Millisecond Shutter Manual V07
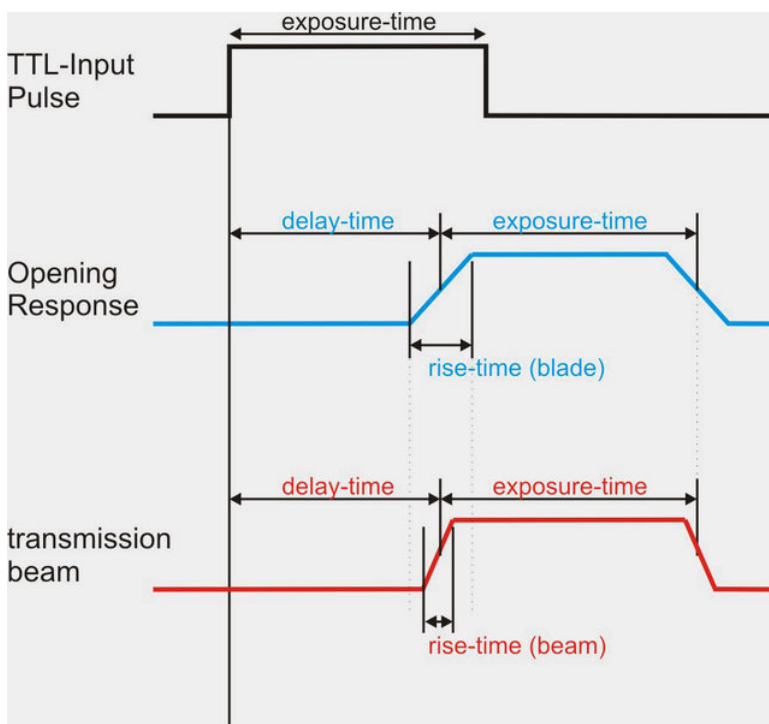
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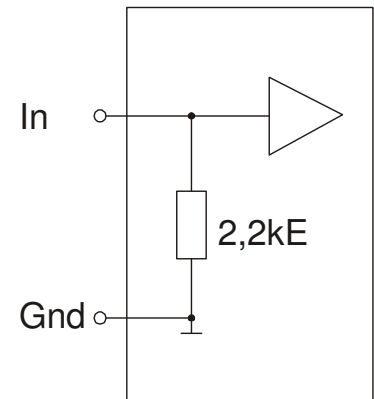
1. Parts

- Shutter (different versions: X3, X10, air / HV / special)

- Driver-Box:

SLS 2004 MMS
MILLISECOND SHUTTER

Shutter

remote control
manual open

open
TTL in
power

In

Gnd

2,2kE

Input circuit.

Input Voltage: TTL 5V --> open shutter
Connector to Shutter: Souriau: UT00104PH
Fuse: 230V-Verion --> 0.5A
Fuse: 115V-Verion --> 1.0A

- Connection Cable
  Opening coil: Pin 1 and 2
  Closing coil: Pin 3 and 4

2. Tools

Important!
Please apply appropriate torque to the screws:
- 4 x   M4x8 to fix the shutter top: →   3.0Nm
- 1 x   M3x6 from top to fix the bearing-holder: →   1.3Nm
- 2 x   M3x8 from side to fix the closing-coil-holder: →   1.3Nm
- 1 x   M3x8 from bottom to fix the closing-coil: →   1.3Nm
- 1 x   To fix the coil on the opening-coil-holder: →   1.5Nm

3. Build together the shutter

1. Attach some Kapton tape to the shutter blade, and cut it properly (1 or 2 layers). The reason is that the blades becomes permanent magnetic over time, and without the tape it might sometimes not come off the coil any more. This depends fully on the thickness of the coating of the blade which might vary.
If the shutter is commissioned, it has this tape already on.

Kapton® tape, 3/4" wide, 0.0035 inch thick, with silcone adhesive.
www.accuglassproducts.com   Part Number 111201

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Materials                     Kapton, Silicon Adhesive
Max. Bake Temperature         260°C
Max. Operating Temperature    260°C
Min. Operating Temperature    -75°C
Max. Vacuum Level             1x10⁻¹⁰ Torr
Contact Material              Silicone adhesive
Length / Height               36-Yards
Width                         0.750              19.05mm
Depth / Thickness             0.0035             88.9um
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UHV-Coils: Add little bit thicker layer of Kapton foil (or just 2 layers) on the bottom of the blade. The UHV-coils are little bit stronger then the air version.

Adjust height of 'opening coil', with the attached M5-screw and its nuts.
The blade should become as horizontal as possible, and it also should touch the coil as flat as possible.

First use only the top nut to fix the coil, then if the height is correct use the bottom coil (and also a spring washer) to fix everything tightly together.


2. Adjust the fastening screw on top of the shutter in a way that you get the shutter aperture you like. (2mm or 4mm or in between). There is 0.5mm 'dead' area at the edges, because some bouncing of the blade.
   Therefore: 1mm beam → 2mm aperture.

   Use spring washers for this top screws to make the screw withstand the permanent vibrations.
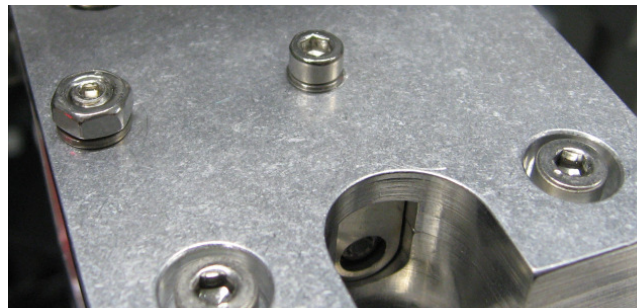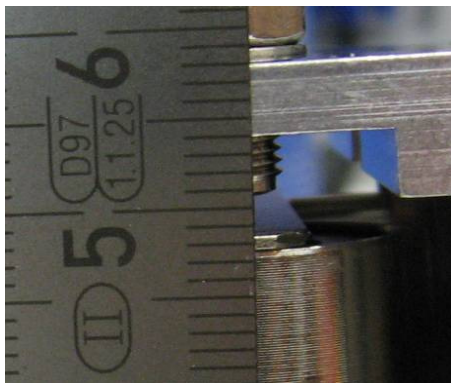
3. Adjust the 'closing coil' to comply to the following 2 conditions:
   - blade touches fastening screw (on top of shutter)
   - blade touches 'closing coil' (flat overlying)

   Fasten the M3 screws very carefully (little bit one, then the other, then the first again) otherwise the coil-holder block will rotate.
   Also make sure the blade is really touching the coils border. (Push coil towards center of the shutter while fixing).
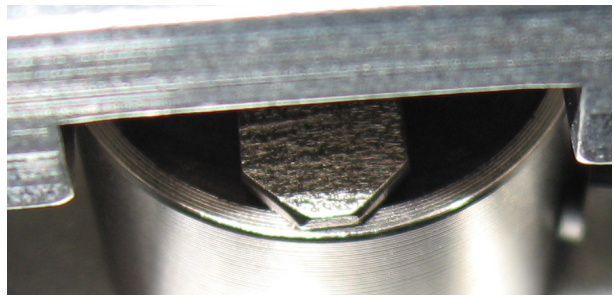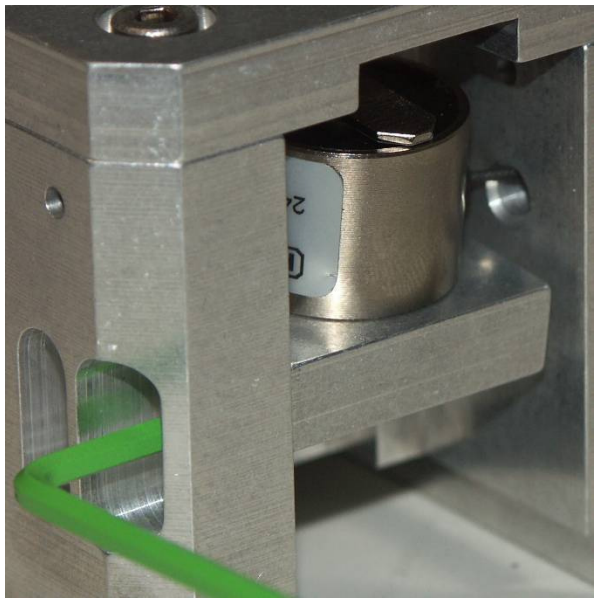
4. Check if the blade can easily move around.

5. Set-Screws from top
In some versions there are additional threads (M4) in the shutter top, there one could add extra screws to fix the bearings tighter. Especially with the new steel-shutter-body we don't suggest to do that.
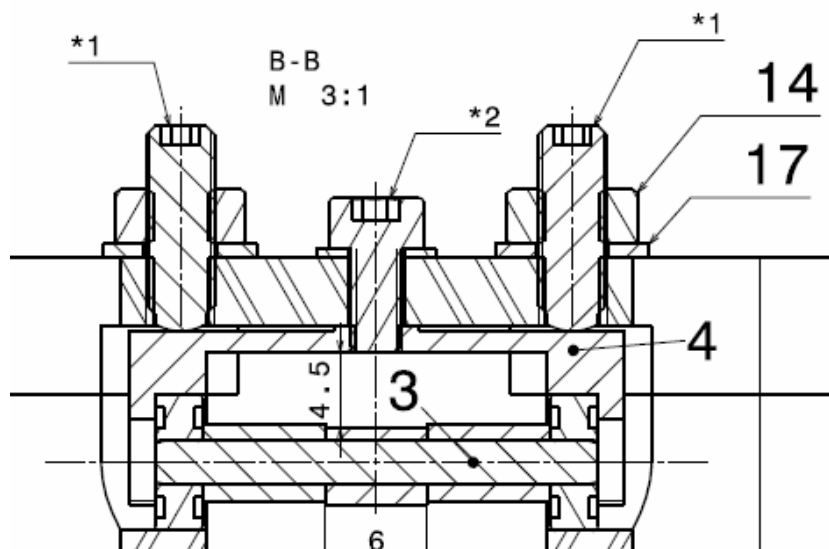
4. Known Problems

Blade sticks to a magnet
In some cases it can happen that the blade sticks to one magnet and one cannot open/close the shutter any more.
- Clean the blade with alcohol and also the surface of the magnet.
- If this doesn't help, one might look at the length of the 'opening' and 'closing' times with a scope, see chapter "Electronically adjustment of shutter-driver".
- Add another thin layer of Kapton foil on the bottom of the blade. Especially for the UHV-coils (they are little bit stronger then the air version) it sometimes needs a thicker layer.
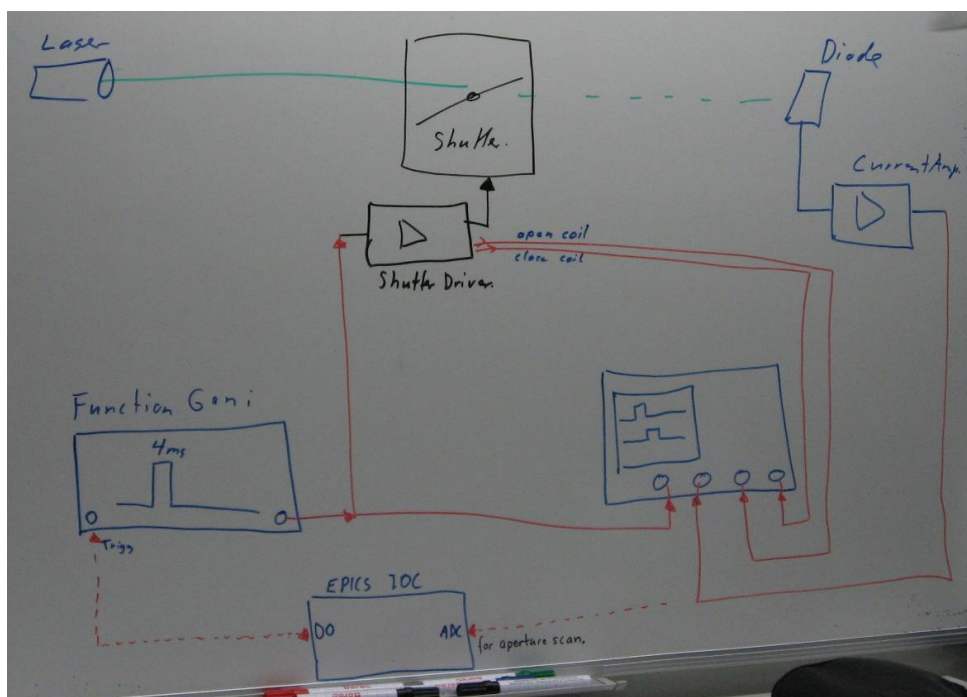
Electronically adjustment of shutter-driver

Please see "shutter specifications detailed" for the values one has to achieve.

1. Build a setup similar to the one described here:

4 Diode   3 Shutter   1 Driver   2 Laser
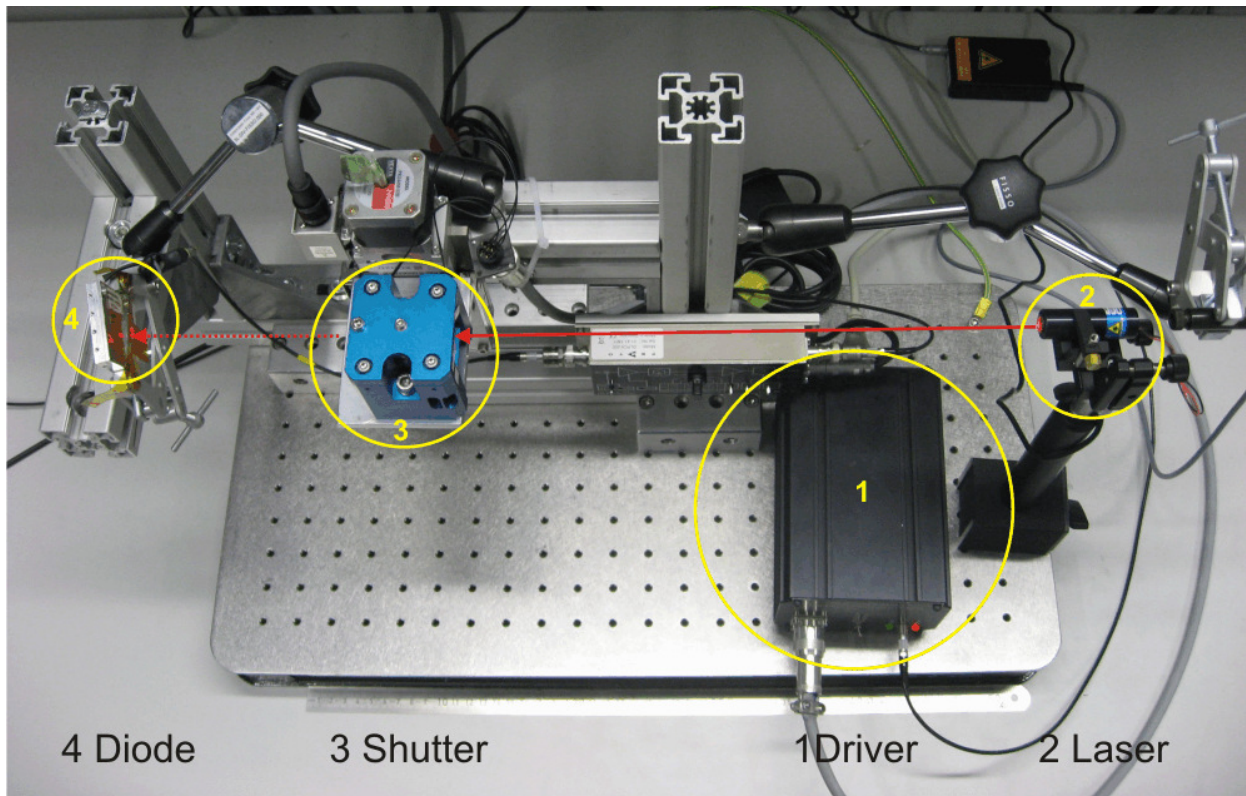
Shutter sits on a vertical translation stage.
Laser beam should be horizontal

2. Attach a 4-channel oscilloscope in the following way:
   - CH1: TTL-Signal (from any frequency-generator,   0 ≤ signal ≤ 5V !)
   - CH2: Signal of diode after the shutter (usually over a current-amplifier)
   - CH3: TP1 inside the shutter (signal to the 'opening-coil')
   - CH4: TP2 inside the shutter (signal to the 'closing-coil')
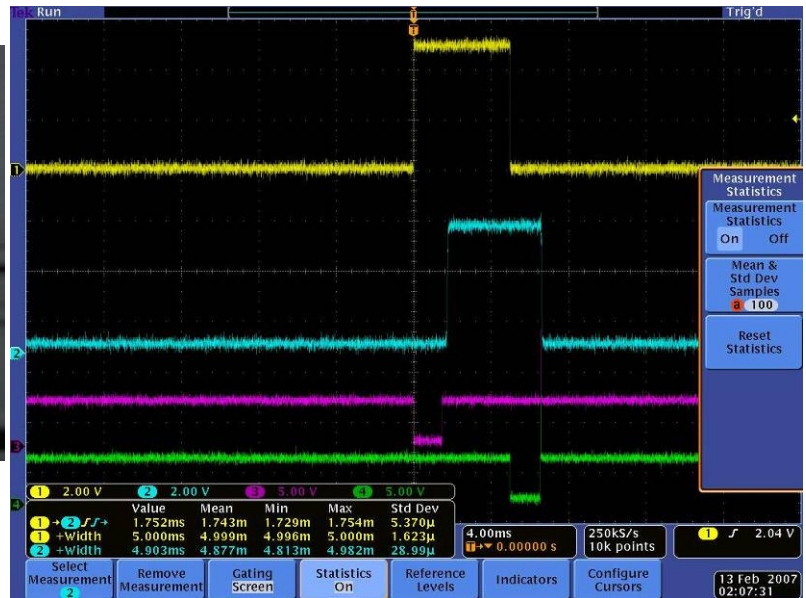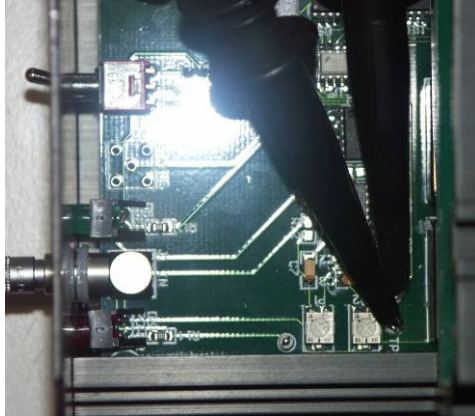
4-channels scope picture

3. Adjustment of the potentiometers for the duration of opening and closing.
   - P1 'opening', pink (adjust until opening jitter is minimized)
   - P2 'closing', green (adjust until specified repetition rate is achieved)
   usually in the range of 1..3ms depending on the shutter.
   !! keep this time <3ms to prevent the coil from short-cut!!

Attention High Voltage
Careful on the wires to the coils there are for several milliseconds > 100VDC!

Software
The is a LabView software available that allows you to measure (statistics) the parameters of the shutter very easily, we strongly suggest to use it when setting up a shutter. There is an extra document describing that, please ask.