

OUR PEOPLE MAKE THE DIFFERENCE

Welded Metal Bellows



www.magnox.com.cn

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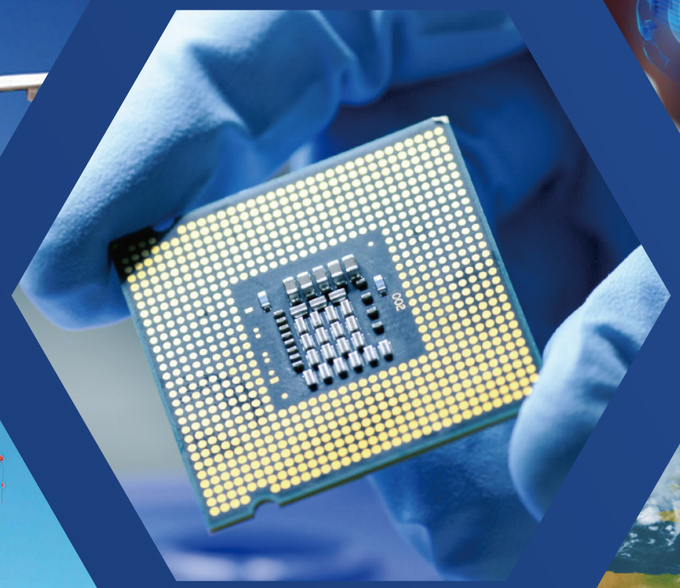
MAGNOX

OUR PEOPLE MAKE THE DIFFERENCE















Your Engineering & Manufacturing Resource For Bellows Solutions



ABOUT MAGNOX WELDED METAL BELLOWS

Magnox was founded on a breakthrough process for creating edge welded diaphragm metal bellows in 2012 Our customers represent the top innovators in aerospace, defense, energy, medical and semiconductor markets.

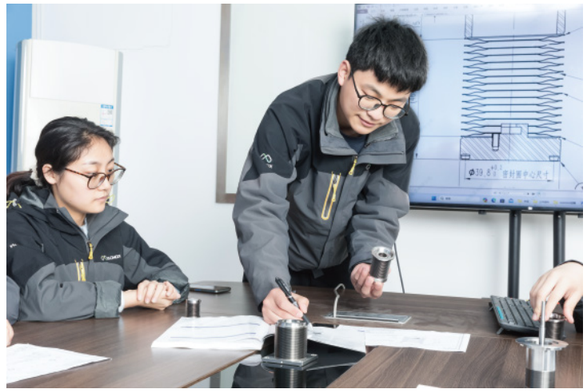
Our vertically integrated plant incorporates all aspects of metal fabricating and joining as well as electromechanical fabrication and assembly. All metal joining processes are maintained in the facility with particular attention to our core competency, fusion welding technologies.
This allows us to completely control the quality of the innovative solutions we offer our clients.

Our factory is located in Xiangcheng District, Suzhou. The factory covers an area of 16,000 square meters and employs 200 people. Has a complete precision machining and TIG welding production line; There is a 100-level dust-free room of 500 ㎡ with valves and equipment assembly, ultra-pure gas pipeline welding, cleaning, testing and packaging that can meet semiconductor requirements through third-party verification. We have all kinds of testing equipment of international first-line brands. The company has obtained ISO-9001 quality management system certification; ISO-3834 welding system certification; PED4.3 Welder and pipe fitting production system certification. The team has a complete set of professional capabilities from design, technology, processing and manufacturing, quality and process control, and has a good reputation and reputation in the industry.

Welded Metal Bellows

MAGNOX

Vertically Integrated From Design To Production Manufacturing
从设计到生产制造的垂直整合



The design process begins with a thorough understanding of the customer's specific requirements for their custom engineered metal bellows solution.

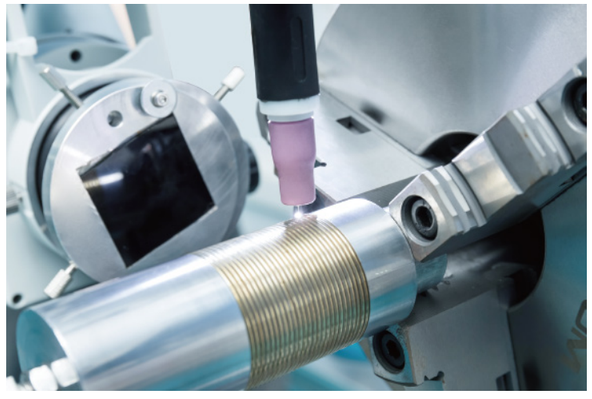
Prototypes can be created and tested to validate the design, ensuring properfunction and performance before themanufacturing process begins.





All products undergo thorough testing,including pressure, life cycle and/or leaktesting, to verify its ability to perform asrequired in real-world applications.

The final design is then manufactured using advanced techniques to produceconsistent, high-quality metal bellows components that meet the customer's specific requirements and specifications.

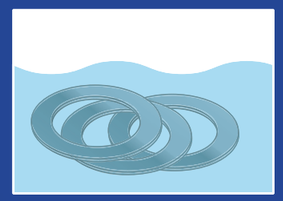


Process Flow
工艺流程

Process.1
Stamping



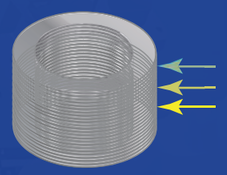
Process.2
Cleaning



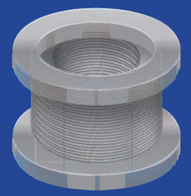
Process.3
ID Welding



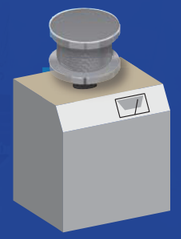
Process.4
OD Welding

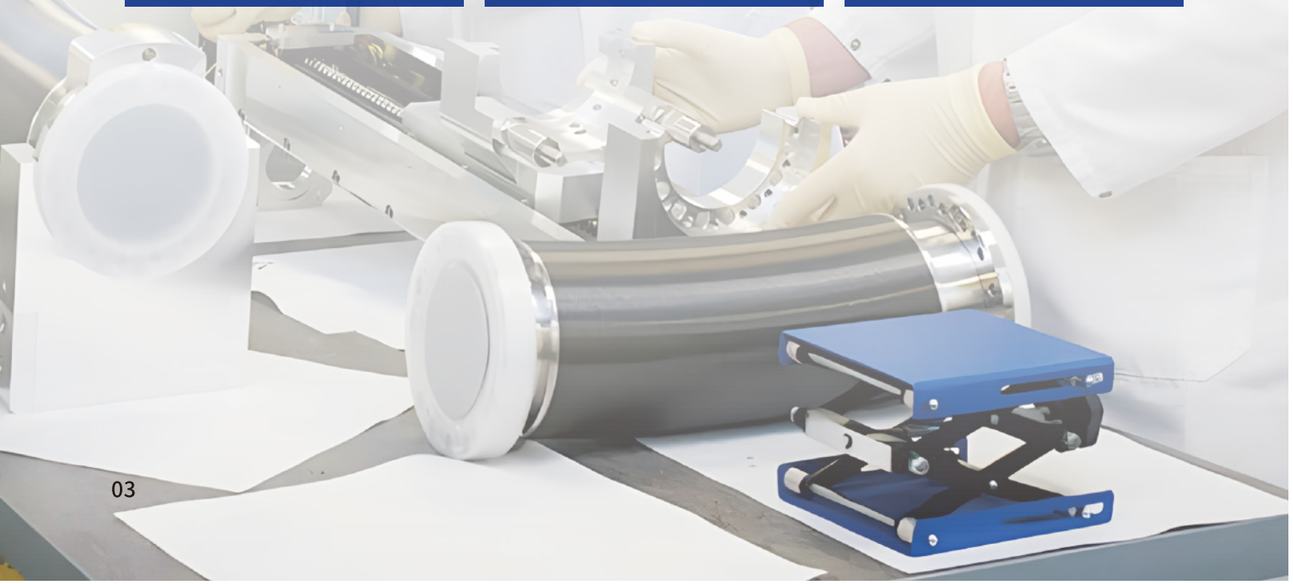


Process.5
Finished Welding



Process.6
Inspection





Detailed Quality Inspection
质量检验

Magnox is delivering the perfect product through Advanced Measuring Technology. The entire process is thoroughly inspected from the warehousing of raw materials to the final shipment of finished products.
Receiving inspection of raw materials is an especially important part of Magnox. Check the condition of the raw material imported through inspection equipment, Check the Mill Sheet provided by the supplier of the raw material every lot and enter it into the system to ensure traceability of the material.

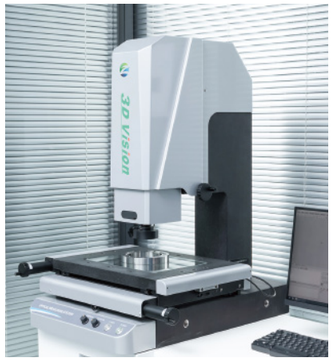




Magnox also carries out a thorough quality test on the workpiece. We ensure that accurate parts that have been machined to fit the needs of the entity are put into production. In the end, we ensures that a complete quality product that meets the customer's needs is delivered to the customer.







Product Application Industry
产品应用行业

Welded Metal Bellows is widely used throughout the manufacturing industry.

Because high levels of weld quality control and reliability are required,

High End Market is dominated by only few leading companies national market, including MAGNOX.

- Maintain internal and external sealing of the product
- Tilt and swivel, compression and stretching is possible
- High durability in a high temperature, a high pressure, and a corrosive environment

Application

Automotive Systems

Aviation/Aerospace Systems

Implantable Medical Devices

Irrigation Processes

Semiconductor Manufacturing

Commercial Batteries

Relay Cases

Accelerator

Energy(Solar)

Oil & Gas

Hydrogen

Nuclear

Weapon Systems

Chemical

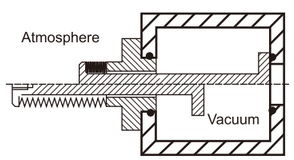
FPD

High Speed Train

Introduction To Welded Metal Bellows
金属焊接波纹管介绍

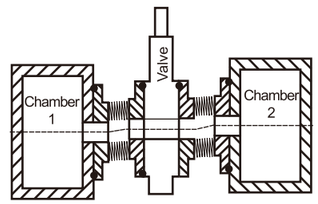
Welded metal bellows are flexible connecting elements between vacuum flanges or end fittings of any kind. The welded metal bellow is not a rigid body but can overcome a specified working stroke. Three main fields of application can be identifed: as feedthrough, as expansion joint or as vibration isolator.





welded metal bellows can serve as feedthroughs to introduce movements into the vacuum or to separate the vacuum chamber from mechanical parts.





welded metal bellows can serve as compensators to balance thermal expansion and mounting tolerances (e.g.height differences or angular offsets).



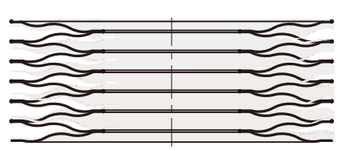
welded metal bellows are often used for vibration decoupling,e.g., between vacu.um pump and measuring instrument. A special design of the compensator causes a better vibration isolation by an increased number of diaphragm pairs, but enlarges the risk of self-resonance.

Advantages Of Welded Metal Bellows
金属焊接波纹管的优点

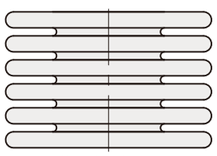
- High flexibility
- Lowest assembly dimension
- For highest demands in UHV applications
- Lower spring forces
- Variable web width (OD-ID)
- Almost unlimited bellow length
- Non-circular shapes available (racetrack, rectangular)

Comparison Of Welded Metal Bellows And Flexible Hoses
金属焊接波纹管与柔性软管比较

In comparison to flexible hoses which are made of a thin-walled, partly bead welded and hydraulically formed tube, welded metal bellows can execute significantly larger lateral, axial, and angular motions in relation to their size. They also have a lower spring rate.



welded metal bellows



Flexible hose

Types Of Movements
动作类型

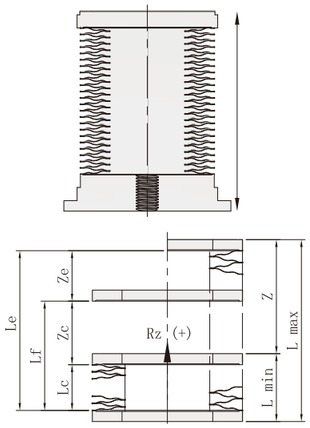
The following movements are possible:

- Axial
- Lateral
- Angular

Any combination of these kinds of movements is possible.
The individual types of movements are briefly explained below:

Axial

The flange surfaces are in parellel position and move towards each other,Thereby, no deflection in lateral direction is executed.The axial stroke is attenuated to achieve higher service life, i. e., a streched stroke should not occur at high-cycle bellows.

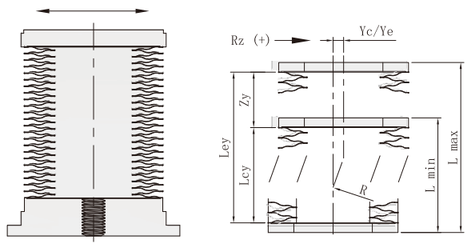


Abbreviations axial

Rz +	positive direction of force
Lf	free bellow length (without end fittings)
Lc	compressed bellow length = min. assembly dimension without end fittings
Le	stretched bellow length = max. assembly dimension without end fittings
Lmin	min. assembly dimension incl. end fittings from seal to seal
Lmax	max assembly dimension incl.end fittings from seal to seal
Z	axial stroke according to specification

Lateral

The flange surfaces shift sideways during lateral movement while always remaining parallel.
The maximal lateral stroke of an edge welded bellow depends on the assembly length.

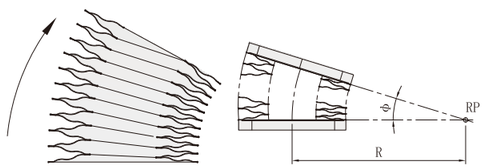


Abbreviations lateral

Ry +	positive direction of force
Yc	lateral stroke at Lcy
Ye	lateral stroke at Ley
Lcy	min. bellow length at given lateral stroke
Ley	max. bellow length at given lateral stroke
Lmin	min. assembly dimension incl. end fittings from seal to seal
Lmax	max. assembly dimension incl. end fittings from seal to seal
Zy	possible axial stroke at given lateral stroke Yc/Ye

Angular

The center axis of the bellow forms a bend with the radius "R" at angular movement(see figure). Not only the angle of rotation but also the location of the center of rotation is very important for dimensioning.



Key angular

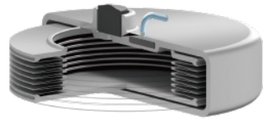
RP	the center of the bow of the bellow axis results from lc and le
R	Rradius of the bellow axis
Φ	angle between the flange surfaces according to specification
Φ/MP	angular stroke per convolution, catalog value
n	number of convolutions

Φ=Φ/MPxn

Design And Connectors
连接设计

Depending on the application, welded metal bellows consist of a number of moulded thin metal plates (diaphraams) which are welded together alternately at their inner or outer diameter.Two of these at the inner diameter welded plates form a convolution.

Usually, bellows will not be supplied without solid connections, so-called end fitings.The weld seam between the bellow and the end fitting needs a special preparation.







Materials
材质

We offer welded metal bellows and the appropriate flanges and end fittings in different materials.We use stainless steel 1.4435(AISI 316L) as standard for welded metal belows.The flanges and end fittings can be made from stainless steel 304, 304L.or 316L. if a very low magnetic permeability μr ≤1.005 is required, the flanges can be made of stainless steel 1.4429 in ESR quality. For welded metal bellows of AM350 we use flanges and end fittings from stainless steel 316L.

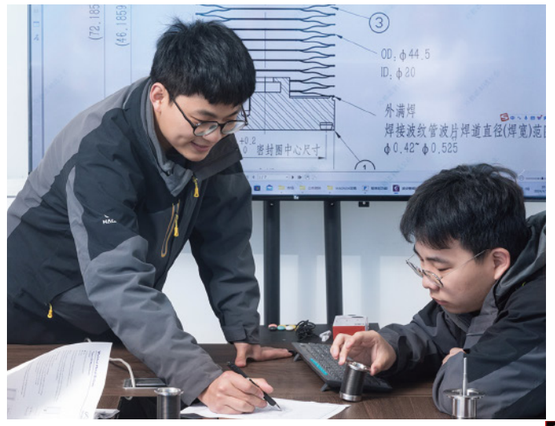
in addition, the special material Titanium Grade 1 can be used if the welded metal bellows are used in an especially corrosive environment in this case the flanges have to be made of Titanium Grade 1. Edge welded bellows of a nickel-based alloy (Haynes 242) are applicable for processes with temperatures up to 600 °C, depending on the environmental conditions even up to 1000 °C The appropriate flanges will be manufactured of the nickel-based alloy AU600.

Materials Properties Table
材料特性表

Material	Temperature（C）	Feature	Heat resistance	Durability	Corrosion Resistance
Austenitic stainless steel					
SUS316L	-251~426	Corrosion resistance, heat resistance, HCl corrosion resistance	B	B	B+
PH Stainless Steel					
AM350	-73~426	High strength,weakly magnetic, universal relevance, worse resistance to corrosive gas	A+	A+	B
On the basis of nickel heat resistance, corrosion resistant steel					
Hastelloy C-276	-251~537	Excellent corrosion resistance, oxidation resistance	A	A	A
Hastelloy C-22	-251~537	Excellent corrosion resistance, oxidation resistance	A	A	A
Inconel 625	-251~815	Acid resistance, high temperature resistance	A	A	A
Inconel 242	-251~698	Fluoride-resistance, excellent stability in high temperature environment	A+	A+	A+

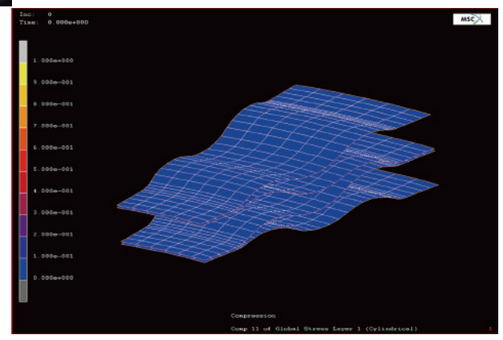
*A+:Excellent A:Good B+:Far B:Acceptable C:Poor

New Product Development
新产品开发



Magnox applies our core edge-welded bellows technology to solve our customers' unique challenges. Our engi.neers work closely with our customer's engineers to ensure that we understand the application and critical perfor-mance factors in order to meet or exceed all technical reguirements.

We can provide custom engineered solutions from one of our existing technology areas or we can create entirely new products whatever is needed to meet our customers' needs.



Our core competencies are:

- Problem solving and new product development
- Designing for high reliability and high cycle life
- Testing
- Production manufacturing

We apply our welded metal bellows technology to overcome performance and/or reliability issues with

Our Areas Senior Excels:

High Reliability

- High cycle life capability
- Zero friction and zero wear
- Zero contamination
- Redundant and double containment systems with fault indication

Zero Leakage

- Candidate for zero leakage replacement of dynamic elastomeric seals
- Movement across a vacuum boundary
- Handling of dangerous/corrosive liquids and gases

High Pressure

- Application pressures of 37000 psi and higher
- Zero leakage pneumatics & hydraulics
- Unique HIPRES
- Patented high pressure bellows technology

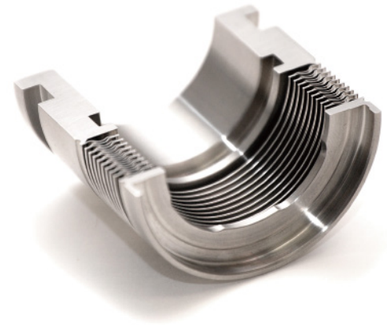
Temperature Extremes

- Cryogenic applications
- Designs to 1800°F or higher
- Automatic thermal actuators to 1000°F plus

Service And Repair
服务和维修

Besides the manufacturing of custom edge welded bellows, we deliver replacement bellows. In addition, we are able to offer the repair of damaged bellows. This includes bellow feedthroughs of valve drives, coupling elements, manipulators, etc.

A drawing, a precise sketch or a photo, if available, is essential for quotation. You can also send a sample or the damaged bellow for the estimation of costs. In this case, please contact us before shipping, so we can start working immediately on receipt of the goods.



Notes

The following criteria have to be considered:

◆ Conditions of surrounding area
Bake-out temperature, operating press ure, operating temperature, possible torsion and the inspection pressure affecting the life cycle directly.

◆ Vacuum inside the welded metal bellow (outside overpressure)
Edge welded bellows are stabilized by the vacuum inside. They can be up to ten times as long as the outside diameter in case of horizontal installation. However, the bellow will become unstable in case of zero pressure difference.

◆ Vacuum outside the welded metal bellow (inside overpressure)
In this case the bellow is very unstable and will buckle soon. The bellow needs to beaxially stabilized by guiding elements.

◆ Horizontal installation of long welded metal bellows
The deflection of the edge welded bellows has to be considered especially in this installation position.
It is recommended to split the bellows with intermediate rings into fragment bellows and put up the intermediate rings into a guidance system.

◆ Vertical installation of long welded metal bellows
It needs to be considered that the diaphragm on top always has to carry the weight of the whole edge welded bellow. Therefore, the edge welded bellow should also be splitinto segments by intermediate rings and should be released by rods or wire for traction relief.

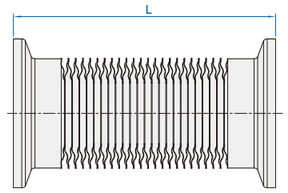


Standard Edge Welded Bellows
标准焊接波纹管

Quick availability of standard dimensions, in stock bellow material stainless steel 316L; flange material stainless steel 316L

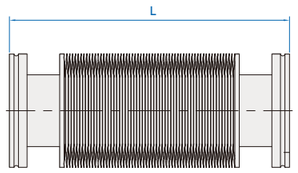
KF Flanges Edge Weld Bellows

Part Number	Flange Size	Dimensions, mm
		L
66710-0016	KF16	100/OPTION
66710-0025	KF25	100/OPTION
66710-0040	KF40	100/OPTION
66710-0050	KF50	100/OPTION



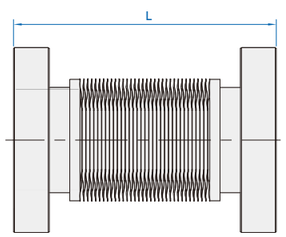
ISO Flanges Edge Weld Bellows

Part Number	Flange Size	Dimensions, mm
		L
66711-0063	IS063	100/OPTION
66711-0080	IS080	100/OPTION
66711-0100	IS0100	100/OPTION
66711-0160	IS0160	100/OPTION
66711-0200	IS0200	100/OPTION



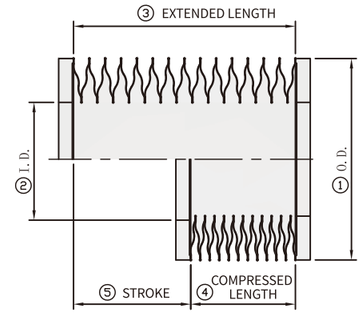
CF Flanges Edge Weld Bellows

Part Number	Flange Size	Dimensions, mm
		L
66712-0133	CF16	100/OPTION
66712-0275	CF35	100/OPTION
66712-0338	CF50	100/OPTION
66712-0450	CF63	100/OPTION
66712-0600	CF100	100/OPTION
66712-0800	CF160	100/OPTION



Welded Metal Bellows

Welded Metal Bellows Design Request
焊接波纹管设计式样委托书



① Bellows Capsule Maximum O.D.: _____ mm
波纹管最大外径:

② Bellows Capsule Minimum I.D.: _____ mm
波纹管最小内径:

③ Extended Length: _____ mm
伸展长度(EL):

④ Compressed Length: _____ mm
压编长度(CL):

⑤ Stroke(EL~CL): _____ mm
行程:

⑥ Install length: _____ mm
安装长度:

⑦ Life Cycle: _____ cycle
寿命:

⑧ Vacuum Side : Inside _____ kg/cm^2.
真空端: 内部

Outside _____ kg/cm^2
外部

⑨ Temperature: _____ °C
使用温度:

⑩ Gas or Fluid: _____
腔体内使用流体(气体/液体):

⑪ Leak Rate : _____ $pa*m^3/s$ He
泄漏率:

⑫ Bellows Capsule Material: _____
波纹管材料:

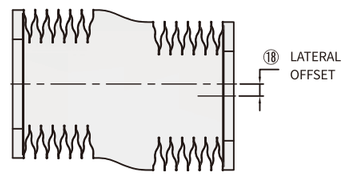
⑬ Flange material: _____
法兰材料:

⑭ Spring rate: _____ /mm
弹性系数:

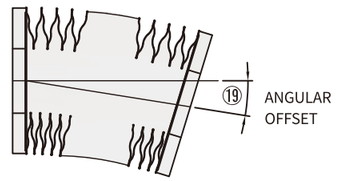
⑮ Shaft size: _____ mm
波纹管内部轴直径:

⑯ Installation:Vertical( ) Horizonal( )
安装方向: 垂直方向 水平方向

⑰ Process or equipment : _____
工程或设备名称:



⑱ Lateral Offset: _____ mm
侧向偏移:



⑲ Angular Oifset: _____ deg
角度偏移:

※ Memo 其他事项要求