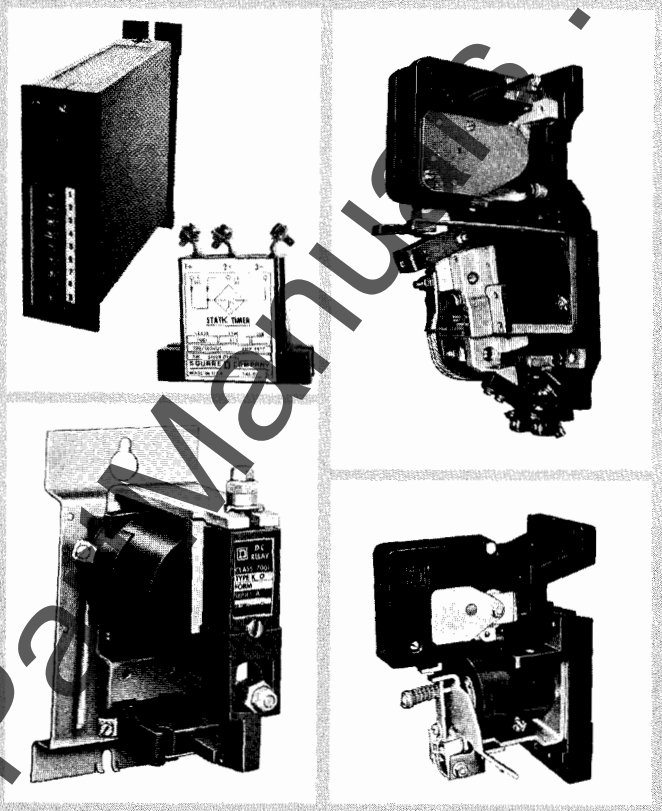


DC Relays & Contactors

CONTENTS

DC RELAYS & CONTACTORS
SELECTION GUIDE

Class 7001 Type K Relays

- Mill duty construction
- Designed for steel base mounting
- 10 ampere continuous rating
- 600 volts dc maximum

For dimensional information see page 7

Type KG **General Purpose Relay**	• Used for general purpose relaying applications • Available with up to 4 double pole single throw contact blocks • Uses shunt operating coils	For product listing see page 3 For application information see pages 3 and 6
Type KP **Plugging Relay**	• Used on dc reversing plugging control panels to detect motor plugging operations • Available with one normally closed contact • Rectifier in series with operating coil	For product listing see page 3 For application information see pages 3 and 6
Type KE **Voltage Sensitive Relay**	• Frequently used for sensing dc motor armature voltage • Available with up to 2 double pole single throw contact blocks	For product listing see page 4 For application information see pages 4 and 6
Type KF **Field Relay**	• Used for controlling dc motor shunt fields • Also used as UV relay on control panels • 25 ampere continuous rating • Single pole normally open or normally closed contact with permanent magnet blowout	For product listing see page 5 For application information see pages 5 and 6
Type KI **Current Sensitive Relay**	• Frequently used for sensing dc motor current • Available with up to 2 double pole single throw contact blocks	For product listing see page 6 For application information see page 6

Class 7001 Type ST Relays

- Used as acceleration relay for dc motor circuits
- Encapsulated dc timing relay consisting of solid state circuit components
- One normally open timed closed contact with two time delay setting
- 300 volts dc maximum

For product listing see page 8

Class 7001 Type SSI Relays

- Used instead of acceleration relays for dc motor circuits
- Time delay depends on motor current
- Solid state circuit components
- Used instead of 3 or 4 acceleration relays
- 300 volts dc maximum

For product listing see page 9

Class 7001 Type SI Relays

- Accelerating relay for dc motor circuits
- Time delay depends on motor current
- Relay operating coil is connected in series with motor armature
- Available with one normally closed contact

For product listing see page 10

Class 7004 Type M Contactors

- Mill duty clapper type contactor
- Available in NEMA sizes 1 through 8
- High strength glass polyester insulating base for steel base mounting
- LINE-ARC® method of arc extinction
- Full line of accessories available
- 600 volts dc maximum

For product listing see page 11
For application information see pages 12 and 13
For user modification kits see page 11
For dimensional information see pages 13 and 14

Class 9999 Type AI Arc Inhibitor

- Reduces arcing of pilot devices in dc inductive circuits
- Limits inductive surge to 600 volts maximum

For product listing see page 13

TYPE K DC RELAYS

PRICING INFORMATION AND APPLICATION DATA

CLASS 7001

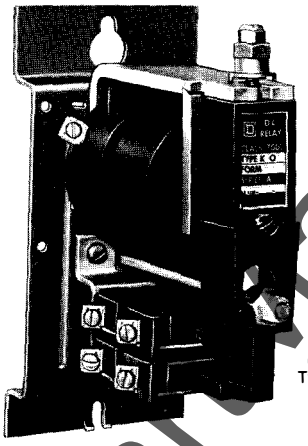
Class 7001 Type K relays are built to withstand severe service. They are recommended for use on heavy industry dc drives such as cranes and mill auxiliaries.

- MILL DUTY CONSTRUCTION
- DESIGNED FOR STEEL BASE MOUNTING
- 10 AMPERE CONTINUOUS RATING
- 600 VOLTS DC MAXIMUM

TYPE KG GENERAL PURPOSE RELAY

Type KG relays are recommended for general purpose relaying applications. The shunt operating coils are designed in accordance with NEMA standards to withstand 110% of rated voltage continuously and to operate successfully at 80% rated voltage.

Total No. of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	Price
1	0	KGO-10	$196.
1	1	KGO-11	208.
0	1	KGO-01	196.
2	0	KGO-20	208.
2	1	KGO-21	228.
2	2	KGO-22	256.
1	2	KGO-12	228.
0	2	KGO-02	208.
3	0	KGO-30	240.
3	1	KGO-31	260.
3	2	KGO-32	284.
3	3	KGO-33	304.
2	3	KGO-23	284.
1	3	KGO-13	260.
0	3	KGO-03	240.
4	0	KGO-40	260.
4	1	KGO-41	284.
4	2	KGO-42	304.
4	3	KGO-43	328.
4	4	KGO-44	352.
3	4	KGO-34	328.
2	4	KGO-24	304.
1	4	KGO-14	284.
0	4	KGO-04	260.



Class 7001
Type KGO-22
Relay

- AVAILABLE WITH UP TO 4 DOUBLE POLE SINGLE THROW CONTACT BLOCKS
- LARGE SELECTION OF STANDARD SHUNT COILS

ORDERING INFORMATION REQUIRED:

1. Class
2. Type
3. Coil voltage

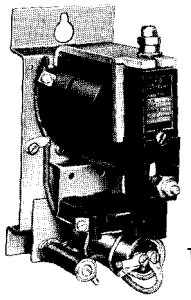
TYPE KP PLUGGING RELAY

Type KP relays are rectifier type plugging relays. They are used on dc reversing plugging control panels to detect plugging operations and limit motor torque by inserting resistance into the motor armature circuit.

APPLICATION DATA

To insure proper operation, the Type KP relay is furnished with a coil rated for one half the system voltage. See Class 6121 or Class 6131 Catalog sheets for typical plugging relay connection on reversing plugging bridge and trolley drives.

The relay is furnished with one normally closed contact. Relays KPO-1 through KPO-4 operate when the motor approaches standstill and are thus suitable for use on a single step plugging scheme or as the final step in a two step plugging scheme. Relays KPO-5 through KPO-7 operate at about motor full load speed and are therefore used in the first plugging step of a two step scheme. To achieve the correct pick-up and drop-out characteristics, relays KPO-5, 6, 7 include a resistor and capacitor mounted to the relay base.



Class 7001
Type KPO-5
Relay

- RECTIFIER IN SERIES WITH OPERATING COIL
- AVAILABLE WITH ONE NORMALLY CLOSED CONTACT

Relay Function	System Voltage	Contacts	Open Type	
			Type	Price
Single Step	120	1 N.C.	KPO-1	$236.
Plugging System or Second Step	240	1 N.C.	KPO-2	
For Two Point	440	1 N.C.	KPO-3	
Plugging System	550	1 N.C.	KPO-4	
First Step	240	1 N.C.	KPO-5	296.
For Two Point	440	1 N.C.	KPO-6	
Plugging System	550	1 N.C.	KPO-7	

ORDERING INFORMATION REQUIRED:

1. Class
2. Type

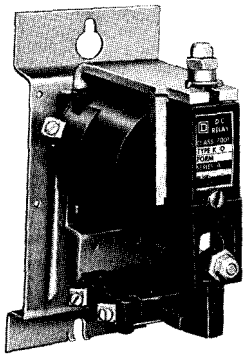
PRINTED IN U.S.A.

TYPE K DC RELAYS

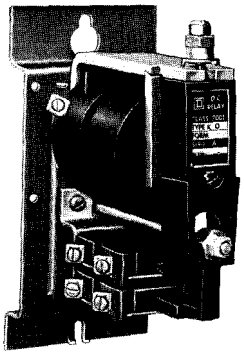
PRICING INFORMATION AND APPLICATION DATA

TYPE KE VOLTAGE SENSITIVE RELAY

Type KE relays are recommended for applications requiring voltage sensitive adjustable relays. They are frequently used for sensing DC motor armature voltage which is an indication of motor speed.



Class 7001
Type KEO-11
Relay



Class 7001
Type KEO-22
Relay

- AVAILABLE WITH UP TO 2 DOUBLE POLE SINGLE THROW CONTACT BLOCKS
- EASILY ADJUSTABLE PICK-UP AND DROP-OUT
- LARGE SELECTION OF STANDARD SHUNT COILS

Total No. of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	**Price**
1	0	KEO-10	**$236.**
1	1	KEO-11	**248.**
0	1	KEO-01	**236.**
2	0	KEO-20	**248.**
2	1	KEO-21	**268.**
2	2	KEO-22	**296.**
1	2	KEO-12	**268.**
0	2	KEO-02	**248.**

APPLICATIONS

Relay Designation	Relay Function	Type	Coil Volts	Relay Setting
LSR	LIMIT SWITCH RELAY used on Class 6121 Frontline hoist control panels with Type H and M contactors.	KEO-01	120	55V P.U.
LSR	LIMIT SWITCH RELAY used on Class 6110 or Class 6121 hoist control panels with Type L LINE-ARC® contactors.	KEO-02	120	55V P.U.
NP	NON-PLUG RELAY for compound and shunt motors.	KEO-02	240	Min. D.O.
VR	VOLTAGE RELAY initiates high speed lowering on hoist controllers.	KEO-11	240	105V P.U.
VR	VOLTAGE RELAY used on reversing-plugging controllers with Emergency or Service Dynamic Braking.	KEO-11	240	Min. D.O.
1VR 2VR	VOLTAGE RELAYS used on hoist controllers. 1VR initiates high speed lowering. 2VR functions as an overspeed relay.	KEO-11 KEO-11	120 120	105V P.U. 250V P.U.
VR	VOLTAGE RELAY used to control application of armature shunt contactors on multi-step slowdown circuits.	KEO-11	as required	as required
VR	VOLTAGE RELAY used for over voltage protection on adjustable voltage controllers.	KEO-11	as required	as required
VR	VOLTAGE RELAY used for clamping circuit to provide fast start in slow speed operating range of controller.	KEO-11	as required	as required

APPLICATION DATA

ADJUSTMENT RANGE

Relay pick-up is adjustable between .20 and 1.34 of rated coil voltage. Relay drop-out is adjustable between .04 and .98 of rated coil voltage. Pick-up and drop-out adjustments are not independent. The ratio of drop-out setting to pick-up setting of the relay must be between .13 and .85.

ORDERING INFORMATION REQUIRED:

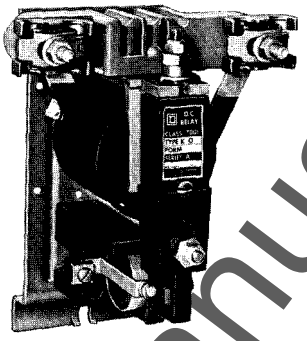
1. Class
2. Type
3. System voltage
4. Pick-up and/or drop-out setting. If both pick-up and drop-out settings are required, also specify which is most important.

TYPE K DC RELAYS
PRICING INFORMATION AND APPLICATION DATA

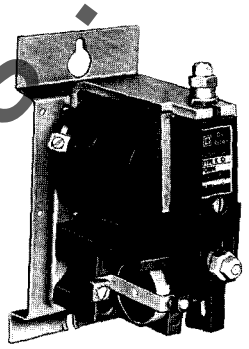
TYPE KF FIELD RELAY

Type KF relays are recommended for controlling dc motor shunt fields and other inductive loads such as groups of relay or contactor coils. All Type KF relays have a high current single pole contact with a permanent magnet blowout.

- 25 AMPERE CONTINUOUS CURRENT RATING
- AVAILABLE WITH A SERIES, A SHUNT, OR A COMBINATION OF ONE SERIES AND ONE SHUNT OPERATING COIL
- AVAILABLE WITH ONE SINGLE POLE SINGLE THROW NORMALLY OPEN OR NORMALLY CLOSED CONTACT



Class 7001
Type KFO-57
Relay



Class 7001
Type KFO-70
Relay

APPLICATIONS

Relay Designation	Relay Function	Type
FA	ACCELERATION of Adjustable Speed Motors on weakened field. (Requires provision on the Control with which it is used, for short-circuiting the Relay Contacts in order to provide full field during acceleration to base speed).	KFO-10 thru KFO-18
FFA	ACCELERATION of Adjustable Speed Motors on weakened field and provides full field during acceleration to base speed.	**Consult Factory**
FK	ACCELERATION and DECELERATION of Adjustable Speed Motors. Provides full field during acceleration to base speed and during dynamic braking for stopping, also provides for acceleration on weakened field.	KFO-50 thru KFO-58
FD	DECELERATION of Adjustable Speed Motors by alternately strengthening and weakening the shunt field during dynamic braking.	KFO-50 thru KFO-58 Form NC
UV	LOW VOLTAGE PROTECTIVE RELAY used on dc Crane and Mill Controllers with protection.	KFO-70 thru KFO-73
GENERAL PURPOSE FIELD RELAY used for General Purpose Relay requiring 25 ampere continuous current rating.		KFO-80 thru KFO-83

Coils		Contacts*	Open Type	
Type	Maximum Contin. Amps. (Series Coil)		Type	Price
1 Series	7.4	1 N.O.	KFO-10	**$340.**
	11.7		KFO-11	
	18.8		KFO-12	
	29.5		KFO-13	
	46.9		KFO-14	
	73.6		KFO-15	
	114		KFO-16	
	172		KFO-17	
	258		KFO-18	
1 Series & 1 Shunt	7.4	1 N.O.	KFO-50	**340.**
	11.7		KFO-51	
	18.8		KFO-52	
	29.5		KFO-53	
	46.9		KFO-54	
	73.6		KFO-55	
	114		KFO-56	
	172		KFO-57	
	258		KFO-58	
1 Shunt	240 Volt	1 N.O.	KFO-70	**340.**
	120		KFO-71	
	440		KFO-72	
	550		KFO-73	
1 Shunt	240 Volt	1 N.O.	KFO-80	**340.**
	120		KFO-81	
	440		KFO-82	
	550		KFO-83	

*For 1 N.C. contact in place of N.O. contact specify Form N.C.

ORDERING INFORMATION REQUIRED:

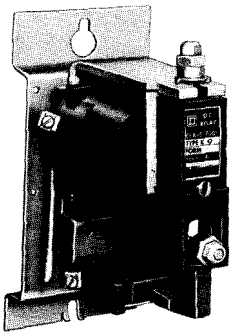
1. Class
2. Type
3. Form
4. System voltage
5. Pick-up and/or drop-out settings. If both pick-up and drop-out settings are required also specify which is most important.

TYPE K DC RELAYS

PRICING INFORMATION AND APPLICATION DATA

TYPE KI CURRENT SENSITIVE RELAY

Type KI relays are recommended for applications requiring current sensitive adjustable relays.



- AVAILABLE WITH UP TO 2 DOUBLE POLE SINGLE THROW CONTACT BLOCKS
- ADJUSTABLE CURRENT PICK-UP AND DROP-OUT
- LARGE SELECTION OF STANDARD COILS

Total No. of Control Circuit Contacts		Open Type	
N.O.	N.C.	Type	Price
1	0	KIO-10	**$256.**
1	1	KIO-11	**288.**
0	1	KIO-01	**256.**
2	0	KIO-20	**268.**
2	1	KIO-21	**288.**
2	2	KIO-22	**316.**
1	2	KIO-12	**288.**
0	2	KIO-02	**268.**

Note: Maximum coil rating 258 amp. continuous. For higher current coils consult factory.

APPLICATION DATA

For low currents, the terminals are on the operating coil. For higher current applications a wire wound or strap wound coil is used. Coil leads are brought to a power termination block at the top of the relay.

ADJUSTMENT RANGE

Relay pick-up is adjustable between .24 and 1.34 of rated coil current. Relay drop-out is adjustable between .20 and .98 of rated coil current. Pick-up and drop-out adjustments are not independent. The ratio of drop-out setting to pick-up setting of the relay must be between .13 and .85. For settings lower than the minimum pick-up or drop-out listed above contact your local Square D field office.

APPLICATIONS

Relay Designation	Relay Function	Type
FL	FIELD FAILURE RELAY for compound and shunt motors	KIO-10
JR	JAM RELAY limits stall torque on series motors.	KIO-01
LR	LOAD RELAY operates at a preset current (load).	KIO-11
SR	SERIES RELAY used as shunt brake interlock relay.	KIO-10

ORDERING INFORMATION REQUIRED:

1. Class and type number
2. Form number
3. Continuous current
4. System voltage
5. Pick-up and drop-out settings

APPLICATION DATA FOR ALL TYPE K RELAYS

WIRING

All wires can be terminated directly at the relay. Each contact block has self-aligning, captive screw type wire clamps. Similar wire clamps are used on the coil terminals. Since these relays are completely front mounted and front connected, all wires are accessible from the front.

MOUNTING

The Type K relays make use of a steel mounting plate and can therefore be mounted directly onto a steel pan or a steel framework structure of suitable dimensions.

CONTACTS

All Type K relays with the exception of the Type KF field relay use the same basic contact block as the Class 7004 Type H contactor. Each control circuit block may contain one normally open contact, one normally closed contact, or one normally open and one normally closed contact. The contact block on the Type KG, KE, and KI Relays is rated in accordance with NEMA Standard ICS2-125-2 for a heavy duty rating. The Type KF relay uses heavy duty contacts equipped with a permanent magnet blowout.

See Class 9999 catalog section for replacement contact block kits.

CONTACT RATINGS

Relay Type	Continuous Current	System Voltage	Interrupting Rating (Inductive)
KG KE KI	10 Amps	115-125 230-250 550-600	2.2 Amps 1.1 Amps 0.4 Amps
KF	25 Amps	115-600	25 Amps ① 15 Amps ②

① The type KF relay can interrupt 25 amps when used to switch resistance in a motor shunt field circuit. Examples are relays designated as FA, FFA, FK, and FD.

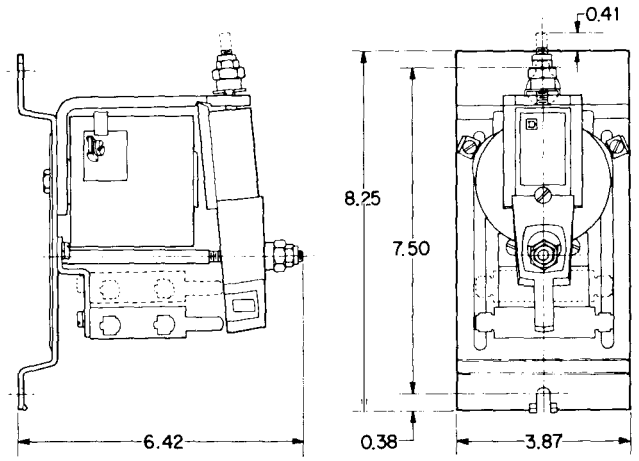
② The type KF relay interrupting rating is limited to 15 amps when the relay is used to switch highly inductive circuits consisting of contactor and relay combinations. A typical example would be a low voltage protective relay, designated UV.

COIL DATA

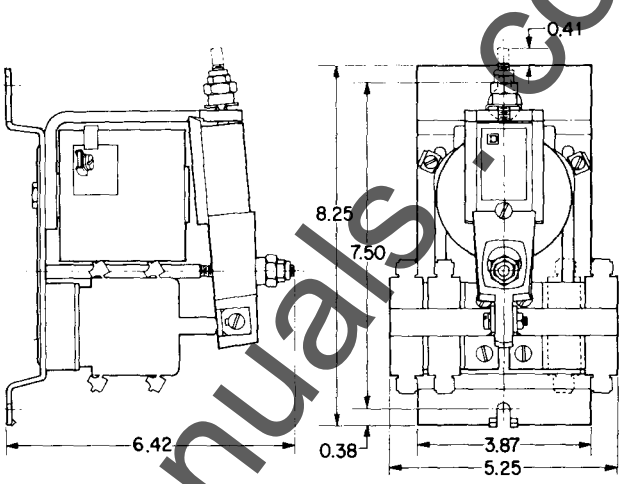
For complete coil data refer to the Class 9998 Coil Data catalog sheet.

TYPE K DC RELAYS

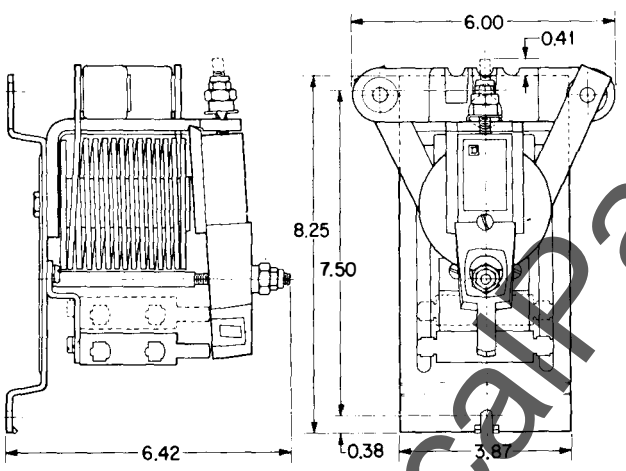
APPROXIMATE DIMENSIONS AND WEIGHTS — OPEN TYPE



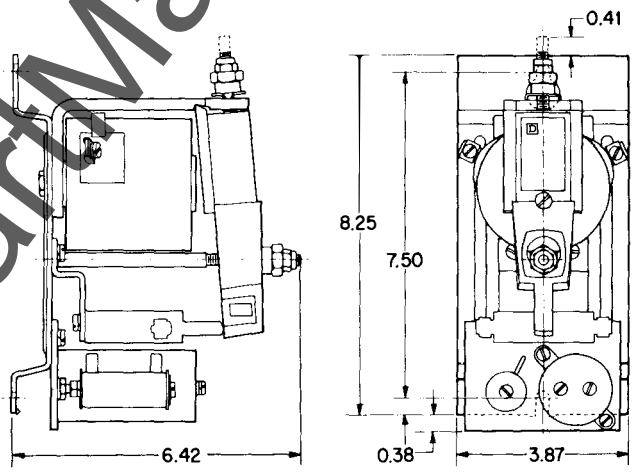
TYPE KGO-10 thru KGO-02, TYPE KEO-10 thru KEO-02, TYPE KPO-1 thru KPO-4 and TYPE KIO-10 thru KIO-02 (with Form Wound Coils)



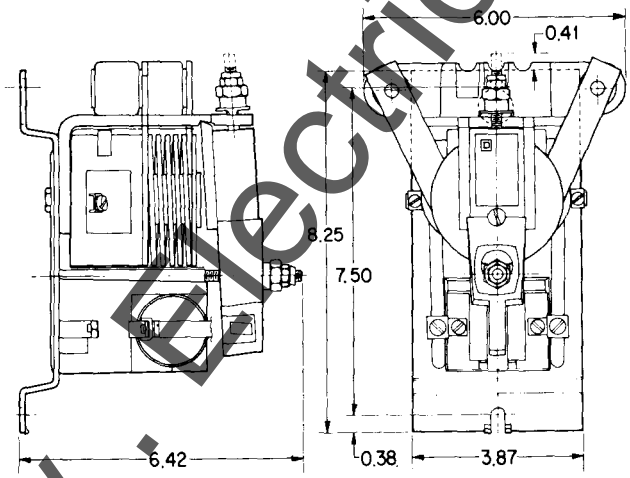
TYPE KGO-30 thru KGO-04



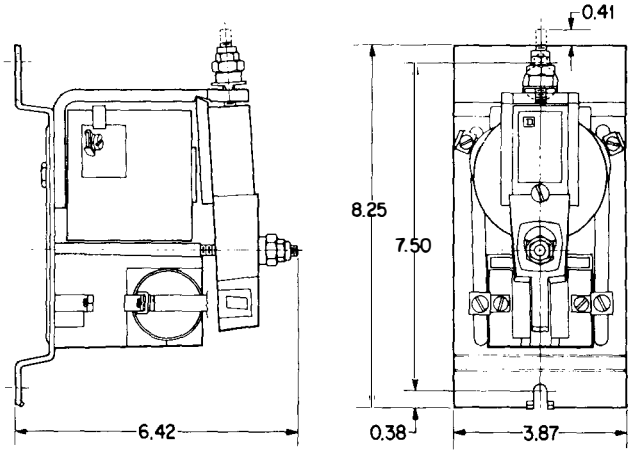
TYPE KIO-10 thru KIO-02 (with Strap Wound Coils)



TYPE KPO-5 thru KPO-7



TYPE KFO-10 thru KFO-69



TYPE KFO-70 thru KFO-73 and TYPE KFO-80 thru KFO-83

All relays have two mounting holes for ¼" screws.

Approximate net weight 7 lbs.

ENCLOSED TYPE

Minimum recommended dimensions for enclosure for all Type K relays — Height: 16", Width: 12", Depth: 8".

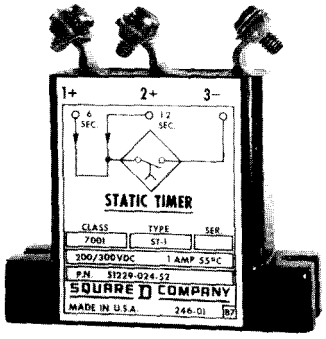
CLASS 7001

TYPE ST DC STATIC TIMER

PRICING INFORMATION AND APPLICATION DATA

JANUARY, 1981

Class 7001 Type ST Static Timers are used to control closure of accelerating contactors on dc crane and mill auxiliary control panels.



Class 7001
Type ST-1
Static Timer

- TWO TIME DELAY SETTINGS
- ENCAPSULATED DC TIMING RELAY CONSISTING OF SOLID STATE CIRCUIT COMPONENTS

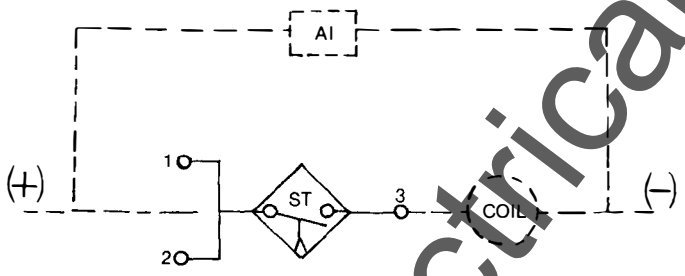
Class	Type	Price
7001	ST-1	$96.

APPLICATION DATA

The static timer is wired in series with the acceleration contactor coil and appears as a normally open timed closed contact. Voltage applied across terminals 1-3 initiates a 0.6 second time delay, whereas voltage applied across terminals 2-3 initiates a 1.2 second time delay. (Terminal 3 is always connected to the power supply negative.) Upon completion of the timing cycle the static timer appears as a contact closure and allows energization of the contactor coil.

Voltage Range	200-300 VDC	
Current Capacity	1 Ampere at 55°C	
Time Delay	Seconds	Terminals
	0.6	1(+)—3(—)
	1.2	2(+)—3(—)
Operating Temperature	-20° to +85°C	
Load Impedance (maximum)	3K ohms	

ARC INHIBITORS INSTALLED IN THE CONTROL CIRCUIT must be connected in parallel with the series combination of static timer and contactor coil as shown below.

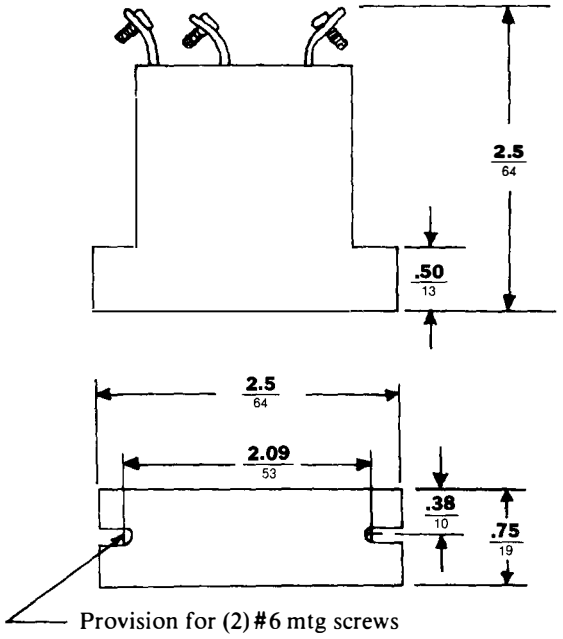


NOTE: Erratic operation of the static timer may result if an arc inhibitor is located directly across the contactor coil.

ORDERING INFORMATION REQUIRED:

1. Class 7001 2. Type ST-1

APPROXIMATE DIMENSIONS



Dual Dimensions: INCHES / Millimeters

TYPE SSI DC ACCELERATION MODULE

PRICING INFORMATION AND APPLICATION DATA

Class 7001 Type SSI accelerating modules are recommended for use in DC motor circuits and are used to control the closure of the accelerating contactors. They are frequently used on DC crane and mill auxiliary control panels.

- TIME DELAY DEPENDS ON MOTOR CURRENT
- SINGLE MODULE PROVIDES UP TO 4 STEPS OF ACCELERATION CONTROL USING 4 REPLACEABLE OUTPUT POWER THYRISTOR UNITS.
- NO POWER CONNECTIONS REQUIRED — MOTOR CURRENT SIGNAL OBTAINED FROM VOLTAGE DROP ACROSS LAST ACCELERATION RESISTOR STEP.
- INDICATING LIGHT MONITORS MODULE OPERATION.

The Type SSI module is used to control closure of the acceleration contactors on dc crane and mill panels. Proper dc motor acceleration is achieved by the module monitoring motor current and automatically adjusting the timing period between acceleration contactor closure.

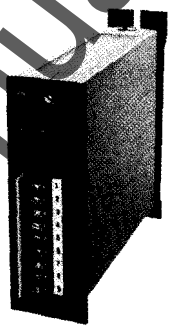
A sixteen position switch is used to adjust a current set point to equal 100% of motor full load current for hoist drives and 50% of motor full load current for travel drives. When the acceleration current falls below the set point, or the maximum time has elapsed, the next acceleration circuit is energized.

A 15 ampere (maximum) fuse should be installed in the control circuit for proper protection of printed circuit board foil runs.

If arc inhibitors are installed on the contactor coils, it is necessary that they be connected from the positive side of the contactor coil to the power supply negative. Erratic operation may result if the arc inhibitors are located directly across the contactor coils.

Voltage Range	200-300 vdc
Current Capacity	0.36 Ampere at 85°C 1.00 Ampere at 55°C
Time Delay +	0.1 to 1.0 Seconds
Operating Temperature	-20° to +85°C
Load Impedance (maximum)	3K ohms

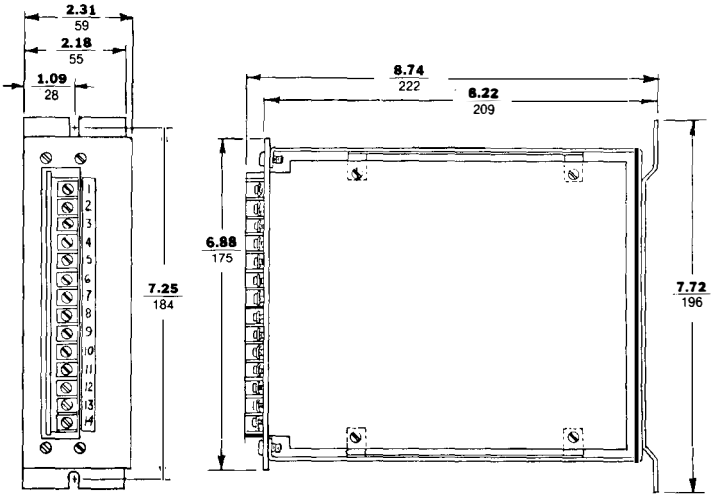
+ On hoist controllers the time delay is increased to 0.5 to 1.0 seconds on the first point of acceleration in the lowering direction to insure brake release.



Class 7001
Type SSI
Acceleration Module

Type	Acceleration Steps	Price
SSI-03	3	**$600.**
SSI-04	4	**700.**

APPROXIMATE DIMENSIONS



Dual Dimensions: **INCHES** / Millimeters

ORDERING INFORMATION REQUIRED:

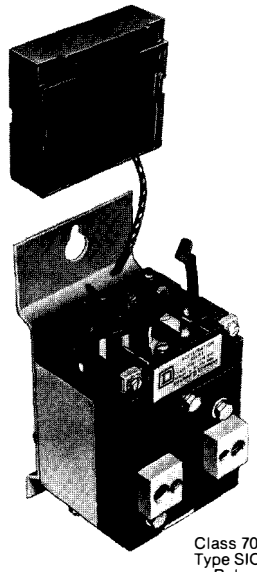
1. Class 2. Type

PRINTED IN U.S.A.

TYPE SI DC ACCELERATION RELAYS

PRICING INFORMATION AND APPLICATION DATA

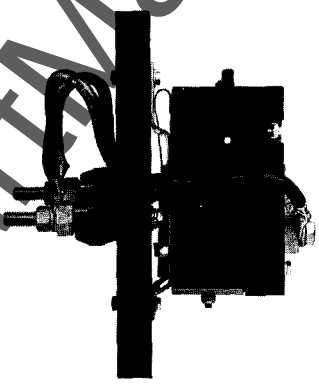
Class 7001 Type SI accelerating relays are used to control the closure of the accelerating contactors in DC motor ciruits. They are used on DC crane and mill auxiliary panels.



Class 7001
Type SIO-3
Relay

- TIME DELAY DEPENDS ON MOTOR CURRENT
- 600 VOLTS DC MAXIMUM
- RELAY OPERATING COIL CONNECTED IN SERIES WITH MOTOR ARMATURE

Maximum Continuous Current (Amperes)	Range of Full Load Motor Current (Amperes)	Open Type		Price
		With Copper Inductor Tube	With Aluminum Inductor Tube	
3.46	1.6- 6.7	SIO-1	SIO-21	**$560.**
14.4	6.8- 33.3	SIO-2	SIO-22	**560.**
32.9	33.4- 80.	SIO-3	SIO-23	**560.**
64.9	80. - 167.	SIO-4	SIO-24	**560.**
95.7	168. - 245.	SIO-5	SIO-25	**560.**
162.	246. - 408.	SIO-6	SIO-26	**560.**
335.	409. - 840.	SIO-7	SIO-27	**560.**
486.	841. -1167.	SIO-8	SIO-28	**560.**
791.	1168. -1900.	SIO-9	SIO-29	**560.**



Class 7001
Type SIO-3B
Back-Wired
Relay

MODIFICATIONS

Description	Price
Relay mounted on insulating base and back-wired to replace back connected relay. To specify this construction, modify the relay type number by the addition of suffix "B". Example: Type SI0-3 becomes SIO-3B.	**$200.**

APPLICATION DATA

Motor full load current range for each relay is selected to provide the following time delays.

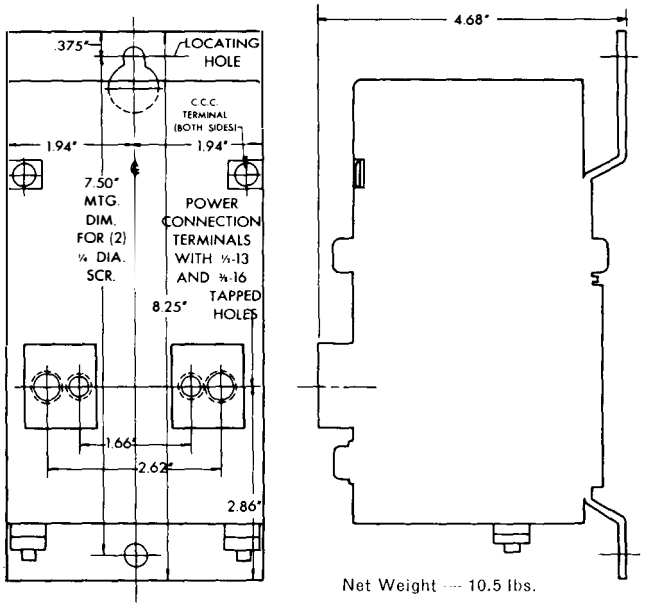
Inductor Tube Type	Time Delay in Seconds
copper	.37-.75
aluminum	.80- 1.45

The back-wired Type SI relay is supplied on an insulating base with the addition of power studs which are located in the same position as the coil leads on the back-connected SI relay which is being replaced.

ORDERING INFORMATION REQUIRED:

1. Class
2. Type
3. For back-wired relay ordered as a replacement device, supply controller references (serial number or wiring diagram) and specify the device designation.

APPROXIMATE DIMENSIONS AND WEIGHTS



Net Weight — 10.5 lbs.

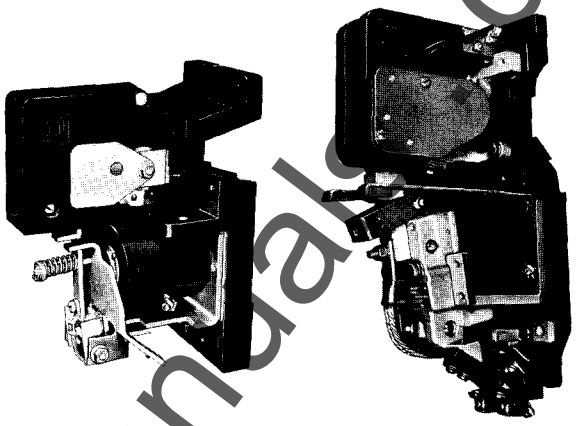
TYPE M LINE-ARC® DC CONTACTORS

PRICING INFORMATION

CLASS 7004

Type M dc magnetic, mill type, clapper contactors are designed for heavy industry dc drives such as dc cranes and mill auxiliaries. These contactors are ideally suited for the control of dc motors.

- FRONT CONNECTED
- HIGH STRENGTH GLASS POLYESTER INSULATING BASE FOR STEEL BASE MOUNTING
- LINE-ARC METHOD OF ARC EXTINCTION
- FULL LINE ACCESSORIES AVAILABLE



Class 7004
Type MXCO-1 Contactor

Class 7004
Type MEO-1 Contactor

BASIC CONTACTOR

The basic contactor is furnished without power lugs, electrical or mechanical interlocks.

Maximum Volts dc	Number of Poles►	NEMA Size	Open 8 Hr. Ampere Rating	Open Type	
				Type	**Price**
600	Single Pole Normally Open	1	25	MXCO-1	**$ 180.**
		2	50	MXDO-1	**224.**
		3	100	MEO-1	**376.**
		4	150	MFO-1	**456.**
		5	300	MGO-1	**616.**
		6	600	MHO-1	**1272.**
		6A†	810	MHAO-1	**1535.**
		7	900	MJO-1	**2254.**
		8	1350	MKO-1	**2552.**
	Single Pole Normally Closed	1	25	MXCO-3	**360.**
		2	50	MXDO-3	**376.**
		3	100	MEO-3	**512.**
		4	150	MFO-3	**624.**
		5	300	MGO-3	**936.**
		6	600	MHO-3	**1886.**
		7	900	MJO-3	**3112.**
		8	1350	MKO-3	**3524.**

► See contactor Application Data for double pole contactors.
† Not a NEMA size/rating.

D1B DISCOUNT

FACTORY INSTALLED MODIFICATIONS

Form	Description	NEMA SIZE	Price
Y78-1	Silver Faced Power Contact Tips	1	**$362.**
		2	**362.**
		3	**519.**
		4	**564.**
		5	**579.**
		6 & 6A*	**884.**
		7	**3303.**
		8	**3303.**

*6A is not a NEMA size/rating.

D15B DISCOUNT

ORDERING INFORMATION REQUIRED:

1. Class
2. Type
3. Form
4. Coil Voltage

ACCESSORY KITS FOR USER INSTALLATION

Class 9999 user modification kits include all necessary mounting hardware and installation instructions. Mechanical interlocks, pneumatic timers, and tie bars can be mounted on normally open devices only.

NEMA Size	Mechanical Interlock		Static Timer		Pneumatic Timer			Tie Bar		Power Lug†		Arc Inhibitor	
	Type	**Price**	On Delay Type	**Price**	On Delay Type	Off Delay Type	**Price**	Type	**Price**	Type	**Price**	Type	**Price**
1 & 2	MM-1	**$ 68.**	MS-1	**$144.**	MK-1	. . .	**$144.**	MT-1	**$24.**	. . .	. . .	. . .	. . .
3 & 4	MM-2	**68.**	MS-1	**144.**	MK-2	MK-5	**144.**	MT-2	**24.**	ML-1	**$24.**	. . .	. . .
5	MM-3	**96.**	MS-1	**144.**	MK-2	MK-5	**144.**	MT-3	**24.**	ML-2	**40.**		
6 & 6A►	MM-4	**120.**	. . .	. . .	MK-3	. . .	**168.**	MT-4	**40.**	ML-3	**92.**	MI-1	**$72.**
7 & 8	MM-5	**140.**	. . .	. . .	MK-3	. . .	**168.**	MT-5	**40.**	ML-3	**92.**	MI-1	**72.**

† Contains four clam-shell type lugs For copper conductors only
► 6A is not a NEMA size/rating

D1B DISCOUNT

NEMA Size	Electrical Interlock (one N.O. and one N.C. contact)	
	Type	**Price**
1 & 2	MX-11	**$85.**
3 & 4	MX-11	**85.**
5	MX-11	**85.**
6 & 6A*	MX-11	**85.**
7 & 8	MX-11	**85.**

*6A is not a NEMA size/rating.

D15B DISCOUNT

ORDERING INFORMATION REQUIRED:

1. Class 2. Type

CLASS 7004

TYPE M LINE-ARC® DC CONTACTORS

JANUARY, 1981

CONTACTOR APPLICATION DATA

WIRING

The NEMA sizes 1 through 5 Type M contactors have a wire accessway in the base for convenient out-of-the-way routing of cables and control wires. The NEMA size 6, 7 and 8 contactors have a flat mounting base. Power connections to the NEMA sizes 3 through 8 contactors can be made from either side.

MOUNTING

The Type M contactor with its insulated base can be mounted directly on uninsulated steel panels, angle iron frames, etc. The contactors are completely front-connected.

COIL DATA

Operating coils are designed in accordance with NEMA standards to withstand 110% of rated voltage continuously and to operate the contactor successfully at 80% of rated voltage. Standard coil voltages are 120V and 240V. For other available coil voltages, refer to the Class 9998 Coil Data Catalog Sheet.

ELECTRICAL INTERLOCKS

Electrical interlocks are rated in accordance with NEMA Standard ICS-2-125 (A600 and N600 Table Ratings).

A600	Maximum Continuous Amperes	Maximum Make and Break Current Amperes*							
		120V		240V		480V		600V	
		Make	Break	Make	Break	Make	Break	Make	Break
AC	10	60	6	30	3	15	1.5	12	1.2

N600	Maximum Continuous Amperes	Maximum Make and Break Current Amperes*					
		125V		250V		600V	
		Make	Break	Make	Break	Make	Break
DC	10	2.2	2.2	1.1	1.1	.4	.4

* Make and break ratings apply for double-throw contacts only when both the normally open and normally closed contacts are connected to the same polarity.

DOUBLE POLE CONTACTORS

Double pole normally open contactors can be built by ordering two single pole normally open contactors with half voltage operating coils and one tie bar kit. The two coils must be connected in series.

USER MODIFICATION KITS APPLICATION DATA

A number of Class 9999 user modification kits are available for use with Type M Contactors. Power contact tip parts kits are listed under Class 9998 in Catalog 9998/9999.

Maximum Number of Accessories and Accessory Combinations—

For single pole normally open contactors:

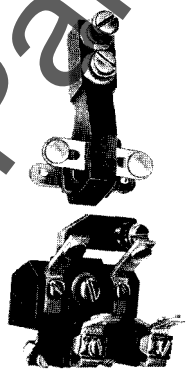
Two electrical interlock kits and any one of the following:

- Two static or pneumatic timer kits (one for NEMA sizes 1 & 2) (pneumatic timer only for sizes 6, 6A, 7 & 8) and one tie bar kit
- One pneumatic timer kit, one mechanical interlock kit and one tie bar kit
- Two mechanical interlocks
- One arc inhibitor kit, one pneumatic timer kit and one tie bar kit (on sizes 6, 6A, 7 & 8)
- One arc inhibitor kit, one tie bar kit (on sizes 6, 6A, 7 & 8) and one mechanical interlock kit

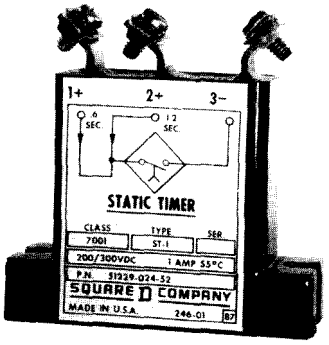
For single pole normally closed contactors:

Two electrical interlock kits and

- One arc inhibitor kit (on sizes 6, 6A, 7 & 8)



Class 9999 Type MX-11
Electrical Interlock Kit



Class 9999 Type MS-1
Static Timer Kit

ELECTRICAL INTERLOCKS

Control circuit interlocks are available in units of one normally open and one normally closed contacts. On each single pole normally open and normally closed contactor a maximum of two interlock kits can be mounted. Interlock kits include the movable and stationary contacts plus all necessary hardware for mounting.

STATIC TIMER

A static timer attachment is available in kit form for mounting on the Type M contactor. The kit includes a Class 7001 Type ST-1 dc static timer and all necessary hardware for mounting. The static timer cannot be mounted between two mechanically interlocked contactors. Initiation of timer must be done with an external contact. For application information, refer to the Class 7001 Type ST static timer in this catalog.

PNEUMATIC TIMER

A pneumatic timer attachment is available in kit form for mounting on the Type M contactors. The timer is convertible from on-delay to off-delay, and vice versa and has one normally open and one normally closed circuit. The timing range is adjustable from 0.1 second to one minute. A pneumatic timer cannot be mounted between two mechanically interlocked contactors.

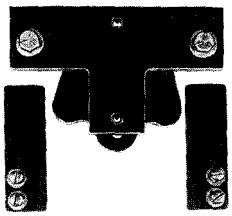
CONTACT RATINGS

System Voltage	Interrupting Rating (Inductive) — Amperes	
	Single Throw	Double Throw*
115-125	1.1	0.25
230-250	0.25	0.1
550-600	0.05	—

*Same Polarity

TYPE M LINE-ARC® DC CONTACTORS

USER MODIFICATION KITS APPLICATION DATA (CONT'D)



Class 9999
Type MM-1
Mechanical
Interlock Kit

MECHANICAL INTERLOCK

A horizontal mechanical interlock is mounted between two single pole normally open or double pole tied normally open contactors mounted side by side. This interlock prevents the two contactors from operating simultaneously. A pneumatic or static timer cannot be mounted between the two mechanically interlocked contactors.

LUGS

TYPE M contactors are furnished without power lugs. A kit is available consisting of lugs and hardware for mounting on Size 3 and larger contactors. No power lug kits are available for the NEMA Size 1 and 2 contactors. These contactors are designed to use crimp-on lugs supplied by the user.

LUG WIRE CAPACITY

*Lug Type	Min. Wire Size	Max. Wire Size
ML-1	Number 8	Number 00
ML-2	Number 0	300 MCM
ML-3	250 MCM	500 MCM

*Contains four clam shell type lugs. For copper conductors only.

POWER CONTACT TIPS

A Class 9998 power contact tips part kit consists of movable and stationary contact tips for two single pole contactors. Consult catalog 9998/9999 for additional information.

Copper contact tips are standard. Silver-faced contact tips are available and are recommended for applications where the contactors remain closed for long periods of time. Silver-faced contact tips are standard on crane manual magnetic disconnect switches and are optional on dc starters.

TIE BAR

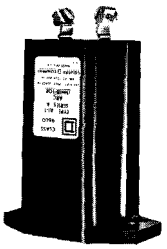
Applications requiring double pole Type M connectors can be met by supplying single pole contactors with tie bars. The tie bar is made from an insulating material and connects the armatures of the contactors together. For double pole contactors, it is recommended that the operating coils be connected in series. Each coil should be rated for one half of line voltage.

ARC INHIBITOR

The MI-1 arc inhibitor kit is available for Size 6, 6A, 7 & 8 Type M Contactors. The arc inhibitor mounts directly on the contactor and does not reduce the number of electrical interlock blocks that can be used. For NEMA Size 1 through 5 Type M Contactors, the arc inhibitor is separately mounted and should be ordered as a Class 9999 Type AI-1 arc inhibitor.

CLASS 9999 AI-1 ARC INHIBITOR

The Class 9999 AI-1 arc inhibitor is designed to reduce arcing of pilot devices in dc inductive control circuits of 250 vdc or less.

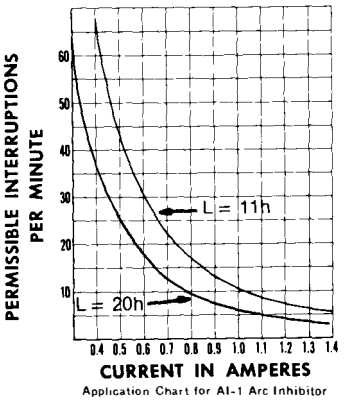


Class 9999
Type AI-1
Arc Inhibitor

Type	Price
AI-1	$56.

The AI-1 arc inhibitor will limit the inductive voltage surge to a maximum of 600 volts when applied in accordance with the application chart. When applying the arc inhibitor to a circuit, two factors must be considered — the current drawn by the inductive load and the number of times per minute that the load will be interrupted. Once these two factors are determined, the application is checked against the application chart. The chart shows the maximum interruptions per minute that the arc inhibitor can handle at a given current. As long as an application falls below the curve, the arc inhibitor will handle the load. The arc inhibitor is connected in parallel with the inductive load and is in the circuit at all times.

APPLICATION CHART FOR AI-1 ARC INHIBITOR

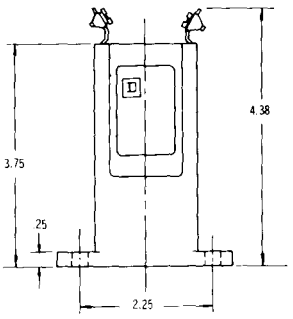


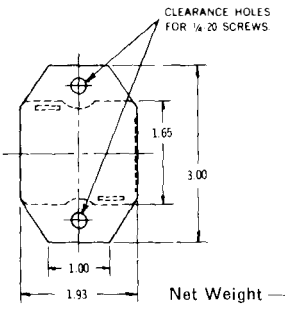
Application Chart for AI-1 Arc Inhibitor

ORDERING INFORMATION REQUIRED:

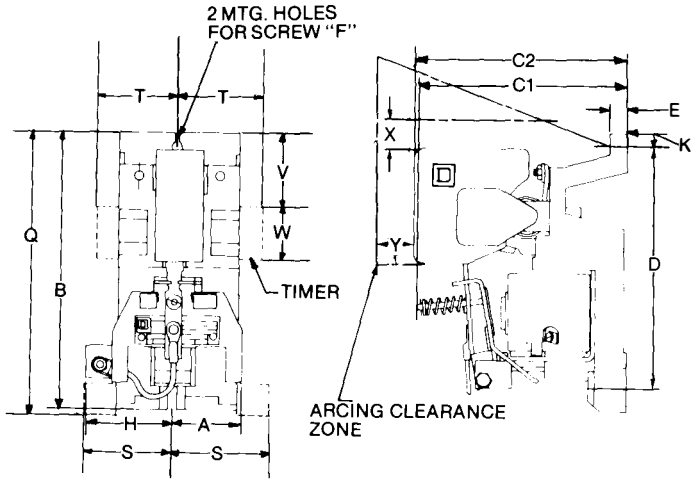
1. Class 9999 2. Type AI-1

APPROXIMATE DIMENSIONS AND WEIGHTS

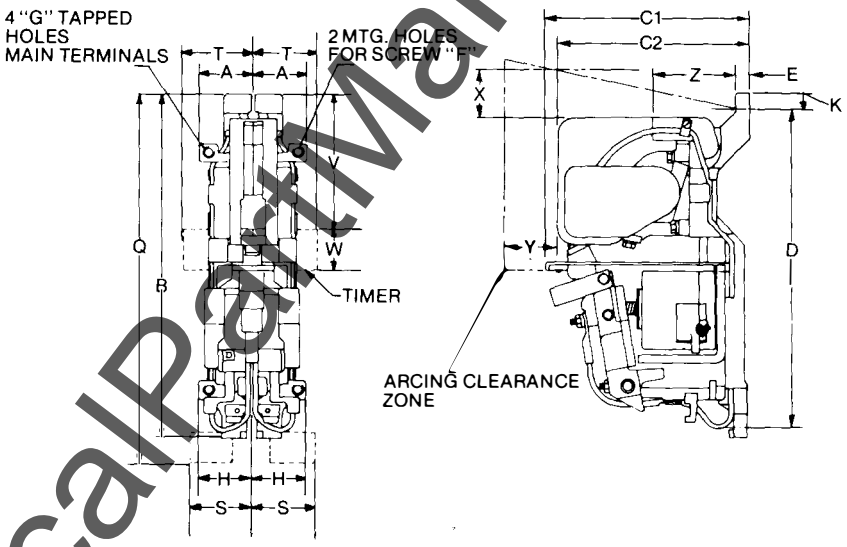




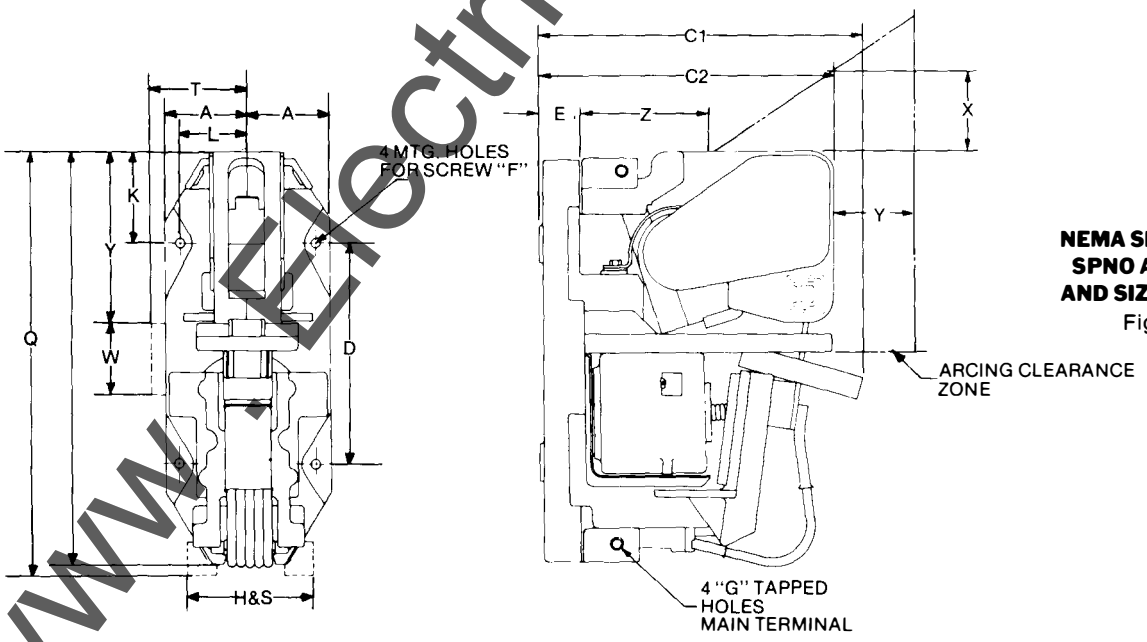
Net Weight — 1 lb.



NEMA SIZES 1, 2 SPNO AND SPNC
Figure 1



NEMA SIZES 3, 4, 5 SPNO AND SPNC
Figure 2



NEMA SIZES 6, 7, 8 SPNO AND SPNC AND SIZE 6A SPNO
Figure 3

TYPE M LINE-ARC® DC CONTACTORS

APPROXIMATE DIMENSIONS AND WEIGHTS — OPEN TYPE

CLASS 7004

NEMA Size	Type	Fig. No.	CONTACTOR DIMENSIONS ▲ A	B	C1	C2	D	E	F	G	H	K	L	Net Weight	Center to Center Spacing of S.P. Tied or Mechanically Interlocked Contactors*
1 2	MXCO-1 MXDO-1	1	**1.79** 46	**8.65** 220	**6.00** 153	**6.38** 162	**7.56** 192	**.52** 13	1/4	...	**2.29** 58	**.44** 11	...	**7** 3	**5.63** 143
1 2	MXCO-3 MXDO-3	1	**1.79** 46	**8.65** 220	**6.00** 153	**6.38** 162	**7.56** 192	**.52** 13	1/4	...	**2.29** 58	**.44** 11	...	**7** 3	**5.63** 143
3 4	MEO-1 MFO-1	2	**2.12** 54	**13.10** 333	**7.83** 199	**7.40** 188	**11.50** 292	**.56** 14	3/8	5/16-18	**2.13** 55	**.80** 20	...	**15** 7	**6.00** 153
3 4	MEO-3 MFO-3	2	**2.12** 54	**13.10** 333	**7.83** 199	**7.40** 188	**11.50** 292	**.56** 14	3/8	5/16-18	**2.13** 55	**.80** 20	...	**15** 7	**6.00** 153
5	MGO-1	2	**2.75** 70	**16.54** 420	**9.50** 242	**9.68** 246	**14.50** 368	**.96** 25	3/8	3/8-16	**2.78** 71	**1.02** 26	...	**30** 14	**7.00** 178
5	MGO-3	2	**2.75** 70	**16.54** 420	**9.50** 242	**9.68** 246	**14.50** 368	**.96** 25	3/8	3/8-16	**2.78** 71	**1.02** 26	...	**30** 14	**7.00** 178
6 6A†	MHO-1 MHAO-1	3	**3.50** 89	**19.90** 506	...	**13.64** 346	**6.00** 153	...	7/16	1/2-13	**2.85** 73	**8.30** 211	**2.94** 75	**70** 32	**9.00** 229
6	MHO-3	3	**3.50** 89	**19.90** 506	...	**13.64** 346	**6.00** 153	...	7/16	1/2-13	**2.85** 73	**8.30** 211	**2.94** 75	**70** 32	**9.00** 229
7 8	MJO-1 MKO-1	3	**4.50** 114	**22.90** 582	**17.40** 442	**15.80** 402	**12.00** 305	**2.30** 59	1/2	1/2-13	**6.90** 176	**5.38** 137	**3.19** 82	**160** 73	**11.30** 287
7 8	MJO-3 MKO-3	3	**4.50** 114	**22.90** 582	**17.40** 442	**15.80** 402	**12.00** 305	**2.30** 59	1/2	1/2-13	**6.90** 176	**5.38** 137	**3.19** 82	**160** 73	**11.30** 287

* This spacing allows for the mounting of only one timer per contactor.

▲ Electrical interlocks, timers and all live electrical parts must have a **.50**/13 clearance to ground and other live electrical parts.

† Not a NEMA size/rating.

NEMA Size	Type	Fig. No.	ACCESSORY DIMENSIONS ▲ Electrical Interlock Q	S	Timer T	V	W	ARCING CLEARANCES 240 VDC X	Y	Z	600 VDC X	Y	Z
1 2	MXCO-1 MXDO-1	1	**9.98** 253	**2.34** 60	**4.20** 106	**1.94** 50	**3.87** 98	**1.70** 43	**1.70** 43	...	**3.00** 76	**3.00** 76	...
1 2	MXCO-3 MXDO-3	1	**9.98** 253	**2.34** 60	**4.20** 106	**1.94** 50	**3.87** 98	**1.70** 43	**1.70** 43	...	**3.00** 76	**3.00** 76	...
3 4	MEO-1 MFO-1	2	**13.74** 349	**2.43** 62	**4.40** 112	**3.47** 89	**3.87** 98	**2.00** 51	**2.00** 51	**4.00** 102	**2.00** 51	**6.00** 153	**4.00** 102
3 4	MEO-3 MFO-3	2	**13.74** 349	**2.43** 62	**4.40** 112	**3.47** 89	**3.87** 98	**2.00** 51	**2.00** 51	**4.00** 102	**2.00** 51	**6.00** 153	**4.00** 102
5	MGO-1	2	**16.72** 424	**2.60** 66	**3.79** 87	**7.20** 183	**3.87** 98	**2.04** 52	**2.80** 71	...	**2.04** 52	**6.00** 153	...
5	MGO-3	2	**16.72** 424	**2.60** 66	**3.79** 87	**7.20** 183	**3.87** 98	**2.04** 52	**2.80** 71	...	**2.04** 52	**6.00** 153	...
6 6A†	MHO-1 MHAO-1	3	**18.54** 471	**2.43** 62	**5.65** 144	**13.18** 335	**3.87** 98	**1.96** 50	**2.60** 66	**3.50** 89	**4.00** 102	**11.00** 280	**3.50** 89
6	MHO-3	3	**18.54** 471	**2.43** 62	**5.65** 144	**13.18** 335	**3.87** 98	**1.96** 50	**2.60** 66	**3.50** 89	**4.00** 102	**11.00** 280	**3.50** 89
7 8	MJO-1 MKO-1	3	**23.5** 597	**3.45** 88	**5.70** 144	**8.75** 222	**3.87** 98	**4.50** 115	**4.50** 115	**4.00** 102	**9.00** 229	**12.00** 305	**4.00** 102
7 8	MJO-3 MKO-3	3	**23.5** 597	**3.45** 88	**5.70** 144	**8.75** 222	**3.87** 98	**4.50** 115	**4.50** 115	**4.00** 102	**9.00** 229	**12.00** 305	**4.00** 102

▲ Electrical interlocks, timers and all live electrical parts must have a **.50**/13 clearance to ground and other live electrical parts.

† Not a NEMA size/rating.

The table lists recommended minimum enclosure sizes for single pole-240v dc contactors with contactor mounted accessories. For double pole contactors, increase width by 50%. Size 6A contactor is not rated for use as an enclosed contactor.

NEMA Size	Height	Width	Depth
1 2	**12.00** 305	**12.00** 305	**9.00** 229
3 4	**18.00** 457	**12.00** 305	**12.00** 305
5	**22.00** 559	**15.00** 381	**15.00** 381
6	**32.00** 813	**18.00** 457	**20.00** 508
7 8	**48.00** 1219	**24.00** 610	**24.00** 610

Dual Dimensions: **INCHES** / Millimeters

Dual Weights: **POUNDS** / Kilograms

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