VERSA BUILT

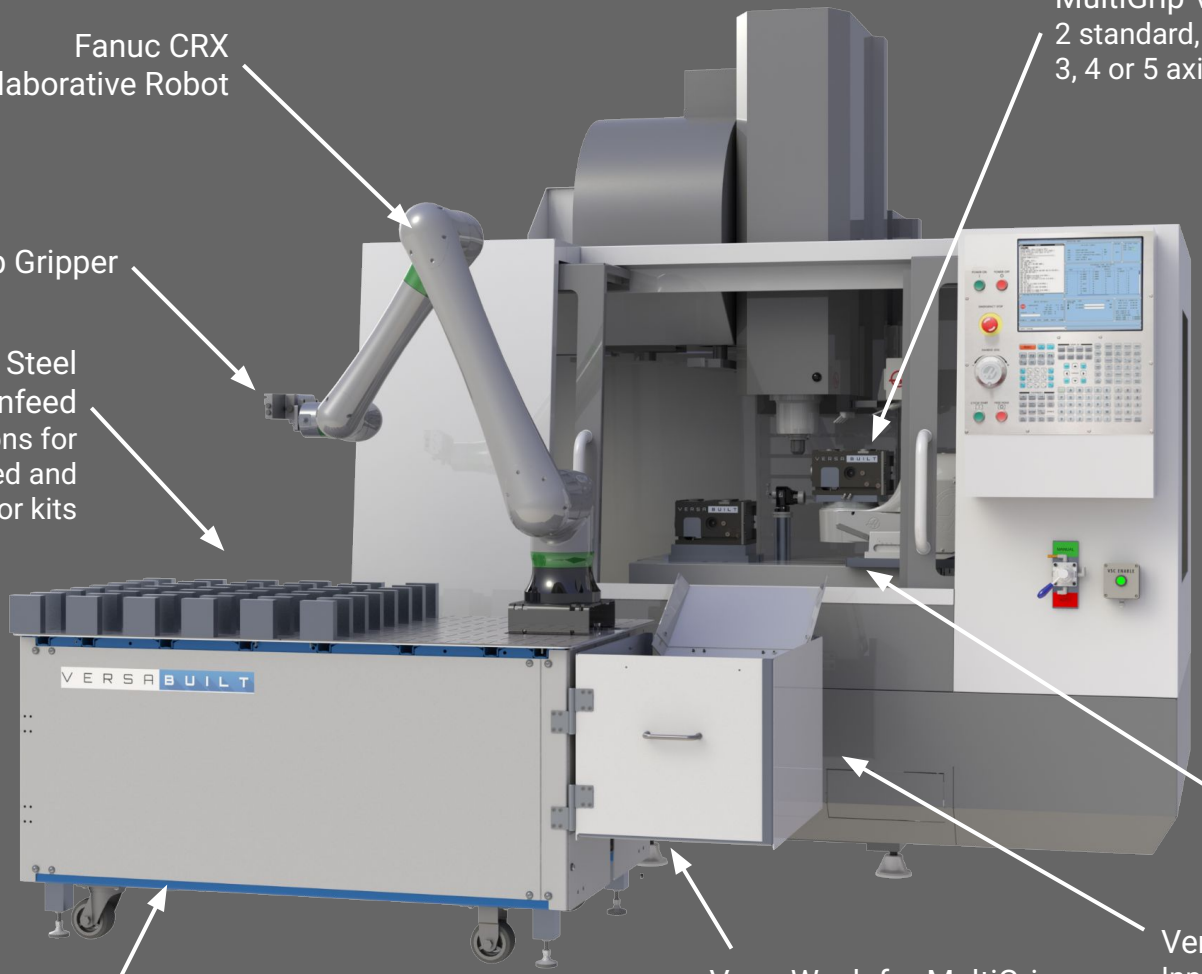
Mill Automation System with MultiGrip and Fanuc CRX

Fanuc CRX
Collaborative Robot

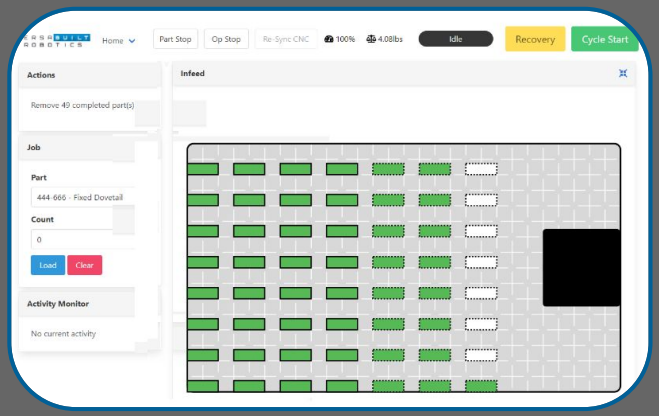
MultiGrip Gripper

Stainless Steel
Visual Infeed
*options for
oversized and
part locator kits

MultiGrip Vises
2 standard, up to 4
3, 4 or 5 axis compatible



Intuitive VSC User Interface



Hand Valves
For manual tending

Applications:
- Vertical Mill
- 3, 4, 5-axis
- High-Mix
- Multiple Operations

VersaBuilt System Controller (VSC)
Inputs and Outputs, Computer, Pneumatic control
Integrated with VersaCart

VersaCart
1300 or 1700 models

VersaWash for MultiGrip
Chip Control
Pivots away for manual access

No Robot Programming

Install in 1-2 days

Plug and Play with any CNC

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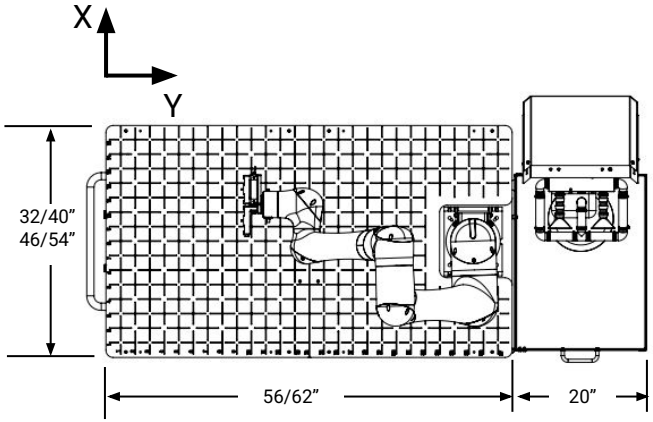
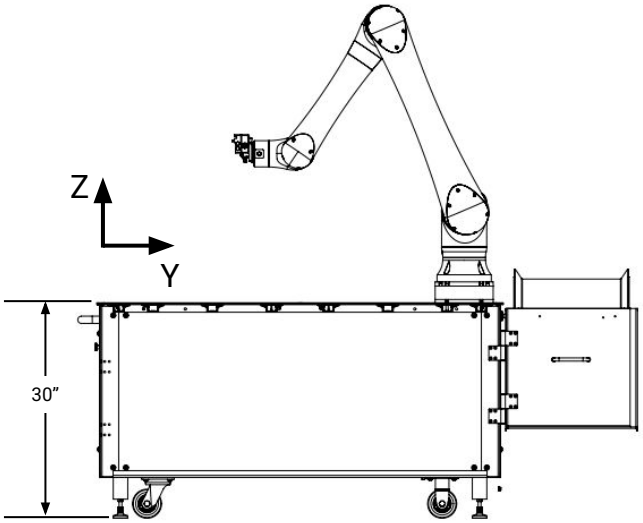
Hardware & Software included **Base System*	VersaCart 1300 with Standard SS Visual Infeed	1x MultiGrip Gripper 2x MultiGrip Vises 2 Sets of MultiGrip Jaws	VersaWash for chip mitigation
	VersaBuilt System Controller (VSC) w/ I/O, Pneumatics and CPU	Inputs and Outputs M8 Connectors for 8 Digital Inputs and 16 Digital Inputs	Software VSC User Interface Software with Pre-Programmed Processes
	VSC solenoid valves for 1 Gripper, 2 Vises, and VersaDoor	All Required Electrical cables & Pneumatic valves and tubing	2x Manual Vise Valves for manual tending
Options and Substitutions	**Robot Types:** Fanuc CRX-10iA/L Fanuc CRX-20iA/L Fanuc CRX-25iA Fanuc CRX-30iA	**VSC Pneumatics Add-on:** Vise Pressure Control MultiGrip and DuoGrip Ready Up to 4 Vise Valves	**VersaCart Sizes:** VersaCart I300 VersaCart 1700
	VersaCart Infeed: Standard Visual Infeed Oversized Visual Infeed Custom Infeed Ready Kit	**VersaCart Accessories:** Keyence Area Safety Scanner Kit VersaCart Anchor Kit Steel serration jaw-interface	**Vise Options:** Up to 4 Vises w/ VSC Upgrade MultiGrip 2000 or 4000 Vise Pressure Doubler
	MultiGrip Jaw Options: OD & ID Jaws Pallet Jaws, Oversized Jaws Base Jaws, Top Jaws, Fixed Jaws	**VersaDoor Options:** Single Door (24, 30, and 40” travel) Double Door (48 and 60” travel)	**Customizations:** Custom software processes Dual CNC Tending
Part Sizes	Max Width x Length x Height = 12 x 16 x 10 inches		
Maximum Payload Gripper = 1.70kg / 3.75lbs	**Robot Model**	**Reach & Max Payload at robot wrist**	
	Fanuc CRX-10iA/L	1418mm Reach / 10kg	
	Fanuc CRX-20iA/L	1418mm Reach / 20kg	
	Fanuc CRX-25iA	1889mm Reach / 25kg	
	Fanuc CRX-30iA	1756mm Reach / 30kg	
Software	VSC Software enables users to setup, calibrate and run system, recover from errors, add/configure new parts, configure settings, test I/O, and enable remote support.		
Programming	No Robot Programming required. VSC software enables new part introduction with configuration forms. Pre-Integrated and Pre-configured for MultiGrip Processing (1 Op w/ 1 Vise, 1 Op w/ 2-Vises, 2Op w/ 2-Vises)		
User Interface	User Interface Connection Options **customer provided* • Web based application, connected via Wi-Fi or network, Phone, Tablet, Laptop or Computer • Monitor, keyboard, mouse connection to VersaBuilt System Controller		
Support	Remote connectivity available for software updates and remote support *Availability of network connection for remote support is customer responsibility		
CNC compatibility	Vertical Machining Centers *Horizontal Milling Centers, depending on layout Robot2CNC dynamic communication for Haas NGC/Legacy and Fanuc Focus 2.0 controls Handshake communication with all other CNC Controls (Cycle Start to CNC; Cycle End from CNC)		
Air Requirements	90-120 psi, 15-20 scfm *air should be conditioned to meet ISO 8573-1:2010 [7:4:4] standard		
Electrical Requirements	120VAC 1 Phase, 50/60Hz, Full Load 30A (Robot, VSC, Ethernet Switch, Router, VersaWash Pump)		





MultiGrip™

- Pick and Place Parts with Jaws
- Flip parts without custom regrip
- Enables Multi-Operation parts
- Enables High-Mix

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Robot2CNC Communication
1. Macro-Driver Communication with CNC
Available for Haas Legacy, Haas NGC, and Fanuc Focus 2.0 controls (see list in VSC/CNC Manual)
With CNC Dispatcher in memory, CNC programs are communicated via macro-variables from the VSC to the CNC to select programs from the CNC program list, then run as sub-routines in the Dispatcher.
CNC Cycle Start is initiated with a 2-wire relay connection to the CNC Cycle Start Button
Cycle End is commanded at the end of the program through the dispatcher and M-code command.
G-Code Commands are available for control of Vise Open, Close, and Pressure Exhaust
2. Standard-Driver Communication with CNC
Generalized handshake between VSC and CNC, for CNC Controls without Macro-Driver option
CNC Cycle Start is initiated with a 2-wire relay connection to the CNC Cycle Start Button
Cycle End is commanded at the end of the program through an M-code command triggering a 24VDC signal to the VSC.
*Alternative options for Cycle Start/Cycle End are available, such as push-button actuator for cycle start, and stack-light trigger for Cycle End, etc.

Infeed Options available with System
Standard > Single Layer of parts, aligned with the VersaCart Visual Infeed
Stacked > Option allowing for stacked parts with Outfeed placement on VersaCart or Bin Drop. Standard Stacked divides the VersaCart in half, one half for infeed, the other for outfeed. Stacked Infeed, with Bin-Drop selected in the part configuration, doubles infeed w/out requirement of restacking the parts on the cart.
Custom Infeed > Single Layer of parts, defined by the location of the first part position relative to the cart X/Y datums, then row/column spacing and quantities

Devices/Hardware:
MultiGrip Gripper - Pneumatic Gripper w/ interface for picking MultiGrip Jaws
MultiGrip Vise - Pneumatic Vise w/ interface for securing MultiGrip Jaws
VersaCart 1300 - Steel construction on casters, with adjustable foot pads to lock position, robot pedestal and infeed options optimized for 1300mm reach robot
VSC - Computer, Pneumatics, and Electrical Signal devices for System
VersaWash - Chip Mitigation solution for MultiGrip processing, with a welded bucket mounted on hinges on the VersaCart, a recirculating pump with protective filter bag and basket, and adjustable nozzles for optimal wash of jaws.
VSC Enable Button - Physical button, local to system, allowing for user access to VSC software
MultiGrip Calibration Jaws - 1-piece MultiGrip Jaw, used for calibration of VersaCart and MultiGrip Vises

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VSC M8 Cable Digital Inputs and Outputs:	
1.	**24VDC Outputs**
	Cycle Start
	VersaWash
	Robot Lock (for Dual CNC tending applications)
	Pallet Ready (for CNC's with Pallet Ready button)
	Door Interlock Release (for CNC's with Door Interlock Release button)
	Chuck 1 Toggle (for lathe foot pedal)
	Chuck 2 Toggle (for lathe foot pedal)
2.	**24VDC Inputs**
	Vise 1 and Vise 2 Sensors
	VersaDoor 1 Open/Close Sensor
	VersaDoor 2 Open/Close Sensor
	VSC Enable
	CNC Cycle End (for non-macro-driver CNC controls)
	Robot Lock (for Dual CNC tending applications)
	Pallet Safe (for CNC's with Pallet Ready button)

VSC Pneumatics:	
1.	**VSC Connections (push-to-connect)**
	Vise 1 Open
	Vise 1 Close
	Vise 2 Open
	Vise 2 Close
	VersaDoor Open
	VersaDoor Close
	VersaBlast (air pilot signal)
2.	**UR Robot Controller connections**
	Gripper 1 Open
	Gripper 1 Close
	Gripper 2 Open
	Gripper 2 Close
3.	**Hand Valves**
	Diverter Valve to switch between "Auto" / VSC valves or "Manual" Vise valves
	2x Vise Hand Valves

VSC Accessories:	
1.	**Pneumatics**
	Supply, Shut-off and Lockout Valve
	Supply Air Pressure Gauge
	Vise Air Pressure Gauge
	VSC Upgrade for Vise Pressure Control and MultiGrip to DuoGrip process switch
2.	**Electrical/User Interface:**
	110 VAC to 24VDC Power Supply with connector
	HDMI for monitor connection to user-interface computer
	2x USB for software backup and connection to user-interface computer
3.	**Networking:**
	5-Port Ethernet Switch
	Ethernet Cables for CNC, Robot Controller, Router, and VSC
	WiFi or Networking Options available for U/I and Remote Support

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Processes included with Mill Automation System w/ MultiGrip
1 Op w/ 1 Vise & 1 Jaw
1 Op w/ 2 Vises & 2 Jaws (pipeline)
2 Op w/ 2 Vises & 2 Jaws (1 jaw per operation)
*custom processes available for quotation, such as: • 2 Op w/ 2 Vises & 1 Jaw (e.g., 3-axis + 4th axis) • 3 Op w/ 3 Vises • 2 Op w/ 4 Vises (2Op per 2 Vises on pallet changer)

CNC Programs for System Operation
Dispatcher Files (9000's) *if 9000 programs are in use, file numbers can be changed
Example Table Load Program (8000) *position the CNC table at the vise calibration location for robot load/unload operations
Example Table Wash Program (8001) *chip mitigation between operations

Jaw Configuration
Jaw Type: OD (outer diameter clamping) ID (inner diameter clamping)
Jaw Weight
Jaw Name and Description (used when selecting Jaws in Part configuration)

General Part Configuration Data Entry
Part Number
Part Description
Process (1Op, 1 Op Pipeline, 2Op)
Part Width/Length/Diameter/Height, Weight at part states: • Raw • Op1 Complete • Op2 Complete (2 Op process only) Pick Heights • Pick from infeed • Place height CNC Programs* • Op1 • Op2 (2 Op process only) • CNC Vise Wash Program • CNC Table Load Program Section of Jaws for each operation

Part Configuration Selections and Options:
Part Picking Options: • Enable Part Find on Pick • Clap Gripper on Pick • Robot Settle • Vise Settle • Custom Infeed Spacing
Op1 Options: • Vise Number (1 or 2 for 2-Vise setup) • Y-Push (pick part with a Y-offset, push part with gripper after load in CNC to nominal center position • Vise Settle
Part Transfer Options (2Op process): • Pick at transfer from Op1 to Op2 • Enable Part Find on Transfer • Custom calibration position for Transfer • CNC Vise wash after Op Transfer • CNC Wash program after Op Transfer • X/Y Transfer Pick Offsets
Op2 Options (2Op process): • Robot Settle • Vise Settle
Place Options • Enable Part Find on Place • Clap Gripper on Place • Bin Drop (calibrated position at or near VersaWash) • X/Y Place Offsets
Jaw Cleaning & VersaWash Options: • Timing of Jaw Cleaning • Dump Coolant • VersaWash # of Cycles/Speed, and Drip Time/Speed

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Standard Systems:
VersaBuilt Automation Systems are Pre-programmed, Standardized CNC Machine Tending solutions with the robot moving between "Home" locations above the Table (Table Home), in front of the CNC (CNC Home), inside the CNC (InCNC Home), and performing options with the Gripper, Vises, VersaWash, and VersaDoor, based on the selected Part Configuration Selections/Options and setup on the VSC User-Interface Settings page. These Standard Systems are pre-programmed in a generalized manner for an easy-to-use interface, incorporating known CNC process requirements.

General MultiGrip Process Overview:

- CNC Dispatcher or Non-Macro Driver program is in memory
- User selects Part, Enters Quantity on VSC User Interface
- Operator loads parts on VersaCart, matching display on User Interface
- Operator loads MultiGrip Jaws for selected Part on Part Configuration defined Vise
- User selects Cycle Start on VSC user interface
- Robot Unloads MultiGrip Jaws from MultiGrip Vise with MultiGrip Gripper
- Robot Picks Part with Jaws
- Robot Loads Part and Jaws into Vise
- CNC Cycle Start / Machining Op1
- For 2Op Parts - Robot Transfers/Flips Part from Op1 to Op2 with Op2 Jaws picking Part from Op1 Jaws, then Unloads empty Op1 Jaws, then CNC Cycle Start / Machining Op2. After machining Op2, Robot Loads next Part with Op1 Jaws.
- Robot Unloads Finished Part and Jaws
- After Unload of Finished Part, the Part is Placed back at VersaCart Infeed location or Bin-Dropped
- Jaws are washed per Part Configuration Selections
    - VersaWash pumps water only and does not include an air knife - Parts and Jaws drip dry.
- CNC Programs are run sequentially one-operation at a time
- Parts can be added to the system while it is running a job, either by adding parts to empty slots shown on the User Interface, or Operator unloading of finished parts and adding on the User Interface.

Definitions:

- **Settle** - Gripper Open/Close or Gripper Float to seat the part in Z, with options for seating in Y
- **Float** - 24VDC Signals to Valves are turned off, allowing Grippers and VersaDoors to move freely
- **Clap** - Open and close the gripper multiple times during part pick and part place
- **Part Find** - Use of robot force-feedback to detect part or surface
- **FreeDrive** - Robot state where an operate can freely move the robot by gently pushing on the robot joints
- **Bin Drop** - Option for placing or dropping a part at a calibrated location (in location behind robot base, near the VersaWash tank), rather than placing the finished part back on the VersaCart Infeed.
- **Pipeline** - Optimized sequence of part processing where a 1Op part is processed in 2 different vises, i.e., first part in Vise 1 with Jaw 1, second part in Vise 2 with Jaw 2, third part in Vise 1 with Jaw 1. Pipelining is the most efficient process for 1 Op parts with MultiGrip.
- **Dump coolant** - after Jaw unload from the Vise, flipping the jaws to drip coolant in the CNC or on the VersaWash bucket

General System Notes:

- The user interfacing device is provided by the customer (not included in the quoted price). The user interface options are:
    - Wi-Fi connected device with Web-Browser (e.g., laptop, tablet) connected to the VSC interface via a Wi-Fi signal from the VSC router
    - Ethernet connectivity from device with Web-Browser connected to the VSC interface via VSC Ethernet Switch
    - Monitor/Keyboard/Mouse connected directly to the VSC via HDMI and USB ports
- The system operates on software local to the system (i.e., an internet connection is not required for the system to run).
- Pneumatic Tubing is color coded for applications. In general, Red or Black = Close, Blue or White/Clear = Open.
- Compressed air supply shall be 80 to 115 psi and conditioned to meet ISO 8573-1:2010 [7:4:4] standard. Maximum system air consumption is 15-20 SCFM.
- Remote Support is critical for success for installation, troubleshooting and software updates.
- Terms and conditions of sale can be found on the VersaBuilt website: www.versabuilt.com