Introduction

There are several types of motors, all fractional horsepower, that are used on Velmex products. Each type has advantages and disadvantages over the other.

The most common motor is the DC step motor. Step motors with a controller like the Velmex VXM are the most cost effective solution for accurate speed and precise incremental positioning. The VXM step motor controller provides multi move programmability and up to four axes of motor control. Step motors produce high torque for their size and have useable torque to around 1K RPM. High accuracy and a wide speed range are accomplished without the need for feedback devices like encoders.

A variation of the DC step motor is the AC high torque 72 RPM synchronous motor. This motor runs a constant 72 RPM from line voltage with a simple capacitor and direction switch circuit. These motors are used for coarse positioning, they can stop within 5 degrees of rotation.

Motors & Controls

For simple variable speed, the (Pittman) DC brush geared motor is a low cost solution. Using a variable voltage controller moderate speed range is achievable. Only coarse positioning is possible and speed may fluctuate with load changes.

The DC servo motor has the advantage over a step motor of less acoustical noise. The servo motor being a closed loop device has position feedback. Higher cost and the need for a larger motor or gear box are the disadvantages of the servo motor compared to a step motor.

When in doubt about what the best motor and control system to use for your application, just contact our sales engineering department for assistance. We have over 30 years experience in motor and control applications, and offer the latest technologies from several manufacturers.

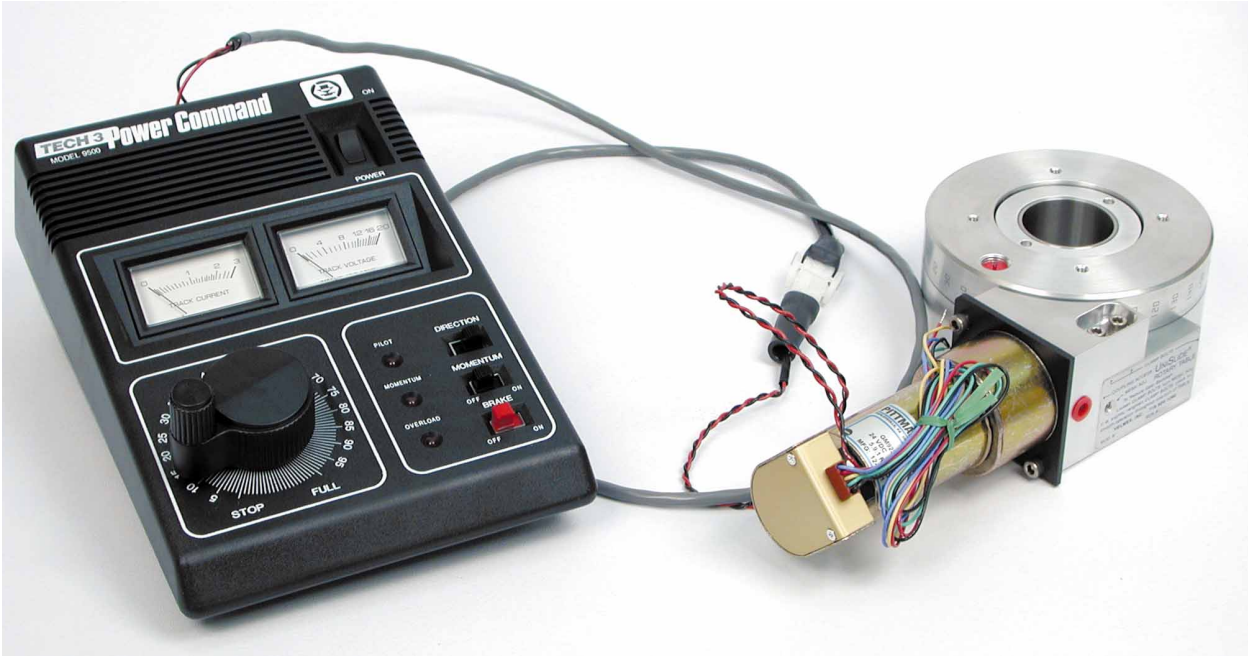
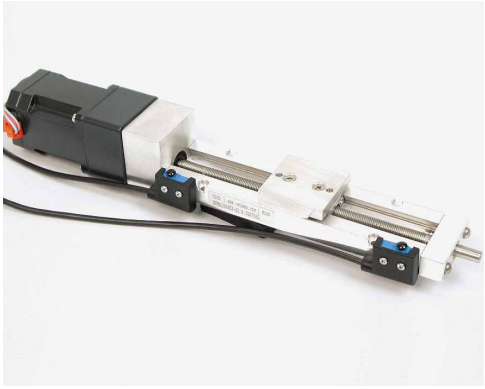

TECH 3 Power Command
MODEL 9500
POWER
ON
TRACK CURRENT
BACK VOLTAGE
PILOT
DIRECTION
MOMENTUM
MOMENTUM
OFF
BRAKE
ON
OVERLOAD
OFF
ON
STOP
FULL

Table of Contents

Motors & Controls

Introduction to Motors & Controls



Functional Classifications

The choice of the correct motor and control should be based on the function you wish to accomplish. Broadly speaking, there are two functions: scanning and positioning.

Scanning

In this category, the objective or work to be accomplished occurs while the slider carriage is in motion. Scanning functions can be further subdivided into two types: scanning at a single, fixed speed or at one of a range of user-selectable variable speeds.

Scanning or feeding at a single, fixed speed – A probe, sensor, cutter, dispenser, transducer or some other object is moved at a single, constant speed. An AC synchronous motor, DC gear motor or stepping motor achieves this function within 0.1% or less speed variation. Linear speed is a function of the motor and lead screw pitch selected. Available motors and the resultant translation speeds with each lead screw pitch are listed on page 3.15.

Scanning or feeding at a selected speed – The objective is same as the above. However, an added advantage is the ability to select one scanning speed from a range of motor speeds via a motor control. There are three possible configurations of speed control: unregulated, regulated and programmable.

Unregulated Speed Control – Typically, a high slip AC induction motor speed will fluctuate due to varying loads and voltages.

Regulated control – In this system, the control senses the motor speed and makes the necessary adjustments. Using a permanent magnet DC motor and speed control, speed regulation is achieved by sensing back-EMF; accuracy is the 1-2% range.

See the next page for motor control information. In some instances, an optional circuit can be added to return to the "home" position at maximum motor speed.

Programmed control – A DC stepper motor can be programmed to run at a predetermined speed. Scan rates can be varied as a function of position. Complex patterns such as raster scan and auto reverse are also easily programmed.

Positioning

The objective is to move to a target position. This is commonly achieved by using a stepper motor and an accurate lead screw. The motor is incremented a predetermined number of steps to achieve the desired position. Consult the section on stepper motors and controls for choice of available equipment.

Some Typical Operating Modes

Scanning

Fig. A – Running between adjustable limit switches.

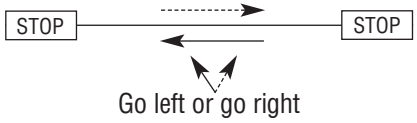


Fig B – Automatic reversing circuit for continuous motion.
Returns at the same or different speed.

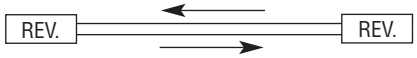
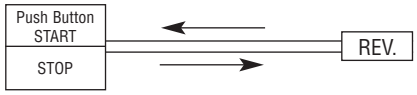


Fig. C – Auto reverse with stop — at — home end.



Positioning

Fig. D – Incremental motion on one axis, scan on return.

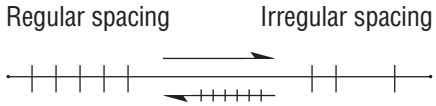


Fig. E – Continuous scan on one axis, incrementally on another.

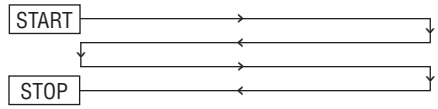
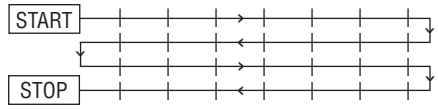


Fig. F – 2 Axes. Stop at each indicated point.
Restart with input signal or after time delay.



General Motor Characteristics

Functional Class	Motor Type	Examples	Advantages	Disadvantages
Scan	AC induction (instrument type)	Bodine type K	No controls needed with fixed speed models Synchronous (constant) speeds No brushes; no RFI Least expensive	Limited power 60 Hz. resonance
Scan	DC shunt or Permanent magnet	Bodine 24A Bodine 043 Pittman	Wide speed control range Dynamic braking Moderate speed accuracy (5%)	Has brushes; moderate RFI
Scan	High Torque AC synchronous 72 RPM	KSL Ø62TIY SS241L	Fast start/stop/reverse Simplified control Good torque without gearhead Synchronous speed No brushes	Fixed speed 60 Hz resonance
Scan & Position	DC stepper	Vexta PK266 Slo-Syn M092	Accurate positioning Well suited to computer control Accurate speeds, no brushes, Fast reversing and acceleration Widest speed range, high torque for size	Requires special controller Vibration at low speed

Contact the factory for non-stepper motors and controls.

Motor Types

DC Brush Gear Motors

DC brush commutated gearmotors are one of the simplest motors to operate. A voltage applied (0 to 24VDC) determines motor speed. Direction is determined by the polarity applied to the power terminals of the motor.

These motors feature sintered steel spur gears and are available in many reduction ratios. Armatures are skewed to minimize magnetic cogging. A 500 count per revolution optical encoder option is available for position or velocity feedback.

For simple forward and reverse with moderate speed range capability, the DC brush gear motor is a low cost option.

Step Motors

Step motors are brushless permanent magnet motors. With logic based electronics they can be controlled to move in discrete increments. Distance, direction, and speed are accomplished by switching the power to the motor windings in specific sequences and frequencies.

Step motors are capable of very precise positioning without the use of feedback devices. Step sizes can be very small producing wide speed ranges, smooth motion, and accurate speeds.

Motor with controller drive built in

These motors advance 0.9 degrees per step with half step controllers. Step accuracy is 3% noncumulative.

For incremental positioning or accurate speed control, a step motor system is the most economical solution.

More Motor and Control Options

Velmex is a longtime integrator of various types and manufacturers of motion control components.

Additional Motors Available:

1. AC 72 RPM Synchronous
2. AC Gear Motor
3. High Resolution Step Motors
4. DC Servo
5. Motors with Controller/Drive built in

More Control Possibilities:

1. Pulse/Direction Step Motor Drives
2. DC Servo Drives and Controllers
3. Position Feedback
4. Preprogrammed and Custom User Interfaces
5. Edge Following

Contact our engineering/sales department to get a perfect motor/controller match for your application.

DC servo drive and controller

Pulse/direction step motor drive

Motor Type vs. Series Compatibility

Specifications for individual motors are found throughout this catalog. Other motors can be installed on special order.

	UniSlide Assembly Series										
	1500	2500		4000		6000		9000	Rotary Tables		
Motor Type[7]	MA	MA	MB	MA	MB	MA	MB	MB	B5990TS	B4800TS	BiSlide M
Motors for Constant Speed Scanning											
Bodine Type K Low-slip, Synchronous			X		X	X				X	
Bodine Type 30R-D Gear Motor					X		X	X			
Bodine Type 30R-F Gear Motor					X		X	X			
Stepper Motor - NEMA 17	X	X	X						X		
Stepper Motor - NEMA 23		X	X	X	X	X	X			X	X
Stepper Motor - NEMA 34					X	X	X	X			X
Motors for Variable Speed Scanning											
Pittman Type (GM8700), GM9400	(X)	X	X						X	X	X
Bodine Type K High Slip			X		X	X				X	
Bodine Type 24A, Model 0043		X	X	X	X					X	
Bodine Type 24A-D Gear Motor					X		X	X			
Bodine Type 24A-3F Gear Motor				X		X		X			
Bodine Type 32A-W Gear Motor							X	X			
Bodine Type 42A, Model 4035							X	X			
Stepper Motor - NEMA 17	X	X	X						X		
Stepper Motor - NEMA 23		X	X	X	X	X	X			X	X
Stepper Motor - NEMA 34					X	X	X	X			X

[7] *Specific motor model numbers for each frame type may be found in the accompanying price list.*

Table of Contents

Motors & Controls

DC Stepping Motors

Note: *Throughout this catalog you'll see* ***Keywords in RED.*** *To get more information, including access to drawings, specs, photos of examples and the latest innovations, go to our web site,* ***www.velmex.com****, and enter the corresponding* ***Keyword in the Quick Search Box.***

Understanding Step Motors and Their Controllers

Since 1980, Velmex has been noted for offering the best value in step motor controllers, and has been the pioneer of step motor controllers featuring two, three, and four axes of microprocessor-based indexer/drivers in a single enclosure.

Originally, step motor controllers/drivers were the resistance limited type (L/R) with large power supplies and current limiting resistors. These L/R step drives are noted for being simple and reliable, but very inefficient when the motor is energized and not stepping. To eliminate this wasted energy, Velmex step motor controllers utilize pulse width modulation current control and automatic motor power-down resulting in low power consumption.

Another potential problem with step motor translator/drivers is position errors due to electrical noise coupling onto pulse inputs. A step motor translator can not discriminate between a valid step pulse and a extraneous electrical spike on its pulse input. When an electrical spike gets to the pulse input, the motor will make a step, putting it out of intended position. The opposite problem can occur when a legitimate step pulse is too weak or its duration the pulse input, the motor will make a step, putting it out of intended position. The opposite problem can occur when a legitimate step pulse is too weak or its duration A too short for the translator to count. However, Velmex step motor controllers by design do not have translators. Instead of a translator (which converts a pulse to a phase change of voltage levels on each motor drive), the Controller's microcomputer is in total control of the voltage level on each phase of each motor drive.

Answers to Commonly Asked Questions About Step Motors

1. When should I use a step motor with a UniSlide Assembly?

Step motors are preferred for incremental positioning or scanning when computer controlled motion is desired, complex motion requirements of more than one distance interval and/or speed, very fast or slow starts/stops, and fast reversing, for accurate speeds, for speed range requirements as high as 1 to 6000 half steps/sec.; and also, when a brushless motor is required.

2. Will the motor "lose"steps occasionally?

Step motors do not "lose" steps. Step motors run synchronously to their phase switching speed. When an external motor load exceeds the running torque of the motor, then the motor will stall, and lose position much greater than one step. Poor wiring practice and full-stepping translators of 25 years ago were the contributors to this "losing step" phenomenon. Velmex step motor controllers eliminate the problems of low speed motor resonance by utilizing half-stepping and current control. The VXM switches the motor drives directly, eliminating the sensitive pulse-to-motor translator link.

3. How do I insure the motor will not stall?

Size the motor for the load and run the motor at a speed that provides 50% more torque than needed. By applying the load and increasing motor speed until a stall occurs will determine the actual torque required. By using the motor speed/torque curves for the particular Controller, maximum reliable operating speed can be determined.

4. When the motor stalls, is it damaging the motor?

When the motor stalls (loses synchronism) the motor output torque drops very low, and the motor current drops slightly. There are not any mechanical parts that are slipping, only magnetic slippage occurs. The step motor is an ideal motor for torque limiting applications.

5. Why do you sell so many step motors and not servo motors for your UniSlide Assemblies?

Closed loop servo systems have more complexity and cost without significant benefits when used with UniSlide assemblies. Servo motors have more torque at RPMs over 1000. However, the UniSlide lead screw/drive nut assembly has limited life at speeds over 1000 RPM, making high RPMs impractical. Ministep/microstep controllers provide smoothness typical of servos, but at less cost.

6. Why do step motors work well on UniSlides and not as well on other types of devices?

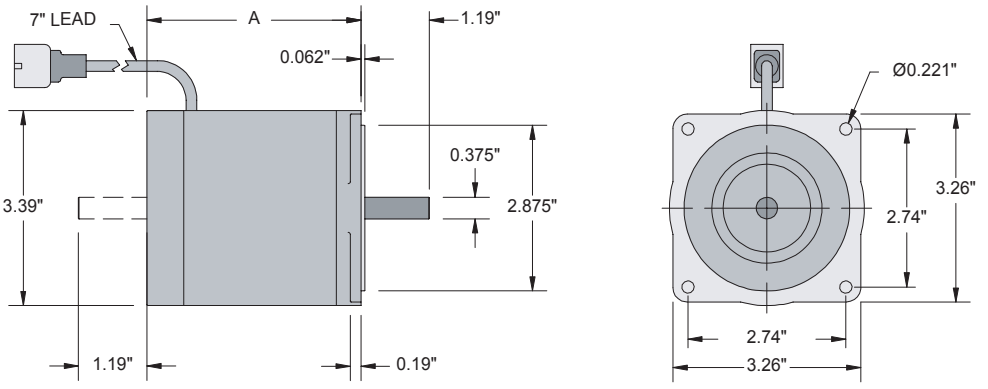
Step motors need some frictional load to dampen the stepping. UniSlides have adequate residual friction, and the polymer lead screw nut helps absorb step vibration. The relatively small diameter lead screws used on UniSlides make the primary inertia very low compared to motor inertia, making very fast accelerations and decelerations possible. Step motors reach full torque in just one step. Therefore, variable loads and friction have a negligible effect on positional accuracy.

Typical DC stepper motors supplied by Velmex

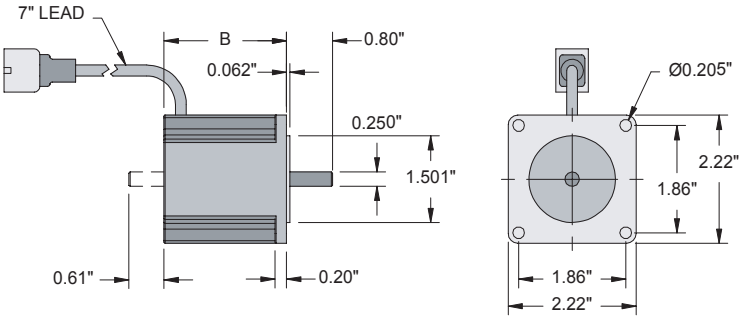
Keyword: FAQ

Step Motors

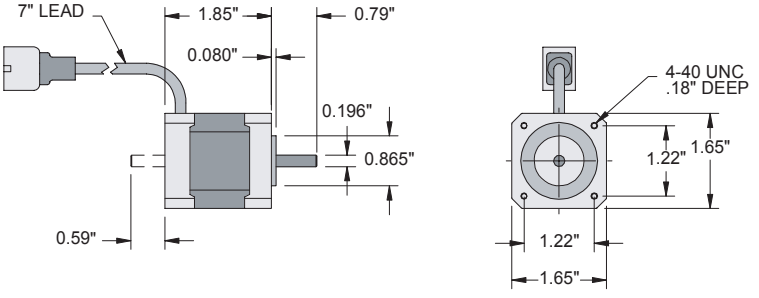
Motor	A
M091-x	2.47”
M092-x	3.72”



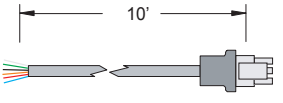
Motor	B
PK264-x	1.54”
PK266-x	2.13”
PK268-x	2.99”



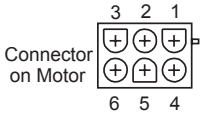
PK245-x



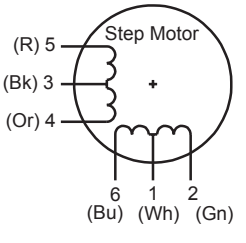
Connections



Optional 4-0700 Motor Cable (6 wire 20 AWG)
Other lengths and wire sizes available



Amp 1-480705-0
(mates with: 1-480704-0 on Cable)



See page 3.19 for limit switch connections.

Table of Contents

Motors & Controls

Translation Speed Tables

Translation Speed Tables

To move at your desired scanning speed, use the charts on the following pages to select a lead screw for your application. For information on lead screws and designations, see page 2.12 of this catalog.

Your choice of lead screw also depends on your choice of motor. Here's how to choose a motor:

1. Determine the minimum torque requirement using the formula on page 2.12.
2. For step motors, choose a motor with the necessary torque on page 3.24. For other motors, see http://www.velmex.com/motor_acdc.html for motor speed and torque characteristics. Rated torque of motors is listed to give a relative measure of torque output between motors. Note also maximum thrust load specifications included with each chart.
3. Be sure that the motor that you've chosen is compatible with the UniSlide or BiSlide base you've chosen. Although a specific motor may be used with multiple UniSlide bases, it may be listed only once, usually for the smallest usable Series. See Page 3.7, for a summary of motors compatible with each UniSlide Series .
4. From the chart, select a desired operating speed.

When choosing a lead screw, you'll find several possible choices. In general, a finer pitch beat screw results in better resolution while a coarser pitch beat screw will result in higher translation speed.

For stepping motors and controls, see Stepping Motors subsection, page 3.9.

Linear Translation Speed as a Function of English Pitch Lead Screw and Step Rate

UniSlide Lead Screw Designation BiSlide Lead Screw Designation			W4 &P2.5 E04	W2 & P5	W1 & P10 E01	B & P20	C & P40	
Travel per Revolution			0.400"	0.200"	0.100"	0.050"	0.025"	
Steps/Sec.(0.9 Degree/Step)	**RPM**	**RPS**						
100	15	0.25	6.00	3.00	1.50	0.75	0.38	Inches/Minute
			0.1	0.05	0.025	0.013	0.006	Inches/Second
500	75	1.25	30.00	15.00	7.50	3.75	1.88	Inches/Minute
			0.5	0.25	0.125	0.063	0.031	Inches/Second
1000	150	2.50	60.00	30.00	15.00	7.50	3.75	Inches/Minute
			1.0	0.05	0.25	0.125	0.063	Inches/Second
1500	225	3.75	90.00	45.00	22.50	11.25	5.63	Inches/Minute
			1.5	0.75	0.375	0.188	0.094	Inches/Second
2000	300	5.00	120.00	60.00	30.00	15.00	7.50	Inches/Minute
			2.0	1.0	0.5	0.250	0.125	Inches/Second
3000	450	7.50	180.00	90.00	45.00	22.50	11.25	Inches/Minute
			3.0	1.5	0.75	0.375	0.188	Inches/Second
4000	600	10.00	240.00	120.00	60.00	30.00	15.00	Inches/Minute
			4.0	2.0	1.0	0.500	0.250	Inches/Second
6000	900	15.00	360.00	180.00	90.00	45.00	22.50	Inches/Minute
			6.0	3.0	1.5	0.750	0.375	Inches/Second
VXM control limit is 6000 steps/second.								
8000	1200	20.00	480.00	240.00	120.00	60.00	30.00	Inches/Minute
			8.0	4.0	2.0	1.000	0.500	Inches/Second
Step resolution @ 400 steps/rev.								
Inches/Step			0.001	0.0005	0.00025	0.00013	0.00006	
Millimeters/Step			0.0254	0.0127	0.00635	0.003175	0.00158	
Theoretical Resolution (Microns)			25.4	12.7	6.35	3.175	1.5875	.

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

See next page for Metric Translation Speed Chart.

Linear Translation Speed as a Function of Metric Pitch Lead Screw and Step Rate

UniSlide Lead Screw Designation BiSlide Lead Screw Designation			K1 & Q1 M01	K2 & Q2 M02	
Travel per Revolution			1 mm	2 mm	
Steps/Sec.(0.9 Degree/Step)	**RPM**	**RPS**			
100	15	0.25	1.5	3.0	Centimeters/Minute
			0.25	0.5	Millimeters/Second
500	75	1.25	7.5	15.0	Centimeters/Minute
			1.25	2.5	Millimeters/Second
1000	150	2.50	15.0	30.0	Centimeters/Minute
			2.5	5.0	Millimeters/Second
1500	225	3.75	22.5	45.0	Centimeters/Minute
			3.75	7.5	Millimeters/Second
2000	300	5.00	30.0	60.0	Centimeters/Minute
			5.0	10.0	Millimeters/Second
3000	450	7.50	45.0	90.0	Centimeters/Minute
			7.5	15.0	Millimeters/Second
4000	600	10.00	60.0	120.0	Centimeters/Minute
			10.0	20.0	Millimeters/Second
6000	900	15.00	90.0	180.0	Centimeters/Minute
			15.0	30.0	Millimeters/Second
VXM control limit is 6000 steps/second.					
8000	1200	20.00	120.0	240.0	Centimeters/Minute
			20.0	40.0	Millimeters/Second
Step resolution @ 400 steps/rev.					
Inches/Step			0.0001	0.0002	
Millimeters/Step			0.0025	0.0050	
Theoretical Resolution (Microns)			2.5	5.	

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

See previous page for English Translation Speed Chart.

Table of Contents

Note: *Throughout this catalog you'll see* ***Keywords in RED.*** *To get more information, including access to drawings, specs, photos of examples and the latest innovations, go to our web site,* ***www.velmex.com****, and enter the corresponding* ***Keyword in the Quick Search Box.***

Motors & Controls

VXM Stepping Motor Control

VXM is a Complete Motor Control Solution

The VXM is a high integration stepping motor controller for "plug and run" with Velmex motor driven products. Reliable performance is achieved with a powerful RISC Microcontroller that directly controls motor phase switching and all other interface functions. The VXM uses an optimized modulated method to produce resonance free motor torque. This proven design is a dependable and low cost solution for high precision positioning requirements.

Firmware

- A single VXM can control 4 motors
- Nonvolatile memory for user programs
- Use interactively with a computer, PLC or standalone
- Special looping commands for doing raster scanning and matrix patterns
- Programmable output trigger to signal external devices
- FIFO buffer to capture motor positions on input trigger
- Conditional branching command
- Automatic "return to position before branch" for pick-and-place from within matrix patterns
- Software/input interrupt capability
- Complex motion profiles with "Continuous Index Mode"
- With two VXMs coordinated motion to produce angle, arcs and circles
- Backward compatible with previously manufactured Velmex NF90 and VP9000

Software

- Velmex COSMOS utility program for easy setup, test and programming
- Examples written in C, LabView, VisualBasic, QuickBasic and other languages

Hardware

- Controller with serial interface/indexer/driver, AC power supply and all cables
- Power switch, Status LEDs, Jog, Run and Stop input buttons on the front
- Multipurpose input and output
- 10 bit analog input for external sensor, setting speed or analog joystick control
- Optically isolated limit switch inputs
- Compatible with size 17 to 34 hybrid step motors rated from 0.4 to 4.7 amps with 6 or 8 wire connections
- 100-200 VAC input desktop power supply that is UL, CE, CSA and TUV safety agency compliant
- Energy saving by automatically de-energizing motors at a standstill

Modular or Integrated Versions from One to Four Axis

1 or 2 motor operation in a compact package.

3 or 4 motor with two linked controls. Plug and Play operation makes for the first (Master) VXM the controller for up to 4 motors.

Rack mountable version integrates VXM(s) and power supply(s) into a 19"x 5.25" rack panel.

Model VXM-1 (1 Axis)

Model VXM-2 (2 Axis)

Model VXM-3 (3 Axis)

Model VXM-4 (4 Axis)

Model VXM-1R (Rack Panel 1 axis)

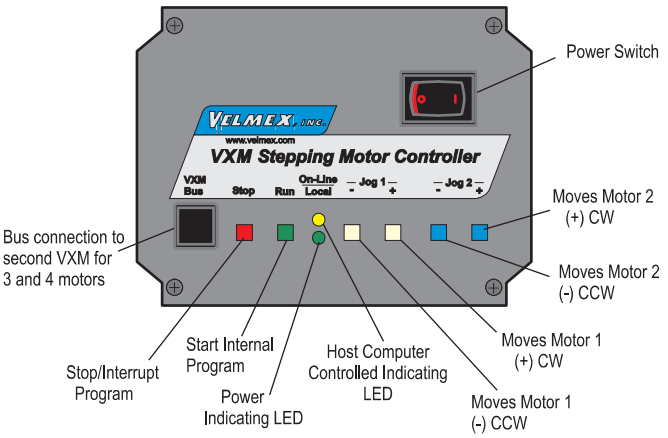
Model VXM-2R (Rack Panel 2 axis)

Model VXM-3R (Rack Panel 3 axis)

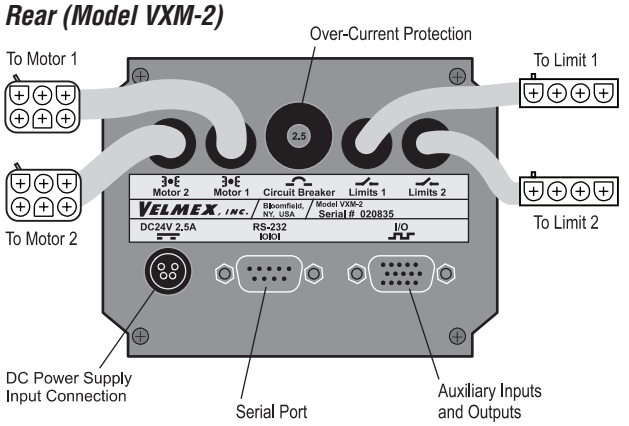
Model VXM-4R (Rack Panel 4 axis)

External Features

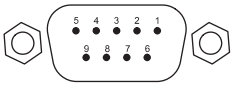
Front (Model VXM-2)



Rear (Model VXM-2)



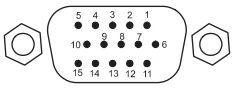
RS-232 Port



9DSUB Socket

Pin No.	Name
1	No Connection
2	Tx
3	Rx
4	Gnd
5	
6	
7	
8	
9	No Connection

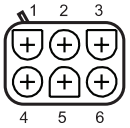
Auxiliary I/O Connection



15DSUBHD Socket

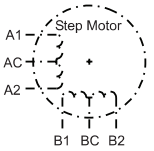
Pin No.	Name
1	OV (Common Ground)
2	+5V Output
3	Ain (Analog in)
4	Run Input
5	I1 (Input 1)
6	I2 (Input 2)
7	I3 (Input 3)
8	I4 (Input 4)
9	OV (Common Ground)
10	J1- (Jog Mtr 1 Negative)
11	J1+ (Jog Mtr 1 Positive)
12	J2- (Jog Mtr 2 Negative)
13	J2+ (Jog Mtr 2 Positive)
14	O1 (Output 1)
15	O2 (Output 2)

VXM Motor Cable Connector

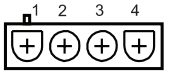


AMP MATE-N-LOK 1-480704-0
(mates with: 1-480705-0 on Motor)

Pin No.	Motor
1	BC
2	B2
3	AC
4	A2
5	A1
6	B1



VXM Limit Cable Connector



AMP MATE-N-LOK 1-480702-0
(mates with: 1-480703-0)

Pin No.	Motor
1, 4	Common
2	CCW (-)
3	CW (+)

Easy Programming with Simple Commands

Example No. 1	Motor Run	Function
Set index and run	1	Incremental index motor one 400 step positive

`I1M400,R`

Example No. 2	Motor Run	Function
Set index and run	1	Incremental index motor one 600 step negative

`I2M600,R`

149 Commands Give You Maximum Versatility

VXM Program Stored

Motor commands:

ImMx Set steps to incremental Index motor CW (positive) m = motor no. (1, 2, 3, 4), x = 1 to16,777,215

ImM-x Set steps to incremental Index motor CCW (negative) m = motor no. (1, 2, 3, 4), x = 1 to16,777,215

IAmMx Set Absolute Index distance, m = motor no. (1, 2, 3, 4), x = ±1 to ±16,777,215

IAmM0 Index motor to Absolute zero position, m = motor no. (1, 2, 3, 4)

IAmM-0 Zero motor position for motor no. m, m = 1, 2, 3, 4

ImM0 Index motor until positive limit is encountered, m = motor no. (1, 2, 3, 4)

ImM-0 Index motor until negative limit is encountered, m = motor no. (1, 2, 3, 4)

(i3,i1…) Combine Index commands to run simultaneously on two VXM controllers connected by VXM bus

SmMx Set speed of motor (70% power), m = motor no. (1, 2, 3, 4), x = 1 to 6000 step/sec.

SAmMx Set speed of motor (100% power), m = motor no. (1, 2, 3, 4), x = 1 to 6000 step/sec.

SmM-x Read and assign analog input value to motor m speed (70% power), x = range

SAmM-x Read and assign analog input value to motor m speed (100% power), x = range

AmMx Acceleration/deceleration, m = motor no. (1, 2, 3, 4), x = 1 to 127

Looping/branching commands:

L0 Loop continually from the beginning or Loop-to-marker of the current program

LM0 Sets the Loop-to-marker at the current location in the program

LM-0 Resets the Loop-to-marker to the beginning of the current program

Lx Loop from beginning or Loop-to-marker x-1 times (x = 2 to 65,535), when the loop reaches its last count the non-loop command directly preceding will be ignored

L-x Loop from beginning or Loop-to-marker x-1 times, alternating direction of motor 1, when the loop reaches its last count the non-loop command directly preceding will be ignored

LAx Loop Always from beginning or Loop-to-marker x-1 times (x = 2 to 65,535)

LA-x Loop Always from beginning or Loop-to-marker x-1 times, alternating direction of motor 1

LM-2 Loop once from beginning or Loop-to-marker reversing index direction of motor 2

LM-3 Loop once from beginning or Loop-to-marker reversing index direction of motors 1 and 2

Jx Jump to beginning of program number x, x = 0 to 4

JMx Jump to beginning of program number x and come back for More after program x ends, x = 0 to 4

JM-x Similar to JMx except automatically moves back from absolute indexes after program x ends: For pick-and-place within matrix looping patterns

Pausing command:

Px Pause x tenths of a second, (x = 0 to 65,535)

P-x Pause x tenths of a millisecond, (x = 1 to 65,535)

PAx Pause x tenths of a second (x = 0 to 65,535, 10 µsec pause when x = 0) Alternating output 1 high for duration of the pause

PA-x Pause x tenths of a millisecond (x = 0 to 65,535, 10 µsec pause when x = 0) Alternating output 1 high for duration of the pause

Input/output commands*:

U0 Wait for a “low” on user input 1

U1 Wait for a low on user input 1, holding user input 1 high while waiting

U2 Enable Jog mode while waiting for input

U3 Disable jog mode while waiting for input

U4 User output 1 “low” (reset state)

U5 User output 1 high

U6 Send “WE” to host and wait for a “G” to continue

**There are 22 additional commands for addressing the I/Os on the second VXM of two linked controls.*

U7	Start the Continuous Index with pulse on output 2
U77	Start the Continuous Index with no output
U8	Start the Continuous Index sending "@" to the host
U9	End of Continuous Index with auto-decel to stop
U91	End of Continuous Index with auto-generate a deceleration Index as next command
U92	End of Continuous Index using next Index for deceleration to stop
U99	End of Continuous Index with instantaneous stop
U11	Skip next command if input 1 is high
U12	Skip next command if input 2 is high
U13	Wait for front panel button to jump to a program or continue: "Motor 1 jog -" button to jump to program no. 1, "Motor 1 jog+" button to jump to program no. 2, "Run" button to proceed in current program
U14	User output 2 low (reset state)
U15	User output 2 high
U16	Optional User output 3 low (reset state)
U17	Optional User output 3 high
U18	Optional User output 4 low (reset state)
U19	Optional User output 4 high
U23	Wait for front panel button to jump to a program and come back or continue: "Motor 1 jog -" button to jump to program no. 1, "Motor 1 jog+" button to jump to program no. 2, "Run" button to proceed in current program
U30	Wait for a low to high transition on user input 1
U31	Wait for a low to high transition on user input 1, holding user output 1 high while waiting
U32	Wait for "Motor 1 Jog -" button to be pressed on front panel with debouncing
U33	Wait for "Motor 1 Jog +" button to be pressed on front panel with debouncing
U50	Wait for a low and high on user input 1 with debouncing for a mechanical push-button switch
U51	Wait for a low and high on user input 1 with debouncing for a mechanical push-button switch, holding user output 1 high while waiting
U90	Wait for a low to high on the Run button or connection I/O, 4 with debouncing for a mechanical pus-button switch

VXM Immediate Commands

Status request commands:

V	Verify Controller's status, VXM sends "B" to host if busy, "R" is ready, "J" if in the Jog/slew mode, or "b" if Jog/slewing
X	Send current position of motor 1 to host (Motor can be in motion)
Y	Send current position of motor 2 to host (Motor can be in motion)
Z	Send current position of motor 3 to host (Motor must be stationary)
T	Send current position of motor 4 to host (Motor must be stationary)
M	Request memory available for currently selected program
lst	List current program to host (ASCII text)
x	Send last 4 positions of motor 1 to host that were captured by the "!" command or Input 4 trigger
y	Send last 4 positions of motor 2 to host that were captured by the "!" command or Input 4 trigger
#	Request the number of the currently selected motor
*****	Request the position when the last motor started decelerating (show position when "D" command or Stop/User input 4 used
?	Read state of limit switch inputs for Motor 1 and 2 (8 bit binary value)
~	Read state of User Inputs, Motor 1 and 2 Jog Inputs (8 bit binary value)
$	Read state of User Outputs (8 bit binary value)
@	Read user analog input value
B	Read Backlash compensation setting
O	Read Indicate limit switch setting
D	Read/Digitize motor position (Jog Mode)
PM	Request the number of the current Program
PMA	Request the current program associate number (255 = default/disabled)
getMmM	Read motor type/size selected for axis m
getDM	Read operating mode of VXM (8 bit binary value)
getD0	Gets the VXM's firmware version in the format X.XX
getD1	Gets the VXM's firmware date code in the format XX-XX-XX (month/date/year)

getD2 Return 2 if system is a single VXM, returns 4 if VXM is a Master
getDA Read Analog Joystick Deadband setting
getjmM Read first Jog Speed setting for motor m
getjAmM Read first Analog Joystick range for motor m
getJmM Read second Jog Speed setting for motor m
getJAmM Read second Analog Joystick range for motor m
getLmM Read mode of limits for motor m
getPmM Read "Pulse Every x number Step" value for axis m
getPA Read Pulse width used by **setPmMx** and **U7**
getI Read operating mode for user inputs

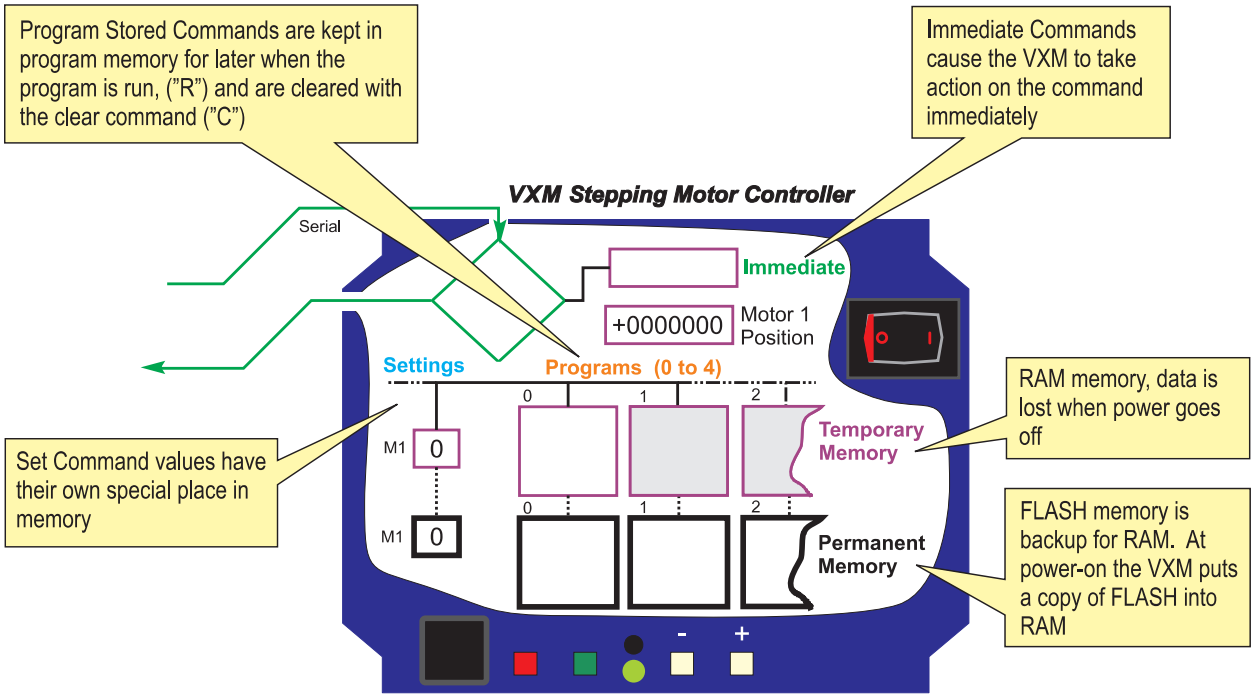
Operation commands:

C Clear all commands from currently selected program
D Decelerate to a stop(interrupts current index/program in progress)
E Enable On-Line mode with echo "on"
F Enable On-Line mode with echo "off"
G Enable On-Line mode with echo off Grouping a <cr> with "^", ":", "W","O" responses; Also Go after waiting or holding
H Put Controller on Hold (stop after each command and wait for go)
K Kill operation/program in progress and reset user outputs
N Null (zero) motors 1, 2, 3, 4 absolute position registers
Q Quit On-Line mode (return to Local mode)
R Run currently selected program
! Record motor positions for later recall with "x", "y" commands
rsm Run save memory (saves setup/program values to nonvolatile memory
res Software reset control
del Delete last command
[i1, i2…] Send data to Slave through Master (two VXM controllers connected by VXM bus)
setD0 Set VXM back to factory defaults (All programs, settings, motor selections will be erased)
PMx Select Program number x, x = 0 to 4
PM-x Select and clear all commands from Program number x, x = 0 to 4

VXM Set Commands

setMmM*x* Set axis m for motor type/size *x*
setDMx Set VXM/VP9000 or NF90 emulation modes, and other operating parameters
setDAx Set Analog Joystick Deadband value
setjmM Set first Jog Speed setting motor m
setjAmM Set first Analog Joystick range setting for motor m
setJmM Set second Jog Speed setting for motor m
setJAmM Set second Analog Joystick range for motor m
setLmMx Set limit switch mode for axis m
setPmMx Set "Pulse Every number Steps" on output 2 for axis m
setPAx Set Pulse width used by **setPmMx** and **U7**, x = 1 to 255 (10 microsecond increments)
setIx Set operating mode of inputs
setBx Set RS-232 Baud rate (9 = 9600, 19 = 19200, 38 = 38400)
Bx Backlash compensation, 20 steps when x = 1, off when x = 0
Ox Indicate limit switch Over-travel to host, off when x = 0, VXM sends "O" when x = 1 and hit limit, x = 3 program stops too
PMAx Program Associate program x in Master to program x in Slave (Linked VXMs start the same time) (255 = default/disabled)

VXM Internal Function

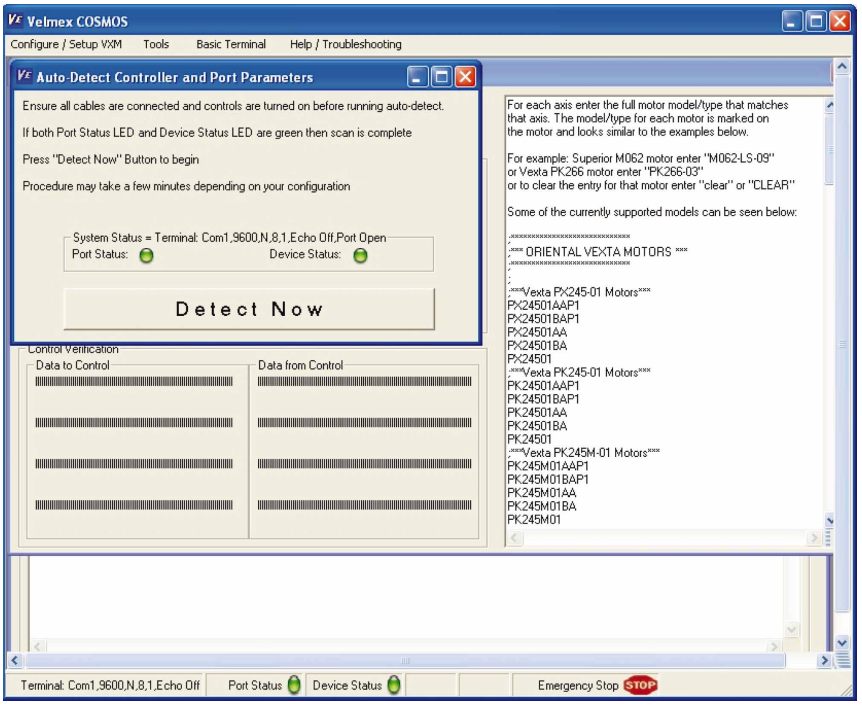


Get "Up and Running" in Record Time with C.O.S.M.O.S.™

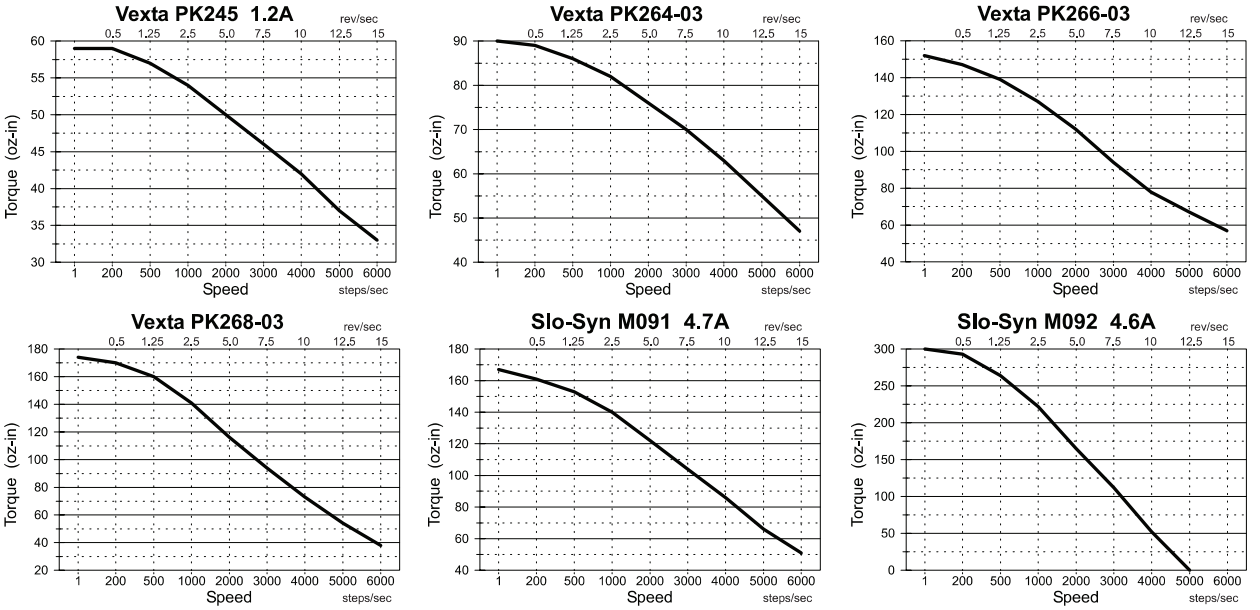
The Velmex COSMOS software for Windows is the easiest way to configure, program, and become familiar with the features of the VXM controller. COSMOS has the following capabilities:

- Test serial port for communications
- Retrieve and update setup information
- Display status and error messages
- Move motor(s) exact distances without programming or without learning any commands
- Enter commands directly to the VXM

COSMOS is included free with every VXM on CDROM, or it can be downloaded at www.velmex.com.



Motor Performance



Options

USB Serial Adapter

The USB Serial Adapter connects the VXM to a computer USB port. This adapter will automatically be configured as a virtual COM serial port on a PC. This virtual COM port works exactly the same as a standard COM port allowing all software to address the VXM directly through a COM port number. Use this adapter with a computer with an available USB port, but no RS-232 (COM) serial port.

Digital Joystick

The optional Digital Joystick allows remote jog control of a one or two axis VXM controller. The Joystick provides on/off outputs that connect to the Jog Motor inputs on the Auxiliary I/O with the included 10 foot cable. An input switch allows toggling between 2 settable maximum speed values. The Joystick functions like the front panel jog buttons: Momentary = motor moves one step; Hold = accelerate slowly to settable speeds; Release = decelerate quickly to a stop.

Analog Joystick

The Analog Joystick derives speed and direction (velocity) from joystick position. Motor velocity is proportional to joystick distance from center and the settable speed ranges. Simultaneous two axis motion is accomplished with two VXMs. An input switch allows a single joystick to toggle between 2 motors of a 4 motor system. The Joystick is 1 million cycle design in a hand held size enclosure with a 10 foot cable.

Auxiliary I/O Breakout Module

The optional Auxiliary I/O Breakout Module is a convenient method to interface to the VXMs auxiliary I/O. Wire (26 to 18 AWG) connections can be made to all 15 I/Os using the screw type terminal blocks. A 6 foot cable and a PVC insulating boot is included.

I/O Splitter

The I/O Splitter allows both a joystick and the Auxiliary I/O Breakout Module to be connected to the VXM at the same time. The splitter has 8inch cables with a DB15HD plug connector to two DB15HD socket connectors.

Special Options

- Input terminal for data entry
- OEM mountable joysticks
- Potentiometer speed input
- Additional user outputs
- Half enclosure for OEM embedded applications
- Thumbwheel program selector switch
- Custom programming
- Customized cables & connectors

Backed by a 2 Year Warranty

Stepping Motor Controllers manufactured by Velmex are warranted to be free from defects for a period of two (2) years on all parts. Velmex's obligation under this warranty does not apply to defects due, directly or indirectly, to misuse, abuse, negligence, accidents, or unauthorized repairs, alterations, or cables/connectors that require replacement due to wear. Claims must be authorized, and a return authorization number issued before a product can be returned.

The warranty does not cover items which are not manufactured or constructed by Velmex, Inc. These components are warranted by their respective manufacturer.

Under the above warranty, Velmex will, at its option, either repair or replace a nonconforming or defective product.

The above warranty is the only warranty authorized by Velmex. Velmex shall in no event be responsible for any loss of business or profits, downtime or delay, labor, repair, or material costs, injury to person or property or any similar or dissimilar incidental or consequential loss or damage incurred by purchaser, even if Velmex has been advised of the possibility of such losses or damages.

Inasmuch as Velmex does not undertake to evaluate the suitability of any Velmex product for any particular application, the purchaser is expected to understand the operational characteristics of the product, as suggested in documentation supplied by Velmex, and to assess the suitability of Velmex products for this application.

This limited warranty give you specific legal rights which vary from State to State.

Specifications

Environmental:
Ambient Operating Temperature – 35° - 95° F (2° - 35° C)
Relative Humidity – 10% - 90% (non-condensing)

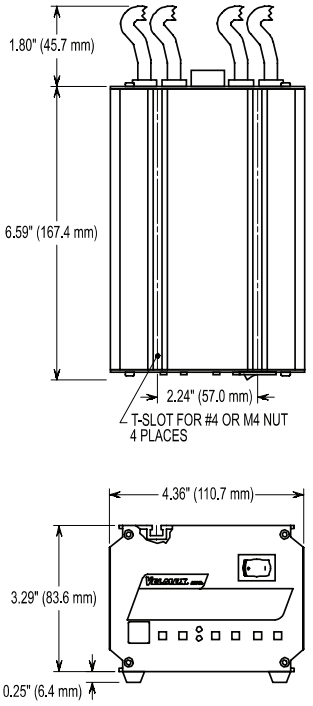
VXM

Function:
PWM Step Motor Controller for 1/2 Step Unipolar Motor Operation. RS-232 Interface, 9600, 19200, 38400 baud rate settable.

Physical:
VXM-1
Weight – 2.6 lbs (1.2 kg)
VXM-2
Weight – 2.9 lbs (1.3 kg)

Integrated 10 foot long Motor and Limit Cable(s)

Electrical Requirements:
24VDC 2.5A



Power Supply

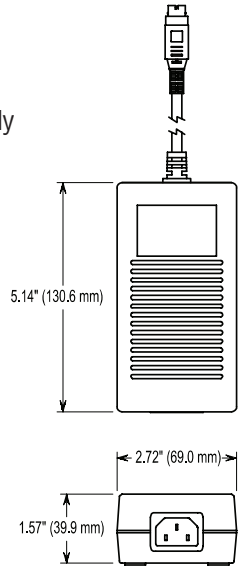
Function:
Switch Mode Desktop Power Supply
Complies with FCC Class B, EN55022B and UL1950, CSA 22.2 234, EN60950, CE

Physical:
Weight.1.0 lbs (0.45kg)

Integrated 1 meter (39") output cable. Removable AC Cord included.

Electrical Requirements:
100-240VAC 2A 50-60Hz

Output (to VXM):
24VDC 2.5A



VELMEX, INC.

Request for Quotation

Please copy and fill in this form for help in selecting your UniSlide Assembly.

Name _____ Phone _____

Company _____ Fax _____

Address _____ Email _____

City _____ State _____ Zip _____

Application Objective _____

_____

_____

_____

_____

Have you used UniSlide Assemblies before? Yes No

Operating environment is _____

Do you need UniSlide Assembly options? See pages 00 and 00.

☐ I need nonmagnetic slides

A sketch or drawing of your application is helpful.

*Axis**	*Travel Distance*	*Payload Weight*	*Measure Travel or Position?*	*Position Readout Resolution*	*Other Requirements*
X			Yes No		
Y			Yes No		
Z			Yes No		
Rotary			Yes No		

** See page 1.36 for orientation of XYZ axes.*

Fax form to us at 585-657-6153