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Motors and 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 commands
- ☑ 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 angles, 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 front
- ☑ Multipurpose inputs and outputs
- ☑ 10 bit analog input for external sensor, setting speed, or for 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
- ☑ 100-240 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 and 2 motor operation in a compact package

3 or 4 motors with two linked controls. Plug and Play operation makes 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)

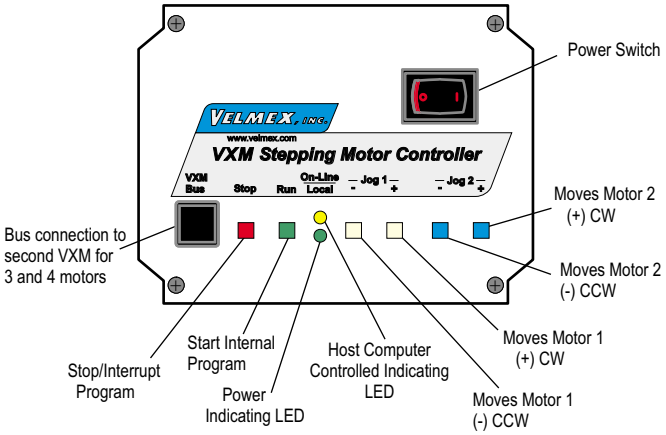
Model VXM-2R (Rack Panel 2 Axis)

Model VXM-3R (Rack Panel 3 Axis)

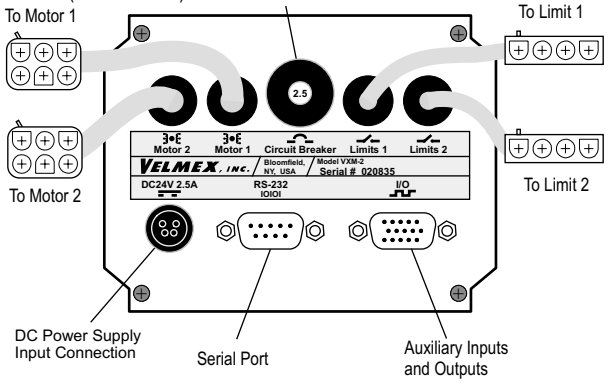
Model VXM-4R (Rack Panel 4 Axis)

External Features

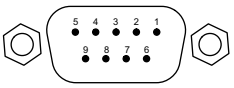
Front (Model VXM-2)



Rear (Model VXM-2)



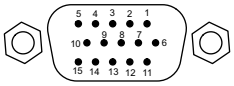
RS-232 Port



9DSUB Socket

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

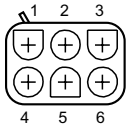
Auxiliary I/O Connection



15DSUBHD Socket

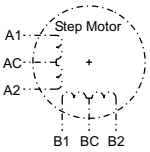
Pin#	Name
1	0V (Common Ground)
2	+5V Output
3	Ain (Analog In)
4	Run Input
5	I1 (Input 1)
6	I2 (Input 2)
7	I3 (Input 3)
8	I4 (Input 4/ Stop)
9	0V (Common Ground)
10	J1- (Jog Mtr 1 negative)
11	J1+ (Jog Mtr 1 positive)
12	J2- (Jog Mtr 2 negative)
13	J2+ (Jog Mtr 2 positive)
14	O1 (Output 1)
15	O2 (Output 2)

VXM Motor Cable Connector

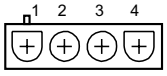


AMP MATE-N-LOK 1-480704-0
(mates with: 1-480705-0 on Motor)

Pin#	Motor
1	BC
2	B2
3	AC
4	A2
5	A1
6	B1



VXM Limit Cable Connector



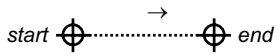
AMP MATE-N-LOK 1-480702-0
(mates with: 1-480703-0)

Pin#	Switch
1,4	Common
2	CCW (-)
3	CW (+)

Easy Programming With Simple Commands

Example #1	Motors run	Function
Set Index and Run	1	Incremental Index Motor one 400 steps positive

```
I1M400,R
```



Example #2	Motors run	Function
Set Index and Run	1	Incremental Index Motor two 600 steps negative

```
I2M-600,R
```

149 Commands Give You Maximum Versatility

VXM Program Stored Commands

Motor commands:

ImMx Set steps to incremental Index motor CW (positive) m=motor# (1,2,3,4), x=1 to 16,777,215

ImM-x Set steps to incremental Index motor CCW (negative) m=motor# (1,2,3,4), x=1 to 16,777,215

IAmMx Set Absolute Index distance, m=motor# (1,2,3,4), x= ±1 to ±16,777,215 steps

IAmM0 Index motor to Absolute zero position, m=motor# (1,2,3,4)

IAmM-0 Zero motor position for motor# m, m= 1,2,3,4

ImM0 Index motor until positive limit is encountered m=motor# (1,2,3,4)

ImM-0 Index motor until negative limit is encountered, m=motor# (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# (1,2,3,4), x=1 to 6000 steps/sec.

SAmMx Set Speed of motor (100% power), m= motor# (1,2,3,4), x=1 to 6000 steps/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# (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 motor 1 and motor 2

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

JMx Jump to the 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 commands:

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) Altering output 1 high for duration of the pause

PA-x Pause x tenths of a millisecond (x=1 to 65,535) Altering 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 output 1 high while waiting

U2 Enable Jog mode while waiting for an input

U3 Disable Jog mode while waiting for an input

U4 User output 1 "low" (reset state)

U5 User output 1 high

U6 Send "W" to host and wait for a "G" to continue

U7 Start of Continuous Index with pulse on output 2

U77 Start of Continuous Index with no output

U8 Start of 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 a front panel button to jump to a program or continue: "Motor 1 Jog -" button to jump to program #1, "Motor 1 Jog +" button to jump to program #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 a front panel button to jump to a program and come back, or continue: "Motor 1 Jog -" button to jump and return to program #1, "Motor 1 Jog +" button to jump and return to program #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 push-button switch

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

VXM Immediate Commands

***Status request commands*:**

V Verify Controller's status, VXM sends "B" to host if busy, "R" if 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 (shows 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,day,year)

getD2 Returns 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 setting for motor m

getJmM Read second Jog Speed setting for motor m

getJAmM Read second Analog Joystick range setting for motor m

getLmM Read mode of limits for motor m

getPmM Read "Pulse Every x # Steps" value for axis m

getPA Read Pulse width used by **setPmMx** and **U7**

getI Read operating mode of 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 controller

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 for 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 x # 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

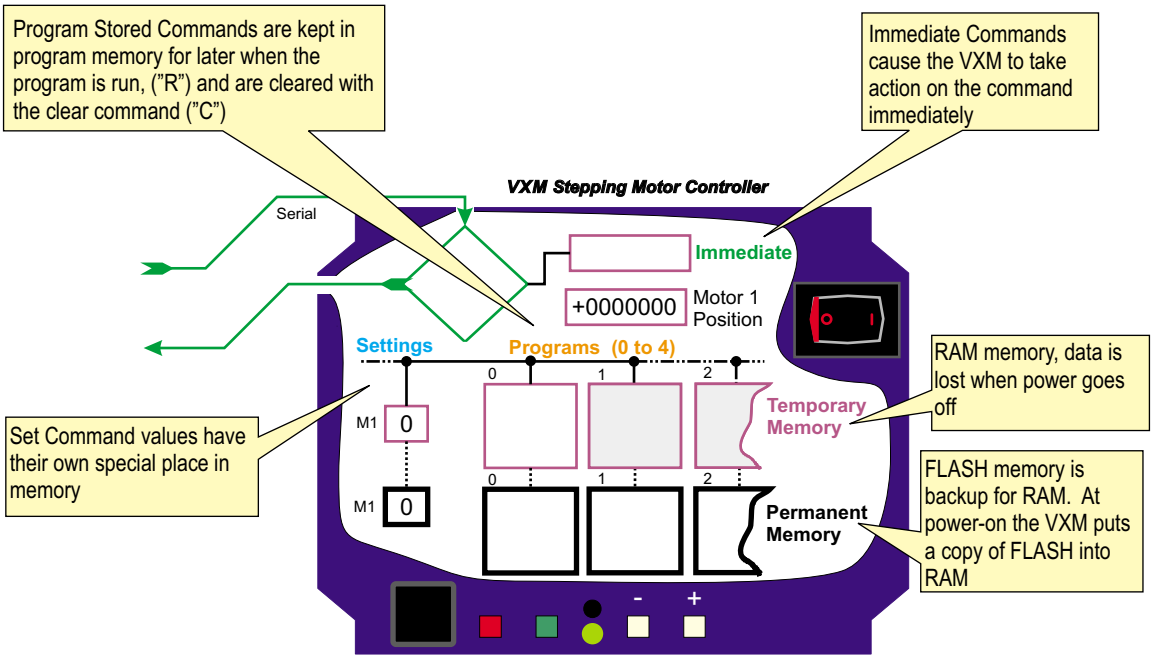
setBx Set RS-232 Baud rate (9=9600, 19=19200, 38=38400)

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

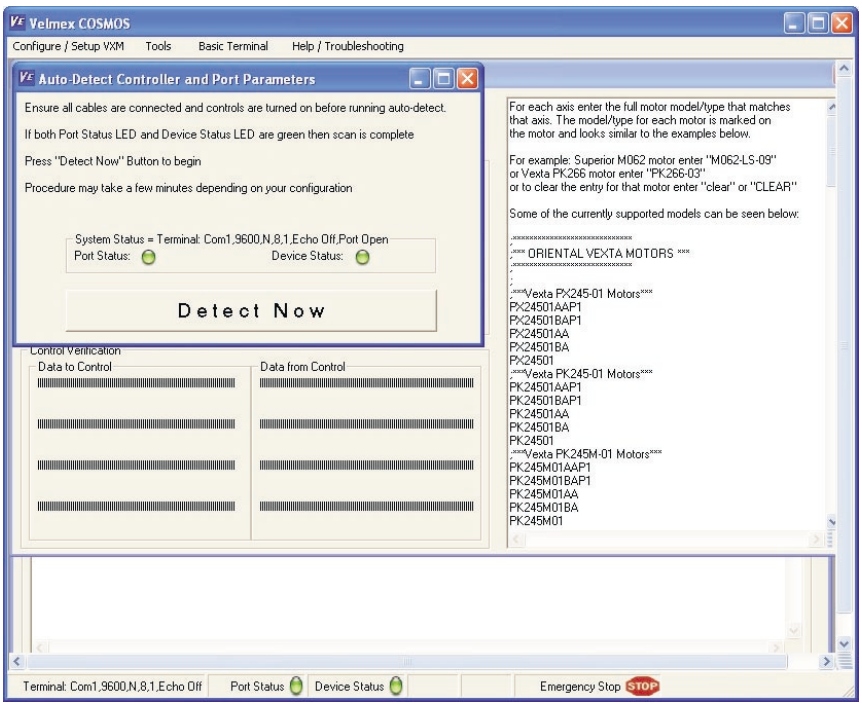


Get "Up and Running" In Record Time With C.O.S.M.O.S.™

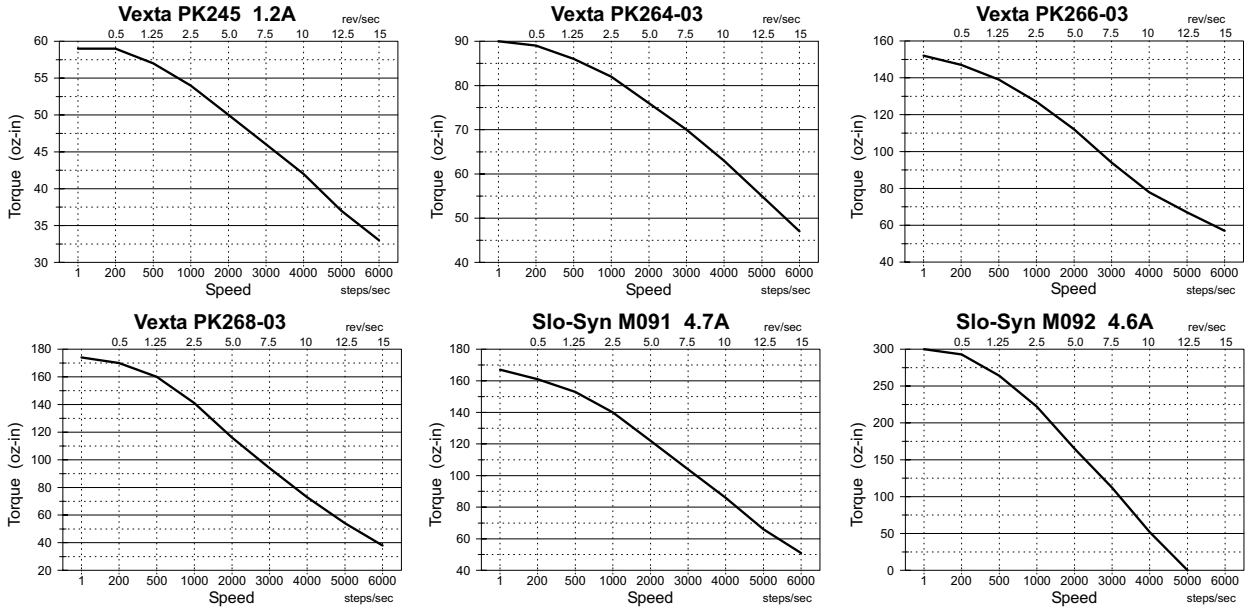
The Velmex COSMOS software for Windows is the easiest way to configure, program, and become familiar with the features of the VXM controller. COSMOS has the following capabilities:

- 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 8" 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 Two 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)

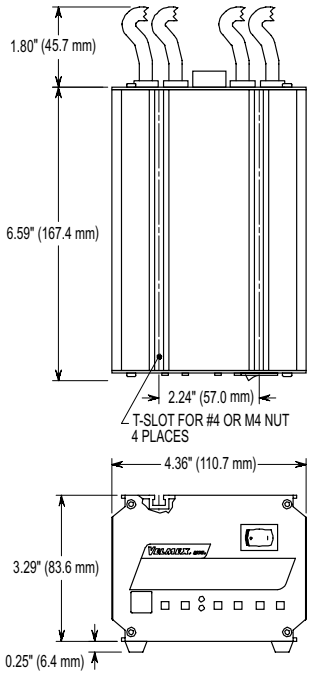
VXM

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

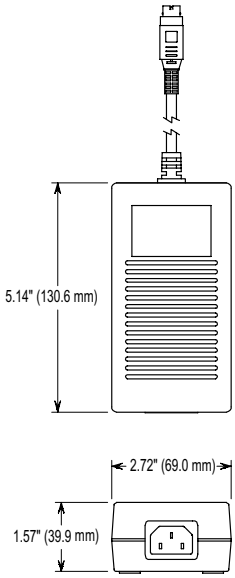
Function:
Switch Mode Desktop Power Supply Complies with FCC Class B, EN55022B and UL1950, CSA 22.2 234, EN60950, CE

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



Models/Price:
(Items below include power supply(s) and connecting hardware on 3 and 4 motor models)
VXM-1 (one motor version) $640
VXM-2 (two motor version, one motor operates at a time) $785
VXM-3 (three motor version two motors can operate at a time).....$1535
VXM-4 (four motor version two motors can operate at a time).....$1680
VXM-1R (one motor version in 19x5.25 rack panel).....$845
VXM-2R (two motor version, in 19x5.25 rack panel) $990
VXM-3R (three motor version in 19x5.25 rack panel).....$1695
VXM-4R (four motor version in 19x5.25 rack panel).....$1840

Options/Price:
USB Serial Adapter.....$39
Digital Joystick.....$95
Analog Joystick for Single VXM.....$125
Analog Joystick for Two VXMs.....$165
Auxiliary I/O Breakout Module.....$49
I/O Splitter.....$10

Call for information on other Options

Contact Information

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