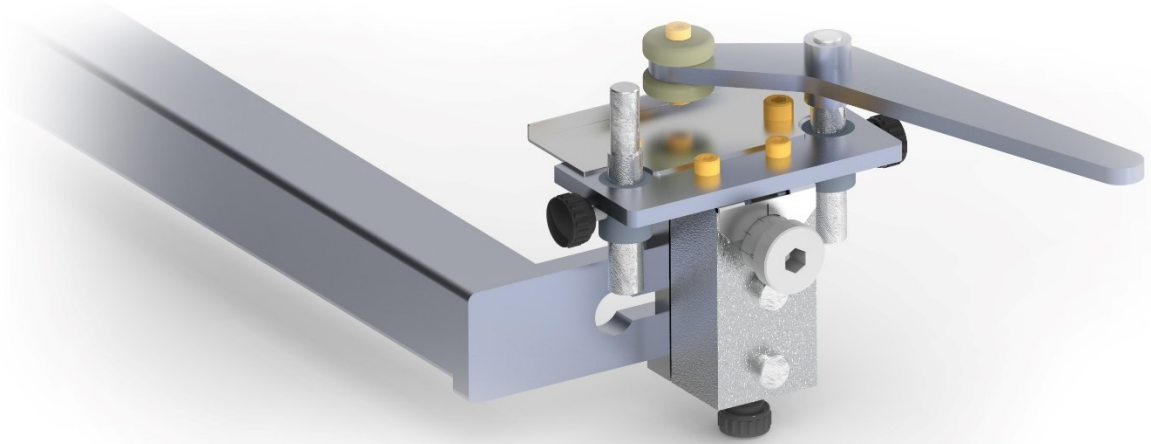


# Universal blade jig

for belt grinder

Tobin BS-1

and other grinders



## Operators Manual

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# 1 Safety instructions



Before using any attachments, read the operating instructions for the basic machine carefully and follow all the safety instructions given there! Keep all instructions for attachments together with the operating instructions for the basic machine!

**ATTENTION:** For your own safety, do not attempt to use the machine with these attachments until the machine and attachment are properly installed.

**ATTENTION:** When using power tools, always follow basic precautions to reduce the risk of fire, electric shock, and personal injury.

## 1.1 Use personal protective equipment (PPE)



When operating machines, foreign objects can get into your eyes, which can cause serious eye damage. Safety glasses or other suitable eye or face protection must be used at all times.



Use earplugs or ear protection when the machine is in operation.



Non-slip safety shoes are recommended when you operate the machine and handle large workpieces. Be aware that the floor can become wet and slippery when using coolant.



To protect against injury or burns, suitable safety gloves must be worn each time the machine is used.



Use suitable respiratory protective equipment (dust mask, etc.) if dust is generated during processing. Exposure to high concentrations of dust caused by the processing of hardwood, softwood and artificial composite panels can lead to serious damage to health! Find out about the required filter class, depending on the material to be sanded.

## 1.2 Residual risks

Every machine has residual risks that must be observed for safe operation.

- Risk of injury from hair, jewelry, clothing or parts of the body being trapped between the grinding belt and rollers.
- The running grinding belt can cause injuries and burns if touched!
- Risk of electric shock from touching live parts in the control cabinet!
- Risk of injury from swept away parts and flying sparks!
- Danger of hearing damage from prolonged work without hearing protection!
- Health hazard from dust emissions!
- Risk of injury from incorrectly or insufficiently assembled machine!

These risks can be minimized if all safety regulations are applied, the machine is properly maintained and cared for and the machine is operated as intended and by appropriately trained specialist personnel.

Despite all safety precautions, common sense and your technical suitability / training to operate a machine is the most important safety factor!

## 2 Technical specifications

Attachment type	Universal blade jig
Compatible with	Tobin BS-1, other machines after successful compatibility check
Main dimensions W x H x D (mm)	120x100x550
Mass	3kg
Compatible belt width	25 – 75mm

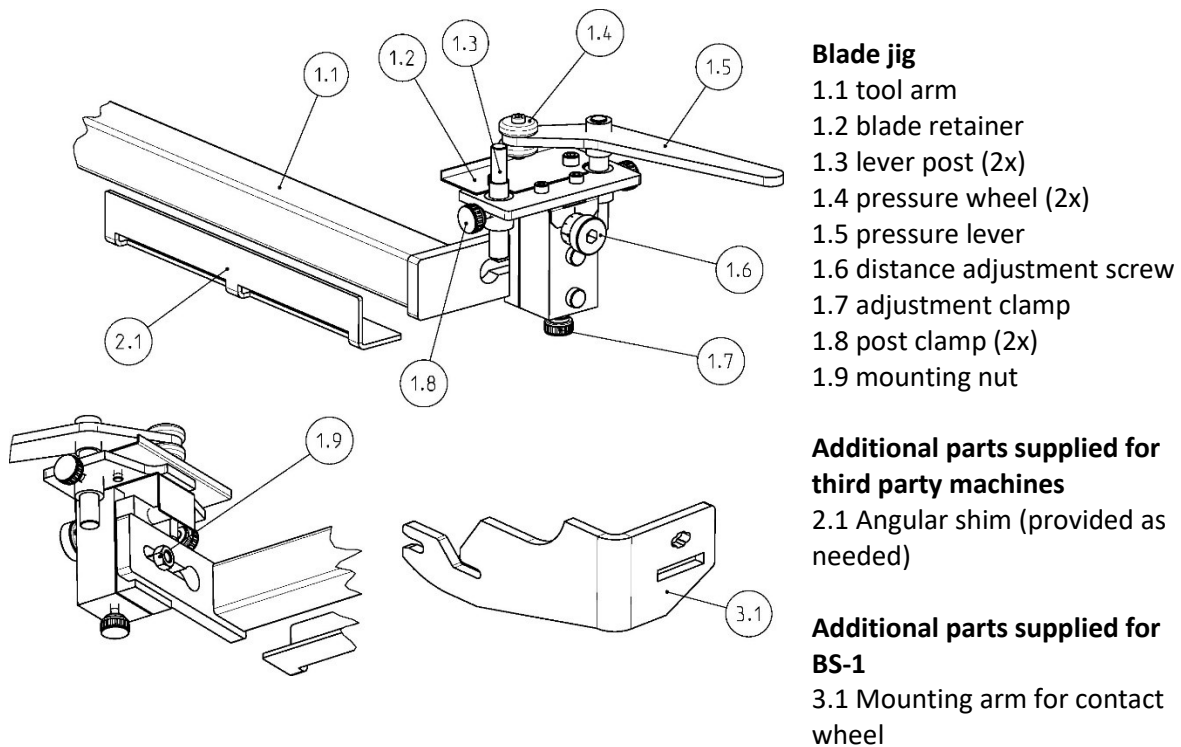
## 3 Description of the attachment

The universal blade jig helps to guide the grinding process of blade bevels. The principle of function is to keep the blade spine at a defined distance while the blade is moved manually in all other ways. A pressure lever helps to apply constant pressure to the blade.

On the BS-1 belt grinder, the attachment can be used together with different grinding areas to either grind flat features, hollow grinds, or more complex combinations like S-grinds.

With third-party machines, the main usage is to create flat grinds, but depending on the setup, the blade jig may also be combined with a contact wheel correspondingly.

Table 1: Parts of the attachments



## 4 Assembly – BS-1

**ATTENTION:** Before installing the attachment, familiarize yourself with the parts of the basic machine listed in chapter 3 of the operating instructions for the belt grinder BS-1!

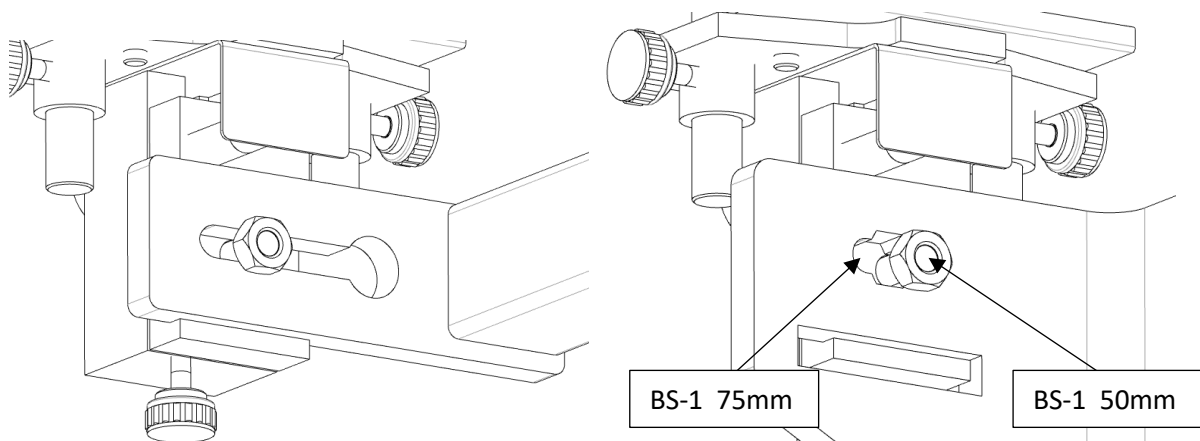
**CAUTION!** Only make the following settings when the machine is switched off!

### 4.1 Adjusting the blade jig to the belt width

The blade jig is compatible with both the BS-1 models for 50mm and for 75mm belts. The blade jig must be adjusted to be aligned centered with the grinding belt.

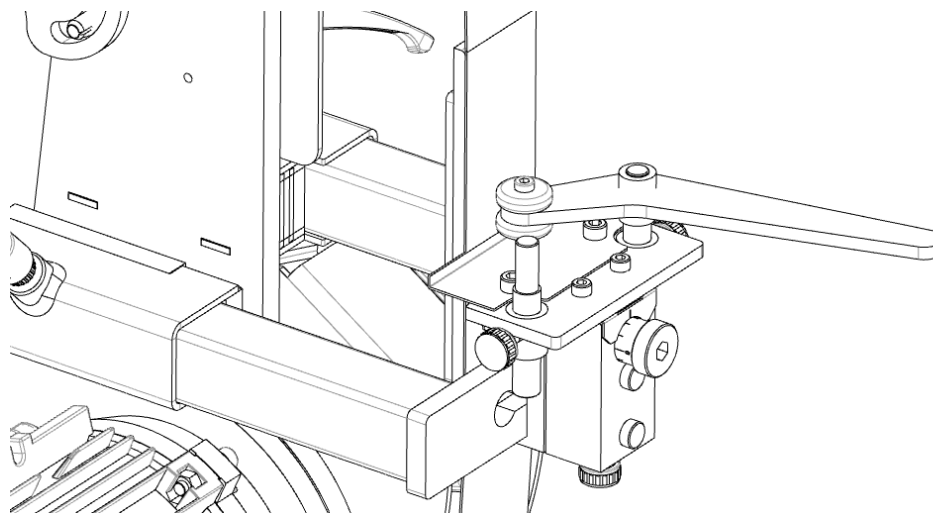
To adjust the position on the tool arm (> 1.1), shift the jig assembly by loosening the mounting nut (>1.9). Tighten the nut in the correct position for your BS-1 model. **Do not overtighten the nut, as it may lead to the distance adjustment seizing.**

The same procedure applies to the mounting arm for the contact wheel (> 3.1). The correct positions sit on either end of the oblong hole.



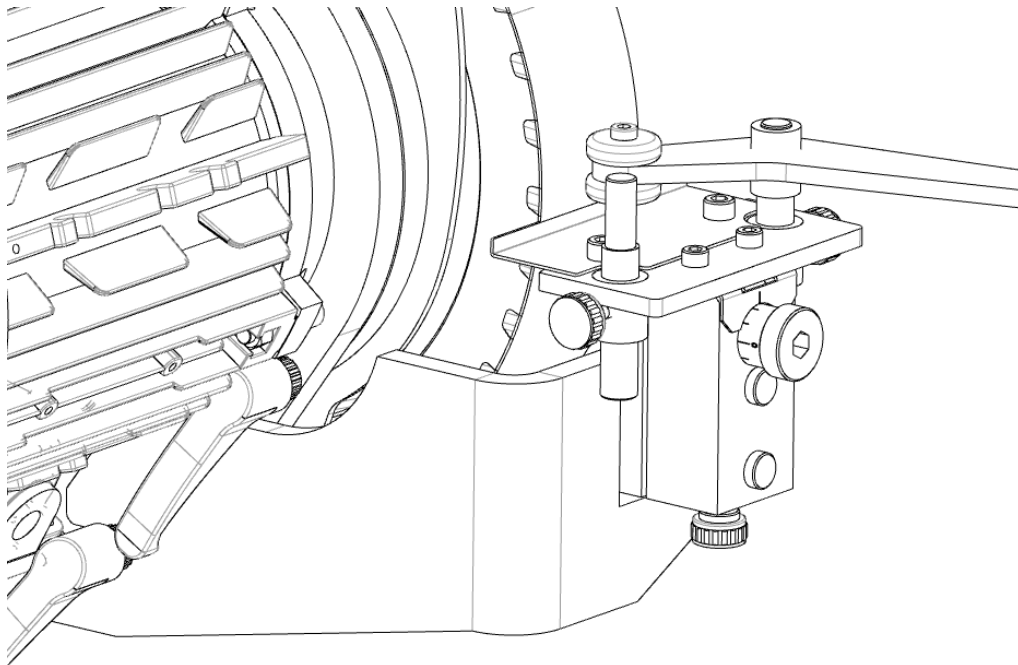
### 4.2 Mounting the blade jig with the flat platen

Set the angle adjustment of the BS-1 to 0°. Insert the blade jig with its tool arm into the clamp for the guiding attachment of the BS-1. Make sure there is a small airgap between the blade retainer and the grinding belt and tighten the clamp lever on the BS-1.



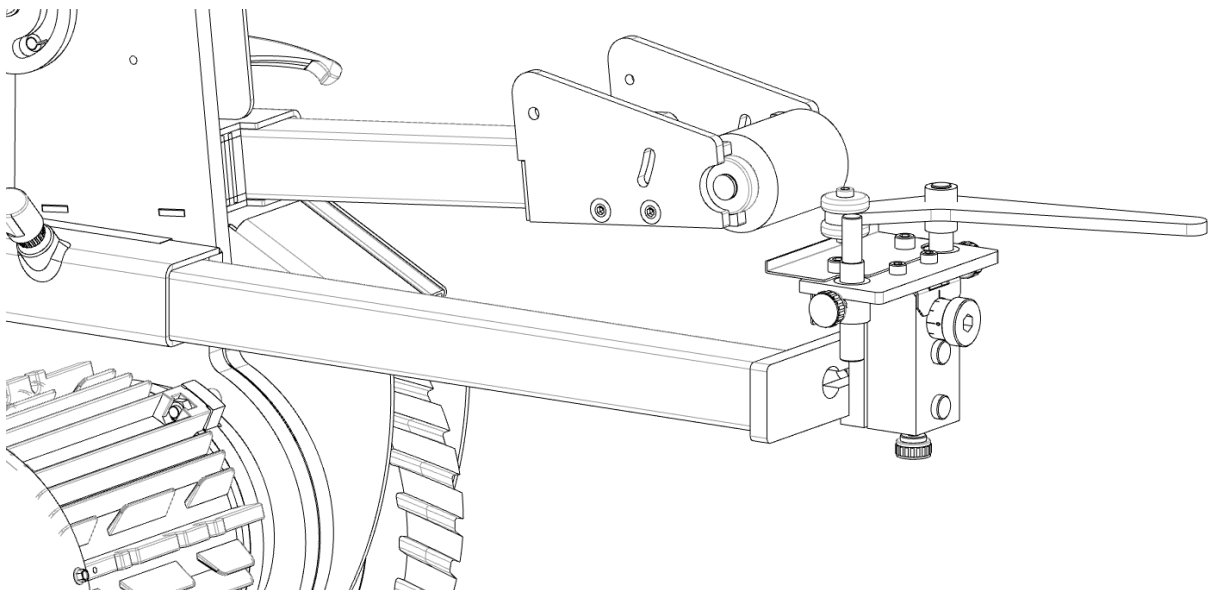
#### 4.3 Mounting the blade jig with the contact wheel

Set the angle adjustment of the BS-1 to 30°. Use the blade jig together with the supplied mounting arm for the contact wheel and clamp the unit to the lower attachment point of the BS-1. Make sure there is a small airgap between the blade retainer and the grinding belt and tighten the clamp lever on the BS-1.



#### 4.4 Mounting the blade jig with the radius grinder

Set the angle adjustment of the BS-1 to around 0°. Insert the blade jig with its tool arm into the clamp for the guiding attachment of the BS-1. Make sure there is a small airgap between the blade retainer and the grinding belt and tighten the clamp lever on the BS-1. Note that the combination with the radius grinder only works for wheels of 50mm diameter or bigger. After setting up the tool, you can use the angle adjustment of the BS-1 to fine tune the vertical alignment between the radius wheel and the blade jig.



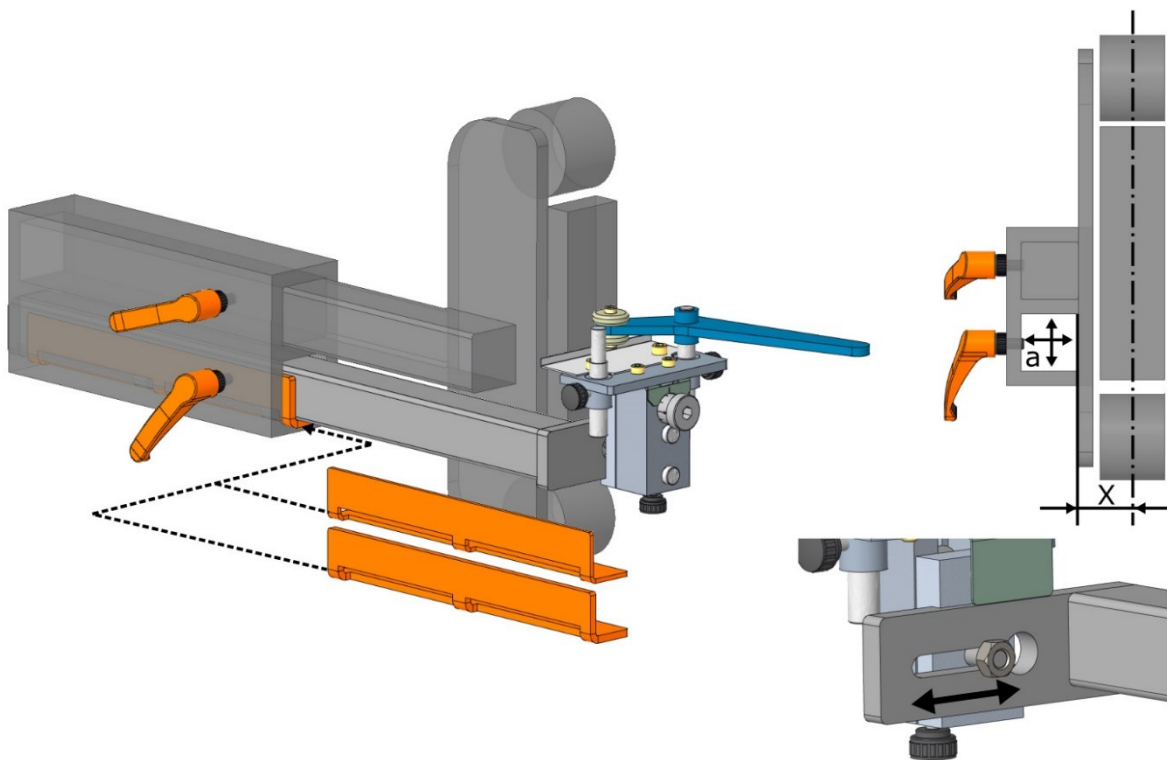
## 5 Assembly – Other machines

**CAUTION!** Only make the following measurements and adjustments when the machine is switched off!

### 5.1 Compatibility check

The following requirements must be met in order to mount the universal blade jig to other grinders without modifications:

1. The grinder takes attachments with a square tool arm coming from the left of the grinding belt. There is a free clamp available to attach the jig to.
2. The size  $a$  of the tool arms is either 35mm, 40mm or 1.5" (38.1mm) square. The basic size of the jig's tool arm is always 35mm, for the other two sizes, angular shims are provided (orange in picture).
3. The distance  $x$  between the tool arm clamp and the center of the grinding belt is anywhere between 35mm and 70mm. The user can adjust the jig to the machine's measurement by an oblong hole.



### 5.2 Correct mounting of the blade jig

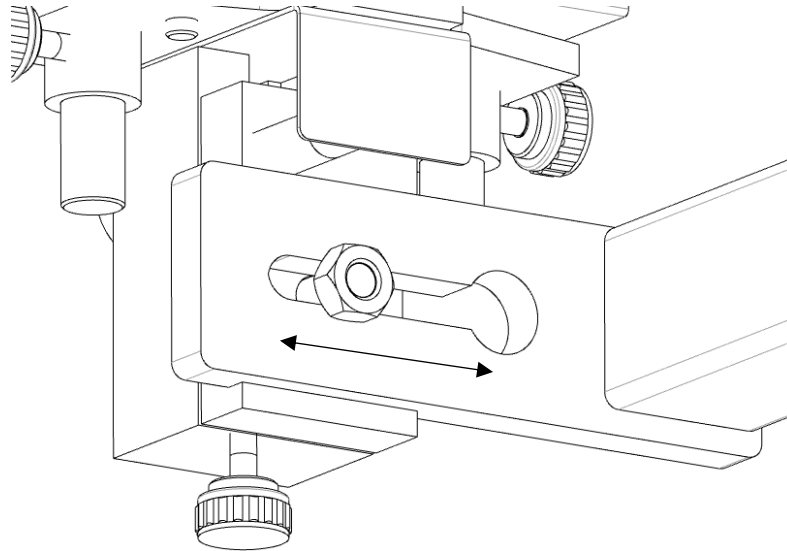
If the target belt grinder passed the compatibility check, the jig mounts like any other attachment to this machine. The size of the tool arm (> 1.1) is 35mm. If the tool arm system of the target machine is 40mm or 1.5", an angular shim (> 2.1) is supplied that slides into the clamp together with the tool arm as illustrated. Make sure there is a small airgap between the blade retainer and the grinding belt and tighten the clamp lever on the machine.



### 5.3 Adjusting the blade jig to the machine

The blade jig must be adjusted to be aligned centered with the grinding belt.

To adjust the position on the tool arm (> 1.1), shift the jig assembly by loosening the mounting nut (>1.9). Tighten the nut in the correct position for your BS-1 model. **Do not overtighten the nut, as it may lead to the distance adjustment seizing.**



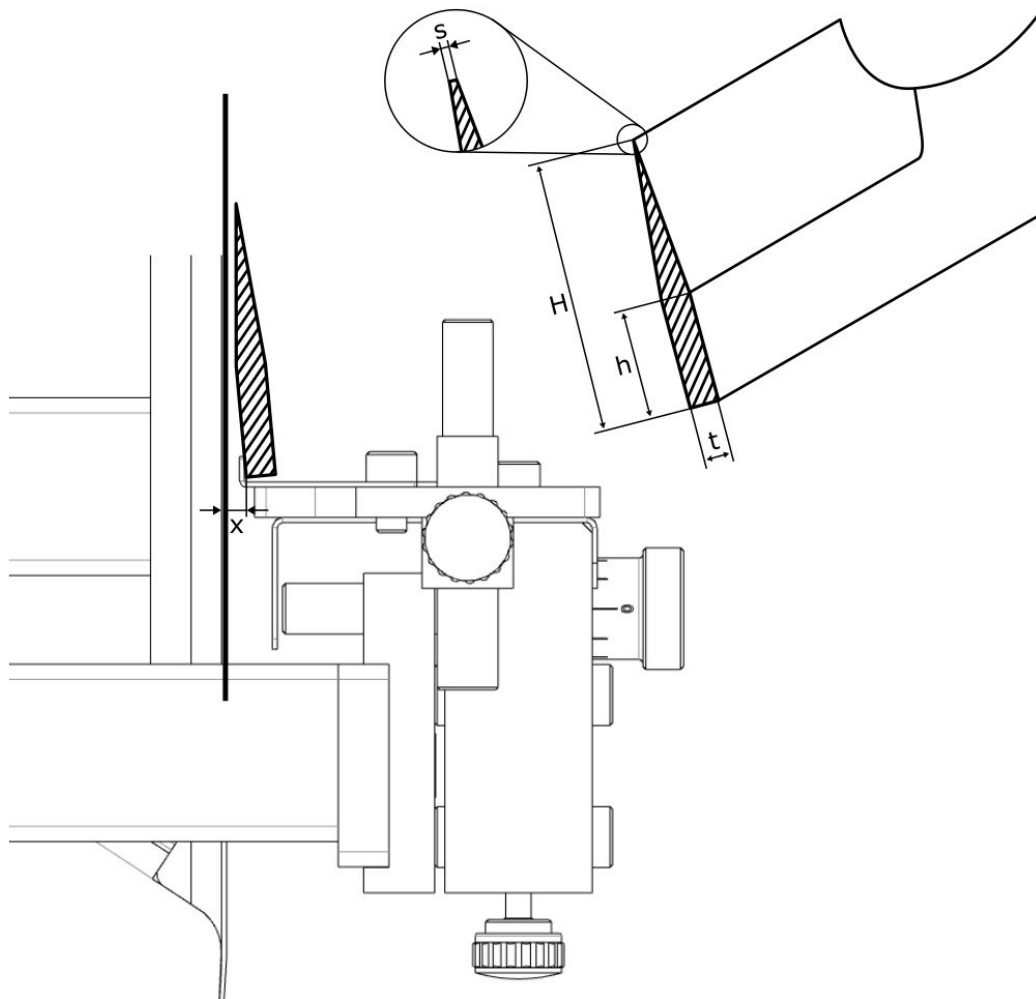
## 6 Usage for flat grinds

The blade jig helps to keep a steady angle when grinding blade bevels by holding the blade spine in a certain distance to the grinding belt while allowing (and requiring) the user to manually guide the blade in all other ways. This way, it takes away the most difficult part of the job while still being able to accommodate for the variety of use cases and blade shapes.

To get started, the following instructions give a basic introduction in how to determine, set and grind a certain angle onto a blade. It can not cover all possible shapes and techniques and practice is needed to produce perfect results.

### 6.1 Determine the grinding geometry

Assuming a symmetric blade with flat bevels, a typical cross section looks like this:



To grind this section, the blade retainer of the blade jig must be set to a distance  $x$  to the grinding belt surface:

$$x = \frac{t - s}{2} * \left( \frac{H}{h} - 1 \right)$$

Some examples with numbers (measurements in mm):

	Hunting knife	Scandi blade	Kitchen knife 1	Kitchen knife 2
Blade height H	35	40	50	60
Bevel height h	25	12	50	45
Spine thickness t	4	6	2,2	3,5
Edge thickness s	0,4	0,5	0,1	0,15
Distance x	<b>7,2</b>	<b>6,4</b>	<b>0</b>	<b>0,56</b>
Wedge angle $\alpha$	<b>8,2°</b>	<b>26°</b>	<b>2,4°</b>	<b>4,3°</b>

## 6.2 Adjusting the blade jig

**Note:** every grinding belt is slightly different in thickness, so you must redo the setup step after every belt change. Setting up the jig with no belt or a different belt than used for subsequent grinding will change the grinding result.

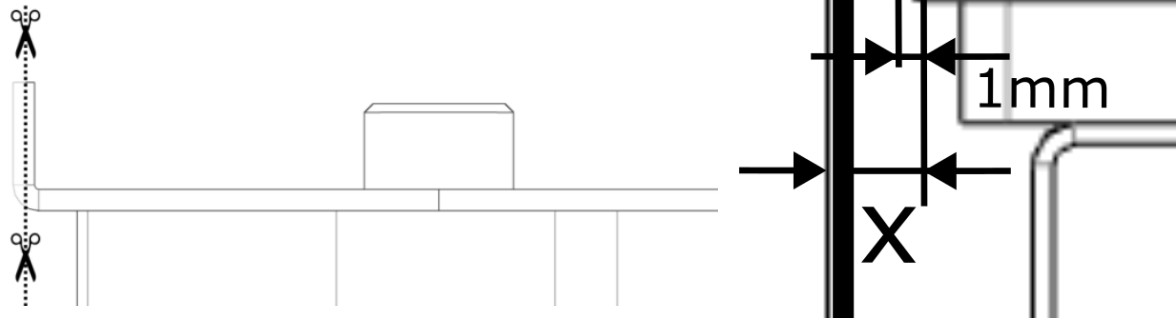
With the distance  $x$  determined, the jig can be set up:

- 1) If the edge of the blade retainer is not parallel to the grinding belt when looking at it from above, it may lead to asymmetric grinding results. If that is the case, loosen the two screws that hold the blade retainer and adjust it to be parallel. This procedure normally doesn't have to be repeated.
- 2) Slightly loosen the adjustment clamp (>1.7)
- 3) Set the distance  $x$  using the distance adjustment screw (>1.6)
- 4) Tighten the adjustment clamp again.

### 6.3 Setting a distance $x$

There are multiple methods for setting the jig to an exact distance  $x$ . In any case, keep in mind that the airgap between the blade retainer and the grinding belt doesn't equal  $x$ , but is reduced by the thickness of the blade retainers, which is 1mm when delivered.

Hence, if your calculated  $x$  is less than 1mm, it is necessary to thin out the blade retainer for  $x < 1\text{mm}$ . Experience showed that you can thin out the retainer down to 0.3mm.



**Note:** The blade retainers are meant to be modified by grinding material off depending on the grinding job to be achieved. If more than the supplied retainers are needed, please contact me.

Methods to set the distance  $x$ :

1. With the designated grinding belt mounted, use the distance adjustment screw to crank the blade retainer all the way to an airgap to the belt of 0. Now, observe the scale divisions on the adjustment screw as you crank the blade retainer away from the belt. Each revolution of the screw equals 1mm, each division equals 1/10mm. Note that due to backlash of the screw, one should approach the desired setting from the outside.
2. Another way to set the distance  $x$  is using a set of feeler gauges or calipers put between the blade retainer and the grinding belt.

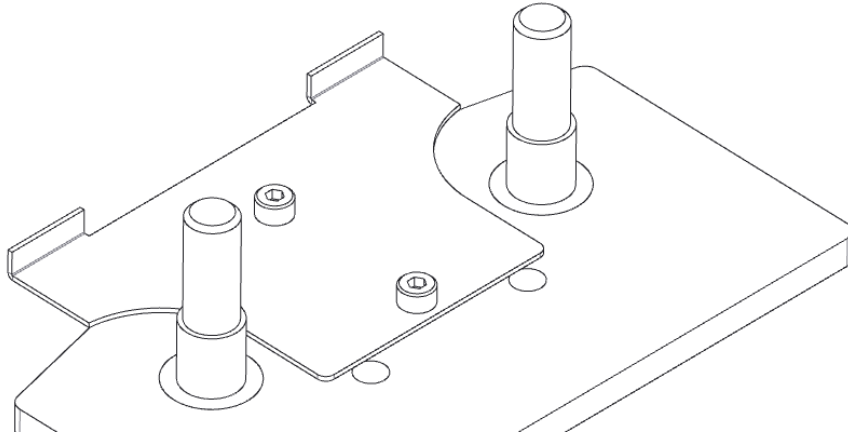
Keep in mind that these methods don't set  $x$  directly, but the airgap! For example, when your blade retainer has 1mm thickness and your desired  $x$  value is 3.2mm, the airgap to set the jig to is 2.2mm.

**Note:** As an alternative to these considerations, you can of course also intuitively approach the desired distance by trial-and-error and continuous readjustments of the distance during grinding!

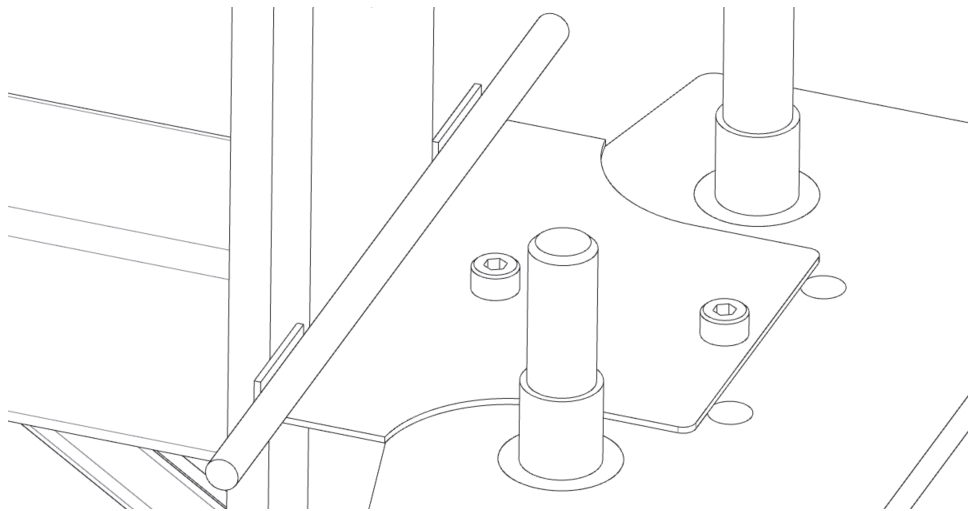
## 6.4 Considerations for full-flat bevels

Achieving a measure  $x=0$  needed for blades with a full flat bevel like “kitchen knife 1” from the table of example geometries requires a different technique.

Modify a blade retainer so that it has a cutout for the grinding belt:



Now, line up the **blade facing side** of the retainer with the belt by using a ruler or straight piece of metal. This way, you are set up to grind full flat bevels and the support for the blade comes from the remaining side parts of the blade retainer.



## 6.5 Grinding

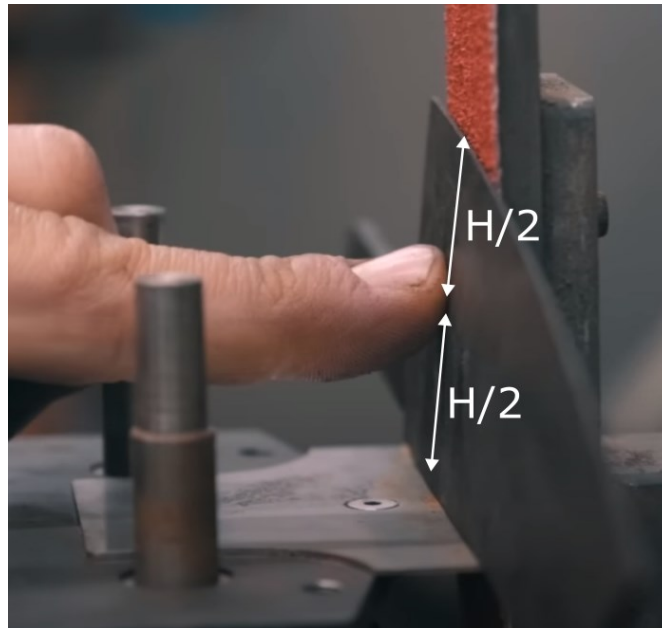
### Additional content

The easiest way to get to know the jig is by watching one of its co-developers and professional knifemaker Tobias Hangler using it. Youtuber UKBladeshow made a teaching video about grinding techniques that also contains an introduction into the blade jig. The video can be watched on Youtube.

<https://youtu.be/VEVmXViW34c?t=385>



During grinding, let the blade's spine always sit flat on the blade retainer as you move along the length of the blade. Push the blade against the grinding belt at approximately the half point of its height  $H$ . Also make sure that the push force sits behind the center of the grinding belt's width. This way, the pushing force will always stabilize the system and keep it geometrically defined.

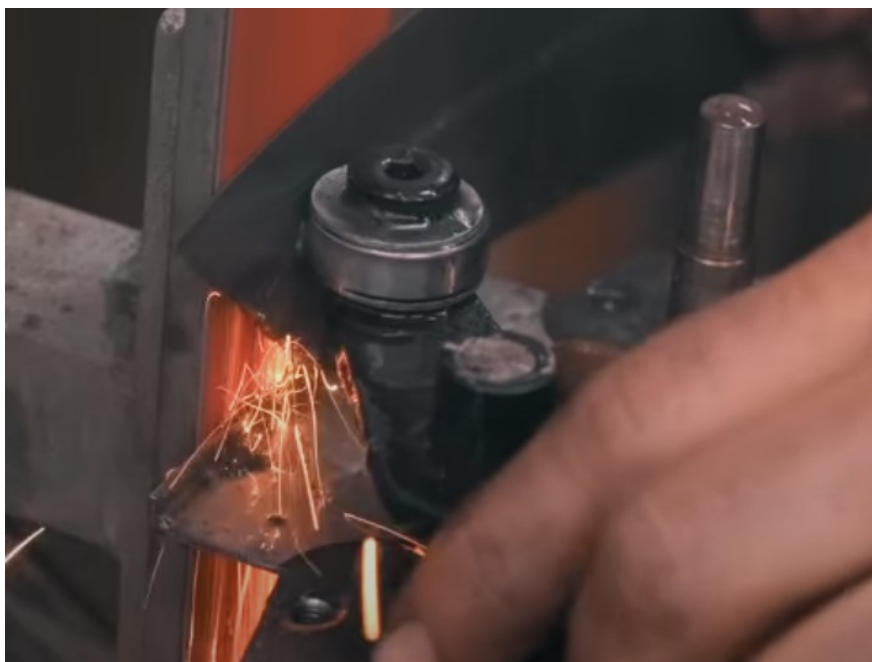


You can use your fingers or a wooden push stick to apply the pushing force. This is especially recommended for fine geometries and finishing work. You can remove the two lever posts (> 1.3) when using your fingers. Make sure to use proper protective equipment.

Alternatively, you can use the supplied pressure lever (> 1.5) to apply the pressure.

#### **6.6 Pressure lever**

The pressure lever makes grinding more ergonomic and safe. To use the pressure lever, place it on one of the two supplied lever posts (> 1.3). Adjust the height of the post so that the (lower) pressure wheel (>1.4) touches the blade at approximately the half point of its height  $H$ . The pressure lever is designed symmetrically, so that its orientation does not affect the height of the pressure wheel in use.



**Note:** If more than the supplied wheels are needed, please contact me.

## 7 Dealing with real blade geometries

The steps in chapter 6 assume that the spine and edge of a blade are almost parallel, like in a Japanese Nakiri or Bunka shape. In this case, using the blade jig always leads to geometrically correct bevels.

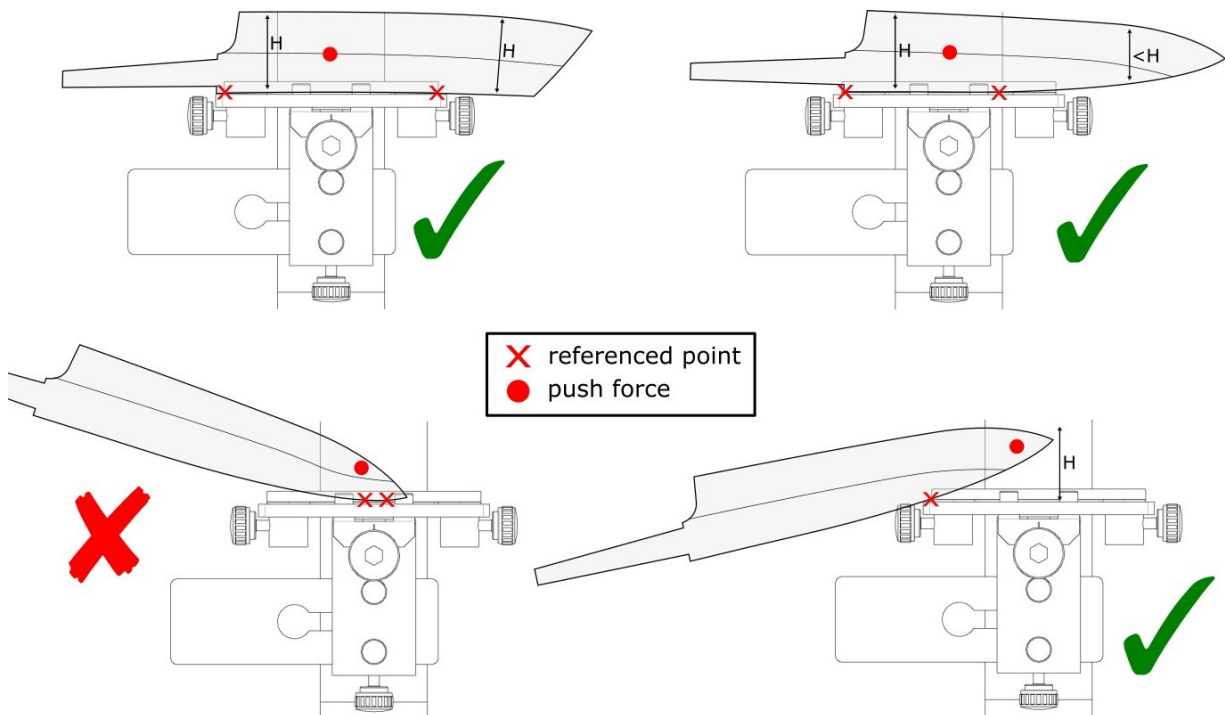
With most blade shapes, this condition is not met towards the tip. Like all grinding jigs, the universal blade jig can not cover all complex bevel geometries on all blade types. However, the limitations are easy to understand and to mitigate so that the blade jig is still very useful for most blade shapes.

As established in chapter 6.1, the angle reference when grinding with the blade jig is the blade's spine thickness  $t$  in conjunction with the blade height  $H$ . Depending on the spine thickness along the blade length (the presence of a distal taper), there is a way to correctly grind the tip area of almost any blade shape. In the following, we will discuss techniques for grinding blades of general shape with and without distal tapers in place.

### 7.1 No distal taper

These blades have no distal taper (no change of spine thickness towards the tip).

Grinding the tip area works by tilting the blade and thus lifting the edge to the same level  $H$  as the rear section of the blade was. Since the spine point that the jig references still has the original thickness, the created angle in the tip area will also be the original angle.



The blade jig “magnifies” the control over the angle:

- If the blade is tilted steeper and the tip area is ground pointing farther up than  $H$ , the wedge angle is smaller (often preferred for kitchen knives)
- If the blade is tilted less or even the other way, the angle will be more blunt (rarely desired)

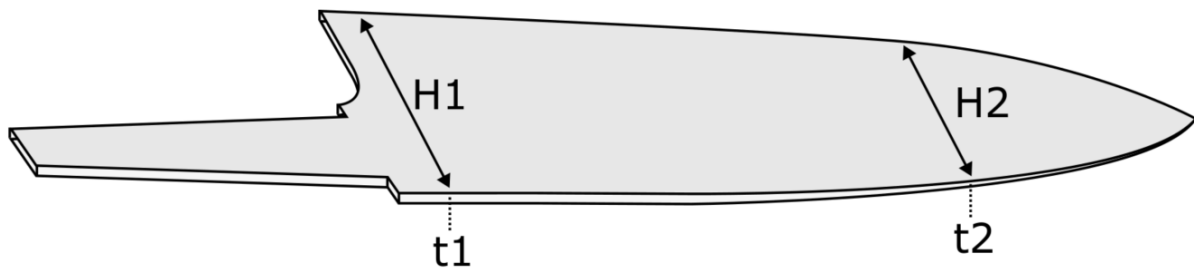
Tilting the blade typically leaves you with only one reference point on the blade retainer. This means that you must guide the blade more yourself by putting the push force in the right area as depicted.

This process is still easier to control than entirely without the blade jig, but knowing, understanding, and practicing how these factors play together is essential for good results with the blade jig!

## 7.2 Distal taper

On a tapered blade, the spine thickness is reduced more or less proportional to the blade height at a specific point:

$$\frac{H1}{t1} \sim \frac{H2}{t2}$$



In grinding the tip area of a tapered blade, the cutting edge does not need to be lifted as much as if the blade had no distal taper. The reason is that the referenced thickness at any point corresponds to the actual blade height at this point.

Depending on the actual geometry, tilting the blade slightly in one or the other direction might still improve the result. Please note that the exact geometry of the tapered blade determines how influences add up against each other. Practice your geometry on test pieces to find out the ideal process before working on actual production blades.

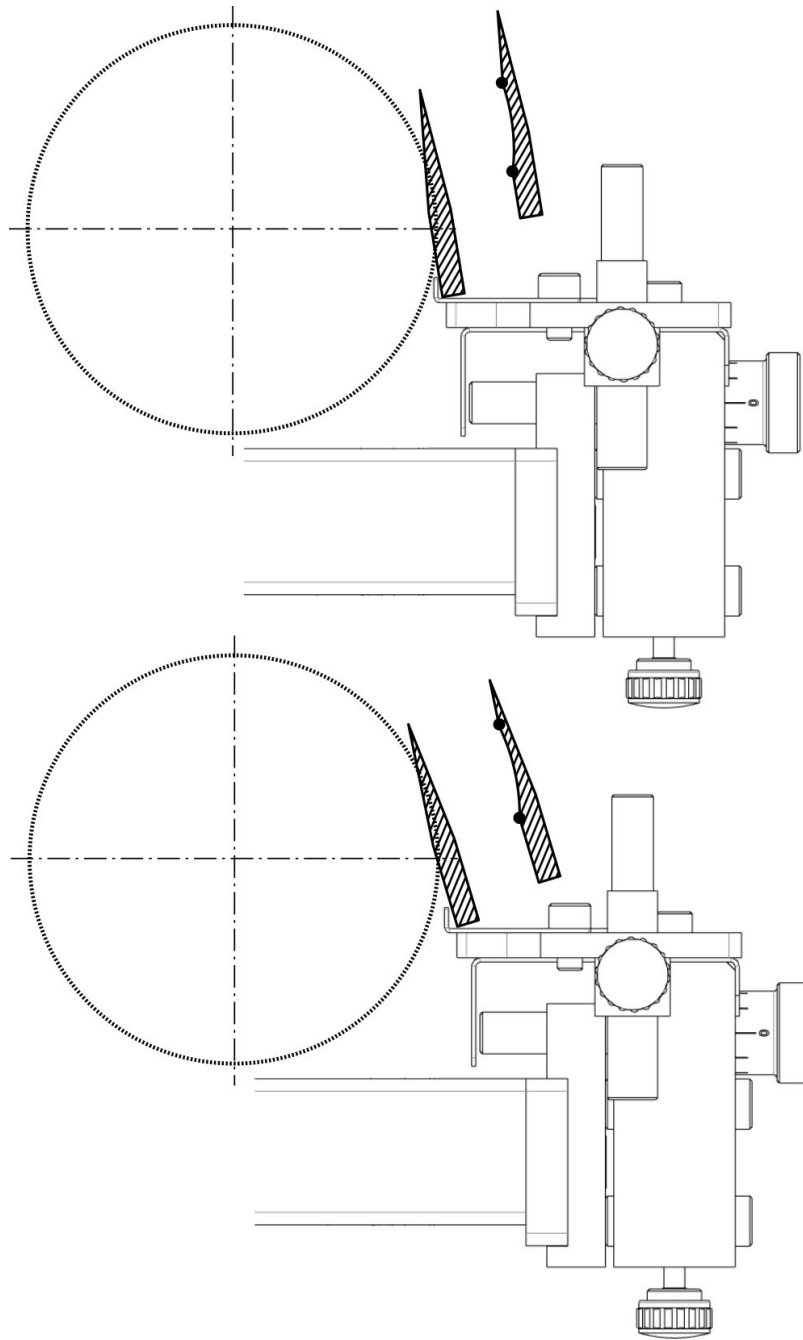
## 8 Usage with contact wheels

The blade jig can be also combined with contact wheels to grind hollow features.

This can be achieved by

- Using the blade jig on the BS-1 belt grinder with the mounting arm for the contact wheel (see chapter 4.3 for mounting)
- Using the blade jig on the BS-1 belt grinder with the radius grinder attachment (see chapter 4.4 for mounting)
- Combining the blade jig with contact wheels on other belt grinders in the same sense

The ideas described in the previous chapters apply here too, with the important difference that the distance  $x$  to the grinding belt is not used to set the grinding angle, but to determine, at what height (above the blade retainer) the contact wheel touches the blade.



Combining flat ground and hollow ground features allows to create S-grinds and other more complex knife geometries using the universal blade jig.

