

# VXM® Calculation of Steps, Direction and Speed

(with standard 1.8° (200 step) motor)

Lead Screw Code for Velmex Linear Products				Advance per turn	Advance per Step*	Speed for the VXM	
BiSlide®	UniSlide®		XSlide™	Lead Screw Pitch >		1000 SPS (steps / sec)*	
						2.5 RPS (rev / sec)	
E04	W4		E04	0.400"	0.0010000"	1 in/sec	2.54 cm/sec
E02	W2	P5	E02	0.200"	0.0005000"	0.5 in/sec	1.27 cm/sec
E01	W1	P10	E01	0.100"	0.0002500"	0.25 in/sec	0.635 cm/sec
	B	P20	E50	0.050"	0.0001250"	0.125 in/sec	0.3175 cm/sec
	C	P40	E25	0.025"	0.0000625"	0.0625 in/sec	0.1588 cm/sec
M01	K1	Q1	M01	1 mm	0.0025 mm	0.0985 in/sec	0.25 cm/sec
M02	K2	Q2	M02	2 mm	0.0050 mm	0.1968 in/sec	0.5 cm/sec

## Velmex Rotary Tables

Model	Gear Ratio	Advance per turn	Advance per Step*	Speed for the VXM
B4872	72:1	5 degree	0.0125 degree	12.5 degree/sec
B4836	36:1	10 degree	0.0250 degree	25 degree/sec
B4818	18:1	20 degree	0.0500 degree	50 degree/sec
B5990	90:1	4 degree	0.0100 degree	10 degree/sec

\*Calculated with a VXM half step control and a 1.8° (200 step) motor

# VXM® Calculation of Steps, Direction and Speed

(with .9° (400 step) motor)

Lead Screw Code for Velmex Linear Products				Advance per turn	Advance per Step**	Speed for the VXM	
BiSlide®	UniSlide®		XSlide™	Lead Screw Pitch >		1000 SPS (steps / sec)**	
						2.5 RPS (rev / sec)	
E04	W4		E04	0.400"	0.00050000"	0.5 in/sec	
E02	W2	P5	E02	0.200"	0.00025000"	0.25 in/sec	
E01	W1	P10	E01	0.100"	0.00012500"	0.125 in/sec	
	B	P20	E50	0.050"	0.00006250"	0.0625 in/sec	
	C	P40	E25	0.025"	0.00003125"	0.03125 in/sec	
M01	K1	Q1	M01	1 mm	0.00125 mm		1.25 mm/sec
M02	K2	Q2	M02	2 mm	0.00250 mm		2.5 mm/sec

## Velmex Rotary Tables

Model	Gear Ratio	Advance per turn	Advance per Step*	Speed for the VXM
B4872	72:1	5 degree	0.00625 degree	6.25 degree/sec
B4836	36:1	10 degree	0.01250 degree	12.5 degree/sec
B4818	18:1	20 degree	0.02500 degree	25 degree/sec
B5990	90:1	4 degree	0.00500 degree	5 degree/sec

\*\*Calculated with a VXM half step control and a .9° (400 step) motor

# VXM® Calculation of Steps, Direction and Speed

- Direction is relative to the device the motor is on. On screw drive actuators like UniSlides®, BiSlides® and XSlides™, positive is the direction moving away from the motor.
- On worm gear type Rotary Tables like the Velmex B4800 or B5990, positive is normally counter clockwise (CCW.)

To convert from “real” units to steps when using a 1.8°, divide the distanced desired to move by the Advance Per Step.  
(Distance / Advance per Step = Steps for the VXM)

Example #1: To move 3 inches with the BiSlide E04 lead screw ( $3 \div 0.001 = 3,000$ ) requires a 3,000 step index

Example #2: To move 90 degrees with the B5990 rotary table ( $90 \div 0.01 = 9,000$ ) requires a 9,000 step index.

Example #3: To move 4 inches with the UniSlide W1 lead screw ( $4 \div 0.00025 = 16,000$ ) requires a 16,000 step index

## **Other Formulas**

1 Motor (1.8°) rev = 400 half-steps on the VXM

1 Motor (.9°) rev = 800 half-steps on the VXM

Linear Speed = Advance per step x steps per second

Rotary Speed = Advance per step x steps per second

Pulses per second  $\div$  400 = rev/sec of the motor (if using a .9° motor divide by 800)

# Linear Distance with Stepper Motors and Velmex Lead Screws (per minute)

		Velmex Lead Screw Code							
		BiSlide®	E04	E02	E01			M01	M02
		XSlide™	E04	E02	E01	E50	E25	M01	M02
		UniSlide®	W4	W2 P5	W1 P10	B P20	C P40	K1 Q1	K2 Q2
Step Motor Rate: in half Steps/Sec.	Screw Pitch >	0.400"	0.200"	0.100"	0.050"	0.025"	1 mm	2 mm	
	RPM								
100	15	6 in/min	3 in/min	1.5 in/min	0.75 in/min	0.38 in/min	0.59 in/min	1.18 in/min	
		15.24 cm/min	7.62 cm/min	3.81 cm/min	1.91 cm/min	0.95 cm/min	1.5 cm/min	3 cm/min	
500	75	30 in/min	15 in/min	7.5 in/min	3.75 in/min	1.88 in/min	2.95 in/min	5.91 in/min	
		76.2 cm/min	38.1 cm/min	19.05 cm/min	9.53 cm/min	4.76 cm/min	7.5 cm/min	15 cm/min	
1000	150	60 in/min	30 in/min	15 in/min	7.5 in/min	3.75 in/min	5.91 in/min	11.81 in/min	
		152.4 cm/min	76.2 cm/min	38.1 cm/min	19.05 cm/min	9.53 cm/min	15 cm/min	30 cm/min	
1500	225	90 in/min	45 in/min	22.5 in/min	11.25 in/min	5.63 in/min	8.86 in/min	17.72 in/min	
		228.6 cm/min	114.3 cm/min	57.15 cm/min	28.58 cm/min	14.29 cm/min	22.5 cm/min	45 cm/min	
2000	300	120 in/min	60 in/min	30 in/min	15 in/min	7.5 in/min	11.81 in/min	23.62 in/min	
		304.8 cm/min	152.4 cm/min	76.2 cm/min	38.1 cm/min	19.05 cm/min	30 cm/min	60 cm/min	
3000	450	180 in/min	90 in/min	45 in/min	22.5 in/min	11.25 in/min	17.72 in/min	35.43 in/min	
		457.2 cm/min	228.6 cm/min	114.3 cm/min	57.15 cm/min	28.58 cm/min	45 cm/min	90 cm/min	
4000	600	240 in/min	120 in/min	60 in/min	30 in/min	15 in/min	23.62 in/min	47.24 in/min	
		609.6 cm/min	304.8 cm/min	152.4 cm/min	76.2 cm/min	38.1 cm/min	60 cm/min	120 cm/min	
6000	900	360 in/min	180 in/min	90 in/min	45 in/min	22.5 in/min	35.43 in/min	70.87 in/min	
		914.4 cm/min	457.2 cm/min	228.6 cm/min	114.3 cm/min	57.15 cm/min	90 cm/min	180 cm/min	
Limit of VXM Controller (6000)									
8000	1200	480 in/min	240 in/min	120 in/min	60 in/min	30 in/min	47.24 in/min	94.49 in/min	
		1219.2 cm/min	609.6 cm/min	304.8 cm/min	152.4 cm/min	76.2 cm/min	120 cm/min	240 cm/min	

# Linear Distance with Stepper Motors and Velmex Lead Screws (per second)

		Velmex Lead Screw Code							
		BiSlide®	E04	E02	E01			M01	M02
		XSlide™	E04	E02	E01	E50	E25	M01	M02
		UniSlide®	W4	W2 P5	W1 P10	B P20	C P40	K1 Q1	K2 Q2
Step Motor Rate: in half Steps/Sec.	Screw Pitch >	0.400"	0.200"	0.100"	0.050"	0.025"	1 mm	2 mm	
	RPS								
100	0.25	0.1 in/sec	0.05 in/sec	0.025 in/sec	0.0125 in/sec	0.0063 in/sec	0.0098 in/sec	0.0196 in/sec	
		0.254 cm/sec	0.127 cm/sec	0.0635 cm/sec	0.0318 cm/sec	0.0158 cm/sec	0.025 cm/sec	0.05 cm/sec	
500	1.25	0.5 in/sec	0.25 in/sec	0.125 in/sec	0.0625 in/sec	0.0313 in/sec	0.0491 in/sec	0.0985 in/sec	
		1.27 cm/sec	0.635 cm/sec	0.3175 cm/sec	0.1588 cm/sec	0.0793 cm/sec	0.125 cm/sec	0.25 cm/sec	
1000	2.5	1 in/sec	0.5 in/sec	0.25 in/sec	0.125 in/sec	0.0625 in/sec	0.0985 in/sec	0.1968 in/sec	
		2.54 cm/sec	1.27 cm/sec	0.635 cm/sec	0.3175 cm/sec	0.1588 cm/sec	0.25 cm/sec	0.5 cm/sec	
1500	3.75	1.5 in/sec	0.75 in/sec	0.375 in/sec	0.1875 in/sec	0.0938 in/sec	0.1476 in/sec	0.2953 in/sec	
		3.81 cm/sec	1.905 cm/sec	0.9525 cm/sec	0.4763 cm/sec	0.2381 cm/sec	0.375 cm/sec	0.75 cm/sec	
2000	5	2 in/sec	1 in/sec	0.5 in/sec	0.25 in/sec	0.125 in/sec	0.1968 in/sec	0.3936 in/sec	
		5.08 cm/sec	2.54 cm/sec	1.27 cm/sec	0.635 cm/sec	0.3175 cm/sec	0.5 cm/sec	1 cm/sec	
3000	7.5	3 in/sec	1.5 in/sec	0.75 in/sec	0.375 in/sec	0.1875 in/sec	0.2953 in/sec	0.5905 in/sec	
		7.62 cm/sec	3.81 cm/sec	1.905 cm/sec	0.9525 cm/sec	0.4763 cm/sec	0.75 cm/sec	1.5 cm/sec	
4000	10	4 in/sec	2 in/sec	1 in/sec	0.5 in/sec	0.25 in/sec	0.3936 in/sec	0.7873 in/sec	
		10.16 cm/sec	5.08 cm/sec	2.54 cm/sec	1.27 cm/sec	0.635 cm/sec	1 cm/sec	2 cm/sec	
6000	15	6 in/sec	3 in/sec	1.5 in/sec	0.75 in/sec	0.375 in/sec	0.5905 in/sec	1.1811 in/sec	
		15.24 cm/sec	7.62 cm/sec	3.81 cm/sec	1.905 cm/sec	0.9525 cm/sec	1.5 cm/sec	3 cm/sec	
Limit of VXM Controller (6000)									
8000	20	8 in/sec	4 in/sec	2 in/sec	1 in/sec	0.5 in/sec	0.7873 in/sec	1.5748 in/sec	
		20.32 cm/sec	10.16 cm/sec	5.08 cm/sec	2.54 cm/sec	1.27 cm/sec	2 cm/sec	4 cm/sec	

Conditions:

- Calculated with VXM™ Motor Controller which operates at 400 half-steps per revolution
- Standard motor resolution is 1.8° per full step or 0.9° per half-step with the VXM

## Shortest Advance with VXM and 1.8° (200 step) Step Motor

The increment of a single half-step\* is

BiSlide®	E04	E02	E01			M01	M02
XSlide™	E04	E02	E01	E50	E25	M01	M02
UniSlide®	W4	W2 P5	W1 P10	B P20	C P40	K1 Q1	K2 Q2
<b>Lead Screw Pitch &gt;</b>	<b>0.400"</b>	<b>0.200"</b>	<b>0.100"</b>	<b>0.050"</b>	<b>0.025"</b>	<b>1 mm</b>	<b>2 mm</b>
<b>Inches per Step</b>	0.001	0.0005	0.00025	0.000125	0.00006	0.0001	0.0002
<b>Millimeters per Step</b>	0.0254	0.0127	0.00635	0.003175	0.00158	0.0025	0.005
<b>Microns per Step</b>	25.4	12.7	6.35	3.175	1.5875	2.5	5

- Conditions:
- Calculated with VXM™ Motor Controller which operates at 400 half-steps per revolution
  - Standard motor resolution is 1.8° per full step or 0.9° per half-step with the VXM

\*System step resolution or smallest repeatable move is dependent on system orientation, rigidity, friction, wear and applied load.

† Velmex also offers Vexta High Resolution 0.9° motors. When driven by the VXM, resolution is 800 steps/rev.

This effectively doubles the resolution but halves the translation speed.

Speed can also be reduced with the insertion of a gear head between the motor and stage.