

# BRUSHLESS DRIVE

## Versions : BC05A; BC10A

Features:

- SMT technology.
- Reduced dimensions, low cost, easy use.
- Protections: over- and under-voltage, phase to phase short circuit, positive phase, 0V power supply phase.
- Speed and current control.

DESCRIPTION : Series BC05A and BC10A drive has been carried out to control a DC brushless motor. It's protected in full against over-voltage, under-voltage, over-temperature, phase to phase short circuit, power supply phase, 0V power supply phase. Both models can be controlled from outside or can be used independently through the proper set up on the board. Three leds show the condition of board's functioning. Off-set regulator trimmer can be used to adjust the speed on board.

**Warning** : this drive has been designed to control a 48V Brushless motor. Any other use has not been considered, therefore could damage the drive, the host system and could be dangerous for the users.

POWER STAGE SPECIFICATION	MODEL	
	BC10A	BC05A
DC SUPPLY VOLTAGE	48V +/-15%	48V +/-15%
MAX. DIRECT CURRENT (internally limited)	10A	5A
MINIMUM LOAD INDUCTANCE*	1mH	1mH
UNDER-OVER VOLT. SHUT-DOWN (manual reset)	18V – 57V	18V – 57V
HEATSINK SHUT-DOWN TEMPERATURE (manual reset)	100°C +/-15%	
SWITCHING FREQUENCY	17KHz +/-15%	

\*Low inductance motor requires external inductors.

MECHANICAL SPECIFICATIONS	
POWER CONNECTOR	ELGIBI PA258
SIGNAL CONNECTOR	ELGIBI PA258
SIZE ( A x B x H )	140 x 100 x 55 mm.
WEIGHT	0,35 Kg

CONNECTOR	PIN	NAME	DESCRIPTION	I/O
J5*	1	POWER GND	Power ground	I
	2	MOTOR VOLTAGE	DC power input	I
J6A*	1	DIR	Motor direction (open = clockwise)	I
	2	ENABLE	Motor enable ( 0V= on; open = off)	I
J6B*	1	ERROR Led DS1 = on	Open collector output; Becomes low during short-circuit, over-voltage, under-voltage, over-temperature. Error condition indicated by led DS1 on.	O
	2	SPEED	Speed reference (0V=stop ; 10V= Max)	I
	3	+12V (signal)	Signal voltage 12V 100mA max.	O
J2A*	1	HALL sensor PHASE - C	Hall sensor input, logic level, internal 20K pull-up. Max. low level input is 1,4V. Min. high level input is 3V.	I
	2	HALL sensor PHASE – B		I
	3	HALL sensor PHASE – A		I
J2B*	1	POS. HALL sens. supply	Power for Hall sensor. +4,5V @ 20mA max.	O
	2	GND HALL sens. supply		O
	3	SHIELD		GND
J7A*	1	PHASE 2 MOTOR	Motor phase B connection	O
	2	PHASE 1 MOTOR	Motor phase A connection	O
J7B*	1	MOTOR SHIELD		GND
	2	PHASE 3 MOTOR	Motor phase C connection	O
FT1 – J1		EARTH		EARTH

\* rating contact 2,5mmq – 12 AWG

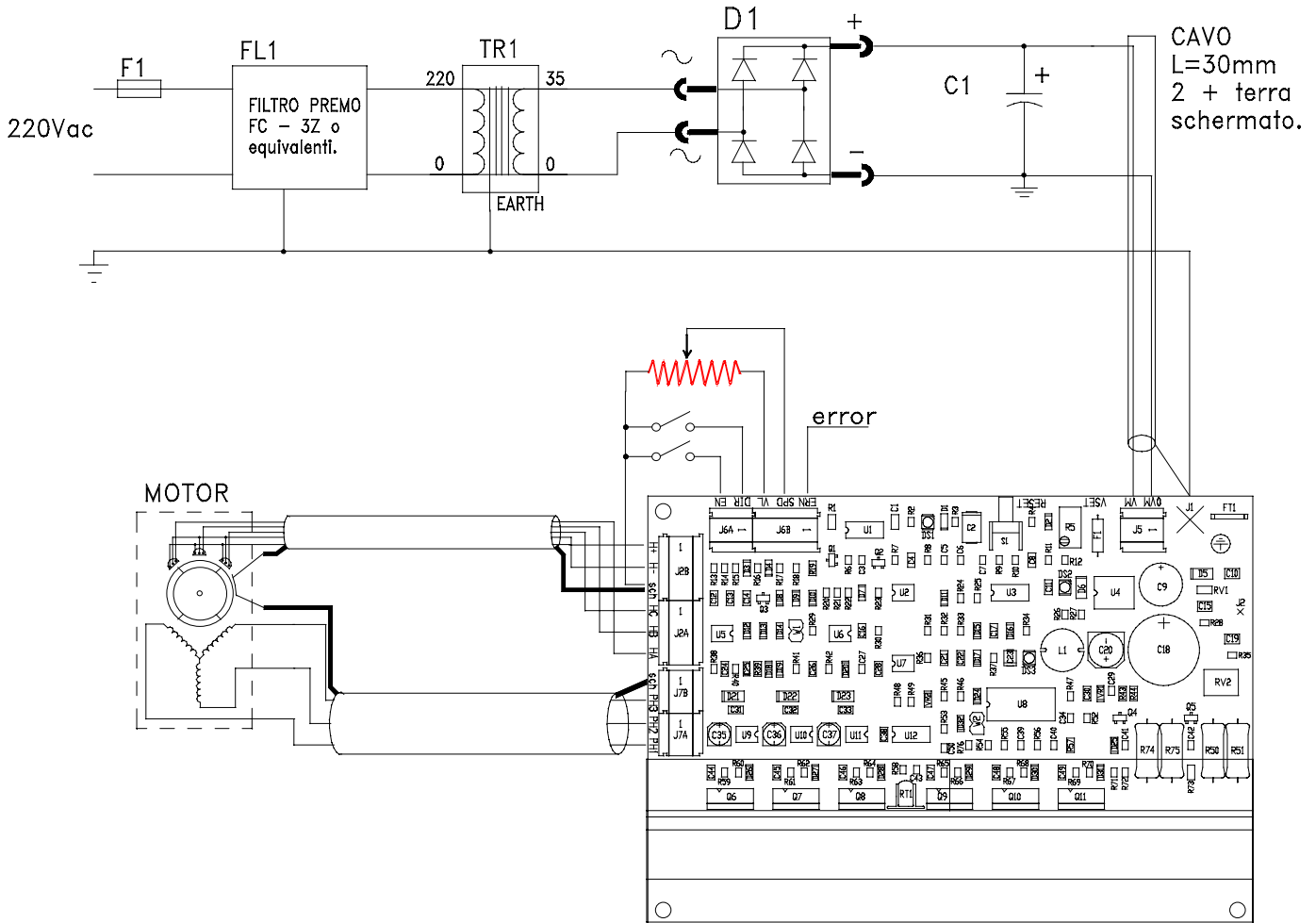
SEGNALATIONS DEVICE LED	ON	OFF
DS1	ALARM, one of this event occurs: short-circuit, over-voltage, under-voltage, over-temperature. Press S1, reset, to turn-off	Normal operation
DS2	Inside Supply voltage present (+12V)	Supply voltage fault
DS3	Current limit reached, or enable = off, or an Alarm is occurred.	

SETTING DEVICE	
W1	Motor direction. Insert = (0V) only counterclockwise; not insert = external setting or clockwise.
W2	Phase of Hall sensor. Insert = 120° electrical phase; not insert = 60° electrical phase)
TRIMMER "R5"	Clockwise = speed decrease; counterclockwise = speed increase
FUSE "F1"	LINE PICO FUSE 10A fast.
R47	Gain resistance. High value, high gain. Before modify the value contact the customer
S1	ALARM RESET. Turn-off led DS1.

## INSTALLATION NOTES

Drive's overall dimensions and drilling layout have been studied to allow different kinds of fixing, such as by means of spacers, WEIDMULLER RS 100 bar or similar.

Installation must be effected as follows:



### a) POWER SUPPLY :

- External power supply unit or the components of power supply circuit, must be sized according to the application.
- Connecting cable between the power supply unit and the drive must not be longer than 30 cm. and must be composed of two conductors + earth and shielded wire.
- Should you need to use a longer cable, a 6800uF ( $\geq 63V$ ) capacitor has to be inserted near the drive's terminal block.
- Earth connection and cable's shield can be fixed to J1 hole or to FT1 faston.

## **b) POWER :**

- The three motor phases must be wired to the drive by means of a shielded cable with three helicoidal windings.
- Cable dimensions must be suitable for the type of motor used (about 4A/mm<sup>2</sup>) and the length must not exceed 0,5 mt.. In case of a longer distance between motor and drive (do not exceed 1 meter ) the use of a phases filter is suggested. This filter should be composed of an inductor on series and of a capacitor to earth (100uH,10A – 10nF, 250V), to reduce DV/DT produced by mosfets commutation.
- Cable's shield must be connected to both motor and drive.

## **c) SIGNAL :**

- The cable connecting motor's Hall sensors to the drive, must be shielded and with 5 helicoidal windings of section = 0.22 mm<sup>2</sup>. Max. length should be 0.5 mt.
- In case of a longer distance between drive and motor (do not exceed 1 meter), we suggest to use the same cable but with a section of 0.35 mm<sup>2</sup>.
- To connect the remaining signals, if possible, use shielded cables with section of 0.35 mm<sup>2</sup> and no longer than 1 meter.
- Do not use one single cable for both signals and power wires (motor – power supply).

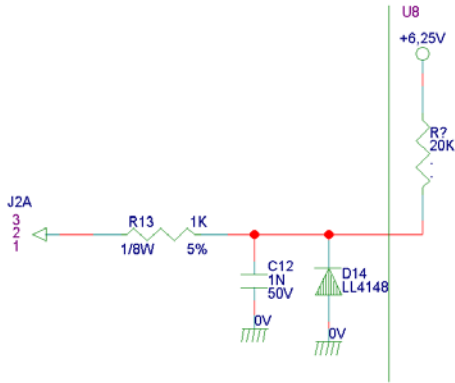
## **d) NOISES SUPPRESSING :**

- By a tester or another suitable instrument, check that the drive is perfectly earth connected. The same must be checked also for all shieldings, for both motor and drive.  
The board complies with all regulations in force, if it's used according to above installation notes. The total compliance with EMI standards depends on the final application. Who integrates the drive into final application must care of the compliance of the whole device with all relevant regulations.
- The drive board has to be put into a metallic box, provided with openings for proper ventilation, which has to be earth connected by means of a minimum resistance connection and as close as possible to the corresponding pole of distribution plug.

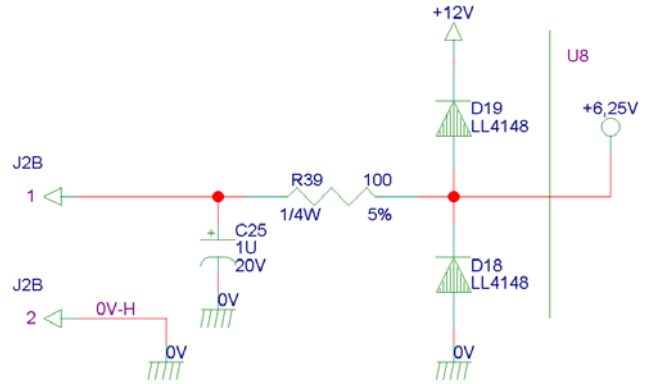
# INPUTS AND OUTPUTS

## a) HALL SENSORS

Hall sensors input.



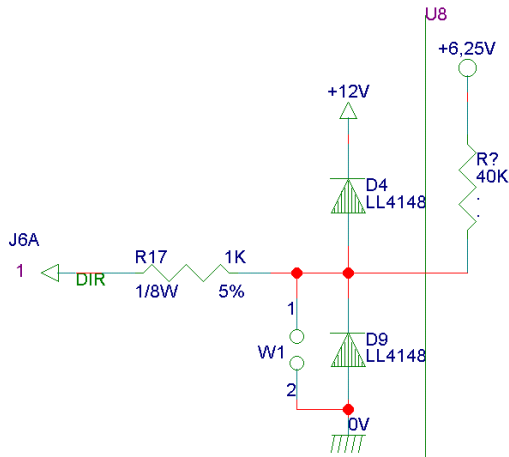
Hall sensors power supply.



**Remark :** Do not connect the two wires inversely and do not short-circuit them, otherwise the drive would be damaged.

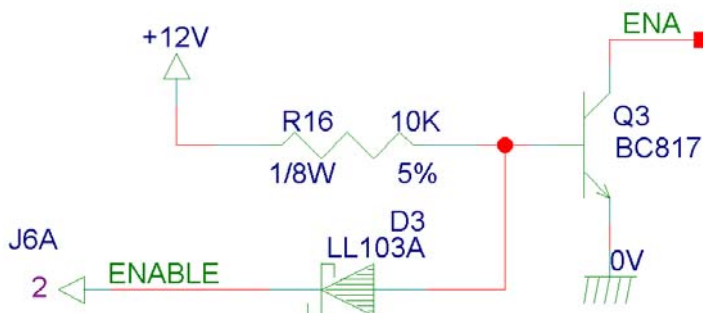
## b) INPUTS.

- Direction



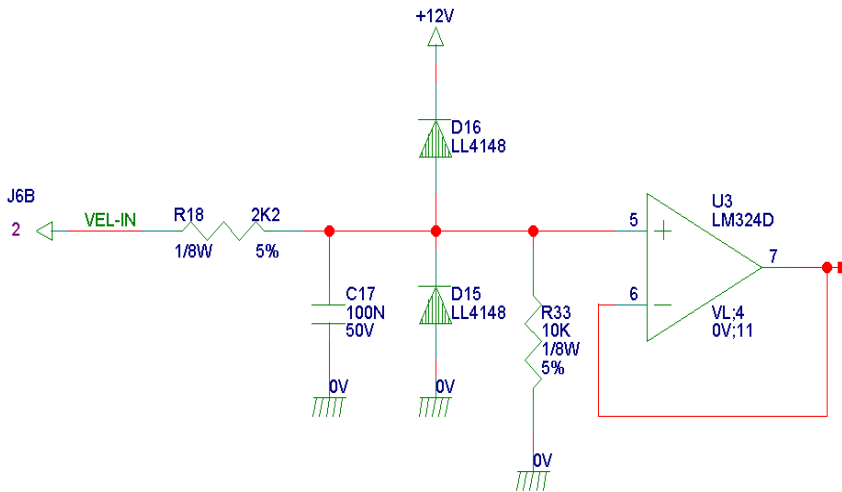
The change of direction of motor rotation has to be effected when motor is stopped.

- Enable



The drive is unidirectional, therefore when it's disabled the motor stops due to the inertia.

- Speed reference



- If you use the external speed reference, the internal trimmer "R5" must be set on "zero"

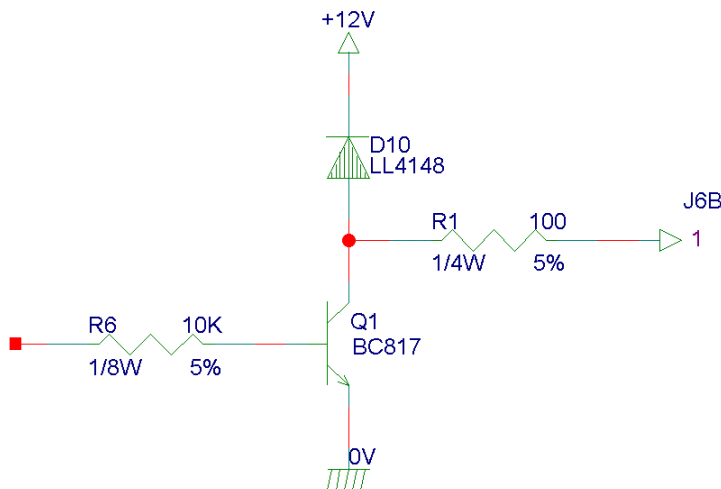
(completely rotate clockwise). Otherwise you can use R5 as off-set to balance the stall torque of the motor.

- By using R5 trimmer to adjust the speed, the external speed reference has to be set on 0V power supply.

**Remark :** since the drive hasn't got an internal ramp generator, it runs correctly only if it's controlled through voltage ramps. In case of high load or sudden start the drive could run irregularly

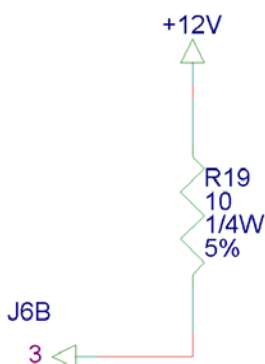
### c) OUTPUTS

- Error



It can control a maximum load of 50mA. After each alarm the circuit of pin 1 of J6B is set on 0V power supply. By pressing reset button (S1), the pin turns on high impedance condition (led DS1 off).

- Uscita +12V



- This output can supply max. 150 mA, assuring an output voltage of 10V.

**Remark :** do not short-circuit the pin because the board would be damaged (R19).

## Components view of PCB

This view enables the user to find out all components mentioned in the hand-book.

