714623   Motor (BRUSH)

◆ italsea

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7BL00097_2	DATE : 06/11/2018	REV. 0.2

7BL00097

MICROPROCESSOR CONTROLLER FOR BLDC MOTORS
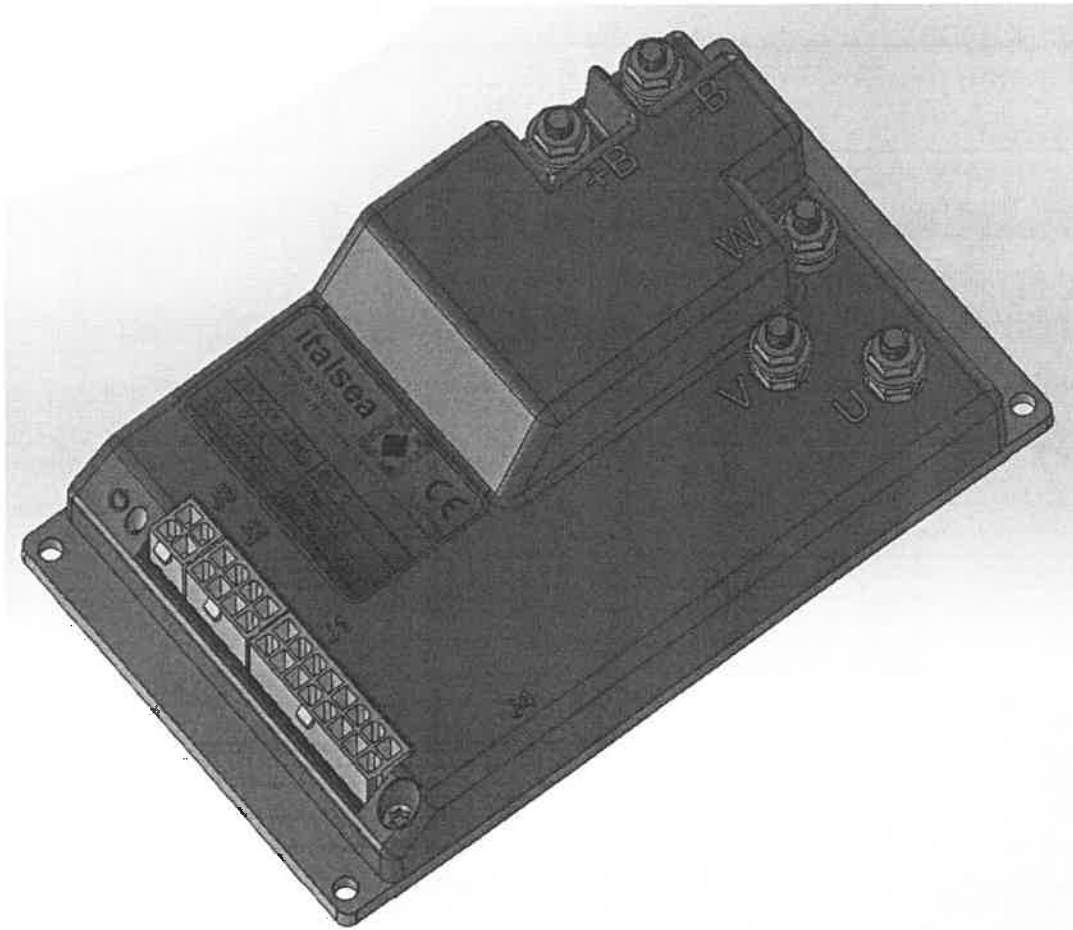
- USER'S GUIDE -

- INTRODUCTION -

The 7BL00097 is a controller designed for brushless DC PM motors powered by battery 24V - 36V .

The inverter is equipped with a powerful microprocessor for digital control of the speed, current regulation and failures of the motor; an efficient diagnostics of the failures and wrong wiring connections, programmability of the main parameters.

The MOSFET power stage is operating with PWM modulation.

The ripple of the current is very low so the efficiency of the system is very high.

The chopper is designed in accordance with the most important EC standards.

- FEATURES -

SUPPLY	36 V (Battery)
RATED CURRENT	30 Arms
MAX CURRENT(@25°C)	70 Arms
FREQUENCY	16 KHz
MAX HEATSINK TEMPERATURE	90 °C
OPERATING TEMPERATURE	-10°C / 40°C
SPEED REFERENCE	FIXED SPEED
REGENERATIVE BREAKING	ONLY FOR BATTERY APPLICATIONS
ON BOARD MAIN RELAY	24V-40A
PARAMETERS PROGRAMMABLE	

<u>SAFETY:</u>	• OUTPUT SHORT CIRCUIT PROTECTION • MOSFET SHORT CIRCUIT PROTECTION • THERMAL PROTECTION • LOW VOLTAGE AND OVERVOLTAGE PROTECTION • REVERSE BATTERY PROTECTION • OVERCURRENT PROTECTION (FUNCTION OF TEMPERATURE) • POTENTIOMETER AND WIRINGS FAULT

PROTECTION	CONFORMAL COATING OF PCB

- MECHANICAL DRAWING -

[6,298]
160mm

[5,984]
152mm

+B   B

W

V

U

[3,346]
85mm

[3,738]
95mm

[0,175]
⌀4.47mm

[1,748]
44.4mm
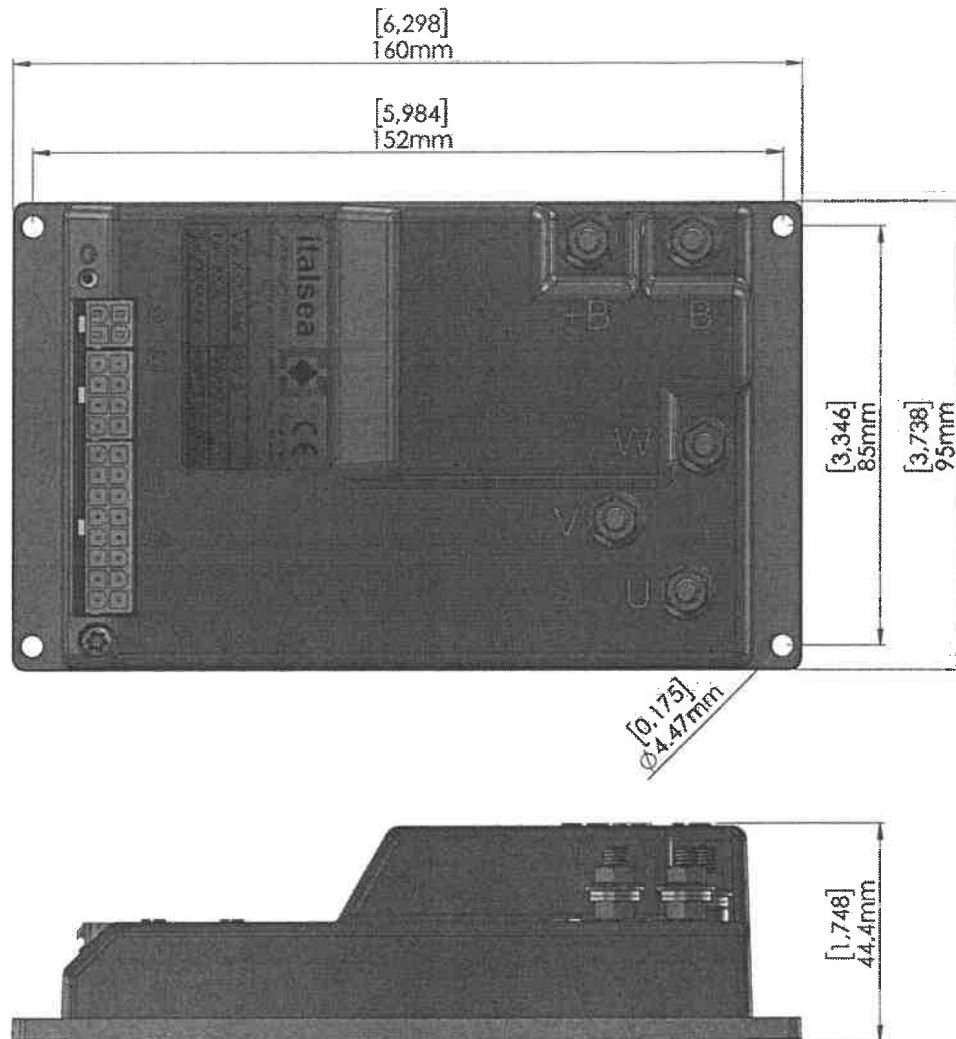
Locate the inverter in a place protected against mechanical abuse, water and dirty.
Fix it with all the screws on a metal surface (aluminum if possible) to reduce the heat and
so for longer period of work.
If during the standard operations the thermal protection is activated very often an
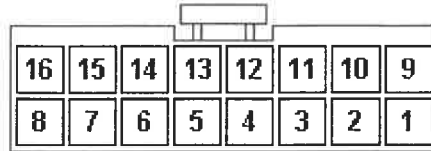additional heath-sink or fan is requested to assure longer periods of work.

- WIRING DIAGRAM FIXED SPEED -
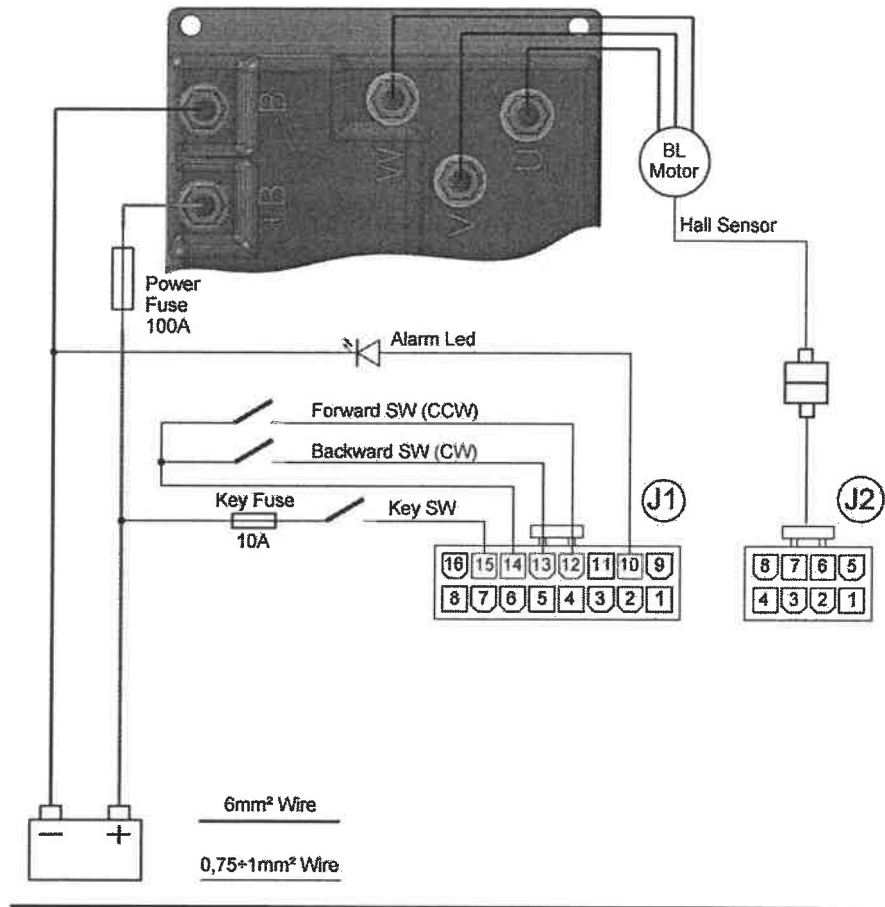
NOTE :
CONNECT FOR EACH MOTOR ONLY FORWARD OR
BACKWARD SW ACCORDING TO THE ROTATION
REQUESTED WHEN MOUNTED ON THE MACHINE

- I/O CONNECTOR -

J1-16v Molex connector (Molex p/n.39012160, contacts p/n.39000038)

Pin 1-8: NOT CONNECTED
Pin 10: ALARM (OPTIONAL)
> Connection for the diagnostic Blinking Led indicator (5Vdc-10mA) output: the number of blinks indicates the alarm type (example 5 blinks -> Alarm 5).

Pin 11: NOT CONNECTED
Pin 12: FORWARD SWITCH
> N.O. input to +V_Batt.

Pin 13: BACKWARD SWITCH
> N.O. input to +V_Batt.

Pin 14: COMMON HIGH
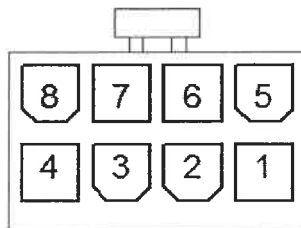> +V_Batt output for switches.

Pin 15: KEY IN
> Key switch input (+V_Batt).

Pin 16: NOT CONNECTED

- MOTOR ENCODER/HALL SENSORS CONNECTOR -

J2-8v Molex connector

- PIN 1 = positive supply (14V)
- PIN 2 = Hall sensor U
- PIN 3 = Hall sensor W
- PIN 4 = temperature sensor optional (negative)
- PIN 5 = negative supply (-Battery)
- PIN 6 = Hall sensor V
- PIN 7 = Encoder A (optional)
- PIN 8 = Encoder B (optional)

- SERIAL COMMUNICATION CONNECTOR -

J3-4v Molex connector (Molex p/n.3901240, contacts p/n. 39000038)

Used for handheld programmer

- CONTROLLER SETTING -

7PROGLCD HANDHELD PROGRAMMER

fig.6

LCD 16X2:
Displays parameters, alarms and measures (description and value).

UP Key:
Rolls up parameters and increases values.

MODE Key:
Confirms a selection and the change of value.

UP Key:
Rolls down parameters and decreases values.

At power-on, handheld programmer displays the "Tester Mode" pages. In this pages, you'll find the motor current and voltage, speed reference input, internal aluminum heat-sink temperature, battery voltage, hour-meter and software release.

To start the programming function push the button "MODE", and the first parameter will appear; pushing the "UP" button the number of the parameter will be increased and with the "DOWN" button the number will be decreased. When a parameter is selected, push the button "MODE" to enter in the change menu, change the value with the buttons "UP" and "DOWN", then confirm the value with the button "MODE". To return to the TESTER menu push together the buttons "MODE "and "UP", or wait few seconds.
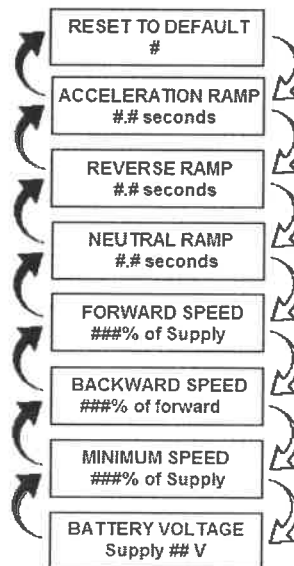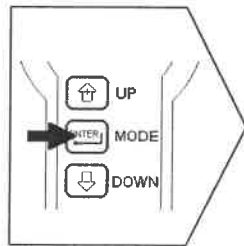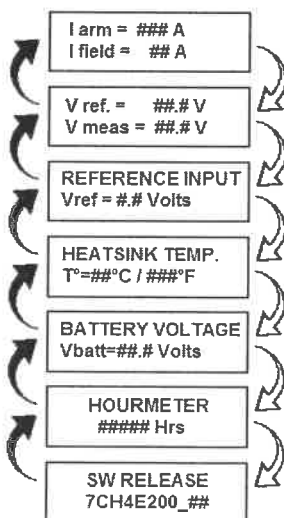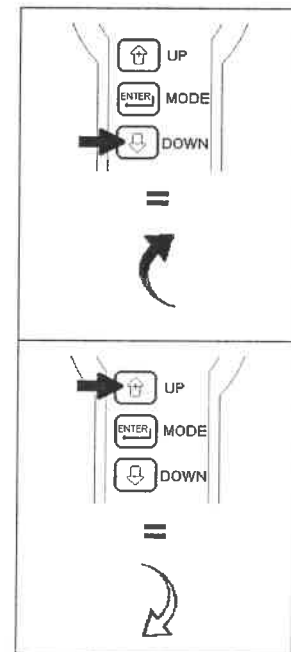

fig.7

714623 BRUSH MOTOR

- ALARMS-

DISPLAY	ALARM	WHAT TO DO
ALARM A1 FW Switch ON	Forward switch closed at power-on	Put the speed reference to zero and open the FW switch.
ALARM A2 BW Switch ON	Backward switch closed at power-on	Put the speed reference to zero and open the BW switch.
ALARM A3 Pot. FAULT	Potentiometer fault.	Check the potentiometer's wires.
ALARM A4 Ref OUT Neutral	Potentiometer out of neutral position at power-on	Move the potentiometer to neutral position or calibrate the speed reference.
ALARM A5 Over temperature	Thermal protection	Wait few minutes and check the motor current.
ALARM A6 POWER STAGE	Controller's power stage damaged	Change the controller.
ALARM A7 OVERCURRENT	Over-current : short circuit	Check the motor's wires then change the controller.
ALARM A8 POWER FUSE/RELAY	Power fuse or main contactor damaged.	Check fuse and connection, then change the controller.
ALARM A9 UNDERVOLTAGE	Under-voltage.	Check battery's charge.
ALARM A10 OVERVOLTAGE	Over-voltage.	Battery voltage upper than 45V: check the battery.
ALARM A11 OVERLOAD CURRENT	Overload protection	Check the motor working current and parameters "rated current" and "overload time".
ALARM A12 DISABLE ON	Disable switch on.	Check the input switch: this alarm will reset by power-off.
ALARM A13 KEY-OFF	Key-off sequence detected.	Check the key switch connections.
ALARM A14 EEPROM FAIL	E²prom fail.	Check your settings, then change the controller.
ALARM A16 ENCODER FAIL	Encoder signals failure.	Check encoder connections.

7

- TESTER MODE -

MOTOR SPEED **#### rpm**	Motor speed (measure unit=Rpm).
SPEED REF. **#.#V #### rpm**	Speed reference voltage (measure unit=Volts); potentiometer or voltage (0-5V) speed reference.
HEATSINK TEMP. **T°= ##°C / ###°F**	Internal heat-sink temperature (measure unit C° and F° degrees)
BATTERY VOLTAGE **Vbatt= ##.# Volts**	Battery supply voltage (measure unit=Volts)
Inputs monitor **J1: ##,##,##,##**	Digital inputs actually actives (if input is present, pin id is shown)
Overload level: **##% (at ### Amps)**	Percentage of ammeter protection level (100% means alarm on), and actual motor current.
HOURMETER **#### hrs, ##### min**	Measure of worked hours (power-on and out of stop position).
SW RELEASE **7BL00XXX_#**	Software's release number.
MOTOR CURRENT **Imot= ## Amps[rms]**	Motor current measure (measure unit=Amperes).

- PARAMETERS FIXED SPEED -

PARAMETER	DESCRIPTION	DEFAULT 1	DEFAULT 2	DEFAULT 3
RESET TO DEFAULT	Reset to default	DCM3512	DCM3513	DCM3647
ACCELERATION RAMP	Acceleration ramp	1.0s	1.0s	1.0s
REVERSE RAMP	Reverse dec. ramp	1.0s	1.0s	1.0s
NEUTRAL RAMP	Neutral dec. ramp	1.0s	1.0s	1.0s
FORWARD SPEED	Forward max. speed	100%	100%	100%
BACKWARD SPEED	Backward max speed	100%	100%	100%
MINIMUM SPEED	Minimum speed	10%	10%	10%
BATTERY VOLTAGE	Battery Voltage	36.0V	36.0V	36.0V
SPEED REFERENCE	Speed Reference	FW/BW	FW/BW	FW/BW
REF. DEADBAND	Reference Dead-band	100mV	100mV	100mV
BRAKE DELAY	Brake delay	1.0s	1.0s	1.0s
MODE 1 SPEED	Speed in Mode 1	50%	50%	50%
MODE 1 CURRENT	Current in Mode 1	70Arms	70Arms	70Arms
BW SAFETY TIME	Backward safety time	3.0s	3.0s	3.0s
BW SAFETY SPEED	Backward safety speed	30%	30%	30%
LOW BATTERY	Undervoltage protection	19.0V	19.0V	19.0V
MOTOR DIRECTION	Direction in forward	CCW	CCW	CCW
CURRENT LIMIT	Controller's current limit	70Arms	70Arms	70Arms
RATED CURR	Motor's rated current	30Arms	30Arms	30Arms
OVERLOAD TIME	Motor's overload time	60s	60s	60s
MOTOR POLAR COUPLES	Number of polar couples	4	4	4
MAX SPEED	Max no load speed [rpm]	1750	2800	1800
MAX MOT TEMPE	Max motor temperature [°C]	150	150	150
ENC ABILITATION	Encoder abilitation/reverse	No	No	No
ENC PULSES	Total encoder pulses/rev	32	32	32
5-J1 HW CONFIG	Pin 5 – J1 hw config.	N.O. switch	N.O. switch	N.O. switch
6-J1 HW CONFIG	Pin 6 – J1 hw config.	N.O. switch	N.O. switch	N.O. switch
11-J1 HW CONFIG	Pin 11 – J1 hw config.	N.O. switch	N.O. switch	N.O. switch
5-J1 P.UP-DOWN	Pin 5 – J1 pulled up/down	Pull up	Pull up	Pull up
6-J1 P.UP-DOWN	Pin 6 – J1 pulled up/down	Pull up	Pull up	Pull up
11-J1 P.UP-DOWN	Pin 11 – J1 pulled up/down	Pull down	Pull down	Pull down
12-J1 P.UP-DOWN	Pin 12 – J1 pulled up/down	Pull down	Pull down	Pull down
13-J1 P.UP-DOWN	Pin 13 – J1 pulled up/down	Pull down	Pull down	Pull down
ENABLE ALARM 1	A1 alarm enabling	DISABLE	DISABLE	DISABLE
ENABLE ALARM 2	A2 alarm enabling	DISABLE	DISABLE	DISABLE
ENABLE ALARM 3	A3 alarm enabling	DISABLE	DISABLE	DISABLE
ENABLE ALARM 4	A4 alarm enabling	DISABLE	DISABLE	DISABLE
ENABLE ALARM 12	A12 alarm enabling	DISABLE	DISABLE	DISABLE
PASSWORD	Password			

RESET TO DEFAULT PARAMETER

ATTENTION : FIRST OPERATION TO DO FOR SETTING THE
CONTROLLER TO DIFFERENT MOTOR MODELS ;
- ENTER WITH THE PROGRAMMER THE "RESET TO
  DEFAULT" MENU
- SELECT DEFAULT 1-2-3 ACCORDING TO THE MOTOR
  MODEL IN THE TABLE (DCM3512-3513-3647) AND CONFIRM
  WITH "MODE"
- SWITCH OFF THE CONTROLLER FOR MEMORIZATION

RESET TO DEFAULT **######**	DEFAULT: 0 MIN: no MAX: 1-2-3

To reset all the parameters, set 1-2-3 and power-off ; at the next power-on, the controller
will update the defaults settings.

MOTOR CURRENT SETTING

CURRENT LIMIT **### Arms**	DEFAULT: 70 MIN: 20 MAX: 75

Maximum output motor's current: this value is used also to calculate the ammeter/overload
protection.

OVERLOAD PROTECTION

In the programming mode set the rated current and overload time for the motor:

RATED CURRENT **## Arms**	DEFAULT: 30 MIN: 10 MAX: 30

OVERLOAD TIME **### seconds**	DEFAULT: 10 MIN: 10 MAX: 120

The protection will be activated each time the current overcome the value In and the
overload time is as shorter as higher is the overload according to the function. After the
integration time the controller will stop the machine and an alarm (A11) will be activated.

*NOTE: ammeter time depends on heatsink temperature too; if the temperature is
higher than 50°C the protection time is reduced (at 80°C is about 1/4 of calculated
time).*