

http://www.dynamic-structures.com/
615-595-6665
salesinfo@dynamic-structures.com



205 Williamson Square
Franklin, TN 37064

Company Introduction

2010

DSM is an active research and development, mechanical / electrical design firm and manufacturer of both standard and custom piezo electric devices. Founded in 1998 and located in Franklin, Tennessee, DSM is a U.S. based, small technical business providing services to a wide range of organizations and industries. DSM is listed in the 2009 top ten organizations of Tennessee representing “*economic prosperity through science and engineering research.*” *

DSM’s Professional Services Include:

Product Design and Development · Custom Research, Development and Testing
Power and Control Electronics Design · Micro/Nano-Positioning Systems Design
SBIR / R&D Partnering · Reengineering · Mechatronics · Technical Sourcing · Feasibility Studies

The process of developing new ideas and products is a collaborative and challenging one. Trust and communication are key.

Consider DSM when You:

- Have a new idea and need an experienced research and development service or partner
- Have an existing product or component and want to update, improve, or create a custom version
- Want a custom or standard piezo electric actuator, motor, driver or amplifier
- Need advanced technical expertise not available in your company
- Have an approaching critical deadline and are understaffed or don’t yet have a solution
- Want to investigate the feasibility of an idea by commissioning a design study

Typical Client Interaction:

DSM’s flexibility and reputation for honest, no-nonsense technical project execution attracts clients ranging from entrepreneurial groups exploring healthcare product designs to the US Military and NASA. No interaction is exactly the same but many follow this path:

1. Interest is established through concept level discussions via email, phone or in person.
2. A non-disclosure agreement (NDA) is signed (as required.)
3. A face-to-face or teleconferenced meeting is held to explore project details.
4. A statement of project objectives, schedule and deliverables is prepared collaboratively.
5. DSM provides a quote. Depending on the project and your needs, DSM may quote a phased project approach based on a fixed-price, time-and-material or a combination.

* Source – www.usinnovation.org

Increase the effectiveness of your R&D and product development dollars by leveraging DSM's extensive research project experience and contacts. Partner with DSM to explore new, higher risk technologies.

PHASE II & III – SBIR / STTR AWARDED TOPICS

- Cryogenic Rotary Piezoelectric Motor – NASA
 - Novel Thrust Vector Control (TVC) Mini Divert Attitude Control (DAC) System – Missile Defense Agency (MDA)
 - Miniature Piezo Semi-Active Seat Damper – Marines
 - Vertical Accelerator for Visual-Vestibular Acuity Testing and Training – NAVY
 - Compact High Specific Power (HSP) Linear Actuator for Divert and Attitude Control Systems (DACs) – Navy
 - Fast-acting, Compact, Piezoelectric Actuator for Control of Mini-Interceptor – MDA
 - Precision Robotic Tomography System – ARMY
 - Rapid Hole Array Using Laser and Mechanical Processes – Air Force
 - Miniature Compliant Spatial Parallel Manipulators – Ballistic Missile Defense Organization (BMDO)
 - Piezoelectric Step and Repeat Hydraulic Motor – Defense Advanced Research Projects Agency (DARPA)
 - A Highly Damped, High Strength, Puncture Resistant Fabric for Multi-threat Protective Uniforms – ARMY
 - Self Contained Actuator/Sensor for Positioning and Vibration Isolation – BMDO
 - Unobtrusive Sensor and Effector Technology with Optical Applications – NASA-MSFC
 - Quick Look Modal Testing of Flexible Structures – NASA-JSC
-

PHASE I – SBIR / STTR AWARDED TOPICS

- Nanoscale X-Y stage for Precision Lithography – National Science Foundation (NSF)
- Smart Bolts for Remote Non-destructive Inspection – National Science Foundation (NSF)
- Pharaoh's Drive Motor – NASA-JSC
- Solid State PZT Flexure Mechanism for Vibration Attenuation/Isolation – NASA-JPL
- Self Contained Actuator/Sensor for Positioning and Vibration Isolation – BMDO
- Design of Superelastic Nitinol Enhanced Puncture Resistant Armor – DARPA
- An Actuator System for the Vibro-Acoustic Control of Structures – NAVY
- Unobtrusive Sensor and Effector Technology with Optical Applications – NASA-MSFC
- Quick Look Modal Testing of Flexible Structures – NASA-JSC
- Precision Motorized Cryo/Vacuum Stage – Air Force
- Cryogenic Rotary Piezoelectric Motor – NASA
- Miniaturized Safe-Fuel Electrically-Controlled Divert & Attitude Control System (DACs) – Navy
- Novel Thrust Vector Control (TVC) Mini Divert Attitude Control (DAC) System – MDA
- Miniature Piezo Semi-Active Seat Damper – MarComSysCorp
- Innovative Piezoelectric Air Pump Manufacturing Technology – OSD-NAVY
- Vertical Accelerator for Visual-Vestibular Acuity Testing and Training – OSD-NAVY
- Compact High Specific Power Linear Actuator For Divert and Attitude Control Systems – MDA
- Piezo-Driven Inertial Stages for Ultra-High-Vacuum (UHV) – NSF
- Precision Robotic Tomography System – ARMY
- Fast-acting, Compact, Piezoelectric Actuator for Control of Mini-Interceptor – MDA
- Rapid Hole Array Drilling Using Laser and Mechanical Processes - Air Force
- High Power Rotary Actuator for Kinetic energy Weapons – BMDO
- Active Textiles for Life Support Ensembles and Medical Applications – NSF
- Simplified Solid-State Thermal Power Generation – BMDO
- Miniature Compliant Spatial Parallel Manipulators – BMDO
- Compact Nitinol Hydraulic Actuator for Munitions Control – Air Force
- Portable Composite Structure and Missile Evaluation – BMDO
- Novel Magnetic Field Sensor - BMDO
- Portable High Efficiency Power Source for Missile Technology – BMDO
- Dissipative Acoustic Arrays for Interior Noise Control - Air Force
- Piezoelectric Step and Repeat Hydraulic Motor – DARPA
- Highly Damped, High Strength, Puncture Resistant Fabric for Multi-threat Protective Uniforms - Army or OSD
- Remotely Detecting Damage in Critical Structural Bolted Joints - BMDO

Actuator for Metered Dose Inhaler

Proof of Concept Design · Prototyping · Patent Support

DSM was selected to develop a proof of concept design for a new product by a healthcare company. The device provides a consistent, highly repeatable metered dose method for expensive inhalant medications. DSM co-authored and supported the patent application by the company's investment firm.

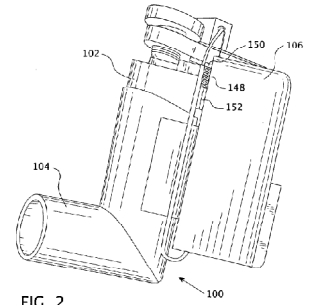


FIG. 2

Custom Electronics Design & Development

Circuit Design · Digital Controls · Power Amplifiers

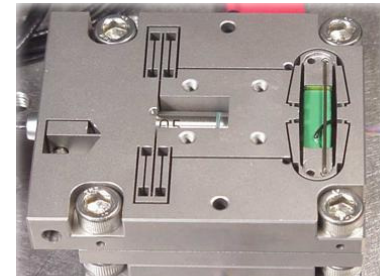
If you are unable to locate the electronics you need for a product or project, chances are DSM can provide a solution. Example custom systems include: High-Power 12 Channel Linear Piezo Amplifier, Digital Controllers and Quasi-Resonate Drivers.



Flexure-Based Actuators & Positioning Stages

Piezo Actuation · Precision Alignment · Vacuum Compatibility

DSM's flexure-guided FlexFrame PiezoActuator™ designs use mechanical amplification to provide extremely linear displacement capabilities ranging from <math><100\mu\text{m}</math> to 10mm. Used in applications ranging from flight controls to proportional valves to new product R&D.



Specialty Motion/Vibration System Design

Vibration Suppression · Unimorph Piezo Actuator · Control Electronics

DSM was contracted by Boeing to develop a complete proof-mass shaker system for testing the limits of the current active and passive vibration suppression systems aboard the International Space Station (ISS). Within a four month period DSM delivered a demonstration test system and the final flight qualified unit. The system was subsequently delivered to the ISS by the Space Shuttle *Endeavor*.

Helical Miniature Tube Crawler

Minature Mechatronics · Novel Kinematic Design

DSM provided a solution when engineers at NASA's Marshall Space Flight Center wanted a device that could crawl through the coolant lines of the Space Shuttle's main engine. The crawler prototype enabled imaging of a pipes <math><1</math> inch over distances greater than ten feet with greater than 90° turns having radii > 4".



TECHNICAL STAFF

JEFFREY S. N. PAINE, PH.D.

Chief Manager, President

Ph.D., Mechanical Engineering, Virginia Tech
M.S., Mechanical Engineering, Virginia Tech
B.S., Mechanical Engineering, Brigham Young University

KEN GARRETT

Project Engineer

B.S., Electro-Mechanical Engineering Technology, Middle Tennessee State University

JOHN KENNEDY

Staff Engineer

M.S., Mechanical Engineering, Brigham Young University
B.S., Mechanical Engineering, Brigham Young University

STEPHANIE KIVARI

Electronics Technician

B.S., Electro-Mechanical Engineering Technology, Middle Tennessee State University

PATRICK MCGIRT

Senior Engineer

M.S., Mechanical Engineering, Clemson University
B.S., Mechanical Engineering, Clemson University

BERT MCMAHAN

Staff Engineer

B.S., Engineering Mechanics, Lipscomb University

MATTHEW T. PAINE

Senior Engineer

B.S., Mechanical Engineering, Brigham Young University
B.S., Electronics Engineering Technology, Brigham Young University

JONATHAN ROGERS

Lab Manager

B.A., Music Performance/Spanish Language, Western Michigan University

JOSH SESLER

Staff Engineer

M.S., Mechanical Engineering, Virginia Polytechnic University
B.S., Mechanical Engineering, Tennessee Technological University

BYRON SMITH

Project Engineer

M.S., Mechanical Engineering, Virginia Commonwealth University
B.S., Mechanical Engineering, Virginia Commonwealth University

MATTHEW STEFANICK

Staff Engineer

M.S., Mechanical Engineering, Tennessee Technological University
B.S., Electrical Engineering Technology, Tennessee Technological University

ROBERT H. THOMPSON III

Program Manager, Business Development

M.B.A., Tepper School of Business, Carnegie Mellon University
M.S., Engineering Management, Southern Methodist University
B.S., Industrial Engineering, Tennessee Technological University

BUSINESS STAFF

JENNI STURGIS

Accounting and Contracts Manager

JODY BLACKHURST

Bookkeeper

Many of the products created by DSM are proprietary. However, DSM offers a selection of standard products that represent some of the fundamental building blocks of our most successful projects. DSM can quickly modify an existing design and manufacture to meet your OEM needs. All products are built-to-order with lead times typically 2-6 weeks. Contact a DSM Sales Representative for complete details.

Linear Piezo Amplifiers

Voltage Follower (VF) Series: DSM's VF linear piezo amplifiers are high-quality voltage followers that amplify a low voltage input signal.

VF-90: Compact OEM format providing 90 mA maximum continuous and peak current for piezo devices rated for up to 150V, 200V or for piezo benders (bimorphs) rated for up to $\pm 100V$.

VF-500: High-power benchtop instrument providing 500 mA maximum continuous current (1 A peak) for driving piezoelectric devices rated up to 200V.

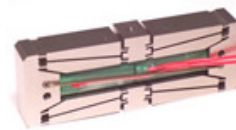


Flexure-Based Actuators & Positioning Stages

The FlexFrame PiezoActuator™ product family uses solid-state flexures as pivot joints to provide smooth, stiction-free and backlash-free motion for positioning applications. FlexFrame products are lever mechanisms that mechanically amplify the output motion of piezoelectric elements. Piezo actuators require no lubrication, and because there are no internal components sliding on each other, there are no particulates generated from the actuator's motion.



Linear Series
Up to 80 μm



FlexFrame Series
Up to 2000 μm



Lever Series
Up to 10 mm

(Available in a range of standard sizes)