Dold Trapped Key System Overview

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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.

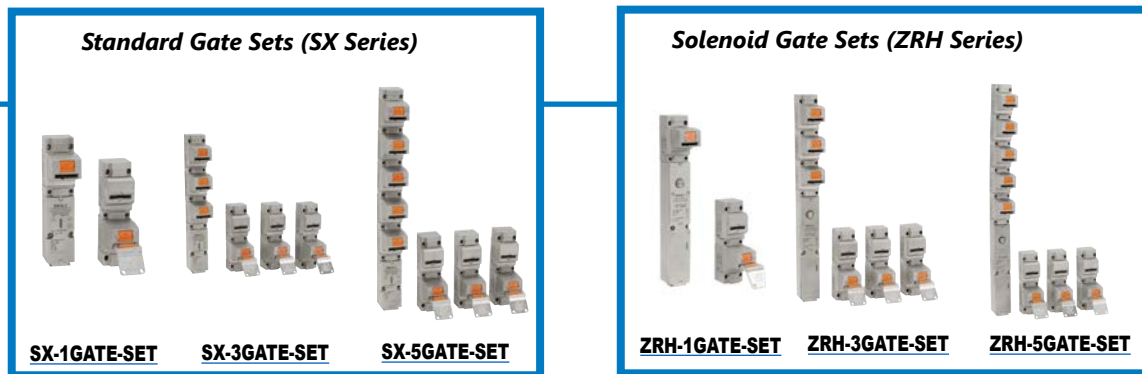*See our website: www.AutomationDirect.com for Online Training Videos.*
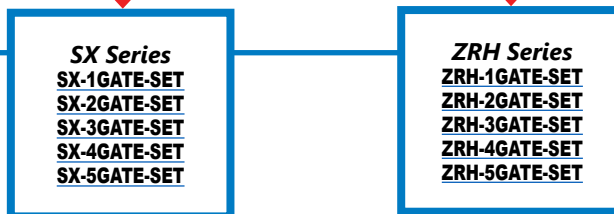
Selecting a Dold Trapped Key Gate Set

DOLD

STEP 1

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

Standard Gate Sets (SX Series)

SX-1GATE-SET   SX-3GATE-SET   SX-5GATE-SET

Solenoid Gate Sets (ZRH Series)

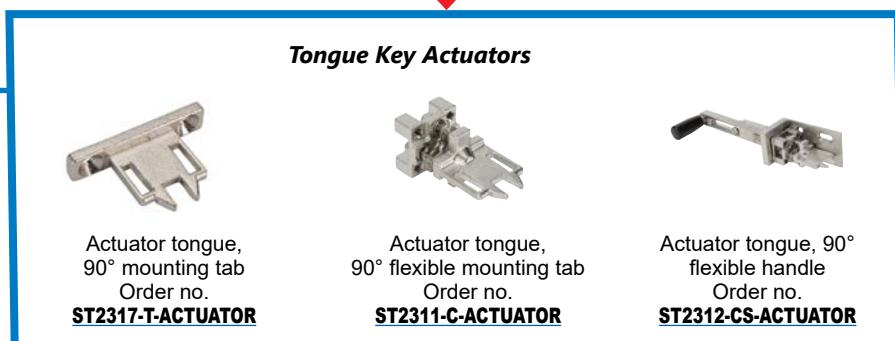ZRH-1GATE-SET   ZRH-3GATE-SET   ZRH-5GATE-SET

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.)

SX Series
SX-1GATE-SET
SX-2GATE-SET
SX-3GATE-SET
SX-4GATE-SET
SX-5GATE-SET

ZRH Series
ZRH-1GATE-SET
ZRH-2GATE-SET
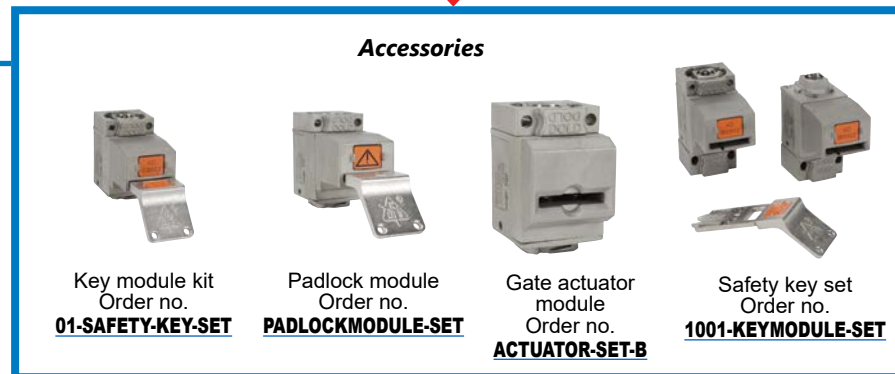ZRH-3GATE-SET
ZRH-4GATE-SET
ZRH-5GATE-SET

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.)
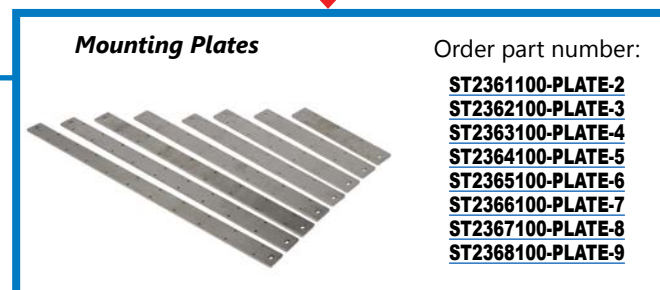
Tongue Key Actuators

Actuator tongue, 90° mounting tab
Order no.
ST2317-T-ACTUATOR

Actuator tongue, 90° flexible mounting tab
Order no.
ST2311-C-ACTUATOR

Actuator tongue, 90° flexible handle
Order no.
ST2312-CS-ACTUATOR

STEP 4

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

Accessories

Key module kit
Order no.
01-SAFETY-KEY-SET

Padlock module
Order no.
PADLOCKMODULE-SET

Gate actuator module
Order no.
ACTUATOR-SET-B

Safety key set
Order no.
1001-KEYMODULE-SET

STEP 5

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

Mounting Plates

Order part number:
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 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

✔RoHS 2002/95/EC CE

ZRH-1GATE-SET

Dold Trapped Key Interlock Gate Sets*			
Part Number	**Price**	**Description**	**Weight (kg [lb])**
ZRH-1GATE-SET	$;0005e0:	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]
ZRH-2GATE-SET	$;0005e1:	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]
ZRH-3GATE-SET	$;0005e2:	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]
ZRH-4GATE-SET	$;0005e3:	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]
ZRH-5GATE-SET	$;0005e4:	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]
SX-1GATE-SET	$;0005e5:	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]
SX-2GATE-SET	$;0005e6:	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]
SX-3GATE-SET	$;0005e7:	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]
SX-4GATE-SET	$;0005e8:	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]
SX-5GATE-SET	$;0005e9:	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**
ST2317-T-ACTUATOR	$42pb:	Dold Safemaster actuator tongue (key), for trapped key interlock systems, 316L stainless steel, 90° mounting tab	45.4 [0.1]	NA
ST2311-C-ACTUATOR	$04d#:	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)
ST2312-CS-ACTUATOR	$;004d!:	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.

Safety Electrical Components

Dold Trapped Key Accessories

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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)**
1001-KEYMODULE-SET	$004dz:	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
PADLOCKMODULE-SET	$;004d[:	Dold Safemaster padlock module, for trapped key interlock systems, 316L stainless steel. Includes bayonet mounting ring.	1.4
ACTUATOR-SET-B	$;004d]:	Dold Safemaster gate actuator module, for trapped key interlock systems, 316L stainless steel. Includes bayonet mounting ring. Order actuating tongue (key) separately.	1.1
01-SAFETY-KEY-SET	$004dy:	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
Safety and Electrical Specifications

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Specifications		
	Standard (SX)	*Solenoid (ZRH)*
Safety Classification and Reliability Data		
Switching Reliability (B10d)	2×10^6 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

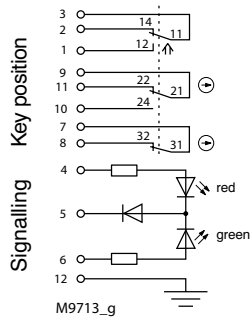**DOLD** ®

SX Series

Switching logic

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

■ closed
□ open

M9713_g

M10171

Fig. 1:
Locked while activated:
Key inserted
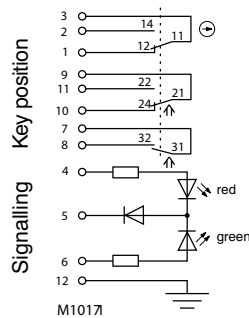
Fig. 2:
Lock deactivated:
Key removed

ZRH Series

Switching logic

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

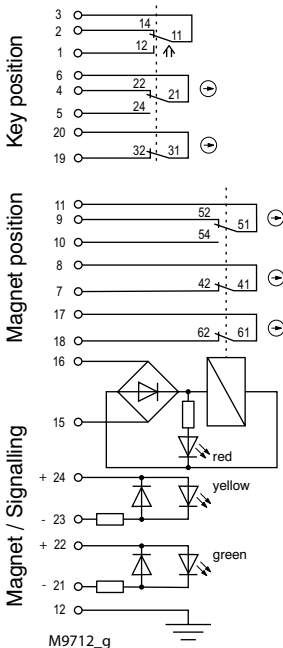■ closed
□ open

M9712_g

M10178

M10170

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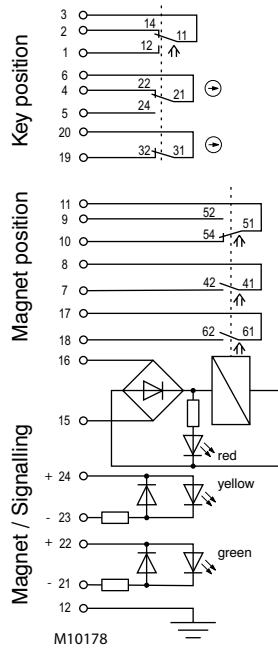Solenoid locking activated:
Magnet locked,
Key inserted

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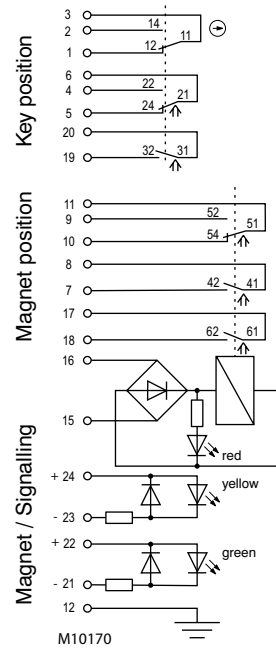Solenoid locking deactivated:
Magnet released,
Key inserted

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

The state shown in **Figure 3** does not depend on the control signal of the magnet.
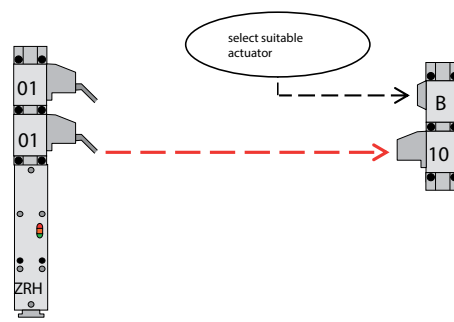If the control signal is applied and the key inserted the solenoid locking changes to the state of **Figure 2**.
If no signal is applied and the key inserted the solenoid locking changes to the state of **Figure 1**
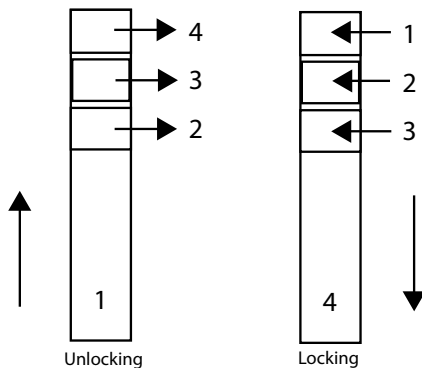
Dold Trapped Key Transfer Plans

DOLD ⬡

Example: 2-gate Set Mechanical Trapped Key Path

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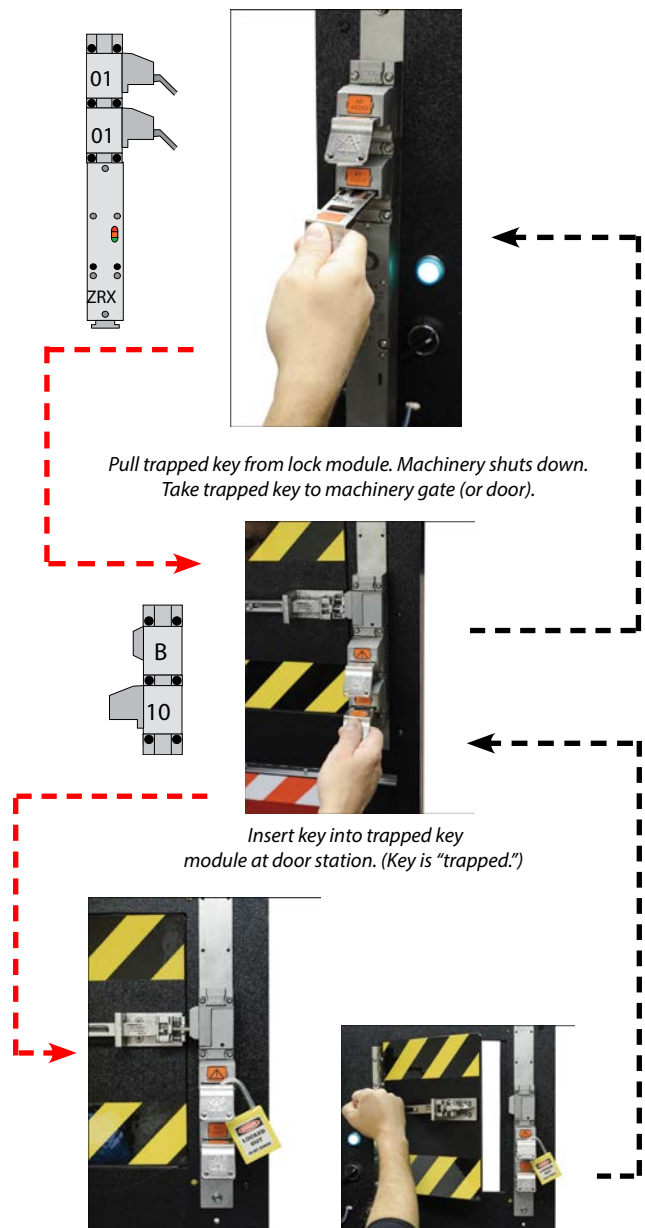*Door station with optional padlock module (right).*

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

Unlocking	Locking

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.

Pull trapped key from lock module. Machinery shuts down.
Take trapped key to machinery gate (or door).

Insert key into trapped key module at door station. (Key is "trapped.")

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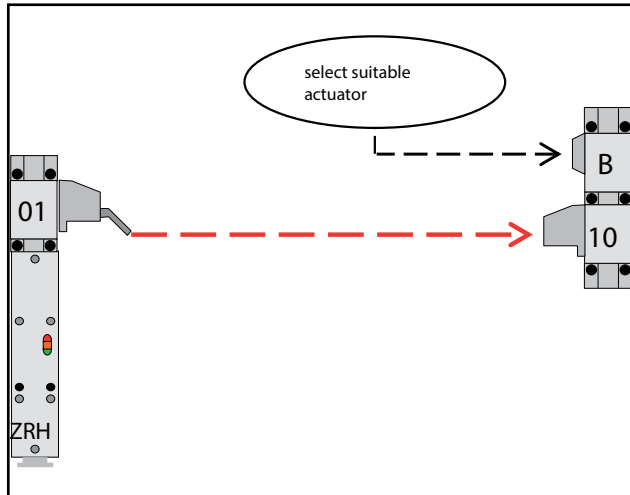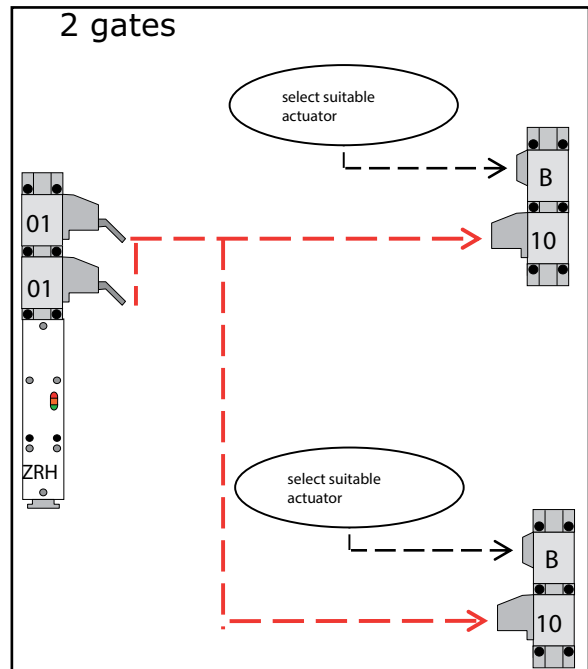
Reverse steps to restart machine.

Transfer Plan Legend

Gate Sets		
SX	Standard key set base (main station)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
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

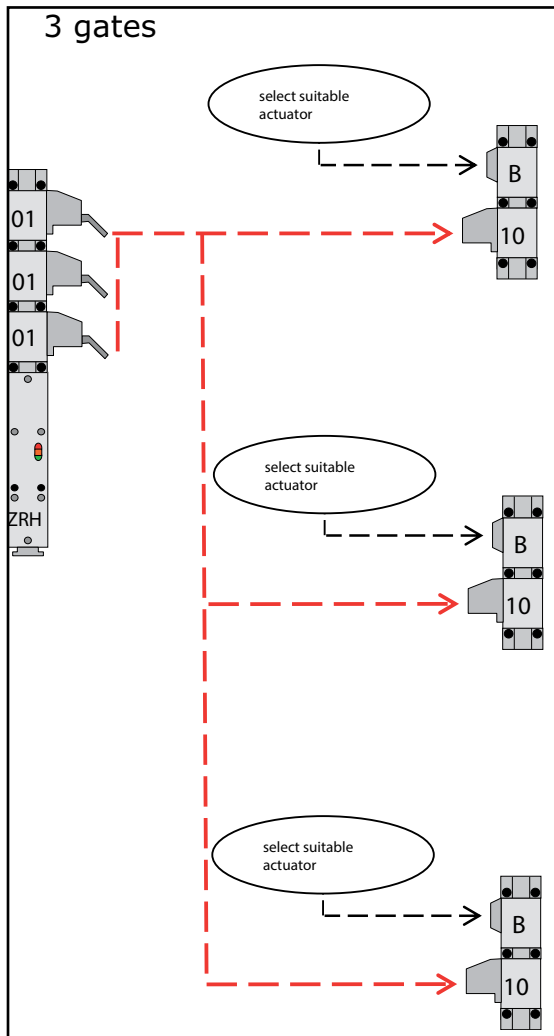**DOLD**

SX and ZRH Series

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

1-Gate Set

2-Gate Set

3-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)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
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

Safety Electrical Components   tESC-272

Dold Trapped Key Transfer Plans

DOLD ⓔⒹⓢ

4-Gate Set

4 gates

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

Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
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

Safety Electrical Components   tESC-273

Dold Trapped Key Transfer Plans

DOLD

5-Gate Set

5 gate

select suitable actuator

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

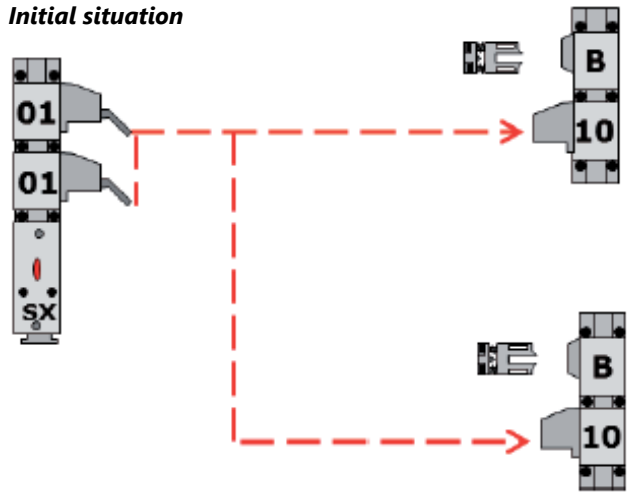| Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange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

DOLD

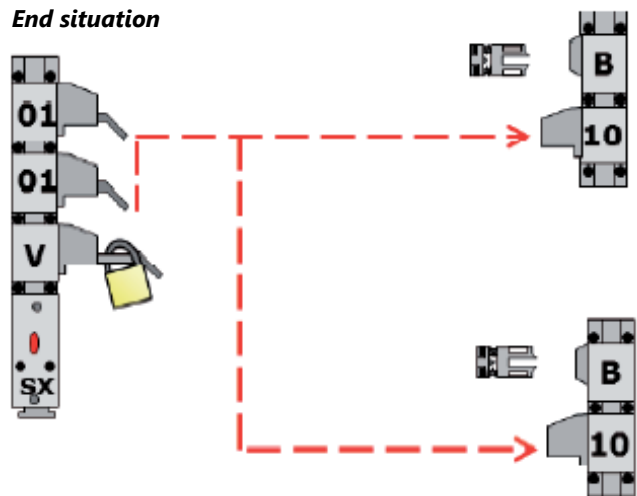## Accessories

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

Initial situation
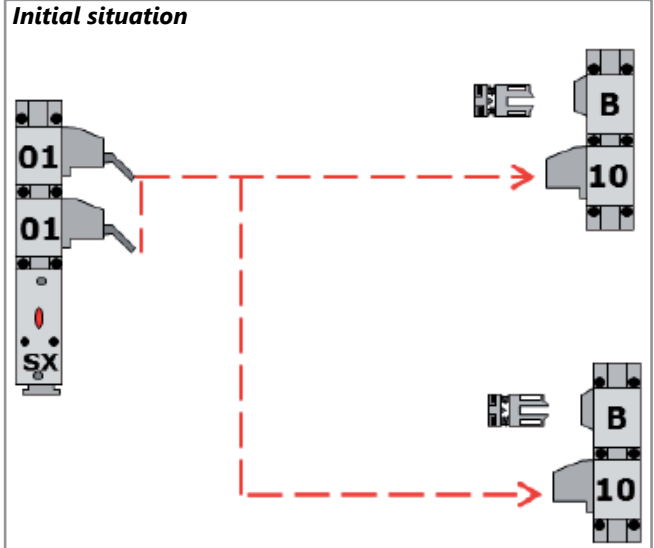
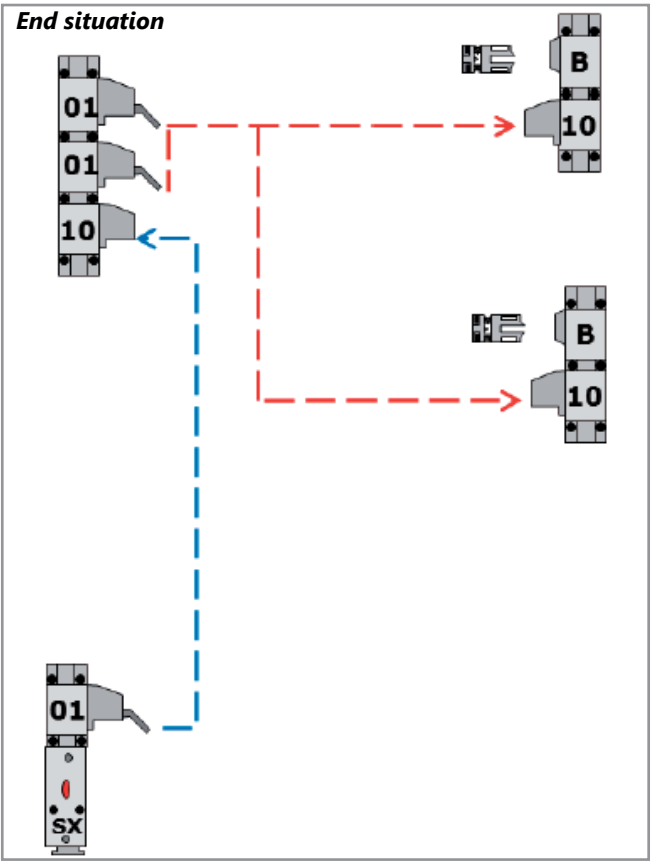**Example: SX-2GATE-SET with additional PADLOCKMODULE-SET:**

End situation

1001-KEYMODULE-SET
Example: SX-2GATE-SET:

Initial situation

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

End situation

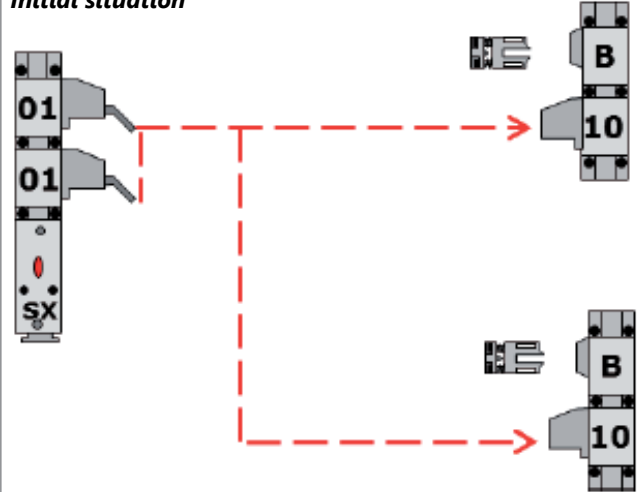| Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
B	Door actuator (door station)	
10	Trapped key Insertion module (door station)	
Accessories		
10/01	Key exchange 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
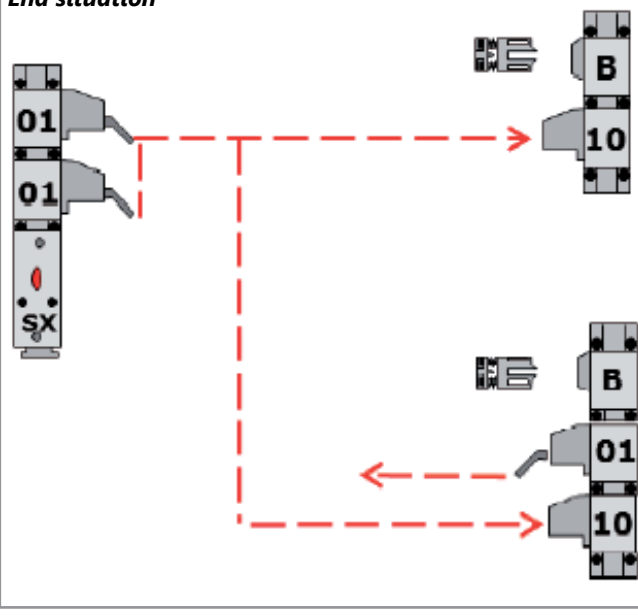
DOLD Ⓔ

Accessories

01-SAFETY-KEY-SET
Example: SX-2GATE-SET:

Initial situation

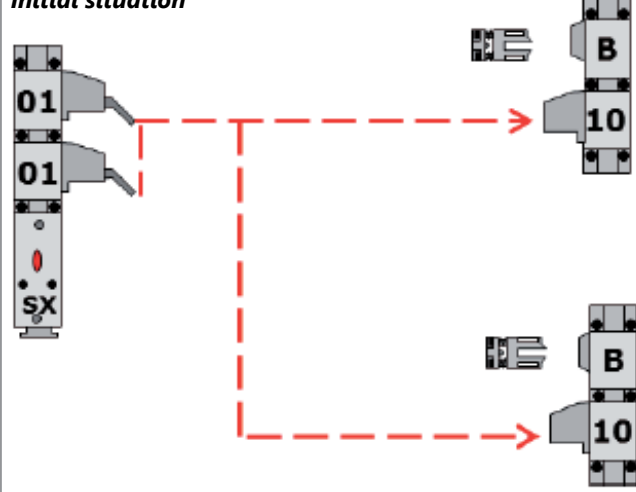**Example: SX-2GATE-SET with safety key:**
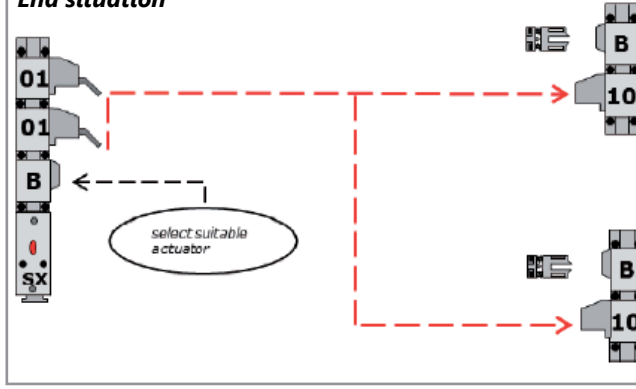

End situation

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

Initial situation

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

End situation

select suitable actuator

| Transfer Plan Legend		
Gate Sets		
SX	Standard key set base (main station)	
ZRH	Solenoid locking key set base (main station)	
01	Trapped key removal module (main station)	A-labeled keys
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

DOLD

Dimensions

mm [in]

ZRH-XGATE-SET

UP TO 5X GATE MODULE
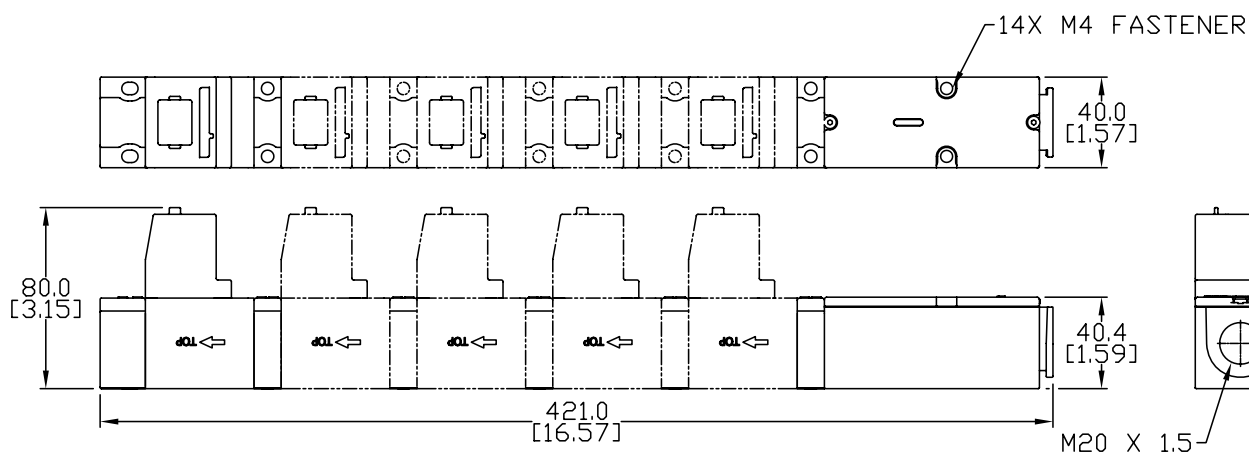
80.0 [3.15]

541.0 [21.30]

40.2 [1.58]

40.0 [1.57]

M20 X 1.5
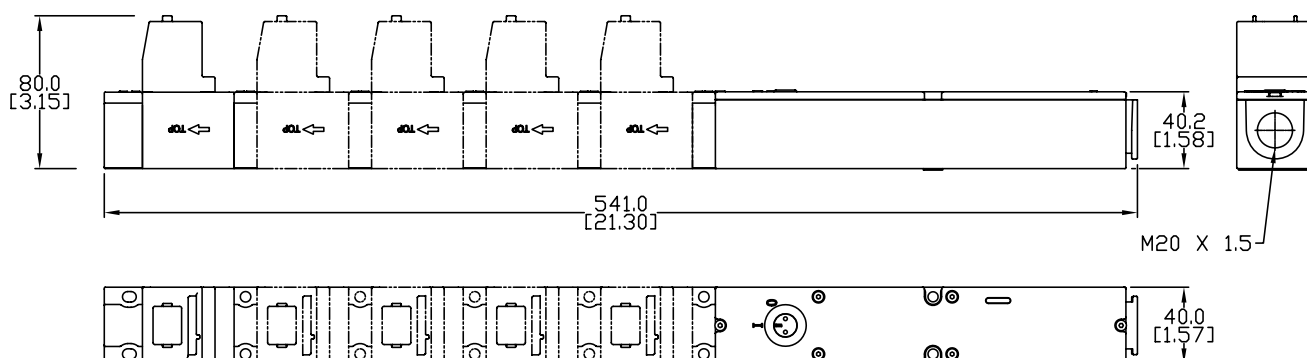
Note: ZRH-XGATE-SET also includes 1-5 GATE ACTUATOR MODULES, depending on the gate set kit number (1-5).

SX-XGATE-SET

UP TO 5X GATE MODULE

14X M4 FASTENER

40.0 [1.57]

80.0 [3.15]

421.0 [16.57]

40.4 [1.59]

M20 X 1.5

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

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

Dold Trapped Key System Dimensions
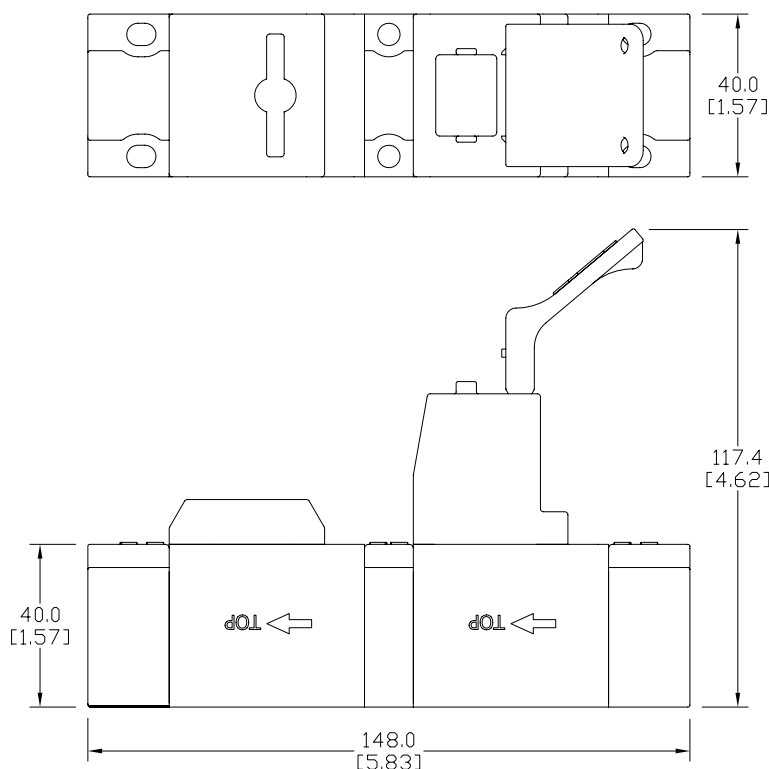
DOLD ®

Dimensions

mm [in]

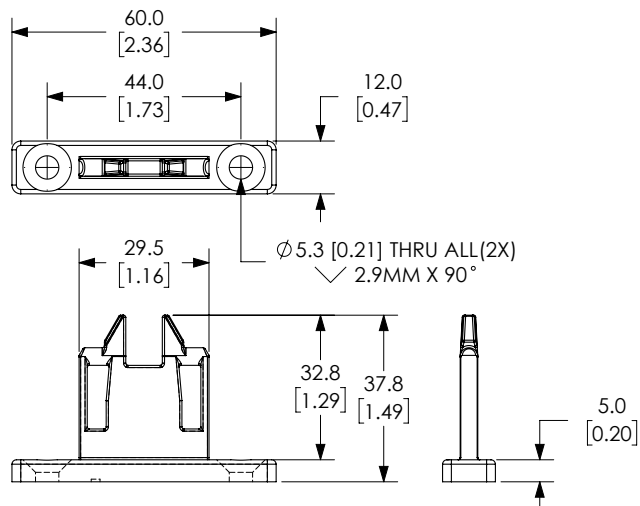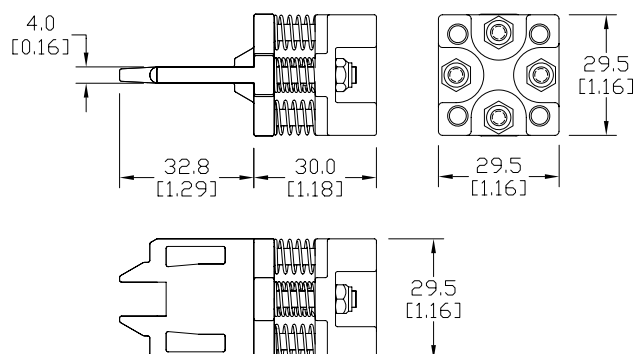### Gate Actuator Module

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.

40.0 [1.57]

117.4 [4.62]

40.0 [1.57]

TOP TOP

148.0 [5.83]

ST2317-T-ACTUATOR

60.0 [2.36]

44.0 [1.73]

12.0 [0.47]

29.5 [1.16]

∅5.3 [0.21] THRU ALL(2X)
∨ 2.9MM X 90°

32.8 [1.29] 37.8 [1.49]

5.0 [0.20]

ST2311-C-ACTUATOR

4.0 [0.16]

29.5 [1.16]

32.8 [1.29]   30.0 [1.18]

29.5 [1.16]

29.5 [1.16]

Dold Trapped Key System Dimensions

DOLD

Dimensions

mm [in]

ST2312-CS-ACTUATOR

40.0 [1.57]
19.8 [0.78]
41.8 [1.65]
75.0 [2.95]
66.0 [2.60]

29.7 [1.17]
68.6 [2.70]
29.8 [1.17]

CLOSED POSITION

40.0 [1.57]
4.0 [0.16]
43.0 [1.69]
66.0 [2.60]

OPEN POSITION

75.0 [2.95]
108.5 [4.27]

1001-KEYMODULE-SET

2X ACTUATOR MODULE

80.0 [3.15]
77.0 [3.03]
48.0 [1.89]
TOP

65.8 [2.59]

7.0 [0.28]
101.3 [3.99]
3.9 [0.15]

34.7 [1.36]
29.5 [1.16]

40.0 [1.57]
118.9 [4.68]
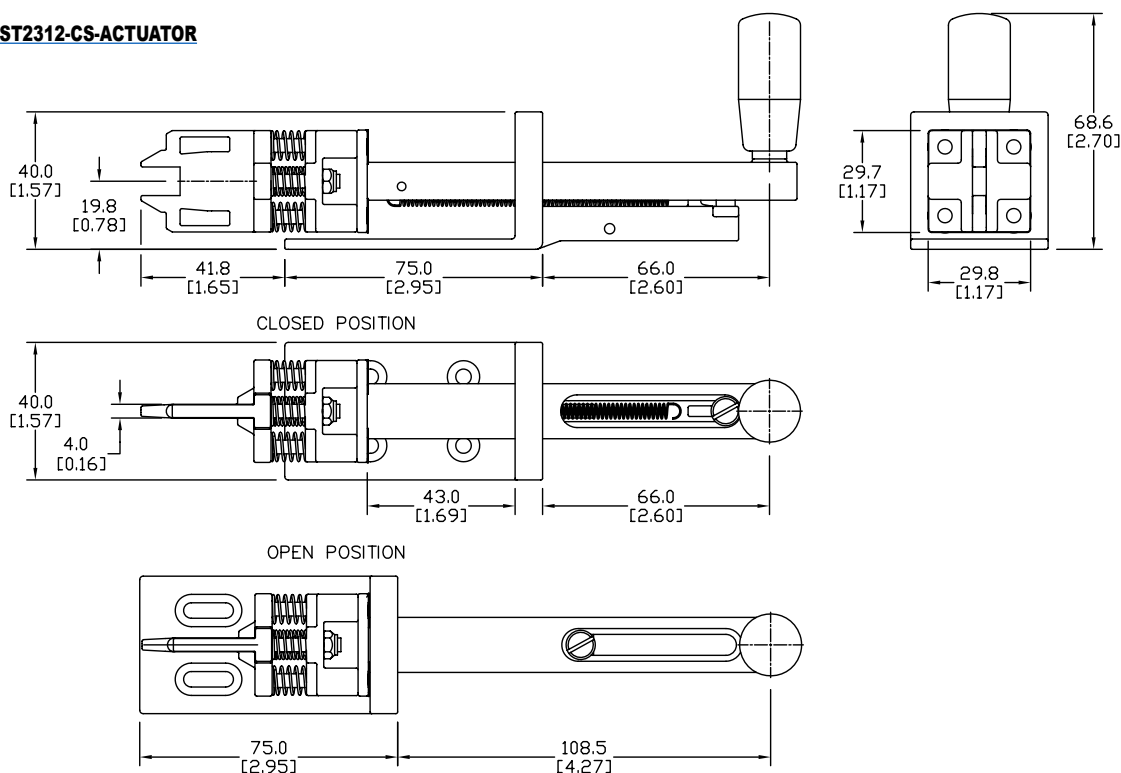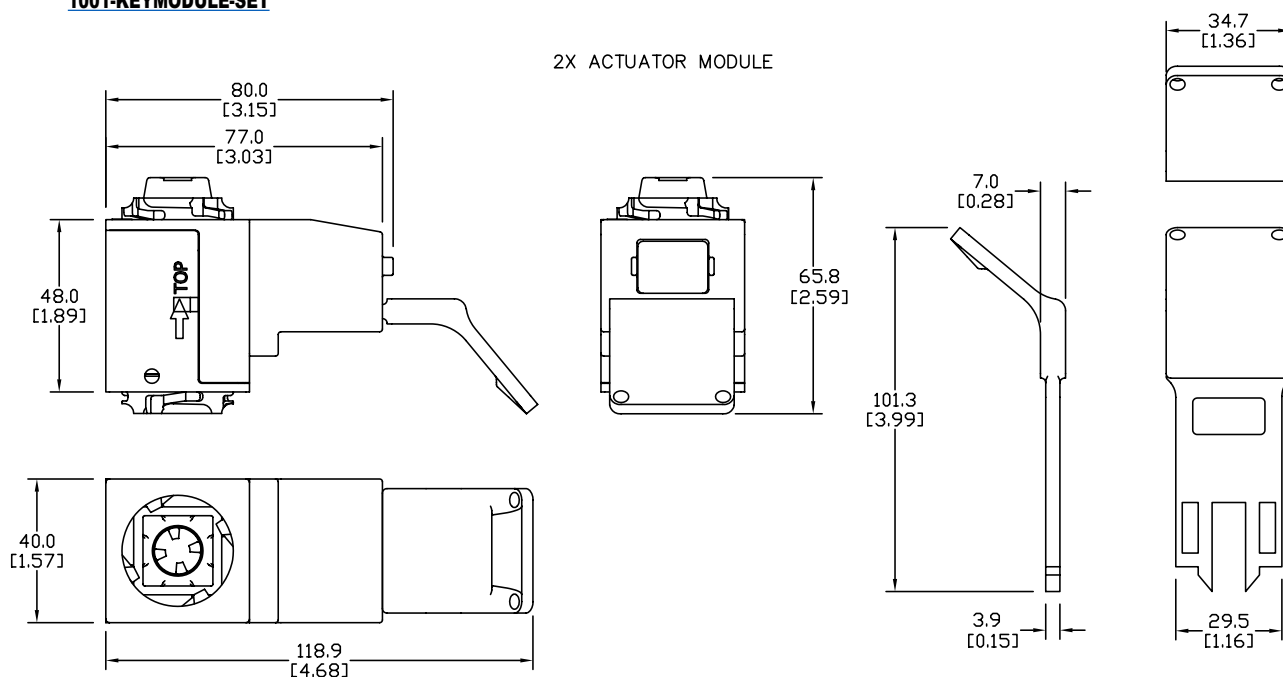
Dold Trapped Key System Dimensions

DOLD ®

Dimensions

mm [in]

ACTUATOR-SET-B
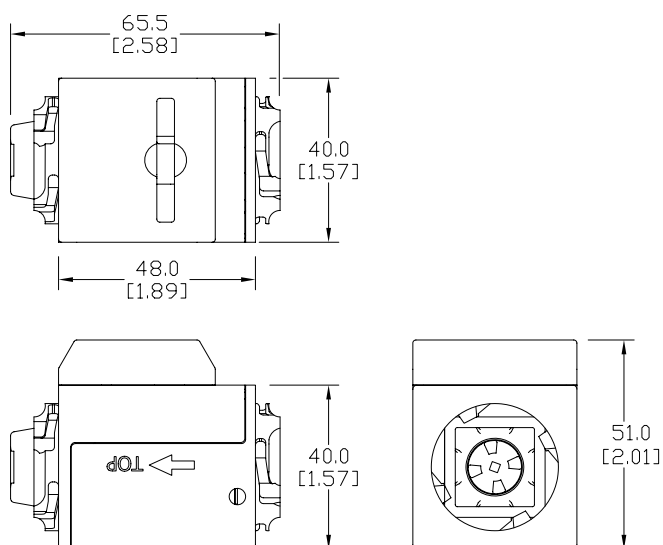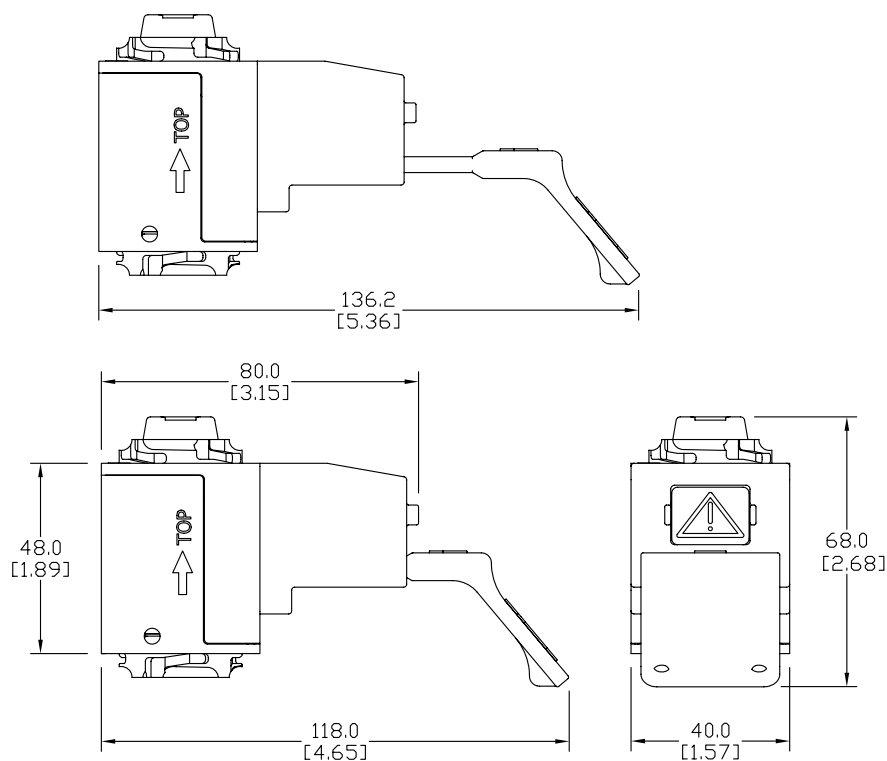
65.5 [2.58]

40.0 [1.57]

48.0 [1.89]

TOP

40.0 [1.57]

51.0 [2.01]

PADLOCKMODULE-SET

TOP

136.2 [5.36]

80.0 [3.15]

48.0 [1.89]

TOP

118.0 [4.65]

68.0 [2.68]

40.0 [1.57]

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

Dold Trapped Key System Dimensions

DOLD ®

Dimensions
mm [in]

01-SAFETY-KEY-SET

1 ACTUATOR MODULE 1 KEY

80.0 [3.15]
77.0 [3.03]
48.0 [1.89]
TOP
40.0 [1.57]
118.9 [4.68]
65.8 [2.59]
7.0 [0.28]
101.3 [3.99]
3.9 [0.15]
34.7 [1.36]
29.5 [1.16]

STX36XXXX-PLATE-X

A
B
5.0 [0.20]
2X 20.0 [0.79]
12.5 [0.49]
4X FULL R
2X 5.5 [0.22] X 6.5 [0.26] SLOT THRU
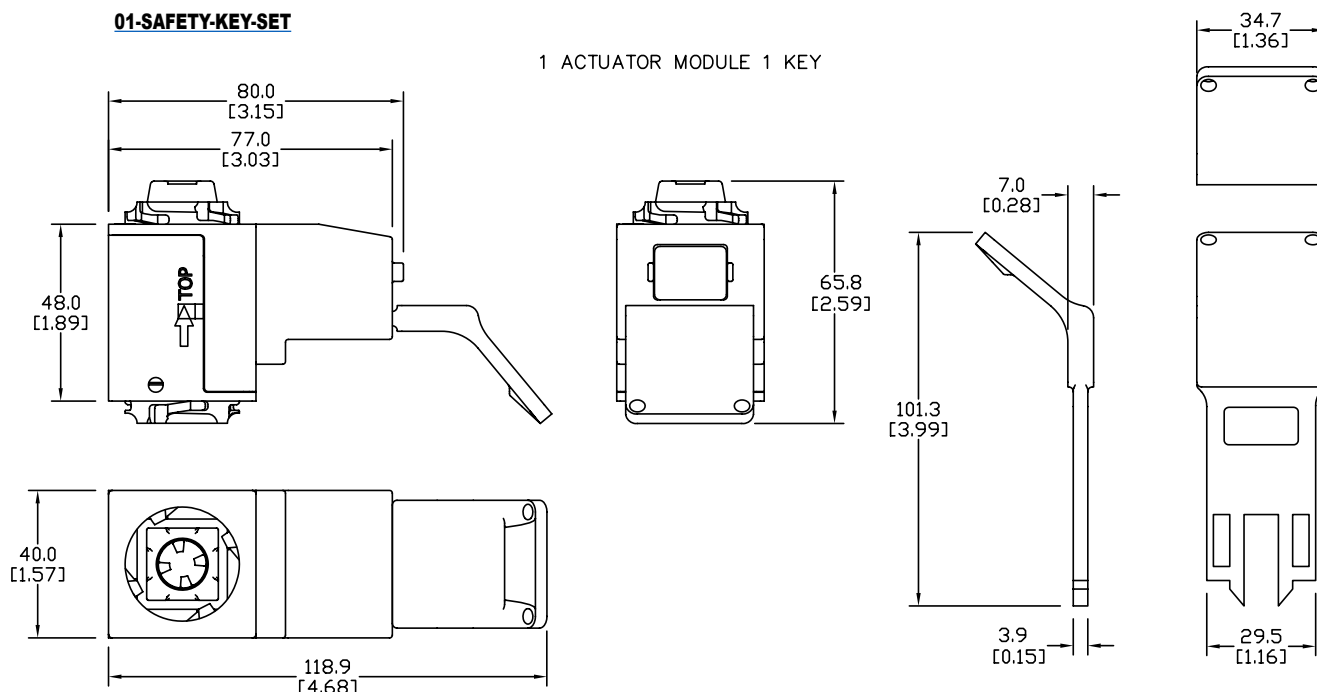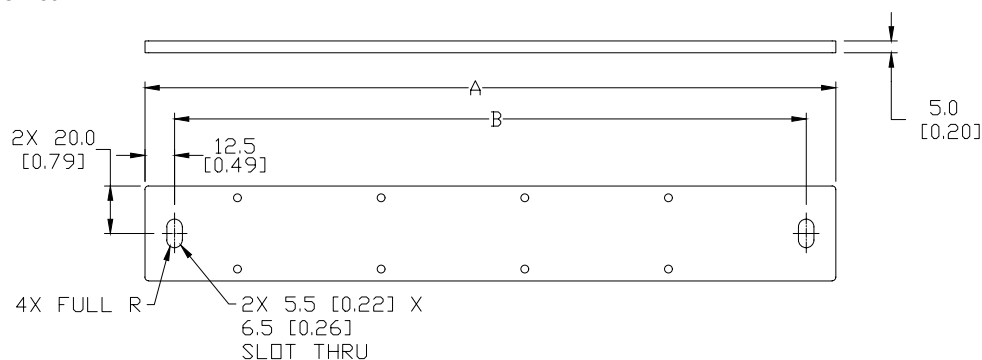
DIMENSION TABLE

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

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Safety Electrical Components tESC-177