



# SuperQuest Salem

## Motion

vEX EDR



# VEX Motion: Motors

- 2-Wire Motor 393
  - 100 RPM
  - Stall Torque 1.67 Nm
- Motor Controller: 2-Wire to 3-Wire
- Integrated Motor Encoder Sold Separately
  - Counts ticks
  - 627.2 Ticks per revolution
- High Speed Gearing (Comes with motor)
  - 160 RPM
  - Stall Torque 1.04 Nm
  - 392 Ticks per Revolution
- Turbo Gear Set (Sold Separately)
  - 240 RPM
  - Stall Torque 0.7 Nm
  - 261.333 Ticks per Revolution



# 393 Specifications

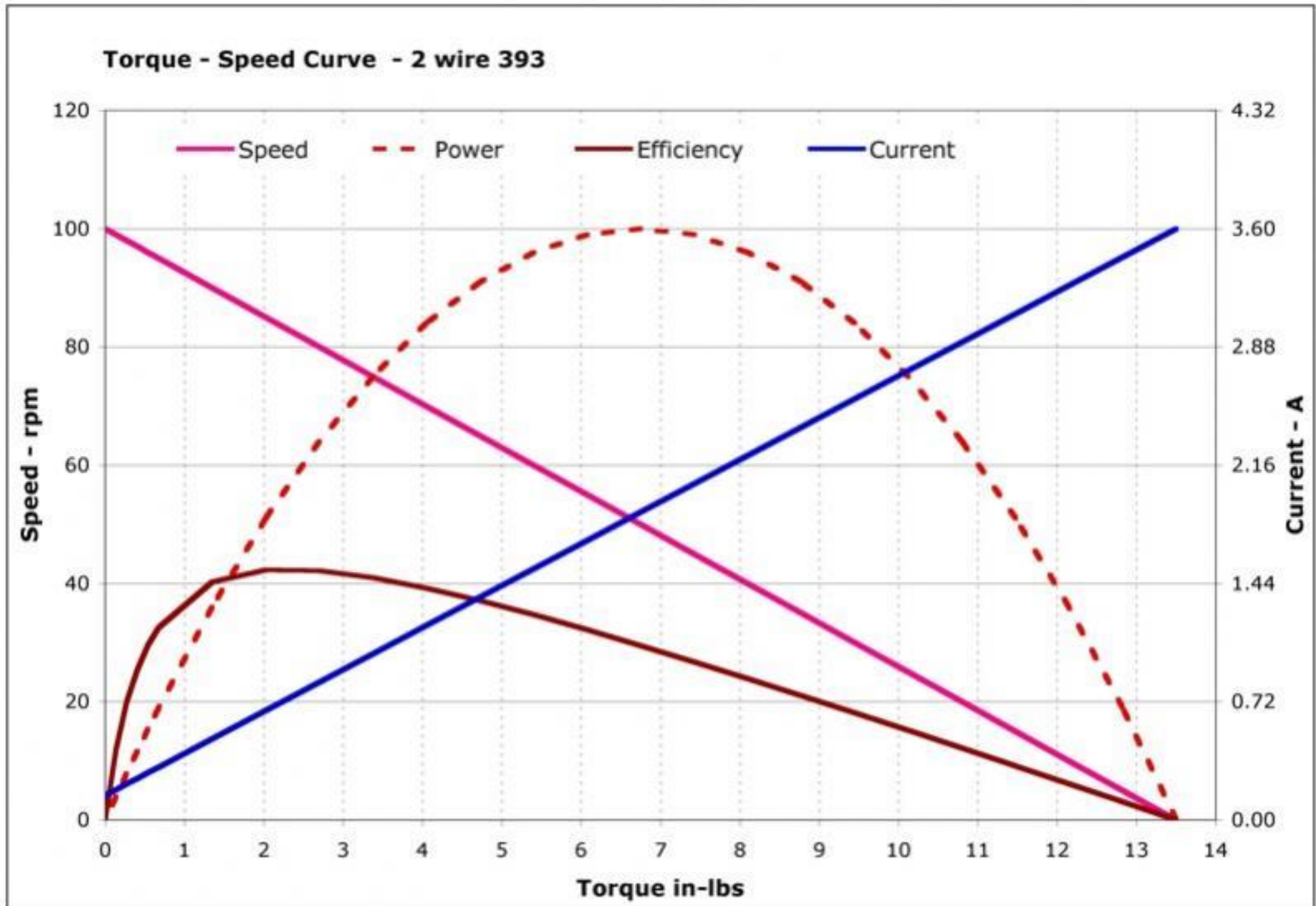
Max Current and Torque at 0 RPM

Max Power (Combination of Speed and Torque) at 50 RPM.

Max Efficiency. Out/In at 85 RPM.

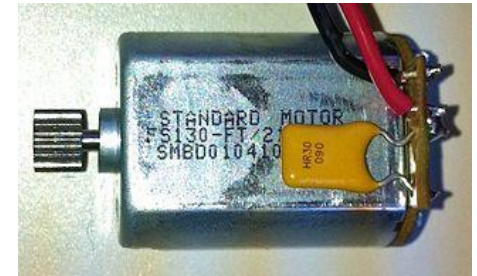
speed rpm	torque in-lbs	power W	Power %	current A	power input W	Efficiency %
0	13.500	0.000	0.000	3.600	25.920	0.000
5	12.825	0.757	19.000	3.428	24.678	3.066
10	12.150	1.434	36.000	3.255	23.436	6.118
15	11.475	2.031	51.000	3.083	22.194	9.151
20	10.800	2.549	64.000	2.910	20.952	12.165
25	10.125	2.987	75.000	2.738	19.710	15.154
30	9.450	3.345	84.000	2.565	18.468	18.114
35	8.775	3.624	91.000	2.393	17.226	21.038
40	8.100	3.823	96.000	2.220	15.984	23.919
45	7.425	3.943	99.000	2.048	14.742	26.745
50	6.750	3.983	100.000	1.875	13.500	29.500
55	6.075	3.943	99.000	1.703	12.258	32.164
60	5.400	3.823	96.000	1.530	11.016	34.706
65	4.725	3.624	91.000	1.358	9.774	37.079
70	4.050	3.345	84.000	1.185	8.532	39.209
75	3.375	2.987	75.000	1.013	7.290	40.972
80	2.700	2.549	64.000	0.840	6.048	42.143
85	2.025	2.031	51.000	0.668	4.806	42.261
90	1.350	1.434	36.000	0.495	3.564	40.227
95	0.675	0.757	19.000	0.323	2.322	32.587
96	0.540	0.612	15.360	0.288	2.074	29.500
97	0.405	0.464	11.640	0.254	1.825	25.398
98	0.270	0.312	7.840	0.219	1.577	19.801
99	0.135	0.158	3.960	0.185	1.328	11.872
100	0.000	0.000	0.000	0.150	1.080	0.000
<b>Max Power</b>		<b>3.983</b>		<b>Max Efficiency</b>		<b>42.261</b>

# 393 Torque – Speed Curve



# More 393 Motor Facts

- 3.6 Amp Stall Current
- Built in Thermal Fuse.
  - Will cut power when pulling 1.8A + for 7 + seconds.
    - Just wait for 10 seconds for fuse to cool.
  - Will trip faster with higher current or warmer temps.
- Designed to run continuously at 0.9 A.





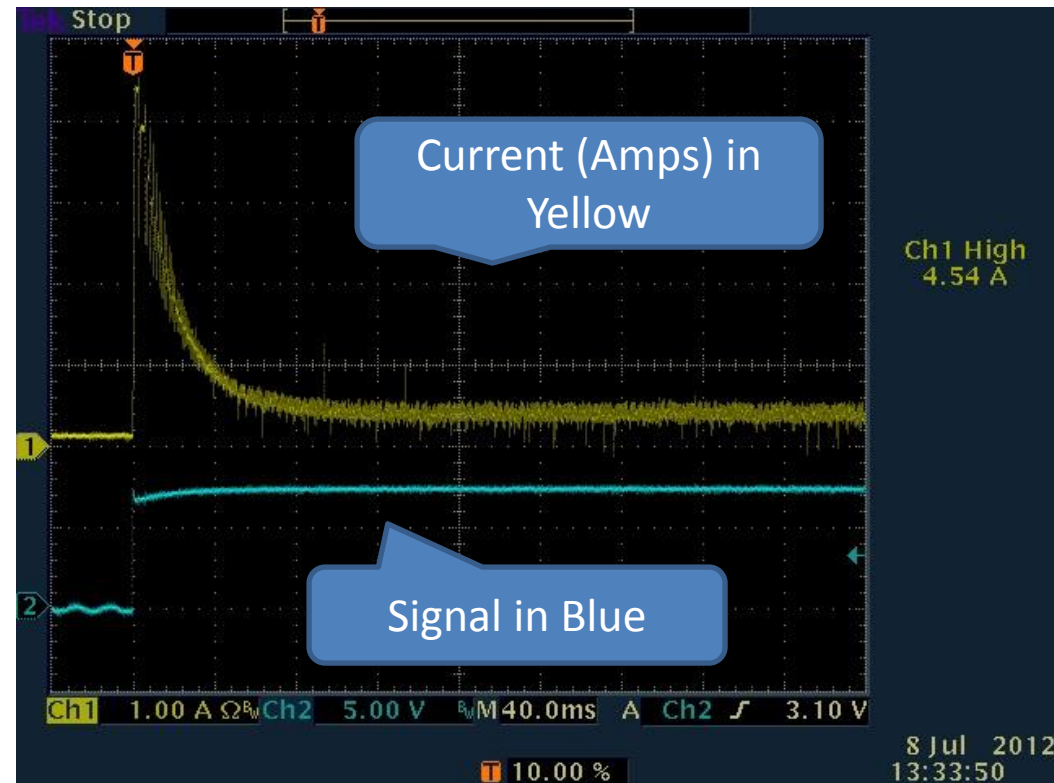
# Cortex Thermal Fuses: Causes robot to stop moving

- 4 amp combined draw from ports 1-5
- 4 amp combined draw from ports 6-10
- 4 amp combined draw from 4 ports on Power Expander
- Motor Controller: Max Current: 3 amps at 8.5 V



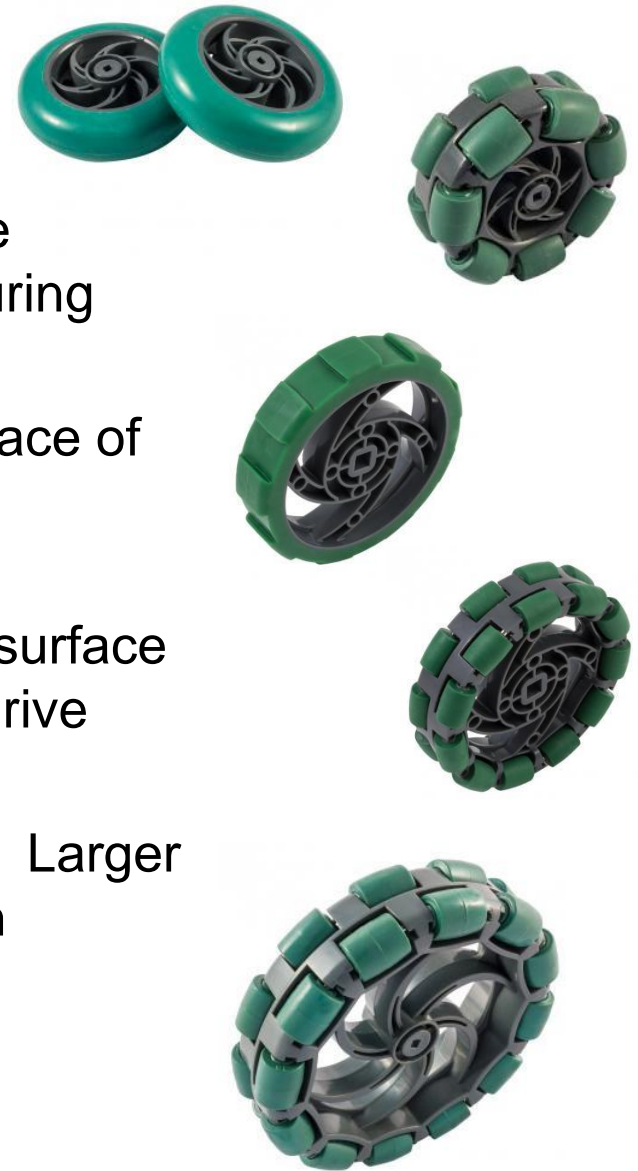
# What happens when you floor it?

- Fuses you can blow
- Motor: 3.6 Amp
  - One Motor Stops
- Controller: 3 Amp
  - One motor stops
- Cortex Port: 4 amps combined with four other ports. Robot Stops



# Motion: Wheels

- 2.75" Wheels: Seldom used in competition
- 2.75" Omni Wheel: Omni Direction Wheels slide sideways with almost no friction (no skidding during turns).
- 3.25" Traction Wheel: Best grip on form tile surface of all VEX Wheels. Use these wheels with either standard [Drive Shafts](#) or [High Strength Shafts](#)
- 3.25 " Omni Wheel: Very good grip on form tile surface of all VEX Wheels. Standard or High Strength drive shafts.
- 4" Omni Wheel: Same benefits of other Omni's. Larger diameter therefor faster. Does not support High Strength Drive Shafts.





# Motion: Wheels

- 4" Mecanum Wheel: Strafe, Orientation/balance important
- 5" Wheels: Good traction on foam
- 6" Wheel Legs: Go over obstacles



# Motion: Gears

- Standard Gear Sizes
  - 12, 36, 60, 84
- Rack Gear Size
  - 19
- Advanced Gear
  - Worm Gears
  - Bevel Gear
  - Differential



# Motion: Gears

- High Strength Gears:  
Double Thickness

- Steel: 12

- Plastic: 36 , 60. 84

- Inserts

- Square for regular shaft

- Free Spinning on regular shaft

- Square High Strength Shaft.



# Motion: Sprockets and Chain

- Regular Strength
- Sizes:
  - 10, 15, 24, 40, 48 teeth
- Each chain is a master link
- Weak



# Motion: High Strength Sprocket and Chain

- Sizes:
  - 6, 12, 18, 24, 30 teeth
- Sprockets also fit VEX Treads
- Support up to 50 lbs.





# Motion: Treads

- Tracks, conveyor
- Upgrade kit



# Motion: Pneumatics

- Compressed air stored in cylinder
- Single and double acting
- Expensive



# Motion: Linear Slides

- Rack and Pinion
- Expanding sections
- Scissor lift base



# Motion: Shafts

- 1/8" Shafts: Attach to motors, wheels, gears, sprockets, ...
  - 2", 3" and 12"
- Shaft Collars: Attach to shafts. Securing and spacing. Regular, clamping and rubber
- Shaft Coupler: Connects two shafts.
- Delrin Bearing Flat: Used when shaft goes through structure.
- Drive Shaft Bar Lock: Helps structure move with shaft.
- Washers: Spacing and reducing friction.
- Bearing Block
- Lock Plate



# Motion: High Strength Shafts and Hardware

- 1/4" Shaft

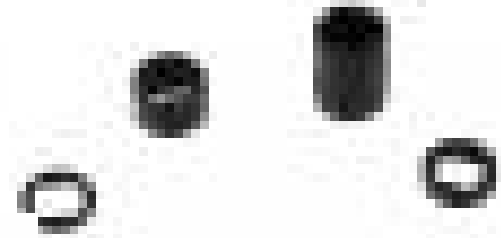
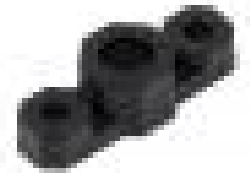
- Sizes

  - 2, 3, 4 and 12" Lengths

- High Strength Shaft Bearing Block

- High Strength Shaft Spacers

- High Strength Shaft Collars.





# Motion: Claw

Attach a motor to grab items.

