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THORLABS

# SH05

# Beam Shutter

Operating Manual




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## *2.2. Ecological background*

It is well known that WEEE pollutes the environment by releasing toxic products during decomposition. The aim of the European RoHS directive is to reduce the content of toxic substances in electronic products in the future.

The intent of the WEEE directive is to enforce the recycling of WEEE. A controlled recycling of end of live products will thereby avoid negative impacts on the environment.

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# Part 1. SH05 Beam Shutter

## *1.1. Product Description*

The SH05 is a rotary, electro-mechanical actuator to provide sub-millisecond shutter operation. In general operation, the shutter remains in a closed position and then opens with a pulse control signal. As long as the control voltage to the shutter remains high, the shutter will stay open; however, if the voltage suddenly decreases, the shutter will close, providing inherent “fail-safe” operation. An optical sensor, which detects the shutter blade's position within the housing, confirms the state of the shutter position, making it ideal in applications where a laser safety lockout is required. The rate at which the device is opened can be controlled. The unit has a 0.50-inch aperture opening and is compatible with the Thorlabs SM05 mounting system.

The input aperture of the SH05 is threaded with Thorlabs' SM05 (0.535"-40) thread to interface easily with all of our SM05 lens tubes. The SH05 is English and Metric System compatible and comes with a 10' cable to connect the shutter directly to the SC10 Controller.

The SH05 can also be used with a third party controller.

# Part 2. Regulatory

As required by the WEEE (Waste Electrical and Electronic Equipment Directive) of the European Community and the corresponding national laws, Thorlabs offers all end users in the EC the possibility to return "end of life" units without incurring disposal charges.

- This offer is valid for Thorlabs electrical and electronic equipment:
- Sold after August 13th 2005
- Marked correspondingly with the crossed out "wheelie bin" logo (see)
- Sold to a company or institute within the EC
- Currently owned by a company or institute within the EC
- Still complete, not disassembled and not contaminated

*Figure 3: Wheelie Bin Logo*

As the WEEE directive applies to self contained operational electrical and electronic products, this end of life take back service does not refer to other Thorlabs products, such as:

- Pure OEM products, that means assemblies to be built into a unit by the user (e. g. OEM laser driver cards)
- Components
- Mechanics and optics
- Left over parts of units disassembled by the user (PCB's, housings etc.).

If you wish to return a Thorlabs unit for waste recovery, please contact Thorlabs or your nearest dealer for further information.

## *2.1. Waste treatment is your own responsibility*

If you do not return an "end of life" unit to Thorlabs, you must hand it to a company specialized in waste recovery. Do not dispose of the unit in a litter bin or at a public waste disposal site.





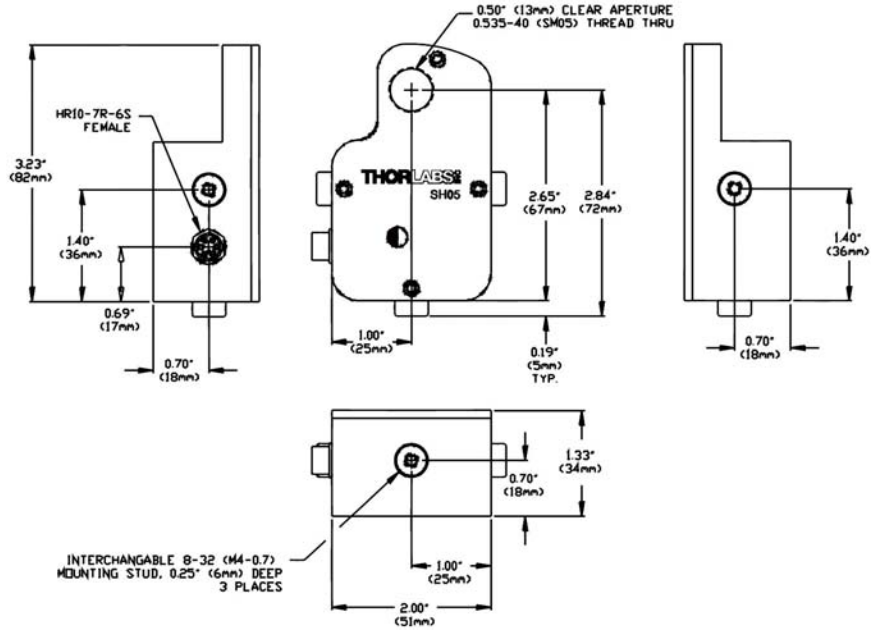
### Interface Connector

The interface connector on the SH05 is a 6-pin HRS female connector (HR10-7R-6S). The pin descriptions are as follows:

| Pin | Description |
|---|---|
| 1 | Monitor Opto Anode |
| 2 | Solenoid |
| 3 | Solenoid |
| 4 | Monitor Opto Cathode |
| 5 | Monitor Opto Emitter |
| 6 | Monitor Opto Collector |


*Figure 2: SH05 Connector*

## *1.3. Drawing*



## 1.2. SH05 Shutter Overview

The SH05 shutter contains a rotary solenoid presenting a large inductive load to the controlling device. As this inductor is charged, the resulting movement of the actuator takes a finite amount of time (opening of the shutter). Conversely when the voltage is removed from the shutter it takes a finite time for the inductor to discharge and for the mechanics to release the actuator (close the shutter). The shutter timing varies and is dependent on the duration and magnitude of the driving pulse and the magnitude of the sustaining hold voltage.

The SC10 provides a 5 millisecond 24 Volt driving voltage to actuate the shutter and a holding voltage of 10 Volts. The timing for the SH05 is characterized below when operated with the SC10 controller.

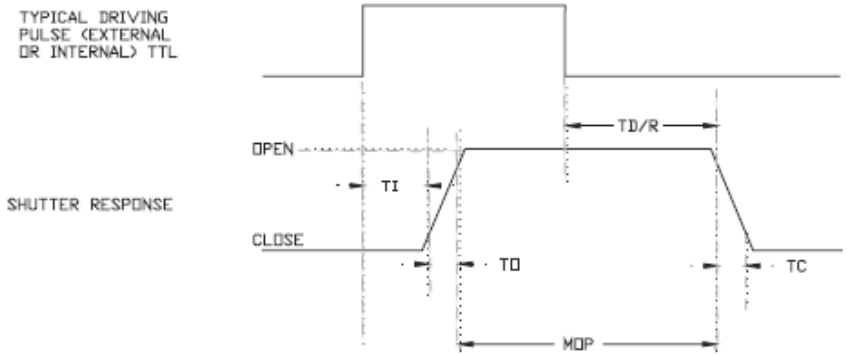



***Figure 1: SH05 Timing Driven by Thorlabs SC10 Shutter Controller***





### Timing Performance

| Event | TIME (ms Typical) |
|---|---|
| TI | 8 |
| TO | 1 |
| TD/R | 13 |
| TC | 1.5 |
| MSOP* | 10 |
| MOP | 10 |

**TI, Transfer Initialize:** Time from the application of an energizing voltage to the initial movement of the shutter.

**TO, Transfer Open:** Time for the shutter to move from 20% exposed to the 80% exposed. This is measured across the 0.5" travel distance of the shutter.

**TD/R, Transfer Dwell/Release:** Time from the removal of the holding voltage or pulse to the point where the shutter begins toclose.

**TC, Transfer Close:** Time for shutter to close from an 80% exposure to 20% exposure.

**MSOP*, Minimum Shutter Open Time:** Minimum shutter open time using the MOP from the SC10 controller.

**MOP, Minimum Open Pulse:** Minimum pulse width (setting on the SC10 controller) to operate the shutter.

## Typical Performance

The SH05 is capable of operating at a sustained maximum rate of 25 Hz with a minimum on time of 10 ms. As programmed exposure times (open times) increase to beyond 20 ms the dominant characteristics of magnetic distortion, TI, and TD/R, as shown in Fig. 1, become constants. The net effect of this anomaly is that the delay from the control pulse (or trigger) to the shutter opening is 5 ms, and the duty cycle distortion incurred is ±5 ms. As an example: If the SC10 is programmed for 100ms open and 100ms close time, the result would be a 105 ms exposure and a 95 ms closure on the SH05.

## Specifications

The following specifications are given for those not using a SC10 controller.

| Parameter | Spec |
|---|---|
| Solenoid Coil Resistance | 28 Ohms |
| Max Solenoid (Pulse) Voltage | 50 V |
| **Max Solenoid Power (@20°C)** | |
| Steady State | 4 Watts |
| 50% Of Duty Cycle | 8 Watts |
| 25% Of Duty Cycle | 16 Watts |
| 5% Of Duty Cycle | 80 Watts |
| **Max Solenoid Time On (@20°C)** | |
| Steady State | Continuous |
| 50% Of Duty Cycle | 100 s |
| 25% Of Duty Cycle | 36 s |
| 5% Of Duty Cycle | 2.5 s |