

Variable Stiffness Actuators: the user's point of view.

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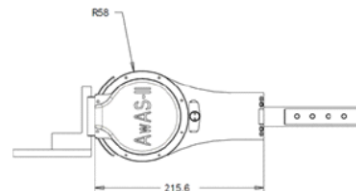
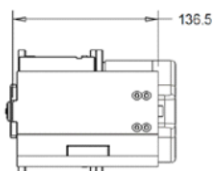
“AwAS-II datasheet”

Multimedia Extension #7

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AwAS-II

The second version of Actuator with Adjustable Stiffness



Operating Data				
#	(quantity)		(unit)	(value)
Mechanical				
1	Continuous Output Power		[W]	56
2	Nominal Torque		[Nm]	10.75
3	Nominal Speed		[rad/s]	10.2
4	Nominal Stiffness Variation Time	with no load	[s]	2
5		with nominal torque	[s]	3
6	Peak (Maximum) Torque		[Nm]	80
7	Maximum Speed		[rad/s]	12
8	Maximum Stiffness		[Nm/rad]	Inf.
9	Minimum Stiffness		[Nm/rad]	0
10	Maximum Elastic Energy		[J]	5.8
11	Maximum Torque Hysteresis		[%]	-
12	Maximum deflection	with max. stiffness	[°]	17
13		with min. stiffness	[°]	0
14	Active Rotation Angle		[°]	*/-150
15	Angular Resolution		[°]	0.02
16	Weight		[Kg]	1.4
Electrical				
17	Nominal Voltage		[V]	24
18	Nominal Current		[A]	2.3
19	Maximum Current		[A]	6.2
Control				
20	Voltage Supply		[V]	24
21	Nominal Current		[A]	2
22	I/O protocol		[]	Ethernet

A

B

C

BLUE

BROWN

ORANGE

YELLOW

GREEN

+5 TO 24 VDC

2.7K OHMS

2.7K OHMS

2.7K OHMS

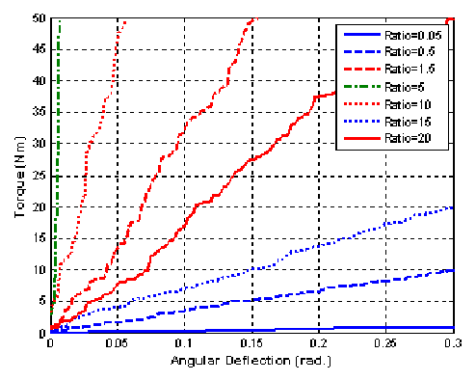
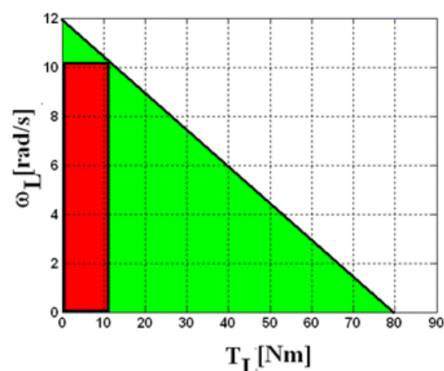
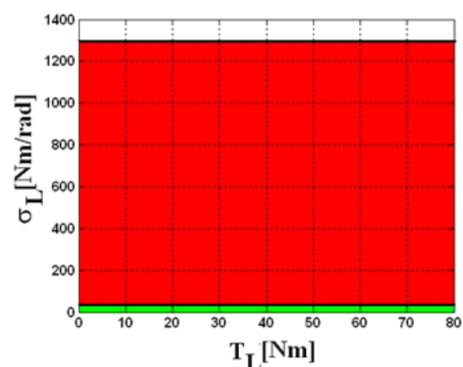
GND

OUTPUTS

SENSOR ASSEMBLY

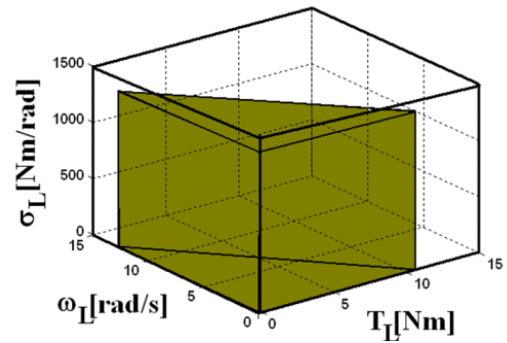
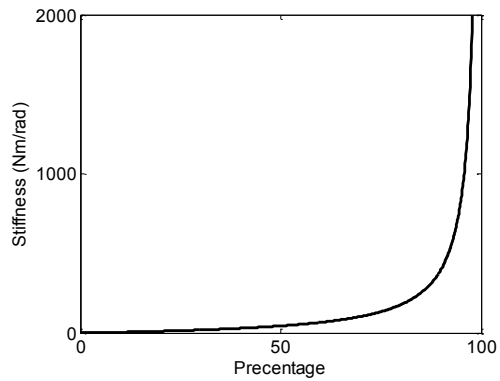
USER SUPPLIED

(PROVIDED WITH EMOTEQ DRIVERS)



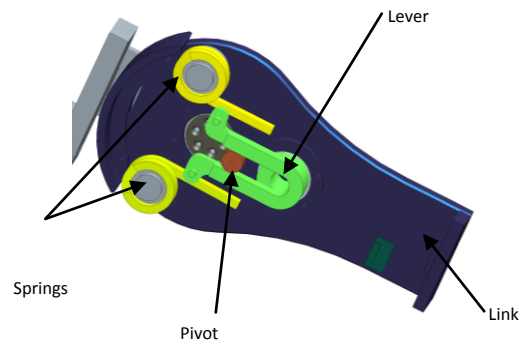
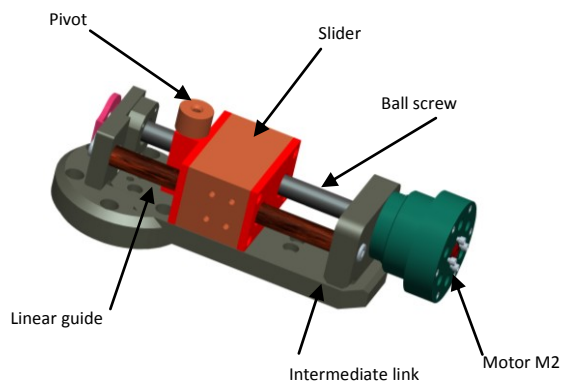
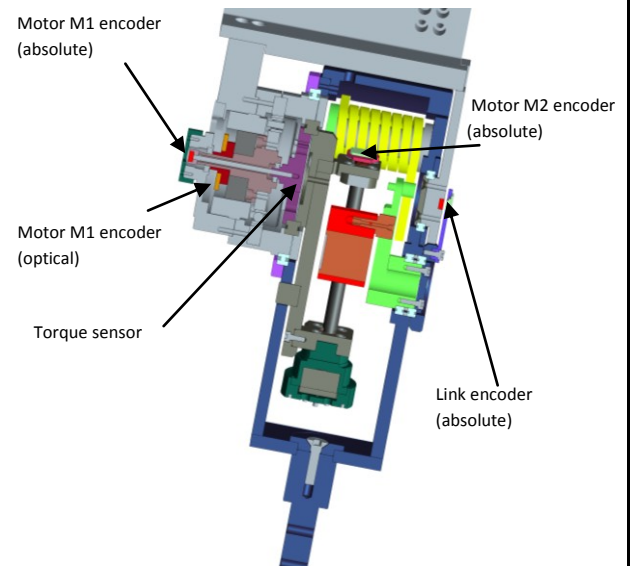
AwAS-II

Additional Characteristics



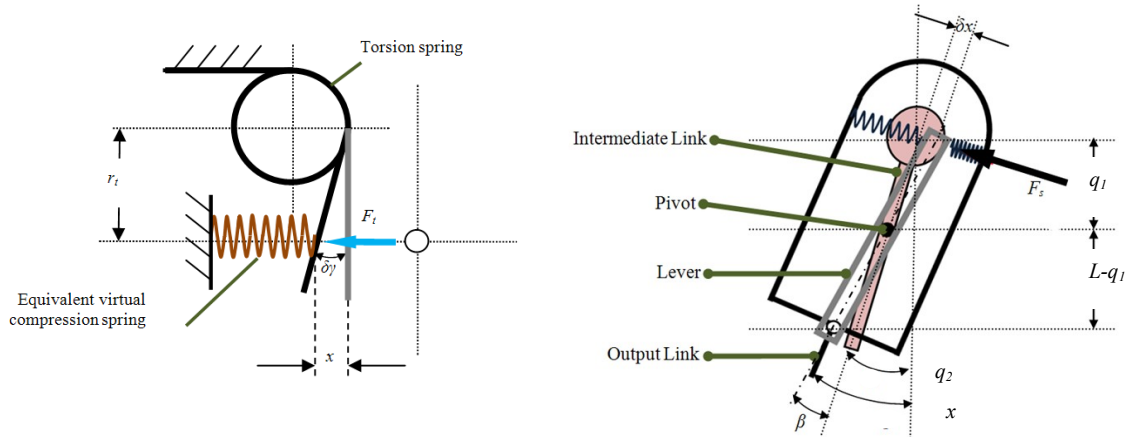
Sensor Map

Additional sensors data			
#	(quantity)	(unit)	(value)
a0	Encoders		
a1	Resolution	[°]	0.09
a2	Range	[kHz]	244
a3	I/O protocol	[yyy]	Ethernet
ax	(specific sensor properties)	[yyy]	xxx



AwAS-II

Model



Mathematical model ($K_s=10\text{Nm/rad}$, $l_0=1\text{ rad}$, $L=0.05\text{m}$, $r_t=0.015$)

101	Recoil Point Function	$x_e = q_2$
102	Energy Function	$H = 1/2 K_s [(l_0 + (L/r_t)(q_1/L - q_1) \sin(q_2 - x))^2 + (l_0 - (L/r_t)(q_1/L - q_1) \sin(q_2 - x))^2]$
103	Output Torque Function	$\tau = 2 K_s [(L/r_t)(q_1/L - q_1)]^2 \sin(x - q_2) \cos(x - q_2)$
104	Output Stiffness Function	$\sigma = 2 K_s [(L/r_t)(q_1/L - q_1)]^2 (2 \cos^2(x - q_2) - 1)$
105	Spring Torque Function	$e_s = e_s(q_1, q_2, x)$
106	Springs to Motors Transmission Ratio	$A = (L/r_t)(q_1/L - q_1) \cos(q_2 - x)$
107	Springs to Output Transmission Ratio	$B = -(L/r_t)(q_1/L - q_1) \cos(q_2 - x)$