VECTOR

CMT CURTIS MACHINE TOOLS LTD

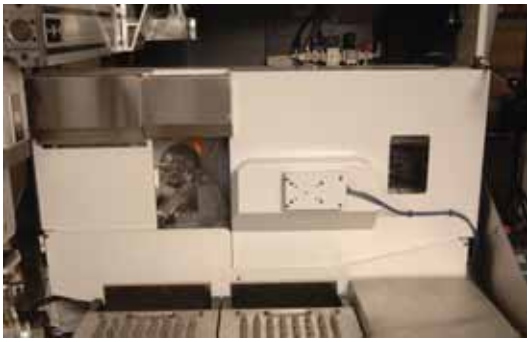
Innovation in production grinding

‘Grinding in a box’

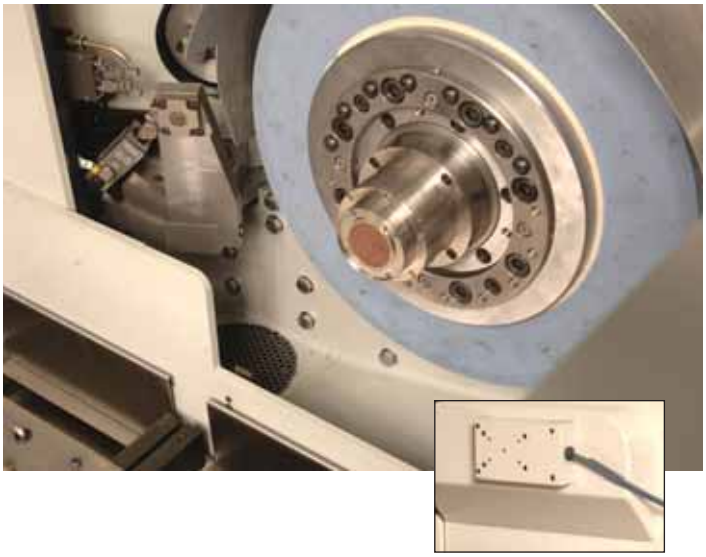
The ‘**VECTOR**’ is a production OD grinding machine with integral automatic loading. The size of component that can be ground has been deliberately restricted so that a very efficient, compact machine can be offered with short distances between the grinding and loading areas. The machine has a unique, patented guarding concept with a fixed grinding guard that encloses the grinding wheel, dressing tool and work holding equipment. During grinding the fixed guard is sealed so that coolant and grinding debris can be piped direct to the coolant tank. The machine slides and loading system are located outside the fixed guard, in a clean environment. The back plate of the guard is a structural part of the machine and can be used for mounting additional equipment.

The grinding wheel head is mounted on a cross slide, with the wheel moving between the fixed grinding and dressing positions. Dressing takes place at the rear of the wheel where a range of interchangeable dressing units can be mounted. The fume extractor draws air directly through the coolant lift tank, so that there is a flow of air through the guard at all times. When the front doors of the fixed guard are opened there is excellent access for machine setting and wheel change. A sliding door allows access to the working area for unload and load.

A 3 axis Cartesian loading unit is mounted directly above the fixed guard. This takes components from the component storage area positioned directly in front of the fixed guard. The use of a 3 axis loader permits the use of pallets for part storage. The whole loading area is protected by a clear, interlocked, guard that can be raised to give complete access for set up. In the standard form, the pallets are located in drawers and can be changed without stopping the machine.



Grinding Wheel Spindle Balancing Option



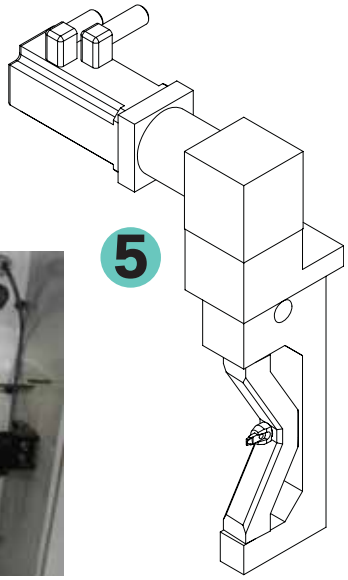
The direct drive spindle motor it mounted behind the fixed guard with the spindle passing through a special seal in the guard back plate. A coolant guard fits round the wheel and rotates so that it covers the front of the wheel while the wheel is retracted or is being dressed. The automatic grinding wheel balancing head mounts on the grinding spindle and has non-contact transmission to the receiver so that the balancer is not removed for grinding wheel changing. The receiver is mounted on the outer face of the guard. Off machine balancing is available using conventional weights and a balancing mandrel.

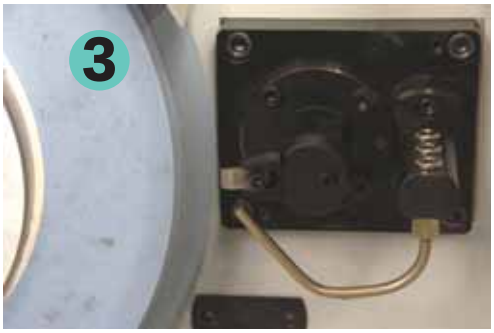
Dressing Options

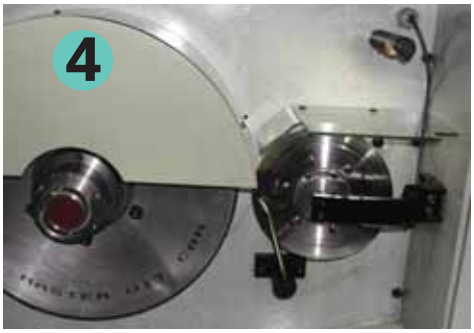
The dressing units are mounted on the guard back plate, a full range of interchangeable dressing units are available including:

1. **Grit wheels for conditioning diamond and CBN wheels.**
2. **Diamond roll.**
3. **Single (or twin) fixed dressing tools.**
4. **Diamond disc, 150 mm diameter.**
5. **Servo driven radius dressing.**

The drive units for the dressing options are outside the grinding area.







Universal Workhead

A range of interchangeable workheads are available. These mount on the large platform, behind the grinding guard and only the work holding equipment extends into the grinding area. A stainless steel plate seals the workhead front face to the guard backplate so that coolant and grinding debris cannot escape. Each workhead can be positioned for straight or angle approach grinding.

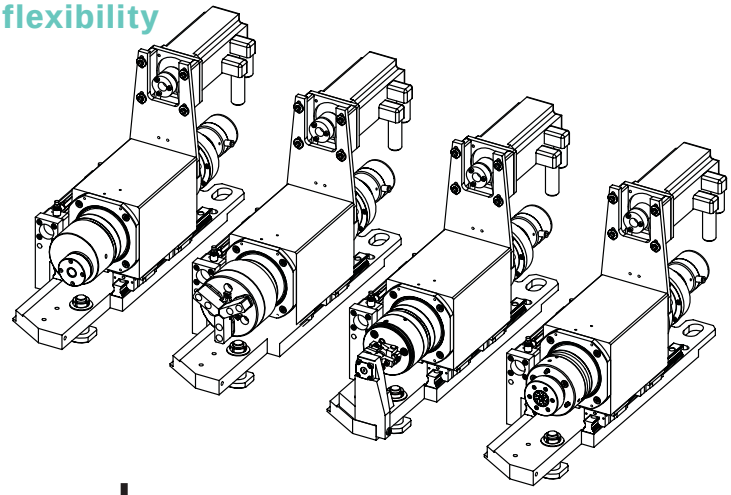
The Universal workhead is mounted on a pneumatic slide with 100 mm stroke, and can be used with a fixed tailstock. For loading between centres the workhead is retracted, allowing the tailstock to be very short and used for length reference. All workheads have a 'live spindle', which has a 52mm bore allowing a wide range of work holding equipment to be used with the operating system located in the spindle bore.

Standard work driving applications mount direct onto the universal workhead, allowing for greater flexibility

(From Left to Right)

- **Eccentric Collet Chuck**
- **3-jaw Chuck**
- **Between Centers with Auto-drive**
- **Standard Collet Chuck**

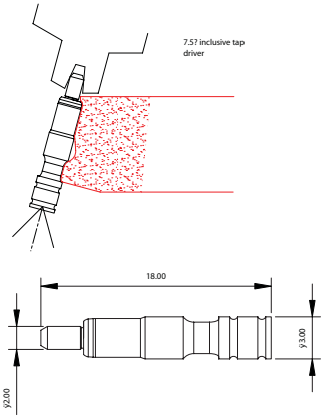
All of the above are actuated by the same draw bar and pneumatic slide giving simple interchangeability.



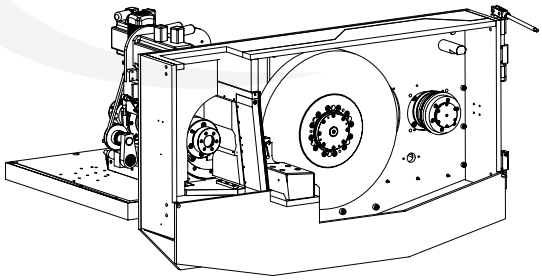
Miniature Workhead

The low-inertia workhead makes the machine ideal for grinding very small components to high tolerances. The spindle unit is mounted on a precision slideway for use with a fixed tailstock, the drive motor is dynamically isolated from the spindle to reduce vibration and momentum.

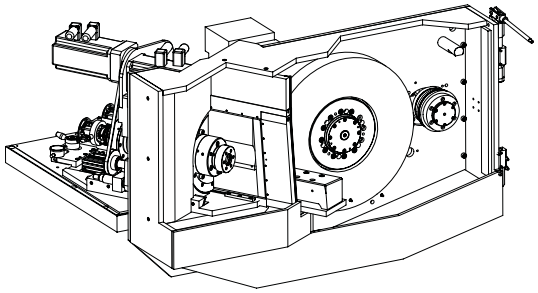
The miniature workhead is capable of –7.5º or 0º or 10º approach angle.



Twin Spindle Variant



For very high volume production the **VECTOR** can be supplied with a **TWIN SPINDLE** workhead which allows loading and grinding to take place concurrently. Two spindles are mounted in a drum that rotates through 180º. A dividing plate between the 2 spindles provides a seal between the grinding and loading area. This enables the grinding operation to take place on one spindle whilst the second spindle is in a clean environment for the loading operation. At the end of the grinding cycle the workhead drum rotates through 180º alternating the positions of the 2 spindles.



Applications available with the twin spindle workhead

- **Straight approach grinding**
- **Angle approach grinding**
- **Between centre grinding**
- **Chuck or collet work holding**
- **Eccentric collet work holding**
- **For grinding between centres, each spindle has its own tailstock mounted on the dividing plate and each tailstock has manual taper adjustment.**

In-cycle gauging

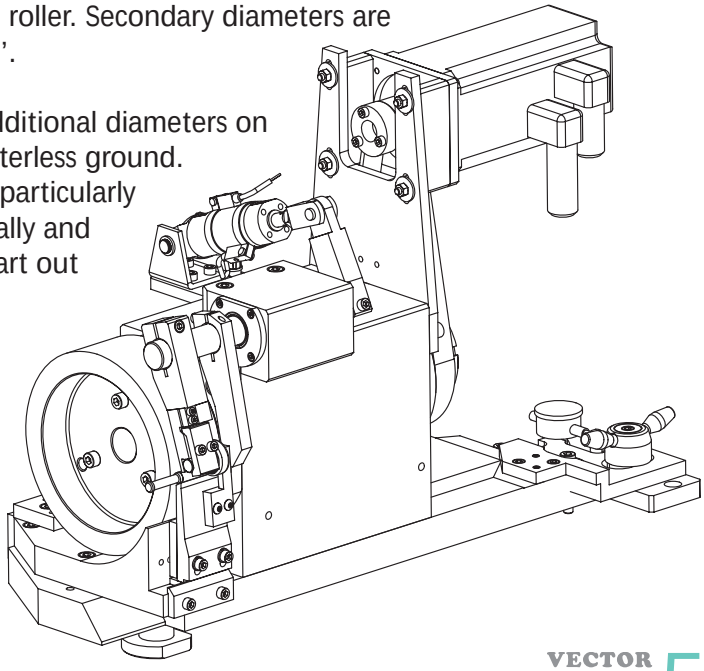
Pre-grinding length gauging and post grinding OD gauging may be carried out in the loading position. This further increases the productivity.

Concentric Workhead

Concentric grinding

This is a form of centerless grinding, the component is clamped against a steel control wheel and work rest blade by a pneumatically applied clamp roller. Secondary diameters are then ground 'concentric to the clamped diameter'.

This technique is particularly suited to grinding additional diameters on components that have first been through fed centerless ground. Automatic loading of the concentric unit can be particularly simple as the component can be loaded horizontally and the following component can push the ground part out as it is being is loaded.



VECTOR Options

Gauging Options

In-process diameter and length gauging being used with the universal workhead and automatic driver.

Coolant Tank Options

Above: Coolant lift tank with a magnetic separator.

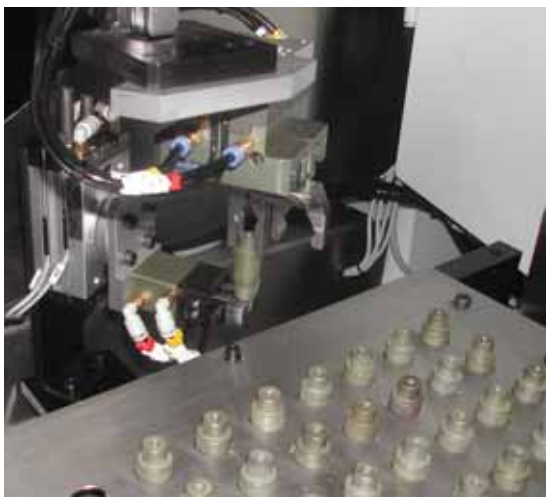
Below: A full range of coolant filtration systems are available, the guarding system is suitable for grinding pressures of up to 40 bar.

Extraction System

The mist extractor is an integral part of the guard system and installed on top of the machine.

Turn Over Station

Loading system turn over unit, used so that the parts can be stored vertically in pallets and loaded horizontally in to the machine.



Loading Systems

Cartesian Robot

(Shown with protective visor raised for clarity)

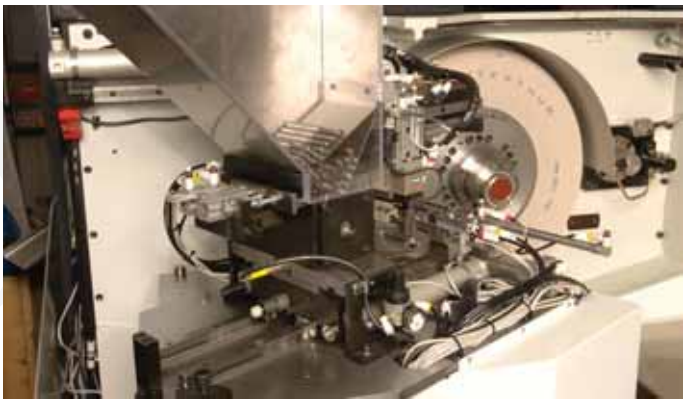
A 3 axis Cartesian loading unit is designed into the machine. It is mounted above the fixed guard, in the clean area, and does not increase the machines floor plan. Having 3 axes the standard loader is suitable for loading from pallet, with the components located vertically to give the most efficient storage density. The simple pallet system has 2 pallet drawers built into the area at the front of the machine and gives un-manned running times depending on nesting density and cycle time. For increased un-manned running – pallet conveyors or stacking systems can be offered.

Vibratory Bowl Feeder

Hopper Loading System

(with Component Orientation and Pre-Gauging)

The standard 3 axis loader gives the customer the maximum flexibility as only the grippers and pallet needs to be changed to switch from one component to another. Small parts are frequently supplied to the machine from a vibratory bowl and after grinding they are placed in bins or pallets. Concentric grinding applications can either use the standard 3 axis loader or a horizontal inserting unit attached to a hopper loader.



Pallet Drawer System

VECTOR

Grinding Wheel	
Outside diameter	450 mm
Maximum width	50 mm
Bore diameter	152.4 mm
Drive power	5.5 Kw
Maximum speed	5,000 rpm

Workheads	
Maximum grinding length	100 mm
Maximum length between centres	160 mm
Maximum diameter swing in chuck	150 mm

Workhead Swivel Options	
Standard workheads	0º/5º/10º/15º/20º/30º
Heavy duty workhead	0º/15º/30º
Miniature workhead	–7.5º/0º/10º
Concentric grinding	0º/15º/30º

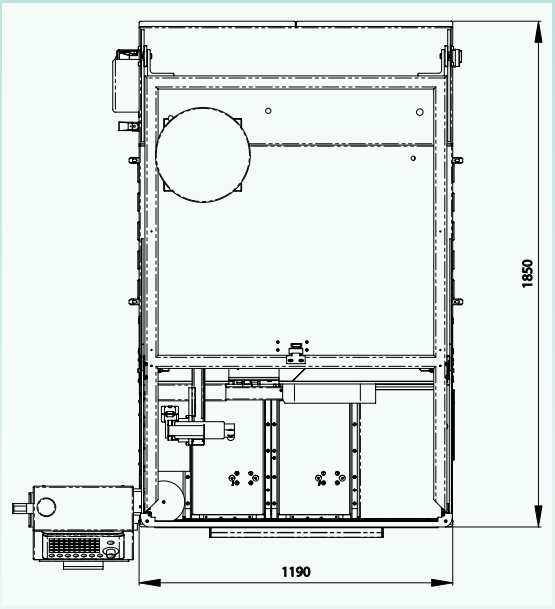
VECTOR Twin	
Grinding approach angle	0º or 30º
Maximum length between centres	80 mm
Maximum diameter ground between centres	30 mm
Maximum diameter held in chuck	50 mm
Maximum diameter swing in chuck	120 mm

Dimensions

Including Loading System, without Coolant System

1,200 x 1,900 x 2,100 mm

Weight	Approx 3,500 Kg



CMT CURTIS MACHINE TOOLS LTD

Martells Industrial Estate
Slough Lane
Ardleigh
Colchester
Essex
CO7 7RU
England

Tel: +44 (0)1206 230 032
Fax: +44 (0)1206 321 426
Email: info@curtisgrinding.com
Web: www.curtisgrinding.com

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Certificate No: FM67235