

BE25A20AC SERIES BRUSHLESS SERVO AMPLIFIERS

Model: BE25A20AC

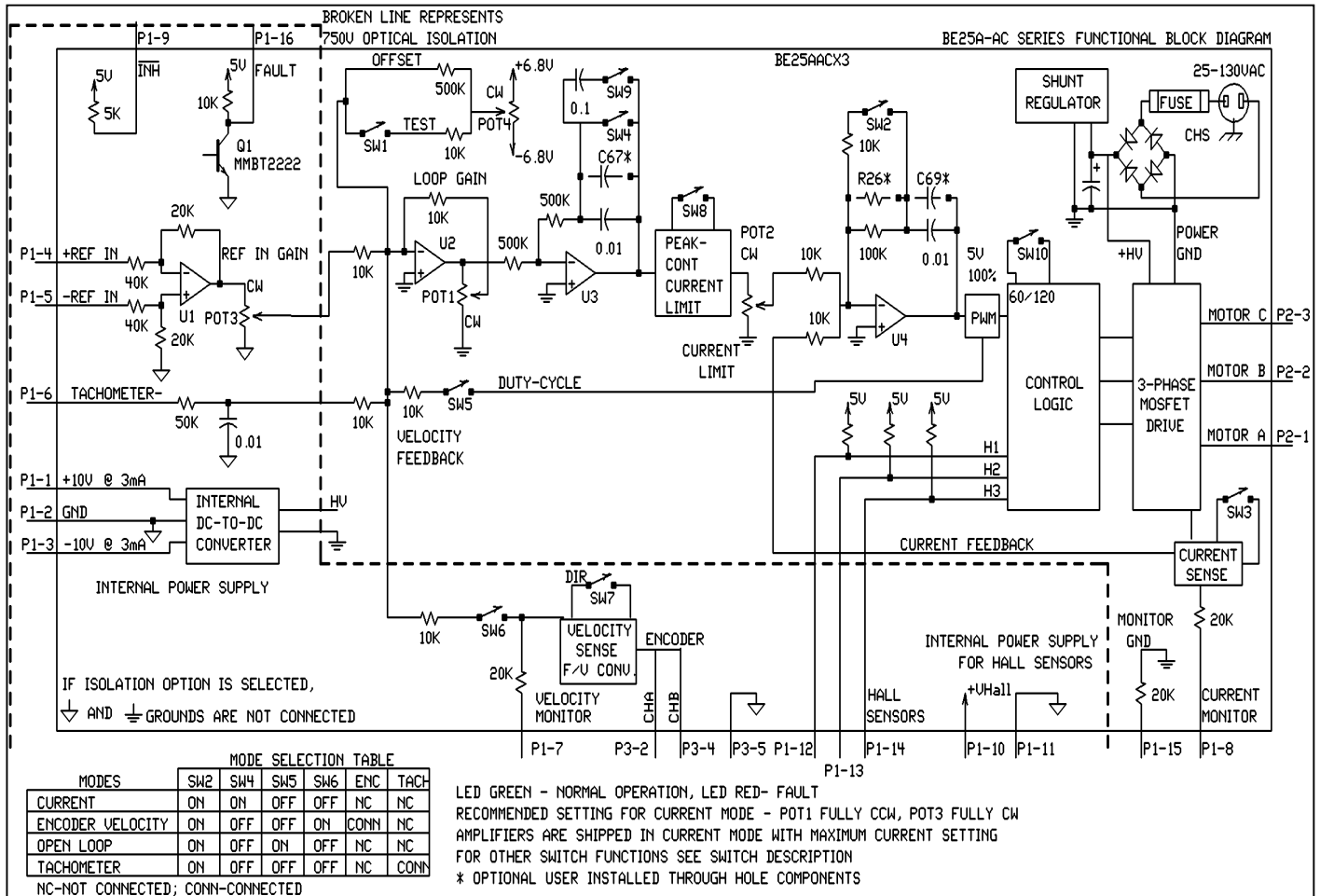
120VAC Single Supply Operation

FEATURES:

- Surface-mount technology
- Small size, low cost, ease of use
- Built-in input signal isolation and shunt regulator
- DIP switch selectable modes:
current, open loop, tachometer,
Encoder velocity
- Four quadrant regenerative operation
- Agency Approvals:



BLOCK DIAGRAM:



DESCRIPTION: The BE25A20AC Series PWM servo amplifiers are designed to drive brushless DC motors at a high switching frequency. The BE25A20AC is fully protected against over-voltage, over-current, over-heating and short-circuits. This model interfaces with digital controllers or can be used as a stand-alone drive and requires only a single AC power supply. A single red/green LED and a single digital output indicates operating status. Loop gain, current limit, input gain and offset can be adjusted using 14-turn potentiometers. The offset adjusting potentiometer can also be used as an on-board input signal for testing purposes, when SW1 (DIP switch) is ON.

SPECIFICATIONS:

All BE25A20AC specifications are identical to the BE25A20 specifications (see BE30A series data sheets) except for:

	MODEL
POWER STAGE SPECIFICATIONS	BE25A20AC
SINGLE PHASE AC SUPPLY VOLTAGE	30 - 125 VAC @ 50-60 Hz
SHUNT RESISTOR	10 Ω @ 50 W
SHUNT REGULATOR TRIP VOLTAGE*	187 V = On, 177 V = Off (+/-5V)
BUS CAPACITANCE	3600 μ F
SHUNT FUSE (d=.25 inches, L=1.25 inches)	3 A Motor Delay rated @ 250 VAC
BUS FUSE (5x20 mm)	16 A slow-blow rated @ 250 VAC
PEAK CURRENT (2 sec. max, internally limited)	\pm 25A
MAX. CONTINUOUS CURRENT (internally limited)	\pm 12.5A
MINIMUM LOAD INDUCTANCE**	250 μ H
SWITCHING FREQUENCY	22 kHz \pm 15%
HEATSINK (BASE) TEMPERATURE RANGE	0° to 65° C, disables if > 65°
POWER DISSIPATION AT CONTINUOUS CURRENT	125 W
OVER-VOLTAGE SHUT-DOWN (self reset)	195 V
BANDWIDTH (load dependent)	2.5 kHz

MECHANICAL SPECIFICATIONS	
POWER CONNECTOR	Screw terminals
SIGNAL CONNECTOR	Molex connector
SIZE	7.35 x 4.23 x 2.45 inches
	186.7 x 107.4 x 62.2 mm
WEIGHT	2.5 lb.
	1.14 kg

* If the shunt regulator is disabled the shut down voltage is 195 VDC.

** Low inductance motors require external inductors.

These amplifiers contain a rectifier bridge and filter capacitors to generate the DC bus internally from the AC input power. The DC bus voltage is 1.4 times AC voltage (RMS), e.g. 170 VDC from 120 VAC. During braking much of the stored mechanical energy is fed back into the power supply and charges the output capacitor to a higher voltage. If the charge reaches the amplifier's over-voltage shutdown point, output current and braking will cease. To ensure smooth braking of

large inertial loads, a built-in "shunt regulator" is provided in this model. The shunt regulator will switch on the internal power resistor when the bus voltage reaches 185 VDC. This resistor then dissipates the extra energy of the DC bus.

INPUT SIGNAL ISOLATION:

All input and output signals are isolated (750 V optical isolation) from the power stage except CURR MONITOR OUT (P1-8), which is referenced to MONITOR GND (P1-15).

BE25A20AC and BE25A20 AMPLIFIER PIN OUT DIFFERENCES:

A current reference output is not available on this drive since this pin is required for the MONITOR GND (P1-15). +5V (P3-1) is also not available isolation reasons.

PIN FUNCTIONS:

CONNECTOR	PIN	NAME	DESCRIPTION / NOTES	I/O
P1	1	+10V 3 mA OUT	For customer use	O
	2	SIGNAL GND	Reference ground	SGND
	3	-10V 3 mA OUT	For customer use	O
	4	+REF IN	Differential reference input, Maximum ± 15 V, 40K input resistance	I
	5	-REF IN		
	6	-TACH IN	Tachometer input, max. ± 60 VDC, 60K input resistance	I
	7	VELOCITY MONITOR OUT	Velocity monitor, 1 V = 22 kHz encoder frequency	O
	8	CURRENT MONITOR OUT	Models BE30A8, BE25A20: when SW3 is OFF, 1 V = 2 A; when SW3 is ON, 1 V = 4 A. Models BE40A8, BE40A20: when SW3 is OFF, 1 V = 4 A; when SW3 is ON, 1 V = 8 A	O
	9	INHIBIT IN	This TTL level input signal turns off all power devices of the "H" bridge when pulled to ground. This inhibit will cause a fault condition and a red led. For inverted inhibit inputs, see section "G".	I
	10	+V HALL 30 mA OUT	Power for HALL sensors, short circuit protected, +6 V @ +30 mA	O
	11	GND		SGND
	12	HALL 1	HALL sensor inputs, logic levels, Internal 5 K Ω pull-up. Maximum low level input is 1.5 V, minimum high level input is 3.5 V	I
	13	HALL 2		
	14	HALL 3		
	15	MONITOR GND	Reference ground for current monitor measurements.	PGND
	16	FAULT OUT (LED red)	Transistor output. Becomes high during output short circuit, over-voltage, over temperature, inhibit, and power-up reset. Fault condition indicated by red LED.	O
P2	1	MOTOR A	Motor phase A connection	O
	2	MOTOR B	Motor phase B connection	O
	3	MOTOR C	Motor phase C connection	O
	4	POWER GND	Power ground	PGND
	5	HIGH VOLT	DC power input	I
P3 ENCODER	1	NC	Not connected	
	2	CHANNEL A	5V CMOS level quadrature encoder input	I
	3	NC	Not connected	
	4	CHANNEL B	5V CMOS level quadrature encoder input	I
	5	SIGNAL GND	Reference ground	SGND

SWITCH FUNCTIONS:

SWITCH	FUNCTION DESCRIPTION	SETTING	
		ON	OFF
1	Test / Offset. Sensitivity of the "offset" pot. Used as an on-board reference signal in test mode.	Test	Offset
2	Current loop gain	Decrease	Increase
3	Current scaling. When OFF, increases sensitivity of current sense thus reducing both peak and continuous current limit by 50%.	100%	50%
4	Loop integrator. This capacitor normally ensures "error-free" operation in velocity mode by reducing the error signal (output of summing amplifier) to zero.	Shorts out the velocity/voltage loop integrator capacitor	Velocity/voltage loop integrator operating
5	Internal duty-cycle feedback for open loop mode	On	Off
6	Velocity feedback. Connects the internally generated velocity signal from encoder.	On	Off
7	Velocity direction. Changes the polarity of the velocity monitor signal.		
8	Continuous current reduction. Reduces continuous current limit by 50%.	Continuous / peak current limit ratio is 50%	Continuous / peak current limit ratio is 25%
9	Integrator capacitor. Adjusts the value of the integrator capacitor in velocity mode.	Increase	Decrease
10	60/120 degree commutation phasing setting	120 degree phasing	60 degree phasing

POTENTIOMETER FUNCTIONS:

POTENTIOMETER	DESCRIPTION	TURNING CW
Pot 1	Loop gain adjustment in open loop & velocity modes. Turn this pot fully ccw in current mode.	Increases loop gain
Pot 2	Current limit. It adjusts both continuous and peak current limit maintaining selected ratio (50%).	Increases current limit
Pot 3	Reference gain. It adjusts the ratio between input signal and output variables (voltage, current, velocity).	Increases reference input gain
Pot 4	Test / Offset. Used to adjust any imbalance in the input signal or in the amplifier. When SW1 (DIP switch) is ON, the sensitivity of this pot is greatly increased thus it can be used as an on-board signal source for testing purposes. See section "G".	N/A

TEST POINTS FOR POTENTIOMETERS: See section "G".

OPERATING MODE SELECTION:

These modes can be selected by the DIP switches according to the chart in the functional block diagram:

- Current mode
- Open loop mode
- Tachometer mode
- Encoder velocity mode

See section "G" for more information.

SET-UP: See section "G" for engineering and installation notes.

CURRENT LIMIT ADJUSTMENTS:

These amplifiers feature separate peak and continuous current limit adjustments. The current limit adjustment Pot 2 adjusts both peak and continuous current limit simultaneously. It has 12 active turns plus 1 inactive turn at each end and is approximately linear. Thus, to adjust the current limit turn the potentiometer fully counter-clockwise, then turn clockwise to the appropriate value.

In many applications it is sufficient to use only the DIP switches for current limit adjustments. SW3 reduces both peak and continuous current limit by 50% when OFF. SW8 reduces only the continuous current limit by 50% when OFF:

SW8	CONTINUOUS / PEAK CURRENT LIMIT RATIO
ON	50%
OFF	25%

ORDERING INFORMATION:

Model: BE25A20ACX

X indicates the current revision letter.

TYPICAL SYSTEM WIRING: See section "G".

MOUNTING DIMENSIONS: See page F-11.