

FEATURES

- PMAC2 controller from Delta-Tau controls amp bridge directly
- Serial digital current feedback from U & V phases
- Mini D type connector for direct connection to PMAC2 controller interface
- Full optical & transformer isolation between signal and power stages.
- Protections: Output shorts from output-output & output-ground, overtemperature, under/over voltage, and user/card faults.
- **No Transformer Required!**
Operates directly from AC mains 32~132VAC (7229AC) or 32~264VAC (7429AC)
- Terminals for DC Buss connect to external regenerative energy dissipater

THE OEM ADVANTAGE

- **Conservative design for high MTBF**

MODEL	POWER	I-CONT (A)	I-PEAK (A)
7229AC	32~132VAC	10	20
7429AC	32~264VAC	10	20



DESCRIPTION

These models work with Delta-Tau PMAC2 control cards in *Direct-Drive* mode. Card controls output power bridge PWM waveform directly. All tuning is done on the control card.

Current feedback from the amplifier is in serial-digital form. Digital current monitors are provided for the U & V winding currents. These feed-back to the control card for full digital control of the amplifier.

Commutation is determined externally in the control card using encoder feedback from the motor, and a variety of methods to determine the rotor position on power-up. Position and velocity control are handled externally by the control card.

Internal guard circuits prevent damage from input signal errors such as turning on top and bottom MOSFET's together, and too-high PWM frequency.

MOSFET (7229AC) and IGBT (7429AC) output stages deliver four-quadrant power for bi-directional acceleration and deceleration of motors. For high-inertia loads, an external regenerative energy dissipater is available.

All models are protected against output short circuits (output to output and output to ground) and heatplate overtemperature.

Models 7229AC, 7429AC

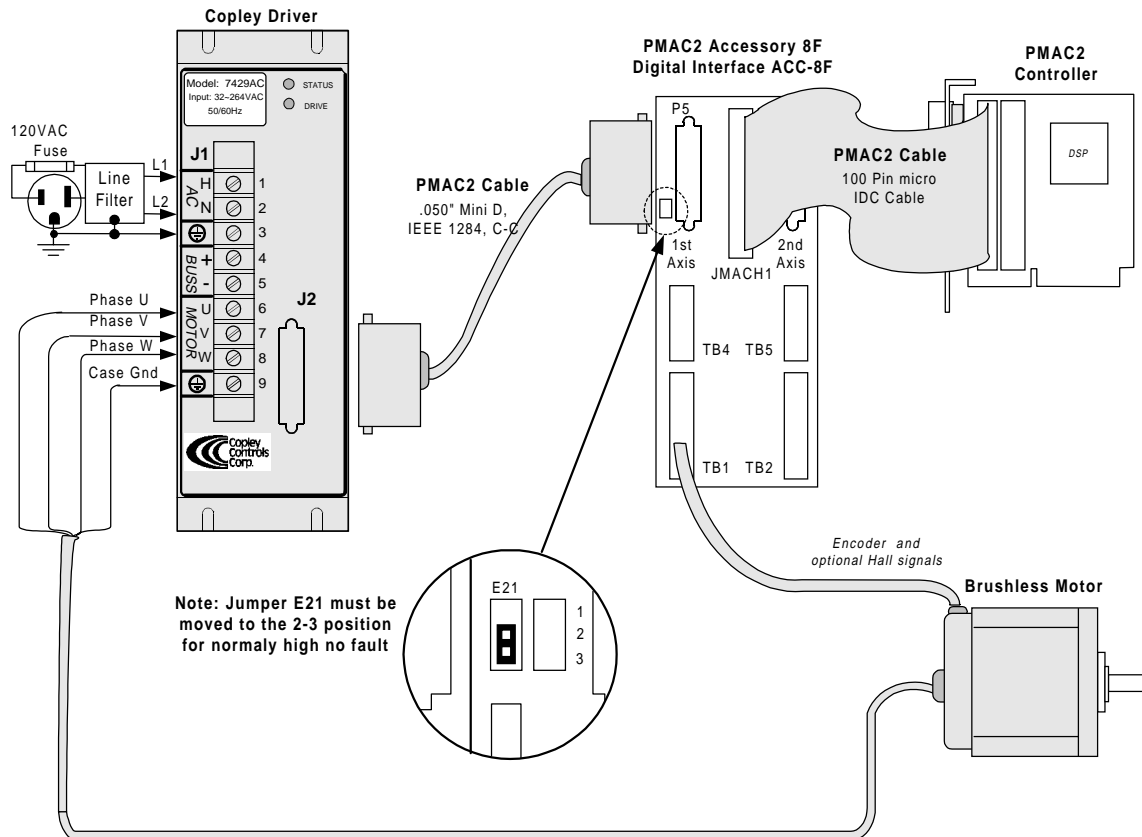
Line-Powered AC Brushless Servo Amplifiers

for Direct-Drive operation with Delta-Tau PMAC2 Controller

TECHNICAL SPECIFICATIONS

MODEL	7229AC	7429AC
OUTPUT POWER		
Peak power	20 A @ 110V	20 A @ 205V
Peak time	2 sec at peak power independent of polarity reversal	
Continuous power	10 A @ 130V	10 A @ 250V
OUTPUT VOLTAGE		
On-resistance (Ro, ohms)	0.2	0.15
Max PWM Peak Output Voltage	$\pm V_{out} = (VAC \times 1.41 \cdot 2) \times (0.97) - (R_o) \times (I_o)$	
INPUT POWER		
Mains voltage	32~132VAC, 47~63Hz	32~264VAC, 47~63Hz
Mains current @ continuous output rating	16 A	16 A
Inrush current on startup	19 A.	37 A.
External mains fuse rating	20 A/125V	20 A/250V
LOAD INDUCTANCE		
Minimum inductance	400 μ H.	400 μ H.
Maximum inductance	No maximum. Bandwidth varies with inductance and tuning.	
BANDWIDTH	Small signal -3dB @ 3kHz with minimum load at nominal supply voltage. Varies with load inductance and tuning	
PWM OUTPUTS		
PWM frequency	25kHz maximum	
Modulation	Carrier-cancellation, 50% duty cycle at 0V output	
DRIVE LED		
Bicolor LED changes color and flashes to indicate amplifier operating status		
Green = Amp OK		
Green / Red Alternating = Warning! current limit imminent		
Red = Current limiting		
Red Blinking = Warning! switch freq. >25kHz, operation continues		
STATUS LED		
Bicolor LED changes color and flashes to indicate amplifier operating status		
Green = Normal <i>Amplifier enabled AND Amp OK</i>		
Blinking green = Ready <i>Amplifier OK, will run when enabled</i>		
Red = Fault, non-latching <i>Over or under-voltage condition; Amplifier recovers when voltage is in normal range.</i>		
Blinking red = Latching Fault <i>Output overcurrent (short circuit) or amp. overtemp condition power amp. off/on or disable/enable to clear condition</i>		
INPUTS		
Inputs are differential (+/-) line receivers EIA-423 & EIA-232D (+) 2.5V divider, 4.7k Ω pull-up to +5V, 4.7k Ω pulldown to GND; (-) 4.7k Ω pull-up to +5V.		
TopA (+/-)	(+) high and (-) lo, or (-) lo, activates phase A top and disables bottom.	
TopB (+/-)	(+) high and (-) lo, or (-) lo, activates phase A top and disables bottom.	
TopC (+/-)	(+) high and (-) lo, or (-) lo, activates phase A top and disables bottom.	
Enable (+/-)	(+) high and (-) lo, or (-) lo, enables amplifier	
Clock (+/-)	(+) high and (-) lo, or (-) lo, transitions A/D clock lo	
Strobe (-/+)	(+) high and (-) lo, or (-) lo, transition A/D Conversion start high to initiate current monitor transmission	
OUTPUTS		
Outputs are differential (+/-) line transmitters EIA-423 & EIA-232D		
DataA (+/-)	Motor winding current in U phase: 12-Bit serial-output, successive approximation A/D, 3.5us conversion.	
DataB (+/-)	Motor winding current in V phase: 12-Bit serial-output, successive approximation A/D, 3.5us conversion.	
Fault (+/-)	Amplifier is shutdown by protection features see below: (+) high and (-) lo for Fault.	
Outputs are CMOS		
FO/State1	Active lo over temperature	
FO/State2	Active lo over/under voltage	
FC2/Ofrequ	Active lo over frequency	
FC2/Ocurr	Active lo over current	
PROTECTIVE FEATURES		
Short circuit (output to output, output to ground)	Latches unit OFF (Power off/on, or disable/enable resets)	
OverTemperature	Latches unit OFF at 70°C on heatplate (Power off/on, or disable/enable resets)	
Undervoltage	Shutdown at internal DC buss < 45VDC	
Overvoltage	Shutdown at internal DC buss > 195VDC (Model 7229AC), or internal DC buss > 390VDC (Model 7429AC) (Amplifier operation resumes when internal DC buss is NOT undervoltage or NOT overvoltage)	
Current-limiting	Current will fold-back to continuous rated current (10 A) after 2s maximum at 20 A Relative amplitude of U/V/W phase currents maintained for no loss of commutation	
AMPLIFIER DISSIPATION		
Watts minimum	17W (Model 7229AC)	7W (Model 7429AC)
Watts @ continuous current	60W (Model 7229AC)	61W (Model 7429AC)
THERMAL REQUIREMENTS		
Storage temperature range	-30°C to +85°C	
Operating temperature range	0° to 70°C baseplate temperature	
Thermal resistance (heatplate to ambient):	No heatsink or fan: 0.92 deg. C/W; no heatsink with fan: 0.51 deg. C/W With heatsink, no fan: 0.6 deg. C/W; with heatsink and fan: 0.23 deg. C/W	

INTERFACE DIAGRAM



For more information on Delta Tau's PMAC2 visit the web site www.deltatau.com

AMPLIFIER WIRING & CABLING

Power supply and motor connections should be made with wire that has a rating to support the amplifiers continuous current. AWG 14 wire will support all amplifiers in this series. To minimize noise radiation from the motor and power cabling, wires should be twisted and shielded. Motor sensor signals are often routed near the motor phase winding cables. To minimize coupling of PWM noise, sensor signal wiring should be multiple-conductor-shielded cable.

GROUNDING AND ISOLATION

The signal board is fully isolated from the power section in this series of amplifiers.

For safety, it is important that J1-3 be connected to earth ground, typically through the power cable.

The connections on the power board, such as the motor phase, are at line potential.

SETUP FOR THE MOTOR

The motor windings and encoder are to be connected in accordance with the control card setup.

CONNECTORS

J1 POWER AND MOTOR WINDING CONNECTIONS

Connector type: Barrier-block. Screw-terminal connections. #6-32 locking screws with cable clamps.

PIN	SIGNAL	FUNCTION
1	L1	AC Power Input Hot (black or brown wire from AC mains)
2	L2	AC Power Input Neutral (white or blue wire from AC mains)
3	GND	Chassis safety ground (green or green/yel wire from AC mains)
4	Buss (+)	Positive terminal of internal DC power supply
5	Buss (-)	Negative terminal of internal DC power supply
6	Motor U	Amplifier output to "U" winding of motor
7	Motor V	Amplifier output to "V" winding of motor
8	Motor W	Amplifier output to "W" winding of motor
9	GND	Chassis safety ground. Also for cable shield of motor cable.

J2 SIGNAL CONNECTIONS

Connector type: 36 position male Mini D; with Quick "C" latch posts

PIN	SIGNAL	FUNCTION
1	FC0/State1	Fault code bit for output short circuit or over temperature
2	FC2/OFreq	Fault code bit for over frequency
3	Clock+	A/D serial output clock
4	Strobe+	Conversion Start
5	DataA	Phase A current serial data line
6	DataB	Phase B current serial data line
7	Enable+	Active high amplifier enable
8	Fault+	High with amplifier fault
9	TopA+	Active high Phase A
10	NC	
11	TopB+	Active high Phase B
12	NC	
13	TopC+	Active high Phase C
14	NC	
15	GND	Signal ground
16	NC	
17	NC	
18	NC	
19	FC1/State2	Fault code bit for over/under voltage
20	FC3/Ocurr	Fault code bit for over current
21	Clock-	A/D serial output clock
22	Strobe-	Conversion Start
23	DataA-	Phase A current serial data line
24	DataB-	Phase B current serial data line
25	Enable-	Active lo amplifier enable
26	Fault-	Lo with amplifier fault
27	TopA-	Active lo Phase A
28	NC	
29	TopB-	Active lo Phase B
30	NC	
31	TopC-	Active lo Phase C
32	NC	
33	GND	Signal ground
34	NC	
35	NC	
36	NC	

LED INDICATOR FUNCTIONS

STATUS LED

Color and state of Status LED indicates amplifier operating conditions

LED COLOR ENABLE	CONDITION	ACTION to
Flashing Green	Ready (AMP OK)	Activate /ENABLE
Green	Normal	None
Red	Fault	Power
Flashing Red	Latching Fault	Power OFF/ON
Ready	= Amp OK AND NOT enabled	
Normal	= Amp OK AND enabled	
Amp OK	= Internal buss voltage is within limits AND NOT Fault	

Fault	= Over voltage, under voltage	
Latching Fault	= Output short circuit or Heatplate overtemperature. Amplifier 'latches' off and stays off until reset power OFF/ON or Disable/Enable	

DRIVE LED

Color and state of Drive LED indicates amplifier fault conditions

LED COLOR	CONDITION	ACTION to Correct
Alt. Green / Red	Warning! Current imminent	Reduce current limit command
Green	Normal	None
Red command	Current limiting	Reduce current
Flashing Red	Warning! Switching frequency >25kHz	Reduce switching frequency

Warning	= Operation continuous
Normal	= No warning and not current limiting
Limiting	= Current folding back to amplifier continuous rating

USING THE PMAC2 WITH THE COPLEY

PMAC2 JUMPER CONFIGURATION

Move the **E21 jumper**, on the **PMAC2 ACC-8F**, from the default position 1-2 to the **2-3 position**. This is required since the Copley amplifier Fault- (J2-26), is pulled low, if a fault condition occurs that will shutdown the amplifier.

WHEN RUNNING THE PS2SETUP

At the motor selection step;
Select, PWM frequency of typical 12khz, but do not exceed **25kHz**.

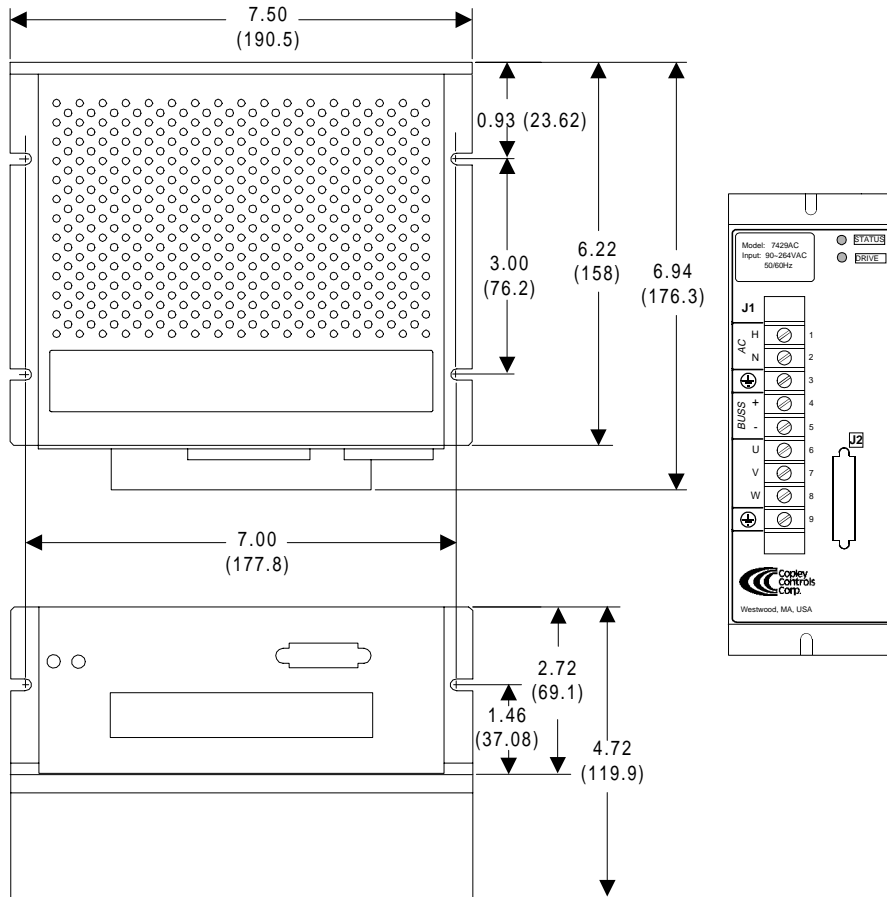
At the fault step;
Select, **low, true amp. fault**.

At the current protection step;
Set,

1. The full-range current to **25 Amps**.
2. The Peak or instantaneous current to **20 Amps** or lower, depending on the motor peak current spec.
3. The continuous current to **10 Amps** or lower, depending on the motor continuous current spec.
4. The peak time to **1 second** or lower, depending on the motor peak time specification.

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OUTLINE DIMENSIONS



Dimensions in inches (mm)

WEIGHT

3.71 lbs. (1.69 kg) without optional heatsink.
 Add 3.2 lbs. (1.47 kg) for heatsink.

CONNECTORS

J1: Power & motor 9-position barrier strip; #6-32 screws
 J2: Controller 36 position female .050" Mini D, IEEE 1284,C-C; locks with Quick "C" latch; For use with 3M cable assembly 4120-4120-XX-B series,
 Or solder plug connector 10136-3000VE and shell kit 10336-52A0-008

ORDERING GUIDE

Model 7229AC	20A peak, 10A continuous, from 32~132VAC, 50/60Hz AC mains
Model 7429AC	20A peak, 10A continuous, from 32~264VAC, 50/60Hz AC mains

Notes:

1. Add "H" to model number to specify heatsink option.

OTHER AC BRUSHLESS AMPLIFIERS

For AC Brushless Motors (Sinusoidal) each type available in AC (Off-line) or DC powered variants

7xx5 Models For controllers that output +/-10V analog torque commands for U & V phases

7xx6 Models For linear motors that use analog Hall sensors for commutation

7xx7 Models For resolver-equipped motors

7xx8 Models For motors using incremental encoders as feedback