

## Supplementary Materials

### **Load-adaptive shape sensing and control of a tendon-driven continuum robot actuated by SMA springs**

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**Supplementary Table 1.** Comprehensive comparison of drive technologies

Performance Metric	SMA	Electric Motor Actuator	Pneumatic Actuator
Power Density	Extremely High (4 kJ/kg)	High (>90%)	Medium (15-20% efficiency)
Response Speed	Slow (second-level)	Extremely Fast (millisecond-level)	Fast (0.5s to full speed)
Noise Level	Silent	Low (chopper-driven)	High (>100 dB)
Energy Efficiency	Medium (Joule heating loss)	High (>90%)	Very Low (15-20%)
Special Capabilities	Biocompatibility	Precision Positioning	Intrinsic Safety
Cost Factors	High material cost but simple structure	Medium-High (rare-earth materials)	Low (system simplicity)