



**BELLOWS**  
MANUFACTURING & RESEARCH

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# OUR MISSION

We provide solutions for machine tool protection needs, to anyone who manufacture, owns or sells machines all over the world.

# ABOUT US

Bellows Manufacturing & Research Inc. (BM&R Inc.) was founded in 1957. We are a Quality Bellows Designer and Manufacturer for a wide variety of Bellows applications. Our United States based company provides products and services worldwide and specializes in the engineering and production of high technology, thin wall flexible metal components and systems for automotive and industrial applications.

BMR provides diverse engineering and manufacturing resources to design and build unique metal bellows assemblies and metal joining solutions for customer applications. We are vertically integrated with all engineering disciplines and manufacturing processes in-house. Sophisticated engineering tools including CAD/CAM and 3D Solid modeling are utilized to support challenging applications. Every single employee has been schooled in Lean Manufacturing Principles which translate into more efficient product output for the customer. Bellows Manufacturing and Research, Inc. focuses on understanding and solving customer problems with permanent, cost effective solutions. We provide the highest quality and reliability, customer service, on time delivery, and competitive pricing, to our Customers, for their Bellows application needs.

# CLASSIFICATIONS

**DUNS:** 099464380    **CAGE/NCAGE:** 54ZS9

## **North American Industry Classification System (NAICS)**

**332114** - Custom Roll Forming

**332116** - Metal Stamping

**332212** - Hand and Edge Tool Manufacturing

**332710** - Machine Shops

**332721** - Precision Turned Product Manufacturing

**332722** - Bolt, Nut, Screw, Rivet, and Washer Manufacturing

**332992** - Small Arms Ammunition Manufacturing

**332999** - All Other Miscellaneous Fabricated Metal Product Manufacturing

**333514** - Special Die and Tool, Die Set, Jig, and Fixture Manufacturing

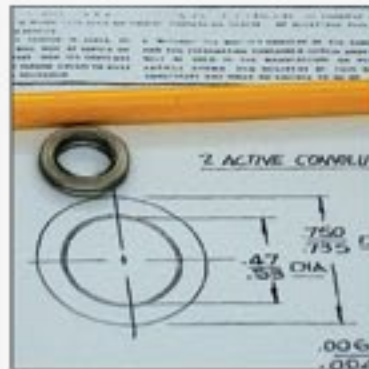
**333992** - Welding and Soldering Equipment Manufacturing

# ENGINEERING

Utilizing the latest design software and analysis applications, as well as in-house developed Software, Bellows Manufacturing and Research, Inc., can design and manufacture specialized custom units per your specifications.

Our highly experienced engineering department has extensive experience in metal bellows and metal joining. For bellows design, there is an internally developed, life cycle prediction program which uses stress analysis algorithms combined with empirical test data to predict bellows life. This tool takes into account material type and thickness, operating conditions, temperatures, and duty cycles which all allow for an accurate calculated life expectancy.

Several other tools are employed to support the engineering design function including 3D solid modeling and stress analysis. 3D solid modeling provides realistic images of the final assembly during design. This capability assists in determining the final interface configurations. These solid models are provided to customers to ensure proper fit within the assembly.



Bellows Manufacturing & Research Inc., Custom designs and complete solutions for your complex component and fabrication requirements.

## REVERSE ENGINEERING & DEVELOPMENT

Reverse engineering programs are undertaken as a team effort in which the metallurgical laboratory participates as one of the team members.

### CAD - Computer Aided Design

BMR, Inc. has the capability (skills and equipment) to measure parts and/or assemblies and then reconstruct them as a 3-D model and into 2-D drawings for fabrication.

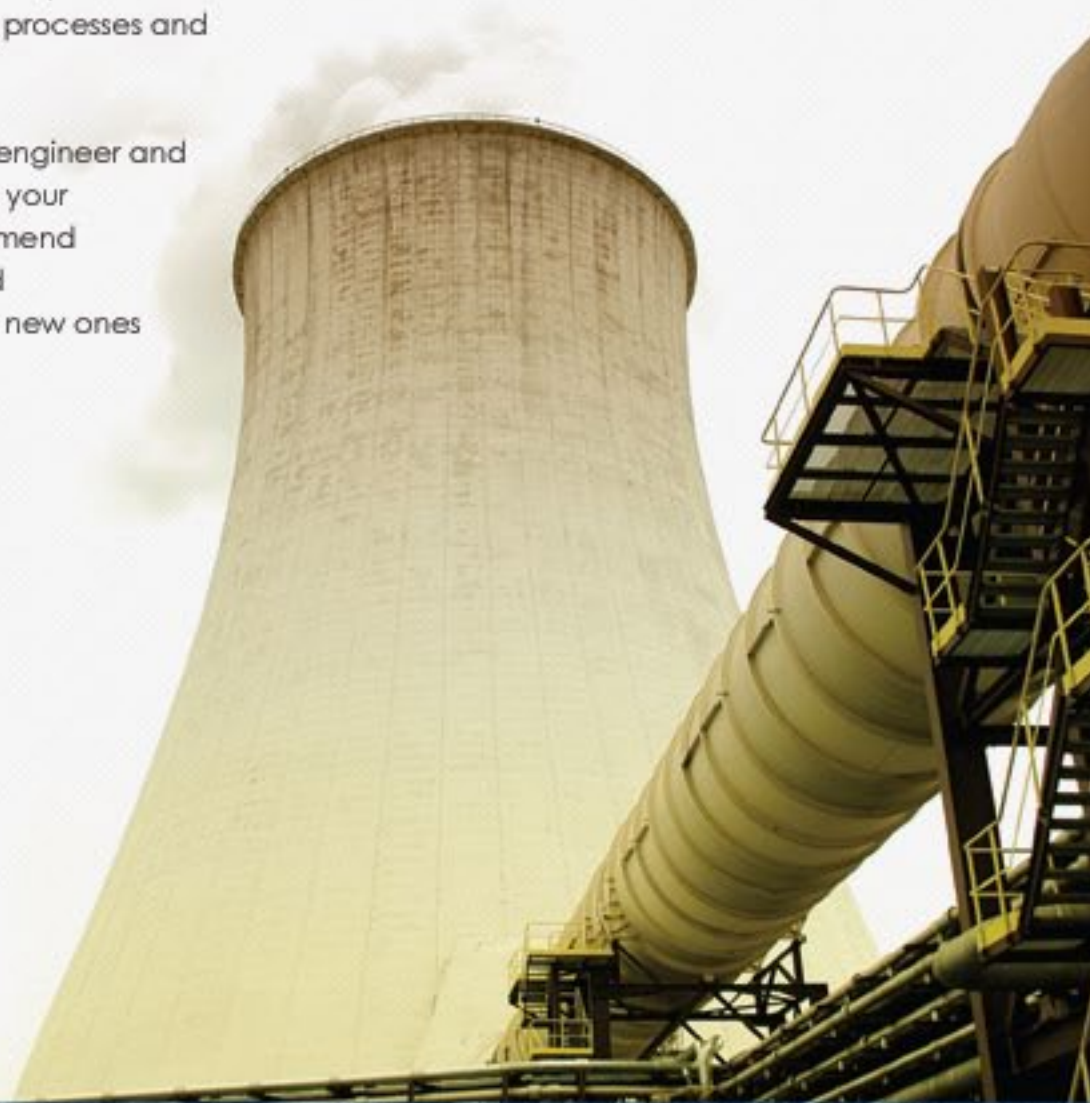
## **MATERIALS, PROCESSES, JOINING METHODS, SURFACE FINISHES & TREATMENTS**

We analyze every metallurgical characteristic to determine alloy selection, manufacturing processes such as forging, casting and thermo-mechanical sequences, joining methods, surface finishes such as plating and coating, and surface treatments such as shot peening. We also specify the governing specifications and participate in developing technical data packages and vendor qualification.

## **SPECIFICATION SUBSTITUTION**

BMR can evaluate your (current or) outdated material, testing and product specifications to determine if they are compatible with current materials, manufacturing processes and specifications.

Our experienced staff of engineer and metallurgists will evaluate your requirements and recommend alternative processes and specifications or develop new ones to meet your needs.



## TOOLING

We design and build tooling with the flexibility to change quickly if the situation is called for. Our in-house engineering department works with our customers to review all electronic files that we receive. We review all dimensional and part geometry to insure the manufacturability of the part. In addition we utilize CAD/CAM to generate 3D printouts for visual review of how the part is formed. The final review takes place with our in-house tool makers to develop the most cost efficient methods for manufacturing your part.

We are expert at matching the right tools for the right tooling application. That's because our engineering skills apply directly to our tool and die making capabilities. At BMR you'll discover a level of craftsmanship you are unlikely to find anywhere else. We have a high level of employee retention, experts who grew up in our company and have become masters of the art form. Plus our experience has taught us that an efficient operation all around helps improve the quality of the craft itself.

## PART PROFILE SCANNING

At Bellows Manufacturing & Research Inc. we can scan your product critical profiles using the latest measurement technology. Dimensional data can be generated, imported and evaluated into a CAD model for further development.

We can confirm compliance with your tolerances and display the results with color coded printouts including: nominal part shape, tolerance bands, actual shape and deviations.

We can accommodate your CAD files to define nominal part shape.

## DATA PACKAGE DEVELOPMENT

With over 50 years of experience in engineering, design and fabrication. BMR can reverse engineer your prototype and develop a complete data package with materials and specifications that is ready for first article production or suitable for immediate procurement.

## ELECTRO DISCHARGE MACHINE (EDM)

### Wire EDM Capabilities

- High Taper
- Small Diameter Wires
- Auto threading
- Submerged cutting for thermal
- Stability and efficient interrupted cutting

### Other Services

- Prototyping
- Reverse Engineering

### Production Quality

- High Volume Production
- Prototype

### Quality Control Certifications

- AS 9003 Compliant

### Software Used

- BOBCAD

### MATERIALS

- All Tool Steels
- Stainless Steel
- Aluminum
- Inconel
- Tungsten
- Carbide
- Nickel
- Brass
- Copper
- Copper Tungsten
- Kovar
- Invar
- Platinum
- Molybdenum
- Titanium
- Nitinol
- Tantalum
- Hastalloy
- Refractory Materials

### WIRE MATERIAL

- Brass
- Stratified Copper

### Wire Diameter

- 0.006" to 0.012" (inches)

### Material Removal in Skim Pass

- 0.0001" to 0.002" (inches)

### Positional Accuracy

- 0.000020" (inches)

### Tolerances

- +/- 0.0002" (inches)

### Work Piece Thickness

- Up to 6" (inches)

### Taper Angles

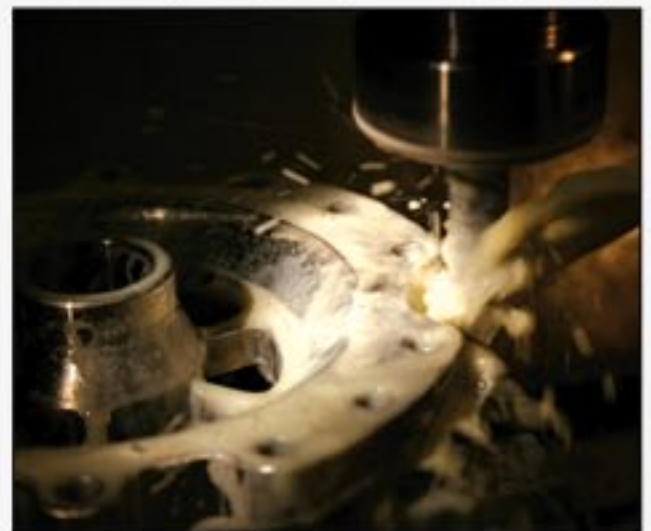
- Up to +30°

### Equipment Used

- Charmilles Robofil 2020 Wire EDM Machine
- 9.5" x 12.5" travel
- 6" thick
- 30° taper

## MACHINING

- CNC Mill
- CNC Lathe
- CNC 4X 0.150 up to 1.25" (Screw Machine)
- CNC Wire EDM 5X
- Conventional Mill and Lathe
- Punch Presses up to 30 Tons
- Sand Blasting



# BELLOWS

Many of today's sophisticated applications require bellows. Our bellows can be produced in sizes smaller than any other bellow. The bellows walls can be as thin as 0.003" up to 0.180 which creates extreme sensitivity, making them perfect for very accurate instrument applications, with bellow diameter manufacturing from 0.5" to 36". They're also seamless and non-porous, meaning no dust or moisture can infiltrate the seams and cause contamination in critical application. This ensures our bellows have the longest life expectancy and the best performance possible.



## BELLOWS ASSEMBLIES

### Expansion & Gimbal Joint Design & Manufacturing

BMR has supplied high quality metal bellows expansion joints to industry for more than 50 years. The BMR name is recognized around the world as being at the forefront for innovative technical solutions and highly reliable products.



BMR expansion joints are used in a wide variety of piping applications to compensate for thermal pipe expansion or contraction, and to absorb equipment vibration or pipe motions. These products provide piping system flexibility under extreme operating conditions. BMR manufactures single, multiply, and two-ply testable bellows in sizes from 0.5" to 36" in diameter using precision forming technology.



Bellows materials utilized include stainless steels, nickel based alloys, titanium, and many others for extreme pressure, temperature, and corrosive conditions. BMR's expansion joint business is focused on providing engineering excellence, responsive and timely deliverables, and dedication to customer success and satisfaction.

Each Bellow and Expansion Joint is inspected thoroughly, both during the fabrication process and prior to shipping, to ensure the products are delivered to our customers in optimum condition.

**Applications include:**

- High vacuum seals
- Leak-free motion feedthroughs
- Flexible joints
- Volume compensators, accumulators
- Pressure and temperature actuators

BMR can custom design and manufacture various types of expansion joints based on your needs and requirements. For all of your flexible metal products let BMR be your partner.



## WELDING CAPABILITIES

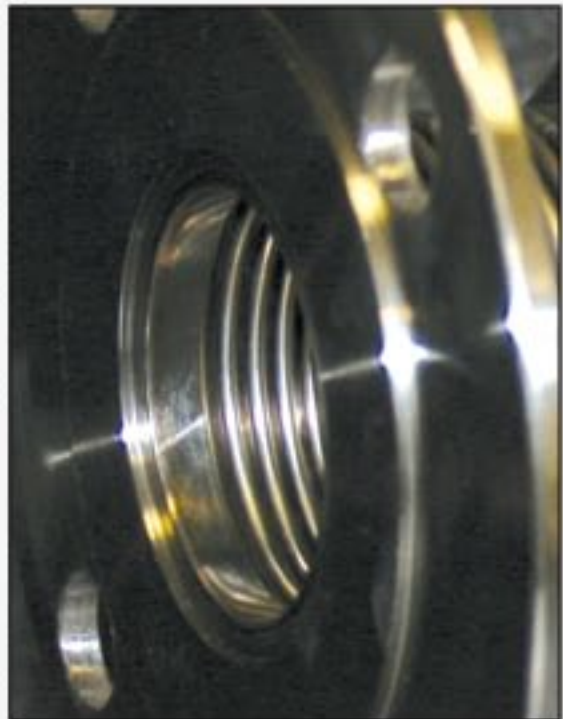
Precision metal joining is our core technology especially in the area of thin metal stock (0.003" to .130" wall thickness). Our welding technologies include:

- Resistance Spot & Roll
- Seam Welding
- Tig Welding
- Mig Welding
- Horizontal & Vertical Tig Welding
- Resistance Roll & Spot Welding

Welding is our core technology especially in the area of thin metal stock (0.003" to 0.180" wall thickness). Metal Bellows welding technologies include Tungsten Inert Gas (TIG), Spot welding, MIG welding, horizontal and vertical TIG welding.

These techniques are employed to join a variety of metals including stainless steel, Inconel, Hastelloy, titanium and other exotic materials. All welders are trained and certified by function, material type and thickness.

Weld equipment includes multiple ID and OD welding stations for bellows manufacturing. Machines are set up in flexible work cells and employees cross trained to optimize manufacturing capability and minimize delivery time.



## HOSES

**STAINLESS SINGLE BRAIDED METAL HOSE** - SB1 is a corrugated stainless steel hose with a stainless steel braid. It is resistant to bursting, cracking, and crushing, while being quite flexible. 1/4" to 8" diameters. -320F to 1500F.

**STAINLESS DOUBLE BRAIDED METAL HOSE** - SB2 is a corrugated stainless steel hose with a double stainless steel braid for a higher pressure capacity than the SB1 single braided hose. It is resistant to bursting, cracking, and crushing, while being quite flexible. 1/4" to 8" diameters. -320F to 1500F.

**STAINLESS HIGH PRESSURE BRAIDED HOSE** - SB3 is a very high pressure corrugated stainless steel hose with a stainless steel braid. It has a higher pressure capacity than the standard braided metal hoses. 1/4" to 8" diameters. -320F to 1500F.

**BRONZE SINGLE BRAIDED HOSE** - BB1 is a corrugated bronze hose with a single bronze braid. It has a high pressure capacity at high temperatures. It is resistant to bursting, cracking, and crushing, while being quite flexible. 1/4" to 3" diameters. -50F to 450F.

**SU1 STAINLESS CORRUGATED UNBRAIDED HOSE** - SU1 is a corrugated stainless steel hose that can be used at lower pressures at high temperatures. For higher pressures, see the braided metal hoses options. 1/4" to 8" diameters. -320F to 1500F.

### **STANDARD AND CUSTOM FITTINGS AND FLANGES ARE AVAILABLE UPON REQUEST FOR HOSE ASSEMBLIES.**

BMR utilizes state of the art machinery to allow us to make a few, a hundred, or a thousand of tube assemblies to exacting requirements time and time again. Our CMM capabilities allow our quality control functions to communicate with computer-aided design programs to assure you of continued repeatability. BMR can provide tube assemblies from 3/16" through 2" OD size in an assortment of tube thickness. Our welders are qualified to ASME SEC IX.

**MATERIALS** - Carbon Steel (CS) Hydraulic Tube, Type 304, Type 316L, Type 321, Type 21-6-9, Aluminum, Copper, Monel, Titanium

**FITTINGS** - Available to customer specification: Parker Tube Fittings, Parker Instrumentation, Brennan Instrumentation, SSP Instrumentation, Swagelok, Hamlet, Hoke, and AN & MS

**GRADES** - Per ASTM and Military Grades

**TYPE** - Welded, Welded & Drawn, and Seamless

**FULL MANUFACTURER WARRANTY**



# TESTING



At Bellows Manufacturing & Research Inc. we understand that our customers have different demands for the quality of our bellows; therefore, we offer several methods of inspecting bellows and assemblies. Some of our in-house test capabilities are:

- Spring Rate
- Life Cycle
- Leak Tests
- Hydraulic

- Mass Spectrometer  $1+10^{-9}cc$
- Proof Testing
- Pressure Testing
- Dye Penetrate
- Fatigue Testing
- Axial Cyclic Motion Int./Ext. Pressure
- Lateral Stroke Motion Int./Ext. Pressure



# Contact Us

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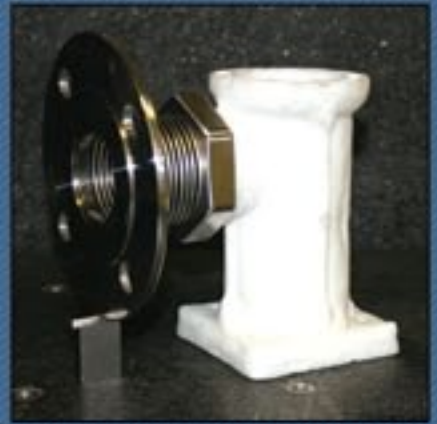
## General Ordering Information

To help us provide you with the best Expansion Joint for the service intended and at the lowest possible cost, please use the following checklist.

- Quantity required
- Pipe Size—size of existing pipe
- Installed face-to-face dimensions
- End Connections—advise type of end, alloy and method of attachment for each end. Also, specify drilling pattern, number of bolt holes, bolt circle and flange O.D. for flange connections
- Medium Conveyed—type of liquid, gas vapor etc
- Pressure and/or vacuum ranges
- Temperature range
- Movements—minimum and maximum axial compression, extension and lateral deflection. Also, angular rotation if applicable.
- Liners and/or covers
- Control Units—control units are recommended for use with all Expansion Joints. For the small additional charge, safety and longevity are enhanced. They must be used when piping support is insufficient.
- Other conditions which will help us provide the best possible Expansion Joint for the service. A complete range of standard products as well as special constructions are available to serve every possible need



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