



MODEL 36D/E

- **Description:** Variable Voltage DC Output Power Controls
- **Product Range:** 120-600 VAC, Single- or Three-Phase, 10-1200 Amps
- **Applications:** Resistive or Inductive DC Loads

FEATURES

- All Solid-State Construction
- **Exclusive** "2 Millisecond" Fuses for Short-Circuit 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

- DC Voltage for Electric Heaters
- Magnet Excitation
- Field Excitation
- Saturable Core Reactors
- Electrolytic Cells

Model 36D/E DC Power Controls provide a full wave rectified, infinitely variable DC output voltage from single-phase (36D) or three-phase (36E) AC input voltages. These controls use phase angle control to

vary AC voltage, which is full-wave rectified to provide an infinitely variable DC output voltage. Power SCRs and diodes replace contacts and brushes to switch electric power without moving parts, and, when operated within stated ratings for current, voltage, and temperature, have no known MTBF or life expectancy rating.

INNOVATIVE ADVANCED TECHNOLOGY:

Three Pillars Of Protection

36D/E DC Power Controls incorporate **exclusive** design features to protect the power semiconductor components against damage:

1> Series diodes and high-voltage MOVs provide 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 that are equipped with factory tested and approved fuses that are 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

All 36D/E DC Power Controls will control resistive or inductive DC loads. A 1/2 second soft-start feature minimizes the current inrush to the load 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: full-wave single or three phase bridge using power SCRs and diodes, with free-wheeling diode to prevent circulating current damage to the other semiconductors. R-C networks for dv/dt protection are parallel to SCRs and diodes.

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: DC average voltage, variable from 0-90% of single phase input, 0-108% of three phase input.

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 indicating 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: R-C and MOV suppressors are coordinated with thyristor and diode PIV ratings.

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

Terminal Connections: 10-30 amps use bakelite or thermoplastic blocks; 50 amps and up use screw lugs or stud bolts.

AVAILABLE OPTIONS

DC 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.

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

DC Output Voltage Regulation: output voltage variations are limited to $\pm 1\%$ for input variations up to $\pm 30\%$. 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. Op-

tically 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

36D/E controls can be supplied in steel electrical enclosure with hinged front cover. Enclosures are ventilated to facilitate proper cooling of the control. Ventilation openings, covered by expanded metal mesh, are located at 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 36D and 36E DC Power Controls are designed for use with resistive or inductive loads requiring variable DC power. **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 power fuse(s). Current draw must not exceed the fuse rating at any time.

3> Rated voltage of the connected load should match the maximum output voltage of the control.

SIZING EXAMPLE

Application: 23 amp, max. 500 VDC magnet; three-phase, 480 VAC, 60 Hz input voltage.

Model Number Selection:

- Variable DC Output: 36
- Three Phase AC Input: E
- 480 VAC Input: -4-
- Amp Rating: 25<30, so control amp rating = 30.

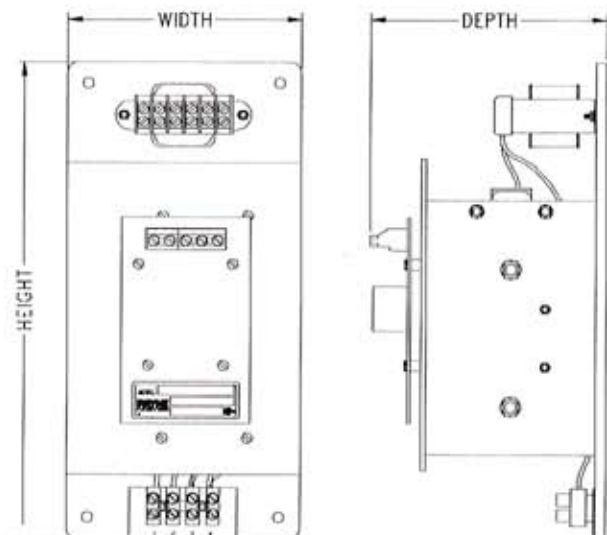
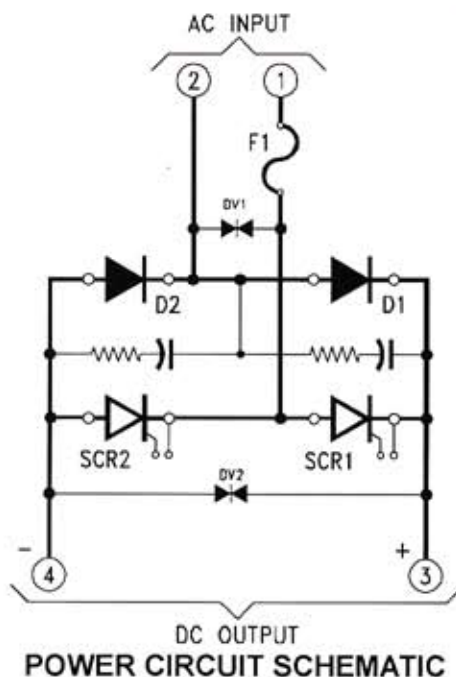
Model Number: 36E-4-30

Options: as required.

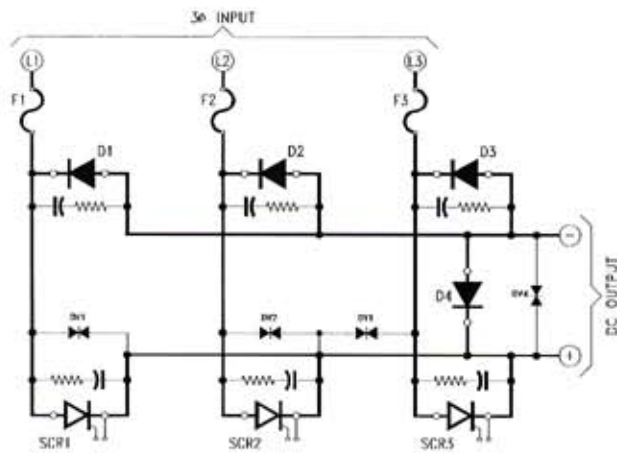
WHEN ORDERING, SPECIFY:

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

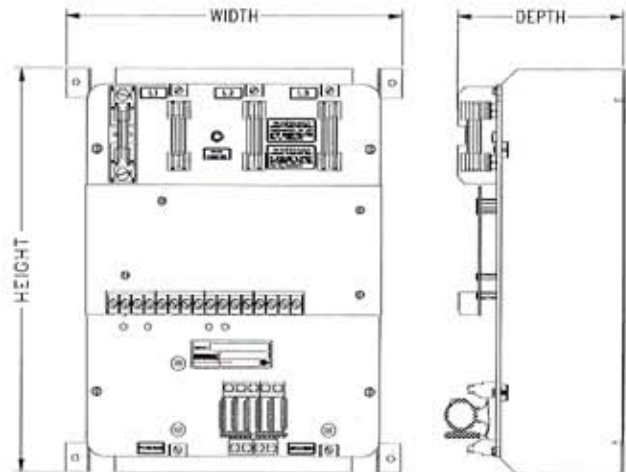
Model Number	Amps (Fuse)	Fuse Number	Open Chassis Dimensions Inches (millimeters)			Enclosed Dimensions Inches (millimeters)		
			Height	Width	Depth	Height	Width	Depth
Single-Phase, 120 VAC, 50/60 Hz Input, 0-107 VDC Output								
36D-1-10	10	49B25-10	9.8 (249)	3.5 (89)	4.62 (118)	12 (305)	10 (254)	8 (203)
36D-1-20	20	49B25-20	10 (254)	5.5 (140)	6 (153)	12 (305)	10 (254)	8 (203)
36D-1-30	30	49B25-30	12 (305)	5.5 (140)	6 (153)	14 (356)	12 (305)	8 (203)
36D-1-50	50	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
36D-1-80	80	49A50-80	17 (432)	13 (331)	8 (204)	30 (762)	20 (508)	10 (254)
36D-1-150	150	49A50-150	21 (534)	17 (432)	9 (229)	36 (915)	24 (610)	12(305)
36D-1-250	250	49A50-250	27 (686)	17 (432)	9 (229)	36 (915)	24 (610)	12 (305)
36D-1-600	600	49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)
36D-1-1200	1200	(2) 49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)
Single-Phase, 208/220/240 VAC, 50/60 Hz Input, 0-185/197/215 VDC Output								
36D-2-10	10	49B25-10	9.8 (249)	3.5 (89)	4.62 (118)	12 (305)	10 (254)	8 (203)
36D-2-20	20	49B25-20	10 (254)	5.5 (140)	6 (153)	12 (305)	10 (254)	8 (203)
36D-2-30	30	49B25-30	12 (305)	5.5 (140)	6 (153)	14 (356)	12 (305)	8 (203)
36D-2-50	50	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
36D-2-80	80	49A50-80	17 (432)	13 (331)	8 (204)	30 (762)	20 (508)	10 (254)
36D-2-150	150	49A50-150	21 (534)	17 (432)	9 (229)	36 (915)	24 (610)	12 (305)
36D-2-250	250	49A50-250	27 (686)	17 (432)	9 (229)	36 (915)	24 (610)	12 (305)
36D-2-600	600	49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)
36D-2-1200	1200	(2) 49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)
Single-Phase, 380/415/440/480 VAC, 50/60 Hz Input, 0-340/370/394/430 VDC Output								
36D-4-10	10	49B70-10	10 (254)	5.5 (140)	4.62 (118)	12 (305)	10 (254)	8 (203)
36D-4-20	20	49B70-20	10 (254)	5.5 (140)	6 (153)	12 (305)	10 (254)	8 (203)
36D-4-30	30	49B70-30	10 (254)	5.5 (140)	6 (153)	14 (356)	12 (305)	8 (203)
36D-4-50	50	49A50-50	12 (305)	5.5 (140)	7 (178)	14 (356)	12 (305)	8 (203)
36D-4-80	80	49A50-80	17 (432)	13 (331)	8 (204)	30 (762)	20 (508)	10 (254)
36D-4-150	150	49A50-150	21 (534)	17 (432)	9 (229)	36 (915)	24 (610)	12 (305)
36D-4-250	250	49A50-250	27 (686)	17 (432)	9 (229)	36 (915)	24 (610)	12 (305)
36D-4-600	600	49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)
36D-4-1200	1200	(2) 49A50-600	45 (1143)	27 (686)	10.5 (267)	72 (1829)	36 (915)	12 (305)



Model Number	Amps (Fuse)	Fuse Number	Open Chassis Dimensions Inches (millimeters)			Enclosed Dimensions Inches (millimeters)		
			Height	Width	Depth	Height	Width	Depth
Three-Phase, 208/220/240 VAC, 50/60 Hz Input, 0-220/235/260 VDC Output								
36E-2-10	10	49B25-10	10.5 (266)	8.25 (210)	5.37 (137)	16 (407)	14 (356)	8 (204)
36E-2-20	20	49B25-20	12.5 (317)	10.25 (261)	5.37 (137)	16 (407)	14 (356)	8 (204)
36E-2-30	30	49B25-30	15.125 (384)	11.25 (286)	6.37 (162)	20 (508)	16 (407)	9 (229)
36E-2-50	50	49A50-50	15 (381)	13 (331)	6 (153)	24 (610)	24 (610)	9 (229)
36E-2-80	80	49A50-80	21 (533)	13 (331)	6 (153)	30 (762)	20 (508)	9 (229)
36E-2-150	150	49A50-150	27 (686)	24 (610)	9 (229)	36 (915)	30 (762)	12 (305)
36E-2-250	250	49A50-250	27 (696)	27 (696)	9 (229)	42 (1067)	36 (915)	12 (305)
36E-2-450	450	49A50-450	33 (839)	33 (839)	12.5 (318)	48 (1067)	36 (915)	16 (407)
36E-2-600	600	49A50-600	39 (991)	33 (839)	12.5 (318)	48 (1067)	36 (915)	16 (407)
36E-2-1200	1200	(2) 49A50-600	48 (1220)	33 (839)	12.5 (318)	72 (1829)	36 (915)	16 (407)
Three-Phase, 380/415/440/480 VAC, 50/60 Hz Input, 0-405/430/470/520 VDC Output								
36E-4-10	10	49B70-10	10.5 (266)	8.25 (210)	5.37 (137)	16 (407)	14 (356)	8 (204)
36E-4-20	20	49B70-20	12.5 (317)	10.25 (261)	5.37 (137)	16 (407)	14 (356)	8 (204)
36E-4-30	30	49B70-30	15.125 (384)	11.25 (286)	6.37 (162)	20 (508)	16 (407)	9 (229)
36E-4-50	50	49A50-50	15 (381)	13 (331)	6 (153)	24 (610)	24 (610)	9 (229)
36E-4-80	80	49A50-80	21 (533)	13 (331)	6 (153)	30 (762)	20 (508)	9 (229)
36E-4-150	150	49A50-150	27 (686)	24 (610)	9 (229)	36 (915)	30 (762)	12 (305)
36E-4-250	250	49A50-250	27 (696)	27 (696)	9 (229)	42 (1067)	36 (915)	12 (305)
36E-4-450	450	49A50-450	33 (839)	33 (839)	12.5 (318)	48 (1067)	36 (915)	16 (407)
36E-4-600	600	49A50-600	39 (991)	33 (839)	12.5 (318)	48 (1067)	36 (915)	16 (407)
36E-4-1200	1200	(2) 49A50-600	48 (1220)	33 (839)	12.5 (318)	72 (1829)	36 (915)	16 (407)



POWER CIRCUIT SCHEMATIC



OPEN CHASSIS DIMENSIONS

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.