

PCB Separator **MAESTRO 4M**

Description	Type
PCB Separator	MAESTRO 4M/450
PCB Separator	MAESTRO 4M/70
PCB Separator	MAESTRO 4M/600
PCB Separator	MAESTRO 4M/70/520

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Topicality

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1.1 Instructions

Important information and instructions in this documentation are designated as follows:



Danger!

Draws your attention to an exceptionally grave, impending danger to your health or life.



Warning!

Indicates a hazardous situation that could lead to injuries or material damage.



Attention!

Draws attention to possible dangers, material damage or loss of quality.



Notice!

Gives you tips. They make a working sequence easier or draw attention to important working processes.



Environment!

Gives you tips on protecting the environment.



Handling instruction



Reference to section, position, illustration number or document.



Option (accessories, peripheral equipment, special fittings).

1.2 Intended Use

- The device is manufactured in accordance with the current technological status and the recognized safety rules. However, danger to the life and limb of the user or third parties and/or damage to the device and other tangible assets can arise during use.
- The device may only be used for its intended purpose and if it is in perfect working order, and it must be used with regard to safety and dangers as stated in the operating manual.
- The device is intended exclusively for separating pre-scored PCB's. Any other use or use going beyond this shall be regarded as improper use. The manufacturer/supplier shall not be liable for damage resulting from unauthorized use; the user shall bear the risk alone.
- Usage for the intended purpose also includes complying with the operating manual, including the manufacturer's maintenance recommendations and specifications.



Notice!

The complete documentation can also currently be found in the Internet.

1.3 Safety Instructions

- The device is configured for voltages of 115 or 230 V AC. It only has to be plugged into a grounded socket.
- Hazard by electrical charge. Provide an earthing connection via press stud.
- Only connect the device to other devices which have a protective low voltage.
- Switch off all affected devices (e.g. conveyor belt) before connecting or disconnecting.
- Risk of hand injury. Wear protective gloves while PCB separating.
- Ensure that people's clothing, hair, jewelry etc. do not come into contact with the exposed rotating blade.
- In an emergency situation, actuate the emergency stop switch in the control panel by tight pressing. This interrupts the voltage supply to the device.
- The device may only be used in a dry environment, do not expose it to moisture (sprays of water, mists, etc.).
- Do not use the device in an explosive atmosphere.
- Do not use the device close to high-voltage power lines.

1 Introduction

- Work going beyond this may only be performed by trained personnel or service technicians.
- Unauthorized interference with electronic modules or their software can cause malfunctions.
- Other unauthorized work on or modifications to the device can also endanger operational safety.
- Always have service work done in a qualified workshop, where the personnel have the technical knowledge and tools required to do the necessary work.
- There are various warning stickers on the device. They draw your attention to dangers.
Warning stickers must therefore not be removed, as then you and other people cannot be aware of dangers and may be injured.



Danger!

Danger to life and limb from power supply.

- **Do not open the device casing.**

1.4 Safety Marking

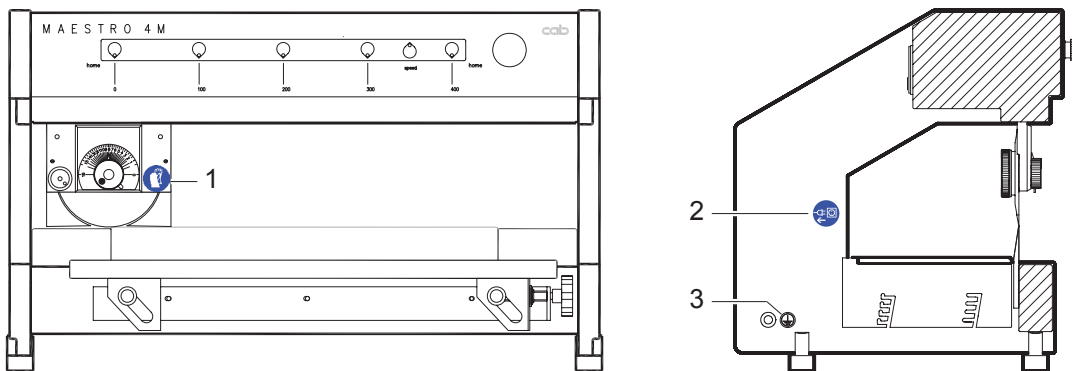


Fig. 1 Safety marking

1		Risk of hand injury ! ► Wear protective gloves while PCB separating.
2		Possible damage of electronics ! ► Disconnect the PCB separator from the electrical outlet before mounting or removing an optional conveyor belt.
3		Hazard by electrical charge ! ► Provide an earthing connection via press stud.

Table 1 Safety marking

1.5 Environment



Obsolete devices contain valuable recyclable materials that should be sent for recycling.

- Send to suitable collection points, separately from residual waste.

The modular construction of the printer enables it to be easily disassembled into its component parts.

- Send the parts for recycling.

For the commercially viable assembly and mounting of printed circuit boards, there is an ever increasing requirement for multiple-use material. The necessity however, to break off sections of the circuit board by hand can cause damage to the delicate circuitry and components. The fibre-glass material tears at the broken edge, leaving it rough and fissured.

Using the MAESTRO 4M, both large and small pre-scored PCB's can be cleanly and economically separated. The PCB to be separated is laid onto the lineal blade in such a way that the edge of the blade locates into the pre-scored groove in the PCB. When the foot-switch is operated the carrier assembly holding the circular blade is drawn across the PCB, separating it into individual pieces. The scored groove can be interrupted by any number of cut-outs. In order to ensure that the separation is performed in the optimal manner, five programming keys enable the length of separation to be varied in four stages.

Wear resistant blades and a guide assembly manufactured from special steel ensure maximum periods between readjustments.

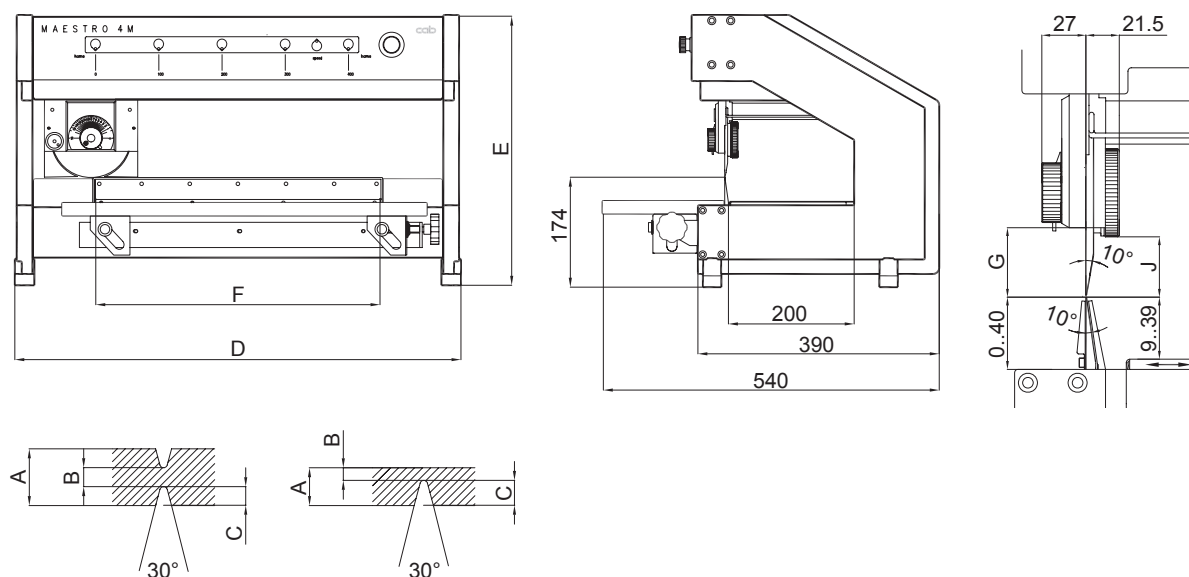


Fig. 2 Device and PCB dimension

	MAESTRO 4M/450	MAESTRO 4M/70	MAESTRO 4M/600	MAESTRO 4M/70/520
Length D in mm	702	702	852	852
Height E in mm	434	492	434	492
Separation Length F in mm	450	370	600	520
Comp. Height G in front of the blades in mm	40	70	40	70
Comp. Height J behind the blades in mm	34	64	34	64
Weight in kg	38	40	46	48
Separating Principle	Components side circular blade, Soldering side lineal blade			
PCB Thickness A in mm	0,8 - 3,2			
Material Thickness B after pre-scoring in mm	A/3, min. 0,25, max. 0,8			
Slot Depth C in mm	> 0,25			
Increase of External Dimensions following Separation in mm	0,1 - 0,2			
Separation Speed in mm/s	300, 500			
Voltage	230/115 V~ - 50/60 Hz			
Earthing	Press Stud ø 10 mm			
Operating Temperature	10 - 35 °C			
Storage and Transport Temperature	-20 - +50 °C			
Humidity	10 - 85%, non-condensing			
Maximum Sound Pressure Level LpA	< 70 dB(A)			
Emergency Switch				

Table 2 Technical Data

3.1 Unpacking and Setting-up the Device

- ▶ Lift the device out of the box.
- ▶ Check device for damage which may have occurred during transport.
- ▶ Set up device on a level surface.
- ▶ Check delivery for completeness.

Contents of delivery:

- PCB Separator
- Power cable
- 2 Fuses T 1,6 A for operation at 115 V
- Foot switch
- Allen key 2 mm
- Documentation
- Adjustable platform with
 - 3 Screws M5x12
 - 3 Washers A5,3
 - Allen key 4 mm
- optional : Dial Gauge Assy. (Part No. 8970208) to check the alignment of the blades

Notice!

- ▶ **Please keep the original packaging in case the device must be returned.**

Attention!

The device and printing materials will be damaged by moisture and wetness.

- ▶ **Set up the device only in dry locations protected from splash water.**

3.2 Connecting the Device

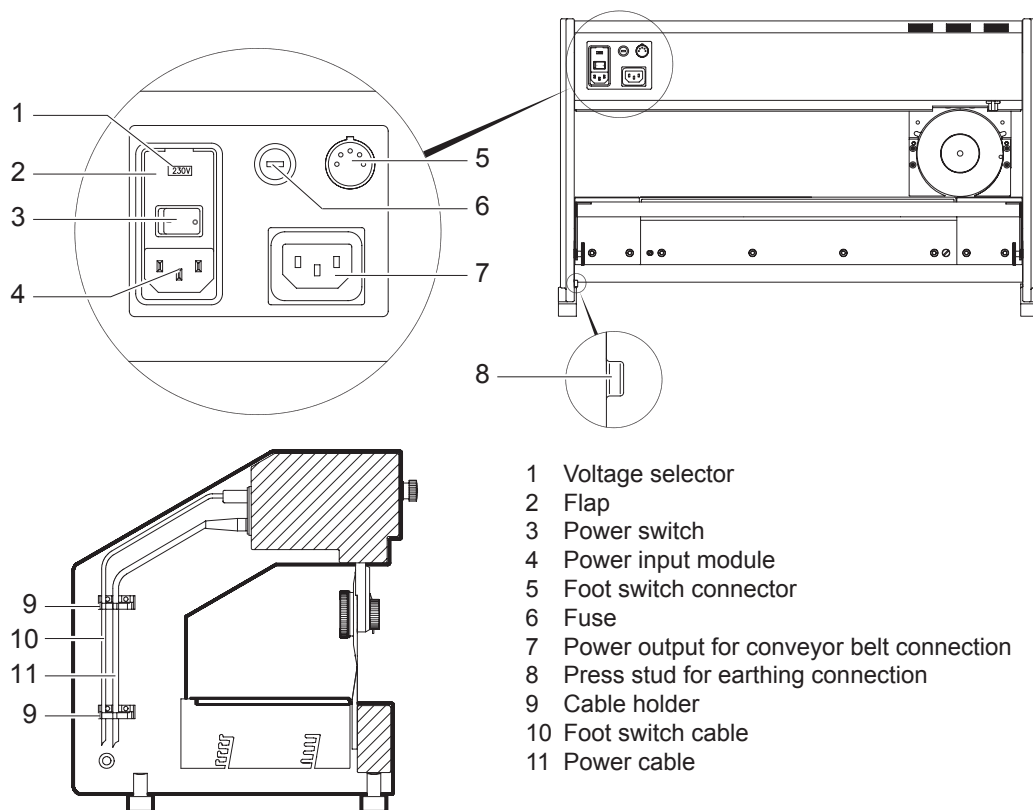


Fig. 3 Connections

3.2.1 Earthing Connection



Attention!

Hazard by electrical charge !

► Provide an earthing connection via press stud (8).

3.2.2 Foot Switch Connection

► Connect the foot switch cable (10) to the socket (5)

3.2.3 Power Connection

1. Ensure that the device is switched off at the power switch (3).
2. Check the setting of the voltage selector (1).
 - In order to alter the setting open the flap (2) at the power input module.
 - Remove the voltage selector and re-insert it so that the correct voltage is visible when module the flap is closed.
 - Upon altering the setting, the fuses in the module must also be changed accordingly (T800 mA for 230 V; T1,6 A for 115 V).
3. Connect the power cable to the power input module (4) and to an earthed socket.
4. If the machine does not show any function after it has been switched on, please check the fuses of the mains module and the fuse (T4A) (6) of the electronics board.



Attention!

**The power output (7) is intended for the connection of an cab conveyor belt.
Any other use of this socket is inadmissible.**

3.2.4 Cable Attachment

► Attach the power cable (11) and the cable (10) from the foot-switch using the cable holders (9) on the inner side of the machine frame.

3.3 Height Adjustment of the Upper Blade

Notice!

To avoid possible damage on the blades during transport the upper blade (5) is fixed in the "Park Position" so that there is a maximum distance to the lower blade.

► Set the upper blade into the working position before switching on the machine.

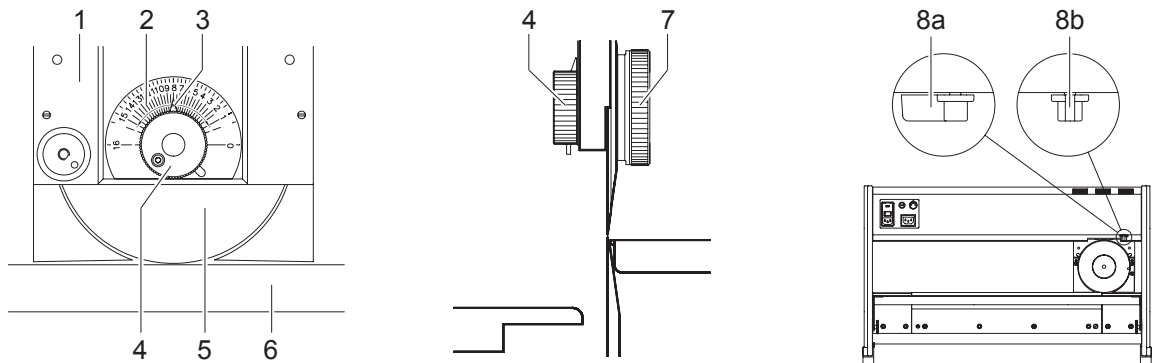


Fig. 4 Height adjustment of the upper blade

1. Move the lever (8) to the position 'a'. The motor drive to the blade carrier (1) is now disconnected.
2. Move the blade carrier (1) to the approximate middle position over the lower blade (6).
There is a scale (2) on the upper blade carrier where you can see the height adjustment in steps of 1/10 mm.
When you receive the machine, the pointer (3) of the scale is in position "16".
3. Hold the knob (4) and loosen the knurled knob (7).
4. Rotate the knob (4) clockwise until stop.
Through that the upper blade (5) move down to the lower blade (6) until both blades are just touching one another (lower end position). Make a notice of the position of the pointer (3) to use it for all further adjustments.
This lower end position locks the upper blade in place to prevent it from moving out of adjustment.
5. Move the knob (4) anti-clockwise until the pointer is in the middle position between the lower end position and the position "16".
6. Tighten the knurled knob (7).
7. Move the lever (8) to the position 'b'. The motor drive to the blade carrier (1) is now reconnected.
8. Run some test-cuts to check if it is possible to separate the PCB's. If it is not possible reduce the distance between the blades in small steps.

Notice!

The described adjustment helps to reduce the separation forces. This is important when sensitive components are very close to the groove.

3.4 Adjustment of the Stop of the Upper Blade

Notice!

The lower stop of the upper blade adjustment is already adjusted by delivery.

► After a long operation time, while working at strongly varying temperatures or else after replacing a blade, it is recommended to re-adjust the lower stop.

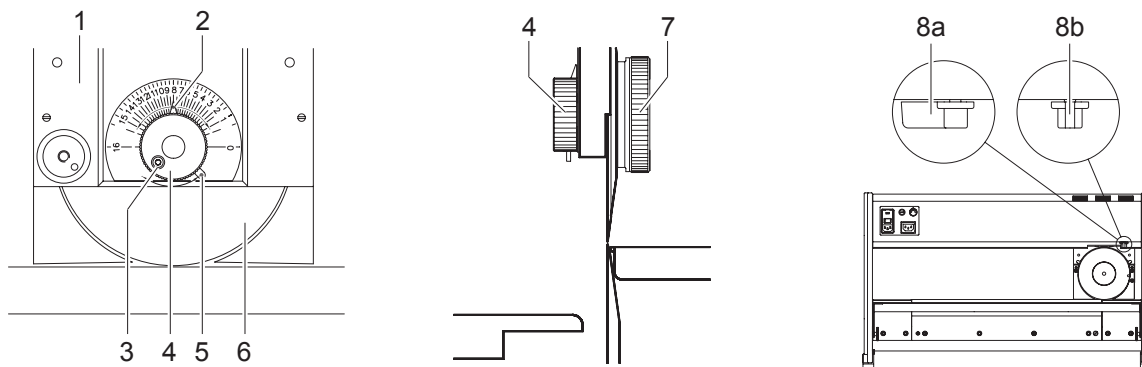


Fig. 5 Adjustment of the stop of the upper blade

1. Move the lever (8) to the position 'a'. The motor drive to the blade carrier (1) is now disconnected.
2. Move the upper blade carrier (1) in the middle position of the lower blade.
3. Hold the knob (4) and loosen the knurled knob (7).
4. Rotate the pointer (2) with the knob (4) anti-clockwise into position "16".
5. Loosen the cylinder screw (3).
6. Move the knob (4) clockwise until the upper and lower blades gently touch without overlapping.
7. Hold tight the knob (4) and tighten the knurled knob (7).
8. Swing the strut (5) clockwise until you reach the stop and tighten the cylinder screw (3). This adjustment locks the upper blade in place to prevent it from moving out of adjustment.
9. Re-adjust the upper blade position ► 3.3 on page 9.
10. Move the lever (8) to the position 'b'. The motor drive to the blade carrier (1) is now reconnected.

3.5 Check the Blade Alignment

**Notice!**

When the machine is put into operation for the first time, or following a move of equipment or a change of blades, it is advantageous to re-check the alignment of the blades in relationship to one another. For this purpose a dial gauge assembly (Part No. 8970208) is available as an option.

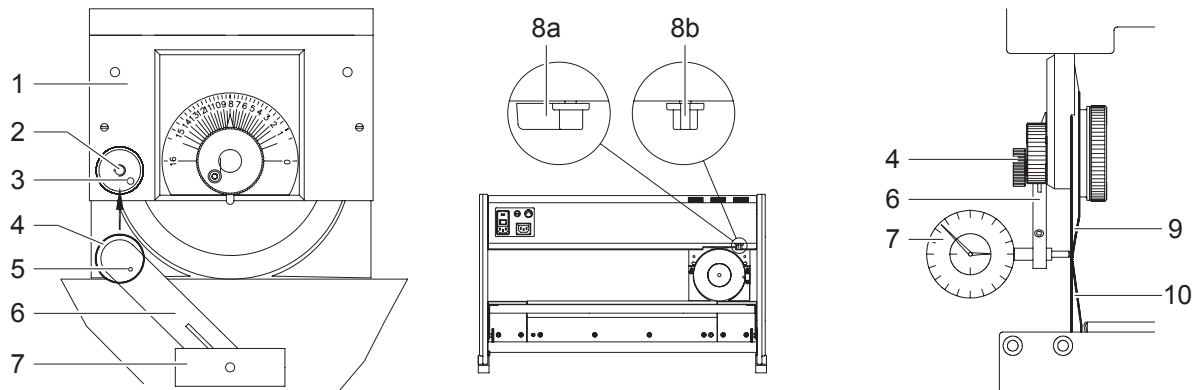


Fig. 6 Check the blade alignment

1. Move the lever (8) to the position 'a'. The motor drive to the blade carrier (1) is now disconnected.
2. Move the blade carrier (1) to the middle of its range of travel.
3. Affix the dial gauge assembly onto the threaded hole (2) in the blade carrier and screw tight with the knurled screw (4) provided.
Ensure that the small spigot (5) mounted on the inside of the lever (6) locates correctly into the hole (3) provided in the blade carrier.
4. Swing the lever (6) upwards until the tip of the gauge feeler (7) presses onto the upper blade (9) at 2 mm of the edge of the blade. Rotate the scale on the dial gauge until the pointer in the 1/100 mm division is lined up with the „0“ on the scale.
5. Swing the lever (6) downwards until the tip of the gauge feeler (7) presses onto the lower blade (10) at 2 mm of the edge of the blade. The results achieved from measuring along the complete length of the lower blade may not vary by more than ± 0.1 mm from the values obtained from the upper blade measurements.
6. In the event of the values obtained by the above procedure being greater than ± 0.1 mm, the servicing agent responsible for your machine should be contacted.
7. Remove the dial gauge assembly.
8. Move the lever (8) to the position 'b'. The motor drive to the blade carrier (1) is now reconnected.

3.6 Upper Guide Adjustment

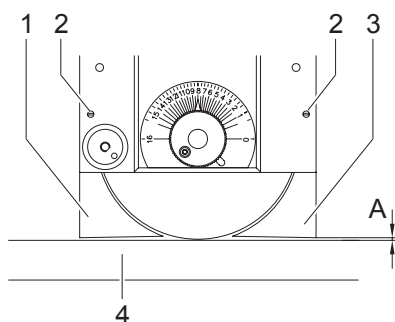


Fig. 7 Upper guide adjustment

1. Using a pre-scored PCB, check the clearance „A“ between the upper guides (1,3) and the lower blade (4). The clearance should be set so that the edge of the upper guide is located correctly into the pre-scored groove of the PCB. The PCB can be smoothly moved backwards and forwards but cannot move sideways. The upper guides (1,3) prevent the PCB from slipping to the side and therefore ensures that it is not separated other than at the pre-scored groove.
2. As required, the clearance A should be adjusted as described above by turning the eccentric adjusters (2).

3.7 Table Adjustment

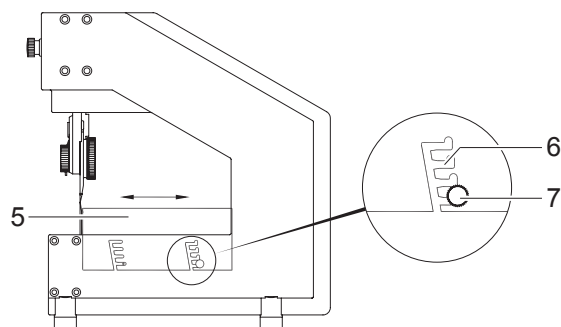


Fig. 8 Table adjustment

To suit the MAESTRO 4M to differing requirements, the height of the table can be adjusted as follows:

1. Loosen the knurled screws (7) located on the inner side of the machine frame.
2. Lift the table (5) slightly and move it towards the rear until the stop.
3. Slide the table on the slots (6) and mount it at the height required.
4. Pull the table gently forwards until it locks into place.
5. Tighten the knurled screws (7).
6. Whilst the knurled screws are loose, the table can be removed completely from the machine frame as the elongated slots (6) have an opening underneath. Complete removal of the table is required especially for replacement of the lower blade or mounting the optional conveyor belt.

Additionally, by sliding the table towards the rear it is possible to form a space between the table and the lower blade through which the edge strips of the PCB can fall through into a container placed underneath.

3.8 Assembly of the Adjustable Platform

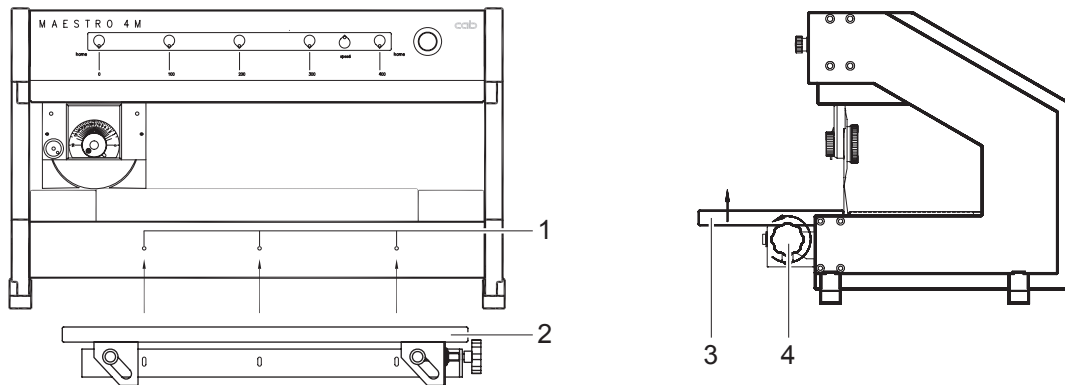


Fig. 9 Assembly of the adjustable platform

The adjustable platform delivered with the machine is designed for use as a hand-rest, easing the placement of the PCB on the lineal blade. Thereby it is also preventing a possible premature tiring for the user.

The adjustable platform is delivered with 3 cylinder screws, washers and an Allen Screwdriver.

1. Mount the platform (2) by inserting the screws provided into the threaded holes (1) in the frame of the MAESTRO 4M.
Using the elongated holes in the retainer of the platform a rough height adjustment is possible.
2. By turning the knurled screw (4), the platform (3) can be raised or lowered sensitively. Rotating the knurled screw anti-clockwise will lift up the platform.

4.1 Function of the Foot Switch



Attention!

For all operations where a movement of the blade carrier is demanded as described in the following, the foot switch has to be pressed until the movement is completed !

If the foot switch is released before, this will cause an error !

4.2 Switching on the Machine

1. Switch the machine ON. The mains power switch is situated at the rear of the machine in the mains module. After switching on the machine, the LED on the outermost left position key (2) blinks.
2. Press the outermost left position key (2) and then operate the foot switch until the blade carrier (1) stops in the left end position after a synchronised movement.

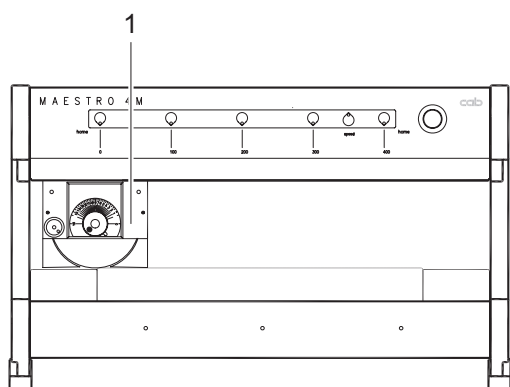
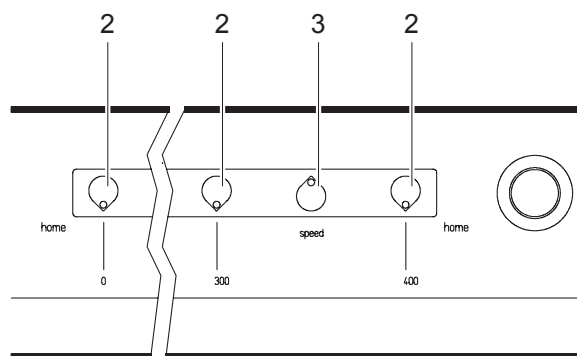


Fig. 10 Setting length and speed of separation



4.3 Setting the Length of Separation

The limit of travel is indicated by two LED's in the positioning keys (2) on the control panel.

- To change the end position of travel of the blade, press the lighten key on the relevant side of the control panel. This will turn off, then set the length required by pressing the relevant key (100/200/300/400). Alteration of the length of separation can be made as often as required just as soon as the blade carrier (1) is at rest.

Notice!



The machine can commence operation just as soon as two LED's in the positioning keys are lit.

- To complete the setting, the foot switch must be pressed by permanent operation. In the event of the length being greater than that at which the blade carrier is already set to, the carrier will move to the new position.

4.4 Setting the Speed of Separation

The MAESTRO 4M can be operated at two speeds.

Each time the machine is switched ON, the initial speed setting is the lower speed. The LED in the SPEED (3) key is OFF.

- In order to change the speed press the SPEED key (3).
If the higher speed is set the LED SPEED is switched ON.

Notice!



The speed can be changed after each separation cycle.

4.5 Separating the PCB's



Warning!
Risk of hand injury !



► Wear protective gloves while PCB separating.



Notice!
When using the machine for the first time, degrease the blades with a soft cloth.

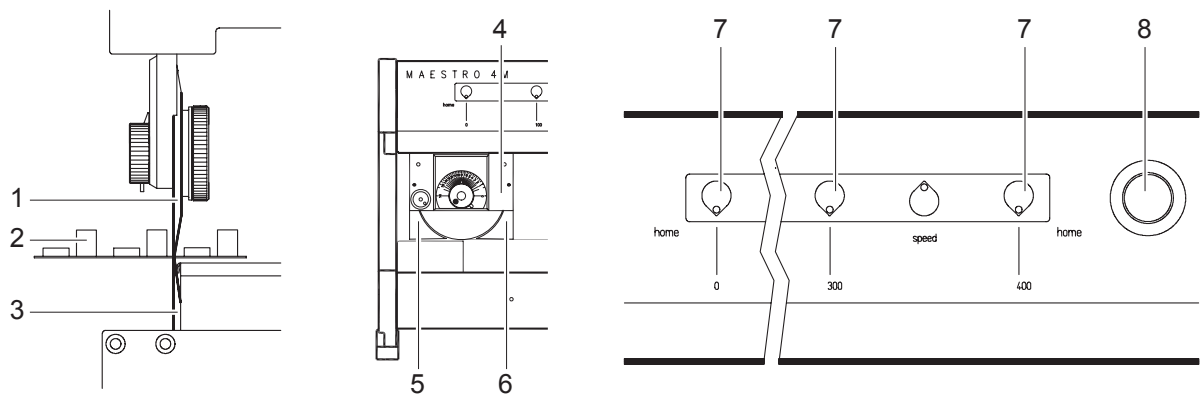


Fig. 11 Separating the PCB's

1. Position the pre-scored groove in the PCB (2) onto the lineal blade (3) and hold the PCB in the horizontal plane with the hand. Ensure that the PCB is positioned within the area of the press-keys with illuminated LED's, ie. the pre-selected area of travel of the upper blade.
2. Large PCB's which require almost the complete length of the lineal blade should be slide under the respective upper guide (5,6).
3. Operate the foot switch.
The PCB's are separated when the upper blade with carrier (4) moves across the pre-scored groove in the board (2). Operate the foot switch until the carrier reaches the opposite end position.
4. When the outermost positioning press-keys are not activated in order to limit the length of separation, (LED is OUT), the blade carrier can be moved to the extreme left or right hand end position (outside the programmed length of separation), by pressing the appropriate outermost positioning key and after that a permanent operation of the foot switch.

4.6 Emergency Switch

1. In an emergency situation, actuate the emergency stop switch (8) by tight pressing. This interrupts the voltage supply to the MAESTRO 4M.
2. It may be switched on again by turning the switch. At this moment the same start routine is performed as when switching the device on via power switch.

4.7 Error Messages

Errors during the operation of the MAESTRO 4M are indicated by blinking of a LED in one of the outermost positioning press-keys (1), dependent upon the direction of travel.

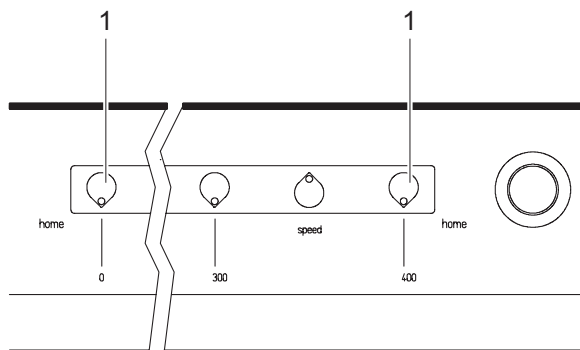


Fig. 12 Error indicators

Error Message	Cause	Remedy
One of the outermost LEDs blinks	Device was just switched on	No error
	The upper blade is blocked, for example, when trying to cut beside the pre-scored groove (overload protection)	<p>The blade carrier performs a short backward movement</p> <ul style="list-style-type: none"> ► Press blinking key and operate the foot switch <p>The blade carrier will move back to the respective end position and the piece of jammed material will be released.</p> <ul style="list-style-type: none"> ► Switched off the machine and examine it for any possible damage.
Both outermost LEDs blink	The foot switch has been released before the completion of the movement of the blade carrier and, thereby, the movement is interrupted.	<p>The blade carrier performs a short backward movement</p> <ul style="list-style-type: none"> ► Press blinking key and operate the foot switch <p>The blade carrier will move back to the respective end position and the piece of jammed material will be released.</p>
	The blade carrier is moved whilst it is disconnected from the motor-drive, but whilst the machine is switched on.	<ul style="list-style-type: none"> ► Reconnect the motor drive ► Switch off and on again the device.

Table 3 Error messages

5.1 Replacement Blades

Type		Circular Blade		Lineal Blade	
Part No.	Description	Part No.	Description	Part No.	Description
8933955	MAESTRO 4M/450	8930509.001	Circular Blade	8933394.001	Lineal Blade 450/370
8933965	MAESTRO 4M/70	8933933.001	Circular Blade	8933394.001	Lineal Blade 450/370
8933960	MAESTRO 4M/600	8930509.001	Circular Blade	8933682.001	Lineal Blade 600/520
8933905	MAESTRO 4M/70/520	8933933.001	Circular Blade	8933682.001	Lineal Blade 600/520

Table 4 Replacement Blades

5.2 Replacement of the Upper (Circular) Blade



Danger!

- Unplug power cord before starting maintenance operation.



Warning!

Risk of hand injury !



- Wear protective gloves while handling the blades.

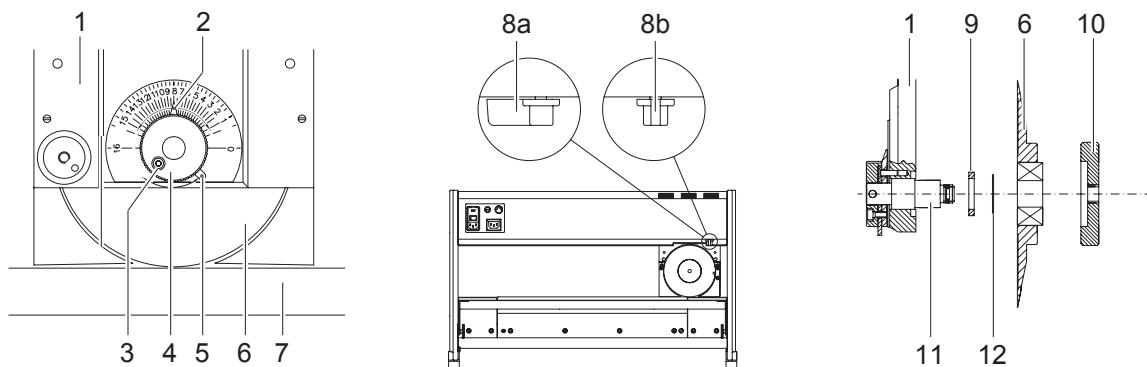


Fig. 13 Replacement of the upper blade

1. Move the lever (8) to the position 'a'. The motor drive to the blade carrier (1) is now disconnected.
2. Move the blade carrier (1) to left end position.
3. Loosen the knurled knob (10) completely from the blade shaft (11).
4. Rotate the pointer (2) with the knob (4) anti-clockwise into position "16".
5. Remove the circular blade (6) from the blade shaft (11).
Do not lose the spacers (9,12) located on the blade shaft (11), between the blade (6) and the carrier (1).
Replace the spacers (9,12) if necessary.
6. Slide the replacement blade (6) onto the blade shaft as far as possible.
7. Put the knurled knob (10) onto the blade shaft.
8. Move the blade carrier (1) to the center of the lower blade (7).
9. Loosen the cylinder screw (3).
10. Move the knob (4) clockwise until the upper and lower blade gently touch without overlapping.
11. Swing the strut (5) clockwise until you reach the stop and tighten the cylinder screw (3). This adjustment locks the upper blade in place to prevent it from moving out of adjustment.
12. Adjust the upper blade position ► 3.3 on page 9.
13. Tighten the knurled knob (10).
14. In the event of the optional dial gauge assembly being available, check the alignment of the blades
► 3.5 on page 11.
15. Move the lever (8) to the position 'b'. The motor drive to the blade carrier (1) is now reconnected.

5.3 Replacement of the Lower (Lineal) Blade



Danger!

- Unplug power cord before starting maintenance operation.



Warning!

Risk of hand injury !



- Wear protective gloves while handling the blades.

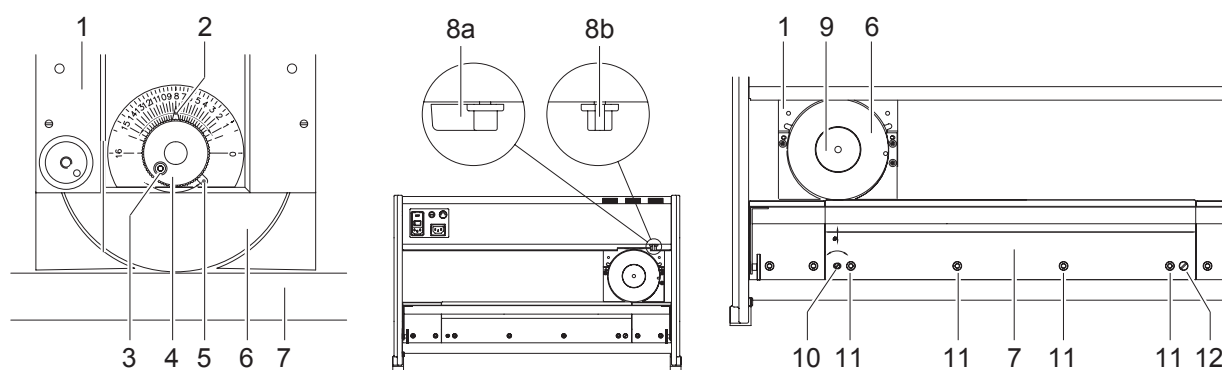


Fig. 14 Replacement of the lower blade


1. Move the lever (8) to the position 'a'. The motor drive to the blade carrier (1) is now disconnected.
2. Move the blade carrier (1) to the left end position.
3. Remove the table ▷ 3.7 on page 12.
4. Loosen the cylinder screws (11).
5. Move the lower blade (7) fully downwards by carefully rotating the eccentric adjuster (10).
6. Loosen the set-screw (12) and remove the lower blade (7) from the eccentric adjuster (10).
7. Mount the new lower blade (7) onto the eccentric adjuster (10) and reinsert the set-screw (12) into the machine frame.
8. Tighten loosely the cylinder screws (11).
9. Loosen the knurled knob (9) on the upper blade (6) and move the pointer (2) with knob (4) anti-clockwise into position "16".
10. Move the carrier (1) to the end of the lower blade (7) above the locking screw (12).
11. Loosen the cylinder screw (3).
12. Rotate the knob (4) clockwise until the upper and lower blades gently touch without overlapping.
13. Swing the strut (5) clockwise until you reach the stop and tighten the cylinder screw (3). This adjustment locks the upper blade (6) in place to prevent it from moving out of adjustment.
14. Tighten the knurled knob (9).
15. Move the blade carrier (1) to the other end of the lower blade (7) above the eccentric adjuster (10).
16. Raise the lower blade by carefully rotating the eccentric adjuster (10) until the upper and lower blades are just touching one another at this position, but do not jam.
17. Tighten the cylinder screws (11).
18. Adjust the upper blade position ▷ 3.3 on page 9.
19. In the event of the optional dial gauge assembly being available, check the alignment of the blades ▷ 3.5 on page 11.
20. Remount table.
21. Move the lever (8) to the position 'b'. The motor drive to the blade carrier (1) is now reconnected.



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EC Declaration of Conformity

We declare herewith that the following device as a result of design, construction and the version put in circulation complies with the relevant fundamental regulations of the EC Rules for Safety and Health. In the event of any alteration which has not been approved by us being made to any device as designated below, this statement shall thereby be made invalid.

Description:	PCB Separator
Device:	MAESTRO 4M
Applied EC-Directives and Standards :	
Directive 2006/42/EC on machinery	• EN ISO 12100:2010
	• EN ISO 13857:2008
	• EN 349:1993+A1:2008
	• EN 61029-1:2009+A11:2010
	• EN 61558-1:2005+A1:2009
Directive 2004/108/EC relating to electromagnetic compatibility	• EN 61000-3-2:2006+A1:2009+A2:2009
	• EN 61000-3-3:2008
	• EN 61000-6-2:2005
	• EN 61000-6-4:2007+A1:2011
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	 Erwin Fascher Managing Director

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