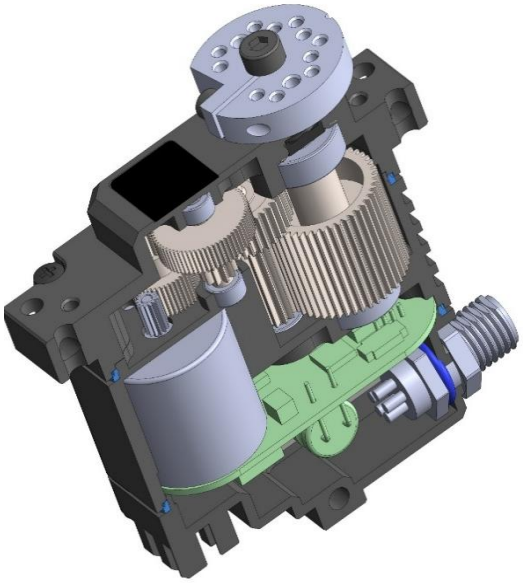
BLA21-28U-A02/AB2 Technical Specification

This product is a compact servo motor featuring high torque, IP67-rated, and a long-life.



Model	Features
BLA21-28U-A02	Supports DroneCAN v1 signals. Case shielded line and Battery line(-) are separated. No PWM.
BLA21-28U-AB2	Supports DroneCAN v1 and PWM signals. Case shielded line and Battery line(-) are common. No Case shield.

■Caution

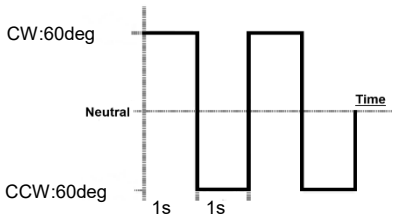
- **This product SHOULD NOT been used for the devices that is directly related to human life.**
- **The application of this product as a weapon of mass destruction is banned, and for military use, it is confined to defense purposes in regions with no security risks.**
- **Keep the servo away from an object which produces a strong magnetic field. There is a possibility of malfunction if the servo is affected by a strong magnetic field.**
- **Specifications and appearance of hardware/software and accessories are subject to change without notice for improvement.**
- **When disposing of this product, please comply with the relevant laws and regulations of each country and dispose of it as industrial waste.**
- **Do not insert or remove connectors while the power is on. Always turn off the power before connecting or disconnecting any connector.**
- **If you use this product in a vibrating environment, please check the connectors regularly to ensure they have not become loose.**

Basic specifications

Item		Specification				Remarks	
Rated Voltage	typical	28.0			V	DC power supply.	
	range	24.0	～	28.0	V	DC power supply.	
Operating Voltage		20.0	～	32.0	V	DC power supply.	
Standby Current		≦		42	mA	at 28.0V	
Starting Current *1	Design value	≦		5	A	at 28.0V	
		BLA21-28U-A02: 3.2 BLA21-28U-AB2: 2.4			A	100% of torque control. See each signal specification.	
Consumption Current *1,*2		80			mA	at 28.0V , No-load	
Max Torque *1,*2		4.51			N·m	at 28.0V	Applying this torque value for more than 1 second may cause damage.
		46.0			kgf·cm		
		638.7			ozf·in		
		4.31			N·m	at 24.0V	
		4.71				at 32.0V	
Rated Torque *1,*2		1.47			N·m	at 28.0V	Please use at or below this torque.
		15.0			kgf·cm		
		208.2			ozf·in		
		1.36			N·m	at 24.0V	
		1.47				at 32.0V	
Rotation Time *1		0.07			s/60°	at 28.0V	This unit is commonly used as the speed unit for RC servos.
		0.08				at 24.0V	
		0.06				at 32.0V	
Speed with no load *1,*2 (Angle control mode)		857			°/s	at 28.0V	
		143			min^{-1}		
Speed with no load *1,*2 (Speed control mode)		143			min^{-1}	at 28.0V	
Rotation Angle *1	Range	Mechanical	179.9	～ -180.0	°	Absolute	
		Software	- 36,000,000	～	°	Pseudo absolute *Incremental above mechanical range.	
			+ 36,000,000				
	Accuracy	±3.0			°	Standard value	at 28.0V, No- Load, Position:±60°
		±1.5				Measured value	
Direction *1		CW :Rotation Angle ＞ 0 (+) CCW :Rotation Angle ＜ 0 (-)				Based on the top surface of the servo (the side with the nameplate).	
BackLash *1		≦		0.50	°		
Temperature Range	Operating	-40	～	70	℃	-40 °F ～ 158 °F	
	Storage	-40	～	80	℃	-40 °F ～ 176 °F	
Over heat protection		80			℃	The default temperature to activate the self-protection function “Torque OFF” in order to prevent overheat. The temperature can be set from 20° C to 80°C on the Signal line※3 and on the program tool additionally provided by Futaba.	
		176			°F		

*1 At 23±5°C (Initial Performance Data)
*2 Each value is typical.
*3 The signal used for configuration varies depending on the model.

Mechanical specifications

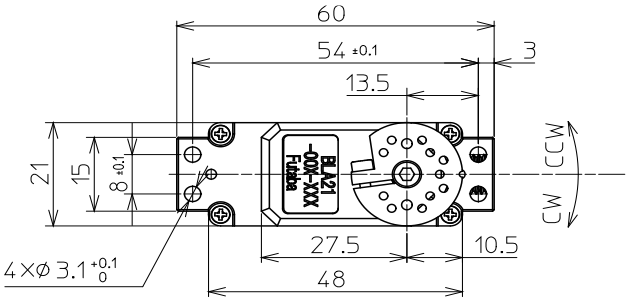
Item	Specification							Remarks
Outer Dimension	48.0	×	21.0	×	51.0	mm		See below Outer Dimension
	1.89	×	0.83	×	2.01	inch		
Weight	127					g		with Horn and screws without cables
	4.48					oz		
IP Code	IP67							Waterproof and Dustproof
Case Material	Upper		Aluminium					Surface : Anodizing
	Middle		Aluminium					Surface : Anodizing
	Bottom		Aluminium					Surface : Anodizing
Gear Set Material	Steel							Surface : Hardening treatment
Gear bearing	8					ball bearing		Assembled to the final gear
Output Shaft	Serration S6L							Size: φ6mm, 25 teeth
Radial load	100					N		Load position : Refer to Outer Dimension
Position Sensor	Magnetic Encoder							
Motor Type	Brushless DC Motor							
MTTF *1	Operating time *2 (Inquire for the test report)			1,000		h		Operating Condition ・ at 28.0V ・ ±60°, 0.5Hz sweep Test Condition ・ Load : Rated Torque (Powder Brake)
				1,800,000		cycle		Angle Command Value 
Vibration Resistance *1	Operating time *2 (Inquire for the test report)			300		h		Operating Condition ・ at 28.0V ・ ±60°, 0.5Hz sweep ・ No-Load Test Condition(sine wave) ・Frequency : 10 to 500Hz (sweep 1oct/min, amplitude limit 2mm) ・Acceleration : 300m/s^2 ・Vibration axis : X,Y,Z
	Equivalent to MIL-STD-810H Method 514.8 (Annex E,Minimum Integrity)			Operating Condition ・ at 28.0V ・ ±60°, 0.5Hz sweep ・ No-Load				Test Condition (Random wave) ・Refer to MIL-STD-810H Method 514.8 ・Company internal test

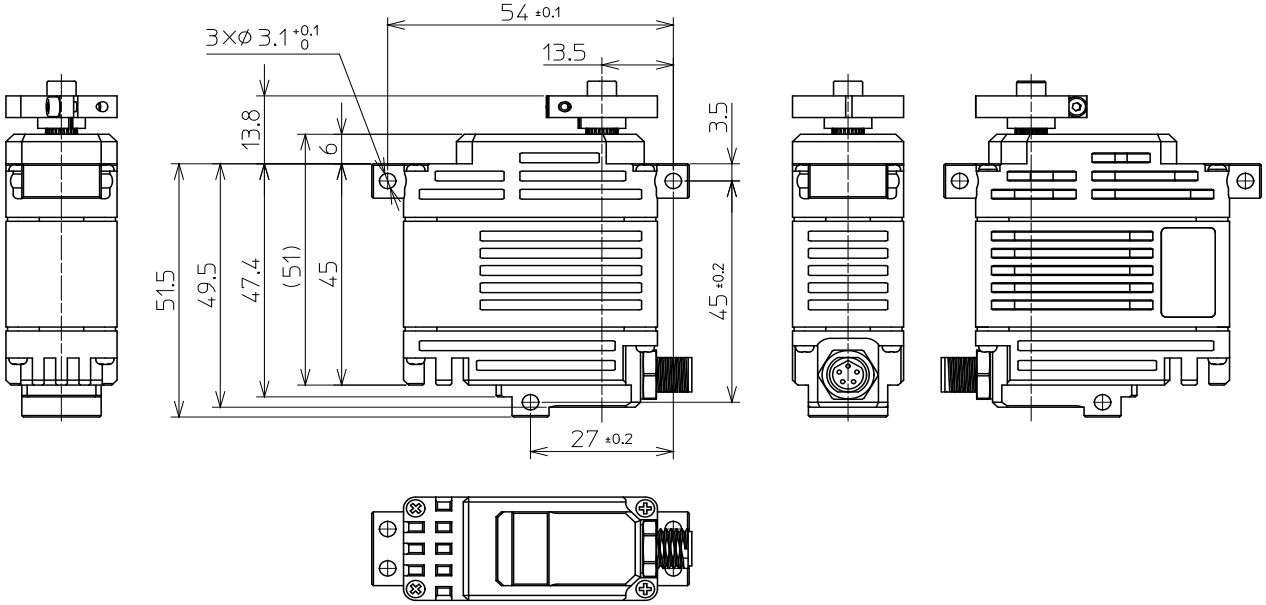
*1 At 23±5°C (Initial Performance Data) Each values are measured values and are not guaranteed values.

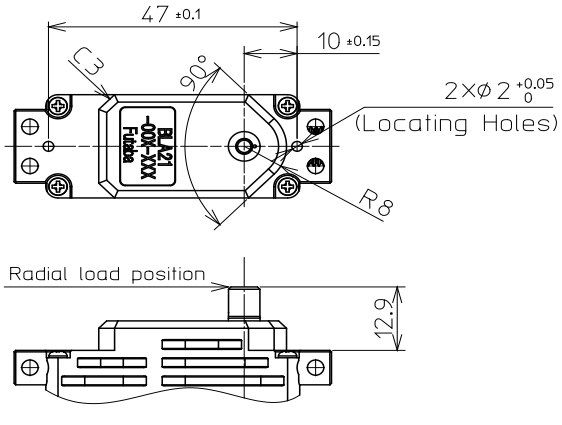
*2 This test is currently undergoing continuous measurement.

Outer Dimension

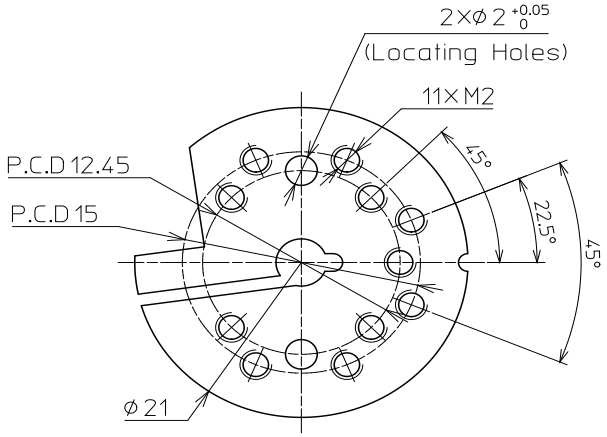
(unit : mm)





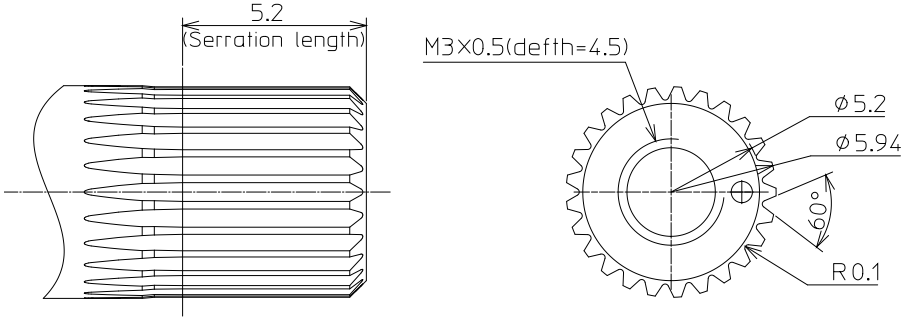


Without Servo Horn



Servo Horn

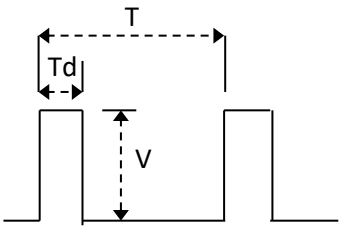
OUTPUT SHAFT



Sarretion Size

Standard Diameter : Φ6
Angle : 60°
Tooth : 25

Specifications for PWM signals

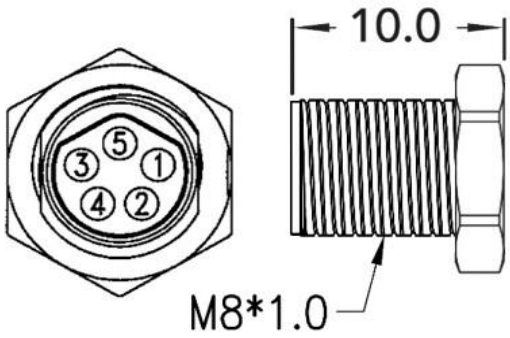
<table>
<tr><th colspan="3">Item</th><th colspan="4">Specification</th><th colspan="4">Remarks</th></tr>
<tr><td colspan="3">Communication Interface</td><td colspan="4">PWM
 
</td><td>Signal Voltage HIGH:V</td><td>max</td><td>2.0</td><td>V</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td></td><td>min</td><td>5.0</td><td>V</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td>Signal Voltage LOW:V</td><td>max</td><td>0.0</td><td>V</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td></td><td>min</td><td>0.45</td><td>V</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td>Frame Rate:T</td><td colspan="2">14.25</td><td>ms</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td rowspan="3">Pulse Wide:Td</td><td>CW</td><td>2,120</td><td rowspan="3">μs</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td>Center</td><td>1,520</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td>CCW</td><td>920</td></tr>
<tr><td colspan="3"></td><td colspan="4"></td><td colspan="4">If the high level voltage exceeds 2.0V, the servo may be damaged.
If you use an RC device as a signal source, please pay attention to the voltage level of the PWM signal.</td></tr>
<tr><td rowspan="5">Operating Mode (PWM)
+ :CW
- :CCW
(Turn direction reversible)*1</td><td rowspan="4">Angle control (Absolute)</td><td rowspan="4">Rotation Angle</td><td>Default</td><td>Max</td><td></td><td rowspan="4">The travel ends are ±60° (default) with a pulse of 1,520 ± 600μs, where the input width is 600μs centered at a neutral of 1,520μs. The travel ends can be adjusted from ±60° to ±180° using the CANBUS line and the Futaba program tool. Both the neutral (1,520μs) and input width (600μs) can be set within ranges of 100 to 10,000μs and 10 to 10,000μs, respectively.</td></tr>
<tr><td>+60.0°</td><td>+180.0°</td><td>2,120μs</td></tr>
<tr><td colspan="2">Neutral 0°</td><td>1,520μs</td></tr>
<tr><td>-60.0°</td><td>-180.0°</td><td>920μs</td></tr>
<tr><td rowspan="3">Angle control (Extended)</td><td rowspan="3">Rotation Angle</td><td colspan="2">+360.0°</td><td>2,120μs</td><td rowspan="3">The travel ends can be extended to ± 360°, beyond the absolute range of ± 180°. After the servo is switched off, positions in the extended range (± 360° > position > ±180°) will be recognized within the absolute range. For example, an end position of CW 270° will be regarded as CCW 90°.</td></tr>
<tr><td colspan="2">Neutral 0°</td><td>1,520μs</td></tr>
<tr><td colspan="2">-360.0°</td><td>920μs</td></tr>
<tr><td rowspan="3">Speed control</td><td rowspan="3">Max Speed</td><td>+600</td><td rowspan="3">min^{-1}</td><td>2,120μs</td><td rowspan="3">This mode is for applications requiring continuous servo rotation. The speed can be set within ±600min-1 using the CANBUS line and the Futaba program tool. Refer to “Speed with no load (Speed control mode)“ for speed variations.</td></tr>
<tr><td>0</td><td>1,520μs</td></tr>
<tr><td>-600</td><td>920μs</td></tr>
</table>

*1 Based on the top surface of the servo(the side with the nameplate).

Specifications for CAN BUS signals

Item		Specification				Remarks		
Communication Interface		CAN BUS				Protocol :	DroneCAN v1	
						Baud Rate :	1	Mbps
						Sample Point:	87.5	%
						NodeID:	1 ~ 127	
Operating mode (CAN BUS)	Angle control (Absolute)	-180.0	~	+179.9	°	The position within this range is absolute and can be recognized by the servo even after power-off. The position commands within this range are uniquely identified. For accuracy, see "Speed with no load (Speed control mode)". Resolution is 0.1°.		
	Angle control	-36,000,000.0	~	+36,000,000.0	°	The servo can accept position commands over 360°, but will lose multi-turn information when switched off, recognizing only the absolute position within 360°. Resolution is 0.1°.		
	Speed control	-300	~	+300	min^{-1}	This mode is for continuous servo rotation, with speeds ranging within 300min-1. Speed settings can be adjusted via CANBUS and a Futaba program tool. Refer to “Speed with no load (Speed control mode)“ for actual speed details.		
	Torque control	-100	~	+100	%	Maximum torque at 28.0V supply voltage is 100%. Refer to “Max Torque“.		

Connector specifications

Item		Specification			Remarks	
Cable		Shielded Cable(Detachable)			400	mm
					15.75	inch
Cable bending radius		78		mm		
Connector	Manufacture	ODS Electronics Co., Ltd.				
	Type	MMEPM05MCC-SHS7001				
	Matching	BE0010 or BE0011			Futaba Support Product Code	
Pin Assignment (BLA21-28U-A02)		Pin No.	Assignment	Cable Color	BLA21-28U-AB2 Pin Assignment	
		①	Battery(+)	Brown	Battery(+)	
		②	Battery(-)	White	PWM	
		③	CAN-H	Blue	CAN-H	
		④	CAN-L	Black	CAN-L	
		⑤	Case Shield Line	Drain	Battery(-) and Case Shield Line	
Pin Layout						

Model name system

BLA 21 - 28 U - A B 2

Motor type
BLA : Brushless Motor

Servo width
21 : 21mm
*Gear box width

Power-supply voltage
(Rated Voltage)
06 : 6.0~7.4V
12 : 11.1~14.8V
28 : 24.0~28.0V

Main signal type
U : DroneCAN v1

Development code

Optional function 1
0: Case shielded line and Battery(-) are separated.
B: Supports PWM signals (Rotation direction: CW *)
*Operation of PWM signal 1,520 → 2,120 μs.

Optional function 2
1: Straight connector type.
2: Side connector type.