Magtrol's controllers, readouts and software calculate horsepower as defined by 1 hp = 550 lb·ft / s. Using this definition: hp = P (watts) / 745.7

The Dynamometer's ability to dissipate heat is a function of how long a load will be applied. For this reason, the maximum power ratings given are based on continuous operation under load, as well as a maximum of 5 minutes under load.

To safely dissipate heat and avoid Dynamometer failure, the maximum power rating is the most important consideration in selecting a Dynamometer.

Magtrol offers three types of dynamometer brakes to absorb load: Hysteresis, Eddy Current and Magnetic Powder. Each type of Dynamometer has advantages and limitations and choosing the correct one will depend largely on the type of testing to be performed. With over 50 models to choose from, Magtrol Sales professionals are readily available to assist in selecting the proper Dynamometer to meet your testing needs.

🖌 Ratings

HD / ED

	Torque	Maximum	Drag Torque	Nom	ninal	Max. Pov	ver Ratings	Maximum	Brake	
Model	Measure	Torque	De-Energized	Input	nertia	5 minute	continuous***	Speed	Cooling	
	Unit Code	Range	at 1000 rpm	lb·ft·s²	kg∙m²	W	W	rpm	Method	
	5N**	0.018 N·m	0.056 mN∙m							
	6N	2.50 oz∙in	0.008 oz∙in	7.04×10^{-7}	0.54×10^{-7}	25	7	30,000	Convoction	
10-100	7N	180.0 g·cm	0.57 g·cm	7.04 × 10	9.34 × 10		/	30,000	Convection	
	8N	18.00 mN·m	0.056 mN·m							
	5N**	0.08 N∙m	0.64 mN∙m				20			
	6N	11.00 oz∙in	0.09 oz∙in	2 40 ~ 10-6	4 61 × 10-6	75		25 000	Convection	
HD-100	7N	800 g·cm	6.5 g·cm	3.40 × 10	4.01 × 10	75		25,000	Convection	
	8N	80.0 mN∙m	0.64 mN·m							
	5N**	0.28 N·m	2 mN·m							
	6N	40.0 oz∙in	0.25 oz∙in	1 55 ~ 10-5	2 10 ~ 10-5	200	55	25 000	Convection	
110-400	7N	2.80 kg·cm	0.02 kg·cm	1.55 × 10 *	2.10 × 10 *	400	55	23,000	Convection	
	8N	280 mN∙m	2 mN·m							
	5N**	0.85 N·m	5 mN∙m							
HD-500	6N	120.0 oz∙in	0.5 oz∙in	9 05 v 10-5	1.00×10^{-4}			25.000	Convoction	
HD-300	7N	8.50 kg·cm	0.05 kg·cm	0.05 × 10 *	1.09 × 10	400	00	23,000	Convection	
	8N	850 mN·m	5 mN·m							
	5N**	0.85 N·m	5 mN·m						Compressed	
HD-510	6N	120.0 oz∙in	0.5 oz∙in	8 05 ~ 10-5	1.09 ~ 10-4	750	375	25 000	Air*	
110-510	7N	8.50 kg·cm	0.05 kg·cm	0.05 × 10	1.03 × 10	750	075	23,000	(7 CFM @	
	8N	850 mN·m	5 mN·m						1.75 PSI)	
	5N**	1.7 N·m	10 mN·m							
HD-505	6N	240 oz∙in	1.0 oz∙in	1.61×10^{-4}	2 18 × 10 ⁻⁴	800	160	25 000	Convection	
110-303	7N	17.00 kg·cm	0.1 kg·cm	1.01 × 10	2.10 × 10	000	100	23,000	Convection	
	8N	1700 mN·m	10 mN·m							
	5N**	1.7 N·m	10 mN·m		2.18 × 10 ⁻⁴				Compressed	
HD-515	6N	240 oz∙in	1.0 oz∙in	1.61×10^{-4}		1,500	900	25,000	Air*	
110-515	7N	17.00 kg·cm	0.1 kg·cm	1.01 × 10					(10 CFM @ 4 PSI)	
	8N	1700 mN·m	10 mN·m							
	5N**	3.10 N·m	0.013 N·m							
HD-700	6N	440 oz∙in	2.0 oz∙in	5.51×10^{-4}	7.47×10^{-4}	700	150	25 000	Convection	
110-700	7N	31.0 kg·cm	0.14 kg·cm	0.01 × 10	7.47 × 10	700	100	20,000	Convection	
	8N	3.10 N·m	0.013 N·m							
	5N**	3.10 N·m	0.013 N·m							
HD-710	6N	440 oz∙in	2.0 oz∙in	5.51×10^{-4}	7 47 × 10 ⁻⁴	1 500	935	25 000	Blower	
110-710	7N	31.0 kg·cm	0.14 kg·cm	0.01 × 10	7.47 × 10	1,000		20,000	(included)	
	8N	3.10 N·m	0.013 N·m							
	5N**	6.20 N·m	0.023 N·m							
HD-705	6N	55.0 lb∙in	0.2 lb∙in	1.10×10^{-3}	1 49 × 10 ⁻³	1 400	300	25 000	Convection	
HD-705	7N	62.0 kg·cm	0.24 kg·cm	1.10 × 10	1.40 × 10	1,400		20,000	Conveolion	
	8N	6.20 N·m	0.023 N·m							
	5N**	6.20 N·m	0.023 N·m							
HD-715	6N	55.0 lb∙in	0.2 lb∙in	1.10×10^{-3}	1 49 × 10 ⁻³	3 400	3,000	25 000	Blower (included)	
110-713	7N	62.0 kg·cm	0.24 kg·cm	1.10 × 10	1.10 × 10	3,400		20,000		
	8N	6.20 N·m	0.023 N·m							

* Requires air cooling provided by user. Regulator and filter package is provided as standard equipment on these units.

** 5 Volt output

*** NOTE: Operating at the continuous power rating for periods of up to 4 hours is acceptable. However, operating for extended periods at high temperatures will result in premature component and bearing failure. Limiting the length of the cycle and the component temperatures will guard against premature failure. Where continuous duty is desired for longer time intervals, component temperatures should be maintained less than 100°C; monitoring the outside brake surface temperature is a sufficient reference.

F Ratings

HD / ED

	5N**	14.00 N·m	0.10 N·m						Compressed
	6N	125.0 lb∙in	0.8 lb∙in	4 42 × 10-3	6 01 v 10-3	2 900	1 900	12 000	Air*
п D- 000	7N	140.0 kg·cm	1.0 kg·cm	4.43 × 10 -	0.01 x 10 -	2,000	1,000	12,000	(13 CFM @
	8N	14.00 N⋅m	0.10 N·m						10 PSI)
	5N**	14.00 N·m	0.10 N·m		6.01 × 10 ⁻³	3,500			
	6N	125.0 lb∙in	0.8 lb∙in	4 40 + 10-3			2 000	10.000	Blower
HD-810	7N	140.0 kg·cm	1.0 kg·cm	4.43 × 10 °			3,000	12,000	(included)
	8N	14.00 N·m	0.10 N·m						
	5N**	28.0 N·m	0.14 N·m				3 000		Compressed
	6N	250 lb∙in	1.2 lb∙in	0.0110-3	1 10 10-2	5 000		10.000	Air* (15 CFM @
HD-805	7N	280 kg·cm	1.5 kg·cm	8.81 × 10 °	1.19×10-	5,300	3,000	12,000	
	8N	28.0 N·m	0.14 N·m						14 PSI)
	5N**	28.0 N·m	0.14 N∙m			7 000	C 000		Blower
	6N	250 lb∙in	1.2 lb∙in	0.01 10-3	1 10 1 10-2			10.000	
HD-015	7N	280 kg·cm	1.5 kg·cm	0.01 × 10 °	1.19 × 10-	7,000	6,000	12,000	(included)
	8N	28.0 N·m	0.14 N·m						
	5N**	56.5 N·m	0.22 N·m						
	6N	500 lb∙in	3.5 lb∙in	1.05 10-2	0 51 1 10-2	14 000	10.000	8 000	Blower
HD-825	7N	565 kg·cm	4.0 kg·cm	1.05 × 10 -	2.31 × 10 -	14,000	12,000	8,000	(included)
	8N	56.5 N·m	0.40 N·m						

* Requires air cooling provided by user. Regulator and filter package is provided as standard equipment on these units.

** 5 Volt output

*** NOTE: Operating at the continuous power rating for periods of up to 4 hours is acceptable. However, operating for extended periods at high temperatures will result in premature component and bearing failure. Limiting the length of the cycle and the component temperatures will guard against premature failure. Where continuous duty is desired for longer time intervals, component temperatures should be maintained less than 100°C; monitoring the outside brake surface temperature is a sufficient reference.

Model	Torque Measure	Maximum Torque	Drag Torque De-Energized	Nom Input	Ma 5 mi	ax. Pov inute	ver Ra contii	tings nuous***	Maximum Speed *	Brake Cooling	
	Unit Code	Range	at 1000 rpm	lb·ft·s²	lb·ft·s ² kg·m ² hp W hp W		W	rpm	Method		
	5N**	6.20 N·m	0.035 N·m								
ED-715	6N	55.0 lb∙in	0.3 lb∙in	1 07 10-3	1.72 × 10 ⁻³	5	2400	1	2000	25.000	Blower
	7N	62.0 kg·cm	0.36 kg·cm	1.27 × 10 -		5	3400	4	3000	25,000	(included)
	8N	6.20 N·m	0.035 N·m								
	5N**	28.0 N·m	0.14 N·m					00 8			
ED 015	6N	250 lb∙in	1.2 lb∙in	0 61 + 10-3	1 20 1 10-2	10	7000		6000	10.000	Blower
ED-815	7N	280 kg·cm	1.4 kg·cm	9.01 × 10 -	1.30 × 10 -		0 7000		6000	12,000	(included)
	8N	28.0 N·m	0.14 N·m								

* The maximum speed will depend on what type of keyway (if any) is used on the shaft. Unless specified, the dynamometer shaft will be made without a keyway.

** 5 Volt Output

*** NOTE: Operating at the continuous power rating for periods of up to 4 hours is acceptable. However, operating for extended periods at high temperatures will result in premature component and bearing failure. Limiting the length of the cycle and the component temperatures will guard against premature failure. Where continuous duty is desired for longer time intervals, component temperatures should be maintained less than 100°C; monitoring the outside brake surface temperature is a sufficient reference.

HD / ED

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GENERAL INFORMATION

ELECTRICAL POWER AND FUSES

Model	Voltage	VA	Style	Rating				
HD-1XX-XN	120 V	30	UL/CSA	300 mA	250 V	SB		
HD-1XX-XNA	240 V	30	IEC	125 mA	250 V	Т		
HD-4XX-XN	120 V	30	UL/CSA	300 mA	250 V	SB		
HD-4XX-XNA	240 V	30	IEC	125 mA	250 V	Т		
HD-5XX-XN	120 V	30	UL/CSA	300 mA	250 V	SB		
HD-5XX-XNA	240 V	30	IEC	125 mA	250 V	Т		
HD-800-XN	120 V	65	UL/CSA	800 mA	250 V	SB		
HD-800-XNA	240 V	65	IEC	315 mA	250 V	Т		
HD-810-XN	120 V	65	UL/CSA	800 mA	250 V	SB		
HD-810-XNA	240 V	65	IEC	315 mA	250 V	Т		
HD-805-XN	120 V	130	UL/CSA	1.25 A	250 V	SB		
HD-805-XNA	240 V	130	IEC	630 mA	250 V	Т		
HD/ED-815-XN	120 V	130	UL/CSA	1.25 A	250 V	SB		
HD/ED-815-XNA	240 V	130	IEC	630 mA	250 V	Т		
HD-825-XN	120 V	N/A	N/A	N/A				
HD-825-XNA	240 V	N/A	N/A	N/A				

BLOWER POWER AND FUSES -

- Models HD-710, HD-715, HD-810 and ED-715 • include the BL-001 blower.
- Models HD-815 and ED-815 include the BL-002 blower.
- Model HD-825 uses two BL-002 blowers for • cooling its two brake sets.

Model	Voltage	VA	Style	Rating		
BL-001	120 V	600	UL/CSA	6.3 A	250 V	SB
BL-001A	240 V	500	IEC	3.15 A	250 V	Т
BL-002	120 V	1000	UL/CSA	15 A	250 V	SB
BL-002A	240 V	1000	IEC	6.3 A	250 V	Т

BLOWER DIMENSIONS

Allow approximately 6 in to 8 in (152 mm to 203 mm) between rear of dynamometer base plate and blower for connection hardware. Required hardware is supplied with the dynamometer.

BL-002 Blower has two filter elements.



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NOTE: Original dimensions are in English units. Dimensions converted to Metric units have been rounded and are for reference only.

HD-100/400/500 SERIES WITH LONG BASE PLATE -

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Model	units	Α	ØB	С	D	E	F	G	н	J	L*	М*	ØN	Р	Q	Weight
110 100	in	0.50	0.1245/0.1247	3.5	17	9.38	10	0.5	6.3	8.5	15.5	8.5	0.37	0.015	0.375	12.0 lb
HD-106	mm	12.7	3.162/3.167	88.9	432	238.3	254	12.7	159	216	394	216	9.4	0.38	9.53	5.4 kg
UD 100	in	0.75	0.1870/0.1875	3.5	17	9.13	10	0.5	6.3	8.5	15.5	8.5	0.37	0.025	0.375	12.5 lb
HD-100	mm	19.1	4.750/4.763	88.9	432	231.9	254	12.7	159	216	394	216	9.4	0.64	9.53	5.7 kg
HD 400	in	0.67	0.2495/0.2497	3.5	17	9.13	10	0.5	6.3	8.5	15.5	8.5	0.37	0.03	0.438	15.0 lb
HD-400	mm	17.0	6.337/6.342	88.9	432	231.9	254	12.7	159	216	394	216	9.4	0.76	11.13	6.8 kg
	in	0.88	0.3745/0.3750	4.0	17	9.13	10	0.5	6.3	8.5	15.5	8.5	0.37	0.047	0.375	16.0 lb
HD-500	mm	22.2	9.512/9.525	101.6	432	231.9	254	12.7	159	216	394	216	9.4	1.19	9.53	7.3 kg
	in	0.88	0.3745/0.3750	4.0	17	9.13	10	0.5	6.3	8.5	15.5	8.5	0.37	N	/^	16.0 lb
HD-510	mm	22.2	9.512/9.525	101.6	432	231.9	254	12.7	159	216	394	216	9.4	IN	/A	7.3 kg
	in	0.88	0.3745/0.3750	4.0	20	9.64	10	0.5	6.3	8.5	18.5	8.5	0.37	0.05	0.375	18.0 lb
HD-505	mm	22.2	9.512/9.525	101.6	508	244.9	254	12.7	159	216	470	216	9.4	1.27	9.53	8.1 kg
	in	0.88	0.3745/0.3750	4.0	20	9.64	10	0.5	6.3	8.5	18.5	8.5	0.37	N	/^	18.0 lb
HD-515	mm	22.2	9.512/9.525	101.6	508	244.9	254	12.7	159	216	470	216	9.4		A	8.1 ka

HD-100/400/500 SERIES WITH SHORT BASE PLATE-

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Model	units	Α	ØВ	С	D	Е	F	G	н	J	L*	М*	ØN	Р	Q	Weight
110 100	in	0.50	0.1245/0.1247	3.5	7.0	0.33	11	0.5	6.3	8.5	6.0	9.84	0.35	0.015	0.375	7.5 lb
HD-106	mm	12.7	3.162/3.167	88.9	177.8	8.4	279.4	12.7	159	216	152.4	250	9	0.38	9.53	3.4 kg
HD-100	in	0.75	0.1870/0.1875	3.5	7.0	0.08	11	0.5	6.3	8.5	6.0	9.84	0.35	0.025	0.375	8.0 lb
	mm	19.1	4.750/4.763	88.9	177.8	2.1	279.4	12.7	159	216	152.4	250	9	0.64	9.53	3.6 kg
LD-400	in	0.67	0.2495/0.2497	3.5	7.0	0.08	11	0.5	6.3	8.5	6.0	9.84	0.35	0.03	0.438	11.0 lb
HD-400	mm	17.0	6.337/6.342	88.9	177.8	2.1	279.4	12.7	159	216	152.4	250	9	0.76	11.13	5.0 kg
HD-500	in	0.88	0.3745/0.3750	4.0	7.0	0.08	11	0.5	6.3	8.5	6.0	9.84	0.35	0.047	0.375	12.0 lb
110-300	mm	22.2	9.512/9.525	101.6	177.8	2.1	279.4	12.7	159	216	152.4	250	9	1.19	9.53	5.4 kg
HD-510	in	0.88	0.3745/0.3750	4.0	8.0	0.13	11	0.5	6.3	8.5	7.0	9.84	0.35	N	/Δ	12.5 lb
110-510	mm	22.2	9.512/9.525	101.6	203.2	3.2	279.4	12.7	159	216	177.8	250	9	11/	^	5.7 kg
HD-505	in	0.88	0.3745/0.3750	4.0	9.5	0.10	11	0.5	6.3	8.5	8.5	9.84	0.35	0.05	0.375	13.0 lb
HD-303	mm	22.2	9.512/9.525	101.6	241.3	2.6	279.4	12.7	159	216	215.9	250	9	1.27	9.53	5.9 kg
HD-515	in	0.88	0.3745/0.3750	4.0	10.25	0.10	11	0.5	6.3	8.5	9.25	9.84	0.35	N	/Δ	13.0 lb
10-515	mm	22.2	9.512/9.525	101.6	260.4	2.6	279.4	12.7	159	216	234.9	250	9	IN,	~	5.9 kg

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* These dimensions represent the distance between mounting holes. There are four (4) mounting holes on each base plate.

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_	С	D	E	F	G	н	J	' L*	M*	ØN	Р	0	Weigh
7	3.5	17	9.38	10	0.5	6.3	8.5	15.5	8.5	0.37	0.015	0.375	12.0
7	88.9	432	238.3	254	12.7	159	216	394	216	9.4	0.38	9.53	5.4 k
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SHAFT END DETAIL (2:1)

(FLAT)

HD / ED