

28000 Series Size 11 Linear Actuator

HSI's Size 11 hybrid linear actuators are one of our more compact additions to an extensive line production proven miniature motors. The various patent pending designs deliver high performance, opening avenues for equipment designers who require performance and endurance in a very small package.

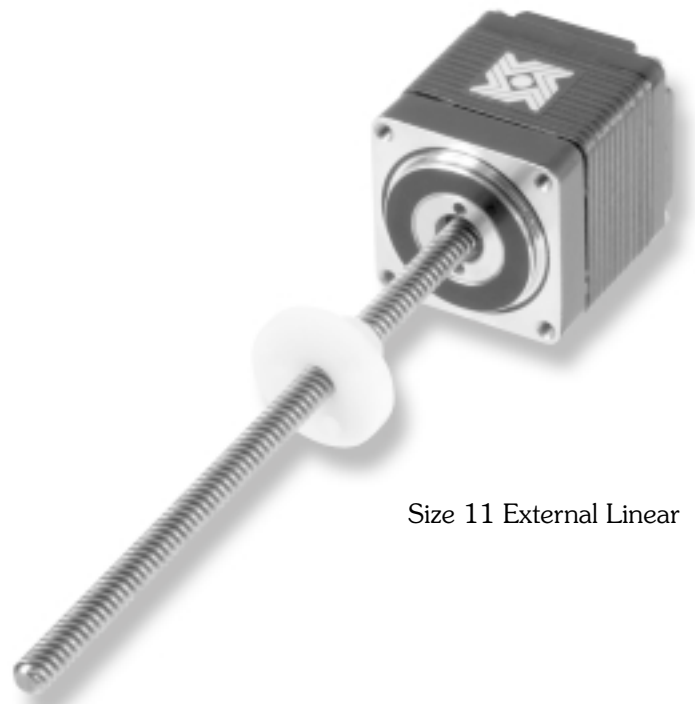
Three designs are available, captive, non-captive and external linear versions. The 28000 Series is available in a wide variety of resolutions - from 0.000125" (.003175 mm) per step to 0.002" (.0508 mm) per step. The Size 11 actuator delivers thrust of up to 25 lbs. (11.5 Kg).



Size 11 Captive Shaft



Size 11 Non-Captive Shaft



Size 11 External Linear

Series 28000 Size 11 Linear Actuator

Salient Characteristics

Size 11: 28 mm (1.1") Hybrid Linear Actuator (1.8° Step Angle)						
Part No.	Captive	28H4(X)-V			28H6(X)-V	
	Non-captive	28F4(X)-V			28F6(X)-V	
	External Lin.	E28H4(X)-V			E28H6(X)-V	
Wiring		Bipolar			Unipolar**	
Operating voltage	2.1 VDC	5 VDC	12 VDC	5 VDC	12 VDC	
Current/phase	1.0 A	0.42 A	0.18 A	0.42 A	0.18 A	
Resistance/phase	2.1 Ω	11.9 Ω	68.6 Ω	11.9 Ω	68.6 Ω	
Inductance/phase	1.5 mH	6.7 mH	39.0 mH	3.3 mH	19.5 mH	
Power consumption	4.2 W					
Rotor inertia	9.0 gcm ²					
Temperature rise	135°F Rise (75°C Rise)					
Weight	4.2 oz (119 g)					
Insulation resistance	20 MΩ					

Linear Travel / Step	
Screw Ø.1875" (4.76mm)	
inches	mm
.000125	.0031*
.00025	.0063*
.0005	.0127
.001	.0254
.002	.0508

*Values truncated

Standard motors are Class B rated for maximum temperature of 130°C.

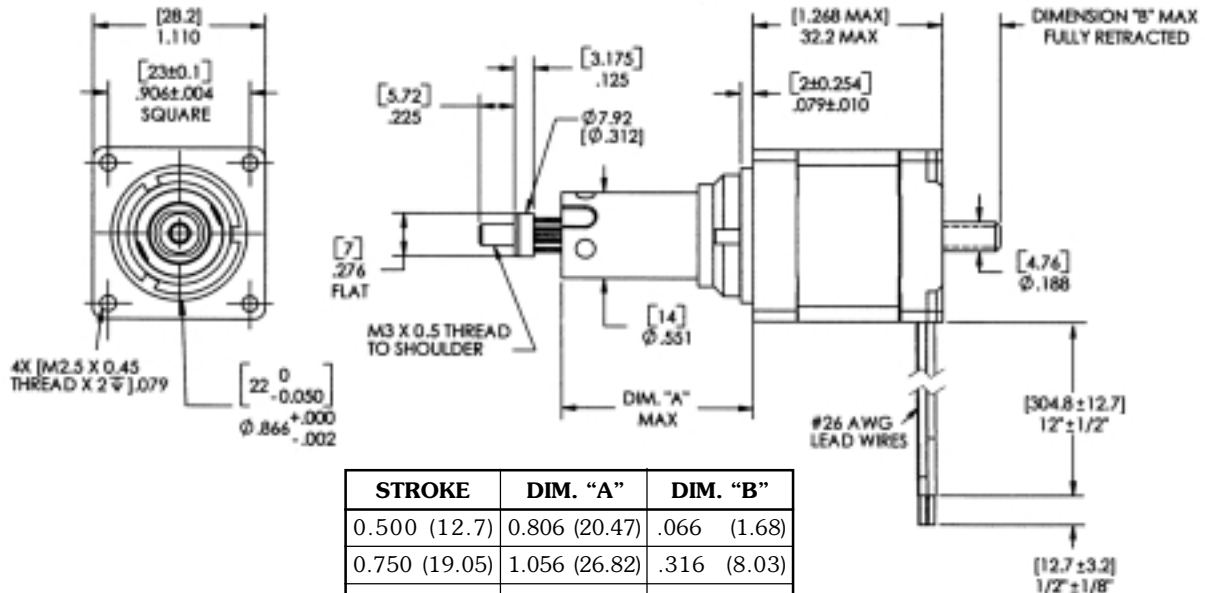
Special drive considerations may be necessary when leaving shaft fully extended or fully retracted.

NOTE: See page 21 to identify product code information before placing order.

** Unipolar drive gives approximately 30% less thrust than bipolar drive.

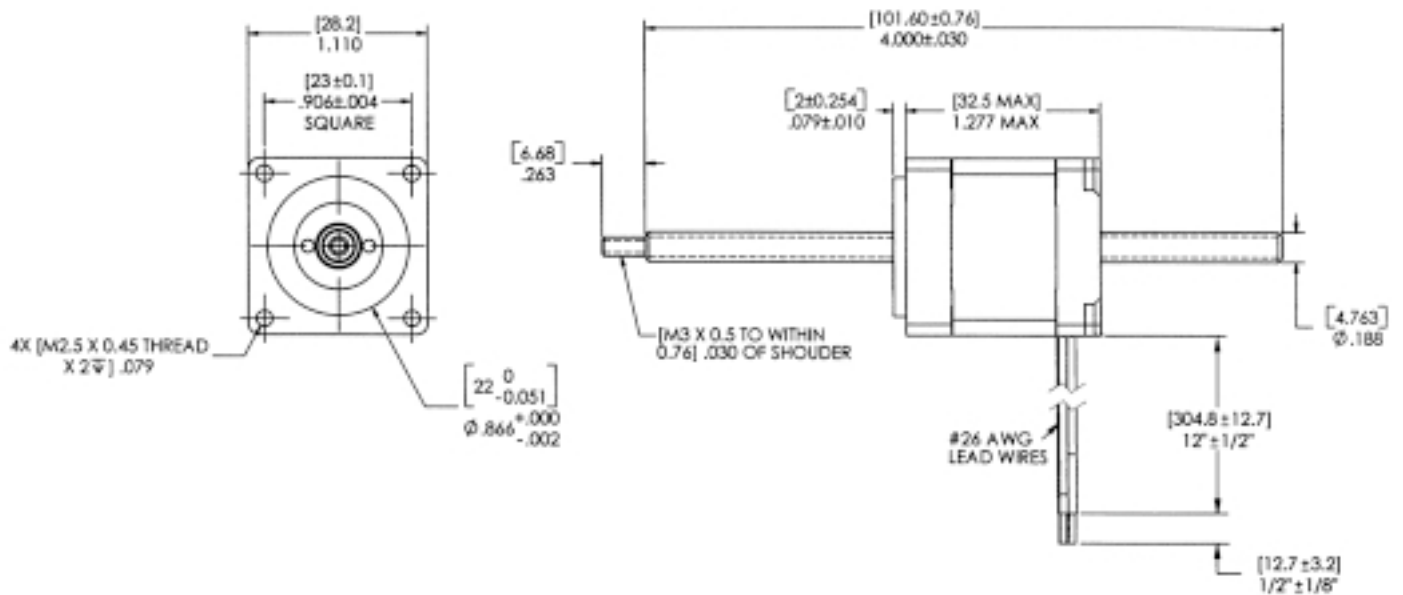
Series 28000 Size 11 Dimensional Drawings

Captive Shaft

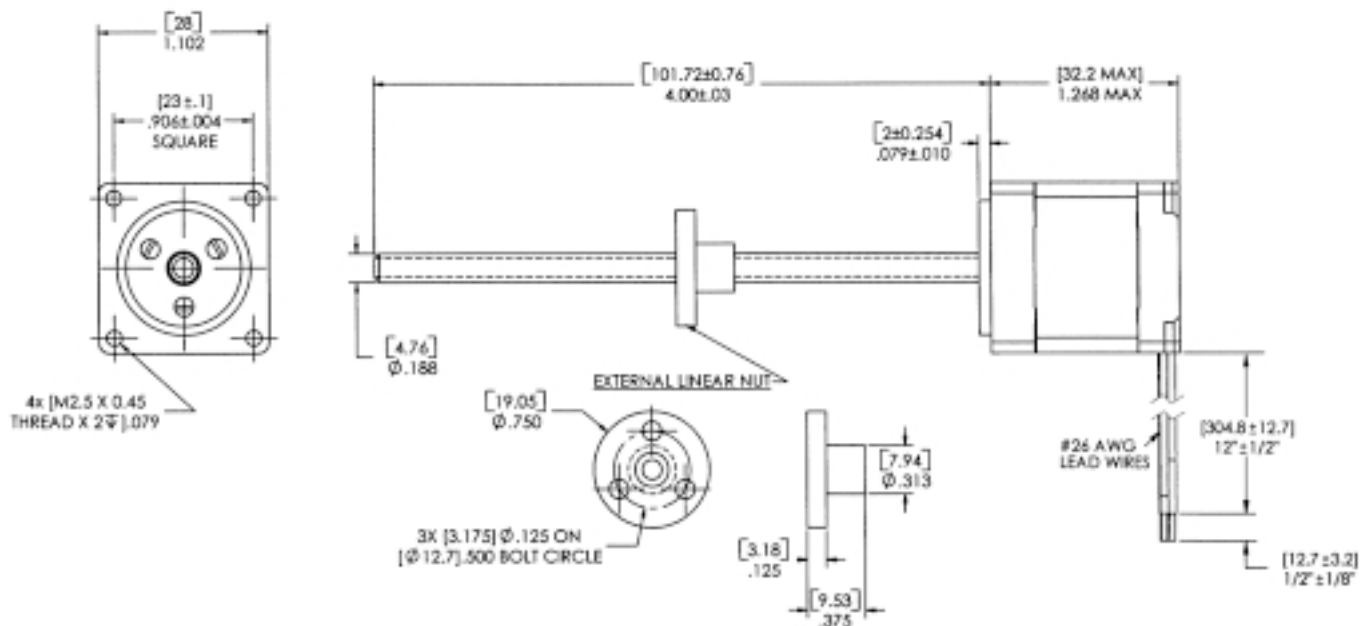


Series 28000 Size 11 Dimensional Drawings

Non-Captive Linear



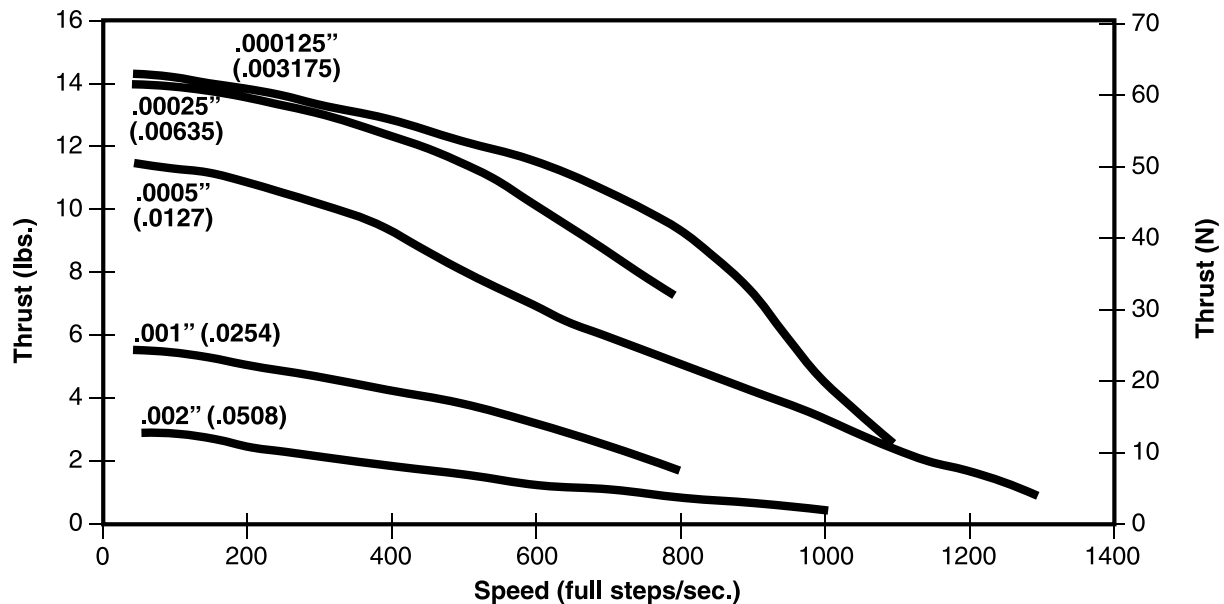
External Linear



Series 28000 Size 11 Speed vs. Thrust Curves

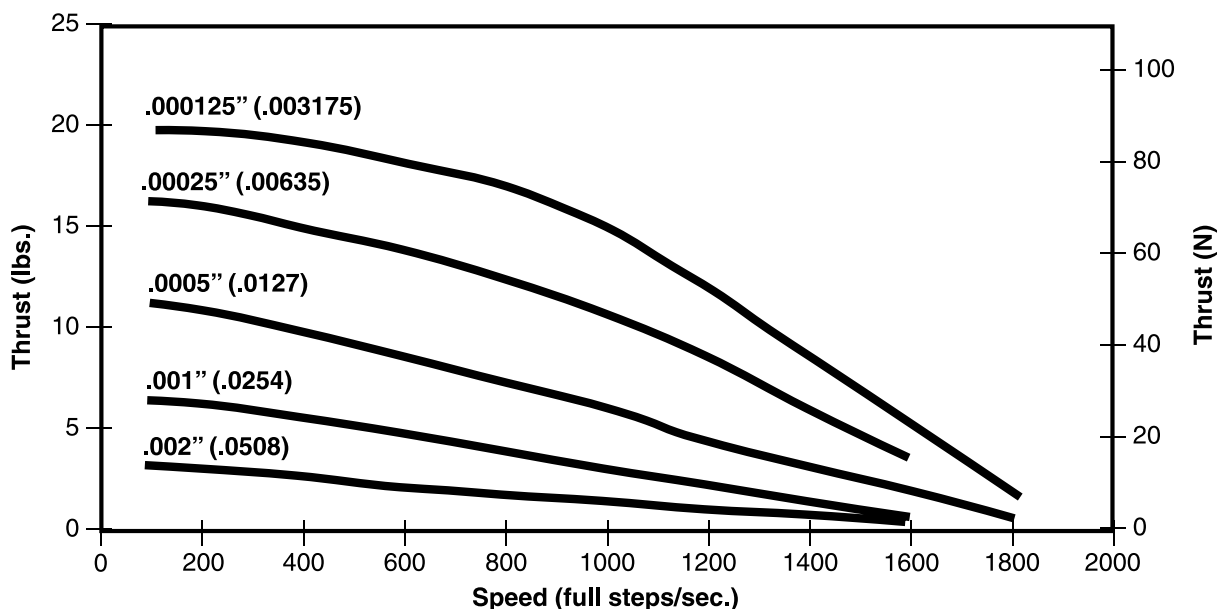
Bipolar • L/R Drive • 100% Duty Cycle

Ø .187 (4.75) Lead Screw



Bipolar • Chopper Drive • 100% Duty Cycle

Ø .187 (4.75) Lead Screw



Ramping can increase the performance of a motor either by increasing the top speed or getting a heavier load accelerated up to speed faster. Also, deceleration can be used to stop the motor without overshoot.

Identifying Part Numbers for Orders

A standard HSI motor part number consists of 7 digits – XXXXX-VV.

- The **first and second** digits indicate the motor's series or size (in mm).
Example: 35000 Series = 35 mm square
- The **third** digit or letter indicates the motor's step angle
Example: F = 1.8° non-captive; H = 1.8° captive or external linear
(NOTE: External linear actuators have the prefix "E" to distinguish them from the captive actuators; High Temperature actuators require the prefix "T")
- The **fourth** digit indicates the number of leads. (4 leads for bipolar; 6 leads for unipolar).
- The **fifth** digit indicates the travel per step (see chart) Example: N = .00012" (.003048 mm)
- The **sixth and seventh** digits indicate the motor's voltage. Standard voltages are 5 (05) and 12 (12) volt. We also have low inductance coils available for chopper drives. Custom voltages are also available.

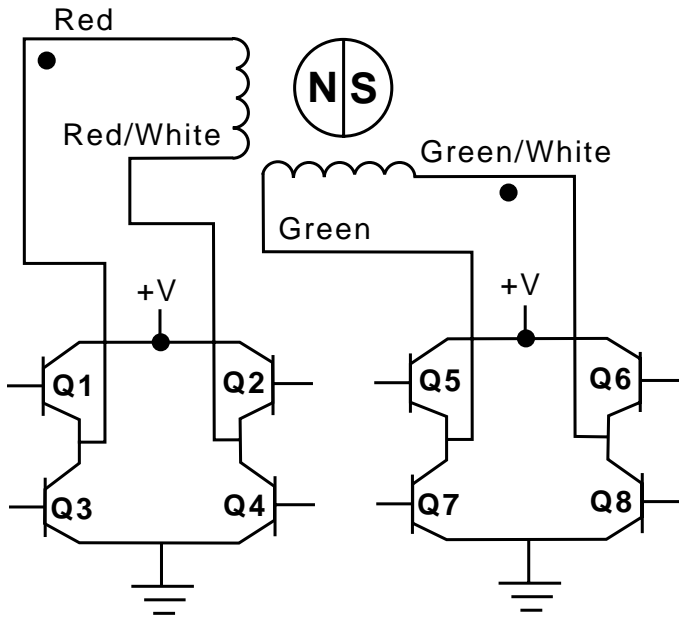
SCREW LENGTH OPTIONS: For non-captive shaft and external linear motors various screw lengths are available to accommodate any travel requirement.

For assistance with a part number or a custom design, please us at call 203.756.7441.

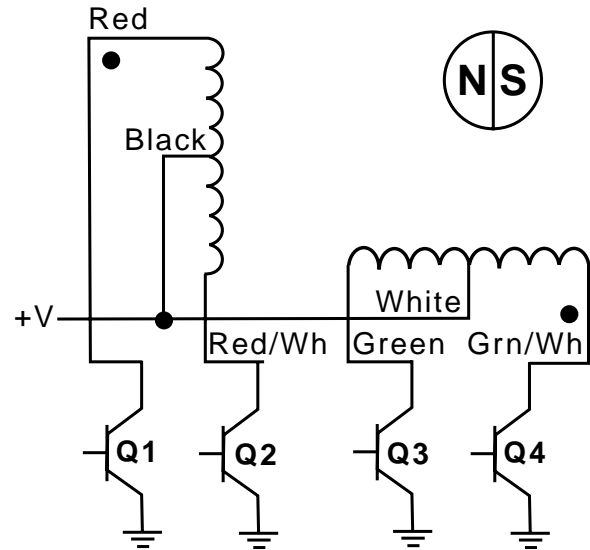
Travel Per Step Code Letter or Digit	Linear Travel Per Step		21000 Series Size 8 21 mm	28000 Series Size 11 28 mm	35000 Series Size 14 35 mm		43000 Series Size 17 43 mm		57000 Series Size 23 57 mm	87000 Series Size 34 87 mm
	Inches	Millimeters	Ø .138" (3.50) Screw	Ø .1875" (4.76) Screw	Ø .218" (5.54) Screw	Ø .250" (6.35) Screw	Ø .218" (5.54) Screw	Ø .250" (6.35) Screw	Ø .375" (9.53) Screw	Ø .625" (15.88) Screw
U	0.00006	0.0015*	●					●		
V	0.000078*	0.002						●		
AA	0.000098*	0.0025	●							
N	0.00012	0.0030*	●		●			●		
7	0.000125	0.0031*		●						
P	0.00015625	0.0039*				●		●		
AB	0.00019*	0.005	●							
K	0.00024	0.0060*	●		●			●		
9	0.00025	0.0063*		●						
A	0.0003125	0.0079*				●		●	●	
AC	0.00039*	0.01	●							
S	0.0004167	0.0105*						●		
J	0.00048	0.0121*	●		●			●		
3	0.0005	0.0127		●					●	●
B	0.000625	0.0158*				●		●		●
AD	0.00078*	0.02	●							
T	0.0008333	0.0211*						●		
Q	0.00096	0.0243*			●			●		
1	0.001	0.0254		●					●	
C	0.00125	0.0317*				●		●		●
AE	0.00157*	0.04	●							
R	0.00192	0.0487*			●			●		
2	0.002	0.0508		●					●	
Y	0.0025	0.0635								●
Z	0.005	0.127								●

Hybrid Linear Actuator Wiring

Bipolar



Unipolar



Hybrid Linear Actuator Stepping Sequence

	Bipolar	Q2-Q3	Q1-Q4	Q6-Q7	Q5-Q8	
	Unipolar	Q1	Q2	Q3	Q4	
EXTEND CW →	Step					← RETRACT CCW
	1	ON	OFF	ON	OFF	
	2	OFF	ON	ON	OFF	
	3	OFF	ON	OFF	ON	
	4	ON	OFF	OFF	ON	
	1	ON	OFF	ON	OFF	

Note: Half stepping is accomplished by inserting an off state between transitioning phases.

Overview of Hybrid Linear Actuators



HSI's line of hybrid linear actuators open new avenues for equipment designers who require high performance and exceptional endurance in a very small package. The various patent pending designs use a proprietary manufacturing process, which incorporates engineering thermoplastics in the rotor drive nut and a stainless steel acme lead screw. This allows the motor to be much quieter, more efficient and more durable than the v-thread and bronze nut configuration commonly used in other actuators. Motor life is improved more than 10 times over the traditional bronze nut style – and it requires no maintenance and does not affect the cost. An additional feature is the bearing pre-load adjustment which, unlike other designs, does not protrude from the motor configuration commonly used in other actuators.

The HSI hybrid actuators come in six sizes, from 21 mm square to 87 mm square. Each size has three designs available – captive, non-captive and an external linear version.

There are twenty different travels per step available, from .00006 inch (.001524 mm) to .005 inch (.127 mm). Micro stepping can be used for even finer resolution. Our 87 mm actuator delivers up to 500 pounds (227 Kg) of force.

These linear actuators are ideal for application requiring a combination of precise positioning, rapid motion and long life.

Typical applications include X-Y tables, medical equipment, semiconductor handling, telecommunications equipment, valve control, and numerous other uses. Sold at competitive prices, this product is an excellent value for incorporation into your next project. In addition to standard configurations, HSI can custom design these motors to meet your specific application needs. Lead time for prototypes is a 2 to 3 days, and 4 to 6 weeks for production orders.

	Size (square)	Configuration	Stroke (mm)	Max Force (N)	Travel/step (micron)	Input Power (W)
21000	21 mm (0.8")	C / NC, EL	6.4 - 38.1 Up to ≈ 200	2 - 98	1.5 - 40	2.45
28000	28 mm (1.1")	C / NC, EL	12.7 - 63.5 Up to ≈ 250	15 - 90	3 - 50	4.2
35000	35 mm (1.4")	C / NC, EL	12.7 - 63.5 Up to ≈ 300	50 - 220	3 - 50	5.7
43000	43 mm (1.7")	C / NC, EL	12.7 - 63.5 Up to ≈ 400	100 - 220	1.5 - 50	7.0
57000	57 mm (2.3")	C / NC, EL	12.7 - 50.8 Up to ≈ 500	300 - 880	8 - 50	13.0
87000	87 mm (3.4")	C / NC, EL	12.7 - 63.5 Up to ≈ 500	400 - 2200	12.7 - 127	31.2