THORLABS
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SC10 - April 15, 2025

Item # SC10 was discontinued on April 15, 2025. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

OPTICAL SHUTTERS

- Ø1/2" and Ø1" Beam Shutters
- Two Controller Options Available
- Interlock Mode Incorporated into Control Logic

SH05R
Ø1/2" Beam Shutter,
8.0 ms (Typ.) Shutter Close Time

SH1
Ø1" Beam Shutter,
10 ms (Typ.) Shutter Close Time

KSC101
K-Cube Compact Shutter Controller
(Compatible with the SH05R(/M)
Optical Beam Shutter)

SC10
Benchtop Shutter Controller

OVERVIEW

Features

Shutter Selection Guide	
Diaphragm	**Single-Blade**
Ø1/4", Ø1/2", and Ø1" Motorized	Ø0.29" Manual
	Ø1/2" and Ø1" Motorized

- Ø1/2" and Ø1" Beam Shutters
- Typical Shutter Close Times:
  - SH05R(/M) with KSC101 Controller: 8.0 ms (90% to 10% Exposure)
  - SH1(/M) with SC10 Controller: 10 ms (80% to 20% Exposure)
- Passive Closure Mechanism Ideal for Laser Safety Applications
- 8-32 (M4) Taps for Ø1/2" Post Mounting
- SC10 Benchtop Controller and KSC101 Compact Controller (for SH05R(/M) Only) Available Separately Below

Thorlabs' Optical Shutters utilize a rotary, electro-mechanical actuator to provide millisecond shutter operation. During operation, these shutters remain in a closed position and then open when a pulse control signal is applied by an external controller. As long as the control voltage to the optical shutter remains high, the shutter stays open, but as soon as the voltage goes low, the shutter closes, providing inherent "fail-safe" operation. The frequency at which the device is opened and closed can be controlled. An optical sensor, which detects the shutter blade position in the housing, provides information that confirms the state of the optical shutter position. This makes it ideal in applications where a laser safety lockout is required.

In order to ensure that your optical shutter has a long lifetime, the aperture should not be located near the focus of a laser beam. Please note that the solenoid's performance is not guaranteed if the case temperature exceeds 50 °C. Significant heat buildup will occur if the aperture is closed for a long time while a high-power laser is incident on the shutter.

Controller Options
Thorlabs offers two controllers for use with our optical shutters: Item #s SC10 and KSC101. The SC10 controller can be used with both the Ø1/2" and Ø1" shutters below, while the KSC101 controller is only compatible with the Ø1/2" shutter. For information on the control requirements, please see the *Specs* tab. Both controllers

include an "interlock mode" that is incorporated into the controller's logic; a physical key lock; and manual, triggered, or sofwtare controlled operation modes. The SC10 benchtop controller has an RS-232 computer connection that allows the controller to be operated using the included standalone software GUI. The KSC101 controller is a compact K-Cube™ controller with a USB 3.0 (2.0 Compliant) computer connection that allows the controller to be controlled using Thorlabs' Kinesis® software package. See the *Specs* tab for a comparison table of the two controller options.

A 10-foot-long cable with 6-way HRS connector is included for connecting the shutter to either the SC10 or KSC101 Shutter Controller. A replacement cable can also be purchased below.

SPECS

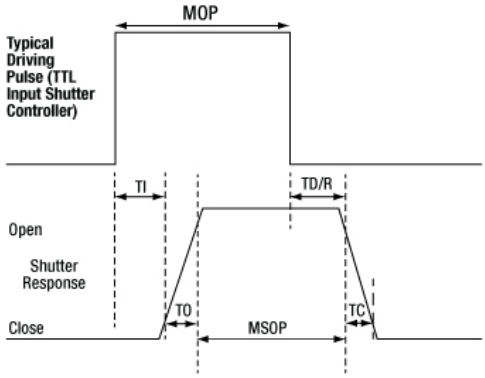
Beam Shutter Specifications		
Item #	**SH05R(/M)**	**SH1(/M)**
Aperture	Ø1/2" (12.7 mm)	Ø1.0" (25.4 mm)
Blade Material	6061-T6 Aluminum	
Blade Thickness	0.063" (1.6 mm)	0.06" (1.6 mm)
Solenoid Coil Resistance	28 Ω	31.84 Ω
Initial State	Closed	
Operation		
Actuation Pulse	8 V to 50 V (Time Dependent)	10 V to 75 V (Time Dependent)
Holding Voltage	8 V to 12 V	8 V to 15 V
Maximum Recommended Applied Solenoid Voltage[a]	<12 VDC (Holding) <50 VDC (Pulse)	15 VDC (Holding) 75 VDC (Pulse)
Maximum Pulse Rate	10 Hz Steady, 25 Hz Burst	12.5 Hz Steady, 16.6 Hz Burst
Duty Cycle[b]	Optimum @ 10 Hz = 40%	Optimum @ 8 Hz = 50%
Lifetime	1,000,000 Cycles (Typical)	
Max Solenoid Power (20°C)		
Steady State	4 W @ Continuous	9 W @ Continuous
50% Duty Cycle	8 W @ 100 s	18 W @ 100 s
25% Duty Cycle	16 W @ 36 s	36 W @ 36 s
5% Duty Cycle	80 W @ 2.5 s	180 W @ 2.8 s

a. To protect the unit from heat, Thorlabs recommends applying an actuation pulse followed by a holding voltage. To keep the unit on for a long period of time, the holding voltage must be ≤12 V. Applying an actuation voltage that is below 8 V may open the shutter; however other timing specs cannot be guaranteed.
b. Measured when the shutter was driven with the SC10 Controller.

Controller Specifications		
Item #	**SC10**	**KSC101**
Maximum Exposure Rate[a]	25 Hz	20 Hz
Minimum Exposure Time[b]	10 ms	15 ms
Typical Transfer Time	1 ms	1.5 ms
Accuracy	0.2 ms	0.3 ms (at 15 ms Exposure)
On/Off Times[b,c]	1 ms to 999.99 s	10 ms to 1000 s
Maximum Steady State Power	5 W	3.5 W
Hold Voltage Range	9 to 11.8 V	6.5 to 7.5 Avg. Volts PWM
Trigger Input/Output	TTL	TTL
Voltage Output	24 V Pulse (10 V Hold)	15 V Max (7 V Avg. PWM Hold)
Output Enable	Key Switch with Interlock Connector	Key Switch and Interlock Jack Plug
Operating Modes		
Manual	User Controlled On/Off	
Single	Trigger Controlled Single On/Off Cycles	DSP Controlled Single On/Cycles
Auto	Trigger Controlled Multiple On/Off Cycles	DSP Controlled Multiple On/Off Cycles
X-Gate (Triggered)	Shutter Controlled by BNC Input Trigger	Externally Triggered On/Off
Trig IN (Trig 1[d])	BNC, TTL, 2.2 - 5 V	SMA, TTL, Type 5 V
Trig OUT (Trig 2[d])	BNC, TTL, 2.2 - 5 V	SMA, TTL, Type 5 V
Output (6 Way Hirose)		
Solenoid Drive	24 V Pulse (10 V Hold)	15 V Regulated DC
Position Feedback Sensor	-	Photodiode
Input Power Requirements		

Voltage	100 - 240 VAC U.S. Power Cord Included	15 V Regulated DC
Current	-	1 A Peak, 300 mA Steady State
General		
Instrument Weight	5 lbs (2 kg)	160 g (5.5 oz)
Housing Dimensions (W x D x H)	11.5" x 5.3" x 3.0" (292 mm x 135 mm x 76 mm)	60.0 x 60.0 x 49.2 mm (2.36 " x 2.36 " x 1.94")[e]

a. Highest frequency that the controller can perform an on/off sequence.
b. If the on/off time is set to a value lower than the minimum exposure time of the unit, the shutter may not open or close fully.
c. Amount of time that the shutter will remain open or closed. This is set in the setting panel and is valid when operating in auto mode.
d. As labeled on the KSC101, Trig 1 is defaulted to Trig IN, while Trig 2 is defaulted to Trig OUT.
e. Height Includes Top Panel Controls



Shutter Response Diagram

Timing Specifications			
Controller	**Event[a]**	**SH05R(/M)[b]**	**SH1(/M)**
SC10	TI	8.0 ms	10 ms
	TO	4.3 ms	10 ms
	TD/R	11.0 ms	20 ms
	TC	6.5 ms	10 ms
	MOP	10 ms	40 ms
	MSOP	14 ms	40 ms
KSC101	TI	11 ms	N/A[c]
	TO	5.5 ms	
	TD/R	26 ms	
	TC	8.0 ms	
	MOP	19 ms	
	MSOP	24 ms	

a. See table to the right for definitions.
b. These are typical values.
c. The SH1(/M) is not compatible with the KSC101.

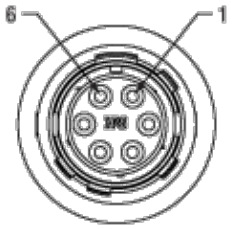
Timing Diagram Definitions		
Event	**SH05R(/M)**	**SH1(/M)**
TI	Time Initialize: Time from Initialization pulse, to energizing of coil, to the initial movement of the shutter.	Transfer Initialize: the time delay between the application of the energizing voltage and the initial movement of the shutter.
TO	Time Open (Rise): Time of shutter blade movement to open from 10% exposure[a] to 90% exposure.	Transfer Open: the time for the shutter to move from 20% exposure[a] to 80% exposure.
TD/R	Time Delay Release: Time delay of release of the hold voltage or pulse at the moment the shutter blade starts to close.	Transfer Dwell/Release: the delay between the removal of the energizing voltage and the initial closing movement of the shutter.
TC	Time Close (Fall): Time of shutter blade movement to close from an 90% exposure[a] to 10% exposure.	Transfer Close: the time for the shutter to move from 80% exposure[a] to 20% exposure.
MOP	Minimum Open Pulse: Minimum pulse width as driven with the SC10 or KSC101 controller.	Minimum Open Pulse: the minimum pulse width supplied by the SC10 controller.
MSOP	Minimum Shutter Open Pulse: Minimum shutter open time (pulse) using the MOP time from the SC10 or KSC101 controller.	Minimum Shutter Open Time: the minimum time the shutter will remain open when using the minimum open pulse (MOP) from the SC10 controller.

a. Exposure refers to the area of the shutter that is open.

PIN DIAGRAMS

SH05R(/M) Interface Connector

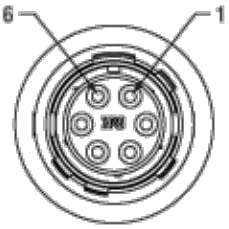
HR10-7R-6S



Pin	Description
1	V_{supply}: 3.3 - 5 V, 20 mA
2	Solenoid
3	Solenoid
4	GND
5	GND
6	Sense Return Low: 0.11 V High: V_{supply} - 0.11 V

SH1(/M) Interface Connector

HR10-7R-6S

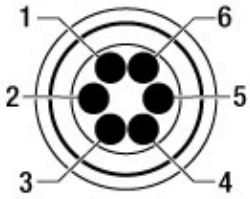


Pin	Description
1	Monitor Opto Anode +V
2	Solenoid +V
3	Solenoid GND
4	Monitor Opto Cathode GND
5	Monitor Opto Emitter GND
6	Monitor Opto Collector +V

SC10 Pin Diagrams

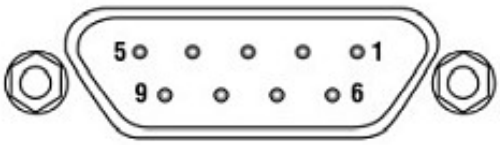
Interface Connector

HR10-7R-6S



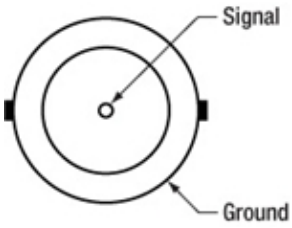
Pin	Description
1	To Opto Anode (12 V limited to 20mA)
2	To Shutter Coil - 24 V Pulse - 10 V Steady State (0.4 A max)
3	To Shutter Coil - GND (on) - Open Ckt (off)
4	To Opto Cathode - GND
5	To Opto Emitter - GND
6	To Opto Collector (2.5V)

Computer Connection
D-type Female



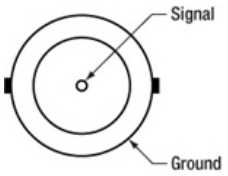
Pin	Description
1	NC
2	TxD (from SC10)
3	RxD (to SC10)
4	NC
5	Signal Ground
6	NC
7	NC
8	NC
9	NC

Trigger In*
BNC Female



*10K Input Impedance, 2.2 V Min, 5 V Max

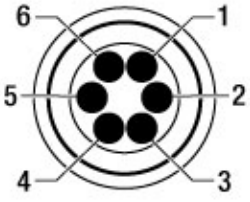
Trigger Out**
BNC Female



**2.2 V Min (500 Ohm Load),
5 V Max (Open Circuit)

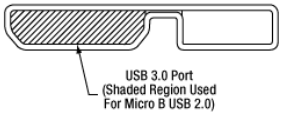
KSC101 Pin Diagrams

Solenoid Connection
Hirose Female



Pin	Description
1	Opto Anode (12 V limited to 20 mA)
2	Shutter Coil 15 V Pulse, 10 V steady state (0.4 A max)
3	Shutter Coil Ground (When ON) Open CCT (When OFF)
4	Opto Cathode Ground
5	Opto Emitter Ground
6	Opto Collector (2.5 V)

Computer Connection*



*The USB 3.0 port is compatible with a USB 2.0 Micro B connector if the Micro B connector is plugged into the shaded region in the photo above. A USB 3.0 type A to type Micro B cable is included with the KSC101.

TRIG 1
(Defaulted to Trig In)
SMA Female

+5 V TTL

TRIG 2
(Defaulted to Trig Out)
SMA Female

+5 V TTL

These connectors provide a 5 V logic level input and output that can be configured to support triggering into and out of external devices. Each port can be independently configured to control the logic level or to set the trigger as an input or output.

Interlock
3.5 mm Jack Plug

A short circuit must be applied across the terminals of this connector before the unit can be enabled. An INTERLOCK jack plug is supplied with the unit. Alternatively, the contact can be controlled externally with a custom 3.5 mm jack plug connected to a switch, which must be closed before the unit can operate.

SC10 SOFTWARE

Software for the SC10 Shutter Controller

Software

Firmware Update

Version 1.3.0 (July 31, 2023)

Standard full software application packages and graphical user interfaces.

Software

OR

Version 1.07 (July 25, 2013)

The firmware of the SC10 has been updated to address compatibility issues with our SH1 Shutter. For units purchased prior to October 2012, a firmware update is available to ensure compatibility with both SH1(/M) and SH05R(/M) shutters. The ability to query the status of the interlock on the device has been added. The latest update also addresses software communication bugs present in the former version.

The SC10 features a serial port for connection to a PC. In order to install the firmware update, a computer with a serial port is required. Alternr can be used.

Software Updates

KINESIS SOFTWARE

Note: The Kinesis® software package can be used to control the KSC101 K-Cube Compact Shutter Controller; it is not compatible with the SC10 Benchtop Shutter Controller.

Thorlabs offers the Kinesis® software package to drive our wide range of motion controllers. The software can be used to control devices in the Kinesis family, which covers a wide variety of motion controllers ranging from small, low-powered, single-channel drivers (such as the K-Cubes®) to high-power, multi-channel benchtop units and modular 19" rack nanopositioning systems (the MMR60x Rack System).

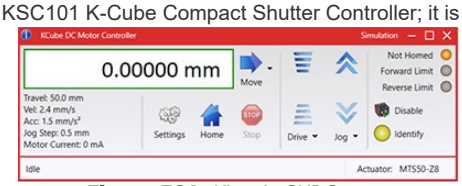


Figure 58A Kinesis GUI Screen

Software

Kinesis Version 1.14.52

The Kinesis Software Package, which includes a GUI for control of Thorlabs' Kinesis system controllers.

Also Available:

- Communications Protocol

Software

The Kinesis Software features .NET controls which can be used by 3rd party developers working in the latest C#, Visual Basic, LabVIEW™, or any .NET compatible languages to create custom applications. Low-level DLL libraries are included for applications not expected to use the .NET framework and APIs are included with each install. A Central Sequence Manager supports integration and synchronization of all Thorlabs motion control hardware.

By providing this common software platform, Thorlabs has ensured that users can mix and match any of our motion control devices in a single application, while only having to learn a single set of software tools. In this way, it is perfectly feasible to combine any of the controllers from single-axis to multi-axis systems and control all from a single, PC-based unified software interface.

The software package allows two methods of usage: graphical user interface (GUI) utilities for direct interaction with and control of the controllers 'out of the box', and a set of programming interfaces that allow custom-integrated positioning and alignment solutions to be easily programmed in the development language of choice.

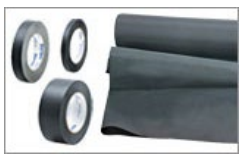
LASER SAFETY

Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina.

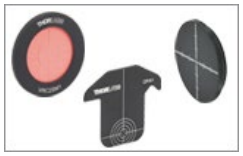
Safe Practices and Light Safety Accessories

- Laser safety eyewear must be worn whenever working with Class 3 or 4 lasers.
- Regardless of laser class, Thorlabs recommends the use of laser safety eyewear whenever working with laser beams with non-negligible powers, since



metallic tools such as screwdrivers can accidentally redirect a beam.

- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Laser Safety Curtains and Laser Safety Fabric shield other parts of the lab from high energy lasers.
- Blackout Materials can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.

- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.
- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use a laser sign with a lightbox if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Beam Trap.

Laser Classification

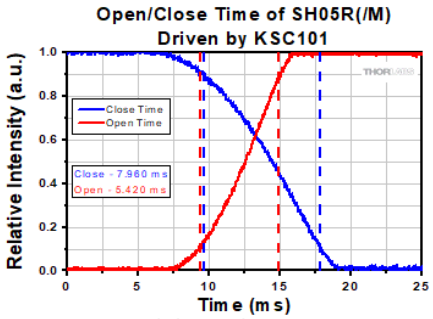
Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1 outlines the safety of laser products. A description of each class of laser is given below:

Class	Description	Warning Label
1	This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser.	
1M	Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly.	
2	Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm).	
2M	Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams.	
3R	Class 3R lasers produce visible and invisible light that is hazardous under direct and specular-reflection viewing conditions. Eye injuries may occur if you directly view the beam, especially when using optical instruments. Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser; however, this presents a low risk level to injury. Visible, continuous-wave lasers in this class are limited to 5 mW of output power.	
3B	Class 3B lasers are hazardous to the eye if exposed directly. Diffuse reflections are usually not harmful, but may be when using higher-power Class 3B lasers. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. Lasers of this class must be equipped with a key switch and a safety interlock; moreover, laser safety signs should be used, such that the laser cannot be used without the safety light turning on. Laser products with power output near the upper range of Class 3B may also cause skin burns.	
	This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may	

4	also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock.	
All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign.		

Ø1/2" Optical Beam Shutter

- Ø1/2" Aperture
- Shutter Close Time (90% to 10% Exposure):
  - 6.5 ms (Typ.) with SC10 Controller
  - 8.0 ms (Typ.) with KSC101 Controller
- SM05-Threaded (0.535"-40) Aperture for SM05 Lens Tube Compatibility
- Default Position: Closed
- Compatible with the SC10 and KSC101 Controllers (Sold Separately Below)



Click to Enlarge
An example measurement of the open and close times of the SH05R(/M) shutter when driven with the KSC101 controller. A collimated LED light was used to overfill the shutter aperture, and as the shutter opened and closed the amount of light transmitted was measured.

The SH05R(/M) Optical Beam Shutter has a single blade that slides across a Ø1/2" aperture. The typical shutter close time, defined as the time it takes for the shutter to go from 90% to 10% of the aperture area exposed, is 6.5 ms when the shutter is driven with the SC10 controller or 8.0 ms with the KSC101 controller. The graph to the right shows a sample measurement of open and close times for an SH05R optical shutter driven with the KSC101 controller. Please see the *Specs* tab for additional specifications.

Both sides of this shutter's aperture are internally SM05 (0.535"-40) threaded for compatablity with our SM05 Lens Tubes. Two 8-32 (M4) tapped holes, located on the side and bottom of the shutter housing, can be used for post mouting.

For applications requiring blades that open from the center, we offer a Ø1/2" diaphragm shutter and controller with five stainless steel blades.

Part Number	Description	Price	Availability
SH05R/M	**Optical Beam Shutter with 10' Long Cable, Ø1/2" Aperture, M4 Taps**	**$547.64**	**Today**
SH05R	**Optical Beam Shutter with 10' Long Cable, Ø1/2" Aperture, 8-32 Taps**	**$547.64**	**Today**

Ø1" Optical Beam Shutter

- Ø1" Aperture
- Shutter Close Time (80% to 20% Exposure): 10 ms (Typ.) with SC10 Controller
- SM1-Threaded (1.035"-40) Aperture for SM1 Lens Tube Compatibility
- Default Position: Closed
- Compatible with the SC10 Controller (Sold Separately Below)

Click to Enlarge
[APPLIST]
[APPLIST]
The SH1 is compatible with SM1 Lens Tubes and 30 mm Cage Systems.

The SH1(/M) Optical Beam Shutter has a single blade that slides across a Ø1" aperture. The typical shutter close time, defined as the time it takes for the shutter to go from 80% to 20% of the aperture area exposed, is 10 ms when used with the SC10 Shutter Controller (sold separately below). Please note that this optical shutter is not compatible with the KSC101 controller. This shutter can be used with third-party controllers, as long as they fall within the solenoid power requirements given in the Beam Shutter Specifications table of the *Specs* tab. For further details, see Chapter 4 of the manual.

Both sides of the aperture are internally SM1 (1.035"-40) threaded for compatibility with our SM1 Lens Tubes. The SH1(/M) has three 8-32 (M4) tapped holes for post mounting and 4-40 taps for use with our 30 mm Cage Components.

For applications requiring blades that open from the center, we offer a Ø1" diaphragm shutter and controller with five stainless steel blades.

Part Number	Description	Price	Availability
SH1/M	Customer Inspired! Optical Beam Shutter with 10' Long Cable, Ø1" Aperture, Metric	$731.76	Today
SH1	Customer Inspired! Optical Beam Shutter with 10' Long Cable, Ø1" Aperture, Imperial	$731.76	Today

Benchtop Optical Shutter Controller

- Local Operation or Remote Control via LabVIEW™, LabWindows™, RS-232, or BNC
- Programmable with Repeating Open/Close Sequences at Millisecond Intervals
- LCD Front Panel with Dedicated Shutter Status Indicators
- Safety Alarm When Coupled with SH05R(/M) or SH1(/M) Beam Shutter
- Key Switch Provides Additional Safety

Thorlabs' SC10 Shutter Controller provides an easy-to-use control interface for our SH05R(/M) and SH1(/M) Optical Shutters. The shutter can be controlled by hand using the buttons on the front of the unit, and the back includes a BNC input for external triggering, a BNC output for synchronization with other equipment, and an RS-232 port for remote computer control. Dedicated lights on the front panel reveal if the shutter is enabled and if the shutter is open. It also features a keyswitch that enables opening of the shutter, helping to comply with lab laser safety requirements. In addition, it incorporates a safety interlock that overrides all system commands and closes the shutter. If the interlock is tripped, the keyswitch must be cycled to resume operations.

The easy-to-read LCD front panel provides access to the same commands as the included LabVIEW and LabWindows software packages. In addition to simply opening or closing the shutter, a repeating sequence of open and close events with exposure times as low as 10 ms can be set up and initiated either by a front panel button, a TTL pulse (+5 V), or a computer command via RS-232. Alternatively, the shutter can be synchronized to follow the rising and falling edges of an external voltage supplied over BNC.

The optical shutter controller includes LabVIEW VI's suitable for integrating into existing LabVIEW applications. A standalone executable written in LabWindows/CVI is also provided, allowing remote computer control of the SC10 without any additional programming. See the *SC10 Software* tab to download these packages.

The shutter controller's BNC output allows it to double as a standalone digital delay generator with 1 ms resolution and 0.1 ms accuracy.

In October 2012, the firmware of the SC10 was updated to address compatibility issues with our SH1 Shutter. For units purchased prior to that date, a free firmware update is available; please see the *SC10 Software* tab for details.

Part Number	Description	Price	Availability
SC10	Optical Beam Shutter Controller	$861.25	Lead Time

K-Cube™ Compact Shutter Controller

- Local Operation or Remote Control via USB or SMA
- Full Kinesis® Software Control Suite (See *Kinesis Software* Tab for Details)
- Programmable with Repeating Open/Close Sequences at Millisecond Intervals
- Manual Controls and Digital Display Allow for Mode Selection and On/Off Time Control
- Laser Safety Interlock Jack and Safety Enable Key Switch
- Single-Channel Power Supply Unit Sold Separately
- Multi-Unit Operation Using USB Controller Hubs (Sold Separately)

Click to Enlarge
Back and Top Views of the KSC101 K-Cube
(See the *Pin Diagrams* Tab for More Information)

Thorlabs' KSC101 K-Cube™ Optical Shutter Controller is a compact, 60.0 mm x 60.0 mm x 49.2 mm controller that is designed for use with our SH05R(/M) Shutter. The controller features an embedded digital signal processor (DSP) to provide a multitude of flexible operating modes; see the *Specs* tab for details. Embedded software functionality allows this unit to control solenoid devices using the on-unit menu button, display, and control wheel; using DSP timed operations; or using external trigger signals for operation with third-party equipment. The trigger out connection, defaulted on Trigger 2, allows multiple K-Cube controllers to be connected together for synchronized multi-channel system operation.

The KSC101 is also equipped with built-in safety interlock functionality in the form of a 3.5 mm stereo jack. A

shorted connector is included for overriding this connection, while a custom circuit may be created for lab safety applications using the included 3.5 mm stereo connector. The circuit must be closed for the controller to be able to open the shutter. To comply with laser safety requirements, the controller also features a key switch that enables or disables opening of the shutter.

Click to Enlarge
[APPLIST]
KCH301 USB Controller Hub (Sold Separately) with Installed K-Cube™ Modules

The easy-to-read digital display provides access to the same commands as the included Kinesis® software package. In addition to simply opening or closing the shutter, a repeating sequence of open and close events with exposure times as low as 15 ms can be set up and initiated either by the top panel controls, a TTL pulse (+5 V), or a computer command via USB 3.0.

USB connectivity provides easy 'Plug-and-Play' PC-controlled operation with our Kinesis software package. For more details, please see the *Kinesis Software* tab. For convenience, a 1.5 m long Type A to Type Micro B USB 3.0 cable is included with the KSC101 cube.

Power Supply Options
The preferred power supply (single channel or hub-based) depends on the end user's application and whether you already own compatible power supplies. To that end and in keeping with Thorlabs' green initiative, we do not ship these units bundled with a power supply.

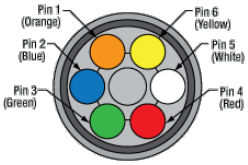
Multiple units can be connected to a single PC by using the KCH301 or KCH601 USB Controller Hubs, available below, for multi-axis motion control applications. The KCH301, shown in the image above, allows up to three T- or K-Cube controllers to be used while the KCH601 allows up to six controllers to be used.

All power supply options compatible with the KSC101 Controller can be found below. For more information on the KSC101, please see the full web presentation.

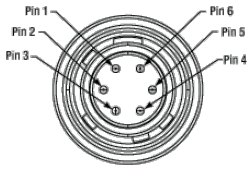
Part Number	Description	Price	Availability
KSC101	K-Cube Solenoid Controller (Power Supply Not Included)	$707.24	Today
KPS201	15 V, 2.66 A Power Supply Unit with 3.5 mm Jack Connector for One K- or T-Cube	$40.33	Today
KCH301	USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes	$598.63	Lead Time
KCH601	USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes	$724.52	Lead Time

Replacement 6-Pin Hirose Cable

- 6-Pin, Male-to-Male Hirose Connector Cable
- Replacement Cable to Connect Shutter and Controller
- Cut Cable to Expose Wires for Custom Applications
  - HR10AD1 Cable with Breakout Box Also Available for Custom Connections to Shutters



Click to Enlarge
Wire Diagram



Click to Enlarge
Male Hirose Connector

The HR10CAB1 is a 3.0 m long, 6-pin, male-to-male Hirose connector cable that is compatible with the shutters and controllers on this page.

If a custom soldered connection is desired, this Hirose connector cable can also be cut to any length leaving one connectorized end and one bare end. The colored wire diagram to the right shows the relationship between the six colored wires and the pins in the connector, allowing the cut cable to be incorporated into a variety of custom applications. Note that the wires in this cable cross over the length of the cable, so the insulation color should be used for pin identification.

For more information on the HR10CAB1, please see the full web presentation.

For custom shutter driving configurations, our HR10AD1 cable with breakout box allows for easy connection to bare wire components without the need for soldering.

Part Number	Description	Price	Availability
HR10CAB1	6-Pin, Male-to-Male Hirose Connector Cable, 3.0 m Long	$81.60	Lead Time