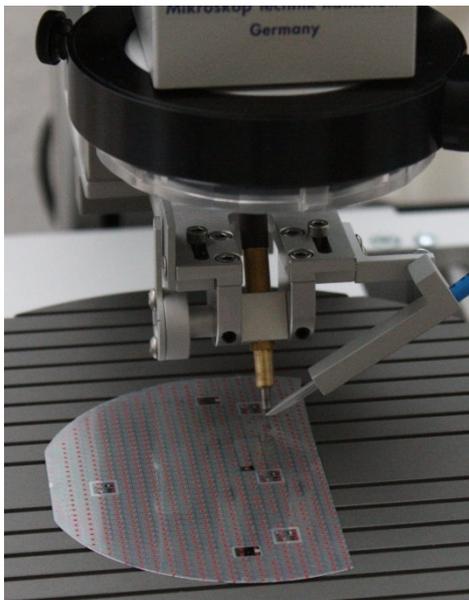


# MANUAL

setup / installation / use



## MICRO DIAMOND SCRIBER MR-200



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## 1. Technical Data MR100 / MR200

	MR100	MR200
Air pressure connection	6 bar	
Power Supply	220 V AC, 150W	
Wafer chuck diameter	100mm	200mm
Fine adjustment	x,y: $\pm 40$ mm/0,01mm; $\phi$ : $\pm 2^\circ$	
Stroke for cutting movement	210mm	
Weight	Approx. 15kg	Approx. 16kg
Scribing power	30g – 250g*; 1,8...3bar **	
Microscope magnification	$\Gamma$ '=8...40x	
Mechanical dimensions	Height: 500mm, Width: 410mm, Depth: 580mm	

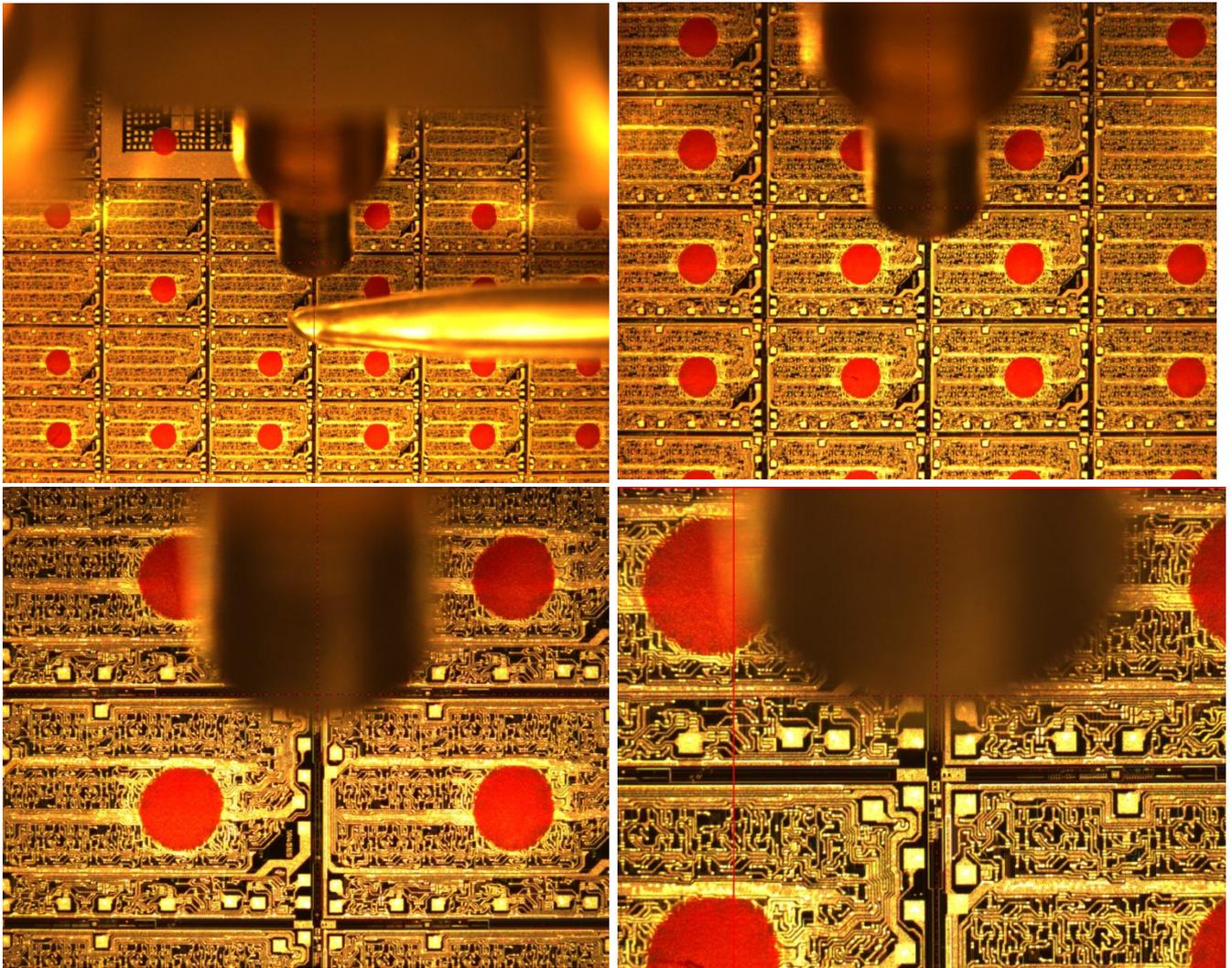
\* - using spring system;

\*\* - using pneumatic system

## Micro diamond scriber MR 200



**Magnification range**



## 2. Installation

### 2.1. Unpacking MR100/200 and assembling the building groups

Unpack first the equipment (basic instrument, microscope building group, cold light source). Loosen the transport lock and execute a visual inspection on possible transport damages.

#### Removing transport protection profiles

Micro Diamond Scriber MR100/MR200 is delivered to customer in a stable wooden box. MR100/200 is screwed on the pallet by an angle piece on the transport protection profiles shown in Fig. 1.

Please remove the screws before removing MR100/200 from box.

Parts for transport protection are marked with red dot. Including protection profiles (1)+(2), diamond lowering device protection (3) and x-,y- translation table protection (4).

**Step 1:** Remove your MR100/200 from transport box

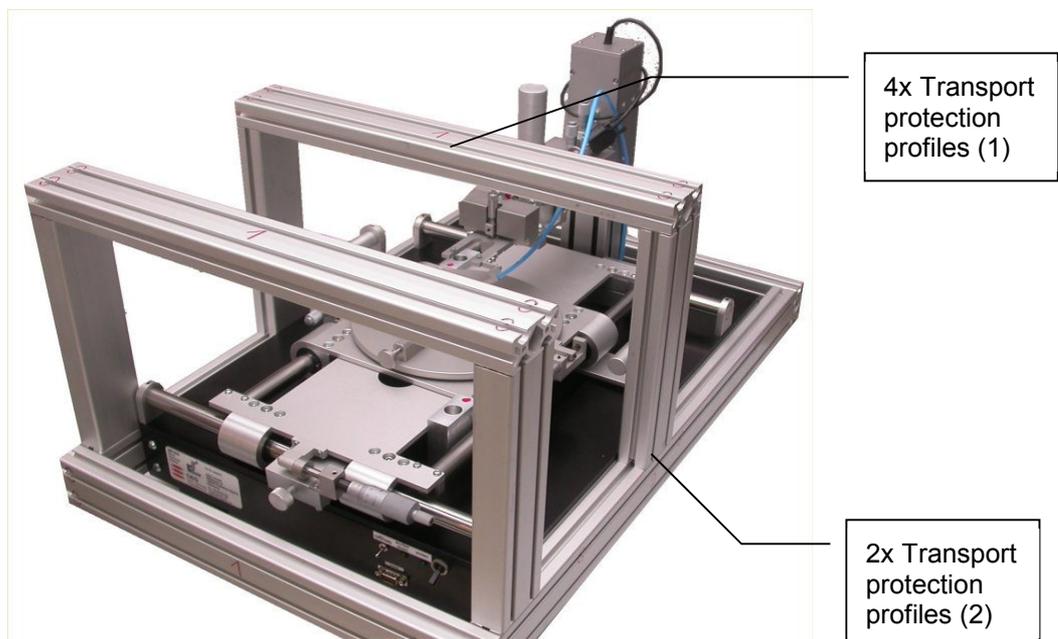


Fig. 1: MR100/200 as delivered with transport protection profiles

**Step 2:** After removing MR100/200 from box, remove transport protection profiles (1) (4 profiles) by unscrewing marked screws (4x each).

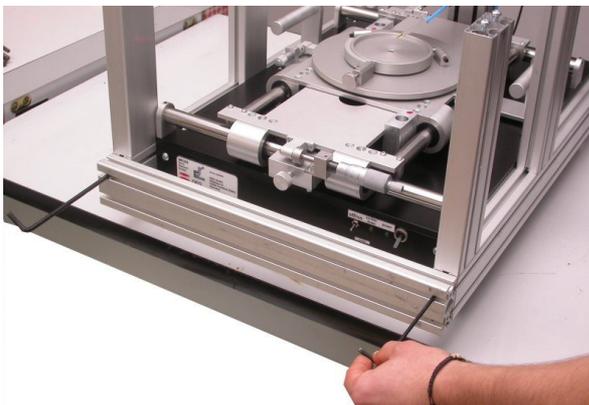


Fig. 2: loosen screws

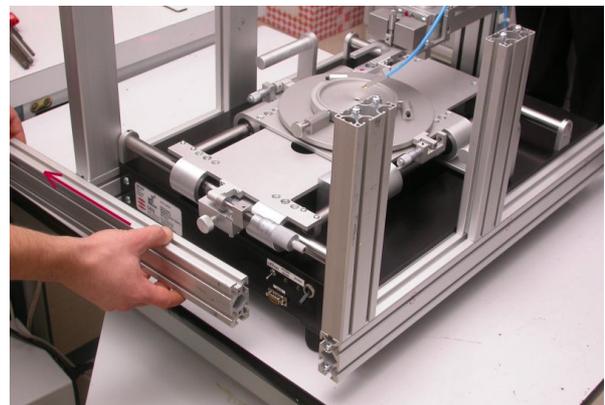


Fig. 3: pull out the profile (1)

**Step 3:** Remove transport protection profiles (2) by unscrewing marked screws (3x each)

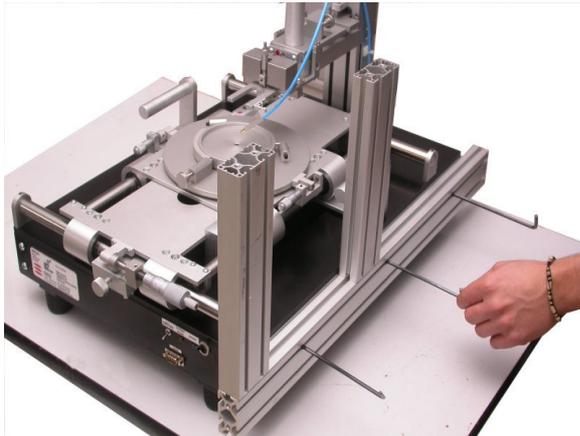


Fig. 4: loosen screws

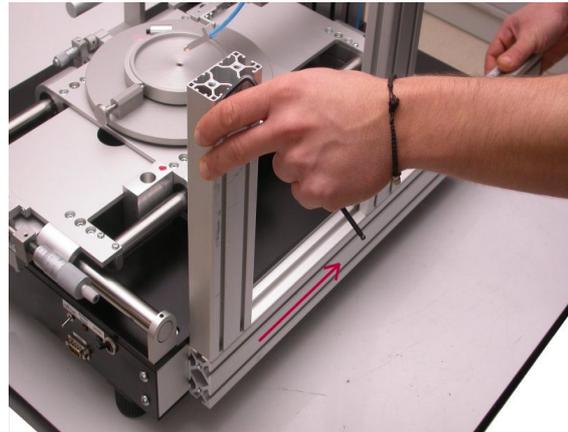


Fig. 5: pull out the profile (2)

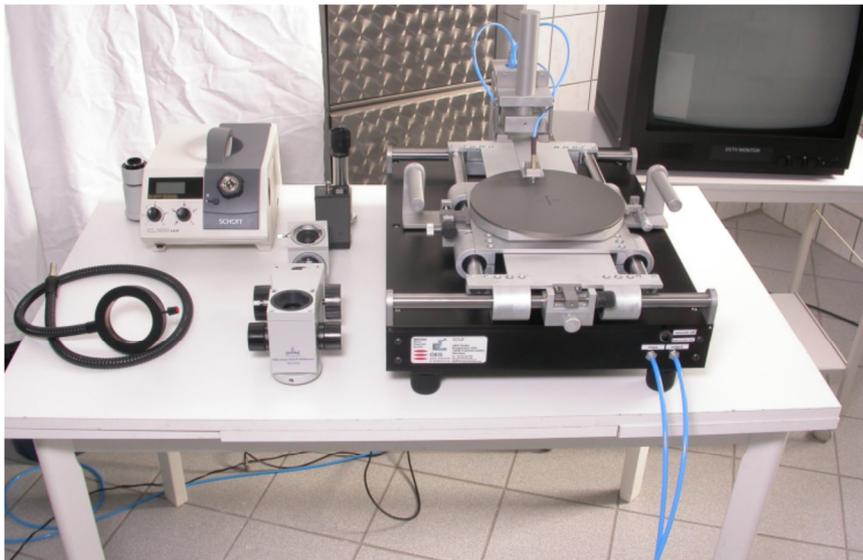


Fig. 6: Components of MR100/200 with TV-equipment, pedal not shown

The components may differ according the ordered equipment degree. Any component should be in optically perfect condition!

**Step 4:** Remove the transport protection for diamond lowering device

Diamond  
lowering device  
4 screws

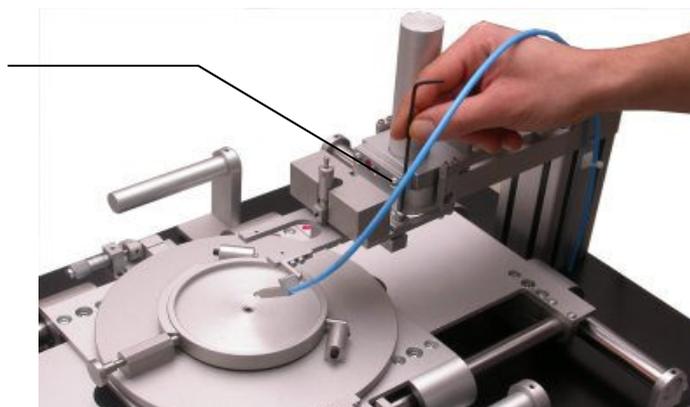
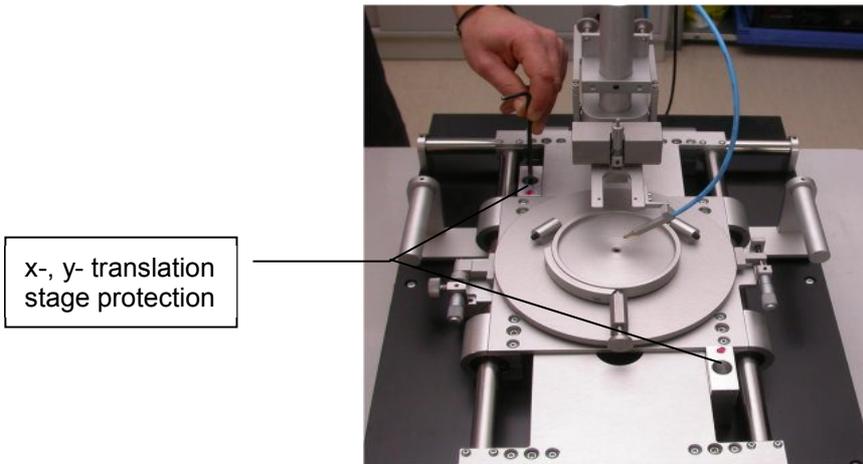


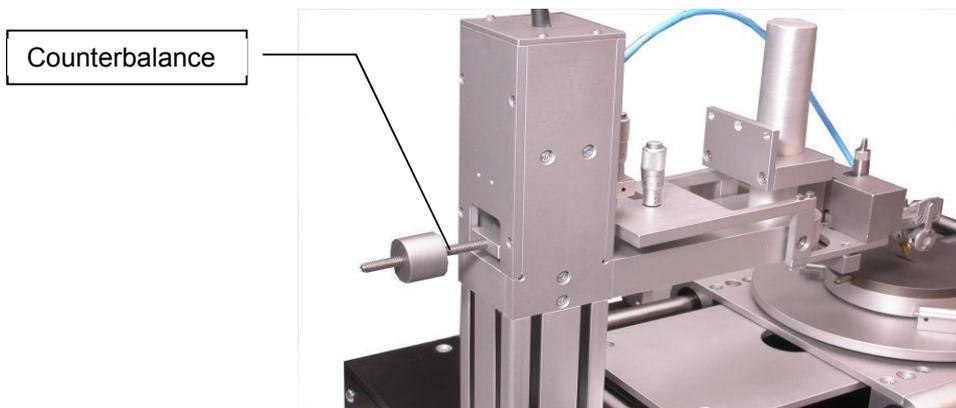
Fig. 7: Remove diamond lowering device protection

**Step 5:** Remove the x-,y-translation stage protection



*Fig. 8: unscrew and remove protection*

**Step 6:** Assemble the counterbalance on the backside of MR100/200

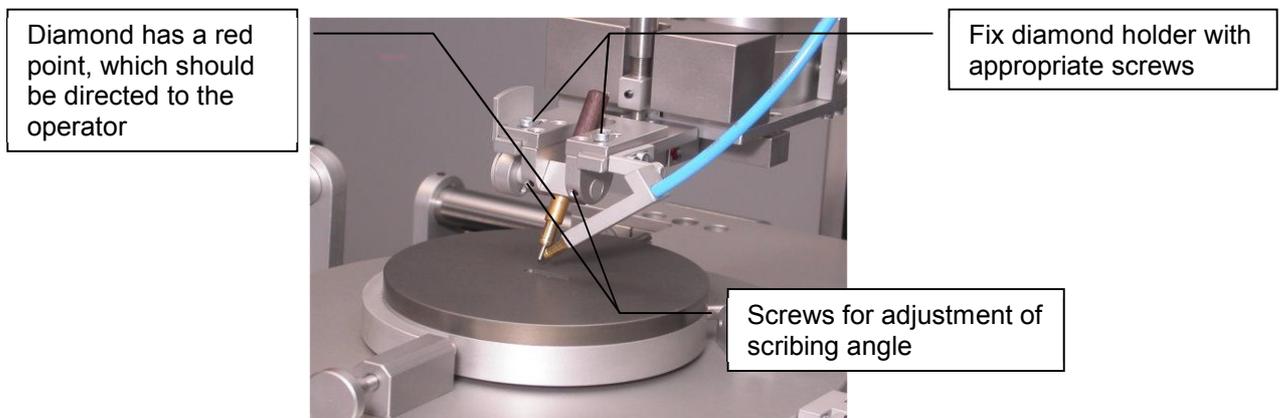


*Fig. 9: Counterbalance for adjustment of lowering speed*

The counterbalance should be screwed as near as possible to the main pillar, fastest lowering speed.

**Step 7:** Assemble the diamond mount on destined position (roughly)

!!! Attention, if wafer chuck already attached, take care not to scratch the wafer chuck with diamond !!!



*Fig. 10: Assemble the diamond holder on destined position*

To rotate the diamond, please loosen the headless screw on the backside of the diamond holder.

**Step 8:** Insert the wafer chuck

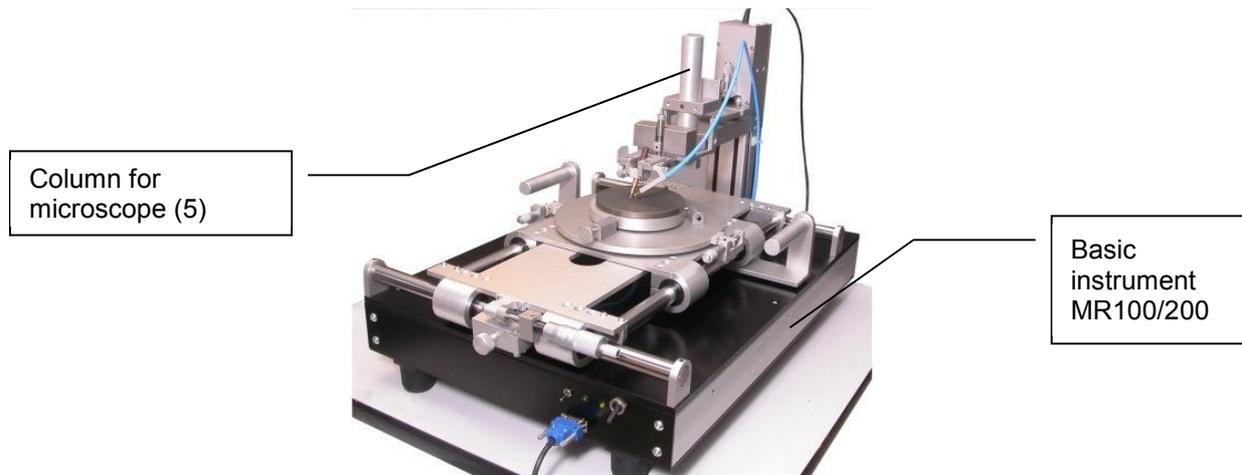
Loosen the locking screw for scribing translation, move translation stage to insert waferchuck easily, take care not to scratch the chuck with diamond



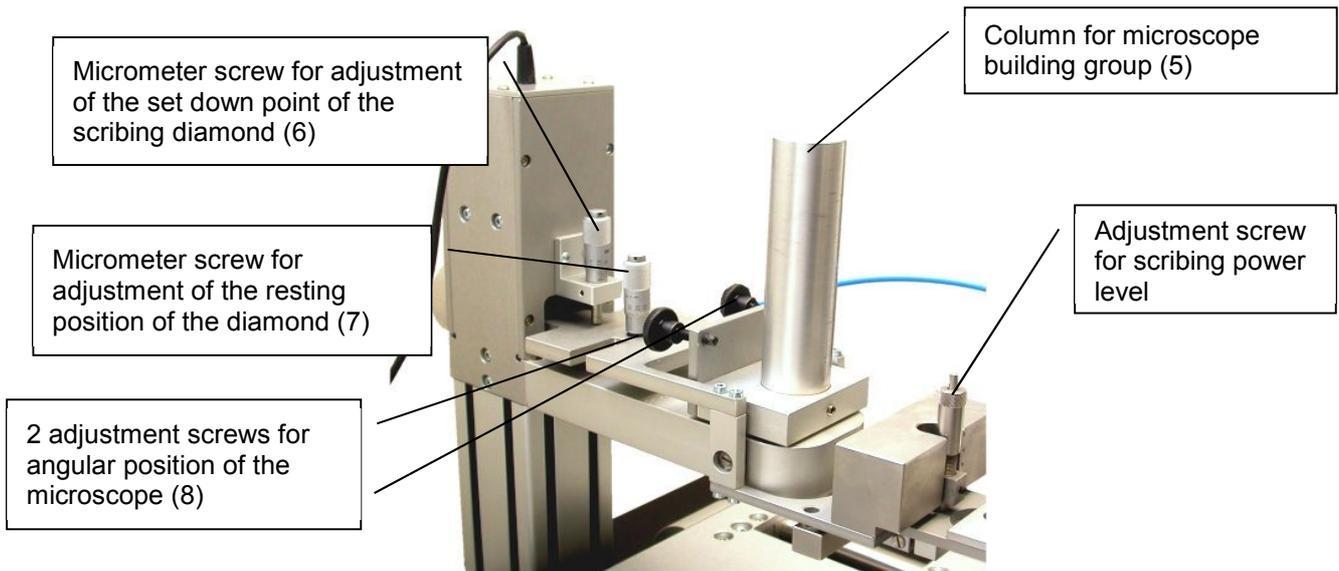
*Fig. 11: Inserting the chuck*

**Step 9:** Assemble the microscope and attach to your MR100/200

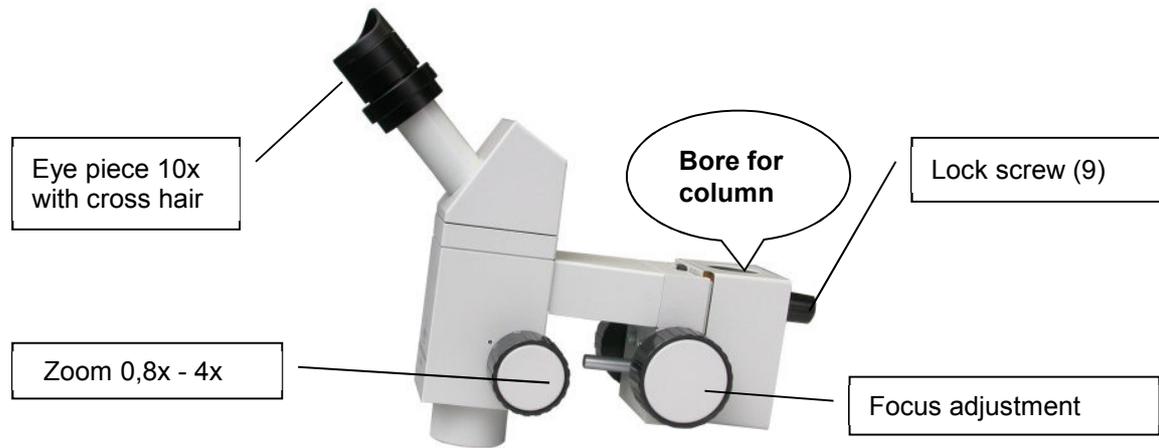
Install the microscope building group onto the column (5) and fix with locking screw (8). The angular position adjustment screws (8) should touch the backside of the microscope building group.



*Fig. 12: Basic instrument overview*



*Fig. 13: Detailed view of diamond adjustment and microscope column*



*Fig. 14: Microscope building group*

**Step 10:** Attach the ring light

Depending on ordering configuration, MR100/200 is delivered with cold light source and ring light, or with LED-ring light.

Unpack the light source.

For use of light source please refer to the separate manual.



*Fig. 15: Cold light source and ring light.*

Use focus adjustment screw to move microscope to the upper position and adapt the ring light to the microscope as shown in Fig 16.



*Fig. 16: Adaption of the microscope and the ring light*

**Step 11:** Plug in cables and connect the MR100/200 to vacuum source



*Fig. 17: Front side panel of the MR100/200*

The micro scriber is supplied with a foot switch. Using the foot switch, the operator can move the diamond upwards and downwards.

- Connect the foot switch to the Sub-D female interface on the front side of MR100/200.



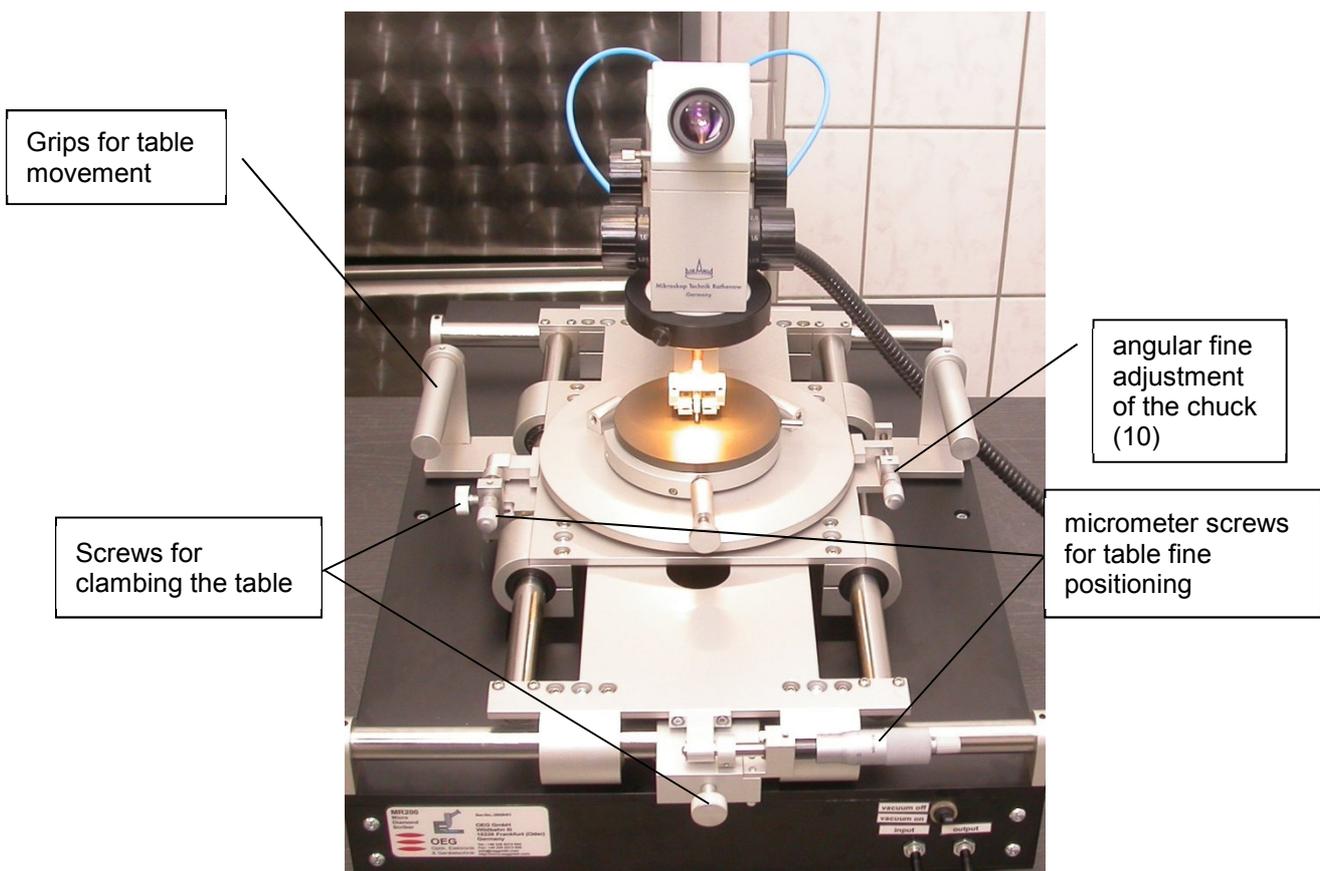
Fig. 18: Back side panel of the MR100/200

- Connect the vacuum supply to the MR 100/200. A tube is supplied with the delivery contents.
- Plug in the cable for the electro-magnet the destined interface (sub-D male).
- Connect the power supply to the MR100/200
- The time delay for lowering the diamond is set by OEG staff.

## 2.2. Implementation

Now the micro scriber is ready for use.

Here are some additional explanations of the operating elements.



## 90°-rotation of the chuck

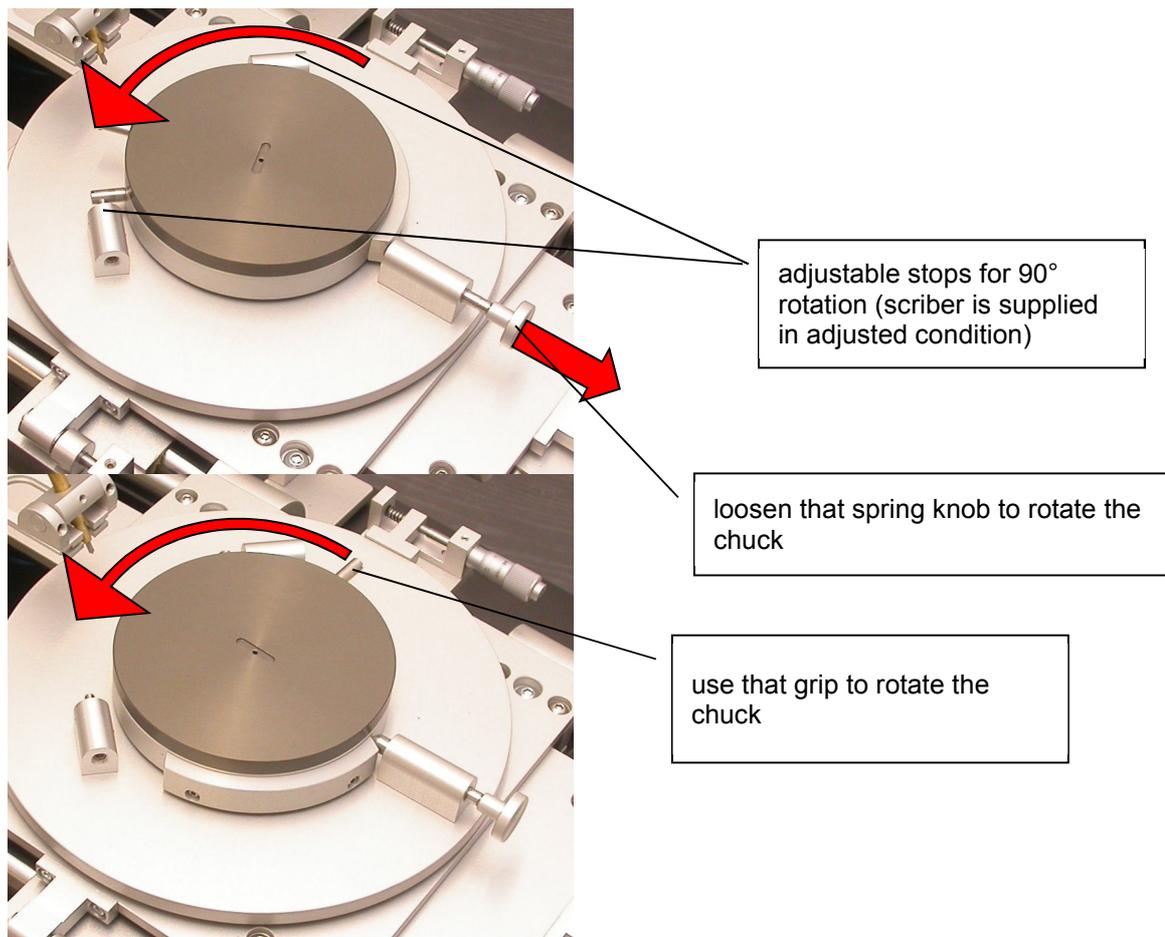


Fig. 20: 90° rotation table

### 2.2.1. Adjustment of the scribing diamond position

The scribing angle which is used in MR100/200 is set to 30° for best scribing results. Operator can adjust the scribing angle by +/-10° loosening the headless screws shown in Fig. 10.

MR100/200 is delivered with clamped lowering device for the diamond. The lowering device is fixed by micrometer screws (6) and (7), see Fig. 13.

Before scribing procedure can be started operator has to adjust the resting and the scribing position of the diamond.

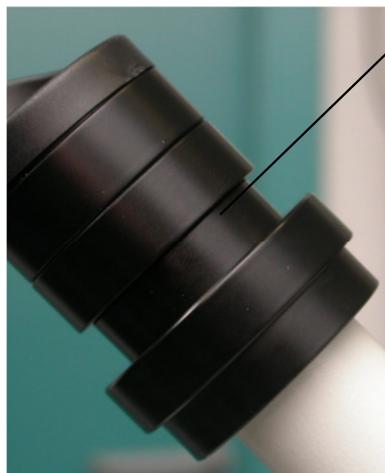
- Turn on the MR100/200, and the vacuum supply
- Loosen the clamping screw for scribing direction and move the stage to the front of MR100/200. Just not to damage the wafer chuck.
- Do **not** activate footswitch. Use micrometer screw (7) in Fig. 13 to adjust the resting position, it might be necessary that micrometer screw (6) has to be loosen at same time. The upper position depends on the sample thickness. As rough indication 2mm above the waferchuck is a sure distance.
- Now activate footswitch and hold on. At the same time adjust the bottom position of the diamond spike using screw (6) about 0.5mm below the waferchuck. Release footswitch.
- Apply a test wafer to the chuck, and move the stage with the sample carefully below the diamond.
- Make test cut, be careful not to scratch beyond the wafer.
- Adjust the lowering speed of the diamond to your requirements using the counterbalance Fig. 9

**The cutting procedure must take place with pulling movement!**

## 2.2.2. Adjustment of the microscope

As observation microscope the mono zoom microscope MZM1 with monocular tube is used. The advantage in comparison with stereo microscopes is the parallax free imaging, i.e. when focusing, no relative motion of the eyepiece hair cross takes place in relation to the object structure. The monocular view is likewise more stable opposite the binocular regarding parallax, since the adjusting movement is void for adjustment to the eye-distance. Only the manipulation of the zoom system leads to an apparent relative motion of the hair cross and object pictures, since guidance tolerances of the optical building group are inevitable. The reversal spans are however small, i.e. the relative positions are reproducible.

**Select therefore an optimum enlargement for you, which you use everytime again with the scribing procedure under use of the hair cross.**



Focus the hair cross by rotating of the upper part

To the visual inspection or other tasks however any zoom position can be selected. The hair cross is to be adjusted in such a way that it appears sharp to the user and that the y axis coincides with the cutting course. Lead to it one sample-cut out. Turn now the eyepiece in such a way that the lines concerned are parallel. Lock the eyepiece position with the help of the clamping screw.

Loosen wedging of the microscope building group slightly. Now the microscope is to be rotated with the help of the set screws [Fig. 13: (8)] at the adjusting assistance, until the cutting line coincides with the y axis of the hair cross. Tighten wedging with moderate strength again. Repeat the procedure if necessary.

The diamond itself is not visible through the microscope due to geometrical dimensions of the diamond pen. But you can adjust the starting point of the cut relative to the haircross. Choose a wafer with a horizontal structure align this structure to the horizontal line of the haircross, and press the footswitch and release immediately.

Then move the table slightly until the scratch is visible. If the scratch does not coincide with the horizontal structure adjust the diamond holder position, by untightening the screws shown in Fig. 10. Repeat procedure if necessary.

These adjustments have to be repeated after replacing diamond, changing diamond angle or parts of the microscope.

**The cutting procedure must take place with pulling movement!**

**Make sure please that the plastic pressure hoses, which lead to the pneumatic actuators as well as the hose to dust eyes are not obstructed in their mobility. Otherwise the function can be impaired with small scribing powers (and/or operating pressures).**

### **2.2.3. Adjustment of the scribing power**

A compressed spring generates a counterforce to the lowering device in order to adjust the scribing power level.

MR100/200 is delivered with 3 springs, one is already installed.

Use following table to adjust the scribing force approximately.

- 1 Spring installed: 30g – 90g
- 2 Springs installed: 90g – 120g
- 3 Springs installed: 100g – 250g

To reach maximum scribing power level, insert 3 springs and tighten the screw.  
The scribing force depends on the scribing angle.

Use screw for scribing power adjustment as shown in Fig. 13. To change or add additional springs, please unscrew and insert new springs.

## **3. The scribing procedure**

### **3.1. Specify to the scribing course.**

For orientation, as the cutting course and/or the break which can be obtained is to run, the test-structures on the wafer usually serve. The wafer is to be aligned by shifting and rotation until the y axis of the hair cross coincides with the desired cutting course and remains also in such a way when shifting the work car.

Omit first the vacuum switched off and to lead a rough adjustment. The  $\varphi$  - Adjustment can take place then still without micrometer screw with the help of the rotating chuck plate.

After switching on of the vacuum the  $\varphi$  - adjustment by the micrometer screw (10) Fig. 19 and the placing elements of the x/y-table can be done.

If possible, the axis of rotation should coincide approximately with the center of the cutting course. The goal is fast achieved, if the distance at the ends of the cutting course becomes balanced the half by shifting and the half by rotating the sample in each case.

### **3.2. Execute scribing / cutting**

The cutting course was specified and adjusted in preliminary tests a cutting strength favorable for the material.

The desired break is to run by certain test-structures, while in these places the sample may not be scratched.

Therefore the cut is implemented only in several small steps.

Some exercise is required for that, since these stages may be long usually only few millimeters and from irregular length are.

Shift the work car for this purpose with **both hands**, whereby on the guidance a lighter pressure is exercised.

The pressure perpendicularly to the guide way reduces stick-slip features.

They reach precision and speed so in a simple manner.

Do not touch thereby at the x/y-table, because you could disadjust your attitude.

Usually the scribing movement with the work car is implemented.

The y axis of the x/y-table can be naturally also used. This function is somewhat more time-consuming, can bring however with very small cutting distances of advantages.

**The scribing procedure must take place with pulling movement!**

### **3.3. Sources of error, references and Tipps**

- With small samples the redundant sucking in holes of the chuck should be covered with paper or plastic foil, so that the sample can be still sufficiently sucked in.
- If the diamond wear shows, it must be usually not directly changed. If you loosen the clamping screw of the diamond mounting plate, turn the diamond over approx. 45 ° around its axle and tightens wedging again. If the sample cutting is correct, you can adjust the microscope again in accordance with chapter 2.2.2 and continue working.

## **4. Exchange of the scribing diamond**

- 4.1. Lower by means of micrometer screw the cutting diamond carefully up to the Chuck. You have so an orientation, as far the new diamond should be introduced to the mounting plate.
- 4.2. Loosen the clamping screw at the diamond mounting plate and pull the diamond write pin out somewhat.
- 4.3. Separate the vacuum suck hose from the diamond and pull the old diamond write pin out of its mounting plate. If necessary the microscope wedging must be solved and be turned the microscope to the side.
- 4.4. The installation of the new cutting diamonds takes place in reverse order.
- 4.5. Afterwards the hair cross and/or the microscope must be adjusted according to chapter 2.2.2.