



### MODEL 11D/E

- **Description:** Solid State Power Contactors
- **Product Range:** 120-600 VAC, Single- or Three-Phase, 10-600 Amps
- **Application:** Constant Resistance Loads

### FEATURES

- All Solid State Construction
- **Exclusive** "2 Millisecond" Fuses for Short-Circuit Protection
- **Exclusive** " $V_{bo}$  Clamping" Transient Voltage Protection
- **Exclusive** Full Rated Operation in 50°C (122°F) Ambients Without Fans Through 450 Amps
- **Exclusive** Proprietary Heatsinks
- Silent, Arcless Switching
- Cycle Rates to 600 Times/Minute
- Open-Chassis or Enclosed
- Full Range of Control Options and Accessories

### TYPICAL APPLICATIONS

- Replace Mercury Relays
- Replace Unprotected SSRs
- Electric Furnaces and Ovens
- Heat Sealing and Packaging
- Plastic Extruding and Molding
- Heat Treating
- Ink Drying
- Process Heating
- Autoclaves

Model 11D/E solid state contactors provide rapid-cycling On/Off control of single-phase (11D) and three-phase (11E) a.c. voltages to resistive heating elements in process temperature control applications. These units are solid state replacements for electromechanical contactors, mercury relays, and unprotected SSRs. Power semiconductors replace contacts and brushes to switch electric power without moving parts, and, when operated within their stated ratings for current, voltage, and temperature, have no known MTBF or life expectancy rating.

### INNOVATIVE ADVANCED TECHNOLOGY:

#### Three Pillars Of Protection

11D/E contactors incorporate **exclusive** design features to protect the power semiconductor components against damage:

1> Unique " $V_{bo}$  Clamping" provides unmatched protection for power semiconductors against transient voltage spikes common on industrial power mains.

2> "2 millisecond" fuses protect semiconductors against short-circuit faults. Payne Engineering SCR controls are the only power controls in the industry equipped with factory tested and approved fuses coordinated with power semiconductors.

3> Proprietary heatsinks are engineered in-house, coordinating finite-element analysis (FEA) with on-site lab tests. Payne Engineering SCR controls operate at 50°C (122°F) ambient temperatures with no derating.

### APPLICATION FLEXIBILITY

Standard configuration of all 11D contactors is for actuation in response to a dry-contact closure; 11E units are actuated by a remote 120 volt signal; either may come from a temperature controller, PLC I/O module, or other external source. Controls may also be configured for

other voltage signals (such as 12, 24 VAC/VDC, or 220 VAC). High cycle-rate capabilities allow up to 600 on/off switching operations/minute with no effect on control life expectancies.

### SPECIFICATIONS

**Power Circuit:** inverse-parallel semiconductors selected for  $V_{bo}$  Clamping transient protection, with parallel R-C circuit for dv/dt protection. Current-clamping 2 millisecond power fuses in series with the power semiconductors provide short-circuit protection.

**Control Circuit:** 11D: line-voltage rated dry contact directs anode voltage to line-fire thyristor gates; 11E: optically isolated gate drivers line-fire thyristor gates.

**Mains Frequency:** 50, 60 Hz standard. Other frequencies available as special order (consult factory).

**Output Voltage:** nominal input voltage.

**Overall Efficiency:** 98.5 to 99.5%.

**Power Loss:** approximately 1-2 watts/ampere/switched pole.

**Voltage Drop Across Power Circuit at 100% Output:** 1-2 volts maximum per switched pole.

**Control Input:** 11D: dry-contact closure (line voltage rated); 11E: external 120 VAC signal.

**Control Power:** 5 watt maximum.

**Fuse Protection:** 2 millisecond  $I^2t$  fuses are factory-tested and coordinated with all power semiconductors, considering:

- a. fuse element melt time  $t_{melt}$ ;
- b. peak melt current  $I_{melt}$ ;
- c. arc quench time  $t_{arc}$ ;
- d. peak arc current  $I_{arc}$ .

**Transient Voltage Protection:** voltage breakover ( $V_{bo}$ ) protection with R-C filters for dv/dt protection.

**Ambient Temperature Range:** -10 to +50°C (122°F).

**Terminal Connections:** 10-30 amp use Bakelite or thermoplastic blocks; 50 amps and larger use screw lugs or stud bolts.

### STANDARD OPTIONS

**Isolated Chassis Construction:** electrically isolated chassis available through 80 amp size. Note: 11D controls with "i" suffix in model number include isolated chassis construction as standard feature.

**Heatsink Overtemperature Switch:** temperature sensor mounted to heatsink chassis switches if heatsink temperature exceeds maximum allowable limit. Available to turn off control or drive external indicating signal.

**277 VAC Input:** unit rated for single-phase 277 VAC.

**550 VAC Input:** unit rated for 550 VAC input (+10% max.).

**600 VAC Input:** unit rated for 600 VAC input (+10% max.).

**Retrofit:** 11D construction at 120 and 240 VAC input ratings to 30 amps as built prior to 8/90.

**Alternate Control Voltage:** 11D configured to operate via external voltage signal. 11E configured to operate via external voltage signal other than the standard.

**Dry Contact Operation:** 11E configured to operate via maintained closure of normally-open contact.

### ENCLOSURES

11D/E contactors can be supplied in a steel electrical enclosure with hinged front cover. Enclosures are ventilated to facilitate proper cooling of the control. Ventilation openings are covered by expanded metal mesh, and are located in the bottom and at the top of the side panels. Enclosure fans are not required. For non-ventilated enclosure requirements, consult local sales office.

### SIZING CONSIDERATIONS

Series 11D and 11E contactors are designed for use at rated voltages on constant-resistance loads only. **Size units by actual load current, not kW.**

1> Always use maximum possible load current for sizing purposes.

2> The amp rating on all power controls is determined by the fuse(s). Current draw must not exceed the fuse rating at any time.

3> Rated voltage of the connected load should match the input voltage to the power control.

### SIZING EXAMPLE

**Application:** On/Off control of three-phase, 480 VAC, delta-connected 6 kW constant-resistance heating elements; 480 VAC, three-phase, 60 Hz input voltage.

**Model Number Selection:**

- On/Off control: 11
- Three-phase power: E
- 480 VAC input: -4-
- Amp rating, calculated as follows:

$$\frac{6.0 \times 1000}{480 \times 1.73} = 7.23 \text{ amps/phase}$$

Since 7.23 < 10, amp rating: 10

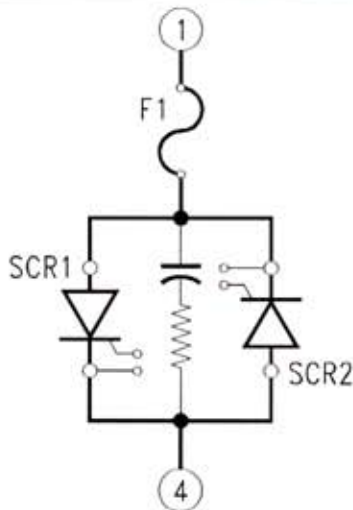
**Model Number:** 11E-4-10

**Options:** as required.

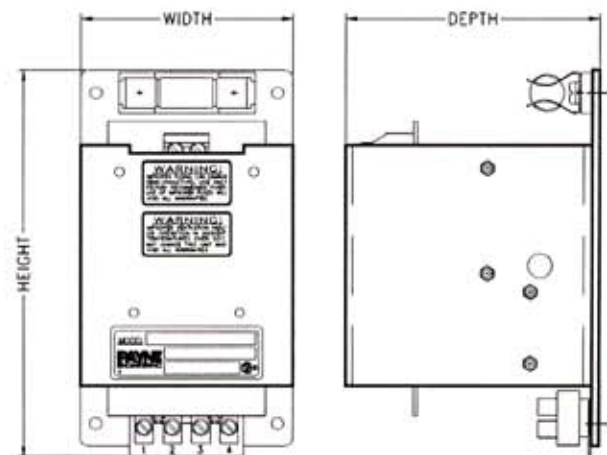
### WHEN ORDERING, SPECIFY:

- Model Number
- Input Voltage
- Frequency
- Load Specifications
- Options
- Enclosure Requirements

Model Number	Amps (Fuse)	KVA @ Max. Rated Voltage	Fuse Number	Open Chassis Dimensions Inches (millimeters)			Enclosed Dimensions Inches (millimeters)		
				Height	Width	Depth	Height	Width	Depth
<b>Single-Phase, 120 VAC, 10-400 Hz Input, 0-118 VAC Output</b>									
11D-1-10i	10	1.2	49B25-10	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
11D-1-20i	20	2.4	49B25-20	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
11D-1-30i	30	3.6	49B25-30	6.25 (159)	3.5 (89)	4 (102)	10 (254)	6 (153)	6 (153)
11D-1-50	50	6.0	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-1-80	80	9.6	49A50-80	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-1-120	120	14.4	49A50-125	12.5 (317)	6.5 (165)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-1-150	150	18.0	49A50-150	15 (381)	9.5 (241)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-1-250	250	30.0	49A50-250	25 (635)	9.5 (241)	8.5 (216)	30 (762)	20 (508)	9 (229)
11D-1-350	350	42.0	49A50-350	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)
<b>Single-Phase, 208/220/240 VAC, 10-400 Hz Input, 0-206/218/238 VAC Output</b>									
11D-2-10i	10	2.4	49B25-10	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
11D-2-15i	15	3.6	49B25-15	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
11D-2-20i	20	4.8	49B25-20	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
11D-2-30i	30	7.2	49B25-30	6.25 (159)	3.5 (89)	4 (102)	10 (254)	6 (153)	6 (153)
11D-2-50	50	12.0	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-2-80	80	19.2	49A50-80	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-2-120	120	28.8	49A50-125	12.5 (317)	6.5 (165)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-2-150	150	36.0	49A50-150	15 (381)	9.5 (241)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-2-250	250	60.0	49A50-250	25 (635)	9.5 (241)	8.5 (216)	30 (762)	20 (508)	9 (229)
11D-2-350	350	84.0	49A50-350	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)
<b>Single-Phase, 380/415/440/480 VAC, 10-400 Hz Input, 0-378/413/438/478 VAC Output</b>									
11D-4-10	10	4.8	49B70-10	7 (178)	5.5 (140)	4.5 (114)	12 (305)	10 (254)	6 (153)
11D-4-20	20	9.6	49B70-20	7 (178)	5.5 (140)	4.5 (114)	12 (305)	10 (254)	6 (153)
11D-4-30	30	14.4	49B70-30	7 (178)	5.5 (140)	5.5 (140)	12 (305)	10 (254)	6 (153)
11D-4-50	50	24.0	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-4-80	80	38.4	49A50-80	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
11D-4-120	120	57.6	49A50-125	12.5 (317)	6.5 (165)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-4-150	150	72.0	49A50-150	15 (381)	9.5 (241)	8.5 (216)	20 (508)	16 (407)	9 (229)
11D-4-250	250	120.0	49A50-250	25 (635)	9.5 (241)	8.5 (216)	30 (762)	20 (508)	9 (229)
11D-4-350	350	168.0	49A50-350	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)
11D-4-450	450	215.0	49A50-450	27 (686)	17 (432)	10.5 (267)	36 (915)	24 (610)	12 (305)
11D-4-600	600	288.0	49A50-600	27 (686)	17 (432)	10.5 (267)	36 (915)	24 (610)	12 (305)
11D-4-1200	1200	576.0	(2) 49A50-600	47 (1194)	21 (534)	10.5 (267)	72 (1829)	36 (915)	12 (305)



**POWER CIRCUIT SCHEMATIC**



**OPEN CHASSIS DIMENSIONS**

