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Optical Shutter

► Ø1/2" and Ø1" Beam Shutters

► Two Controller Options Available

► Interlock Mode Incorporated into Control Logic

SH05

10' Cable Included

SH1

10' Cable Included

KSC101

K-Cube Compact Shutter Controller

SC10

Benchtop Shutter Controller

Related Items

Diaphragm Shutters

SM1-Threaded Manual Shutter

Beam Blocks

HeNe Lasers

Ø1/2" Optical Beam Shutter

Overview

Specs

Pin Diagrams

Laser Safety

Smart Pack

Feedback

Beam Shutter Specifications

General		
Aperture	Ø0.5" (12.7 mm)	
Blade Material	6061-T6 Aluminum	
Blade Thickness	0.06" (1.6 mm)	
Solenoid Coil Resistance	28 Ω	
Initial State	Closed	
Operation		
Actuation Pulse	8 V to 50 V (Time Dependent)	
Holding Voltage	8 V to 12 V	
Maximum Recommended Applied Solenoid Voltage ^a	<12 VDC (Holding) <50 VDC (Pulse)	
Maximum Pulse Rate	10 Hz Steady, 25 Hz Burst	
Duty Cycle ^b	Optimum @ 10 Hz = 40%	
Lifetime	1,000,000 Cycles (Typical)	
Max Solenoid Power (20°C)		
Steady State	4 W @ Continuous	
50% Duty Cycle	8 W @ 100 s	
25% Duty Cycle	16 W @ 36 s	
5% Duty Cycle	80 W @ 2.5 s	
Timing Specifications ^c		
Controller	SC10	KSC101
TI	8.0 ms	13 ms
TO	3.0 ms	1 ms
TD/R	13.0 ms	13 ms
TC	4.08 ms	1.2 ms
MOP	10 ms	15 ms
MSOP	27.0 ms	17.2 ms

Beam Shutter Controller Comparison

Item #	SC10	KSC101
Supply Voltage	24 V Pulse (10 V Hold)	15 VDC (7 V Average PWM Hold)
Maximum Exposure Rate	25 Hz	20 Hz
Minimum Exposure Time	10 ms	15 ms
External Triggering (TTL)	One BNC Trig in and BNC Trig Out	Two Bidirectional SMA Trigger Ports
Computer Connection	RS232	USB 3.0 Micro B (USB 2.0 Compliant)
Sequence Control	Yes	Yes
Manual Key Lock	Yes	Yes
Interlock	2.5 mm Jack Plug	3.5 mm Jack Plug
Software	SC10 Standalone Software^a	Kinesis[®] or APT[™] Software^b
Dimensions	11.5" x 5.3" x 3.0" (292 mm x 135 mm x 76 mm)	2.36" x 2.36" x 1.94" (60.0 mm x 60.0 mm x 49.2 mm)

a. The SC10 software 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.

b. The Kinesis and APT Software feature .Net and activeX controls, respectively, which can be used by 3rd party developers working in other languages, such as LabVIEW and C#, to create custom applications. See the [Kinesis Tutorials](#) and [APT Tutorials](#) tabs below for more information.

Typical Driving Pulse (TTL Input Shutter Controller)

Open

Shutter Response

Close

MOP

TI

TO

TD/R

TC

MSOP

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Shutter Response Diagram

Timing Diagram (See Figure to the Left) Definitions

TI	Transfer Initialize: the time delay between the application of the energizing voltage and the initial movement of the shutter
TO	Transfer Open: the time for the shutter to move from 20% open to 80% open

https://www.thorlabs.com/newgrouppage9.cfm?objectgroup_ID=927

1/4

Timing Diagram (See Figure to the Left) Definitions	
TD/R	Transfer Dwell/Release: the delay between the removal of the energizing voltage and the initial closing movement of the shutter
TC	Transfer Close: the time for the shutter to move from 80% open to 20% open
MOP	Minimum Open Pulse: minimum pulse width supplied by the SC10 or KSC101 controller
MSOP	Minimum Shutter Open Time: the minimum time the shutter can be opened for using the minimum open pulse (MOP) from the SC10 or KSC101 controller

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+1	Qty	Docs	Part Number - Imperial	Price	Available / Ships
	<input type="text"/>		SH05 Optical Beam Shutter with 10' Long Cable, Ø1/2" Aperture, 8-32 Taps	\$470.22	✓ Today

+1	Qty	Docs	Part Number - Metric	Price	Available / Ships
	<input type="text"/>		SH05/M Optical Beam Shutter with 10' Long Cable, Ø1/2" Aperture, M4 Taps	\$470.22	✓ Today

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Ø1" Optical Beam Shutter

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Default Position: Closed
Close Activation Time: <10 ms
Ideal for Laser Safety Applications
SM1-Threaded (1.035"-40) Aperture for [SM1 Lens Tube](#) Compatibility
One 8-32 (M4) Tap on Four Sides for [Ø1/2" Post Mounting](#)
Four 4-40 Taps Around Aperture on Both Sides for [30 mm Cage System](#) Compatibility
Includes 10-Foot-Long Cable for Connection to Controller (Additional Cables Available Below)
Controller Not Included (Sold Below)

[Zoom](#)

The SH1 Optical Beam Shutter utilizes a rotary, electro-mechanical actuator to provide millisecond shutter operation. During operation, the optical shutter remains in a closed position and then opens when a pulse control signal is applied. As long as the control voltage to the shutter remains high, the shutter stays open, but as soon as the voltage goes low, the optical shutter closes, providing inherent "fail-safe" operation. The rate at which the shutter opens can be controlled. An optical sensor, which detects the shutter blade position in the housing, provides information that confirms the state of the shutter position. This makes it ideal in applications where a laser safety lockout is required.

In order to ensure long lifetime of your optical beam shutter, 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.

Both sides of the aperture of the SH1 are internally SM1 (1.035"-40) threaded to easily interface with all of our [SM1 lens tubes](#). In addition, the aperture is surrounded by four, 4-40 holes on both sides for compatibility with our [30 mm cage system](#). For [Ø1/2" post mounting](#), the SH1 has four 8-32 tapped holes. The SH1/M features M4 tapped holes for compatibility with metric Ø1/2" posts.

This shutter features a single blade that slides across the aperture. Additionally, Thorlabs offers a [Ø1" diaphragm shutter and controller](#), which has five stainless steel blades that open from the center.

Controller Options

Thorlabs offers two compatible controllers for the SH1: the SC10 and KSC101. Both include an "interlock mode" that is incorporated into the controller's logic; a physical key lock; and manual, triggered, or software controlled operation modes. The SC10 is a benchtop controller with an RS-232 computer connection that allows the controller to be operated using the included standalone software GUI. The KSC101 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[®] or legacy APT[™] software packages. 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. The SH1 can also be used with a third-party controller. For information on the control requirements, please see the [Specs](#) tab.

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



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[View Imperial Product List](#)
[View Metric Product List](#)

The SH1 is compatible with SM1 Lens Tubes and 30 mm Cage Systems.

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+1	Qty	Docs	Part Number - Imperial	Price	Available / Ships
	<input type="text"/>		SH1 Customer Inspired! Optical Beam Shutter with 10' Long Cable, Ø1" Aperture, Imperial	\$628.32	✓ Today

+1	Qty	Docs	Part Number - Metric	Price	Available / Ships
	<input type="text"/>		SH1/M Customer Inspired! Optical Beam Shutter with 10' Long Cable, Ø1" Aperture, Metric	\$628.32	✓ Today

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Benchtop Shutter Controller

- Overview
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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 SH05 and SH1 Beam Shutter



Key Switch Provides Additional Safety

Thorlabs' SC10 Shutter Controller provides an easy-to-use control interface for our SH05 and SH1 Beam 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.

[Zoom](#)

The 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 *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 *Software* tab for details.

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+1	Qty	Docs	Part Number - Universal	Price	Available / Ships
	<input type="text"/>		SC10 Optical Beam Shutter Controller	\$739.50	✓ Today
<div>Add To Cart</div>					

K-Cube Compact Shutter Controller

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- K-Cubes vs. T-Cubes
- Motion Control Software
- Kinesis Tutorials
- APT Tutorials
- Feedback



- Local Operation or Remote Control via USB or SMA
- Full Kinesis® or APT™ Software Control Suite (See Motion Control 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)

[Zoom](#)

Thorlabs' KSC101 K-Cube Shutter Controller is a compact, 60.0 mm x 60.0 mm x 49.2 mm controller that is designed for use with our SH05 and SH1 Beam Shutters. 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.

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 two available software platforms: our new Kinesis software package or our legacy APT (Advanced Positioning Technology) software package. The Kinesis Software features new .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. Our legacy APT software allows the user to quickly set up complex move sequences with advanced controls made possible via the ActiveX® programming environment. For example, all relevant operating parameters are set automatically by the software for Thorlabs stage and actuator products. For more details on both software packages, please see the *Motion Control Software* and *APT Tutorials* tabs. For convenience, a 1.5 m long Type A to Type Micro B USB 3.0 cable is included with the KSC101 cube.

Optical Table Mounting Plate

Each unit comes with a plastic mounting plate that clips onto the base of the controller. The plate contains two magnets for temporary placement on an optical table and two counterbores for 1/4"-20 (M6) cap screws for a more permanent placement on the tabletop. Please see the *Specs* for a mechanical drawing of the table mounting plate and the *Mounting Options* tab for more information about the mounting plate.

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 Motor Controller can be found below.



Back View



Top View

[Click to Enlarge](#)

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



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KCH301 USB Controller Hub (Sold Separately) with
Installed K-Cube and T-Cube Modules (T-Cubes Require
the [KAP101](#) Adapter)

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+1	Qty	Docs	Part Number - Universal	Price	Available / Ships
	<input type="text"/>		KSC101 K-Cube Solenoid Controller (Power Supply Not Included)	\$584.46	✓ Today
	<input type="text"/>		KPS101 15 V, 2.4 A Power Supply Unit with 3.5 mm Jack Connector for One K- or T-Cube	\$33.33	✓ Today
	<input type="text"/>		KCH301 USB Controller Hub and Power Supply for Three K-Cubes or T-Cubes	\$494.70	✓ Today
	<input type="text"/>		KCH601 USB Controller Hub and Power Supply for Six K-Cubes or T-Cubes	\$598.74	Lead Time
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6-Pin, Hirose Cable

- Overview
- Specs
- Feedback



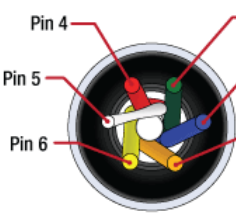
6-Pin, Male-to-Male Hirose Connector Cable
Compatible with Several Thorlabs Products

- [TC200](#) Temperature Controller
- [SC10](#) Shutter Controller
- [KSC101](#) K-Cube Shutter Controller
- [SH05](#) Beam Shutter, Ø1/2" Aperture
- [SH1](#) Beam Shutter, Ø1" Aperture

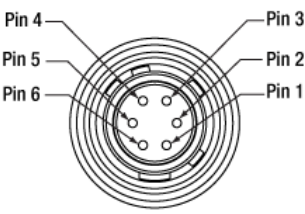
Cut Cable to Expose Wires for Custom Applications

The TC200CAB10 is a 10-foot-long, 6-pin, male-to-male Hirose connector cable that is compatible with our TC200 temperature controller, SH05 and SH1 beam shutters, KSC101 K-Cube shutter controller, and SC10 shutter controller. The wires in this cable cross as seen in the drawing to the right. This is not a straight-through cable.

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.



Wire Diagram
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Male Hirose Connector
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+1	Qty	Docs	Part Number - Universal
	<input type="text"/>		TC200CAB10 6-Pin, Male-Male Hirose Connector Cable, 10' Long

Price	Available / Ships
\$90.02	✓ Today

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