



CAMPDEN INSTRUMENTS LIMITED

INSTRUCTION MANUAL

FOR

ROMA752

REMOTELY OPERATED VIBROSLICE TISSUE CUTTER

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The information provided in this document is intended to be a guide on how to use the Vibroslice instrument safely and effectively and is subject to change without notice. Campden Instruments does not accept liability for any damages arising from this document or the information contained in it. Campden Instruments will not accept liability for damages arising out of misuse of this instrument.

Read and understand this instruction book before using the instrument. Only competent and capable personnel should use the instrument.

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This document should be retained for future reference as it contains the name and address of the manufacturer within the EC.

PACKAGING

Please retain original packaging for future use.

Instruments will not be accepted for service or repair unless the unit is returned adequately and properly packaged.

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INTRODUCTION.

The Campden Instruments Vibroslice was designed to cut 50-700µm thick slices of fresh brain tissue, but it has proved useful with a wide range of other tissues such as kidney or liver. It is also useful with fixed tissue where sections down to 20µm thick help with the penetration of reagents for histochemistry.

Vibrating blade slicers such as the Vibroslice appear to cause less damage than some alternative methods such as tissue choppers, this has proved valuable in preserving neurones in certain brain regions.

As the Vibroslice contains exposed moving parts and by its nature a blade capable of cutting tissue it is important adequate safety precautions are taken.

This instrument contains moving parts. Care must be taken not to interfere with their motion.

The blades used with this instrument are extremely sharp and should be handled with care. Dispose of used blades carefully.

Observe manufacturers guidelines when handling chemicals.

Spillage - If the cutting lubricant/preserving liquid, e.g. physiological saline, is spilt over the instrument it is important for electrical safety reasons to ensure that the instrument remains safe to use. To avoid the possibility of electrical shock if a spillage occurs, the unit should be switched off at the mains electrical outlet and disconnected before touching the instrument. The instrument should be inspected and tested if necessary by a suitably qualified technician before it is put into further use.

This instrument must not be operated unless it is adequately earthed (grounded).

All electrical instruments and equipment should be periodically tested to ensure they remain safe to use. In some countries this may be a statutory requirement. Your local Health and Safety Executive (or equivalent) will be able to advise on this matter.

User servicing is limited to changing the drive belts when necessary, and contains no other user-serviceable parts. Contact your dealer or Campden Instruments if you require assistance.

Operating Controls

The front control panel has been separated into three groupings – see Figure 1 – to enable remote control over Blade Speed, Blade Height and Bath Motion.

On the extreme right of the panel is the power On/Off switch.

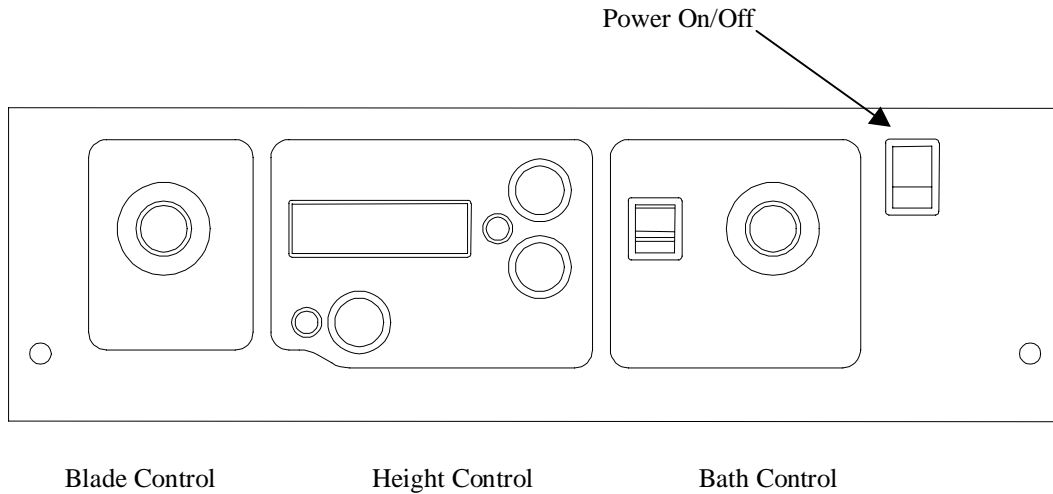


Figure 1

Blade speed

Blade vibration speed is set by turning the rotary knob – Figure 2 - either clockwise to increase the frequency or counter clockwise to reduce the frequency.

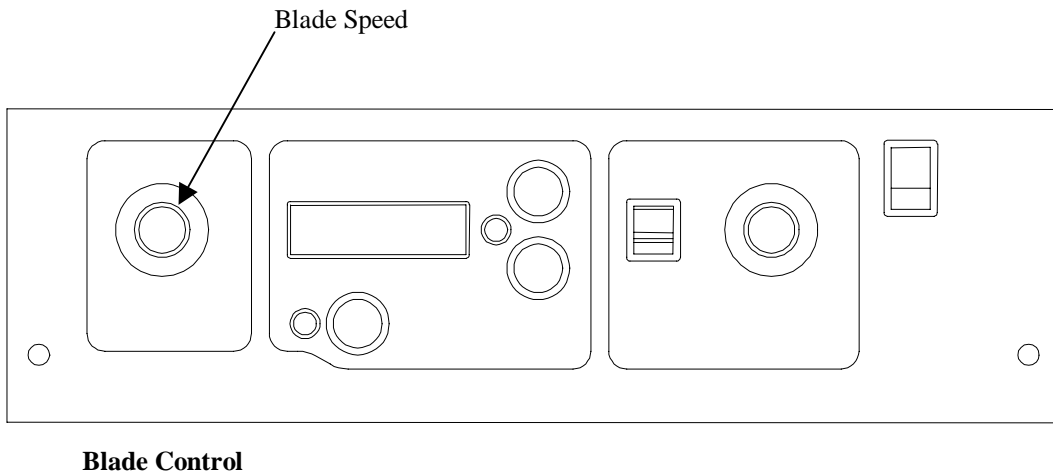


Figure 2

Note that the blade will not vibrate unless the foot switch has been plugged into the rear of the control and the switch is depressed. If the switch is released the blade vibration will cease.

Blade height control

The control allows the blade height to be adjusted under both manual and automatic control.

Manual Control

Referring to Figure 3, if both the Up and Down switches are pressed simultaneously, the unit will switch to manual control. This is indicated by the 'Manual Indicator' LED being illuminated. If either the Up or Down switches are now pressed the blade will move in the appropriate direction. This will be confirmed by:

1. The digital display will count up or down according to direction.
2. The manual indicator will flash.

Note that the four-digit counter will count in microns (thousandths of a millimetre), the leftmost digit therefore represents millimetres and the rightmost digit represents single microns. Bear in mind, however, that the lead screw is of commercial quality.

The rate of motion will initially be slow and will change to a higher rate if the switch is kept depressed.

If the Execute switch is pressed, the control will return to automatic mode.

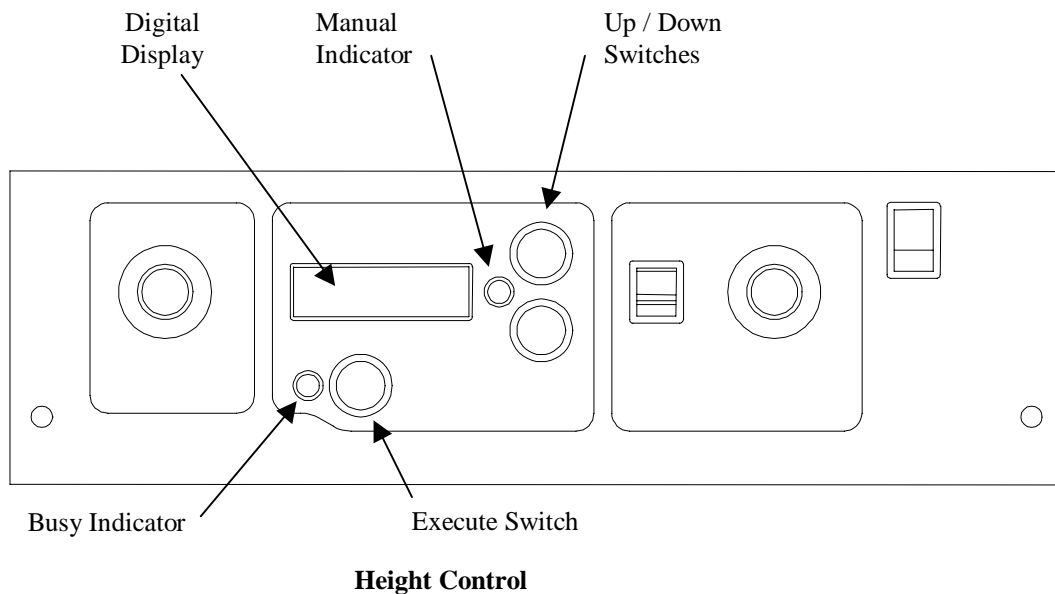


Figure 3

Automatic Control

When the unit is in automatic control, the following sequence occurs whenever the Execute switch is pressed:

1. The blade head will move downwards by the amount shown in the digital display plus one half turn of the lead screw.
 2. The blade head will then move UPWARD by one-half turn of the lead screw.
- The net distance moved downwards is therefore the distance shown on the digital display.

This motion has been programmed to occur in order to eliminate any backlash in the system introduced by moving the head downward in conjunction with gravity.

The net amount to be moved downwards i.e. the slice thickness, can be set by pressing either the Up or Down switches until the desired amount is shown on the display.

Bath control

See Figure 4.

The bath may be advanced or retracted according according to the switch position: up for advance, down for retract.

Bath advance speed may be adjusted by turning the rotary knob – clockwise to increase the speed, counter clockwise to decrease the speed.

Bath retract speed is always at maximum speed.

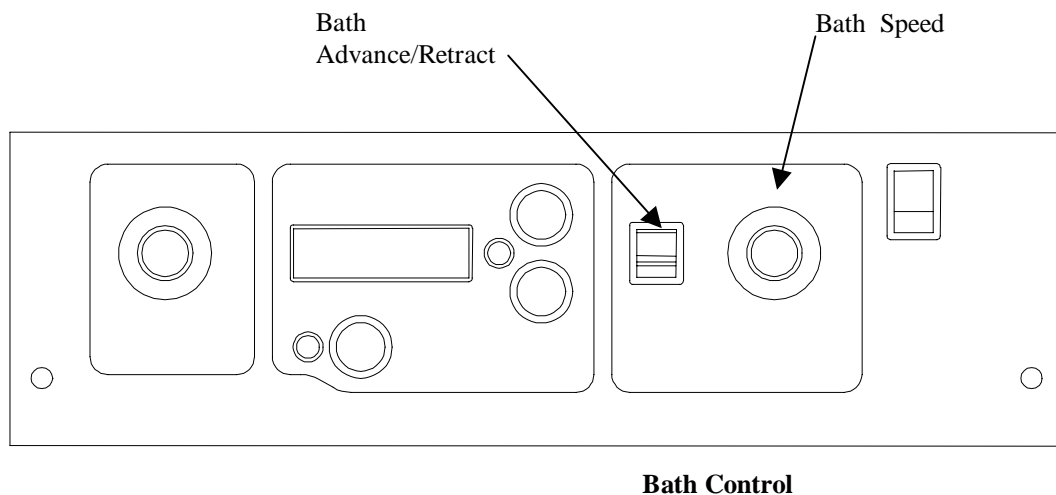
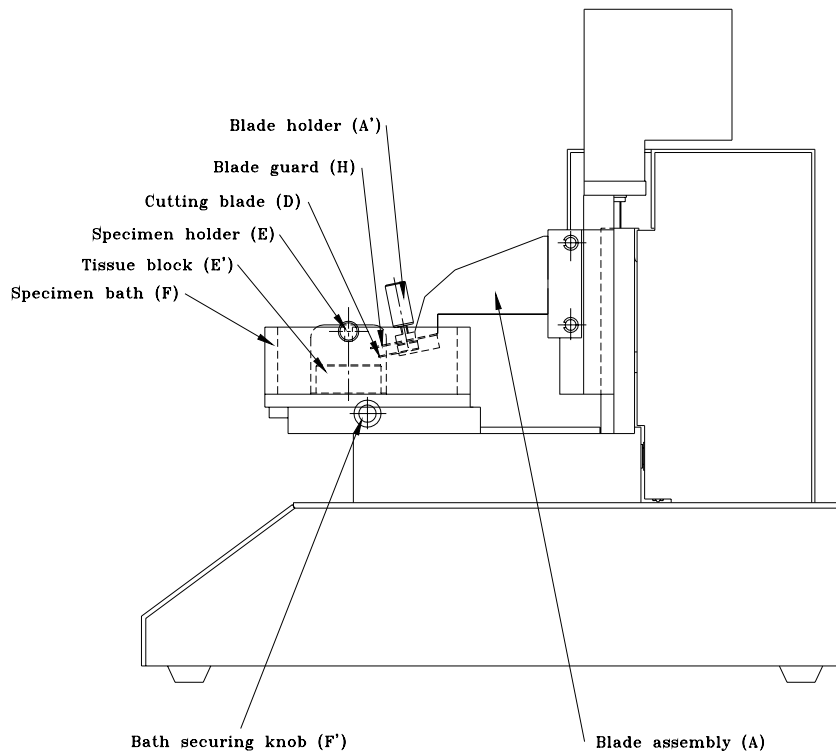


Figure 4

Operating Instructions



752M Motorised Vibroslice

Figure 5

Suitable blades include single segments of Valet strips, or other razor blades that fit in the blade holder. Spare blades (stainless steel or carbon steel) are available from Campden Instruments. Care should be taken when handling, inserting or removing blades.

Fix a new blade (D) in the slot in the blade assembly (A, A') and fix the specimen holder (E) in the bath (F). It should be noted that the blade (D) is protected by a blade guard (H). Care should be taken when setting up the instrument and when replacing the blade.

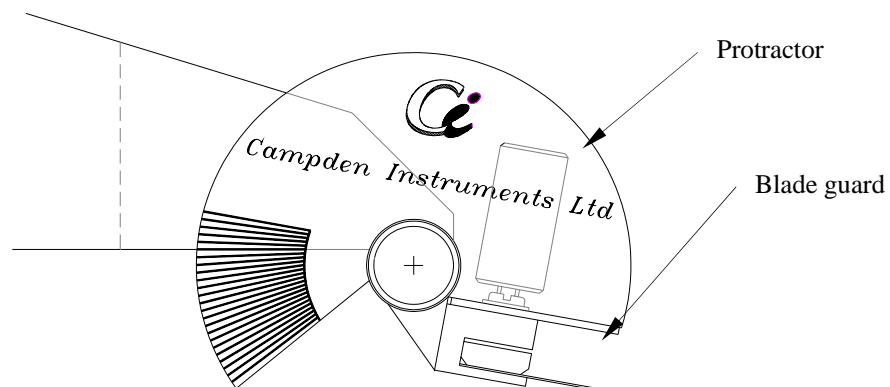


Fig. 1 Use of protractor for adjusting blade angle

The protractor supplied with the instrument is designed to facilitate the setting of the blade angle. The protractor should be slipped over the inner hub of either the blade locking nut or locking screw and rotated so that its leading edge rests on the blade guard as shown above. The blade angle may be set by loosening the locking screw and rotating the blade holder until the desired the graduated line is aligned with the lower edge of the nosepiece. The lines on the protractor are spaced at 2° (nominal) intervals. Experience has shown that an angle of approximately 12° is suitable for the original blades supplied with the instrument. Should you wish to personalise the protractor to suit a particular blade or tissue type additional protractors are available, part number 752/069

Remove the brain or other tissue and trim as necessary.

Glue the tissue block to the specimen holder (E↑) using a thin film of Super glue adhesive.
Pour cold, freshly oxygenated physiological saline into the bath (F) until the tissue block is immersed.

Set the blade vibrating by depressing the non-latching foot switch and adjust the vibration frequency (B) as required.

Position the blade to the correct starting height either by entering the manual control mode as described above or by indexing the head down by using the Execute switch. With the control system in automatic mode, set the slice thickness as required.

Lower the blade by the required slice thickness by pressing the Execute switch.

Advance the tissue block onto the blade by pushing the advance/retract switch upward for 'bath advance' to cut the tissue. When the cut is finished set the switch to the centre 'off position'. Reverse the bath by moving the switch down to 'bath reverse' and holding it down as this position is biased to 'off'. Limit switches will stop the carriage automatically at the limits of travel the handle (G). When the blade begins to cut you may find it necessary to adjust the blade frequency to a more suitable rate.

Repeat as often as required.

Preparing Tissue

The interval between death and the immersion of the glued tissue should be kept as short as possible to minimise anoxic damage, however total failures are more often due to clumsy handling than to anoxia.

Trimming the block is important because the orientation of the slices is determined by that of the surface glued to the stage. Parasagittal cuts have been found useful for transverse slices of rat dorsal hippocampus (glue down the cut midline) and for preserving the planar dendritic trees of Purkinje cells in folia of the cerebellum close to the midline (a Parasagittal initial cut should be made which removes the lateral lobes). In some cases it is easier to dissect the target structure free before mounting it on the stage. In others leaving the adjacent tissues on can give useful mechanical support (e.g. with transverse hippocampal slices); Tough connective tissue can cause trouble and should be cut off, or the block can be oriented to keep it out of the way of the cutting of the target structure. In a few special cases, additional support may be needed from external agents, such as embedding in Agar, or in formalised albumin (fixed tissues only).

Fixing Tissue

The block of tissue must be fixed firmly to the stage. Apply a thin film of cyanoacrylate (Super Glue) adhesive to the stage over an area large enough to accommodate the whole of the cut surface of the tissue block

Two common problems associated with fixing tissue are:

- (i) The tissue block floats away during cutting. This means that the glue has not bonded properly. This is usually due to the specimen being too wet. Use filter paper to draw off the excess liquid from the block before placing it on the stage.
- (ii) The glue forms a rigid film up the side of the block, interfering with the cutting process. This probably means that too much glue has been used.

Preparing the Tissue Bath

Slices are cut under liquid to lubricate the blade as it cuts, and in the case of fresh tissue, to avoid anoxia. The tissue block should be covered to a depth of approximately one millimetre; much more than this reduces visibility due to rippling of the liquid surface.

Cutting fresh tissue under cold (<8 degrees centigrade) physiological saline improves the quality of recordings, presumably by reducing the metabolic rate and avoiding anoxic damage. Keeping the saline on ice while oxygenating it may be enough. However, the saline warms up remarkably during the cutting process (to 10 degrees centigrade in 5-15 min depending on conditions). An ice-cold stainless steel block in the bottom of the chamber can help, as can freezing the whole cutting chamber with a few mm of physiological saline in the bottom (some spare chambers are useful in this case). Chilling can cause condensation on the stage interfering with gluing the tissue block; either wipe it dry at the last moment, or keep it out of the freezer and insert it in the chamber just before slicing. In the latter case a silicone rubber insert can be used to leave a gap in the frozen saline. A simpler solution is to buy the 764 Peltier cooling unit which has been designed to fit onto the Vibroslice.

Speed adjustment

Three factors govern the cutting action: The frequency of the blade vibration (oscillation), the speed of advance of the tissue block onto the blade and the amplitude of the blade movement.

The vibration frequency rarely needs changing. The fastest setting is generally suitable for slices of fresh brain over 200µm thick. Thinner slices may benefit from slower vibration.

The rate of cutting, which is determined by the speed of the tissue advance, is one of the most important factors in successful slice cutting. It should be relatively slow (1 turn every few seconds). If it is too fast the blade tends to deform the tissue, often pushing it over rather than cutting it cleanly. What is meant by 'too fast' depends on the local consistency of the tissue; it tends to be slower in tougher tissues. Sometimes local areas of tougher tissues may require withdrawing the blade a little before resuming the cut. It always pays to monitor the tissue block as the cut progresses to check that all is well; a magnifier or dissecting microscope may help, as will good illumination.

The blade movement amplitude is fixed at 1 mm by an eccentric cam; this has proved suitable for most applications.

If the blade consistently deforms the tissue block rather than cuts it, several possibilities should be considered. The simplest is to use a shorter block of tissue so that the cuts are made closer to the rigid support of the stage. In extreme cases extra support may be needed. This can be achieved most simply by leaving adjacent tissues attached. In a few cases the tissue may need to be embedded in Agar, or perhaps fix a suitable support on the stage next to the tissue, such as cork or pith (not expanded polystyrene as this disintegrates in contact with cyanoacrylate adhesive). If tissue block deformation is a regular problem, it may be worth modifying the stage or blade holder, in which case contact Campden Instruments for advice.

Slice Thickness

Slice thickness depends on why they are being cut. For most physiological studies on brain slices, the thickness is a compromise between anatomical integrity (better in thicker slices), and oxygenation of the tissue (better in thinner slices). There are several experimental and theoretical accounts of the \uparrow limiting thickness \downarrow of tissue slices, which is the thickest slice with a non-anoxic centre (eg; Warburg, 1930; Elliott, 1969; Harvey, Schofield & Brown, 1974). Most researchers usually use 400µm brain slices equilibrated with 95% O₂, 5% CO₂ at 35 degrees centigrade. If thicker slices are essential, then consider reducing the temperature to reduce the metabolic rate, or use a smaller animal. Slices of up to 750µm have been described (Halliwell, 1975). Thinner slices of around 100µm may be needed for applications involving direct visualisation of cells (Yamamoto & Chuko, 1978; Keenen et al, 1988; Konnerth, 1990), or where the problem is to improve the penetration of reagents for horseradish peroxidase labelling.

Removing Slices

Slices can be transferred as they are cut, or accumulated on the stage until the end of the run. A small stainless steel or plastic spatula ground to a fine edge resembling a chisel is useful to help slide the slice on and off. Alternatives are fine paintbrushes to wrap the slices on or wide-mouthed Pasteur pipettes to suck the slice up in a column of saline.

References

1. Elliot, K. (1969) pp103-114 in Handbook of Neurochemistry vol 12 (Ed. Lajtha).
2. Halliwell, J.V. (1975) J.Physiol. 246, 91-93P.
3. Harvey, J.A., Schofield, C.N. & Brown, D.A. (1974) Brain Res. 76, 235-245.
4. Konnerth, A. (1990) Trends Neurosci. 13:321-323 (1990).

5. Keenan, C.L., Chapman, P.F., Chang, V.C. & Brown, T.H. (1988) Brain Res. Bull. 21,373-383.
6. Warburg, O. (1930) pp75-93 in The Metabolism of Tumours. New York.F
7. Yamamoto, C.A. & Chujo, T. (1978) Exp. Brain Res. 31, 299-301.

Maintenance

The robust construction of the Vibroslice means that little maintenance is necessary apart from keeping it clean. The stage should be scraped clean after each use, removing all traces of glue. All the wetted parts, especially the blade holder, should be rinsed in distilled water and dried.

Do not use any solvents such as acetone or chloroform.

After a long period of use, the drive belts may deteriorate and break. To check or change the belts, disconnect the instrument from the electrical supply and remove the screws securing the top cover. Remove the top cover and inspect the condition of the exposed belts - change as required. Replace the top cover and securing screws.

Specifications

| | |
|---|--|
| Section Thickness: | Minimum 20 μ m (fixed tissue), 50 μ m (fresh tissue) Maximum 700 μ m |
| Step size: | 1 μ m |
| Chamber dimensions: | 55mm x 82mm x 31mm |
| Chamber volume: | 140ml. |
| Bath advance speed (752M): | 0.28 to 4mm/sec continuously variable |
| Bath reverse speed: | 4mm/sec |
| Vibration speed: | 60-4500RPM |
| Vibration displacement: | 1mm |
| Power requirements: (switchable on rear of unit) | 220V/240V, 50Hz, 0.5A 110V/130V, 60Hz, 0.5A |
| Permissible Voltage Tolerance: | +10%, -6% |
| Current Consumption: | 0.07A (Average) |
| Power Ratings: | 15W |
| Fuse Ratings: | Mains 220V/240V ac, 250mA, type 'T' 20mm Mains 110V/130V ac, 500mA, type 'T' 20mm |

Each Vibroslice is supplied with a Tissue Holder and Bath, 10 individual stainless steel Blades, Foot Switch, Manual and Mains Lead.

| Order Codes Description | Order Code |
|--|------------|
| Peltier Cooling Bath for Vibroslice, (including tissue holder and control unit) | 764 |
| Blades for Vibroslice, stainless steel (pk of 50 individual blades) | 752/1 |
| Tissue Holder | 752/2A |
| Tissue Bath | 752/2B* |
| Tissue Holder and Bath assembly | 752/2AB |
| Blades for Vibroslice, carbon steel (pk of 50 individual blades) | 752/3 |
| Drive belts (pk of 8, two sets of 4) | 752/4 |
| Blade angle protractor | 752/069 |
| Blade guard, plastic (pk of 5) | 752/6 |

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