Servo Comparison

Monday, August 22, 2022 1:18 PM

Item	AX-12A(OLD)	XM540-W150-T/R (NEW)	MX-64T (IN LAB)
Baud Rate	7,843 [bps] ~ 1 [Mbps]	9,600 [bps] ~ 4.5 [Mbps]	8,000 [bps] ~ 4.5 [Mbps]
Resolution	0.29 [°]	4096 [pulse/rev]	4096 [pulse/rev]
Motor	Cored	Coreless	Coreless
Operating Modes	0 ~ 300 [°] Endless Turn	Current Control Mode Velocity Control Mode Position Control Mode (0 ~ 360 [°]) Extended Position Control Mode (Multi-turn) Current-based Position Control Mode PWM Control Mode (Voltage Control Mode)	Wheel Mode (Endless Turn) Joint Mode (0 ~ 360 [°]) Multi-turn Mode
Gear Ratio	254 : 1	152.3 : 1	200 : 1
Stall Torque	1.5 [N.m] (at 12 [V], 1.5 [A])	6.9 [N.m] (at 11.1 [V] 4.2 [A]) 7.3 [N.m] (at 12.0 [V], 4.4 [A]) 8.9 [N.m] (at 14.8 [V], 5.5 [A])	5.5 [N.m] (at 11.1 [V], 3.9 [A]) 6.0 [N.m] (at 12 [V], 4.1 [A]) 7.3 [N.m] (at 14.8 [V], 5.2 [A])
No Load Speed	59 [rev/min] (at 12V)	50 [rev/min] (at 11.1 [V]) 53 [rev/min] (at 12.0 [V]) 66 [rev/min] (at 14.8)	58 [rev/min] (at 11.1 [V]) 63 [rev/min] (at 12 [V]) 78 [rev/min] (at 14.8 [V])
Input Voltage	9.0 ~ 12.0 [V] (**Recommended : 11.1V**)	10.0 ~ 14.8 [V] (**Recommended : 12.0 [V]**)	10.0 ~ 14.8 [V] (Recommended : 12.0 [V])
Physical Connection	TTL Level Multi Drop Bus Half Duplex Asynchronous Serial Communication (8bit, 1stop, No Parity)	RS485 / TTL Multidrop Bus TTL Half Duplex Asynchronous Serial Communication with 8bit, 1stop, No Parity RS485 Asynchronous Serial Communication with 8bit, 1stop, No Parity	RS485 / TTL Multidrop Bus TTL Half Duplex Asynchronous Serial Communication with 8bit, 1stop, No Parity RS485 Asynchronous Serial Communication with 8bit, 1stop, No Parity
Feedback	Position, Temperature, Load, Input Voltage, etc	Position, Velocity, Current, Realtime tick, Trajectory, Temperature, Input Voltage, etc	Position, Temperature, Load, Input Voltage, etc

	AX-12A(OLD)	XM540-W150-T/R (NEW)
Weight	54.6 [g]	165 [g]
RPM	0 ~ 1,023(0x3FF) 1,023 X 0.111 = 113.553	0 ~ 1,023(0x3FF) 1,023 X 0.229 = 234.267
Operating Voltage	(**Recommended : 11.1V**)	(**Recommended : 12.0 [V]**)
Torque	1.5 [N.m] (at 12 [V], 1.5 [A]) = 1.5 / 9.81 = 0.15 kgf	6.9 [N.m] (at 11.1 [V] 4.2 [A]) = 6.9 / 9.81 = 0.703kgf 7.3 [N.m] (at 12.0 [V], 4.4 [A]) = 7.3 / 9.81 = 0.744kgf 8.9 [N.m] (at 14.8 [V], 5.5 [A]) = 8.9 / 9.81 = 0.907kgf
No-load	59 [rev/min] (at 12V)	50 [rev/min] (at 11.1 [V]) 53 [rev/min] (at 12.0 [V]) 66 [rev/min] (at 14.8)
Total Torque	0.15kgf x 4 = 0.6kgf	0.703kgf x 4 = 2.812kgf 0.744kgf x 4 = 2.976kgf 0.907kgf x 4 = 3.628kgf

Findings:

- The servos are of different types, one cored and one brushless
- The torque has an increase of 368.667%/396%/ 504.667% with varying currents
- Due to the increased baud rate, cable length would potentially need to be reduced.

References from : https://robotics.stackexchange.com/questions/14943/how-much-weight-can-dc-motor-carry
https://en.wikipedia.org/wiki/Kilogram-force