Table of Contents

New Product For 2024

Motors and Controls

VXC MicroStepping Motor Controller/Driver
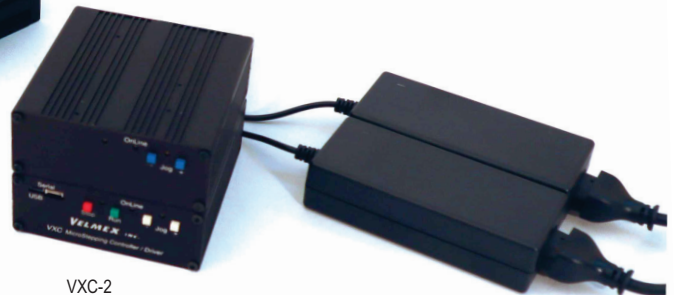

VXC-1

BiSlide Assembly

VXC-2

VXC, a Complete Motor Control Solution

The VXC is a high integration stepping motor controller/drive for "plug-in and run" with Velmex motor driven products. High performance is achieved with a integrated microcontroller that directly controls motor phase switching and all other interface functions. The VXC uses an optimized modulated method and micro-stepping to produce the highest motor torque. This proven design is a dependable and cost effective solution for high precision positioning requirements.

Firmware

- A single host connection can address and coordinate up to 4 motors (Model VXC-4)
- Nonvolatile memory for saving programs
- Use interactively with a computer, PLC, or standalone
- Special looping commands for raster scanning and matrix patterns
- Programmable output trigger to signal external devices
- FIFO buffer to capture motor positions on input trigger
- Conditional branching commands
- Math capability for self calculating long accelerations, self centering, and calculating "return to home" for pick-and-place applications
- Software/input interrupt capability
- Complex motion profiles with Continuous Index Mode
- Simple coordinated motion to produce angles, arcs, and circles
- Command compatible with previously manufactured Velmex VXM Stepping Motor Controller
- Self motor sensing test to verify integrity of motor connections
- Automatic microstepping for smoother low speed operation and 10X higher resolution

Software

- Free Velmex VXC Utility/terminal App for easy setup, test, and programming
- Examples for LabView, Matlab, and most common software languages

Hardware

- Controller with serial interface/Indexer/Driver, AC Power Supply, Power cord, Motor cable, USB cable, and Limit cable included
- Status LEDs, Jog, Run, and Stop input buttons on front panel
- Multipurpose inputs and outputs
- 10 bit analog input for external sensor, setting speed, or for analog joystick control
- Optically isolated limit switch inputs & home input
- Compatible with common size 11 to 34 hybrid 4,6, or 8 wire step motors
- 100-240 VAC input desktop power supply that is UL, CE, CSA, and TUV safety agency compliant
- Energy saving deign automatically de-energizing motors at a standstill, with settable holding torque and failsafe brake control output
- Both USB 2.0 and RS-422/RS-232 serial ports for interfacing with a wide range of host devices
- Customizable Firmware for OEM special requirements
- Motion sensing option with hall sensor input for position verification (stall detection)
- Crystal clock derived timing for precise & accurate motor speeds
- Voltage, Current, Temperature self monitoring
- Rugged all aluminum enclosure
- Ideal for both bench-top use and imbedded designs
- Custom cable lengths and connector options
- Heavy duty motor drive with a 4x over-design for class leading reliability
- 2 Year Limited Warranty

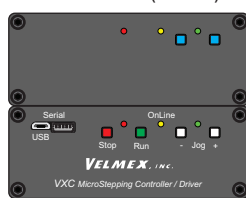## Integrated Versions from One to Four Axis
Multi-axis versions are completely assembled as one unit and factory configured as addressable axes 1,2,3, and 4
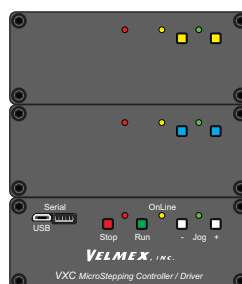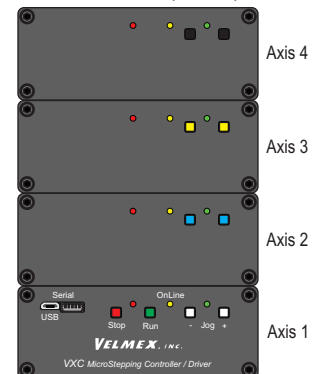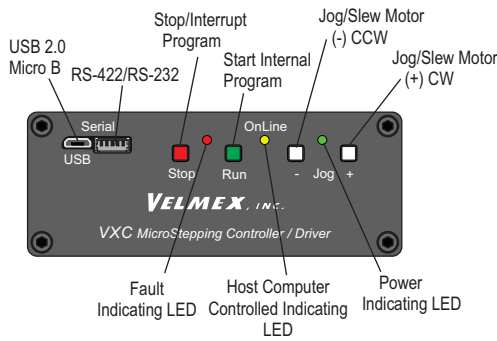
Models

Model VXC-4 (4 Axis)

Axis 4

Axis 3

Axis 2

Axis 1

Model VXC-3 (3 Axis)

Model VXC-2 (2 Axis)

Model VXC-1 (1 Axis)

External Features

Front (Model VXC-1)

USB 2.0 Micro B
RS-422/RS-232
Stop/Interrupt Program
Start Internal Program
Jog/Slew Motor (-) CCW
Jog/Slew Motor (+) CW

Serial
USB
Stop
Run
OnLine
- Jog +

VELMEX, INC.
VXC MicroStepping Controller / Driver

Fault Indicating LED
Host Computer Controlled Indicating LED
Power Indicating LED

Rear (Model VXC-1)

DC Power Supply Input Connection
To Limit & Home Inputs
Auxiliary Inputs and Outputs

24VDC 3A Limits Velmex.com I/O Made in USA
Motor ⚠ Refer to the VXC User's Manual for Operation and Precautions
Model VXC-x Ser # xxxx

To Motor

RS-422 Port

6　1
Molex　#530480610

Pin#	Name
1	Opt. +5V (out)
2	Tx+
3	Tx-
4	Gnd
5	Rx+
6	Rx-

Auxiliary I/O Connection

11 12 13 14 15
6　　　　　10
1　2　3　4　5
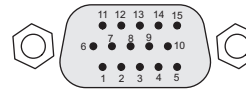
15DSUBHD Socket

Pin#	Name
1	0V (Common Ground)
2	+5V Output (50ma max.)
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	J- (Jog Mtr negative)
11	J+ (Jog Mtr positive)
12	O3 (Output 3)
13	O4 (Output 4)
14	O1 (Output 1)
15	O2 (Output 2)

VXC Motor Cable Connector

1　4
2　3
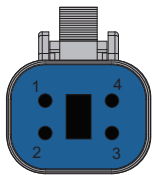
Amphenol #AT06-4S
(mates with: Amphenol #AT04-4P on Motor)

Pin#	Motor
1	B-
2	B+
3	A+
4	A-

Step Motor
A+
A-
+
B+　B-
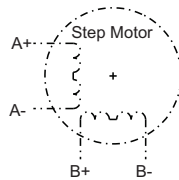
VXC Limit Connection

8　　　1
RJ45 Modular Jack

Pin#	Name
1	Limit CW (+)
2	0V (Common Ground)
3	Limit CCW (-)
4	+10V Output
5	Chassis Ground
6	0V (Common Ground)
7	Home Input
8	0V (Common Ground)

Easy Programming With Simple Commands

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

```
I1M400,R
```

start ⟶ end

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

```
I2M-600,R
```

end ⟵ start

Over 150 Commands For Maximum Versatility

VXC Program Stored Commands

Motor commands

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

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

ImMx.y   Micro-Incremental Index motor CW, x.y= 0.1 to 1,048,575.9 steps

ImM-x.y   Micro-Incremental Index motor CCW, x.y= 0.1 to 1,048,575.9

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

IAmMx.y Micro-Index to Absolute position, x.y= ±0.1 to ±1,048,575.93

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 home or positive limit is encountered   m=motor# (1,2,3,4)

ImM-0   Index motor until home or negative limit is encountered, m=motor# (1,2,3,4)

(i3,i1...)   Combine Index commands to run multi-axes simultaneously

SmMx   Set Speed of motor (70% power), m= motor# (1,2,3,4), x= 1 to 61.9 in 0.1 step/sec intervals, 62 to 6000 in 1 step/sec. intervals

SmM-x   Set Speed of motor (40% power)

SmM+x   Set Speed of motor (100% power)

SmMX   Smart Speed, sets motor to maximum speed based on load & motor attached, m= motor# (1,2,3,4)

AmMx   Acceleration/deceleration, m= motor# (1,2,3,4), x=1 to 127.

AmMX   Smart Acceleration, sets motor to maximum acceleration based on load & motor attached

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

Jx   Jump to the beginning of program x, x=0 to 12

JMx   Jump to the beginning of program x and come back for more after program x ends, x= 0 to 12

Pausing commands

Px   Pause x seconds, (x=0.0001 to 5.9999 & 6.0 to 6553.5 sec.)

PAx   Pause x seconds (x=0.0001 to 5.9999 & 6.0 to 6553.5 sec, 10 μsec when x=0) 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

U10   Synchronize Master and Slave Axis

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

U14   User output 2 low (reset state)

U15   User output 2 high

U16   User output 3 low (reset state)

U17   User output 3 high

U18   User output 4 low (reset state)

U19   User output 4 high

U23   Wait for a front panel button to jump to a program and come back or continue

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

U65   Stop Slave Axes

U66   Kill Slave Axes

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 24 additional commands for addressing the I/Os on the second VXM of two linked controls

VXC Immediate Commands

Status request commands

Help	Help Menu (For use with Terminal App interface)
V	Verify Controller's status, VXC sends "B" to host if busy, "R" if ready, "J" if in the Jog/slew mode, or "b" if Jog/slewing, "F" when in fault
X	Send current position of motor 1 to host (Motor can be in motion)
Y	Send current position of motor 2 to host (Motor must be stationary)
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)
Mem	Request Memory available for currently selected program
lst	List current program to host
lss	List all settings to host
x	Send last 4 positions of motor 1 to host
y	Send last 4 positions of motor 2 to host
z	Send last 4 positions of motor 3 to host
t	Send last 4 positions of motor 4 to host
#	Request the number of the currently selected motor
∗	Request the position when the last motor started decelerating
@	Read user analog input value
PM	Request the number of the current Program
PMA	Request the current program associate number
getF	Read current fault
getFA	Read all current faults (maximum of 10 last)
getF-	Read last fault copied to EEPROM memory
getMTmM=	Read motor type/size selected for axis m
getKmM	Read Backlash compensation setting
getDM	Read operating mode of VXC (8 bit binary value)
getD0	Gets the VXC's firmware version
getD1	Gets the VXC's firmware date code
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
getMJmM	Get Motor Jog function settings 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

VXC Math & Logic

+,-,*,/	Add, Subtract, Multiply, Divide
=,>,<,~	Equal, Greater Than, Less Than, Not Equal
a,b,c	General purpose variables
if	if <expression> True=do next/False=skip next
end	End the program on the result of an "if"
@	Analog value
X	Motor 1 position value
I	Index value
S	Speed value

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
:	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 Jog mode)
R	Run currently selected program
!	Record motor positions for later recall with "x","y","z","t" commands
rsm	Run save memory (saves setup & program values to nonvolatile memory)
rss	Run save settings (saves setup values only)
res	Software reset controller
del	Delete last command
[i1,i2...]	Send data to Slave axes through Master
PMx	Select Program number x, x= 0 to 12
PM-x	Select and clear all commands from Program number x, x= 0 to 12

VXC Setting Commands

setMLHmM=x	Set for Motor, Limits, & Home to Device ID x
setMTmM=x	Set axis m for Motor Type x
setDMx	Set VXC to VXM emulation mode, and other operating parameters
setDAx	Set Analog Joystick Deadband value
setjmMx	Set first Jog Speed setting for motor m
setjAmMx	Set first Analog Joystick range setting for motor m
setJmMx	Set second Jog Speed setting for motor m
setJAmMx	Set second Analog Joystick range for motor m
setKmMx	Set Backlash Compensation
setLmMx	Set limit switch mode for axis m
setMJmMx	Set Motor Jog function to x
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 serial port baud rate (9=9600, 19=19200, 38=38400, 57=57600=Default)
setHSmMx	Set Home/Stall input to x for axis m
PMAx,y	Program Associate axes x to program y (Coordinate programs in master/slaves to start/run simultaneously)

Free Software and Support

Rapid Configure and Run With The VXC Utility App
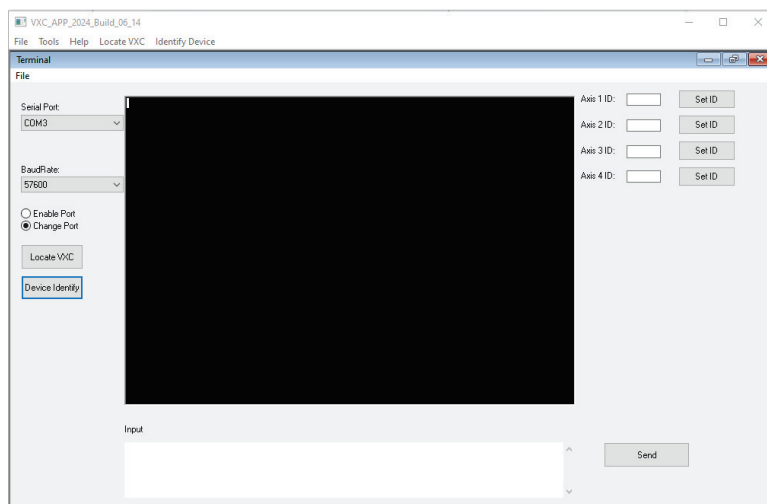
The Velmex VXC Utility App for Windows is the easiest way to configure, program, and become familiar with the features of the VXC controller. The VXC Utility App has the following capabilities.
• Establish serial port for communication
• Retrieve and update setup information
• Display status and error messages
• Move motor(s) exact distances without programming
• Enter and test programs directly with the VXC

VXC Utility App can be downloaded at www.VelmexControls.com

Code Examples for Common Software

Visit VelmexControls.com for software examples in different languages*
•Labview
•Matlab
•BASIC
•Visual Basic
•Visual C
•VB.NET
•C#
•Visual C.Net

*The above names are trademarks of their respective owners. This is a partial list of supported software, email: Suport@Velmex.com for up to date drivers and examples

Motor Performance

The VXC's integrated motor drive is a Velmex design based on 40 years of experience in micro-controller "direct driving" stepping motors.   The benefits of this design are maximum efficiency, high torque, smooth motor motion, and industry leading reliability.

Refer to VelmexControls.com for the motor selections and their related torque curves.

Options

Switchable Power Strip

4 outlet power strip with lighted switch for convenient powering on/off for all VXC-1, VXC-2, VXC-3, VXC-4 models.
Features: Surge protection, built-in circuit breaker, 3ft power cord, UL certification

USB Serial Cable

The USB 2.0 A Male to USB 2.0 Micro B Male connects your computer to the VXC USB port. This RoHS compliant cable is a 3 meter (10 ft) long, twisted-pair construction to eliminate cross talk to ensure error free data transfer.

RS-422 Adapters/Converters
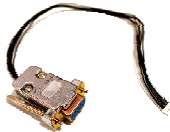
These adapters provide convenient connection/conversion with the front panel RS-422 port. The RS-422 to Terminal Block adapter allows easy wiring between the VXC and other host devices.   The RS-422 to RS-232 DB9 adapter makes the VXC plug and interface compatible to legacy RS-232 host computers and PLCs.

Digital Joystick

The optional Digital Joystick allows remote jog control of a one or two axis VXC 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. Input button switch allows toggling between two 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 set speed ranges. Input button switch allows toggling between two settable speed ranges. Simultaneous two axis motion is accomplished with a VXC-2. There are additional Joystick options available in different sizes with and without an enclosure.

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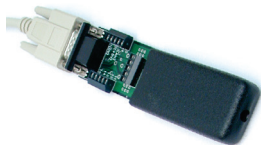
The optional auxiliary I/O breakout module is a convenient method to interface to the VXCs auxiliary I/O. Wire (26 to 18 AWG) connections can be made to all 15 I/Os using the screw type terminal blocks. A 6 foot cable and a PVC insulating boot is included.

Limit/Home Breakout Module
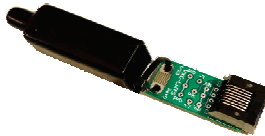
The optional Limit/Home Breakout Module provides a reliable method for mating to the VXC limit cable when using non Velmex actuators. Limit switch and Home switch connections to this module require soldering, and accommodate 22 to 30 AWG wires or cables. A cable (tie) strain relief and a PVC insulating 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 VXC at the same time. The splitter has 8" cables with a DB15HD plug connector to two DB15HD socket connectors.

Mounting Cleats

XMC-2 mounting cleats provide a secure method to mount the VXC to a any solid surface.

Special Options
- Input terminal for data entry
- OEM mountable joysticks
- Potentiometer speed input
- Network and wireless adapters
- Open chassis for OEM embedded applications
- Thumbwheel program selector switch
- Custom programming
- Customized cables & connectors

Optional Rack Mounting Kit

The VXC-xRK rack mounting kits are based on a 2U size 10" deep rack shelf and large paddle power switch.
Two XMC-2 cleats and fasteners are included for securing the VXC to the shelf. All necessary splitter power cord cables included. The VXC and power supplies are shipped separately from this kit.

Rack Kit Model #	For VXC Model #	Maximum Height
VXC-12RK	VXC-1 and VXC-2	3.5" (89 mm)
VXC-3RK	VXC-3	4.62" (117 mm)
VXC-4RK	VXC-4	6.12" (156 mm)

VXC-12RK shown with VXC-2

Optional Universal Mounting Plate

4.96" (126.0mm)
4.58" (116.4mm)
4.96" (126.0mm)
4.58" (116.4mm)
0.25" (6.3mm)
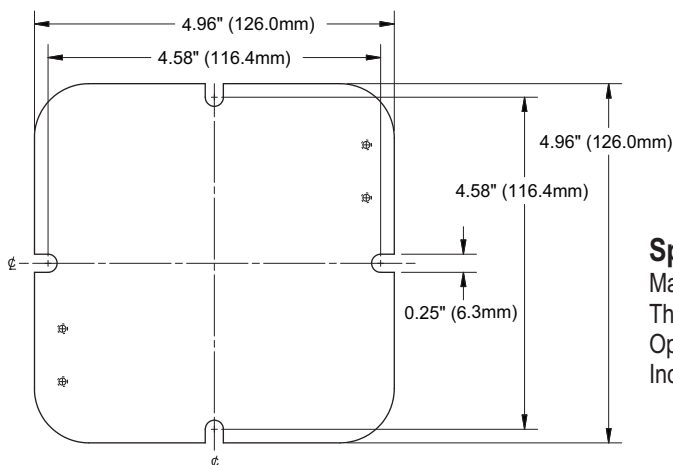
The Universal Mounting plate provides a convenient method to mount a VXC to T-slot profiles with 1/4" or M6 fasteners. Available in natural aluminum finish or black anodized.

Specifications
Matl: 6061 Aluminum Alloy
Thickness: 0.125" (3.18mm)
Options: Black Anodize
Included: XMC-2 cleats (2)
                6-32 x 3/8" Skt Hd Cap Screws (4)

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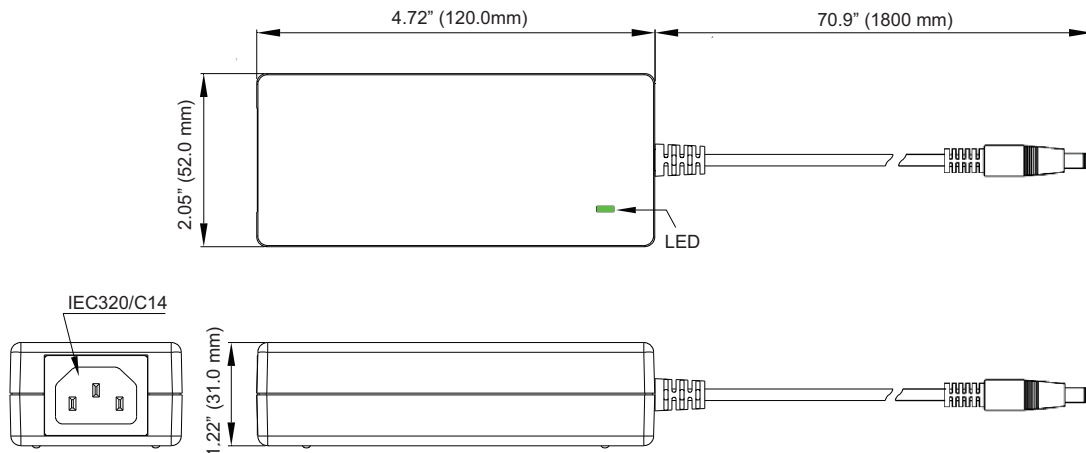This limited warranty give you specific legal rights which vary from State to State.
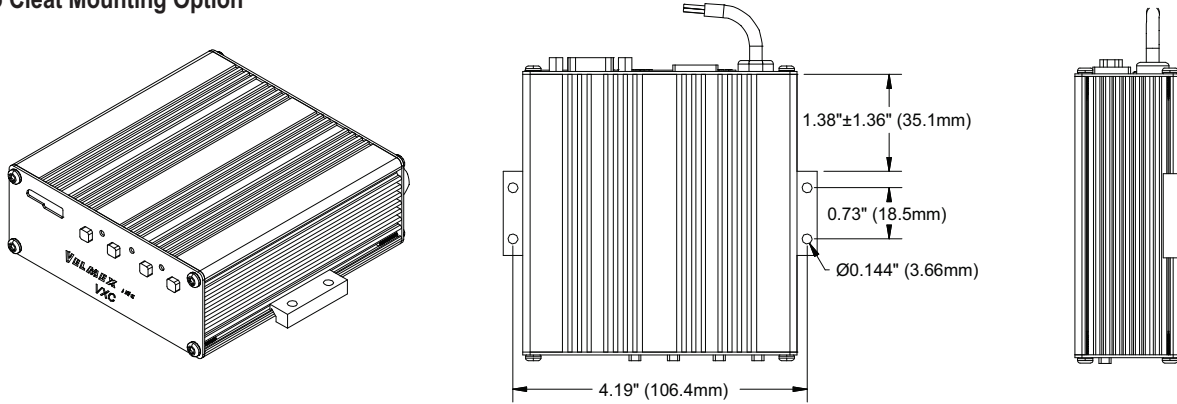
Dimensions

VXC

1.00" (25.4mm)

4.12" (104.6mm)

VXC-1

3.90" (99.1mm)

H

0.11" (2.8mm)
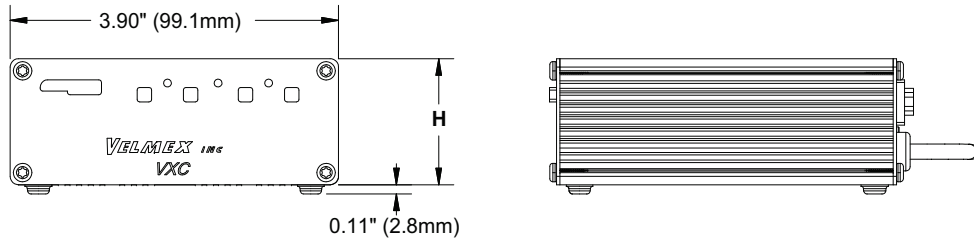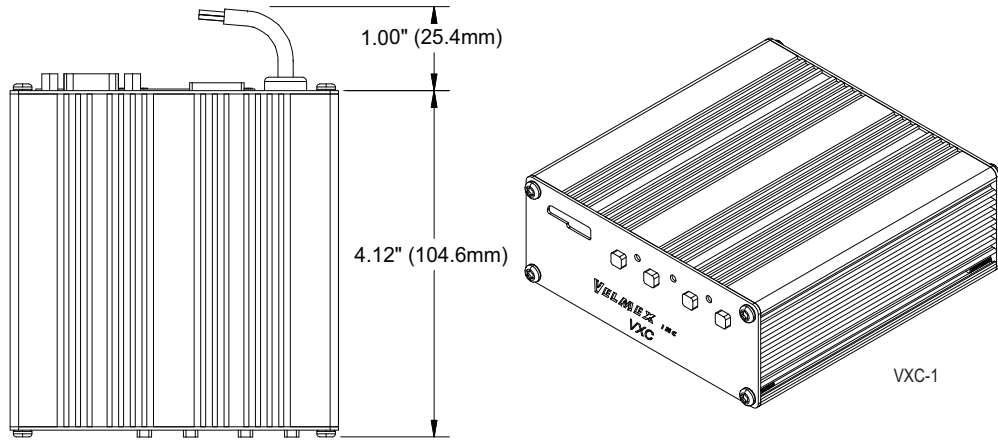
Model	H
VXC-1	1.50" (38.1 mm)
VXC-2	3.00" (76.2 mm)
VXC-3	4.50" (114.3 mm)
VXC-4	6.00" (152.4 mm)

Power Supply

4.72" (120.0mm)   70.9" (1800 mm)

2.05" (52.0 mm)

LED

IEC320/C14

1.22" (31.0 mm)

Two Cleat Mounting Option

1.38"±1.36" (35.1mm)

0.73" (18.5mm)

Ø0.144" (3.66mm)

4.19" (106.4mm)

Four Cleat Mounting Option

0.73" (18.5mm)

3.39" (86.1mm)

+0.06" (1.5mm)
-1.40" (35.6mm)
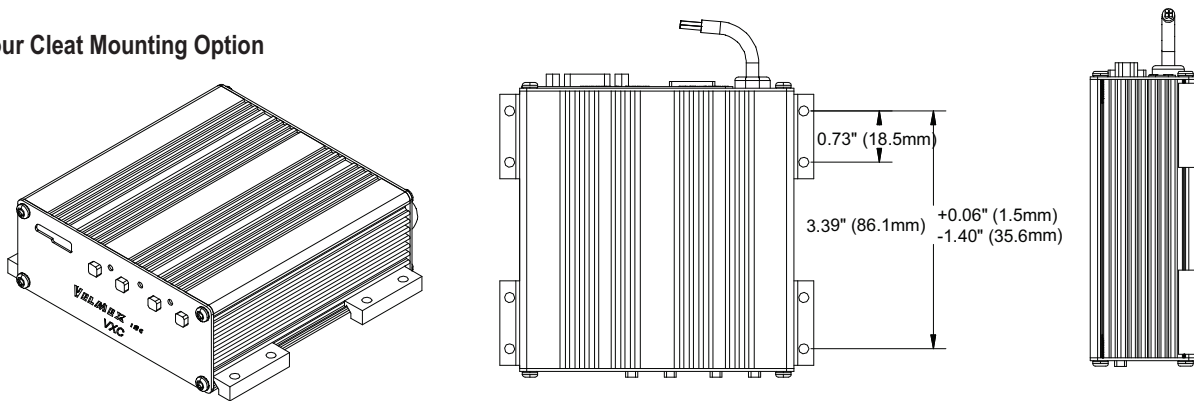
VXC-1 Mounting to Optional Universal Mounting Plate

Serial
USB
OnLine
Stop
Run
Jog
VXC MicroStepping Controller / Driver
VELMEX, INC.
VXC

6-32 x 3/8" Skt Hd Cap (4)

XMC-2 (2)
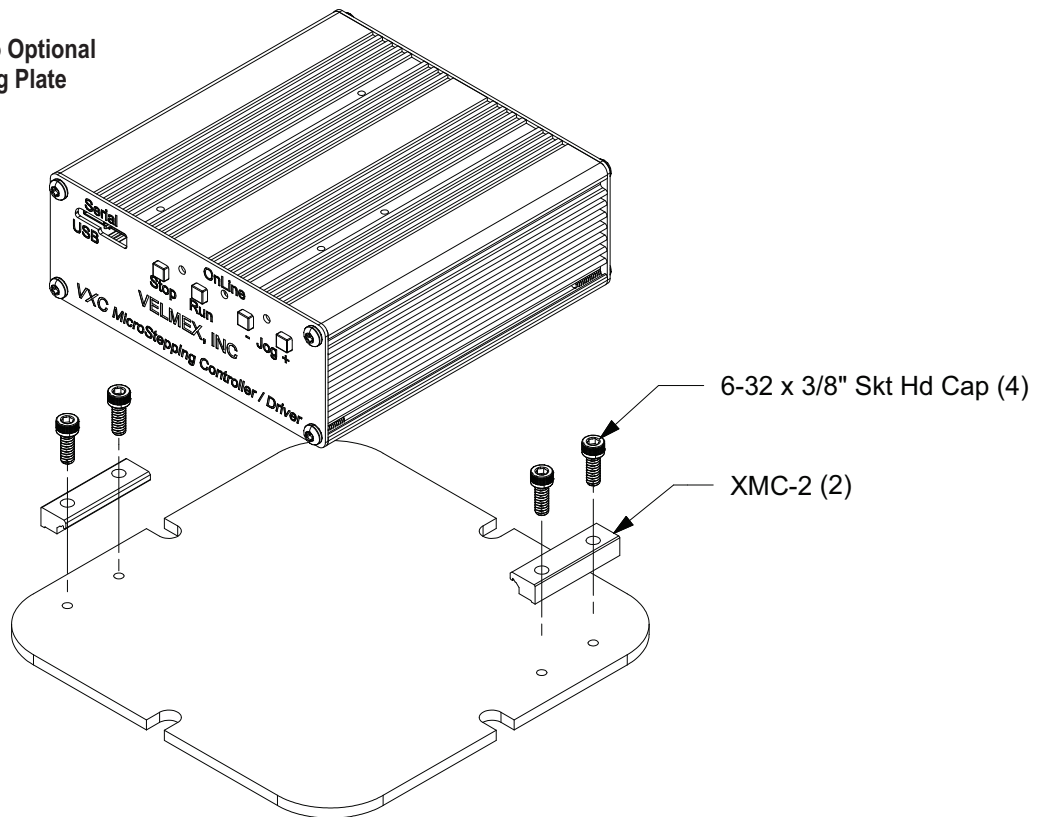
Specifications

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

Function
Motor Controller/Drive with Half-step/Micro-step for size 11 to 34 hybrid stepping motors.

Motor Drive
Type: Bipolar, 31.25 kHz PWM
Output: 3A RMS, 8A peak

Physical (VXC-1)
Weight: 1.3 lbs (0.57 kg)
Height (without feet): 1.5" (38.1 mm)
Width: 3.90" (99.1 mm)
Length: 4.42" (112.3 mm)

Cabling
Integrated 10 ft (3 meter) long Motor Cable, 10 ft (3 meter) Detachable Limit Cable

I/O
All inputs & outputs impedance protected and with internal diodes to +5V and Gnd
Outputs: 5V TTL 25mA maximum
Inputs: 5V TTL compatible active low (4.7k ohm internal pull-up)
Limits and Home input optoisolated (powered by onboard user 10V)

Serial Ports
USB: USB 2.0 standard, micro B connector, electrostatic discharge (ESD) protection > 4 kV
Host controlled/programed with USB-2.0 and RS-422 Interfaces, 8 Data, No Parity, 1 Stop, 57600 (default), 9600,
19200, 38400 baud rate settable.
RS-422 (Configurable to RS-232): Four wire full duplex transceiver with ±18-kV IEC ESD protection
Signals: Tx-, Tx+, Rx-, Rx+
Biasing Resistors on Rx: 4.7k Ohms
Termination: None

Power Supply (Cincon #TRH70A240-11E03-Level-VI)

Function
Switch Mode Desktop Power Supply
Complies with IEC/EN/UL 62368-1, EN55032 and CISPR/FCC Class B, CoC Tier 2 and DOE Level VI

Physical
Weight.1.0 lbs (0.45kg)

Integrated 1.8 meter (71in) output cable.
AC Cord included: NEMA 5-15P plug, 0.9 meter (3ft) long (other cords available on request)

Electrical Requirements
100-240VAC 1.5A 47-63Hz

Output (to VXC) 24VDC 3A

Contact Information

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