



Springfield Vertical Grinders  
& Universal Grinders



# Vertical Grinders: Higher Productivity by Design

Springfield vertical grinder designs incorporate proven engineering technology gained through thousands of applications and more than 40 years of experience.

Built around a building block design concept, our vertical grinders dissipate the grinding forces directly through the work spindle and the base.

## Why Vertical?

When working on larger, heavier pieces, vertical grinding provides advantages that add up to increased productivity:

- Easy loading and unloading
- Workpiece and tooling accessibility
- Improved floor space utilization
- Easy FMS integration
- Standalone automation

Unlike horizontal grinders, where operators are constantly fighting gravity, Springfield grinders use the weight of the workpiece to help position it on the work table. As a result, parts are more easily and correctly loaded the first time, reducing scrap.

The Springfield vertical grinder's design allows for greater stiffness. With increased stability and integrity, you can produce more parts, more accurately at a greater rate. This design concept also eases machine setup and operator load, while increasing operator visibility.

## The Vertical Grinding Process

Springfield vertical grinding stresses rigidity and precision for maximum grinding efficiency in all applications. The result is a super rigid grinding machine that can increase production efficiency without sacrificing precision or reliability.

## Base

The base is a heavy, stress-relieved steel weldment designed to give support direct from the foundation to minimize vibration and preserve alignment while operating to full load capacity.



## Work Spindle

The work spindle is a self-contained unit mounted on precision roller bearings and has infinitely variable speeds within each model's specifications.

## Rail

The rail is a heavy, stress relieved steel weldment braced internally to minimize vibration and maintain alignment. Precision way areas for the cross slide are machined into the rail.

## Fixed Rail

Machines with up to 40" swing are designed with a fixed rail. The fixed rail contributes to machine stiffness on these smaller machines.

## Adjustable Rail

Machines with a swing greater than 40" features an adjustable rail to accommodate extremely large workpieces. The massive rail provides exceptional rigidity, accuracy and processing flexibility.

## Cross Slide and Vertical Slide

The cross slide and vertical slide (X and Z axes) are integrated into a common large casting which allows

for an improved grinding head system with increased rigidity and precision. The slides traverse on hydrostatic or low-friction guide ways and are driven by servo drive motors coupled to large diameter ball screws.

## Grinding Spindle

Cartridge Spindles (CS) are belt-driven to eliminate motor vibration and its effect on surface finish. The cartridge type grinding head handles interchangeable grinding spindles driven through belts by a precision balanced spindle motor.

Motorized Spindles (MS) are directly driven and allow interchangeability of standard machine taper wheel mounts. The wheel head and motor are mounted on the lower end of the vertical slide and may be swiveled either side of vertical. Programmable position of the wheel head is available as an option on CNC models.

Motorized Spindles are also available with compound angle capability. Wheel wear compensation can be provided as an option with this special motorized slide.

# Springfield Vertical Grinding Centers

## Hydrostatic Ways

Hydrostatic ways offer many advantages, including high stiffness and frictionless movement. Because they are controlled hydraulically, they offer excellent vibration dampening and a much smoother infeed. Since they are frictionless, there is virtually no wear. VGCs last longer, and remain temperature-stable throughout the grinding process.

Combine temperature stability with increased stiffness and you achieve higher consistency and repeatability, a superior surface finish, higher production rates and less frequent wheel dressings. Hydraulic controls feature a completely enclosed internal oil recirculation system.

## Grinding Spindle

The grinding spindle is powered by an infinitely variable speed, water-cooled motor. This further stabilizes machine temperature, preventing growth and helping to maintain greater accuracy. Our high-speed spindles are oil-mist lubricated for increased bearing life and temperature stability.

The tilt grinding head is clamped by a Hirth coupling for maximum positioning accuracy, and with the optional servo drive, eases operator control. The standard tilt range is  $\pm 45$  degrees with additional ranges available. It is designed for angular oscillation grinding, and can grind many different surfaces and angles in one-degree increments (standard), with an infinite number of positions available on request.

## CNC Control

All Springfield VGCs utilize the latest CNC technology to assure the machine performs to its full design capabilities. Virtually all aspects of machine operation are controlled by the CNC, including slide movement, positioning, measuring, feed rate, wheel dressing, wheel changing, part prove and size compensation, part loading and unloading and spindle speed.



Frictionless hydrostatic ways enhance stiffness and repeatability.

## The CNC control features:

- Standard programming language (ISO, DIN)
- Geometry, work cycles, technology and special functions menus
- Work cycle illustrations
- Numerical input values in clear text form
- Depiction of the attendant parameters
- Color graphics availability
- Graphic simulation with selectable depiction of the tool path

## Diagnostic Displays

All production conditions are shown to the operator in clear text form. The operator can also call up these images:

- Fault condition
- Production condition
- Status of all inputs and outputs
- Tool life monitor

## User Friendly Macros

User friendly macros are available for:

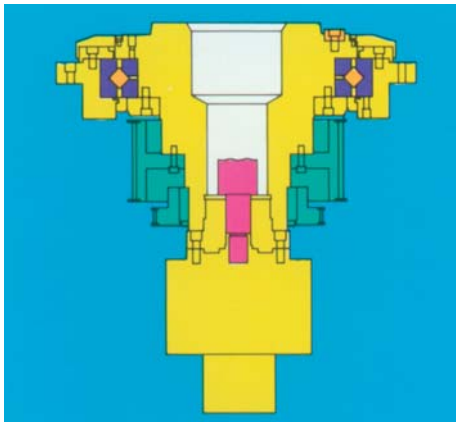
- Vector Grinding
- Creep Feed Grinding
- Head Tilt Control
- Automatic Wheel Dressing
- Programmable Gap-Eliminator Circuitry
- Custom Oscillation Grinding

## Optical Scale Feedback

The direct reading optical scale system delivers increased positioning and feedback accuracy, with resolution to 20 millionths of an inch.



# Advanced Automation for Increased Production



## Precision Work Table

The precision work table and drive feature unique, crossed roller bearings designed for compactness and maximum stiffness.

The table is belt-driven for smooth power transmission. Various table drive combinations are available to meet a wide variety of applications.

## Drive Motors

All servo and drive motors are specified AC motors. Being brushless, they last longer and require less maintenance.

## Automatic Wheel Changer (optional)

An automatic wheel changer automates the grinding process by delivering the wheel to the spindle and loading it without operator intervention. A disc-type grinding



wheel and sizing probe storage magazine is located at the left side of the machine. The magazine can accommodate up to 12 wheels and is positioned for wheel or probe change by CNC control.

## Automatic Pallet Changer (optional)

With the Springfield VGC, you can utilize a pallet shuttle or multi-station pallet changer to maximize machine utilization by minimizing loading and unloading time.

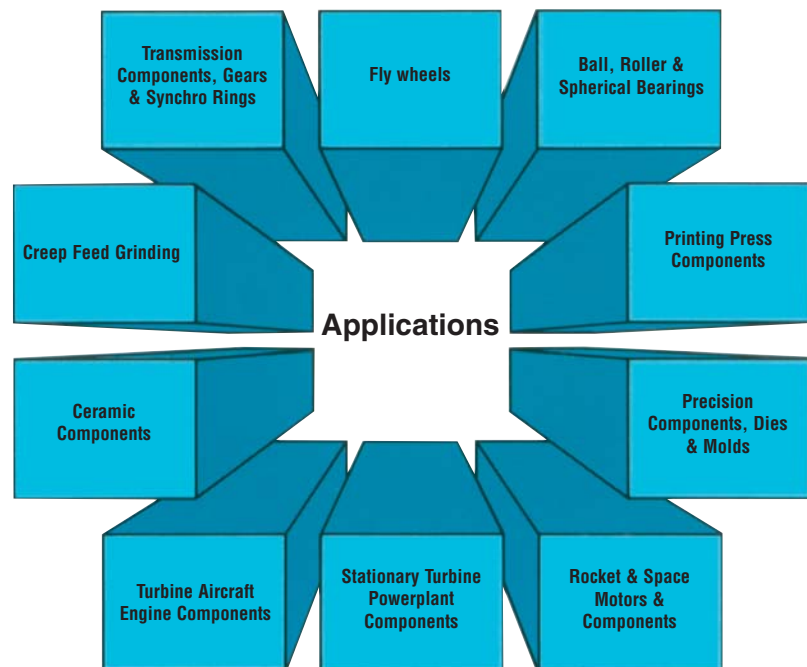
Bourn & Koch can provide engineering to integrate the VGC with AVGs (and other automated material handling equipment) and other machines in Flexible Manufacturing Cells and Systems.

## Automatic Part Probing

The part probe head is stored in the wheel changer for in-process part measuring and verification. The spindle positions the probe to a reference datum point. Automatic updates of machine control offsets are generated and a compensating grinding cycle initiated to bring the workpiece to programmed tolerances. The probe can also be used for optional post-process gaging.

## Wheel Verification

The automatic wheel sensor verifies that the wheel changer has picked up the wheel of the correct diameter. Optional bar coding is also available.



## Machine Capabilities

### Universal Grinders

Data inches/mm	36CNC	42CNC	48CNC	62CNC
Maximum Swing	44/1118	50/1270	60/1829	68/1727
Work Table Clearance	20/508	12-36/305-914	12-60/305-1524	12-48/305-1219
Grinding Head Stroke	28/711	28/711	36/914	36/914
Ground Hole Depth	18/457	18/457	24/609	24/609

### Vertical Grinding Centers

Data inches/mm	VGC 25	VGC 40	VGC 52	VGC 72
Maximum Swing	25/635	40/1016	52/1321	72/1829
Work Table Clearance	13/330	20/508	18-54/457-1372	20-60/508-1524
Grinding Head Stroke	14/355	21/533	24/609	36/914
Ground Hole Depth	12/304	18/457	20/508	30/762

# For Custom Grinding Versatility, Precision and Economy

## Models

Springfield universal grinders are available in a variety of models to meet specific application requirements. You can choose from semiautomatic and complete CNC control machines to achieve the level of automation you require. Models include:

### Fixed Rail Models

Springfield fixed rail models should be considered when the maximum work height is within the machine's fixed vertical range. The vertical capacity is determined by the distance between the work table and the fixed cross rail. Models are available with maximum work height capacities ranging from 12 inches to 24 inches.

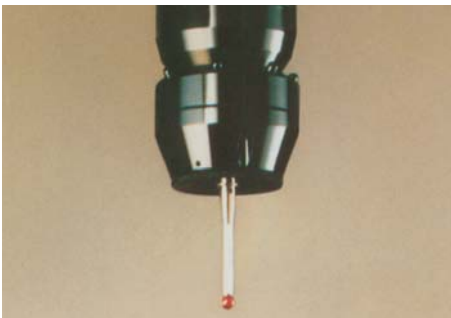
### Adjustable Rail Models

The Springfield adjustable rail models feature moveable cross rails, with the largest model accommodating up to a 60-inch work height. All adjustable rail models are equipped with an absolutely precise means for leveling the rail after moving. Adjustable rail models should be considered when work heights are likely to vary.

### Double Wheel Head Models

Double wheel head Springfields (optional) can perform two grinding tasks simultaneously, depending on part diameter and configuration; therefore, they should be considered for jobs with large stock removal or with more than one surface to grind.

Each wheel head has its own control station. There is sufficient cross-rail travel to allow repositioning of the auxiliary head for single spindle grinding.



## Machine Features

All of the following machine components are designed to minimize vibration and preserve alignment over a long period of time. Mating surfaces are accurately machined to provide extreme rigidity and to assure precise machining accuracies.

### Cross Rail and Vertical Column

The rail on the smaller models (40" swing or less) is fixed in position. On larger models, the rail is adjustable.

On Adjustable Rail models, accurate raising and lowering of the cross rail is accomplished by means of a ball screw and elevating mechanism. Easy adjustment is provided for leveling. Automatic hydraulic rail clamping with interlocks is provided. Rail positioning by CNC control in preset steps is available.

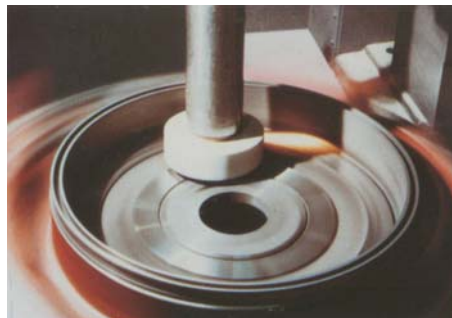
The cross rail elevating unit is mounted across the top of the vertical columns. It contains a gear reduction motor and braking mechanism that drives the ball screws for raising and lowering the cross rail.

### Base

The base is a heavy stress-relieved steel weldment braced internally to provide support from the foundation.

### Cross Slide

The cross slide is fitted in the cross rail on precision ways and moved horizontally by a precision ball screw and a pre-loaded nut to eliminate backlash. The cross slide is equipped with both rapid traverse and automatic feed in either direction over the entire lengths of the cross rail.



## Work Spindle

The work spindle is a self-contained unit mounted on precision tapered roller bearings and has infinitely variable speeds as specified for each model. The work spindle is driven by an AC motor through multiple V-belts.

### Grinding Slide Support

The grinding slide support is mounted on the cross slide and can be precisely and solidly clamped up to 45 degrees either side of vertical. The grinding slide support enables reciprocation of the grinding slide and provides rigidity through the entire length of the work stroke.

### Grinding Spindle

Cartridge Spindles (CS) are belt driven. The material characteristics of the belt help dampen motor vibration and its effect on surface finish. The cartridge type grinding head handles interchangeable grinding spindles driven through belts by a precision balanced spindle motor.

Motorized Spindles (MS) are directly driven by internal motors. The wheel head and motor are mounted on the lower end of the vertical slide and may be swiveled either side of vertical through a worm and worm gear, which are fully protected from swarf. Rotary positioning of the wheel head is manual.



# Universal Specifications for Bourn & Koch Springfield CNC Grinders

## Universal Grinder Specifications

inches (mm)

Machine Component	36 CNC	42 CNC	48 CNC	62 CNC
<b>Work Spindle</b>				
Maximum Swing	44 (1118)	50 (1270)	60 (1829)	68 (1727)
Work Spindle RPM, infinitely variable	6-120	6-120	5-100	5-100
A2 Spindle Nose	8 (137)	8 (137)	15 (381)	20 (508)
<b>Grinding Head</b>				
Nominal Workpiece Ground Hold Depth	18 (457)	18 (457)	24 (609)	24 (609)
Grinding Head Stroke	28 (711)	28 (711)	36 (914)	36 (914)
Clearance Over Work Table	20 (508)	12-36 (305-914)	12-60 (305-1524)	12-48(305-1219)
Wheel Head Pivot Angle (Std)	±45°	±45°	±45°	±45°
Slide Traverse Rates X and Z Axes-per minute	300 (7620)	300 (7620)	300 (7620)	300 (7620)
Slide Feed Rates X and Z Axes-per minute	0-50 (0-1270)	0-50 (0-1270)	0-50 (0-1270)	0-50 (0-1270)
<b>Electrics (Motors) HP (kW)</b>				
Grinding Wheel Spindle	10 (7.46)	10 (7.46)	20 (14.91)	20 (14.91)
Work Table	3 (2.25)	3 (2.25)	5 (3.75)	5 (3.75)
Hydraulic (Optional)	3 (2.25)	3 (2.25)	3 (2.25)	5 (3.75)
Coolant Pump	0.25 (0.19)	0.25 (0.19)	0.25 (0.19)	0.25 (0.19)
Rail Elevating	N/A	1.5 (1.13)	1.5 (1.13)	1.5 (1.13)
<b>Weight lbs (Kg)</b>	17,500 (7955)	27,000 (12272)	44,200 (20090)	50,000 (22727)

**Note:** Springfield Universal Grinders are available with either a programmable controller or CNC control. Specifications subject to change without notice.

### Universal Grinder Optional Equipment

- Adjustable Angle Dresser for 0 degrees to 45 degrees, tapers used with reference diamond dresser
- Adjustable Radius Dresser, used with reference diamond dresser, manually operated
- Automatic Cycling
- Automatic Size Control, electronic gage
- Dial Indicator Angle Setting Attachment, sine bar type
- Extra Head, complete with controls, independently operated
- Hydraulic Actuating Equipment for Chucks and Fixtures
- Magnetic Chucks
- Power Vertical Feed on manual machines
- Reference Diamond Dresser, manually and hydraulically operated
- Rotary Diamond Dresser
- Special Attachments and Fixtures
- Special Contour Dresser
- Special Coolant Filtration Systems
- Special Grinding Stroke Lengths
- Variable Grinding Motor Speeds
- Wheel Wear Compensators, used with MS vertical slide



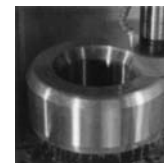
45° left



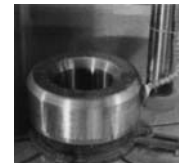
45° right



90° ID



90° surface



90° OD

# VGC Specifications

## Wheel Dressers

A variety of wheel dressers are available:

- Periphery Slide Mounted
- Face and/or Periphery Reference Type
- Radius – attachment for reference dresser
- Angle – attachment for reference dresser
- Rotary Diamond Tool

## Fully Automatic Wheel Dressers

- Single Point Contouring Dressers
- Rotary Diamond Form Dressers

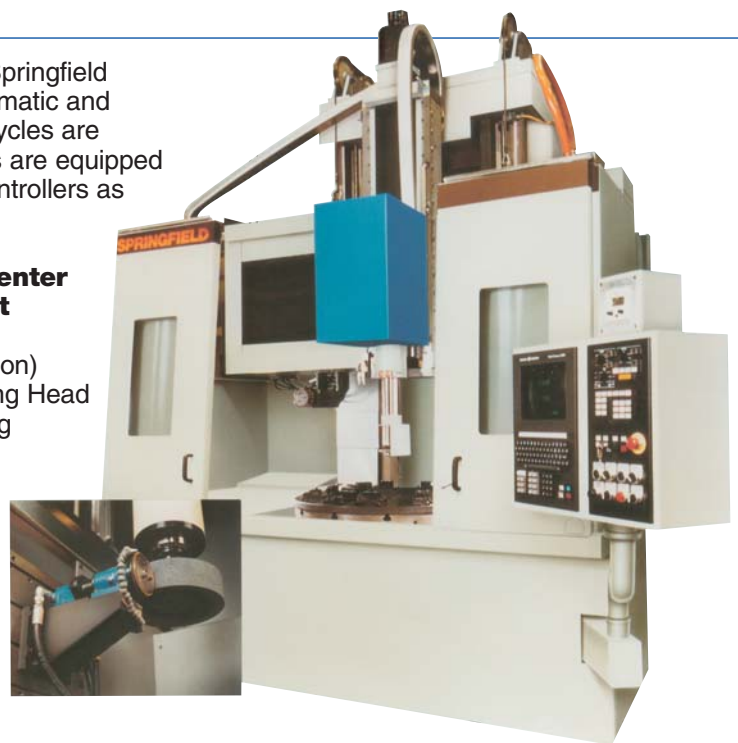
## Controls

Springfield universal grinders offer sophisticated CNC control systems to enhance accuracy and productivity. Precision ball screws and linear encoder driven by high response servo drive motors provide accurate slide positioning. In-process gaging is also available.

Flexibility is built into Springfield machines – semi-automatic and dedicated automatic cycles are available. All machines are equipped with programmable controllers as standard.

## Vertical Grinding Center Optional Equipment

- Pallet Changer (shuttle or multi-station)
- CNC Control of Tilting Head
- Post-Process Gaging
- In-Process Gaging
- Extra Head, complete with controls, independently operated
- Hydraulic Actuating Equipment for Chucks and Fixtures
- Magnetic Chucks
- Rotary Diamond Dresser
- Special Attachments and Fixtures
- Special Coolant Filtration



## Vertical Grinding Center Specifications

inches (mm)

Machine Component	VGC 25	VGC 40	VGC 52	VGC 72
<b>Work Spindle</b>				
Table Size/Swing Thru Columns	25 (635)	40 (1016)	52 (1321)	72 (1829)
Maximum Swing at Work Table	32 (813)	48 (1219)	60 (1524)	80 (2032)
Work Spindle RPM, infinitely variable	10-200	6-120	4-100	3-70
A2 Spindle Nose	11 (279)	15 (381)	20 (508)	28 (711)
<b>Motorized Grinding Head</b>				
Nominal Workpiece Ground Hole Depth	12 (304)	18 (457)	20 (508)	30 (762)
Grinding Head Stroke	14 (355)	21 (533)	24 (610)	36 (914)
Clearance Over Work Table	13 (330)	20 (508)	18-54 (457-1372)	20-60 (508-1524)
Wheel Head Angle (Opt)	±45°	±45°	±45°	±45°
Side Traverse Rates X and Z Axes-per minute	600 (15240)	400 (10160)	300 (7620)	300 (7620)
Slide Feed Rates X and Z Axes-per minute	0-200 (0-5080)	0-200 (0-5080)	0-200 (0-5080)	0-200 (0-5080)
Programmable Resolution Vertical (Z) Axis	.0001 (.0025)	.0001 (.0025)	.0001 (.0025)	.0001 (.0025)
Programmable Resolution Horizontal (X) Axis	.0001 (.0025)	.0001 (.0025)	.0001 (.0025)	.0001 (.0025)
<b>Electrics (Motors) HP (kW)</b>				
Grinding Wheel Spindle 1000-3600 RPM	10 (7.46)	20 (14.91)	25 (18.64)	40 (29.83)
Work Table	5 (3.75)	10 (7.46)	10 (7.46)	15 (11.19)
Hydrostatic Ways	5 (3.75)	5 (3.75)	5 (3.75)	5 (3.75)
Cooler Compressor	1 (0.75)	1 (0.75)	1 (0.75)	1 (0.75)
Cooler Pump	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)	0.33 (0.25)
Hydraulic Power Unit	7.5 (5.63)	7.5 (5.63)	7.5 (5.63)	7.5 (5.63)
Coolant Pump	3 (2.25)	3 (2.25)	3 (2.25)	3 (2.25)
<b>Weight lbs (Kg)</b>	22,500 (10227)	39,000 (17727)	52,000 (23636)	75,000 (34091)

**NOTE:** Specifications subject to change without notice. Special designs are subject to Bourn & Koch review. Remanufacturing offered on all models.

# System Technology From One Source



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 Gear Shaping Machines  
 Gear Grinding Machines  
 Gear Milling Machines  
 Gear Inspection Centers  
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 Springfield Grinders  
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 Extrusion Milling Machines  
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