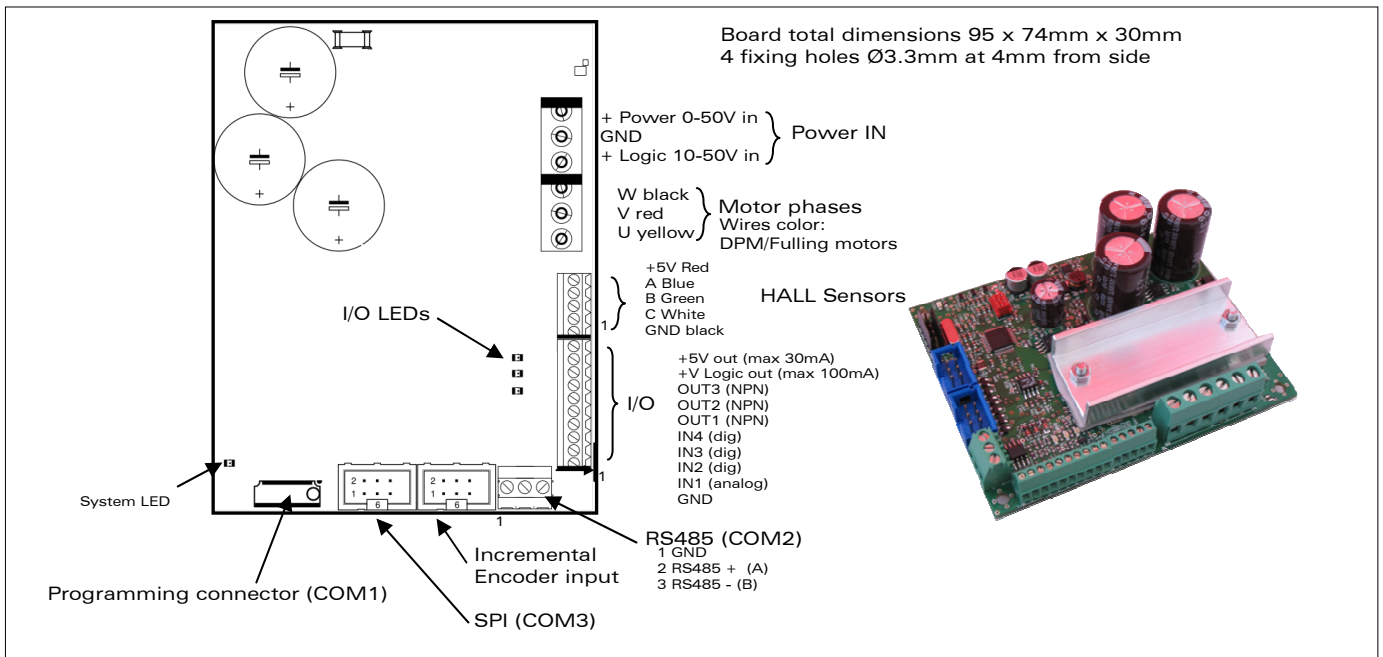


INTELLIGENT BLDC electronic

Programmable in BASIC



Overview

The **Tinaxis BL600 INTELLIGENT controller** is a powerful motor driver, programmable in **BASIC**, includes **32bit ARM processor**
50V- 20A continuous, up to 30 A peak (1000W / 1500W)

- PWM amplifier: 2, 4 quadrants, block commutation, with brake
- High performance multiple PID controllers, predictive module
- Speed 0 to 100'000 RPM
- Rotor detection: Hall sensors
- Programmable in BASIC (12 kB program flash), configuration wizard for easy use
- 50 MHz, 32 bit microcontroller (ARM)
- 4 inputs (1 analog, 3 digital)
- 3 outputs Open collector NPN, 50mA 35V
- 3 serial connectors: RS232 (TTL levels), RS485, SPI
- Encoder input: A/B + Index (SSI possible on SPI)
- Can drive 1 BLDC or 2 DC motors

Parameter	unit	value
1 Supply voltage POWER and LOGIC separated	V	Power: 0-50V / Logic 10-50V
2 Driver current (continuous / peak) (On high values, be careful of temperature elevation)	A	20 / 30
3 Input current when motor OFF	mA	30 to 100 (depend on voltage)
4 General purpose inputs: 1 analog input, 0-25V with 25mV resolution, impedance to GND: ~30kOhm 3 digital. In timer mode, time resolution of 20ns An input not connected is low levelled (<100mV or logical 0)		
5 General purpose outputs: 3 digital outputs, open collector to GND, max 50 mA 35V, visualized by LEDs		
8 PWM frequency	kHz	1 to 60
9 Ambient temperature range for 100% of max power*	°C	-10 to 50
10 Ambient temperature range for 50% of max power*	°C	-10 to 75
11 Response time on input change	ms	<2.5
12 Embedded safety protections: Over temperature, over current (software), low current polarity inversion, ESD in wires, short circuited outputs		
13 Safety precautions: be sure to avoid these parameters during storage and use: Water or metallic particles projections, shocks, over voltage, reversed voltage		
14 Start-up initialisation time (system boot): < 300 ms		
15 Communication, hardware description: COM1 (UART TTL, to USB or RS232 via adapter) 100 to >500000 bps COM2 RS485 with fail safe, no terminal resistor. 100 to >500000 bps COM3 SPI (accessories connector) Optional MODBUS ASCII or RTU (binary)		

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Parameter	unit	value
15	Communication, software description: COM1 and COM2: DM-Remote, DM-binary (slave or master), optional ModbusRTU (s or m), optional DMX (s or m) COM3: to connect SSI encoder(s), I/O module, display module	
16	Movement: Open loop voltage mode – closed loop speed control with ramps – closed loop positioning with trajectory generation – cam generation (optional) – brake mode – free wheel mode	
	* depend on the cooling conditions	

Software

Custom motion software can be written by the user and download to the unit from a user friendly Windows software available at Dynamic Motion, through a RS232 or USB cable provided by Dynamic Motion, or through a long distance RS485. Thanks to the BASIC programming, any kind of sequence and behaviour can be programmed with a

minimum effort, ensuring a reliable operation and fast engineering.

The user can access to the motion parameters, I/O, communication parameters and various other parameters like temperature or timers. Tinaxis BL120 offers the extended parametric motion calculator.

Driver detailed electrical characteristics

Power connector

Pin	Function	Range
1	Logic +	10-50V
2	GND	Common ground
3	Power +	0-50V, typically used with 24V or 48V. Do not reverse!

GND = negative voltage, common to Power, Logic, I/O

V + Power = Supply of the amplifier bridge that power the motor phases. Note: V+ power works from 0V

V + Logic = Supply of the internal circuits (microprocessor, LCD, IO, ...)

Both V+ can be connected together, or separate. Therefore it is possible to connect the power through a safety relay, without affecting the software execution.

Connector type: 5.0 mm pitch, terminal block, for up to 4 mm²

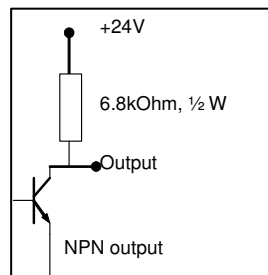
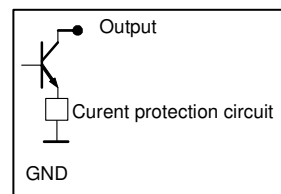
I/O connector (Inputs – Outputs)

Pin	Function	Description
1	+5V out	Max 100mA, usage: only to supply low current devices, as switches, leds, potentiometers, ...
2	+V Logic out	Voltage to connect external low power devices that are connected to the board. This output is not protected, not short-circuit tolerant. Max current: 100mA.
3	Out3	NPN output (see below)
4	Out2	NPN output
5	Out1	NPN output
6	IN4	Digital
7	IN3	Digital
8	IN2	Digital
9	IN1	Analog input: 10 bits with oversampling
10	GND	Use it to reference the I/O. Do not supply from this pin. Internally connected to power GND

The outputs are "Open collector" NPN transistors, with over-current protection circuitry. In software, a level 0 makes the transistor not conducting, and a level 1 makes them conducting up to 100mA in total for the 4 channels. When an over-current is detected, the outputs are disabled up to the next reset (power off of logic supply). The state of the outputs are shown with the LED

Tips: how to make it compatible with PNP logic?

Answer: use a pull-up resistor, to force the voltage to a higher value when the transistor is not active. The value of that resistor can be between 4.7k and 10k.



Programming connector

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The 5 pin connector may be used for downloading the BASIC software and for remotely control the electronic.

Encoder connector

6 PIN Quickie / DIN41651

Pinout:

1. GND
2. A
3. B
4. Index
5. Chip Select (not used with incremental encoders, only for SSI encoders)
6. +5V (max. 40mA)

SPI connector

6 PIN Micromatch type

Pinout:

1. GND
2. CLK
3. RX
4. TX
5. Chip Select
6. +5V (max. 40mA)

Driver software characteristics

For a complete documentation, please refer to the Software manual 3.x. This section is a summary of the most used options

Programming environment

The minimum requirement is:

A computer with a serial connexion, a text editor, a terminal software for downloading and a cable to connect the motor to the computer.

Dynamic Motion provides the following components:

- Free (GNU) text editor with special syntax coloration add-on for Dynamic Motion BASIC language
- Free Dynamic Motion Communication Software that works under Windows XP
- USB - TTL adapter (to buy separately, article P000-034)

Programming language

- The software that runs inside the controller is **Dynamic Motion BASIC**.
- To remotely control the motor, a set of **REMOTE commands** is available.

Dynamic Motion BASIC summary

Instructions	Expression operators	Comparison operators
IF-THEN-ELSE FOR-TO-NEXT GOSUB-RETURN GOTO PRINT PAUSE END	(form: variable = expression) + - * / ^ (power) % (remaining of a division) ()	= < > <> (not equal) <= (smaller or equal) >= (bigger or equal)

Variables, registres	Special	Numbers
user variables: A, B, ...Y, Z Predefined variables: see Dynamic Motion BASIC detailed description Example: SPEED	' (line comment) " (text string descriptor) , ; (argument separators)	Line labels: 0 to 9999999 Numbers: signed integer in decimal notation, 32bit (range: from -2'147'483'648 to +2'147'483'647)

Remote language

Motion Instructions	System Instructions	Programming tools
JG (jog, set speed) MT (move to, absolute position) MB (move by, relative move) MD (mode: brake, speed, ...) DS (Disable motor) BR (Brake)	SB (Stop Basic execution) TB (Start Basic execution) RB (RESET Basic execution) VA (variable get or change) RV (reset all variables to default)	PR (Print the BASIC software currently in Flash memory) PC (Print configuration) UL (Upload BASIC software)

Usage example: jg 1200^{enter}: set the jog speed to 1200RPM

Most used variables

Motion variables	Usage
MODE JOG	0: auto; 1: brake; 2: not powered; 4: open loop; 6: speed regulation; 8: positioning Set the speed regulation value (unit: RPM)

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TARGET	Set the position to reach in positioning mode (unit: encoder increment, 1024 =1 rev.)
MOT_V	Motor voltage: can be read in any modes. Set voltage in open loop. (Unit: mV)
ACC, DEC	Acceleration and deceleration value that regulation must follow
M_SP_P, M_SP_N	Max speed in positive and negative direction in positioning mode
SPEED, POS_HAL	Value of the measured speed and position (unit: RPM and HALL sensor increment)
IN1, IN2, ...IN4	Value of the voltage measured on the 5 inputs (unit: mV)
OUT1, ... OUT3	Set the state of the outputs (0 = not conducting, 1 = conducting)
V_POW, I_MOT	Measured voltage of power supply, measured motor current (unit: mV and mA)
TEMPER	Temperature of the board (unit: 1/1000 °Celsius)
TIME	Time in seconds since last power-up (68 year counting)
TIME_U1, TIME_U2	Timer counting up from 0 to $\sim 2 \cdot 10^9$, stopped when value is neg. (Unit: millisecond)
TIME_D1, TIME_D2	Timer counting down to 0, from any positive value (Unit: millisecond)
PID1_P, PID1_I, PID1_D	PID regulator factors (used in any closed loop modes)
...	<i>See the detailed documentation for complete description</i>

Software example

```

100      'line label of infinite loop
      if in1 > 2000 then gosub 200 'jump to subroutine at label 200 if voltage on IN1 is > 2.0V
      else jog = 0 'stop motor
goto 100 'back to the beginning if infinite loop
200     jog = 2500 'set speed to 2500RPM
      pause 10000 'wait 10.0 second
return  'come back from subroutine
    
```

Commutation table

In the case that the HALL sensor polarity is positive:

Step nr (register HALL_N)	0	1	2	3	4	5
Hall sensor A	0	0	0	1	1	1
Hall sensor B	0	1	1	1	0	0
Hall sensor C	1	1	0	0	0	1
Phases voltage CW						
U	hZ	GND	GND	hZ	+	+
V	GND	hZ	+	+	hZ	GND
W	+	+	hZ	GND	GND	hZ
Phases voltage CCW						
U	hZ	+	+	hZ	GND	GND
V	+	hZ	GND	GND	hZ	+
W	GND	GND	hZ	+	+	hZ

Legend:

0= low voltage level (0V), 1= level high (5V)

hZ = high impedance, + = PWM variable voltage, GND= connected to GND

Ordering information

Désignation	Article
1 Tinaxis Plus BL600.01	P010-E300

Custom versions possible

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