

## Motion Plus™ VRP 100

### Digital Controller for

### Variable Ratio Profiling



#### Features

- Provides ratio solutions for applications requiring cyclic functions such as: rotary knife, index and flying shear cycles
- Highly accurate digital control of follower position using a reference transducer
- Loop and calibration setup parameters are established in software. They can be edited and stored from the keypad or transmitted over the serial link
- A profile can be defined and entered from the keypad, using menu-selected statements
- Battery-backed RAM allows user profiles and setup parameters to be saved while power is off
- RS 232 serial port allows listing to a printer, external profile storage and downloading, or remote operation of one unit. RS 485 serial port allows remote operation of one to eight units
- An access control input is available to restrict unauthorized profile and setup changes
- Analog follower servo interface can be set for voltage or current output
- Designed for panel mounting on new and retrofit machine automation projects
- All signal connections made at conveniently labeled plug-in terminal blocks
- 12 programmable limit switch outputs for use within a machine cycle
- Built-in reference position interface is compatible with incremental encoders and 10- or 12-bit binary or Gray code absolute devices
- Built-in serial communications allows editing, transfer of cam motion programs and setup parameters from host computers
- External program selection and control allows easy integration of the VRP 100 with programmable controller-based systems
- Overtravel limit inputs are available for equipment protection
- Camming profiles can repeat from the same starting position or be consecutive
- On board storage of up to four profiles gives the VRP 100 rapid flexibility for quick change, short run applications

## Motion Plus™ VRP 100

### Functional Description

The VRP 100 is designed as a complete stand-alone unit requiring no additional circuitry to monitor a reference transducer and to provide the velocity command to a servo controlled follower actuator to replicate a machine's mechanical function.

The VRP 100 is an excellent alternative for mechanical clutch/brake systems.

The VRP 100 will also provide ratio solutions for applications that require cyclic functions such as:

- rotary knife cycles
- index cycles
- flying shear cycles

Also, the VRP 100 provides 12 programmable outputs (programmable limit switch) for activating ancillary machine devices throughout a cycle.

An integral keypad and LCD display are used to set up control parameters, to enter profiles, to monitor functions and to jog the follower axis directly.

### Transducer Interfaces

Two incremental encoder interfaces are provided at J5 (follower encoder) and J6 (reference encoder). Each of these interfaces provides connections for A+, A-, B+, B-, Marker+, Marker-, +5 Vdc (or +12 Vdc) and a ground for the encoder, all on one terminal strip.

Also, an absolute 12-bit reference interface is provided at J4. These connect to the digital output lines of an absolute transducer with a maximum +5 V digital output. The transducer output may be any of the following types:

- 10-bit binary
- 12-bit binary
- 10-bit Gray code
- 12-bit Gray code

### Servo Control Interface

The servo control interface includes the following inputs and outputs:

#### •Servo Command Output

The servo output pair (Command + and Command -) is configured for -10 V to +10 Vdc single-ended voltage output. With jumper changes it can be configured for the following outputs:

- 50 mA current sourcing output
- 25 mA to 100 mA current sourcing output (component change required)
- -5 to +5 Vdc single-ended voltage output
- -10 to +10 Vdc differential voltage
- 0 to +10 Vdc single-ended voltage (component change required)

#### •Drive Enable Output

The drive enable output is configured for active low output. With jumper changes, it can be configured for active high or contact closure output. It can be configured to pull up to an internal or external voltage, or down to an internal or external ground. The polarity is also jumper selectable.

#### •Drive Fault Input

The drive fault input is current sourcing (low is active). The fault sense (HIGH or LOW) can be changed from the keypad. When a drive fault is encountered, the fault input acts through software to disable the drive and display an error message on the LCD screen.

#### •Overtravel Limit Inputs

Limit inputs are current sourcing (low is inactive). The limits are hard-wired to the enable output, so that exceeding a limit turns off the enable output to disable the axis.

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## Programmable Limit Switches

Twelve outputs are user programmable. They can be used as “programmable limit switches” to control external events to the running profile. A profile can be defined to turn any output on or off at any point.

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## Serial Communications

The standard RS 232 serial interface allows profiles and setup data to be sent to a printer or other external device. Alternatively, the RS 232 interface allows two-way communications with an external host (such as a personal computer).

The RS 485 Serial Communications mode (jumper selectable) allows a multi-drop configuration using a host plus up to eight VRP 100 Controllers.

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## Operation

A VRP 100 Controller can be used in the following ways:

- Independently, as a stand-alone control system. In this mode, the VRP 100 Controller is programmed from the keypad. The stored profiles can then be selected and started by external switches or relays. Also, the jog inputs allow an operator to jog the follower axis from external switches.
- With digital I/O connections to an external programmable logic controller. In this mode, stored profiles are selected and started by the external controller. The external controller can also interact with the running profile via the digital inputs and outputs.
- Integrated through the serial interface into a multiple controller system. In this mode, up to eight controllers can be connected to a host device such as a personal computer for two-way communications.

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## Optional Features (VRP 500)

The following features have special firmware to help solve specific application requirements.

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<b>VRP 500 Index Registration Software</b>	Application software specifically designed for the automatic calculation of profiles for indexing an axis. The speed of indexing is based on the speed of a reference axis. The operator enters the length of the part and the profile is generated. The length of the index can be modified by a registration mark as well. <ul style="list-style-type: none"><li>• Includes application software documentation</li><li>• Index to a registration mark</li><li>• Follows the speed of external equipment</li><li>• Automatic synchronization to registration marks</li><li>• Output for batch counter</li><li>• Includes VRP 100 Controller with special labels</li><li>• Order part 462576-04</li></ul>
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<b>VRP 500 Rotary-Cutoff-Knife Software</b>	Application software specifically designed to control rotary knives. The VRP 500 controls a servo motor attached to the knife while following the nip rolls that feed material. <ul style="list-style-type: none"><li>• Includes application software documentation</li><li>• Cut at matched speed or programmable overspeed</li><li>• Trim length on-the-fly</li><li>• Knife will speed up or slow down to make cut</li><li>• Includes VRP 100 Controller with special labels</li><li>• Order part 462576-05</li></ul>
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<b>VRP 500 Variable Profiler Software</b>	Application software specifically designed for the automatic calculation of new profiles from seed profiles and a programmable length. Either new profiles are stretched in proportion to the programmed length, or a dwell portion is added. <ul style="list-style-type: none"><li>• Includes application software documentation</li><li>• Proportional profile generator</li><li>• Dwell mode operation</li><li>• Registered operation</li><li>• Includes VRP 100 Controller with special labels</li><li>• Part length changes can be made while operating</li><li>• Order part 462576-09</li></ul>
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<b>VRP 500 Linear Actuator Software</b>	Special software designed for applications that use an incremental reference encoder and a linear (absolute) follower transducer. <ul style="list-style-type: none"><li>• Servo controlled linear actuator (i.e. lead screw or hydraulic cylinder)</li><li>• Absolute encoder feedback</li><li>• Temposonics® feedback with counter card</li><li>• All VRP 100 capabilities available</li><li>• Includes VRP 100 Controller with special label</li><li>• Order part 462576-12</li></ul>
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## Digital I/O

**Inputs.** In addition to the absolute reference inputs, other inputs include the following:

Run	Starts the currently selected profile.
Prof Select 1 and 2	Selects one of four profiles.
Interlock	If off, stops running profile(s) and disables the axis.
Access	If off, allows operator to select and monitor functions, but prevents unauthorized operator access to defining profiles and setup functions.
Jog +, Jog -	If on, moves the follower axis in the specified direction.
Home F	If on, begins the homing sequence for the follower axis.
Home R	Allows the reference axis home position to be defined (if necessary).
Sense Home F	A home switch for the follower axis.
Sense Home R	A home switch for the reference axis (if needed).

**Outputs.** The VRP 100 outputs include the following:

Ready	Indicates that the controller is not running a profile and is not busy with profile editing or calculations.
Status	Indicates that no errors exist.
Aligned	Indicates that the follower axis is aligned (in position).
Homing	Indicates that the reference or follower is being homed.
Outputs	12 user programmable limit switch outputs to provide any necessary machine timing within a cycle.

## Dimensions

Figure 2 shows the overall dimensions and space requirements of the VRP 100 Controller.

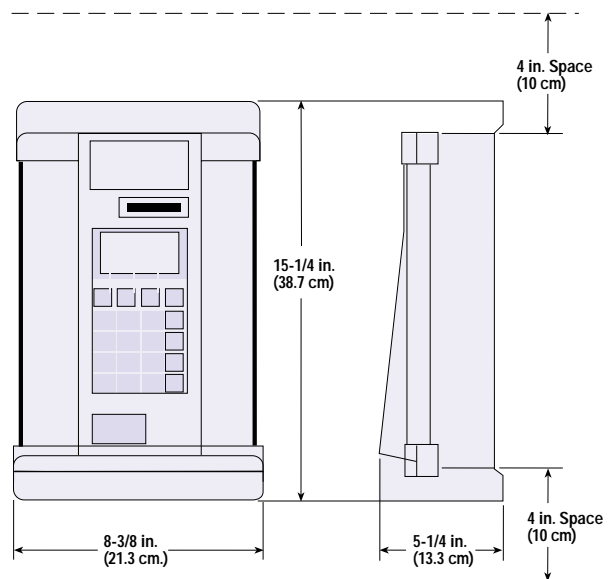


Figure 2. Overall Dimensions

### Motion Plus™ VRP 100 Specifications

Parameter	Specification
<b>CPU</b>	12.5 MHz 80C188 microprocessor
<b>Memory</b>	
System EPROM	Up to 64 KB
CMOS battery-backed RAM	32 KB
<b>Digital Outputs</b>	12 user-programmable outputs ("programmable limit switches" with update time of 1 ms)
	Dedicated outputs (Ready, Enable, Aligned, Homing)
	Optical isolation
	Current sourcing (25 mA maximum at 15 Vdc) (75 mA maximum with external 15 to 24 Vdc supply)
	Active high (ON = high)
<b>Digital Inputs</b>	8 dedicated inputs (2 Profile Selects, Run, Jog+, Jog-, Home F, Home R, Access)
	Optical isolation
	Current sinking (10 mA maximum)
	Active high (10 Vdc minimum to 24 Vdc maximum for active high)
<b>Servo Interface</b>	
	Limits, Interlock, Sense
	Current sourcing (pulled low is inactive)
<b>Drive Fault</b>	Fault input current sourcing (pulled low is active)
<b>Drive Enable</b>	Active low standard, software selectable (Optional active high or contact closure with jumper change)
	75 mA, 24 V maximum
<b>Servo Outputs</b>	
Standard	-10 to +10 Vdc single-ended
Options:	
Current Sourcing	50 mA (jumper selectable) 25 mA to 100 mA (component change required)
Voltage, Singled Ended	-5 to +5 Vdc (jumper selectable) 0 to +10 Vdc (component change)
Voltage, Differential	-10 to +10 Vdc (jumper selectable)
Servo loop update time	1 ms
<b>Follower Encoder Interface</b>	J5 interface to incremental optical encoder requiring either +5 Vdc or +12 Vdc, with either TTL or differential output
	5 V at 400 mA or 12 V at 300 mA
	The software limit on encoder input rate is 750 kHz

Parameter	Specification
<b>Reference Encoder Interface</b>	J6 interface to incremental optical encoder requiring either +5 Vdc or +12 Vdc, with either TTL or differential output
	The maximum encoder input rate to the controller is 750 kHz (5 V at 400 mA or 12 V at 300 mA)
	J4 interface to absolute encoder requiring UDN 2981 or equivalent sourcing driver
<b>Reference Encoder Absolute</b>	Gray code or binary output with 10 or 12 bits of resolution (+5 V maximum, 10 mA typical, 18 mA maximum per input)
<b>Velocity (Gray code)</b>	10-bit      1000 rpm maximum
	12-bit      250 rpm maximum
<b>Velocity (binary)</b>	10-bit      600 rpm maximum
	12-bit      150 rpm maximum
<b>Serial Interface</b>	RS 232
	RS 485 option (with jumper change)
<b>LCD Display</b>	4 lines X 16 characters, (supertwist)
<b>Keypad</b>	20 keys, including 3 function keys
<b>AC Power Input</b>	
Voltage	90 to 264 Vac
Frequency	47 to 63 Hz
Current	1A continuous at 230 Vac 2A continuous at 115 Vac
<b>Optional External Power Supplies</b>	Can be used for: Digital I/O (jumper changes required) +15 V to +24 V (current depends on loads) Limits and enables (jumper changes required) +15 V to +24 V
<b>Environmental Conditions</b>	
Temperature	0° to 50° C (operation or storage)
Humidity	10% to 90% humidity, noncondensing
<b>Overall Dimensions</b>	Height: 15.25 in. (38.7 cm)
	Width: 8.375 in. (21.3 cm)
	Depth: 5.25 in. (13.3 cm)
	Weight: 7.5 lb. (3.4 kg)

*Specifications are subject to change without notice. Contact Custom Servo Motors Inc. for verification of specifications critical to your needs.*

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