The VB36

Master Bowlturner Lathe

With no exaggeration, the VB36 has been designed to equip you with *ultimate* potential to take on any wood-turning project — and enjoy it! In his work, “The Lathe Book”, American author and turner Ernie Conover (who writes for Fine Woodworking Magazine) entitles one chapter “Dream Lathes”. In fact there is only one lathe described — the VB36!

Of course we are very familiar with manufacturers claiming “uniqueness” for their products, but the VB is ***truly*** unique in the best possible way. We want you to understand why.
By all means call us for further information, and don’t forget to e-mail us your address, or phone, for your free video.

VB with Standard bed tailstock

VB with Short bed tailstock

(Some thoughts from Roger Buse, Managing Director, VB Manufacturing)

"WHO BUYS A VB36?"

I have been involved with woodworking and woodworking machinery design and sales for the major part of my working life. In all of that time, I have never met a customer who regretted buying the very best machine that he or she could afford. On the other hand, I have sold a succession of slightly improved specification machines to the same customer over a period of years until he finally ended up with the machine he was truly happy with — that is the one that he "*couldn't justify*" or "*didn't have the space for*" all those years ago!

When considering a purchase, all sorts of reasons are offered for settling for less than what one really wants. Buying the best is the simplest way to save money and enjoy one's woodworking activities from the start. Unlike differences in Hi-Fi equipment, which may cost many hundreds of pounds for an end result that only bats and dogs can distinguish, the woodturner will immediately know when he is using a machine that has no inherent limitations or drawbacks.

Not much that we choose to spend our time and money on can actually be "justified" in any real sense. People play golf, go sailing, take holidays and so on because they enjoy it — not because they will ever be able to make a living by doing these things. Similarly, if you enjoy woodturning, you will derive even greater satisfaction from your time at the lathe if you are untroubled by equipment limitations and shortcomings.

I am often asked if we have any second-hand VB's for sale. In fact, although the VB is now by far the most widely used lathe in its price category, none of us have ever seen one advertised for sale. If one did appear on the market, we don't imagine that it would cost very much less than the owner paid for it! VB owners are not just professional turners, but people from every imaginable background who simply want to enjoy what they do.

"TESTIMONIALS"

Many of us have come to regard "unsolicited testimonials" with some suspicion and so we have avoided relying on "Chris, from Birmingham", or his relatives, for support. (In any case, most turners now know someone who is a VB owner to whom they can talk directly, or we can certainly refer you to one or more local owners.) However, in September '97, a letter appeared in ***"The Woodturner"*** magazine. It was sent by Keith Dickinson in response to what he felt was implied criticism of the VB in the review of another lathe in a previous issue. I include a copy of his letter here because it addresses the sometimes heard objection that the VB "runs hot". The editor devoted an entire page to reprinting Mr. Dickinson's letter. Here it is (without accompanying photographs):

"BRITISH ENGINEERING AT ITS BEST"

I am an obsessive woodturner and two years ago started to plan my own design for a bowl turning lathe. Around the same time I saw an advertisement for the VB36. I asked for information and was greatly impressed by the spec. After reading it, I shelved my plans.

My main reason for choosing the VB36 was because of its bearing specification. I am an engineer working in the Gas Turbine Division of Rolls Royce. We use bearings made on a very similar design principle for the RB211 gas compressor unit which generates 38,000 shaft horse power. It depends on its bearings not only to carry the shaft load, but also to keep things turning without any deviation from a perfect turning circle. I have seen these bearings after 100,000 hours in service (10 years) and found them in the same condition as the day the unit was commissioned.

I mention these facts because in the review of the Turnstyler, it was obvious that theVB36 was being alluded to as the only lathe not using ***"tried and tested"*** ball or roller bearings. In his conclusion, Mr. Warr emphasised that the Turnstyler bearings ***"happily need no attention whatsoever"*** and ***"thanks to those headstock bearings which remain cool, even under heavy load"*** and that ***"they are friction-free".*** The implication is obviously that temperature and rolling resistance are the ways in which bearing performance can best be determined — irrespective of bearing type, shaft seals, or indeed the working application.

The two types of bearing (i.e. plain or rolling element) are as different in their requirements and operating characteristics as chalk and cheese, and it is silly to imply that these differences are in themselves meaningful. A plain bearing "floats" the shaft and the heat generated through the work of the supporting lubricant film sinks away through the surrounding mass of metal in a predictable and controlled way. It is supposed to happen. Engineers evaluate and plan for it.

In the case of the VB36 the effect is moderate and precisely what we would expect from a fine tolerance assembly of this sort. In the same way, the four multi-lip shaft seals that isolate the front and rear bearings serve not only to keep the lubricant in, but also contaminants out. Their resistance is one indication that they are doing the job they are there for.

On the point of maintenance, I now use my VB36 for an average of between 25 to 30 hours a week. I check the bearing lubricant reservoirs before starting a turning session and, to date, have not had to add a single drop of oil.

What a pity that genuinely top quality engineering should be allowed to be denigrated in support of ill-informed conclusions. I feel very strongly that the term "British engineering" should do more than simply describe a product that was made in Britain!

P.K. Dickinson (Merseyside)

INSIGHTS FROM THE DESIGNER

Nigel Voisey explains the VB concept

As a woodworking journalist through the late sixties and on into the nineties, it was not my way to look for faults and shortcomings in the machines I was assigned to review, but simply to report honestly on what I found. I always hoped to find the best but was disappointed that so many manufacturers knew surprisingly little about how the machines they made were actually used.

I came into woodworking from an engineering background and often made suggestions as to ways in whch machines I found fault with could be improved. More and more of my time was spent in original design work for various manufacturers. The main problem was that manufacturing costs placed severe constraints on the choices that could be made. Market forces dictated that "ideal" solutions rarely saw the light of day, that is, if such changes made machines considerably more expensive than outwardly similar competitors. By and large, the woodworking world at user level is too thinly spread for news of product limitations to become shared knowledge. When a newcomer to woodturning experiences problems with a particular cut, he more likely to blame himself than to recognise the limitations of the equipment he is using.

I had settled for the fact that I was not going to find a way of removing accountants from the design loop or changing the world when Roger Buse asked me to design a lathe that I would be truly happy with. Whatever the final cost turned out to be, we would adjust our market expectations on the basis of that figure rather than design with an initial, choice-limiting cost in mind. I was delighted!

By the mid eighties I think I had used every lathe available on the world market. None of them, not one, offered more than a basic means to make the wood go round. I still find it incredible that until very recently the most popular lathe for top woodturners had just four speeds which had to be changed, more or less blind, through a hatch at ankle level in the pedestal whilst, at the same time, supporting the weight of the motor!

NO NOISE, NO WEAR, NO "FLOAT"

Another limitation imposed by cost considerations in the above case (and with most other lathe designs) is seen in the choice of bearings. Although transmuted into a virtue by marketing men, ball bearings are ***not*** the ideal support for heavily loaded shafts running at low speeds. Radial ball bearing assemblies and, to a lesser extent, roller bearings, are specified for reasons of economy as they are relatively cheap to buy and demand far less rigid engineering tolerances in the machining of the housings in which they are fitted than precision plain bearings. However, where extreme load carrying capability is called for, especially at low rotational speeds, plain bearings are the natural choice because they effectively eliminate metal-to-metal contact at the bearing interface. Such bearings often have the capacity to carry loads far in excess of the actual machine frame strength. (The Rolls Royce RB211 turbine developing 38,000 shaft horse power has plain mainshaft bearings lubricated by compressed air. Industrial machines from watchmaker's lathes to micron accurate CNC grinders also use plain bearings.)

The VB's precision bearings cradle the mainshaft without ever allowing metal-to-metal contact.

Consider the total silence with which these bearings do their job; the potentially perfect rotational concentricity they provide (effectively zero shaft float); mind-boggling load carrying capacity, and a life expectancy far exceeding one's own, and you can understand why this is an essential requirement for the "perfect" lathe.

CLEAR TOOL PATH ACCESS

The traditional centre lathe design, which is the basis for virtually all modern lathes, came into existence when turners thought that turning off-centre legs was an adventure. These machines were not made to assist today's turners with the sort of shapes and hollow forms that they often want to create. Although with skill and care such work can be done on them, it generally entails bending and straining at unnatural angles to direct the tool. Swivel head lathes make access easier, at least from the front, but then of course the tailstock cannot be used for initial support in working on deep, hollow forms, or to hold "finished" work between centres to remove evidence of chucking etc.

Contrast the experience of making the cuts required for this sort of work with your weight balanced directly over your feet; elbows pulled into your sides to gain maximum control inertia from your body and you will never want to turn any other way. The new lathe was to incorporate this thinking as another essential feature of its final shape. Vertically sheer casting and cabinet faces on the turner's side of the VB mean that even when approaching the work from behind, that is, alongside the headstock, it is possible to stand within 6" of the turning axis. The rounded nose profile of the casting where the mainshaft emerges clears even this small obstruction that might otherwise limit potential avenues of tool presentation from the rear of the work.

For the same reasons, the (optional) tailstock is offset so that it can be brought into use whenever required without obstructing tool access. The turner can stand directly in front of the work at its outer end with the tailstock in place and enjoy the same freedom of approach. All of this of course is only useful provided the tool rest itself can be positioned so as to eliminate over-reaching and excessive tool overhangs. Here again the VB is unique in allowing complete freedom of movement for the toolrest assembly around workpieces of up to 36" in diameter by 30" in length. (Much larger projects can be turned on the standard VB with the simple addition of the "Free Standing Toolrest")

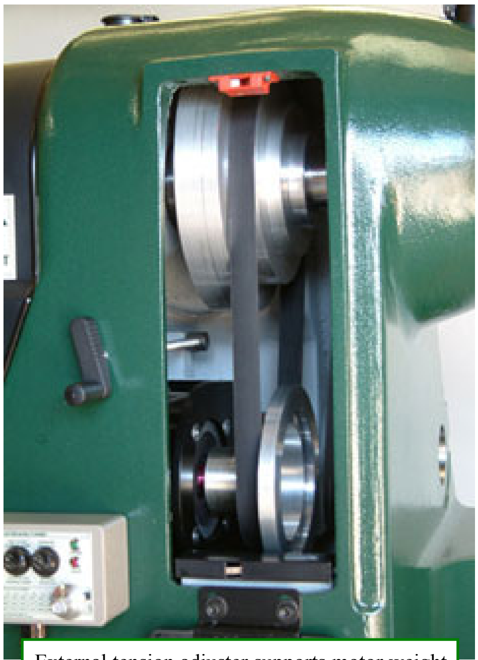
ACCESSIBLE CONTROLS

VB controls can always be held or re-positioned where needed for safety and working convenience

Being able to work freely from the front, side or back of a workpiece that might measure anything up to 7' 6" in diameter (over 2 metres) highlights another essential requirement — that controls should always be comfortably to hand, *or foot*, when ON/OFF functions are needed. Obviously fixed location controls cannot meet this need. VB controls are accordingly fed through a 24volt spur lead to a magnetically backed box that can be stuck on any flat metal surface precisely where needed. Switches are provided for starting and stopping the lathe; running in forward or reverse (useful for sanding, applying sealers and polishing); choosing fast or slow acceleration and braking times; and setting or varying the speed by means of a ten revolution dial. (Changing the speed over such a high number of dial revolutions means that the speed can never be inadvertently knocked to a dangerously high setting — not an uncommon occurrence with lever or "coarse" dial speed change systems.)

If totally hands-free START/STOP functions are called for, such as when deep hollowing through the mouth of a narrow necked vessel, an additional 24volt spur is provided within the standard specification for connection of a footswitch at any time. The addition of a footswitch does not interfere with the normal functioning of the hand control unit.

SMOOTHEST POWER DELIVERY



External tension adjuster supports motor weight for effortless drive ratio selection and change

One of the problems encountered by those who first tried to give that lathe mentioned previously (the one with the ankle level belt change) electronic variable speed was that the belt slipped at low motor speed settings. A drive pulley diameter that has been calculated to transmit the full motor power at normal motor speed (say 1425rpm) loses transmissive efficiency as the motor speed is reduced. The motor will keep turning but the belt will slip. For variable speed lathes, the drive pulley diameters must be re-calculated in line with a formula that describes exactly how much power each rib of a belt will transmit at the lowest envisaged motor speed, and accordingly by how much the drive pulley diameters need to be increased.

Adoption of this principal in the VB design involved a major cost that it would obviously have been much cheaper to compromise — but this would have been to negate the whole point of what we set out to do. The low speed ratio of the VB's three pulley steps is therefore driven through a fifteen rib, 60mm diameter pulley. To achieve the desired 4:1 reduction for best gearing (and to keep the motor turning at a healthy speed when the lowest setting is used), the final drive pulley had to be machined to 240mm diameter. This is about twice the diameter and three times the width of the comparable pulley on any other proprietary lathe for woodturning — and, when the calculations are done, about ten times the cost! Also, we had it in mind that the system needed to be adequate for the larger than standard motors that the VB can be fitted with, and without the need for anything more than moderate belt tension.

Belt tension is applied through a crank handle on the outside of the headstock and held by screw adjustment rather than friction. This allows tension to be finely tuned and set with the lathe running — eliminating the variations and uncertainties of friction held systems.

The electronics package is likewise the most sophisticated available. It allows us to pre-set more than 30 performance parameters to ensure that power delivery and final drive rotations are the smoothest imaginable. Even under operating extremes of free-running or heavy braking , forces are continually monitored and power automatically and instantaneously adjusted to keep the work turning at precisely the pre-selected speed.

LOAD SECURITY

I gave the work mounting arrangement a lot of thought. Turners had become used to the 1½" x 6tpi thread as the one that, at professional and other serious turner level, would enable them to continue using most of the expensive chucks and

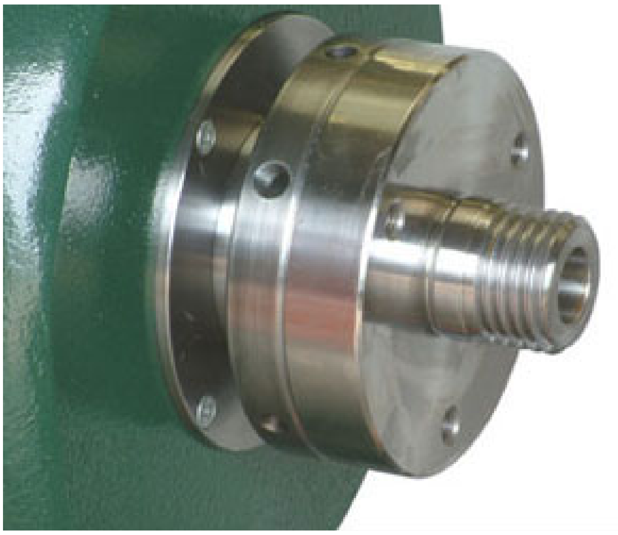
and other threaded fittings they already had. Yet, from an engineering standpoint, it was very clear that this was far less than ideal for the VB. The imposition of a threaded fitting between the lathe and the workpiece would result in a measurable loss of turning concentricity. We wanted the same sort of run-out test figures that would be acceptable in a top quality engineering lathe.

We also had to consider the risks of a heavy load unscrewing itself from a threaded mounting due to its own momentum during a braking cycle. Then there was the occasional need to be able to safely reverse the drive for various reasons (including *left-handed* turning!). We finally decided on a modified bayonet fitting where the chuck or faceplate effectively becomes an integral part, or extension of the mainshaft with no weak or flexible links due to an interposing thread.

To continue using existing chucks (to better effect than ever before in fact), most accessory manufacturers offer an alternative backplate or body for their chucks with the VB fitting. Alternatively if you need to retain the original lathe thread, a range of thread adaptors are available which lock directly onto the VB mandrel nose allowing your chucks to be used in the conventional way.

Secure "bayonet receiver" for VB fittings

Thread adaptor for other fittings



When making thread adaptors we also match the original lathe's Morse Taper so that all other original fittings such as drive centres and M.T. arbor drill chucks will fit.

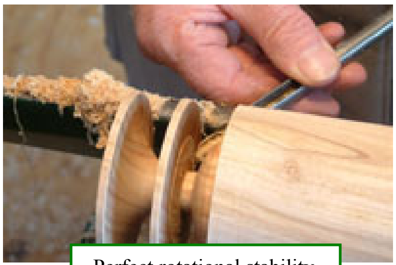
MOST ACCOMODATING TO INDIVIDUAL TURNING STYLES & PROJECT NEEDS

Many of the lathes I used in my reviewing days had toolrests that prohibited the use of anything other than an "overhand" grip. I generally like to turn with my lead hand as close as possible to the bearing edge of the toolrest with the palm facing *up* to cradle the tool. I therefore wanted to ensure that no matter what style of grip a turner favoured, he or she would be happy with the VB rests. Also, there are times when a conventional "T" rest does not offer the particular sort of support that is required, for example whenthe tool needs to be supported close to its tip whilst up to 1 metre deep inside a hollow form.
All of these situations are catered for within the VB system.

Conventional 'T' pattern toolrest

The XDHR Deep Hollowing Rest 1

DESIGNED TO CARRY THE HEAVIEST & *LIGHTEST* OF WORK



Perfect rotational stability facilitates finest tool work

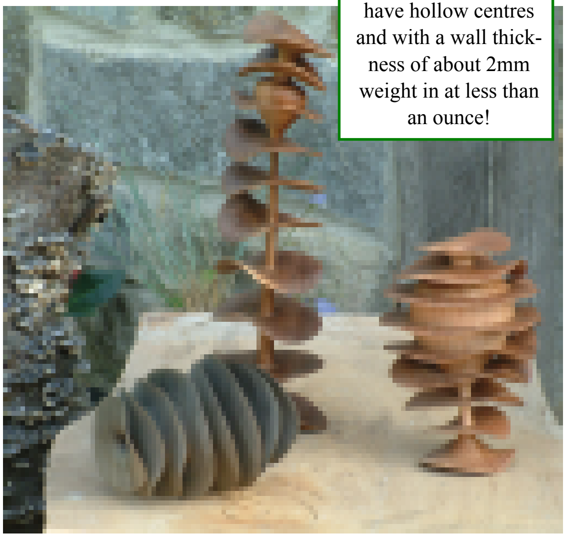
Because of its exceptionally precise turning characteristics, the VB is unmatched in its ability to allow the turner to produce the most delicate forms entirely free from the limiting effects of vibration or unwanted shaft float.

At the other end of the scale, the VB brings you virtually unlimited potential for handling the heaviest of eccentrically shaped pieces. This is partly due to the mainshaft design and bearing configuration that I mentioned earlier. The VB's mainshaft is 500mm in length with an external bearing separation of 400mm. This provides an adequate counter-leverage factor to ensure that the headstock casting is relatively unstressed by the huge dynamic forces that can be placed on it.

To better visualise this, imagine that the rear bearing of the shaft is replaced by your hand. The force you would feel from a static load on the spindle nose would be pushing your hand up and you would exert proportionate downwards pressure to counteract it. The front bearing would be the fulcrum point of the system. A short shaft would severely limit the possible weight of the overhanging load. Conversely, it is easy to see that if the length of the shaft is increased, the forces being focused through the casting where it supports the front bearing are increasingly being directed in the plane of its maximum strength and greater loads can be carried.

In this picture the mainshaft is acting as a beam and its strength must be calculated to span the gap between the bearings without flexing under any load envisaged. Another fact that now becomes obvious is that a lathe's ***real*** performance potential cannot be judged simply by turning a heavy disc - impressive though that may appear. ***Overhang*** of the load beyond the front bearing is the factor that will really test the engineering soundness of a lathe's design.

The VB's shaft is turned from EN8 steel (extremely tough and with about twice the tensile strength of mild steel) and ground to its finished diameter of 60mm. The bearing journals are then electrically hard-chromed in final preparation for their virtually endless working life. To say that ***no*** other woodworking lathe even remotely approaches this specification is no exaggeration; it is an indisputable fact.



These "sea flowers" have hollow centres and with a wall thickness of about 2mm weight in at less than an ounce!

During a recent International Woodworking and Woodturning Exhibition at the NEC, Birmingham, the VB was used to turn a trunk section of wet oak measuring 26" in diameter by 46" in length. The hall owners would not let us drill their floor to secure the lathe so the work was done with the lathe free standing! The standard tailstock was fitted to prevent the lathe toppling forward under the 700lbs overhanging load, but the entire job was finished without support from the tail centre at any stage and without any additional subframe to extend the VB's natural footprint. You may never want to turn anything of this size but it's nice to know that the features which enable pieces of that description to be carried without strain are the same ones that contribute to Melvyn Firmager's production of his incredibly delicate and fragile "Sea Flowers".

Turned *without* tailstock support at any stage

Another piece, this time commissioned by the "Worshipful Company of Turners" for the 400th Anniversary of the guild, was turned at the Stoneleigh Exhibition in September 2003 by Stephen Cooper.

(Finished weight ¼ tonne approx. Height 4'6" by 4' diameter.

"FUTURE-PROOF"

It took about three years to design the VB and another two to get it into production. In the seven years since then it has been tested beyond the limits I had in mind when I was sitting in front of my drawing board, but has successfully met every challenge. Future developments that may come from ideas from users (the "Bennison Adaptor" for example) or new technology will always be introduced in a way that can be applied to existing machines. Owners can be confident that a VB lathe will never be obsolete but will always be "upgradable" to meet the very latest specification.

CAPACITIES & CONFIGURATION
of the VB36 Lathe

BOWL TURNING PEDESTAL

Swing over toolrest beam:	up to 36”Ø (915mm)
Swing over floor:	“H” model, up to 92”Ø (2340mm)
	“L” model, up to 86”Ø (2185mm)

WITH OPTIONAL “STANDARD” TAILSTOCK FITTED

Swing over bed:	up to 26”Ø (660mm)
Max distance between centres:	up to 31” (790mm)

WITH OPTIONAL “SHORTBED” TAILSTOCK FITTED

Swing over bed:	up to 27”Ø (690mm)
Max distance between centres	up to 24” (610mm)

SPEED RANGE

Pulley step 1:	infinitely variable between 50 — 500rpm
Pulley step 2:	infinitely variable between 150 — 1350rpm
Pulley step 3:	infinitely variable between 250 — 2600rpm

MOTOR

2 hp/1500 watt, 240volt, 3 phase continuously rated motor wired through phase inverter for use with 1 phase (domestic) supply.
(3 hp /2250 watt motor with commensurate electronics optional.)

MANDREL SHAFT

60mmØ x 500mm o/a length. Bored through for vacuum chuck.
3 M.T. swallow. Fitted with 8” (200mm) Ø rear handwheel. Nose fitting:
3 point ‘bayonet’ pattern for complete security in forward/reverse.
(Thread adaptors available for any required spec.)

CONTROLS

Housed in magnetically backed box on 2 metre, 24volt lead.
Provides: Stop/Start; Fwd/Rev; Fast/Slow braking and acceleration to pre-selected speed; 10 revolution speed selection dial with lock;
System diagnostic OK and Fault lights. (Footswitch optional.)

TOOLREST BEAM

“Floating” beam clamps in required location by internal folding-wedge mechanism operated by external crank handle. Gives complete range of toolrest positioning options around any form up to 36”Ø x 26” length.
(Floorstanding toolrest holder optional.)

DIMENSIONS

Footprint of pedestal lathe:	21” x 20” (526 x 500mm)
Footprint with HD tailstock added:	65” x 25” (1650 x 640mm)
Overall height:	“H” model, 52” (1325mm)
	“L” model, 49” (1245mm)
Turning axis (centre) height above floor:	“H” model, 46” (1170mm)
	“L” model, 43” (1095mm)

WEIGHT

Pedestal lathe with toolrest beam:	583 lbs (265 kgs)
As Above with HD tailstock fitted:	847 lbs (385 kgs)
As above with shortbed tailstock fitted:	701 lbs (319 kgs)

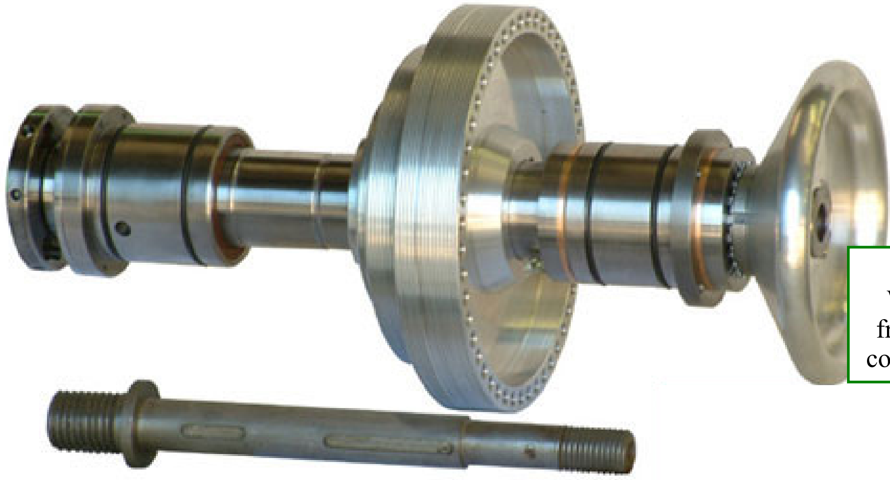
FINISH

Dark green, electrostatic powder coat oven baked at 200ºC

STANDARD EQUIPMENT

12” (300mm) toolrest; 5½” Ø (140mm) steel faceplate; Indexing/shaft locking tool; Centre ejecting bar; 250ml VB Lube; Allen Keys; Comprehensive Owner’s Manual.

BEARING SPECIFICATION



The mainshaft from an industrial Wadkin lathe is photographed in front of the VB's shaft to illustrate comparative size and work potential

The foremost reason for choosing "plain" bearings for the VB has been explained in Section 2 (Designer's view). The choice focuses primarily on their extreme load carrying capability, perfect running concentricity and negligible wear characteristics. An added bonus is that they provide all these benefits in total silence.
Ball or roller bearings have theoretical point or line contact with their tracks and the actual contact area is therefore very small. Especially when subjected to high loads at low speeds (typical operating conditions for woodturning lathes), the boundary film provided by the lubricant breaks down. The load then forces metal-to-metal contact within the assembly. The damage is cumulative and limits the life expectancy of any rolling element bearing. (Also, the necessary working clearance in all such assemblies allows the rolling elements to generate noise, which worsens as the bearing ages.)

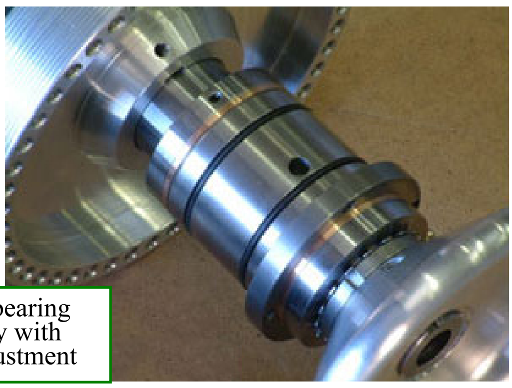
Precision plain bearings by contrast "float" the shaft in a thin film of lubricant and, because the curvature of the adjacent surfaces is practically identical, are capable of carrying hugely increased loads without ever allowing contact between the shaft and the supporting faces of the bearings. In fact, the special lubricant used for the VB bearings provides a boundary film resistance that will withstand load pressures at the interface in excess of 200,000 pounds per square inch. The VB's main bearing alone has an internal surface area of more than 20 square inches so could probably withstand the force of a small nuclear event! The necessary working clearance between the shaft and the supporting bearings is completely taken up by the lubricant film so that the shaft has no detectable play.

A difficulty for manufacturers who want to take advantage of these benefits is that there is zero allowance for misalignment of the bearing housings in a linear plain bearing system. Traditionally, such bearings were therefore fitted undersize, then reamed simultaneously in-line to open them out to the required dimension. However, the reaming process itself could degrade the bearing surface. We solve the problem by using of one of the most advanced machining centres in the world to ensure that the alignment and surface finish of the VB's mainshaft bearing assembly is "perfect". (See Video.) This machine actually monitors its own performance to an accuracy of better than 5 microns on any axis! (A micron is one thousandth of a millimetre.)

Phosphor-bronze is the material most people think of when considering plain bearings and, if lubrication is uncertain or infrequent, this may indeed be an appropriate choice. Where permanent lubrication is provided for however, cast iron has positive advantages in that it can be ground to the finest tolerances and has virtually indefinite working life. VB bearings are machined from a special grade of solid cast iron billet that has been precisely formulated for such bearing duties. Oil reservoirs and galleries are provided above and below the shaft and distribute oil evenly over its surface as it rotates. Oil seepage outside the bearings is inhibited by isolating the journals within spring-loaded, twin lip, high temperature seals and protective steel covers.

Axial clearance (or "end-float") is adjusted by means of a single nut at the rear of the mainshaft. A thrust bearing is sandwiched between a step on the mainshaft and the inner face of the rear bearing.. A second bearing locates against the outer face. The separation between the inner and outer components of the thrust assembly is thereby minimized so that the clearance setting is unaffected by thermally induced variations in the overall length of the shaft. (Because the thrust washers are outside the main bearing lubrication system, they are made from phosphor-bronze and have independent grease nipples.)

We give the VB bearings a 10 year guarantee but firmly believe that they will last forever! (In contrast, service life of ball bearings in lathes might typically be limited to 5000 hours, or *significantly less*, according to load and speed factors as well as the quality of the original bearings and accuracy of housing alignment.



VB rear bearing assembly with thrust adjustment

CONTROLS

Safe turning parameters can be set or altered from any chosen position without ever having to reach around rotating work

"User operated" and "automatic" control functions are uniquely provided for within the VB36's standard specification.

Controls are immediately accessible irrespective of workpiece size and shape.

It is never necessary to reach over or around a rotating workpiece — which may have uneven or sharp edges and enormous momentum. All control functions can be selected and operated through switches or dials that are housed in a magnetically backed box. Simply position the box on any flat metal surface, or hold it and stand wherever convenient to observe and fine tune rotation requirements before proceeding with the work.

Every practical option is provided for precise direction of the turning process.

Control functions include direction of rotation; acceleration and braking times; infinitely variable revolutions without loss of torque, and positive Start/Stop operation. Drive parameters can therefore be simply set to aid rough turning, final shaping, sanding, application of sealers and finish coats, and final polishing *with* and/or *against* the lie of the grain.

Designed to eliminate common mechanical and electrical hazards.

Most importantly, the speed selection dial cannot be operated inadvertently to engage a dangerously high speed (as can lever or single action dial controls). Also, the very high currents and voltages associated with phase conversion electronics are contained in the main control box housed inside the VB's sealed cabinet base. Control circuits outside this, including the leads to the control box and footswitch, are transformed to 24volts for perfect safety.

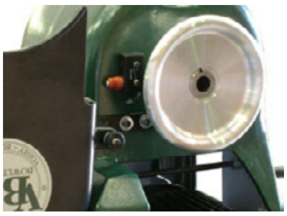
Footswitch — for hands-free operation:

The (optional) footswitch is inoperative as long as the hand control is switched off. Once the hand control is switched to the ON position, full ON/OFF functions can be effected through either the hand or foot controls. Acceleration and/or braking times as well as the desired speed will be as you choose to set them by means of the hand-control unit in the normal way. All hand-control functions continue to be fully operative during a foot-switched cycle.

The footswitch is rated for at least 200,000,000 operations. It is sealed for protection against dust and shrouded to guard against accidental operation.

For electrical safety, the switch is connected through a 24 volt spur and can either be factory-fitted, or added later.

Automatic control systems:



Micro-switches:

Both the rear handwheel cover (left) and transmission access door (centre) are micro-switched to stop the lathe immediately if either is opened when the lathe is running. Similarly, the lathe cannot start if the "shaft locking and indexing bar" is left in place (right).

Prevention of accidental re-start:

If for any reason the mains power supply to the lathe is interrupted, the machine will of course stop. In these circumstances the normal ON/OFF control will not have been used and the switch would remain in the ON position, allowing the lathe to re-start, perhaps without warning, as soon as the mains supply is restored. This is prevented by means of a "No Volt Release" circuit that automatically trips out the normal control functions if power supply is interrupted. The lathe cannot re-start until the NVR switch is operated by a deliberate action of the lathe operator. Once this has been depressed, normal control functions are restored to the hand (and foot) switches.

Combined with the NVR circuit switch is another protective feature that automatically senses and switches off the power if the motor begins to overheat due to sustained overload. The complete switch assembly is referred to as a "TONVR" switch and, in the case of the VB, is conveniently located at knee level on the nearside of the cabinet base. It has a hinged cover that can be locked (small padlock required) to prevent unauthorized use of the lathe.

TRANSMISSION

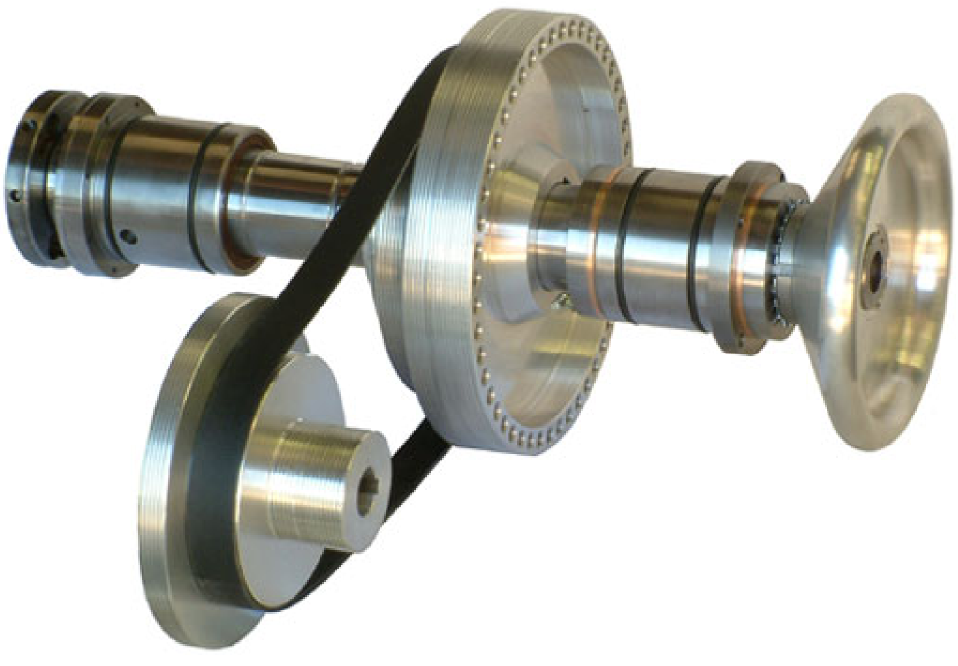
Optimum torque and smoothest power delivery:

Power is transmitted from the motor to the mandrel shaft via pulleys and a ribbed belt. The purpose of the system is to maximize available turning power at any given rpm. At first glance, it might seem that having the means to vary the speed of the motor between its extremes would be sufficient, but in practice, all motors lose the ability to develop power at the bottom and top ends of their revolution range. Gears enable any useful speed to be utilized whilst allowing the motor to keep turning within its most efficient torque generation band and, in the case of an air-cooled motor, enabling its cooling fan to maintain a stream of air over the motor casing.

The ratios provided by the VB gearing are:

1st	4 : 1	reduction of motor speed to final drive speed.	(Range 50 — 500rpm)
2nd	1.25: 1	reduction of motor speed to final drive speed.	(Range 150 — 1350 rpm)
3rd	1: 1.5	increase of final drive speed to motor speed.	(Range 250 — 2600 rpm)

This means for example that when the motor is turning at 200 rpm, in "1st gear" the mandrel shaft will be turning four times as slowly- that is 50rpm, etc. In terms of everyday usage, it is totally unnecessary to go through calculations to determine the best gear to use - any more than one consciously calculates at what speed to change gear in a car. It becomes immediately obvious that a lower gear is needed when climbing a steep hill to enable the motor to keep turning happily and maintain road speed. In the same way, it might seem to be possible to use the highest lathe pulley ratio (3rd gear) to turn a very large and heavy piece of wood because the lowest speed on that ratio is 250rpm. In practice, the lathe will deliver much more turning force if the lowest ratio were to be used. Once the bulk of the rough turning had been done, it might be deemed safe to increase the speed to say, 500rpm. Here again, this would be *possible* in 1st gear (in the same way that it is possible to drive your car at 40 mph in first gear), but hardly ever the best choice. Things will be more relaxed when the middle ratio is selected.



The incorporation of a "soft" transmission between the electric motor and the mandrel shaft additionally minimizes the work that the *motor* bearings have to do.
They are designed to carry the load of the rotor and motor pulley - not any part of the lathe's workload. (Ask the motor manufacturers.)

There are further advantages in the VB transmission in that the drive pulleys for every ratio are very substantially larger than those found on any outwardly similar lathe. This means that all the motor's power can be delivered through the system without slippage and with only moderate belt tension, thereby even further reducing load and wear on the motor bearings whilst contributing to the smoothest turning performance.

The most inexpensive way to produce the large diameter pulleys that are a feature of the VB design is to machine them from castings. However, because gravity castings rarely have uniform density and generally only the external faces are machined, imbalance will cause vibration. VB pulleys (and the rear handwheel) are therefore machined on all faces from solid, extruded billet to ensure *perfect* balance.

TAILSTOCKS

The VB can be fitted with either the "Standard" or "Short Bed" tailstock assemblies. Both are designed with offset beds so as to impede the natural stance of the turner as little as possible. With either tailstock in use, the turner can stand directly in front of the work (that is, facing the spindle nose) and manipulate tools right into the centre of the turning axis without bending or stretching. The important features of the respective assemblies are described below.

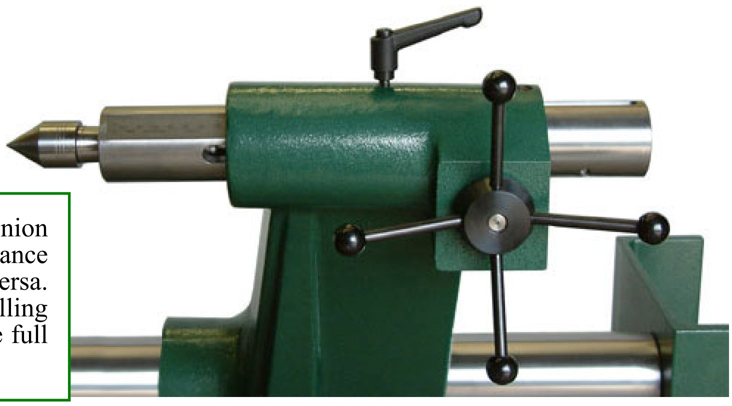
The standard tailstock gives a 30"/750mm by 26"/650mm Ø capacity and operates on the same principle as a conventional centre-lathe tailstock with a tailstock body that slides along a fixed bed. As with the VB's shortbed version, the complete assembly is designed to provide unobstructed tool-paths for virtually 180º access to the "turning" side and ends of the work. Even the turret lever that operates the tailstock quill is a "pop-out" design that can be removed to give clear access alongside the tailstock body. To make use of the VB's full 2 metre swing, the complete bedbar, tooltray and outer support leg structure can be removed or re-fitted in about twenty minutes.

Both the "Standard "and "Short Bed" tailstock spindles are hollow to permit the use of a lamp stem boring auger.

VB with Standard Tailstock:

Pin-point alignment of the centres is set and maintained very simply by adjustment of the bed-bars. The 75mm Ø upper bar, which carries the main load, is machined with a cam-form that, when rotated, raises or lowers the tailstock body so that the point of the tail centre can be vertically aligned with the drive centre. The smaller diameter lower bar is also a cam that operates against a projection on the tailstock body casting to effectively move the tail centre horizontally. When adjusted for perfect centre alignment they are clamped to retain that setting.

When not in use, the tailstock body pivots over to lie clear of the turning circle



Operation of the tailstock quill is through rackand pinion gears. Just four revolutions of the turret lever will advance the quill from retracted to fully extended, and vice versa. A scale is set into the side of the quill so that drilling depth can be very accurately monitored through the full 6" (150mm) travel of the assembly.

Short Bed Tailstock

This is the most convenient option for turners primarily interested in bowl and hollow form turning. It provides a capacity of 24”/600mm between centres and a 27”/675mm diameter swing. Most notably, it can be parked out of the turning circle to restore the full 2M+ swing of the lathe in a matter of seconds. Alternatively, it can be completely removed without the use of tools. When required, it can be just as simply and quickly be brought back into use with its centre alignment automatically retained.

VB with Short Bed Tailstock

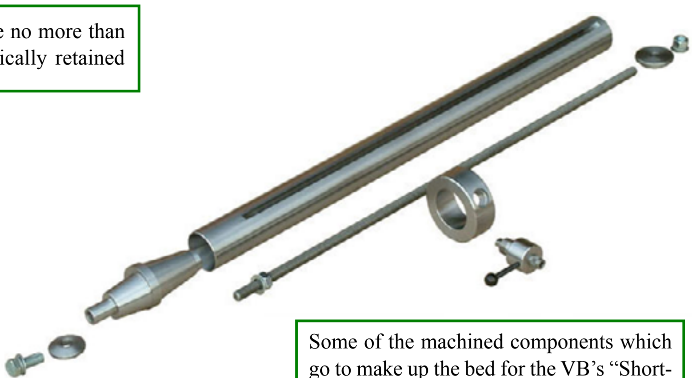
Coarse adjustment of the tail-centre position to hold work of different lengths is made by sliding the complete bed-bar/tailstock assembly through its in-line mounting bores and clamping in the required position. Final adjustment is made using the Q.A. hand lever to advance or retract the tailstock quill in a single movement. This feature is useful for exploring alternative mounting centres by “nipping-up” a workpiece between centres, testing for balance, releasing and repositioning, etc. Once the desired working centres have been established, the work is held with appropriate pressure on the hand lever whilst the quill is clamped.

The Q.A. action is also convenient for rapid centre boring of a piece held on a chuck or faceplate. The quill has a 4”/100mm travel effected in a single movement of the hand lever. To bore deeper than this, after the first 4” plunge has been made, the bit is wthdrawn and the tailstock assembly advanced a further 4” before repeating the boring process, and so on.

To set the tailcentre in perfect alignment with the turning axis (a job that only has to be done once), the tailstock casting is fixed to the bed-bar by means of a twin taper (eccentric/concentric) block that enables vertical and lateral (cross-hair) adjustment of the tailstock position before it is clamped for “permanent” retention of the setting. The bar itself has a tapered keyway machined along its length which accepts a correspondingly wedge profiled detent pin to ensure that the alignment setting of the tailstock assembly is retained at any extension, or can be simply reinstated after the assembly has been swiveled down for parking.

Bringing the tailstock back into use take no more than a few seconds with alignment automatically retained

Particular attention has been paid to ensuring the rigidity of the tailstock assembly mountings to prevent the centre from springing away from the lathe’s true turning axis under load. The 65mm diameter bed bar is turned and ground from a high tensile steel tube to finish at a 12mm wall thickness. When assembled with the tailstock casting, a 25mm Ø steel rod is inserted to run through the length of the bed bar and strained to very high tension by means of a cap and nut at the rear. This enables the assembly to absorb enormous dynamic forces without flexing.



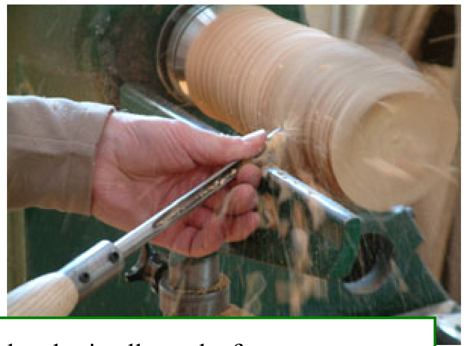
Some of the machined components which go to make up the bed for the VB’s “Short-bed Tailstock”.

TOOLRESTS

Conventional ‘T’ Rests:

These are used to support tools when spindle turning and for general faceplate work. Short toolrests are used where longer versions might foul some projecting part of the work or of the surrounding structure. Long rests are more convenient where space permits because they do not have to be re-positioned so frequently and allow uninterrupted sweeps of long features. Long rests are also useful for reaching inside a bowl or wide-mouthed vessel to bring the point of support for a tool as close as possible to the work.

It might reasonably be assumed that tool-rests for different lathes will provide pretty much the same facility. However, many lathes do not have a support structure for the toolrest that enables it to be adjusted close to the turning axis. The blade of such rests has to be angled forward and largely prevents the use of an underhand grip. The point at which the vertical post meets the blade also creates an obstruction to the free passage of the forward hand along the face of the rest. VB rests are carefully designed to permit the use of *any* preferred grip without the fingers becoming entrapped when the tool handle is held low, and to allow a full traverse of the rest without the hand or fingers having to adjust to changing contours.



An underhand grip allows the fingers to exert control force on the toolshaft very near to its tip for optimum effect with minimum effort

So that they can happily withstand the potentially huge loads to which a lathe with the VB’s capacities may subject them, VB toolrests are made from a combination of materials. (One such situation for example could be when supporting the turning tool on one of the extreme ends of the 16” toolrest and truing up a heavy log.)

The toolbearing blade is cast from SG (Spheroidal Graphite) iron which has about the same tensile strength as mild steel - that is, about *twice* the tensile strength of ordinary cast iron. The 40mm diameter vertical post that carries the blade is machined from EN8 steel, much tougher and harder than mild steel and impervious to the indenting pressure from clamping screws. The area of potential weakness where the vertical post meets the blade is eliminated by having the post threaded to enter a reinforced area of the blade casting. Both the shoulder of the post and the underside of the blade are machined flat to form a perfect interface for the final assembly which is completed by a permanent fusion process.

VB toolrests have an additional feature to aid tool control in particular situations. This is the “Firmager Pin” - a horizontally projecting pin that can be screwed into the turner’s side of the toolrest face to provide a positive anchorage point for the forward hand whilst the fingers curl around the toolshaft.
(A technique developed by Melvyn Firmager.)

DEEP HOLLOWING RESTS:

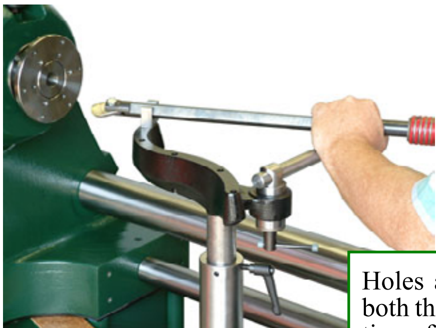
Deep, hollow form turning is carried out with tools that differ from conventional turning tools in that they are designed to be used *horizontally* and frequently project over the toolrest by distances of 12” (300mm) or more. Cutting performance inevitably deteriorates as projection increases, to a point where it becomes impossible to take a clean cut. Having the facility to place the support point of the toolrest actually *inside* the work obviously extends the depth to which a vessel can be worked. Even where tool projection is not an issue, best control is obtained when there is minimal overhang.

In conventional turning, the forward hand would normally be in contact with the toolrest and cradling the toolshaft at that point. (Try conventional turning with the forward hand withdrawn from the rest to appreciate the contribution that positive hand contact with the toolrest makes.) A potential hazard arises in the case of hollow form turning in that the end of the rest which supports the tool may be *inside* the work. It would be extremely risky to insert the forward hand through the neck of a rotating vessel. In practice, the forward hand is used at some point back along the toolshaft, out of contact with the toolrest, and some element of control is lost.

VB Deep Hollowing Rests have an independently adjustable *hand*rest outside the work. The net result is that the *tool*rest can be positioned inside the work to reduce overhang to a minimum and optimize cutting performance, whilst the *hand*rest gives positive anchorage for the forward hand away from rotating sharp edges etc.

The toolrest component of a VB DHR (Deep Hollowing Rest) has holes along its top edge to accept a fork insert or a vertical pin to limit to the travel of the tool when it is possibly out of sight inside the work. The handrest bar can also be used as a toolrest where the neck of the vessel is too narrow to permit the toolrest itself to enter. In anticipation of the fact that the handrest may sometimes be used as a toolrest, it has been designed to accept the vertical pin or fork inserts.

We make two versions of the DHR. Both provide a rock-steady platform for deep hollowing tools and are designed on the principle of linked, but independently adjustable *tool* and *hand* rest components as described above.



Holes are provided on the top edge of both the tool and handrest bars for insertion of a fork or pin. Also, the handrest bar has a threaded hole for use of a “Firmager Pin”.

Small Ø h/rest bar has unstepped tool support surface

The Standard Deep Hollowing Rest provides for an 8” (200mm) reach inside a hollow form. That is, it *increases* the total controllable reach of the tool by 8”. The handrest bar, when used as toolrest, can be extended up to 9” inside the work. A choice of even narrower bars can be fitted in place of the standard handrest bar for use through smaller apertures. Both of these are machined with a camform to bring the tool-bearing edge level with the support boss and form a continuous bearing surface for the tool.
(The photograph above right illustrates this.)

Extra Long-Reach Deep Hollowing Rest

The handrest bar component of the XDHR is available independently and gives an extensible reach up to 12”.

The XDHR assembly has a sliding toolrest beam with locking swivel extension which together give reach adjustment of between 4” and 20” (100 꽏 500mm). Such a potentially long extension of the toolrest means that its mount-ings can be subjected to enormous leverage forces. To enable it to absorb such loads the steel beam is mounted on an SG iron casting which encircles the outer diameter of the main toolrest support post (60mm O.D.). Because of the weight of the assembly, we strongly recommend it be used in conjunction with the HSC60 height setting collar. (See next section.)

HEIGHT SETTING COLLARS:

VB rests are intentionally heavy! The standard 12" (300mm) toolrest supplied with the VB weighs about 8lbs (3.9kgs) and the XDHR toolrest, *without* the handrest component weighs 45lbs (20kgs)! Height setting collars are available to support the weight of any toolrest and maintain its chosen height setting when its clamp is slackened to make a swivel adjustment. HSC40 is suitable for all toolrests with 40mm Ø stems, that is, all VB 'T' rests and the standard DHR rest. HSC 60 is only for use with the XDHR toolrest assembly.

Bennison Adapter:

Invented by VB owner John Bennison, this device allows a useful range of effortless adjustment of the toolrest without having to re-position the main toolrest support beam. A capped sleeve sits over the 60mm Ø post. It extends laterally to form a 40mm Ø receiver for any of the VB's 'T' rests or the standard DHR. A wedge sits in the central gap between the 60mm post and the 40mm toolrest stem. An external handle is threaded into the wedge and, when turned, pulls the wedge against the sides of the post and toolrest stem, effectively locking the double swivel action they provide. A height setting collar can be used in conjunction with the toolrest enabling the whole operation to carried out with one hand.

Free-standing Toolrest Holder:

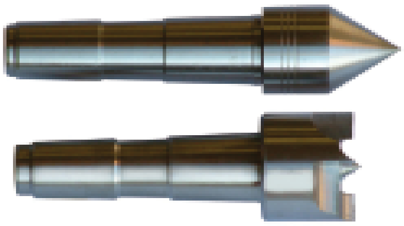
The VB toolrest beam can be positioned *behind* the turning circle of the work and offers a range of movement so that the back and outer rim of a large diameter workpiece (up to 86"/2200mm in the case of the VB 'L' model and 92"/2350mm for the VB 'H') can be shaped. With the beam swiveled forward to work on the front face, the maximum diameter that can be swung over the beam is 36"/925mm. The *Free-standing Toolrest Holder* (VB80) allows a toolrest to be located in *any* required position with no obstruction to the work, irrespective of length or diameter. The VB80 is supplied in H and L versions to match your lathe and accepts all of the VB's rests, including the XDHR. (Outrigger legs are available to further extend the footprint of the VB80 if working with the XDHR.)

The VB80 can be used as a rear positioned "handle rest" for long tools.

The VB80 can also be positioned *behind* or alongside the turner to act as a *handle rest* for long handled deep hollowing tools. In this mode, the horizontal attitude of the tool is effectively controlled by two rests, the conventional toolrest at the front and the handle rest at the rear. The turner simply uses sufficient downwards pressure between the two rests (or directly over the handle rest) to keep the tool in contact with both. The Handle Rest insert (VB80/BR) provides 26"/650mm total lateral sweep for the tool handle before re-positioning becomes necessary. Stops at each end of the rest prevent the tool accidentally running off when concentration is focused on the cutting action.

WORK HOLDING

Centres:

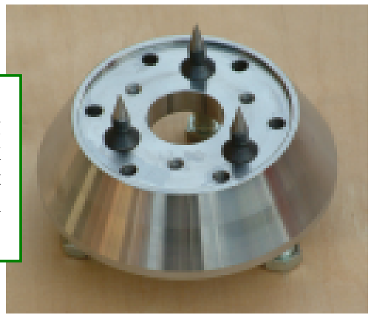


In this, probably the oldest form of mounting work for turning, the timber is simply compressed between a drive centre and a tail centre. Apart from the obvious application (i.e., spindle turning), centres can play a very useful role in the production of deep hollow forms.

For example, being able to mount an irregularly shaped piece of wood between centres is useful for establishing the centres of balance. Again, even where the main turning will be carried out with the work mounted in a chuck or faceplate, strain on the primary fixing is more or less eliminated when rough shaping is carried out with the tailcentre brought up to give support. Lastly, in the very final stages of production, being able to hold a vessel purely between centres (with the addition of bungs, soft pads etc.) facilitates the removal of any evidence as to how the work was held. A four prong centre is generally best for driving as it does not exert the wedging and splitting force of a two prong centre under compression. (With all centres, once their positions in the ends of the work have been decided on, it is a good idea to "pop" them using a wooden or leather mallet. This enables them to have good purchase without using *excessive pressure, which in itself can force the wood to bow and flex even before the cutting tool is applied.)

A revolving tail centre minimizes the need to make running adjustments to the compression as the work proceeds, but will create problems if it is of poor quality and allows the work to vibrate radially.

Sloppy centres make it difficult to execute a clean cut and avoid spiral ribbing on the work. VB centres are designed with these facts in mind and have two internal radial ball races plus a ball bearing thrust assembly to absorb all the turning forces to which they will be subjected. In keeping with this, the morse taper swallows on VB lathes are precision *ground* (not simply bored) to a perfectly dimensioned and smooth finish.

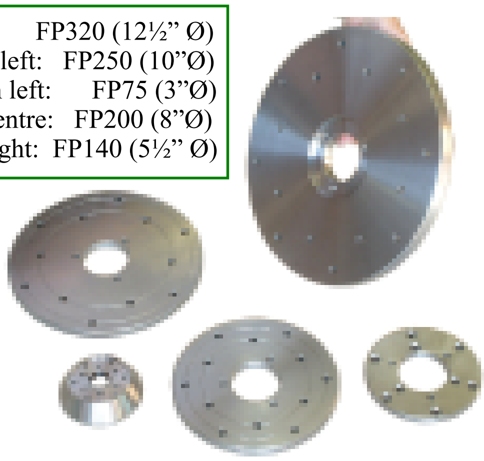


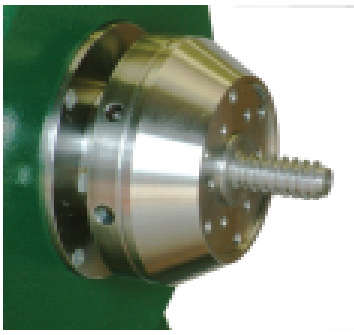
* In the case of very large workpieces being held between centres, it is important to recognize the limited ability of a small diameter drive centre to keep the work turning against the braking force of a heavy cut. Once this mechanical limit is reached, the work will stop whilst the centre continues to turn. Simply increasing tailstock pressure will not help. A larger diameter centre will be necessary, or the use of a small faceplate modified to act as a drive centre — as shown here with the VB's 75mm Ø faceplate (VBFP75).

Faceplates:

A faceplate provides the simplest and generally most secure fixing for heavy pieces or those that are mounted off-centre. Their holding power is frequently under-estimated but, by way of example, there probably never was a 16" (400mm) diameter bowl that could not be held more than adequately on a 4" diameter faceplate. A small plate allows greater freedom in shaping the foot of a vessel and, for say a 12" (300mm) diameter fruit bowl, the holding screws only need to project by ½" (12mm) or so to do their job. Faceplates have another advantage in that they minimise the overhang of the workpiece, enabling deeper vessels to be turned than would be the case were the work to be mounted further away from the main bearing by the imposition of a wide chuck body. (Rotational eccentricity increases as it is measured further out from the front bearing.)

Right: FP320 (12½" Ø)
Centre left: FP250 (10"Ø)
Bottom left: FP75 (3"Ø)
Btm. centre: FP200 (8"Ø)
Btm. right: FP140 (5½" Ø)





VBFP75 Faceplate

The VB's 75mm Ø faceplate has several features that extend its usefulness beyond that of any standard version. The raised rim distributes contact pressure evenly, and 6 parallel and 6 angled screw-fixing holes give it incredible holding power - even in end-grain. Additionally, a 20mm Ø x 40mm helical centre screw or a 1½" Ø pinchuck insert can be fitted to the centre of the faceplate to expand the range of simple, but very effective, mounting options for different types of work.