# Servo Comparison

Monday, August 22, 2022    1:18 PM

| Item | AX-12A(OLD) | XM540-W150-T/R (NEW) |
|---|---|---|
| Baud Rate | 7,843 [bps] ~ 1 [Mbps] | 9,600 [bps] ~ 4.5 [Mbps] |
| Resolution | 0.29 [°] | 4096 [pulse/rev] |
| Motor | Cored | Coreless |
| Running degree | 0 ~ 300 [°]<br>Endless Turn | Position Control Mode (0 ~ 360 [°]) |
| Gear Ratio | 254 : 1 | 152.3 : 1 |
| Stall Torque | 1.5 [N.m] (at 12 [V], 1.5 [A]) | 6.9 [N.m] (at 11.1 [V] 4.2 [A])<br>7.3 [N.m] (at 12.0 [V], 4.4 [A])<br>8.9 [N.m] (at 14.8 [V], 5.5 [A]) |
| No Load Speed | 59 [rev/min] (at 12V) | 50 [rev/min] (at 11.1 [V])<br>53 [rev/min] (at 12.0 [V])<br>66 [rev/min] (at 14.8) |
| Input Voltage | 9.0 ~ 12.0 [V] (**Recommended : 11.1V**) | 10.0 ~ 14.8 [V] (**Recommended : 12.0 [V]**) |
| Physical Connection | TTL Level Multi Drop Bus<br>Half Duplex Asynchronous Serial Communication (8bit, 1stop, No Parity) | RS485 / TTL Multidrop Bus<br>TTL Half Duplex Asynchronous Serial Communication with 8bit, 1stop, No Parity<br>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 |

| | | |
|---|---|---|
| Weight | 54.6 [g] | 165 [g] |
| RPM | 0 ~ 1,023(0x3FF)<br>1,023 X 0.111 = 113.553 | 0 ~ 1,023(0x3FF)<br>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<br><br>7.3 [N.m] (at 12.0 [V], 4.4 [A]) = 7.3 / 9.81 = 0.744kgf<br><br>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])<br>53 [rev/min] (at 12.0 [V])<br>66 [rev/min] (at 14.8) |
| Total Torque | 0.15kgf x 4 = 0.6kgf | 0.703kgf x 4 = 2.812kgf<br><br>0.744kgf x 4 = 2.976kgf<br><br>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