

Dold Trapped Key System Overview



Trapped Key System

A trapped key system uses a series of mechanical locks and keys to control the access via gates or doors to operating equipment or machines, ensuring safe access to those machines. Systems are set up in a predefined sequence, preventing accidental access to operating equipment.

An operator must shut down machinery and lock it down, then remove the key and use the same key to unlock the door or doors that access the machinery. Keys are trapped and released in a sequential order.

- Main station has a switch module and optional solenoid actuator; Door stations have mechanical, rather than electrical, systems to provide safety for one or a series of gates.
- Allows control of a series of lock points.
- Human operation of locking/unlocking provides peace of mind of firsthand, observable safety.
- Cost-effective for multiple locks over a large area; eliminates cost of running electrical wiring over long distances.

Note: Ordering a larger gate set than needed for the number of gates in a system compromises the safety integrity of that system. Spare keys are not available.

Dold Standard and Solenoid Trapped Key Gate Sets

Dold Trapped Key System Gate Sets provide you with a full trapped key safety system, in one- to five-gate sets. They are available in either standard (SX) or solenoid-locking (ZRH) versions. All keys and their corresponding 01 and 10 modules are unique within a set. We also offer tongue key actuators (purchased separately from the gate sets), and optional items such as door actuators, captive safety key sets, key modules for key exchange box setup, and mounting plates.

See the following section, "Selecting a Dold Trapped Key Gate Set," for more information.



ZRH-3GATE-SET

Tongue Key Actuators

Our gate sets require one or more tongue key actuators:

- Standard right-angle actuator (part no. [ST2317-T-ACTUATOR](#)).
- 4-spring actuator (part no. [ST2311-C-ACTUATOR](#)).
- Sliding actuator with spring (part no. [ST2312-CS-ACTUATOR](#)).

Accessories

The following optional actuator key sets can be used with any of our trapped key gate sets:

- Safety key (part no. [01-SAFETY-KEY-SET](#)) or padlock captive door actuator key (part no. [PADLOCKMODULE-SET](#)).
- Door actuator set (part no. [ACTUATOR-SET-B](#)) for use in "door at main" situation.
- Key module set for implementing a key exchange box (part no. [1001-KEYMODULE-SET](#)).

Mounting Plates

- Steel plates sized to easily mount various configured trapped key stations.
- 8 pre-fabricated sizes.
- Mounting plate size depends on size and number of modules in your application.
- See Mounting Plates section for options.

See our website: www.AutomationDirect.com for Online Training Videos.

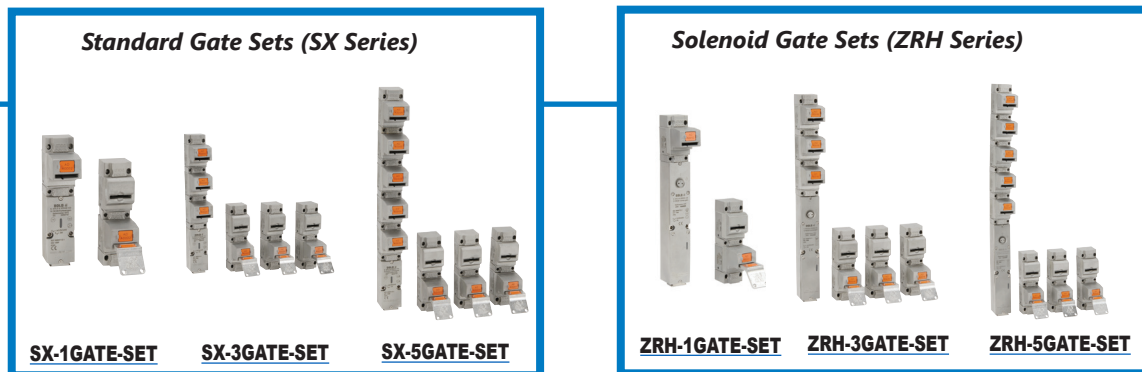
www.automationdirect.com

Selecting a Dold Trapped Key Gate Set



STEP 1

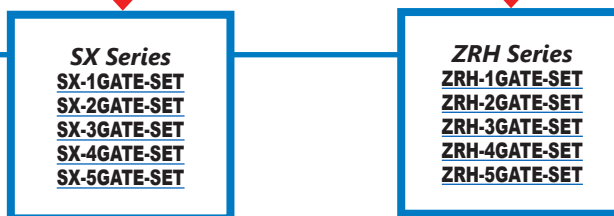
Select the required gate set type for your application, either standard or solenoid locking.



STEP 2

Select the required number of gates for your set (1-5).

Note: Selecting a larger set than needed can compromise the safety integrity of the system. (See Dold Trapped Key Interlock Gate Sets.)



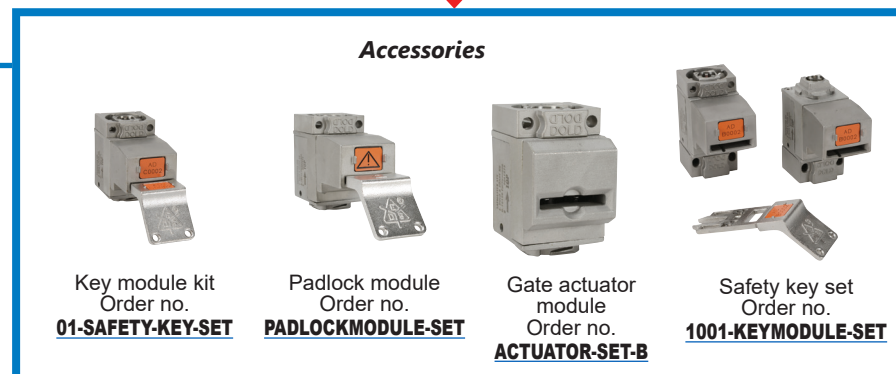
STEP 3

Select the required number of tongue key actuators to match the number of gates in your application. Select one tongue key actuator per gate. (See Tongue Key Lock Actuators.)



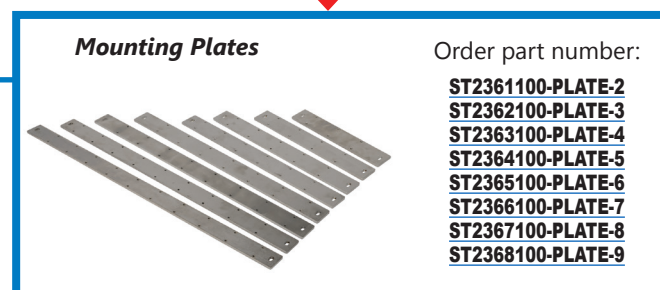
STEP 4

Select optional accessories for your application. (See Dold Trapped Key Accessories.)



STEP 5

Select a mounting plate for your application. (See Dold Trapped Key Mounting Plates.)



Dold Trapped Key Interlock Gate Sets

DOLD

SX and ZRH Series

- Dold Safemaster trapped key modular and expandable interlock gate sets
- Easy installation through comprehensive accessories
- Wireless mechanical safeguarding
- One- to five-gate sets available
- Solenoid and standard versions available
- One conduit opening that accepts M20x1.5 fittings
- 316L stainless steel interlock safety switch body, coded trap key modules, coded keys, and tongue (key) gate actuator modules
- For safety applications up to PLe/Category 4 according to EN/ISO 13849-1
- Order actuating tongue (key) separately
- Includes 2 M4x50 T20 tamper proof screws provided for the main station installation and each additional door installation

Solenoid Gate Sets (ZRH)

- Interlocking safety switch with solenoid (24 VAC/DC), power to unlock
- 1 NC and 2 forced opening NO and NC changeover contacts for actuator tongue (key) status, 2 NC and 1 forced opening NO and NC changeover contacts for solenoid status

Standard Gate Sets (SX)

- 316L stainless steel body interlock safety switches
- 1 NC and 2 forced opening NO/NC changeover contacts

**ZRH-1GATE-SET**

Dold Trapped Key Interlock Gate Sets*

Part Number	Price	Description	Weight (kg [lb])
<u>ZRH-1GATE-SET</u>	\$1,320.00	Solenoid trapped key interlock system, 1-gate set. Includes 1 interlocking safety switch with solenoid, 2 coded trap key modules and 1 coded key, and 1 tongue (key) gate actuator module.	3.45 [7.6]
<u>ZRH-2GATE-SET</u>	\$2,142.00	Solenoid trapped key interlock system, 2-gate set. Includes 1 interlocking safety switch with solenoid, 4 coded trap key modules and 2 coded keys, and 2 tongue (key) gate actuator modules.	5.31 [11.7]
<u>ZRH-3GATE-SET</u>	\$2,968.00	Solenoid trapped key interlock system, 3-gate set. Includes 1 interlocking safety switch with solenoid, 6 coded trap key modules and 3 coded keys, and 3 tongue (key) gate actuator modules.	7.21 [15.9]
<u>ZRH-4GATE-SET</u>	\$3,794.00	Solenoid trapped key interlock system, 4-gate set. Includes 1 interlocking safety switch with solenoid, 8 coded trap key modules and 4 coded keys, and 4 tongue (key) gate actuator modules.	9.07 [20.0]
<u>ZRH-5GATE-SET</u>	\$4,620.00	Solenoid trapped key interlock system, 5-gate set. Includes 1 interlocking safety switch with solenoid, 10 coded trap key modules and 5 coded keys, and 5 tongue (key) gate actuator modules.	10.98 [24.2]
<u>SX-1GATE-SET</u>	\$1,083.00	Trapped key interlock system, 1-gate set. Includes 1 interlock safety switch, 2 coded trap key modules and 1 coded key, and 1 tongue (key) gate actuator module.	2.63 [5.8]
<u>SX-2GATE-SET</u>	\$1,907.00	Trapped key interlock system, 2-gate set. Includes 1 interlock safety switch, 4 coded trap key modules and 2 coded keys, and 2 tongue (key) gate actuator modules.	4.54 [10.0]
<u>SX-3GATE-SET</u>	\$2,733.00	Trapped key interlock system, 3-gate set. Includes 1 interlock safety switch, 6 coded trap key modules and 3 coded keys, and 3 tongue (key) gate actuator modules.	6.40 [14.1]
<u>SX-4GATE-SET</u>	\$3,558.00	Trapped key interlock system, 4-gate set. Includes 1 interlock safety switch, 8 coded trap key modules and 4 coded keys, and 4 tongue (key) gate actuator modules.	8.30 [18.3]
<u>SX-5GATE-SET</u>	\$4,382.00	Trapped key interlock system, 5-gate set. Includes 1 interlock safety switch, 10 coded trap key modules and 5 coded keys, and 5 tongue (key) gate actuator modules.	10.16 [22.4]

* See corresponding key transfer plans for each gate set.

Tongue Key Lock Actuators

- Tongue key lock actuators for use with Dold Trapped Key System gate sets
- Standard right-angle, 4-spring, and sliding with spring actuators available
- Includes one T20 tamper proof screw

ST2317-T-ACTUATOR**ST2311-C-ACTUATOR****ST2312-CS-ACTUATOR**

Dold Trapped Key Interlock Actuator Tongue (Keys)

Part Number	Price	Description	Weight g [lb]	Minimum Entry Radius
<u>ST2317-T-ACTUATOR</u>	\$16.00	Dold Safemaster actuator tongue (key), for trapped key interlock systems, 316L stainless steel, 90° mounting tab	45.4 [0.1]	NA
<u>ST2311-C-ACTUATOR</u>	\$59.00	Dold Safemaster actuator tongue (key), for trapped key interlock systems, 316L stainless steel, 90° flexible mounting tab	90.7 [0.2]	200mm (7.87 in)
<u>ST2312-CS-ACTUATOR</u>	\$127.00	Dold Safemaster actuator tongue (key), for trapped key interlock systems, 316L stainless steel, flexible handle	408.2 [0.9]	NA

Note: Spare keys compromise the safety of the system and are not available.

Dold Trapped Key Accessories



Accessory Sets

- Protection from being locked into machine
- TÜV certificate according to the legal and standard requirements
- For safety applications up to PLe/Category 4 according to EN/ISO 13849-1
- 316L stainless steel

1001-KEYMODULE-SET



1001-KEYMODULE-SET modifies an SX-GATE-SET or a ZRH-GATE-SET to implement a key exchange box. Uniquely keyed within itself, the 1001-KEYMODULE-SET allows for expansion of a key exchange plan.

ACTUATOR-SET-B



ACTUATOR-SET-B is a gate actuator. It can be added anywhere a gate function is required, so that the SX or ZRH module can be used to protect or to lock a gate (mounting it directly on the gate).

Example: Add to an SX or ZRH unit to add a gate lock at the main key station.

(Purchase tongue key separately.)

PADLOCKMODULE-SET



PADLOCKMODULE-SET adds a personal safety feature for protection against being locked into a gate. One or more personal padlocks can be applied to the module. While a padlock is fixed to the module, the system cannot be restarted. The module can be inserted in an SX or ZRH module or for individual protection on the actual gate modules.

01-SAFETY-KEY-SET



01-SAFETY-KEY-SET adds a personal safety key as protection against being locked into any module of an SX or ZRH gate set.

This key is normally trapped; when released the operator can take it while in the machine.

Dold Trapped Key Interlock Accessory Sets

Part Number	Price	Description	Weight (lbs)
<u>1001-KEYMODULE-SET</u>	\$703.00	Dold Safemaster key module set, for trapped key interlock systems, includes (2) 316L stainless steel coded trap key modules, (1) coded key, (1) bayonet mounting ring and (2) end modules	3.1
<u>PADLOCKMODULE-SET</u>	\$241.00	Dold Safemaster padlock module, for trapped key interlock systems, 316L stainless steel. Includes bayonet mounting ring.	1.4
<u>ACTUATOR-SET-B</u>	\$181.00	Dold Safemaster gate actuator module, for trapped key interlock systems, 316L stainless steel. Includes bayonet mounting ring. Order actuating tongue (key) separately.	1.1
<u>01-SAFETY-KEY-SET</u>	\$381.00	Dold Safemaster safety key set, for trapped key interlock systems. Includes (1) 316L stainless steel coded trap key module and (1) coded key	1.3

Dold Trapped Key Mounting Plates



Mounting Plates

- For mounting trapped key interlock systems to gates or doors
- Choose a mounting plate based on the number of modules/gates in your application.
- 316 stainless steel
- T20 M4 x 40 mounting screws (2 tamper proof) included



ST2361100-PLATE-2
ST2362100-PLATE-3
ST2363100-PLATE-4
ST2364100-PLATE-5

ST2365100-PLATE-6
ST2366100-PLATE-7
ST2367100-PLATE-8
ST2368100-PLATE-9

Dold Trapped Key Interlock Mounting Plates			
Part Number	Price	Description	Weight (lbs)
<u>ST2361100-PLATE-2</u>	\$49.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 291mm long	0.8
<u>ST2362100-PLATE-3</u>	\$53.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 351mm long	1.0
<u>ST2363100-PLATE-4</u>	\$63.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 411mm long	1.2
<u>ST2364100-PLATE-5</u>	\$66.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 471mm long	1.4
<u>ST2365100-PLATE-6</u>	\$97.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 531mm long	1.6
<u>ST2366100-PLATE-7</u>	\$122.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 591mm long	1.8
<u>ST2367100-PLATE-8</u>	\$138.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 651mm long	2.0
<u>ST2368100-PLATE-9</u>	\$147.00	Dold Safemaster mounting plate, for trapped key interlock systems, 316L stainless steel, 40mm wide by 711mm long	2.2

Choosing a Mounting Plate

Choose a mounting plate based on the number of modules/gates in your application:

- ZRH counts as three.
- SX counts as one.
- Each actuator counts as one.

Example: A [ZRH-4GATE-SET](#) requires four [ST2361100-PLATE-2](#) and one [ST2366100-PLATE-7](#).

Dold Trapped Key Safety and Electrical Specifications



Specifications		
	Standard (SX)	Solenoid (ZRH)
Safety Classification and Reliability Data		
Switching Reliability (B10d)	2 x 10 ⁶ switching cycles	
EN 954-1	Up to Category 4	
ISO 13849-1	Up to PLe	
Electrical and General Specifications		
Short Circuit Strength	4A max fusing	
Rated Insulation Voltage	<60 V	
Contact Terminals	Cage tension plugs Min. 0.25 mm ² ; max 1.5 mm ² (16 to 22 AWG)	
Current Consumption	0.3W	6W
Solenoid Voltage	NA	24 VAC/VDC
Max. Switching Current	2A @ 24 VAC/VDC	
Enclosure Protection	IP 65 (electrical components only)	
Operating Temperature (Electrical Components)	-25 °C to + 65 °C [-13°F – 149°F]	-25 °C to + 60 °C [-13°F – 140°F]
Storage Temperature (Electrical Components)	Storage temperature: - 40 °C to + 80 °C	
Operating/Storage Temperature (Mechanical Components)	- 75 °C to 140 °C	
Recommended Mounting Screws/Torque	M4; 2Nm	
Cable Entry	M20 x 1.5	
Solenoid Holding Force	>1000N	
Operating Speed (Key/Tongue)	Max 500 mm/s; Min 100 mm/s	
Switching Frequency (Contacts)	Max 360/h	
Agency Approvals	CE, TUV	

Note: To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Dold Trapped Key Safety and Electrical Specifications

Electrical Drawings and Travel Charts



SX Series

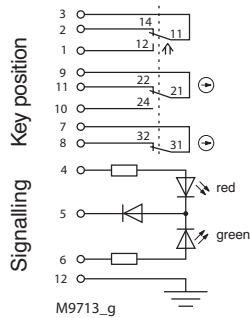


Fig. 1:
Locked while activated:
Key inserted

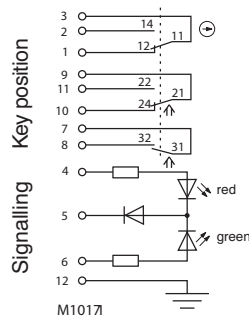


Fig. 2:
Lock deactivated:
Key removed

Switching logic

		Fig. 1	Fig. 2
Door contacts	3	2	
	3	1	
	9	11	
	9	10	
	7	8	

■ closed
□ open

ZRH Series

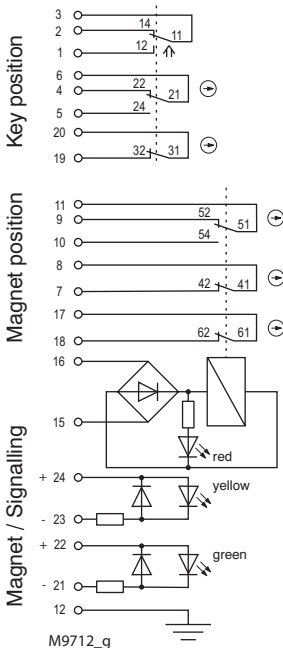


Fig. 1:
Solenoid locking activated:
Magnet locked,
Key inserted

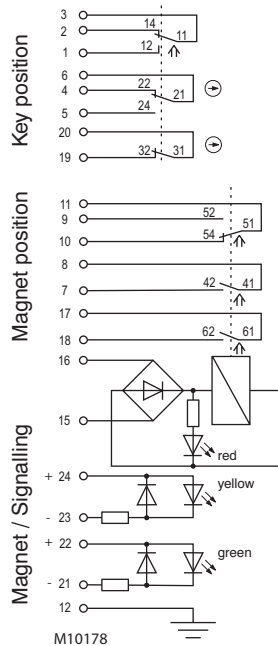


Fig. 2:
Solenoid locking deactivated:
Magnet released,
Key inserted

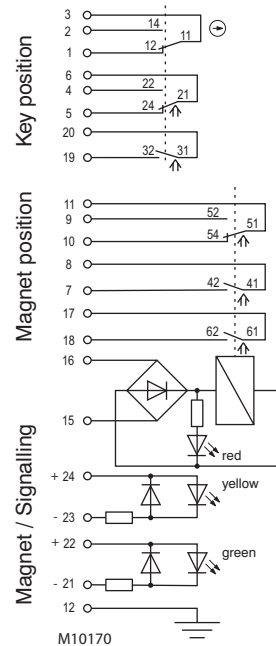


Fig. 3:
Solenoid locking deactivated:
Magnet released,
Key removed

Switching logic

		Fig. 1	Fig. 2	Fig. 3
Key Position	Door contacts			
	3	2		
	3	1		
	6	4		
	6	5		
Magnet Position	19	20		
	11	9		
	11	10		
	7	8		
	17	18		
Magnet/ Signalling	Control signal Magnet	U _N		
	15	16		

■ closed
□ open

The state shown in **Figure 3** does not depend on the control signal of the magnet.

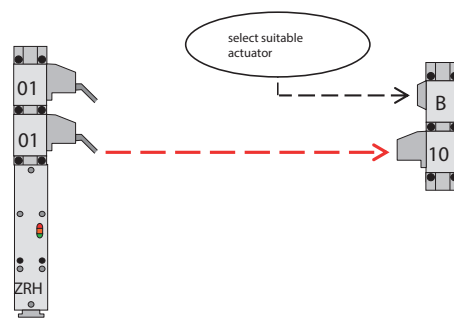
If the control signal is applied and the key inserted the solenoid locking changes to the state of **Figure 2**.

If no signal is applied and the key inserted the solenoid locking changes to the state of **Figure 1**.

Dold Trapped Key Transfer Plans



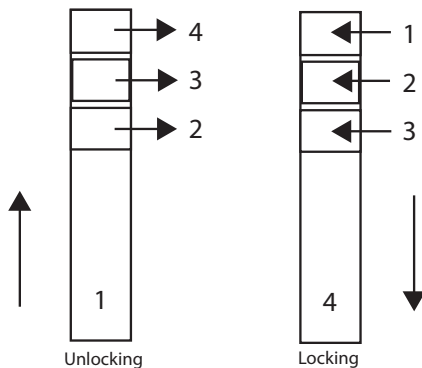
Example: 2-gate Set Mechanical Trapped Key Path



Keys trapped at main station (left).
Door station with optional padlock module (right).

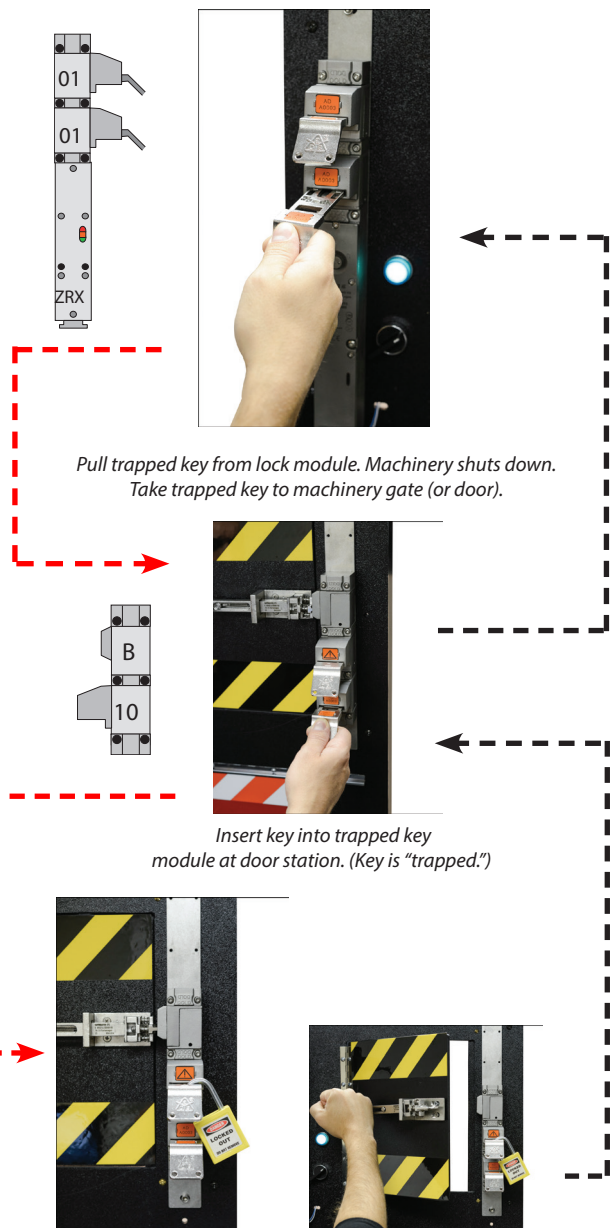
The following example shows the path of the mechanical key opening and closing one gate in a 2-gate set trapped key system.

Trapped Key Locking/Unlocking Sequence



In the locking sequence, when each module is activated, it releases the module above it. Similarly, during the unlocking sequence, when a module is locked, it allows locking of the module below it.

Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys



Remove (or optionally, lock out) optional safety key. (Access to machinery is unlocked. Enter machinery.)

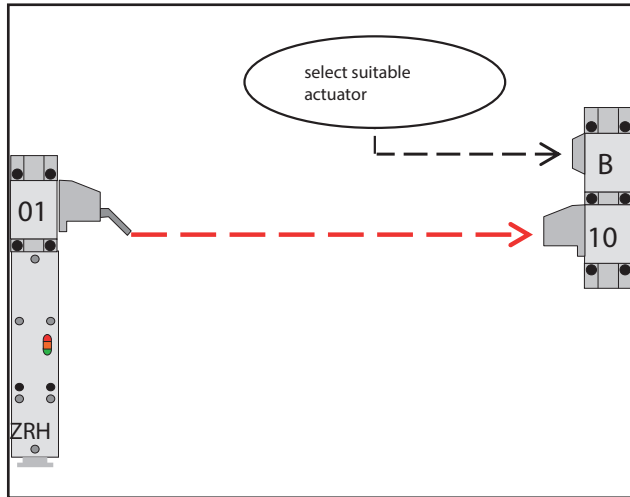
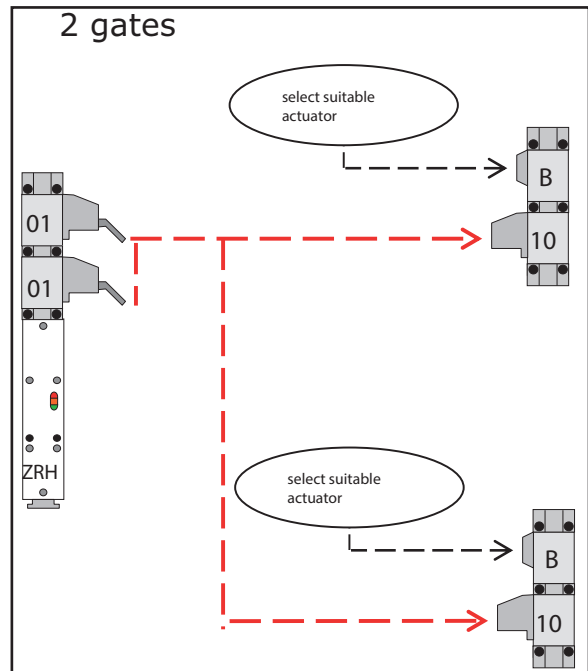
Reverse steps to restart machine.

Dold Trapped Key Transfer Plans

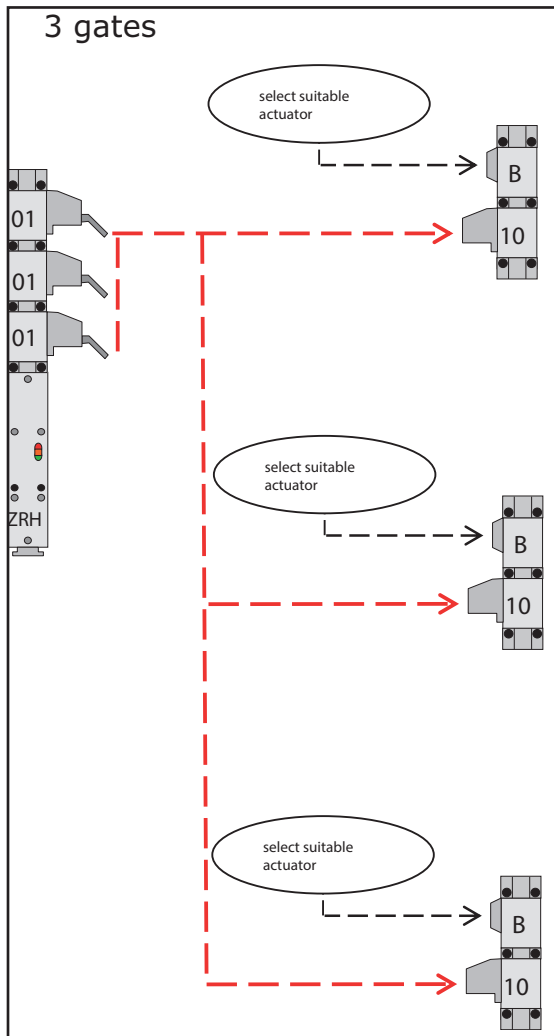
DOLD


SX and ZRH Series

**ZRH Series gate sets shown. (SX series 01 modules have smaller footprint.)*

1-Gate Set

2-Gate Set


***Suitable actuators:**
ST2317-T-ACTUATOR
ST2311-C-ACTUATOR
ST2312-CS-ACTUATOR

3-Gate Set


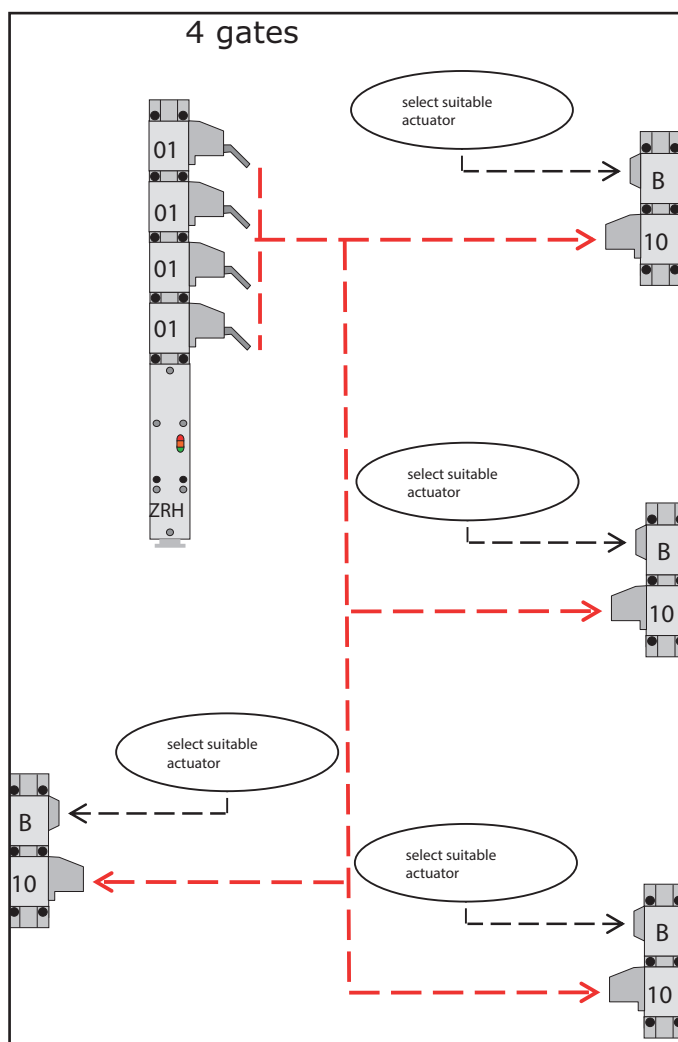
Transfer Plan Legend

Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys

Dold Trapped Key Transfer Plans



4-Gate Set



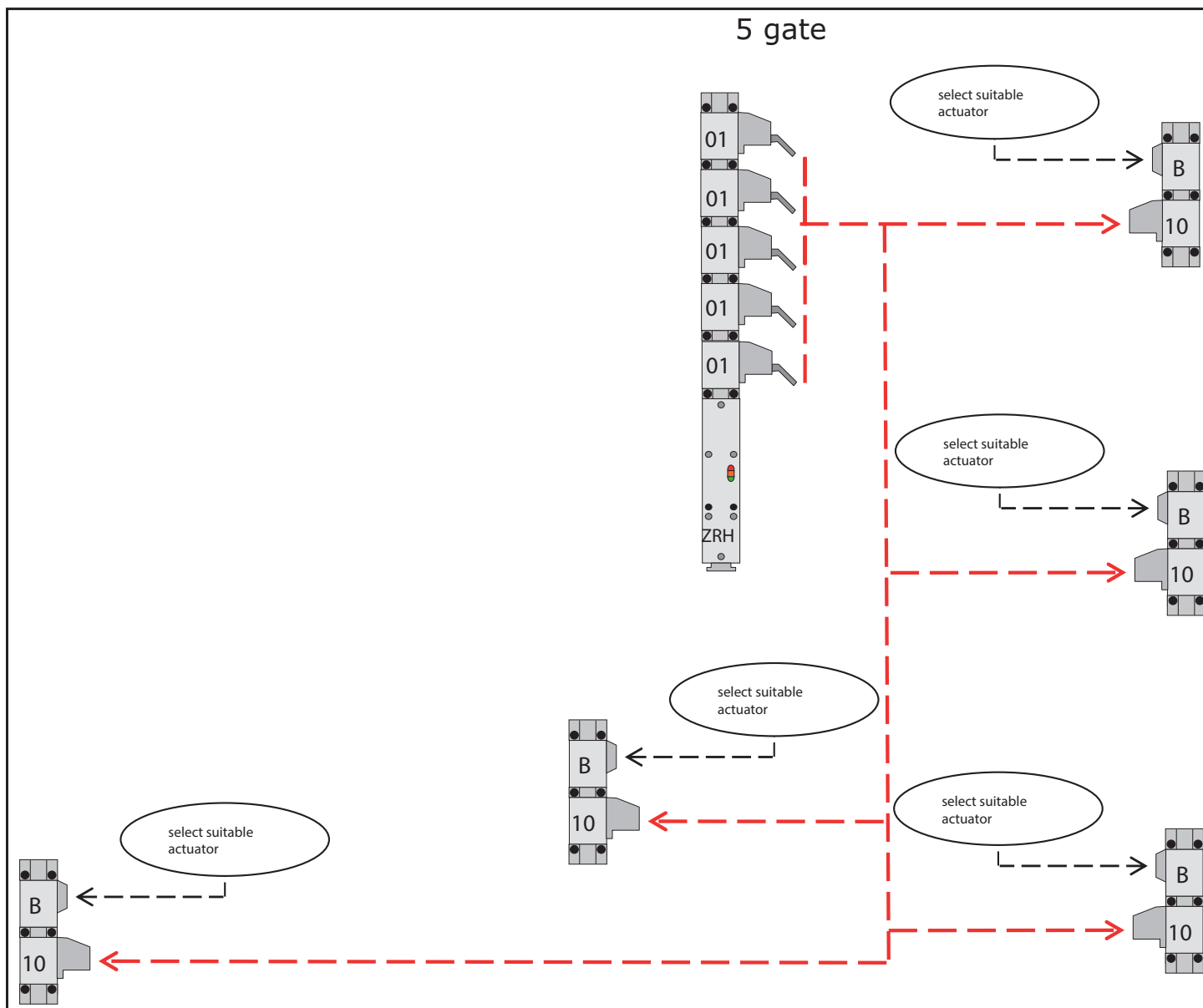
***Suitable actuators:**
ST2317-T-ACTUATOR
ST2311-C-ACTUATOR
ST2312-CS-ACTUATOR

Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys

Dold Trapped Key Transfer Plans



5-Gate Set



***Suitable actuators:**
ST2317-T-ACTUATOR
ST2311-C-ACTUATOR
ST2312-CS-ACTUATOR

Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys

Dold Trapped Key Accessories

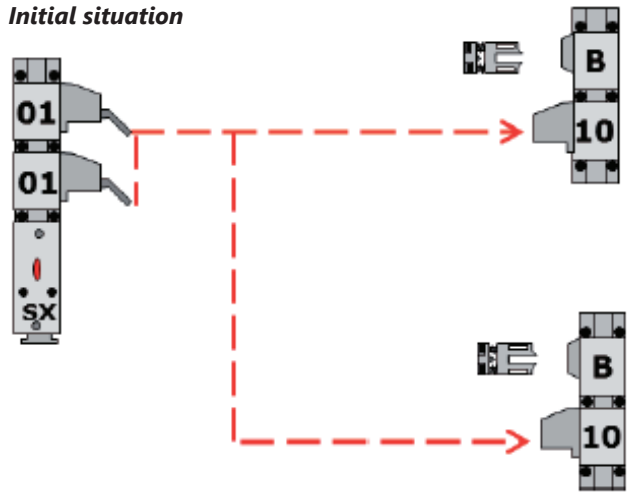


Accessories

PADLOCKMODULE-SET

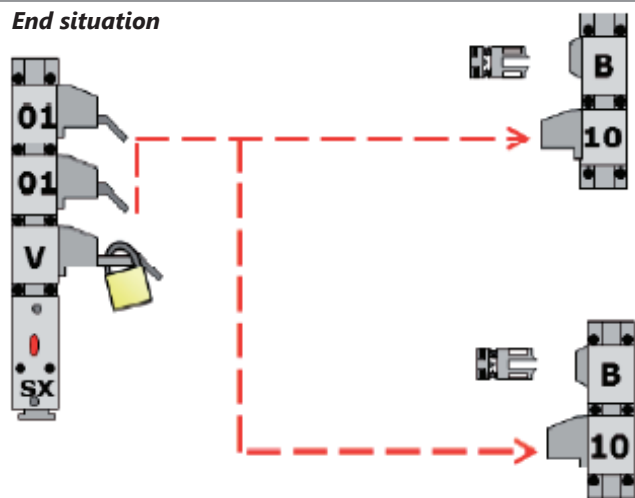
Example: SX-2GATE-SET:

Initial situation



Example: SX-2GATE-SET with additional PADLOCKMODULE-SET:

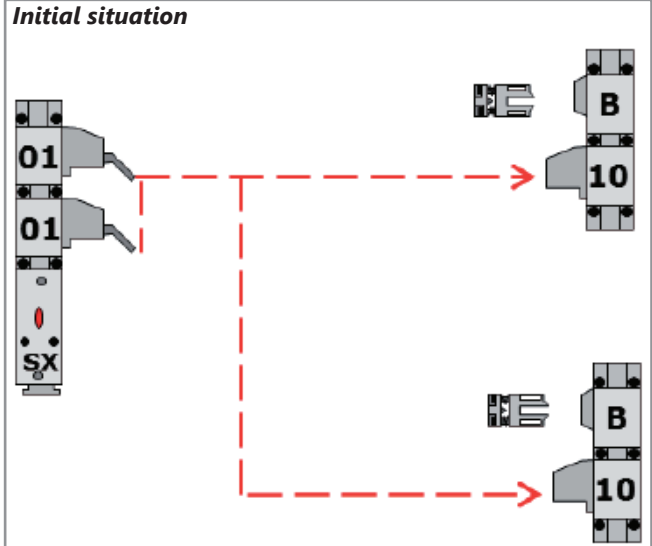
End situation



1001-KEYMODULE-SET

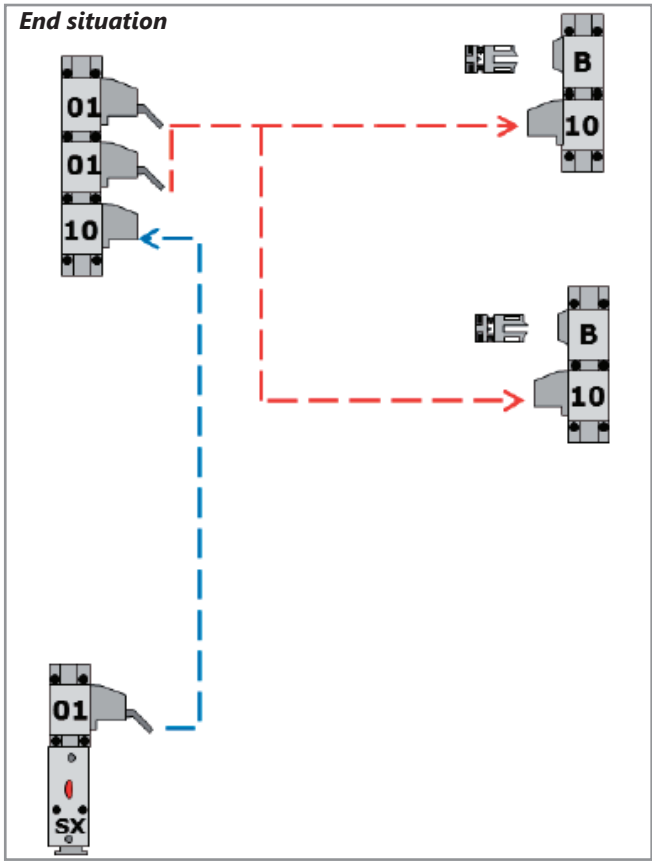
Example: SX-2GATE-SET:

Initial situation



Example: SX-2GATE-SET with key exchange box:

End situation



Transfer Plan Legend

Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys

Dold Trapped Key Accessories

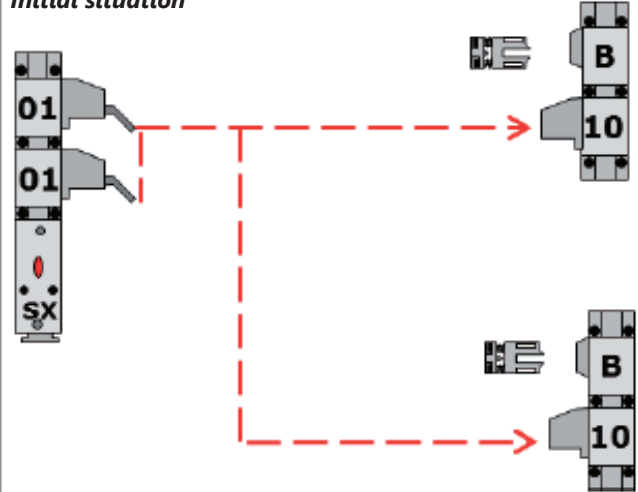


Accessories

01- SAFETY-KEY-SET

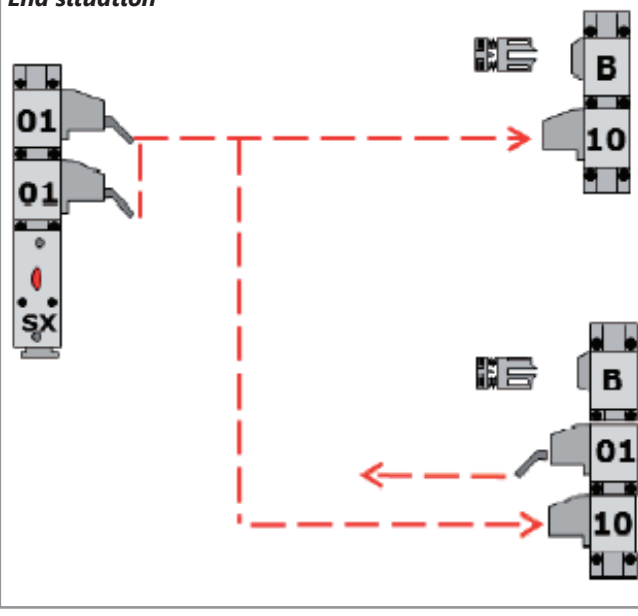
Example: SX-2GATE-SET:

Initial situation



Example: SX-2GATE-SET with safety key:

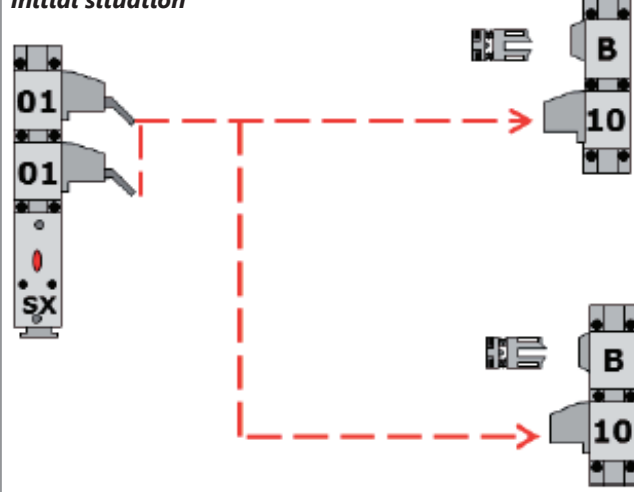
End situation



ACTUATOR-SET-B

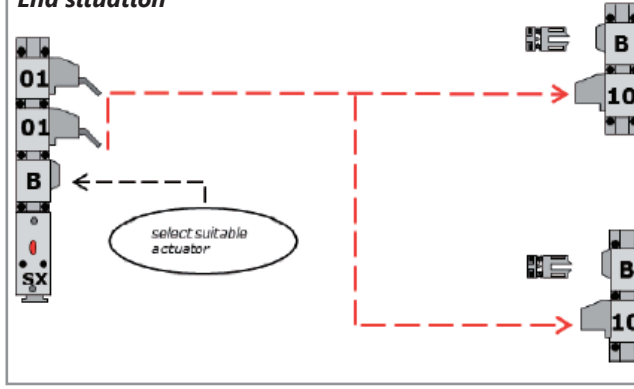
Example: SX-2GATE-SET:

Initial situation



Example: SX-2GATE-SET with additional
ACTUATOR-SET-B:

End situation



Transfer Plan Legend

Gate Sets		
SX	Standard key set base (main station)	A-labeled keys
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange box (main station)	B-labeled keys
V	Padlock Module (main station)	—
B	Door actuator (main station)	—
01	Safety key (door station)	C-labeled keys

Dold Trapped Key System Dimensions

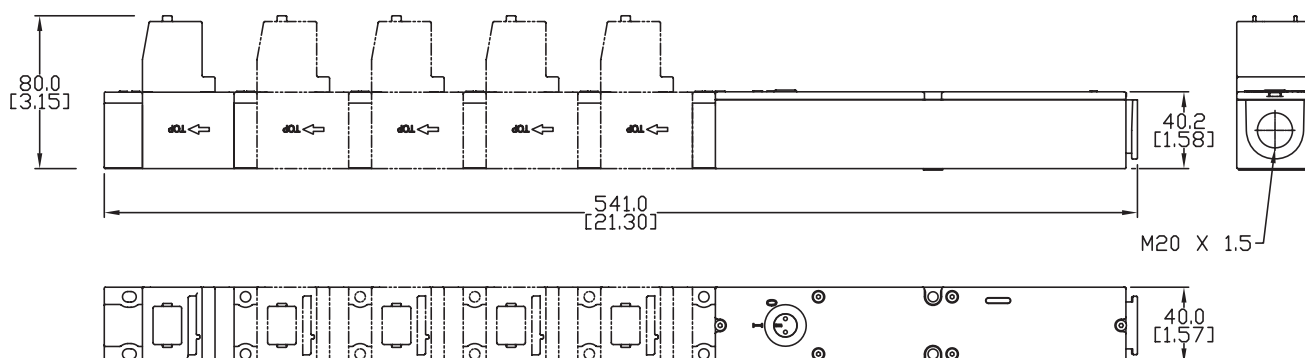


Dimensions

mm [in]

ZRH-XGATE-SET

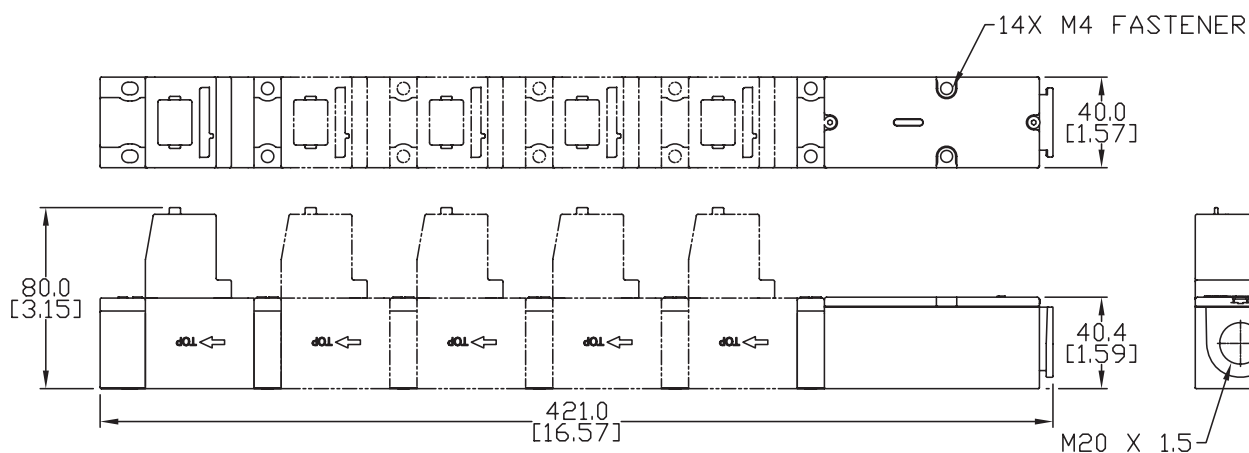
UP TO 5X GATE MODULE



Note: ZRH-XGATE-SET also includes 1-5 GATE ACTUATOR MODULES, depending on the gate set kit number (1-5).

SX-XGATE-SET

UP TO 5X GATE MODULE



Note: SX-XGATE-SET also includes 1-5 GATE ACTUATOR MODULES, depending on the gate set kit number (1-5).

Dold Trapped Key System Dimensions

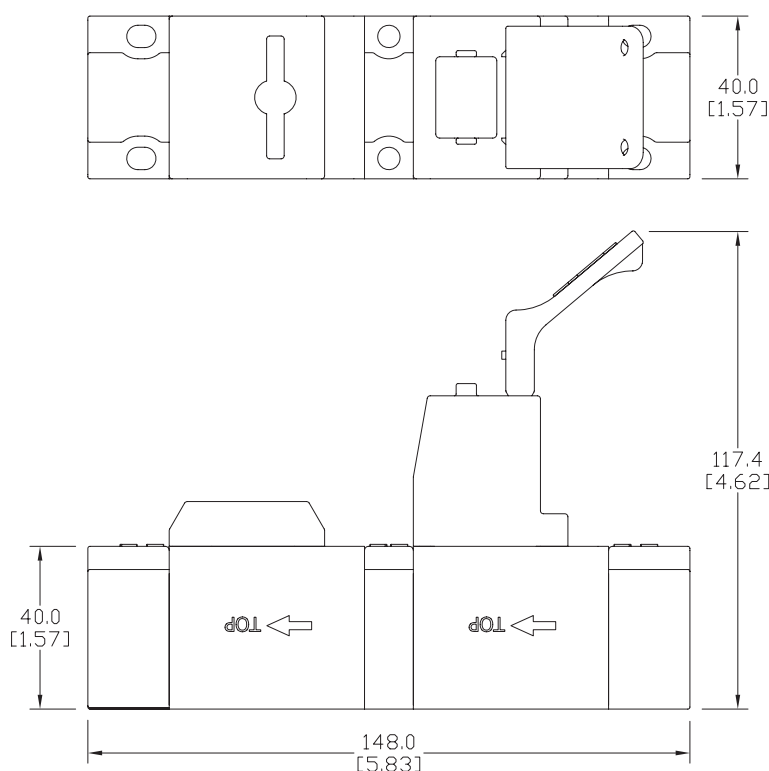


Dimensions

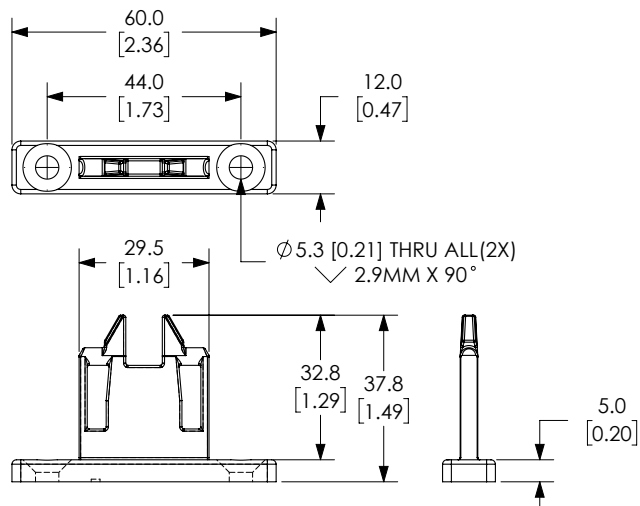
mm [in]

Gate Actuator Module

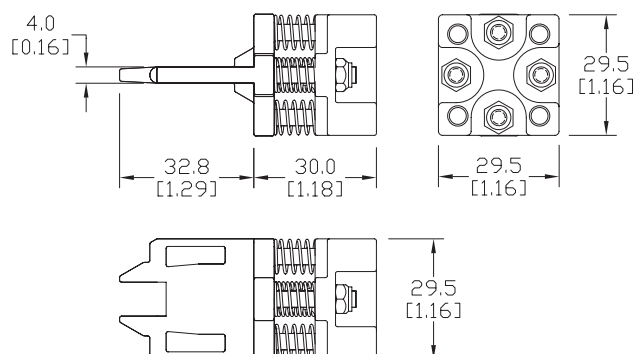
Gate actuator modules are included with both ZRH-XGATE-SET and SX-XGATE-SET. The number of gate actuator modules included in a gate set corresponds to the gate set number (1-5). Example: [ZRH-3GATE-SET](#) kit includes three gate actuator modules.



ST2317-T-ACTUATOR



ST2311-C-ACTUATOR



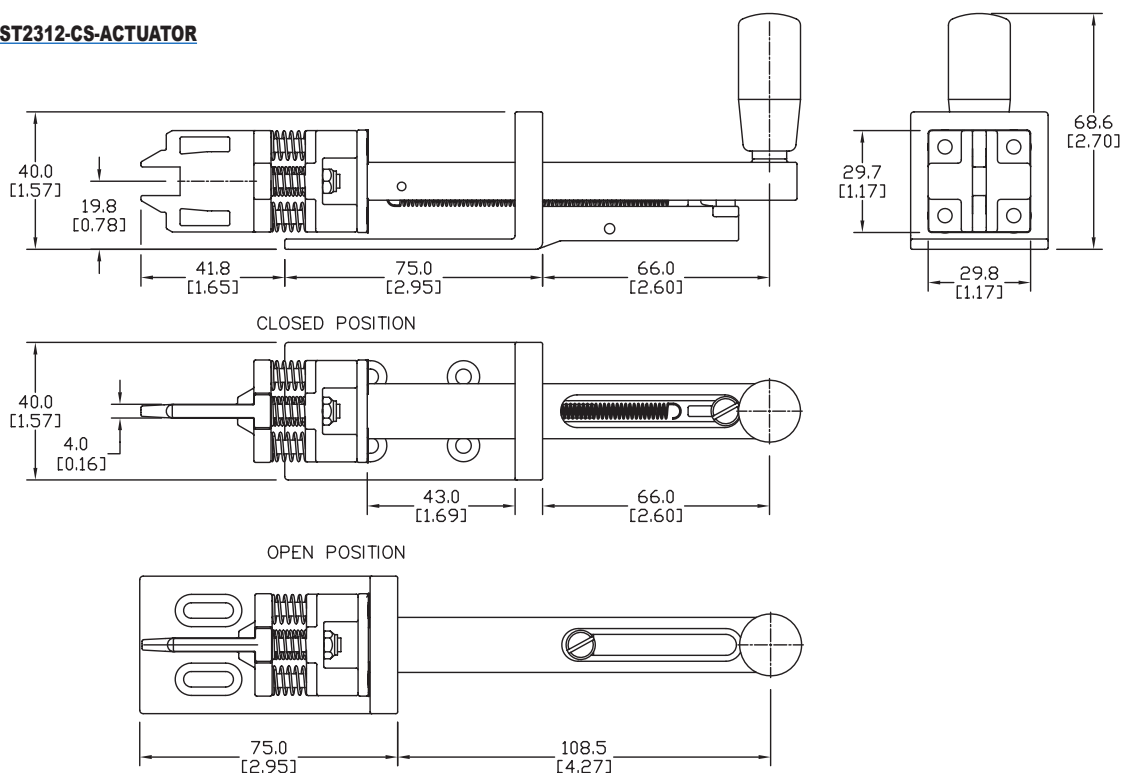
Dold Trapped Key System Dimensions



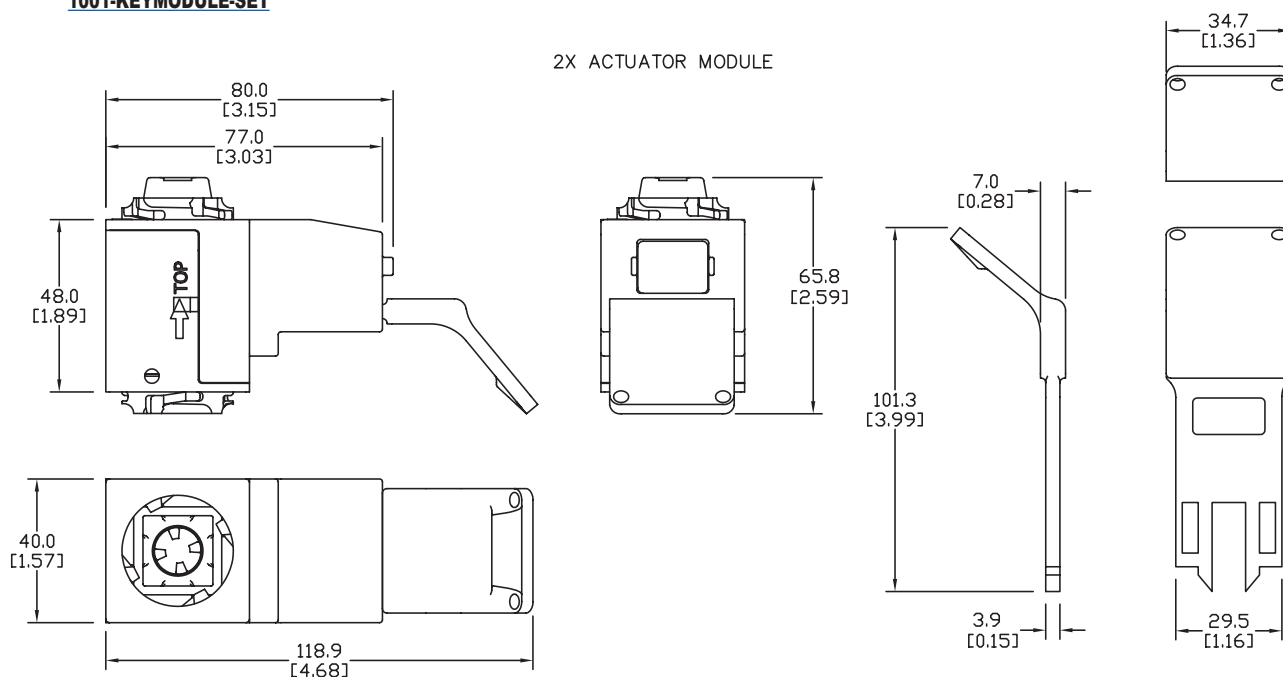
Dimensions

mm [in]

ST2312-CS-ACTUATOR



1001-KEYMODULE-SET



See our website: www.AutomationDirect.com for complete Engineering Drawings.

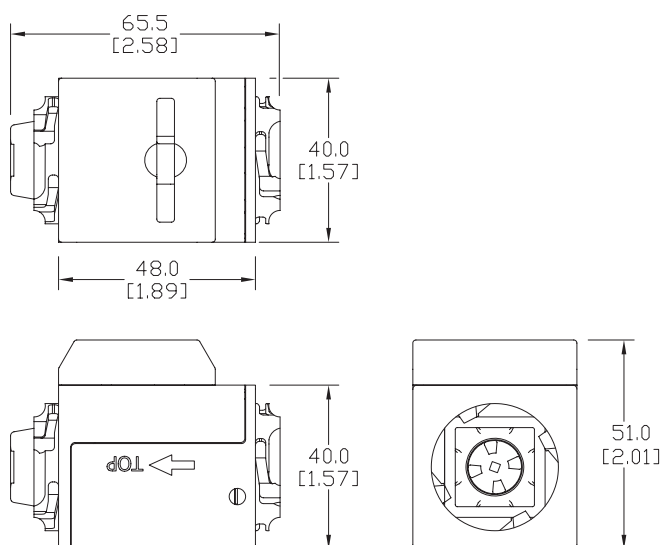
Dold Trapped Key System Dimensions



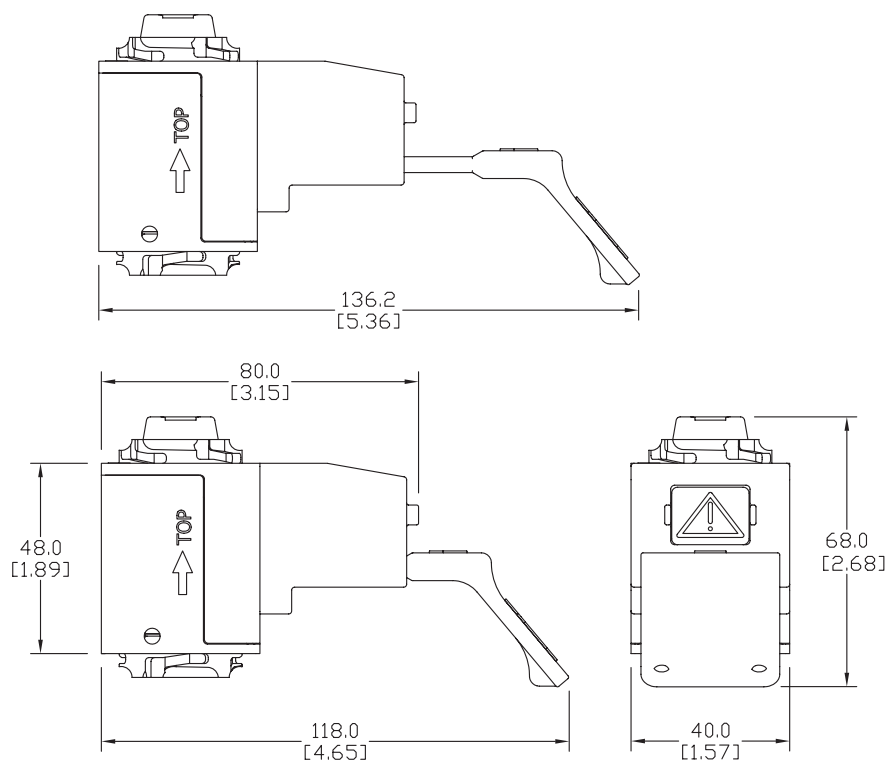
Dimensions

mm [in]

ACTUATOR-SET-B



PADLOCKMODULE-SET



See our website: www.AutomationDirect.com for complete Engineering Drawings.

Dold Trapped Key System Dimensions

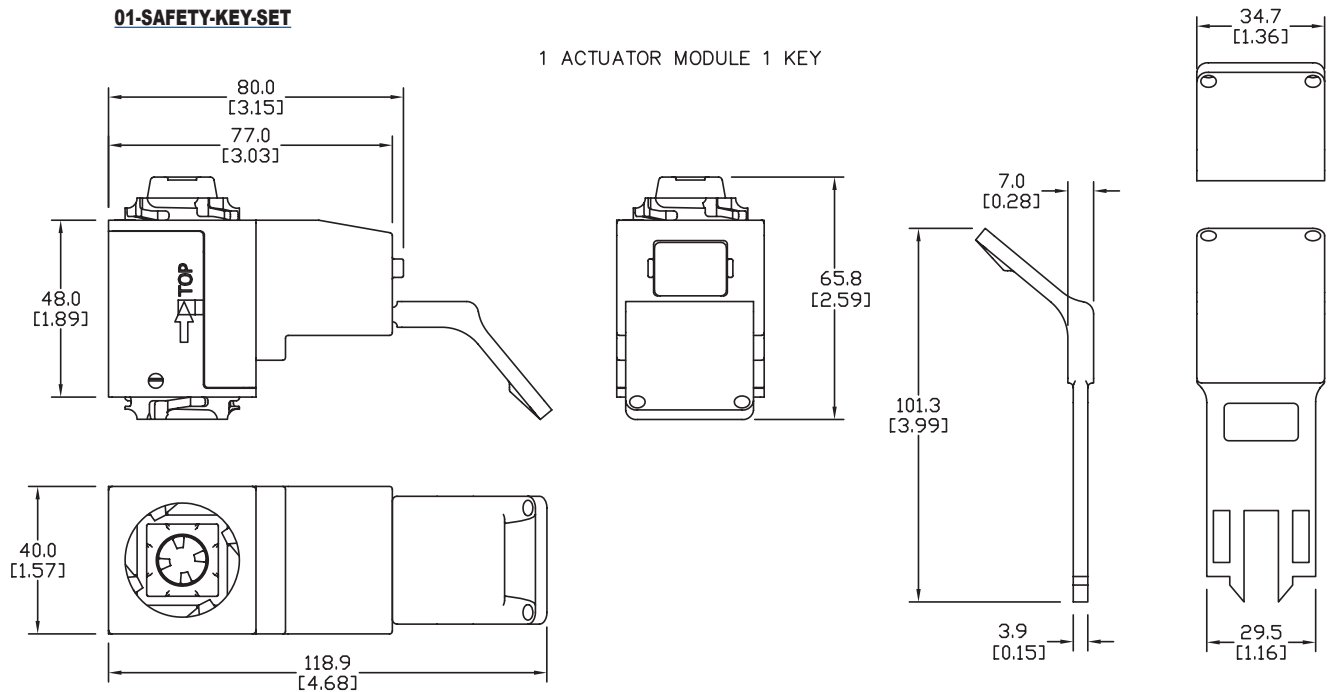


Dimensions

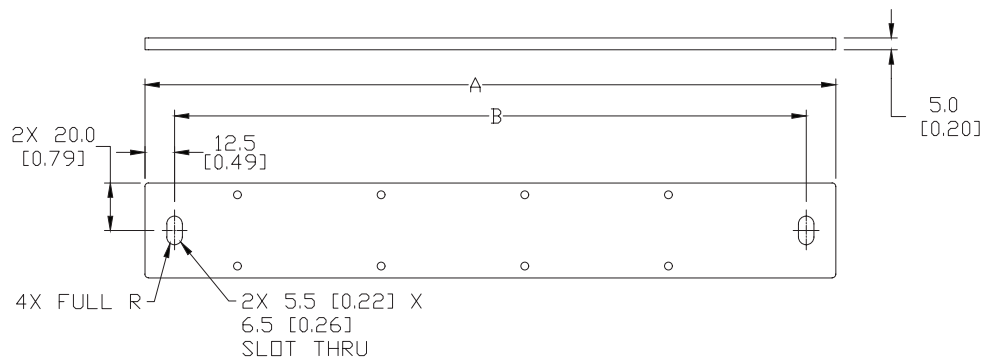
mm [in]

01-SAFETY-KEY-SET

1 ACTUATOR MODULE 1 KEY



STX36XXXX-PLATE-X



DIMENSION TABLE			
PART NO.	A	B	# OF MODULE MNTG HOLES
STE361100-PLATE-2	231.0 [9.09]	266.0 [10.47]	8
STE362100-PLATE-3	291.0 [11.46]	326.0 [12.83]	10
STE363100-PLATE-4	351.0 [13.82]	386.0 [15.20]	12
STE364100-PLATE-5	411.0 [16.18]	446.0 [17.56]	14
STE365100-PLATE-6	471.0 [18.54]	506.0 [19.92]	16
STE366100-PLATE-7	531.0 [20.91]	566.0 [22.28]	18
STE367100-PLATE-8	591.0 [23.27]	626.0 [24.65]	20
STE368100-PLATE-9	651.0 [25.63]	686.0 [27.01]	22

Safety Products



Warning: Safety products sold by AutomationDirect are Safety components only. The purchaser/installer is solely responsible for the application of these components and ensuring all necessary steps have been taken to assure each application and use meets all performance and applicable safety requirements and/or local, national and/or international safety codes as required by the application. AutomationDirect cannot certify that our products, used solely or in conjunction with other AutomationDirect or other vendors' products, will assure safety for any application. Any person using or applying any products sold by AutomationDirect is responsible for learning the safety requirements for their individual application and applying them, and therefore assumes all risks, and accepts full and complete responsibility, for the selection and suitability of the product for their respective application.

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