

MODEL 18D/E-H

- **Description:** Phase-Angle SCR Power Controls
- **Product Range:** 120-600 VAC, Single- or Three-Phase, 10-350 Amps
- **Application:** Variable 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
- **Exclusive** Proprietary Heatsinks
- Silent, Arcless Switching
- 1/2 Second Soft-Start
- Open-Chassis or Enclosed
- Full Range of Control Options and Accessories

TYPICAL APPLICATIONS

- Replace Variable Transformers
- Infra-Red Heating Panels
- Infra-Red Ink Drying
- Heat Sealing
- Packaging
- Infra-Red Paint Drying

Model 18D-H/E-H SCR power controls utilize phase-angle firing to provide infinitely variable control of

single-phase (18D-H) and three-phase (18E-H) a.c. voltages to variable resistance loads such as quartz/tungsten tubes without derating. These units are solid state replacements for variable transformers, saturable core reactors, electromechanical contactors, and mercury relays. 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

18D/E-H SCR controls incorporate **exclusive** design features to protect 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 Series 18D-H/E-H SCR controls is manual control via a 270° turn potentiometer (included). A 1/2 second soft-start feature minimizes the current inrush to variable-resistance loads when first energized. Standard options allow for automatic open- or closed-loop control in response to an

analog control signal from a temperature controller, PLC I/O module, or other external source. Other options allow controls to be configured for the specific requirements of each application.

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: all solid state circuitry supplies synchronized gate firing pulses to each thyristor via isolating pulse transformers.

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

Output Voltage: 0 to nominal input voltage, infinitely variable.

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.

Proof Voltage: (isolation between power circuit, control circuit and ground) greater than 2 kV.

Control Input: manual control via 75K Ohm, 2 watt potentiometer with integral On/Off switch and calibrated dial plate standard.

Control Power: 5 watts maximum, derived from 12 VA isolation control transformer on all units.

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.

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

STANDARD OPTIONS

RMS Voltage Limit: circuit-board mounted variable-resistance trimmer in series with manual control potentiometer. Allows user to limit output voltage to connected load at maximum potentiometer setting. Not applicable to units controlled by external analog signal.

Milliamp Control: circuitry integral to main control board allows output voltage to load to be controlled by external analog signal (milliamps or d.c. voltage) in closed-loop system. Voltage output from power control is proportional to analog signal input. Multi-turn SPAN and GAIN trimmers provided for field calibration/adjustment of signal response range.

Output Current Limit: output voltage from power control is varied to keep load current at or below adjustable limit. Includes current transformer.

RMS Output Voltage Regulation: output voltage variations are limited to ± 1% for input variations up to ± 30%. Maximum regulated output voltage may not be greater than 75% of minimum input voltage.

Isolated Chassis Construction: electrically isolated chassis available through 80 amp size.

Thermistor Control: control circuit accepts direct input from temperature sensing thermistor probe, and automatically adjusts power control output voltage to maintain load temperature at level selected on temperature set potentiometer in closed-loop control scheme. Available temperature ranges: 0-90°C and 90-240°C. Thermistor probe, 3 ft. of cable, and set-point potentiometer included.

Optically Isolated ma. Control Card: circuit card for field retrofit of manually operated power controls for automatic control in response to external analog milliamp signal. Optically isolated circuit permits use in open- or closed-loop control schemes. Voltage output from power control is proportional to analog signal input Multiturn SPAN and GAIN trimmers provided for field calibration/adjustment of signal response range.

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

120 V Pilot: 120 VAC pilot voltage signal used to actuate control.

70-400 Hz: control configured for operation at frequencies ranging from 70-400 Hz or 16-2/3 and 25 Hz.

277 VAC Input: 277 VAC input voltage rating.

550 VAC Input: 550 VAC input voltage rating (+10% max.).

600 VAC Input: 600 VAC input voltage rating (+10% max.).

ENCLOSURES

18D/E-H power controls can be supplied in a steel electrical enclosure with a 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

Model 18D/E-H SCR power controls are designed for use on variable-resistance loads such as quartz/tungsten tubes. **Size units by actual load current, not kW.**

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

2> The amp rating on all 18D/E-H power controls is stated on the nameplate. Steady-state current draw must not exceed that rating.

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

SIZING EXAMPLE

Application: proportional control of three-phase, 480 VAC, delta-connected 20 kW tungsten heating elements; 480 VAC, three-phase, 60 Hz input voltage.

Model Number Selection:

- Variable-voltage: 18
- Three-phase: E
- 480VAC input: -4-
- Amp rating, calculated as follows:

$$\frac{20.0 \times 1000}{480 \times 1.73} = 24.08 \text{ amps/phase}$$

Since 24.08 < 30, amp rating: 30

e. Tungsten Load: H

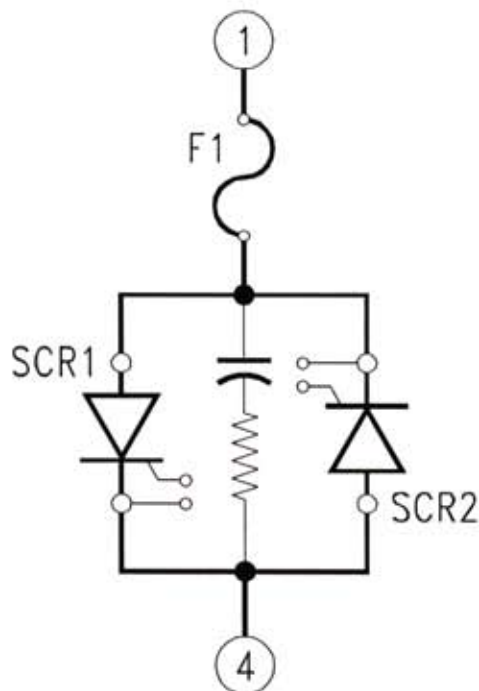
Model Number: 18E-4-30H

Options: as required.

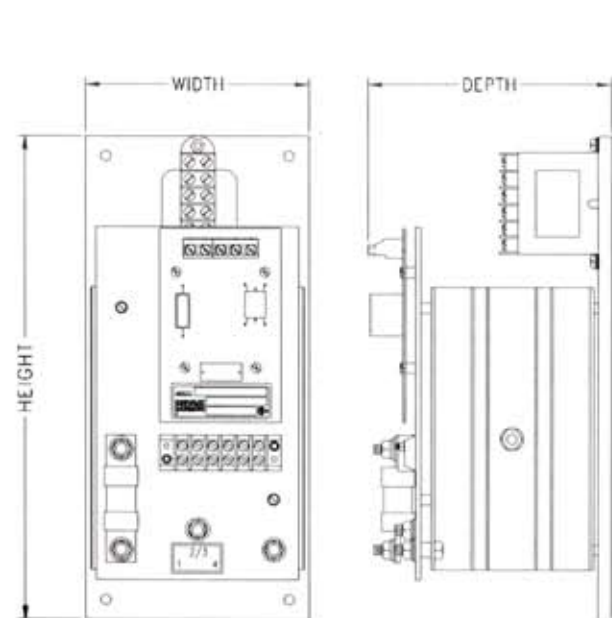
WHEN ORDERING, SPECIFY:

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

Model Number	Max. Amps	KVA @ Max. Rated Voltage	Fuse Number	Open Chassis DimensionS Inches (millimeters)			Enclosed Dimensions Inches (millimeters)		
				Height	Width	Depth	Height	Width	Depth
Single-Phase, 120 VAC, 50/60 Hz Input, 0-118 VAC Output									
18D-1-10H	10	1.2	49B25-30	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
18D-1-30H	30	3.6	49A50-50	7 (178)	5.5 (140)	5.5 (140)	14 (356)	12 (305)	8 (204)
18D-1-80H	80	9.4	49A50-150	12 (305)	6 (153)	7 (178)	14 (356)	12 (305)	8 (204)
18D-1-150H	150	17.7	49A50-250	15 (381)	9.5 (242)	8 (204)	20 (508)	16 (407)	9 (229)
18D-1-350H	350	41.3	49A50-600	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)
Single-Phase, 208/220/240 VAC, 50/60 Hz Input, 0-206/218/238 VAC Output									
18D-2-10H	10	2.4	49B25-30	6.25 (159)	3.5 (89)	3 (76)	10 (254)	6 (153)	6 (153)
18D-2-30H	30	7.2	49A50-80	7 (178)	5.5 (140)	5.5 (140)	14 (356)	12 (305)	8 (204)
18D-2-80H	80	19.0	49A50-150	12 (305)	6 (153)	7 (178)	14 (356)	12 (305)	8 (204)
18D-2-150H	150	35.7	49A50-250	15 (381)	9.5 (242)	8 (204)	20 (508)	16 (407)	9 (229)
18D-2-350H	350	83.3	49A50-600	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)
Single-Phase, 380/415/440/480 VAC, 50/60 Hz Input, 0-378/413/438/478 VAC Output									
18D-4-10H	10	4.8	49B70-30	6.25 (159)	3.5 (89)	3 (76)	12 (305)	10 (254)	6 (153)
18D-4-30H	30	14.4	49A50-80	7 (178)	5.5 (140)	5.5 (140)	14 (356)	12 (305)	8 (204)
18D-4-80H	80	38.2	49A50-150	12 (305)	6 (153)	7 (178)	14 (356)	12 (305)	8 (204)
18D-4-150H	150	71.7	49A50-250	15 (381)	9.5 (242)	8 (204)	20 (508)	16 (407)	9 (229)
18D-4-350H	350	167.0	49A50-600	21 (534)	13 (331)	10.5 (267)	36 (915)	24 (610)	12 (305)

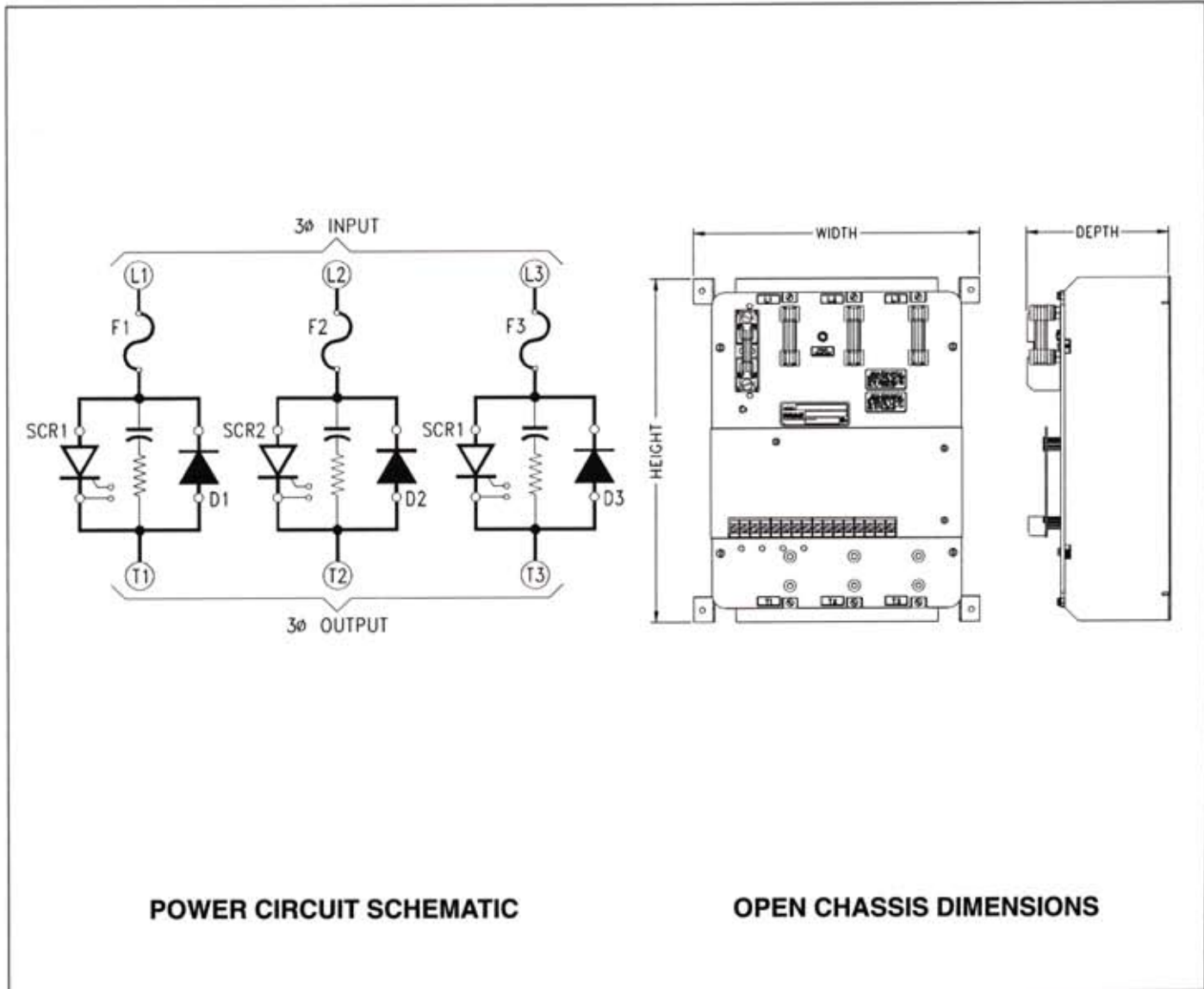


POWER CIRCUIT SCHEMATIC



OPEN CHASSIS DIMENSIONS

Model Number	Max. Amps	KVA @		Fuse Number	Open Chassis Dimensions Inches (millimeters)			Enclosed Dimensions Inches (millimeters)		
		Max. Rated Voltage			Height	Width	Depth	Height	Width	Depth
Three-Phase, 208/220/240 VAC, 50/60 Hz Input, 0-188/200/220 VAC Output										
18E-2-10H	10	4		49B25-30	10.62 (270)	8.25 (210)	5.37 (137)	14 (356)	12 (305)	8 (203)
18E-2-30H	30	12		49A50-80	15.1 (385)	12.87 (286)	6.37 (162)	20 (508)	16 (407)	9 (229)
18E-2-80H	80	32		49A50-150	21 (533)	13 (330)	6.25 (159)	30 (762)	20 (508)	9 (229)
18E-2-150H	150	60		49A50-250	27 (685)	17 (431)	9 (229)	36 (915)	24 (610)	12 (305)
18E-2-350H	350	139		49A50-600	27 (685)	21 (534)	12.5 (318)	42 (1067)	30 (762)	12 (305)
Three-Phase, 380/415/440/480 VAC, 50/60 Hz Input, 0-360/395/420/460 VAC Output										
18E-4-10H	10	8		49B70-30	10.62 (270)	8.25 (210)	5.37 (137)	14 (356)	12 (305)	8 (203)
18E-4-30H	30	24		49A50-80	15.1 (385)	12.87 (286)	6.37 (162)	20 (508)	16 (407)	9 (229)
18E-4-80H	80	64		49A50-150	21 (533)	13 (330)	6.25 (159)	30 (762)	20 (508)	9 (229)
18E-4-150H	150	120		49A50-250	27 (685)	17 (431)	9 (229)	36 (915)	24 (610)	12 (305)
18E-4-350H	350	278		49A50-600	27 (685)	21 (534)	12.5 (318)	42 (1067)	30 (762)	12 (305)



All dimensions are approximate, and are not to be used for construction purposes. Payne Engineering Company Inc. reserves the right to make changes to product design, construction, and component parts in the interest of technical advancement without prior notification.