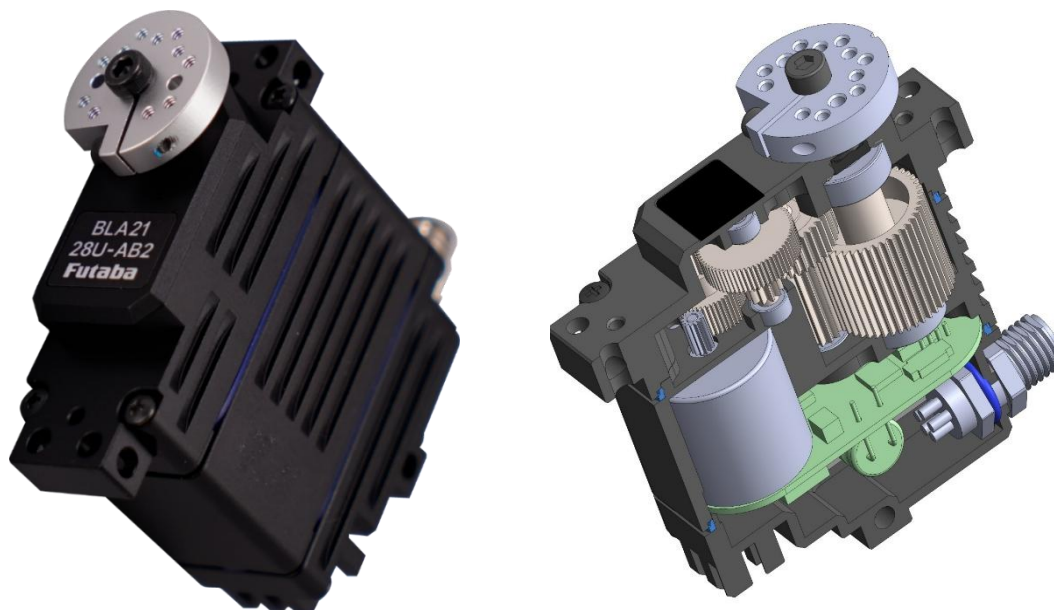


# BLA21-28U-A02/AB2 Technical Specification



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

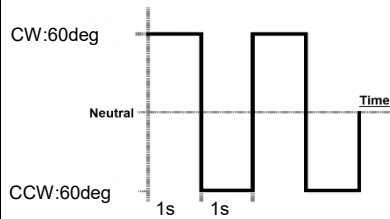
Item		Specification				Remarks	
Rated Voltage	typical	28.0		V	DC power supply.		
	range	24.0	~ 28.0	V	DC power supply.		
Operating Voltage		20.0	~ 32.0	V	DC power supply.		
Standby Current		≤ 42		mA	at 28.0V		
Starting Current <sup>*1</sup>	Design value	≤ 5		A	at 28.0V		
		BLA21-28U-A02: 3.2 BLA21-28U-AB2: 2.4		A	100% of torque control. See each signal specification.		
Consumption Current <sup>*1,*2</sup>		80		mA	at 28.0V , No-load		
Max Torque <sup>*1,*2</sup>		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 <sup>*1,*2</sup>		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 <sup>*1</sup>		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 <sup>*1,*2</sup> (Angle control mode)		857		°/s	at 28.0V		
		143		min <sup>-1</sup>			
Speed with no load <sup>*1,*2</sup> (Speed control mode)		143		min <sup>-1</sup>	at 28.0V		
Rotation Angle <sup>*1</sup>	Range	Mechanical	179.9 ~ -180.0		°	Absolute	
		Software	- 36,000,000 + 36,000,000	~	°	Pseudo absolute *Incremental above mechanical range.	
	Accuracy	±3.0		°	Standard value	at 28.0V, No- Load, Position:±60°	
		±1.5			Measured value		
Direction <sup>*1</sup>		CW :Rotation Angle > 0 (+) CCW :Rotation Angle < 0 (-)			Based on the top surface of the servo (the side with the nameplate).		
BackLash <sup>*1</sup>		≤ 0.50		°			
Temperature Range	Operating	-40	~ 70	°C	-40 °F ~ 158 °F		
	Storage	-40	~ 80	°C	-40 °F ~ 176 °F		
Over heat protection		80		°C	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 <sup>*3</sup> and on the program tool additionally provided by Futaba.		
		176		°F			

<sup>\*1</sup> At 23±5°C (Initial Performance Data)

<sup>\*2</sup> Each value is typical.

<sup>\*3</sup> The signal used for configuration varies depending on the model.

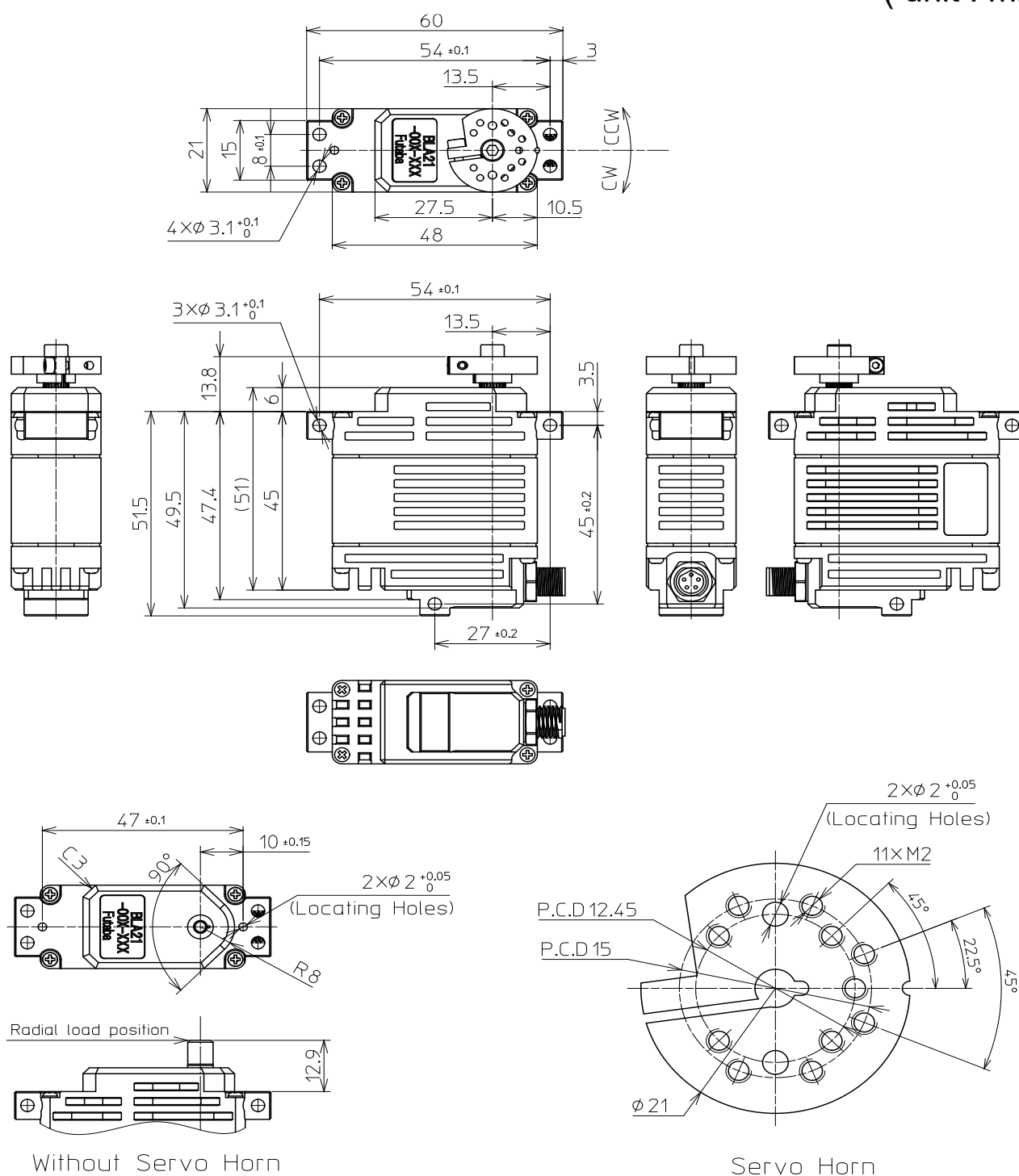
# Mechanical specifications

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
	4.48					oz	without cables
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 (Inquire for the test report)		1,000		h	Operating Condition ▪ at 28.0V ▪ ±60°, 0.5Hz sweep Test Condition ▪ Load : Rated Torque (Powder Brake)	
			7,200,000		cycle	<u>Angle Command Value</u> 	
Vibration Resistance *1	Operating time (Inquire for the test report)		≥	1,000		h	Operating Condition ▪ at 28.0V ▪ ±60°, 0.5Hz sweep ▪ No-Load
							<u>Test Condition(sine wave)</u> ▪Frequency: 10 to 500Hz (sweep 1oct/min, amplitude limit 2mm) ▪Acceleration : 300m/s <sup>2</sup> ▪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			<u>Test Condition (Random wave)</u> ▪Refer to MIL-STD-810H Method 514.8 ▪Company internal test	

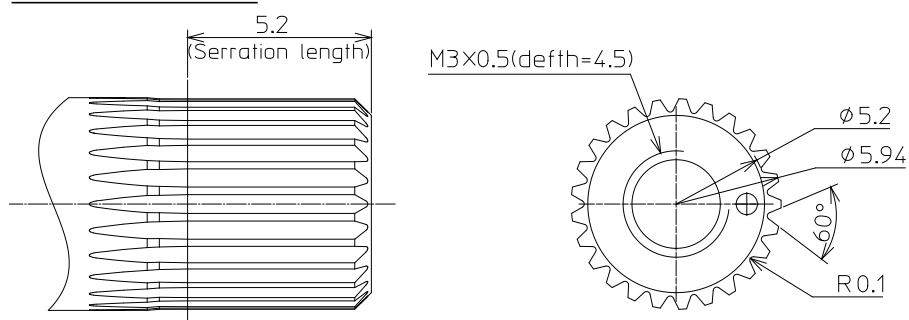
\*1 At  $23\pm 5^\circ\text{C}$  (Initial Performance Data)

## Outer Dimension

( unit : mm )



## OUTPUT SHAFT



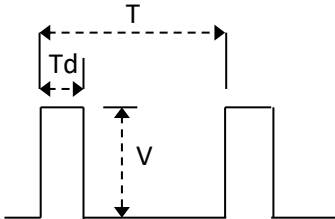
## Sarretion Size

Standard Diameter :  $\phi 6$ 

Angle : 60°

Tooth : 25

# Specifications for PWM signals

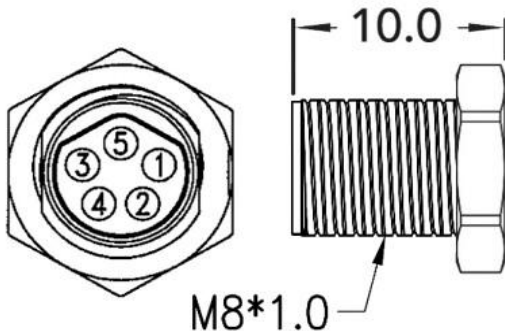
Item		Specification				Remarks			
Communication Interface		<div>PWM</div> 				Signal Voltage HIGH:V	max	2.0	V
						min	5.0	V	
						Signal Voltage LOW:V	max	0.0	V
						min	0.45	V	
						Frame Rate:T	14.25		ms
						Pulse Wide:Td	CW	2,120	μs
							Center	1,520	
							CCW	920	
If the high level voltage 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.									
Operating Mode (PWM) + :CW - :CCW (Turn direction reversible)*1	Angle control (Absolute)	Rotation Angle	Default	Max		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.			
			+60.0°	+180.0°	2,120μs				
			Neutral 0°		1,520μs				
			-60.0°	-180.0°	920μs				
	Angle control (Extended)	Rotation Angle	+360.0°		2,120μs	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°.			
			Neutral 0°		1,520μs				
			-360.0°		920μs				
	Speed control	Max Speed	+600	min <sup>-1</sup>	2,120μs	This mode is for applications requiring continuous servo rotation. The speed can be set within ±600min <sup>-1</sup> using the CANBUS line and the Futaba program tool. Refer to “Speed with no load (Speed control mode)” for speed variations.			
			0		1,520μs				
			-600		920μs				

\*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 <sup>-1</sup>	This mode is for continuous servo rotation, with speeds ranging within 300min <sup>-1</sup> . 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	MAEAF05FCC-SRC7000 etc.			
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
<b>Motor type</b> BLA : Brushless Motor	<b>Servo width</b> 21 : 21mm *Gear box width		<b>Power-supply voltage</b> (Rated Voltage) 06 : 6.0~7.4V 12 : 11.1~14.8V 28 : 24.0~28.0V	<b>Main signal type</b> U : DroneCAN v1		<b>Development code</b> <b>Optional function 1</b> 0: Case shielded line and Battery(-) are separated. B: Supports PWM signals (Rotation direction: CW *) * Operation of PWM signal 1520 → 2120 μs.		
						<b>Optional function 2</b> 1: Straight connector type. 2: Side connector type.		