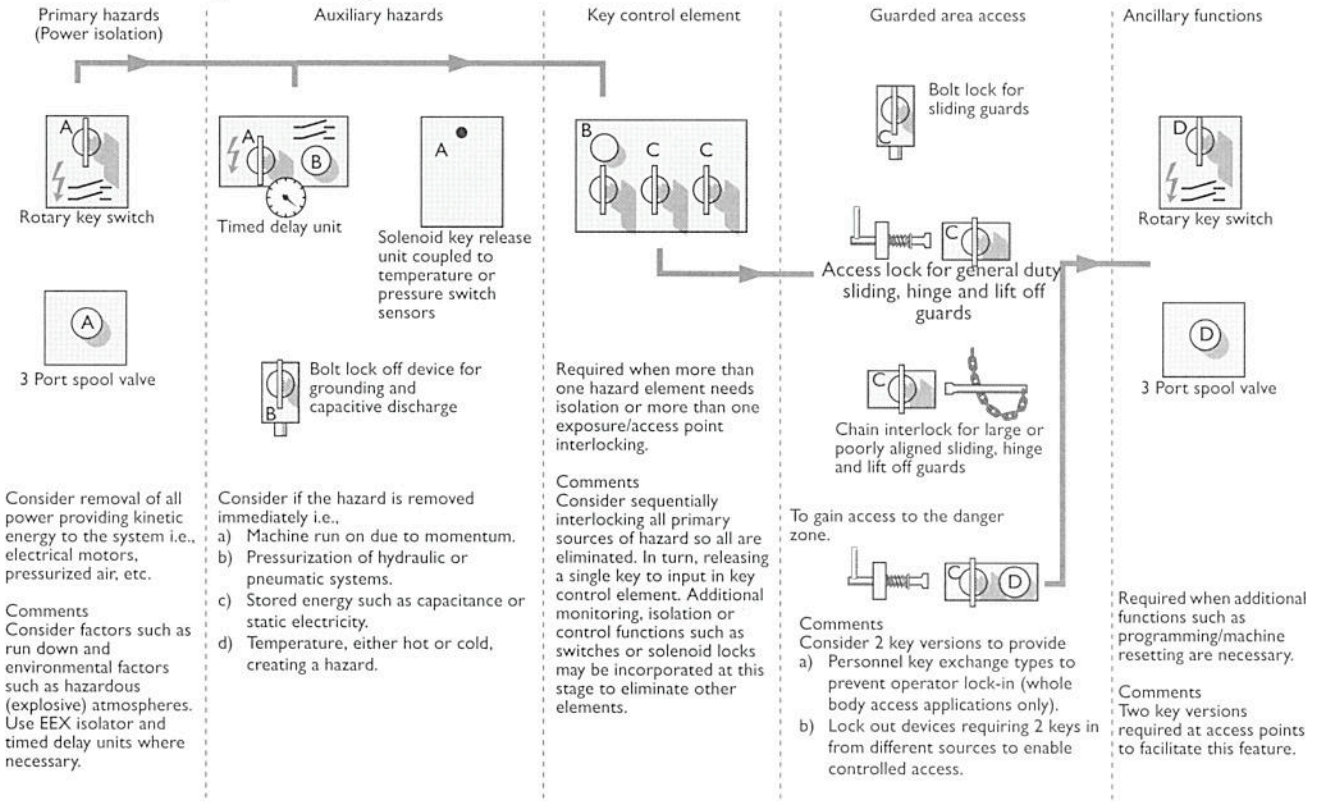
Designing an Interlocking System

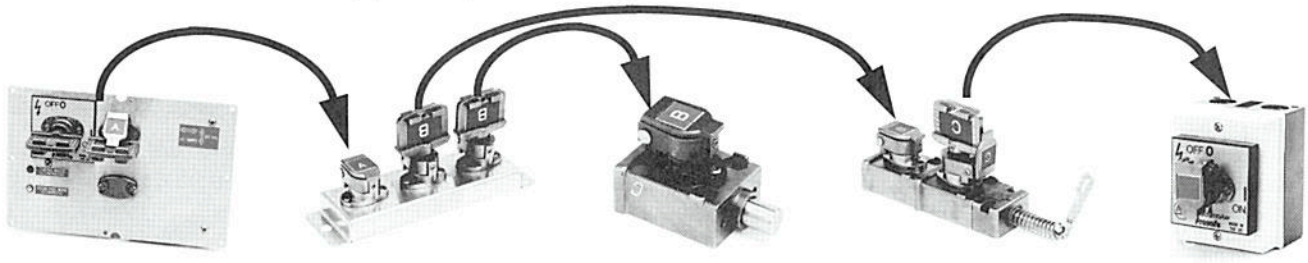
Plant and Machinery Interlocking



The Prosafe Advantage

Stainless steel construction.

Illustrated Principles of Trapped Key Interlocking



A
ETU
Isolator with timed delay key release

A B B
KEX
Trapped key 'A' Locking off ETU, Release access door lock, key 'B'.

B
SBL
'B' key in to retract bolt from guard door.

B C
DAL
'B' key in then 'C' key out to open guard door.

C
RKS
To energize robot teach mode.

Sequence of Operation

1. The ETU isolator has two keys. One is a non removable key. The other key (a 'A' coded key) can be removed after a timed duration, which is set by a potentiometer inside the ETU isolator. Turn the non removable key to turn the hazardous machine motion off and start the timer. When the time expires, the Key Free LED turns ON. Remove the 'A' key.
2. Insert the 'A' key into the Key Exchange Unit (KEX) and turn it 90°.
3. Turn one of the 'B' keys 90° and remove it from the KEX. This traps the 'A' key in the KEX and prevents the restarting of the machine.
4. Insert the 'B' key into the Single-key Bolt Lock (SBL) and turn it 90° to gain partial body access to the machine.
5. Turn the second 'B' key 90° and remove it from the KEX. Removal of this key also traps the 'A' key in the KEX and prevents the restarting of the machine.
6. Insert the 'B' key into the Dual-key Access Lock (DAL) and turn it 90°.
7. Turn the 'C' key 90° and remove the 'C' key. Rotate the access handle to allow full body entry into the hazard zone.
8. Take the 'C' key into the hazard zone, insert it into the rotary key switch (RKS) and turn it 90° to send a signal to the machine control system, to allow the machine to operate in a slow or teach mode.
9. Reverse the process to return the machine to full operational mode.

Bill of Materials

Item	Quantity	Description	Catalogue Number
1	1	Single Key Time Delayed with an B Primary Key	**440T-MSTUE110A**
2	1	Key Exchange Unit, A Primary Key, Two B Secondary Keys Trapped (included)	**440T-MKEXE110A0B0B**
3	1	Single Bolt Lock, B Primary Key	**440T-MSBLE100B**
4	1	Dual Access Lock, B Primary Key, C Secondary Key Trapped (included)	**440T-MDALE100B0C**
5	1	Rotary Key Switch, C Primary Code Barrel	**440T-MRKSE100C**
6	1	A Key	**440T-AKEYE100A**

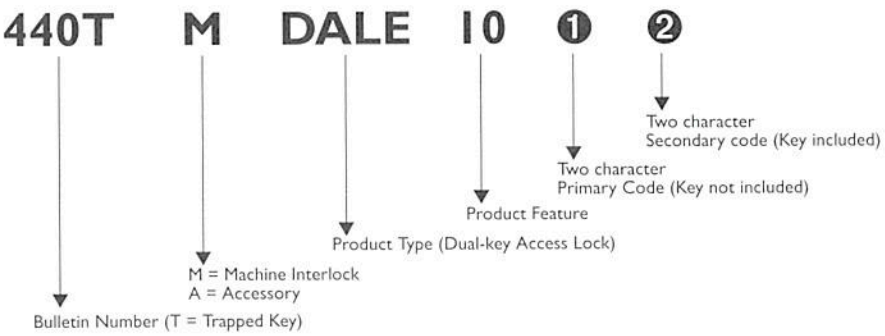
Note: Primary keys must be ordered separately, when not provided for by a previous sequential trapped key.
In the example above, only one primary key must be ordered separately. The remaining primary keys are provided by a previous sequential secondary (trapped) key.

Code Selection

Ordering Prosafe trapped key products requires codes to be included in the catalogue number.

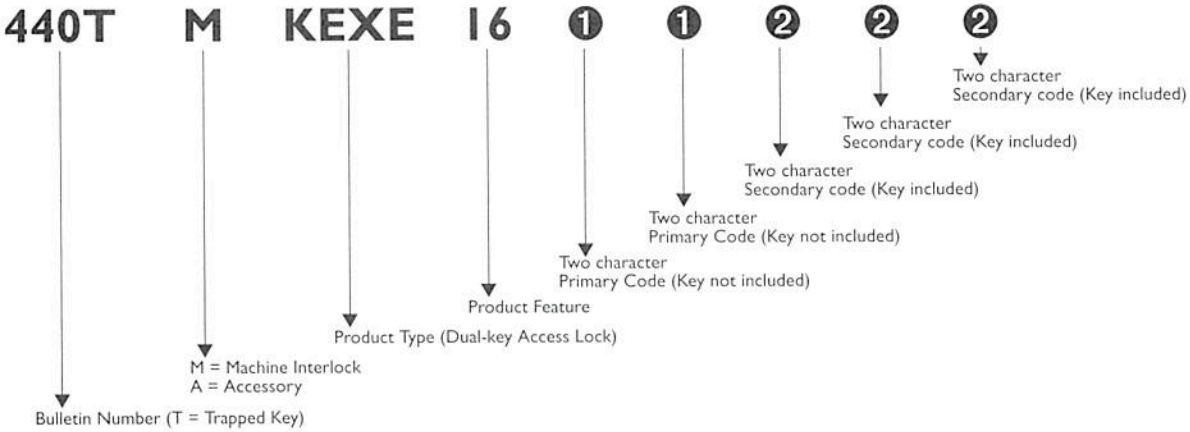
- The codes are added to the end of the catalogue number.
- Each code must be two characters in length.
- Single letter codes must be preceded by a 0 (zero).
- The first code(s) is the primary code and the last code(s), if necessary, are the secondary code(s).
- Primary codes do not include the key. The key must be ordered separately or must come from a previous operation.
- Secondary codes come complete with a key, as the key is trapped in the code barrel.
- Use the table on page 5-7 to select and track codes.

Ordering Example 1:



Order catalogue number 440TMDALE100A0B to get a Dual key Access Lock with an "A" primary code and a "B" secondary code, with a "B" key included.

Ordering Example #2:



Order catalogue number 440TMKEXE160A0B0C0C0C to get a key exchange unit with "A" and "B" primary codes and three "C" secondary codes. The "A "and "B" keys are not included. The three "C" keys, which are trapped in the secondary code barrels, are included.

The Prosafe Advantage

Stainless steel construction.

Key Coding

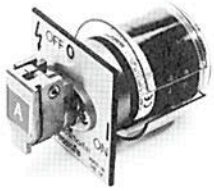
Below is an example reference guide that is useful in selecting and tracking codes. Start down the 0A column as the lower codes (typically 0A to ZA) are stocked. The chart continues on to ZZ. Note that there only 25 letters used—Q is not used.

Codes are ordered with upper case letters. Labels with two letter codes will show the first letter in upper case and the second letter in lower case.

	Code	Application & Date	Code	Application & Date	Code	Appli & Da
Start Down	0A	granulator machine #472 24/3/01	Aa		Ab	
	0B		Ba		Bb	
	0C		Ca		Cb	
	0D	ine 67	Da		Db	

	Code	Application & date	Code	Application & date	Code	Application & date	Code	Application & date	Code	Application & date	Code	Application & date	Code	Application & date
Start Down	0A		Aa		Ab		Ac		Ad		Ae		Af	
	0B		Ba		Bb		Bc		Bd		Be		Bf	
	0C		Ca		Cb		Cc		Cd		Ce		Cf	
	0D		Da		Db		Dc		Dd		De		Df	
	0E		Ea		Eb		Ec		Ed		Ee		Ef	
	0F		Fa		Fb		Fc		Fd		Fe		Ff	
	0G		Ga		Gb		Gc		Gd		Ge		Gf	
	0H		Ha		Hb		Hc		Hd		He		Hf	
	0I		Ia		Ib		Ic		Id		Ie		If	
	0J		Ja		Jb		Jc		Jd		Je		Jf	
	0K		Ka		Kb		Kc		Kd		Ke		Kf	
	0L		La		Lb		Lc		Ld		Le		Lf	
	0M		Ma		Mb		Mc		Md		Me		Mf	
	0N		Na		Nb		Nc		Nd		Ne		Nf	
	0O		Oa		Ob		Oc		Od		Oe		Of	
	0P		Pa		Pb		Pc		Pd		Pe		Pf	
	0R		Ra		Rb		Rc		Rd		Re		Rf	
	0S		Sa		Sb		Sc		Sd		Se		Sf	
	0T		Ta		Tb		Tc		Td		Te		Tf	
	0U		Ua		Ub		Uc		Ud		Ue		Uf	
	0V		Va		Vb		Vc		Vd		Ve		Vf	
	0W		Wa		Wb		Wc		Wd		We		Wf	
	0X		Xa		Xb		Xc		Xd		Xe		Xf	
	0Y		Ya		Yb		Yc		Yd		Ye		Yf	
	0Z		Za		Zb		Zc		Zd		Ze		Zf	

Rotary Switches



BIA 974016

Description

The rotary switches are used for electrical isolation of machinery to enable safe access. Once the power has been turned off, the key can then be withdrawn and used in the next sequence of operation such as unlocking an access hatch or allowing valves to be operated.

The rotary switch can either be mounted in a panel or purchased in an IP65 enclosure. The rotary switch is available with 4 poles, either 4 N.O. or 2 N.C. and 2 N.O. The 100A 4 N.O. switch has 3 contacts rated at 100A and 1 contact rated at 20A.

Features

- 316L stainless steel keys
- Direct drive operation—positively opens contacts
- IP 65 rated enclosure—water and dust resistant
- Stainless steel dust cap included
- Up to 100A isolation
- 4 N.O. or 2 N.O. and 2 N.C. contacts
- Replaceable code barrel assembly

Specifications

Standards	EN292-1&2, EN1088, IEC/EN60204-1, IEC/EN60947-5-1, ISO12100-1&2, ISO14119, GS-ET-19, AS4024.1, UL508, CSA 22.2
Category	Cat. 1 per EN 954-1 (ISO 13849-1) Suitable for Cat. 2, 3, and 4 systems
Approvals	BG, cULus on contact block, CE marked for all applicable directives, and C-Tick not required
Enclosure Rating	IP65 (RKS only)
Conduit Entries	4 x M20 (RKS only)
Operating Temperature	-10°C to +40°C (14°F to +104°F)
Mechanical Operations	100,000
Max. Shear Force to Key	15.1kN (3398lbs)
Max. Torque to Key	14Nm (124lb•in)
Humidity	95% RH
Finger Protection	DIN 57106/VDE 0106 T.100

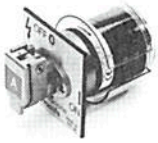
Specifications (continued)

Weight				
RPSE 10, 11, 12, 13, 20	500g (1.1lbs)			
RPSE14, 16	1000g (2.2lbs)			
RKSE10,11,12,13	850g (1.9lbs)			
RKSE14,16	1250g (2.8lbs)			
Electrical Operations	>100,000			
Climatic Test	Constant to DIN IEC 68 Part 2-3 Variable to DIN IEC 68 Part 2-30			
Ambient Temperature	Encased -25°C to +40°C (10°F to +104°F)			
Rtd. Insulation Voltage (Ui)	690V			
Rtd. Impulse withstand Volt. (Uimp)	6kV			
S3 Intermittent Rating (VDE 0530 Part 1) Duty Factor	60/40/25% = 1, 3/1, 6/2xlu			
Last Two-Digits of Catalog No. (See Product Selection table)	10 11 16	12	13	14
Rtd. Uninterrupted Current (Iu)				
IEC/EN/VDE	20A	32A	63A	100A
UL/CSA	16A	30A	60A	100A
Rtd. Operational Voltage (Ue)				
IEC/EN/SEV/VDE	690V	690V	690V	1000V
UL/CSA	600V	600V	600V	600V
Main Switch Isol. Voltage Up To	750V	750V	750V	1000V
Rtd. Operational Current (Ie)				
AC-21A IEC/EN/VDE	20A	32A	63A	100A
AC-1 SEV	20A	32A	63A	100A
Rtd. Oper. Power at 50-60Hz AC-23A IEC/EN/VDE				
3 Phase 220-240V	4kW	7.5kW	15kW	22kW
3 Pole 380-440V	7.5kW	15kW	30kW	37kW
500-690V	7.5kW	15kW	30kW	37kW
AC-3A IEC/EN/VDE				
3 Phase 220-240V	4kW	7.5kW	15kW	22kW
3 Pole 380-440V	5.5kW	11kW	22kW	37kW
500-690V	5.5kW	11kW	22kW	30kW
DOL-Rating UL/CSA				
3 Phase 140V	1.5HP	3HP	5HP	7.5HP
3 Pole 240V	3HP	10HP	15HP	30HP
480V	7.5HP	20HP	30HP	50HP
600V	10HP	20HP	40HP	50HP
Rated Breaking Capacity				
AC-23/AC-3 220-240 V	250A	330A	500A	600A
Motor Switch 380-440 V	250A	330A	500A	600A
500-690 V	150A	220A	270A	300A
Maximum Fuse Size (GI)	25A	35A	63/50A	100A
Rated Fuse Short Circuit Current	15kA	15kA	15/20kA	25kA
Terminal Cross Section				
Single/Multiple Wire: min. mm^2	1	1	4	2.5
max. mm^2	10	10	16	3.5
Fine Strand Wire minimum mm^2	0.75	0.75	2.5	1.5
With Sleeve maximum mm^2	6	6	10	2.5
American Wire Gauge (AWG)	8	8	6	2

The Prosafe Advantage

Stainless steel construction.

Product Selection

Type		Contacts	Current	Catalogue Number
	IP65 Enclosure Mounted	4 N.O.	20A	440T-MRKSE10❶
		2 N.O. & 2 N.C.		440T-MRKSE11❶
		4 N.O.	32A	440T-MRKSE12❶
			63A	440T-MRKSE13❶
		3 N.O. & 1 N.O.	3 N.O. 100A and 1 N.O. 20A	440T-MRKSE14❶
		8 N.O.	20A	440T-MRKSE16❶
	Panel Mounted	4 N.O.	20A	440T-MRPSE10❶
		2 N.O. & 2 N.C.		440T-MRPSE11❶
		4 N.O.	32A	440T-MRPSE12❶
			63A	440T-MRPSE13❶
		3 N.O. & 1 N.O.	3 N.O. 100A and 1 N.O. 20A	440T-MRPSE14❶
		8 N.O.	20A	440T-MRPSE16❶
		4 N.O.	40A	440T-MRPSE20❶

❶ Substitute the desired primary code for this symbol (key not included). See page 5-6 for code selection.

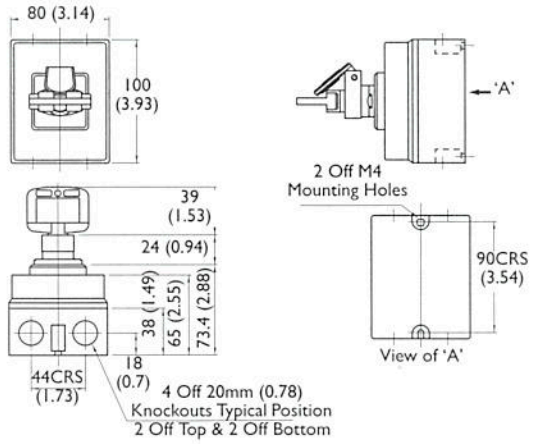
Accessories

Description	Additional Information	Catalogue Number
Replacement Key	See page 5-33	440T-AKEYE10⊗
Replacement Code Barrel, All Except 100A		440T-ASCBE14❶
Replacement Code Barrel, 100A		440T-ASCBE11❶
Replacement Dust Cap		440T-ASFC10⊗
Cable Grip, M20 Conduit	14-2	440A-A09028
Adaptor, M20 to 1/2in NPT Plastic	14-2	440A-A09042
Supplemental Contact Assembly, 20A 1 N.O. Late Make, Early Break 1 N.C. Auxiliary	For use with RPSE12, RPSE13, RPSE20	440T-AACA10
Supplemental Contact Assembly, 20A 2 N.O. Late Make, Early Break	For use with RPSE12, RPSE13, RPSE20	440T-AACA11

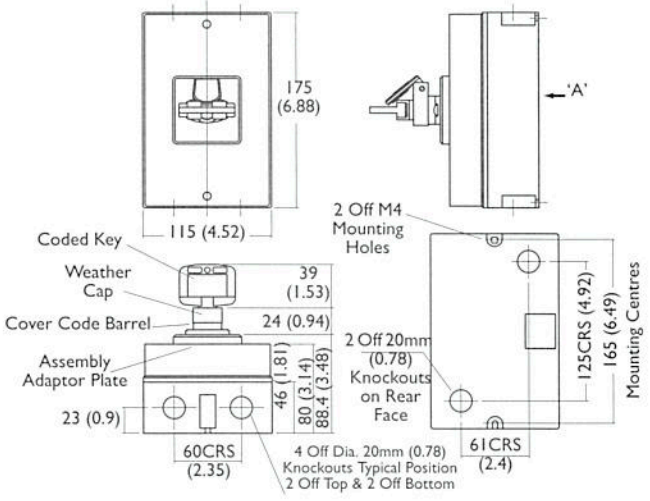
❶ Substitute the desired primary code for this symbol (key not included). See page 5-6 for code selection.
⊗ Substitute the desired code for this symbol. See page 5-6 for code selection.

Approximate Dimensions—mm (inches)

RKSE10 and RKSE11

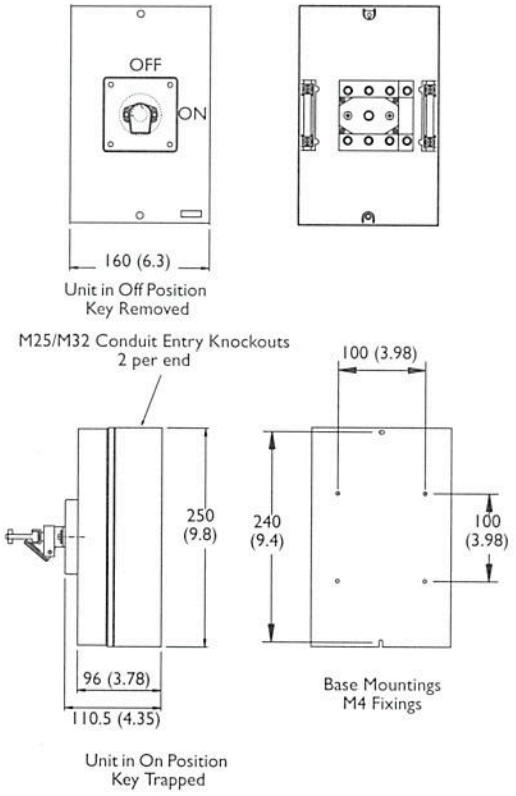


RKSE12 and RKSE13

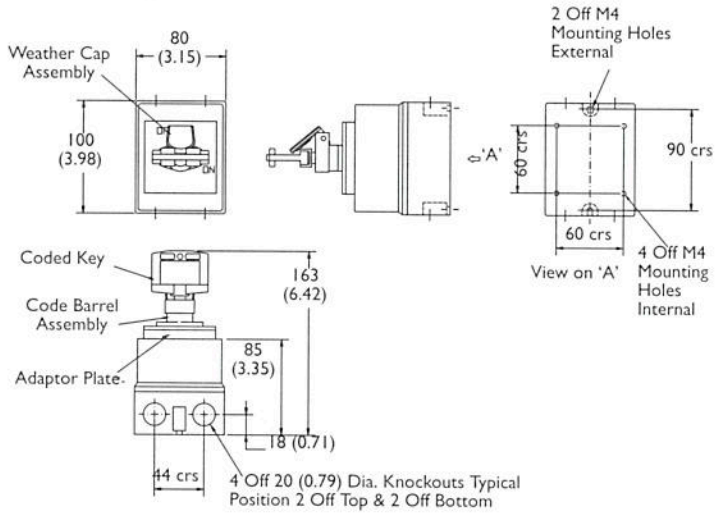


Approximate Dimensions—mm (inches) (continued)

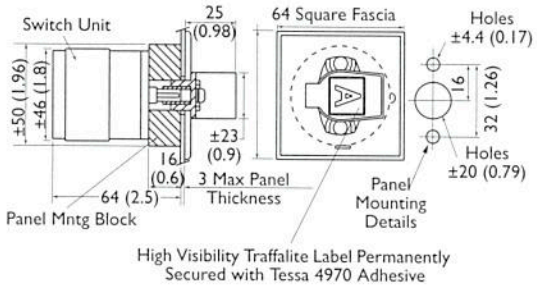
RKSE14



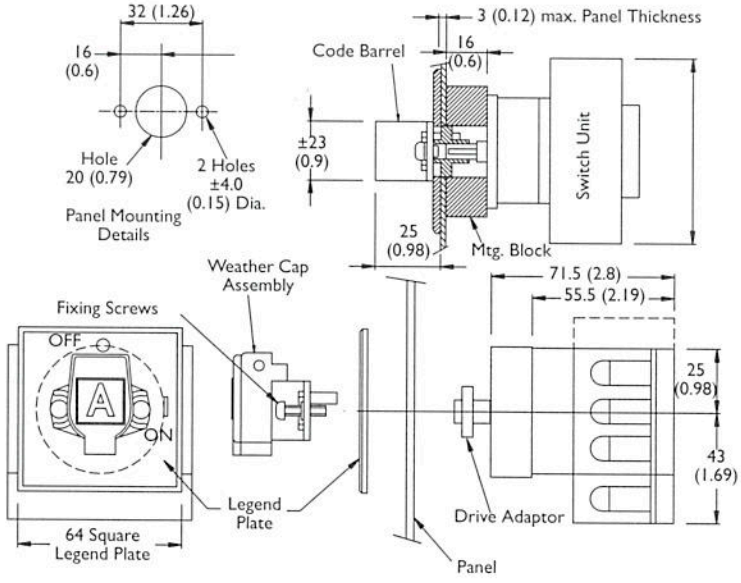
RKSE16



RPSE10 and 11

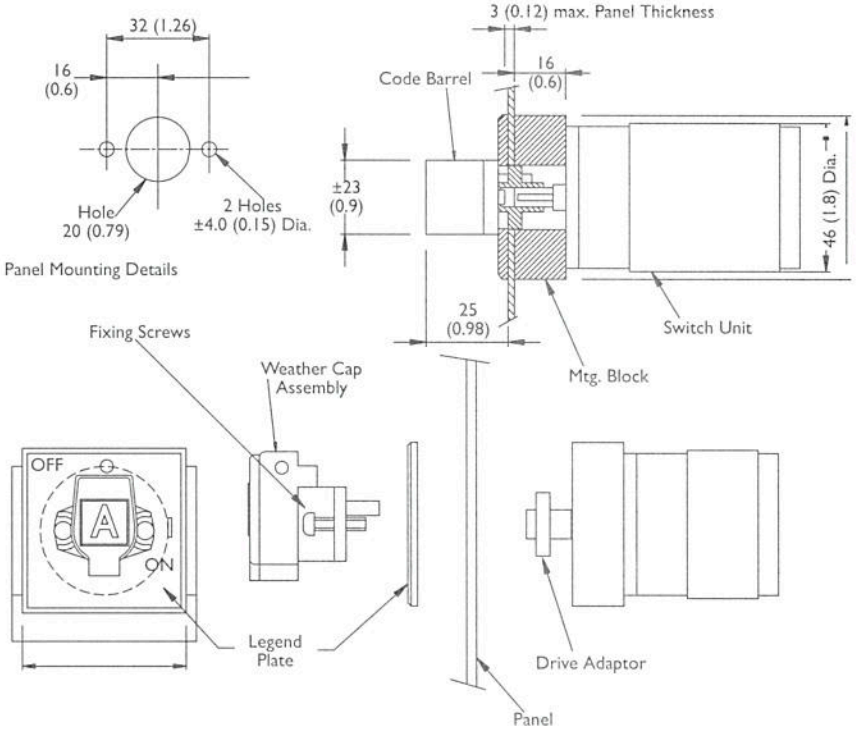


RPSE 12, 13, 14 and 20



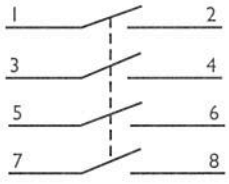
Approximate Dimensions—mm (inches) (continued)

RPSE16

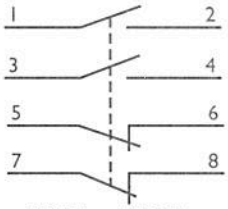


Typical Wiring

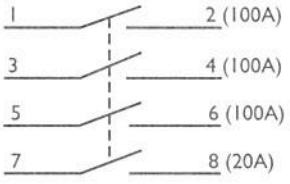
Diagrams Shown with Key Free



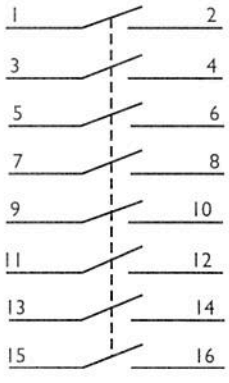
RKSE10 and RPSE10
RKSE12 and RPSE12
PKSE13 and RPSE13
--------- and RPSE20



RKSE11 and RPSE11



RKSE14 and RPSE14



RKSE16 and RPSE16