AoGr
奥光管业

奥光波纹管
AOGUANG CORRUGATED PIPE

为客户提供完美解决方案
Providing Customers with Perfect Solutions

厚德載物

天行健　君子以　自強不息
地勢坤　君子以　厚德載物

厚德物

企业文化
厚德载物，互利共荣
以人为本，城市自信

经营理念
以客户成功为中心
为客户创造价值

服务理念
热情细致，方便快捷

Corporate Enterprise
Great virtue can carry all things,
mutual benefit and prosperity
Human oriented,
sincere and confident

Business philosophy
Centering on customer success
Creating value for customers

Service concept
Warm, meticublous, convenient and prompt

手册目录 CATALOGUE

01
Company Profile
企业简介

　　江苏奥光波纹管有限公司位于江苏省姜堰市曙光大道9号，毗邻328国道，占地15600平方米，生产厂房12600平方米，总资产8210多万元，固定资产3000多万元。各类生产、检测设备齐全，设备精良，研发生产金属软管及管道补偿器产品。本公司本着科技为本的创业理念，全力致力于波纹膨胀节和套管式补偿器的创新和试制工作，近几年来，波纹补偿器用于大型工程和耐磨、耐腐工艺管道工程，并表现出良好的使用效果。

　　公司生产各种规格金属软管、波纹膨胀节、套筒补偿器、非金属补偿器、旋转补偿器、球形补偿器、四氟补偿器、聚四氟乙烯软管、船用补偿器，也可根据用户需求订制生产各类非标产品。

　　本公司现有职工198人，其中工程技术人员15人，从事产品开发、生产、设计及质量检测等工作，本厂连续多年被评为"重合同守信用"、"省市先进企业"、"计量合格企业"、"产品质量合格单位"。

　　随着经济体制不断深入发展，公司积极推行各类先进企业管理，在ISO9001质量保证体系和GB/T12777-2008、GB/T14525-2010等标准下生产，确保产品质量赢得了用户的信赖并取得相关证书。通过我们的努力，一定会使这类产品使用寿命更长，范围更广。

　　欢迎贵公司莅临指导工作，我们将为您提供更满意的服务！

Jiangsu aoguang corrugated pipe co., Ltd. Is located at no. 9 Shuguang avenue, Jiangyan city, Jiangsu province, adjacent to national highway 328th, covering an area of 15600 square meters, 12600 square meters of production plant, with a total assets of more than 82. 10 million yuan. The fixed assets amount to over 30 million yuan.All kinds of production, sophisticated testing equipment, R & D and production of metal hoses and pipe compensator products.The company is based on the concept of science and technology, fully committed to the corrugated expansion joint and casing compensator innovation and trial production, in recent years, corrugated compensator for large-scale projects and wear-resistant, anti-corrosion process pipeline engineering. And show good effect.

The company produces various specifications metal hose, corrugated expansion joint, sleeve compensator, non-metal compensator, tetrafluoroethylene compensator, polytetrafluoroethylene hose, marine compensator, marine flange. We can also be customized according to user needs to produce various non-standard products. The company has 198 employees, including 15 engineers, engaged in development, production, design and quality testing of product and so on . For many years, our factory has been appraised as "respecting contract and keeping promise", "advanced enterprise of provinces and cities", "qualified enterprise of measurement", "unit of qualified product quality".

With the continuous development of the economic system, the company actively carries out various kinds of advanced enterprise management. Production and operations under ISO9001 quality assurance system and GB/T12777-2008, GB/T14525-2010 standards to ensure that the quality of the product has won the trust of users and obtain relevant certificates.Through our efforts, we are sure to make this kind of products have a longer service life and a wider range.

Welcome to your guidance, we will provide you with more satisfactory service!

荣誉因为客户而存在.

因为我们的一切努力,都是为了客户的满意.

一个人性化的品牌,不仅在于获得荣誉的多少,

更在于如何看待荣誉本身.

我们,摒弃了荣誉的表象,真正将其作为激励自身的不竭动力.

Honor exists for customers.

All of our efforts are to meet customers' requirement.

A human-based brand emphasizes not only the quantity of honors,

but how to regard honor.

Abandoning semblance of honor,we has taken it as continuous

inspiration.

高新技术企业证书

营业执照

中华人民共和国
特种设备制造许可证
Manufacture License of Special Equipment
People's Republic of China
(压力管道元件)

辐射安全许可证

安全生产标准化
Work Safety Standardization
证书
CERTIFICATE

特种设备型式试验证书
(压力管道元件)

特种设备型式试验证书
(压力管道元件)

质量管理体系认证证书
江苏奥光波纹管有限公司

环境管理体系认证证书
江苏奥光波纹管有限公司

职业健康安全管理体系认证证书
江苏奥光波纹管有限公司

特种设备型式试验证书
(压力管道元件)

特种设备型式试验证书
(压力管道元件)

特种设备型式试验证书
(压力管道元件)

百尺竿头
更进一步

ZT HAS THE CONVENIENT
NEREFORE IT HAS

有多少关注，就有多少期望......

CONVENIENT HEREFORE
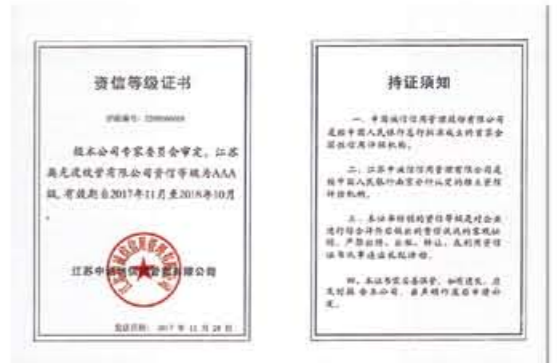
荣誉记载着我们的过去，激励我们攀登新高......

The honors record the ever and encourage us to seek for better and higher......

03
EQUIPMENT STRENGTH
装备实力

生产工具是生产力发展水平的标志，先进的生产设备代表了先进的生产力。公司积极引进的技术和生产设备，使产品内在品质与外在个性化紧密结合，完全满足并引领工业现代化的需要。

Production facility is an important sign of productivity level.
Sophisticated production facilities represent advanced productivity. By introducing superior technology and production facilities continuously, our company perfectly integrates the internal quality of products and requirements of industrial modernization.

质量是企业的基石.我们建立了完整的质量管理体系，以保证卓越的品质。

Quality is the base of enterprise. Wo Company has established perfect quality inspection system to guarantee excellent quality.
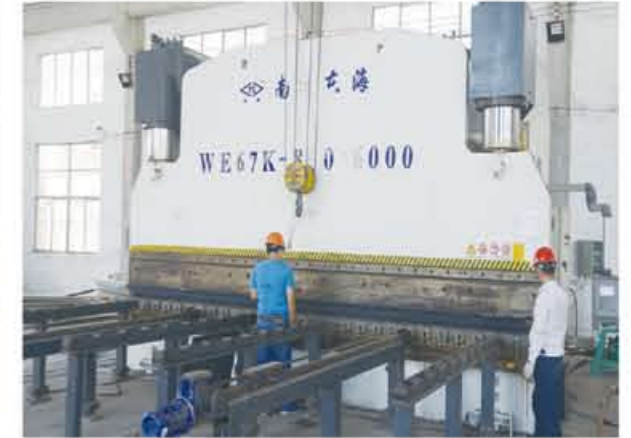
雄厚实力，可靠的产品保障
PRODUCTION EQUIPMENT
生产设备

在技术领先的同时，更注重产品工艺的精良，不论是一个小小的配件还是整体的构造，我们都是一丝不苟。"设计技术"的研发是创新的磐石，公司自成立以来，皆以"力求创新，稳固发展"为目标，不断开发新产品，协助开发新项目，引进先进的生产线，加工中心及检测设备，致力于通过新技术改造提高产业结构，以优势产品占领市场，继而以市场优势确定品牌地位。

While leading in technology, our pays much attention to fine product technique. our personnel are always meticulous towards small fittings and integral construction. The research and development of "design and technology" is the firm base for innovation. Since its establishment, our set up goal of "striving to innovate, developing stably", continuously developed new products, assisted in developing new projects, introduced advanced production lines, machining centers and inspection equipment, and by always insisting on regarding technology reinforcing as the core of operation, our company is devpted to improving industrial structure by new technology reform, occupying the market by dominant products and confirming the brand position by market advantages.

质量 是我们的生命，以质量为核心，我们建立了一套完整的质量控制体系。每一个环节都严格把关，并定期请国家计量、质量检测部门对我厂所有计量检测工具进行检测，确保每一个产品能达到用户的满意。

Focusing on quality, we build up a set of quality control system, in which every link is strictly monitored, and invite national metrological service or quality inspection departments to inspect, calibrate our existing metro-logical tools in order to guarantee high quality of products.

04
Testing Instrument
检验仪器

完善的系统检测设备，
以专业严谨的态度、自主进取的研发精神，
保证我们一流的产品品质.

The complete systematic testing equipment guarantee our first-class products quality with the attitude of rigorous speciality,and the spirit of aggressive research and self probing.

射线探伤室
X-rays Flaw Detection Room

化学分析设备
Chemical Analysis Instrumentation

組織架構
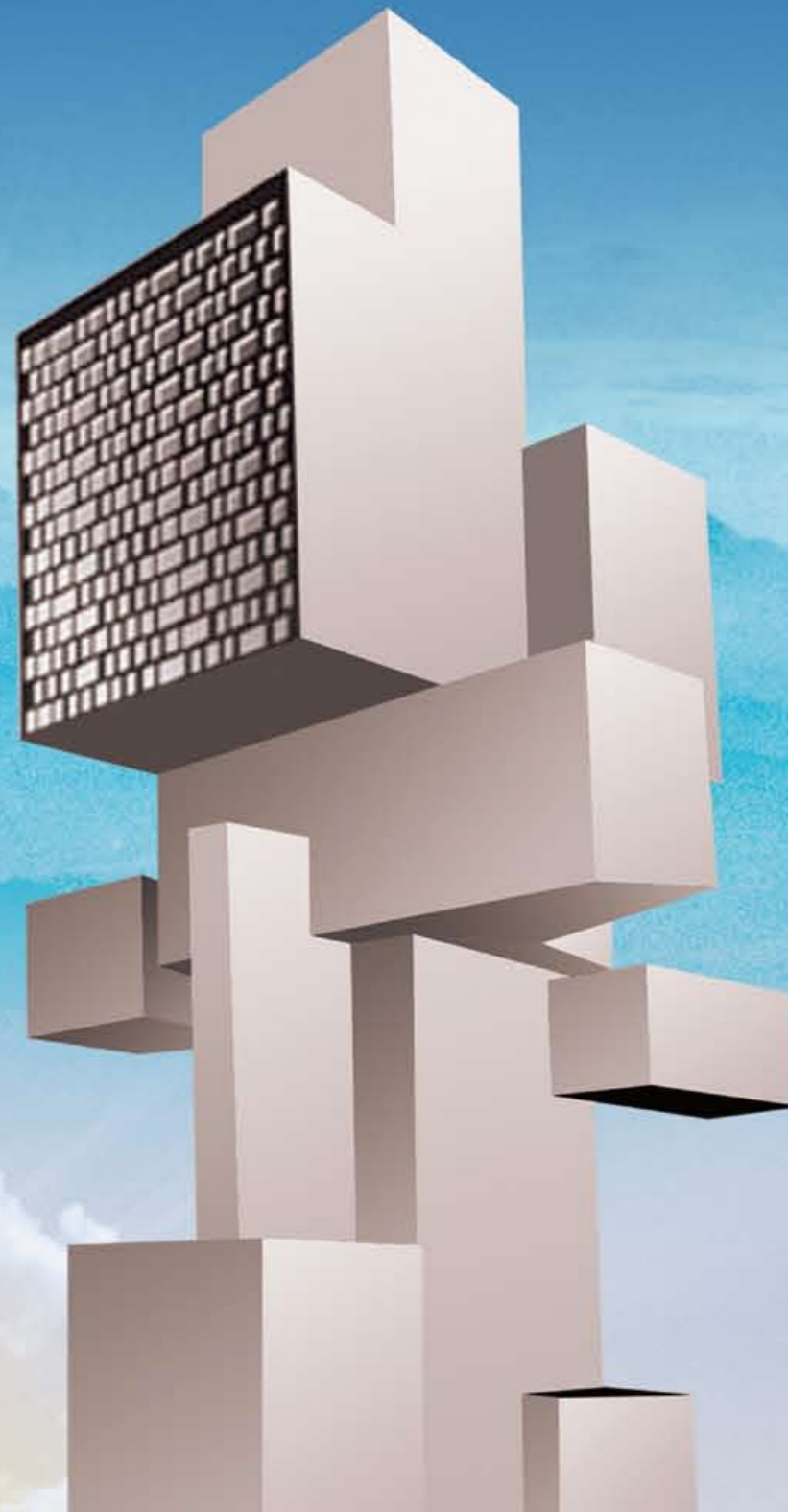
高效的组织架构
是企业持续发展的重要依据

Efficient organizational structure is an important basis
for the sustainable development of enterprises

董事
Board

总经理
General Manager

经营副总经理 Vice Management Manager	总工程师 Chief Engineer	常务副总经理 Executive Assistant Manager
市场开发部 Market Development DPT	技术工艺部 Technical DPT	采购部 Procurement DPT
销售部 Sales DPT	质量检验部 Quality Inspection DPT	安全部 Security DPT
财务部 Finance Office	设备部 Equipments DPT	生产部 Production DPT
行政管理部 Administration DPT	理化试验室 Physis and Chemistry Lab	
售后服务部 Sales Service DPT		

拥有广大忠实的客户，是我们赖以生存的基石。"质量是生命、顾客是上帝"一直是我们公司信奉的经验根本，而与客户共同进步则是我们的目标。

A large number of faithful cornerstone on which Our depend.We adhere to the business principles of regarding quaily as our life and clients as the God Our ultimate aim is to seek progress togetherwith clients.
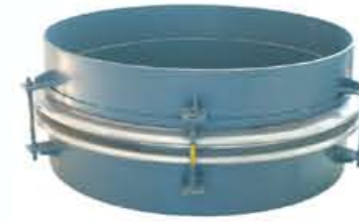
通用型补偿器
General Compensator

无约束型波纹补偿器
Non-restrictive Bellow Compensator

直埋型补偿器
Directly Embedded Compensator

小拉杆波纹补偿器
Pull Rod Bellow Compensator

直埋双向补偿器
Directly Embedded Dual Directions Compensator

外压式波纹补偿器
External Compression Bellow Compensator

大拉杆横向型波纹补偿器
Big Tension Bar Lateral Bellow Compensator

铠装大拉杆横向型补偿器
Armored Big Tension Bar Lateral Bellow Compensator

曲管压力平衡波纹补偿器
Curved Tube Pressure Balanced Bellow Compensator

单式万向铰链波纹补偿器
Single Type Universal Hinged
Bellow Compensator

单式铰链波纹补偿器
Single Type Hinged Bellow
Compensator
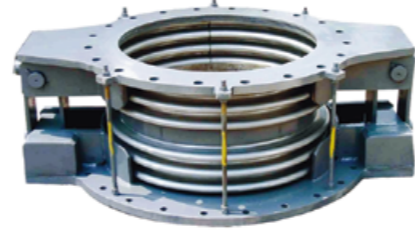
复式铰链横向型波纹补偿器
Duplex Type Hinged Lateral
Bellow Compensator
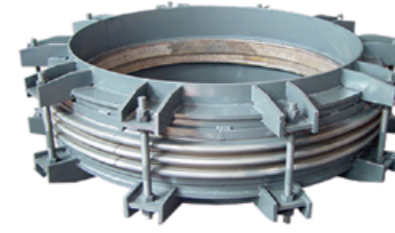
高温轴向型补偿器
High Temperature Axial
Type Compensator

高温型复式波纹补偿器
High Temperature Type Duplex
Bellow Compensator

高温轴向补偿器（催化裂化用）
High Temperature Axial Compensator
(Used in Catalytic Cracking)
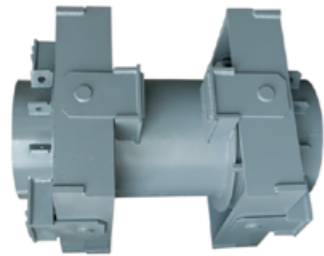
复式万向铰链型波纹补偿器
Duplex Type Universal Hinged
Bellow Compensator
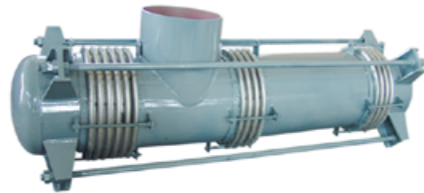
三通压力平衡型波纹补偿器
Tee Joint Pressure Balanced
Bellow Compensator

直管压力平衡型波纹补偿器
Straight Tube Pressure Balanced
Bellow Compensator

高温型补偿器
High Temperature Type
Compensator

圆形金属高温补偿器
Rounded Metallic Hight Temperature
Compensator

炼铁热风高温波纹补偿器
High Temperature Bellow Compensator
for Iron-making Hot Air

直管旁通式压力平衡波纹补偿器
Straight Tube Bypass Pressure Balanced
Bellow Compensator
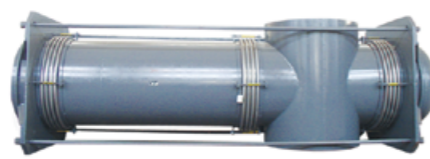
三通压力平衡波纹补偿器
Tee Joint Pressure Balanced
Bellow Compensator

曲管压力平衡型补偿器（小汽机）
Curved Tube Pressure Balanced Compensator
(Small Turbines)

复式高温型波纹补偿器
High Temperature Type Duplex
Bellow Compensator

不锈钢弯管四连杆补偿器
Stainless Steel Curved Tube Four-bar
Linkage Compensator

比例滑槽连杆补偿器
Proportional Chute Linkage
Compensator

优质的产品定能立足于世界竞争的舞台之上，新产品的研发实力能满足于市场不断变化的需求。
High-quality products must be able to stand at worldwide stage, R&D power of new products can meet ever-changing market demands
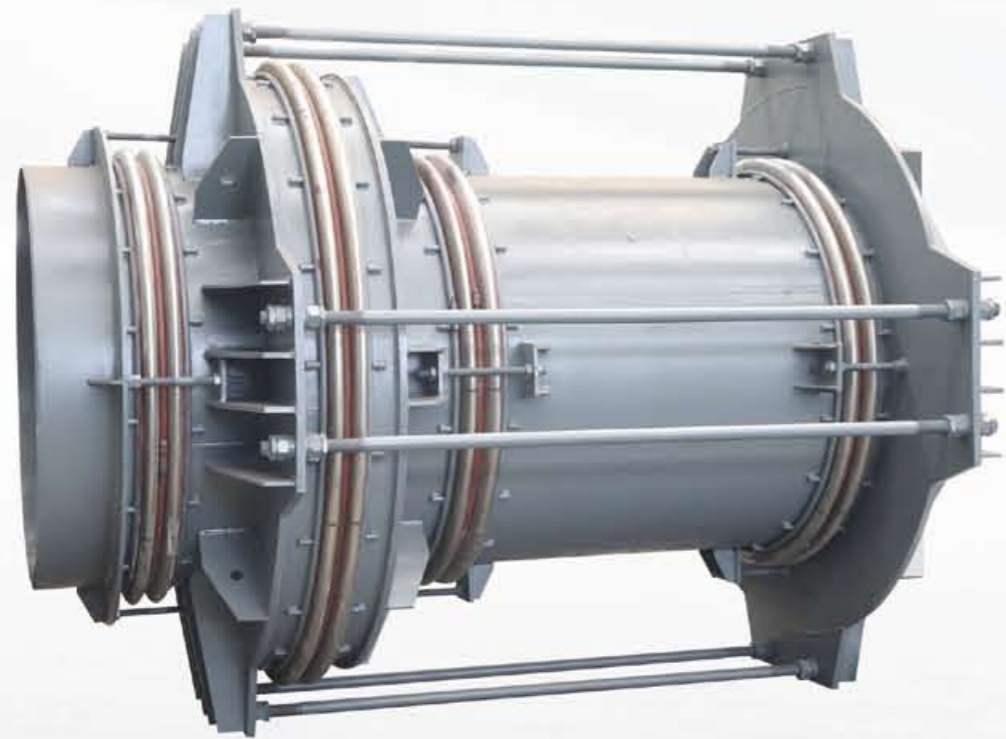
不锈钢补偿器
Stainless steel compensator

超长大拉杆补偿器
Super large lever compensator

四氟补偿器
Tetrafluoro Compensator

水电站轴向(单式)补偿器
Hydropower Station Axial
(Single Type) Compensator

水电站轴向(复式)补偿器
Hydropower Station Axial
(Duplex Type) Compensator

送风装置半成品库房
Semi-finished Warehouse for air Supply Equipment

3200m³ 高炉送风装置使用现场
3200m3 Blast Furnace Air Supply Device use Site

矩形金属补偿器
Rectangular Metallic Compensator
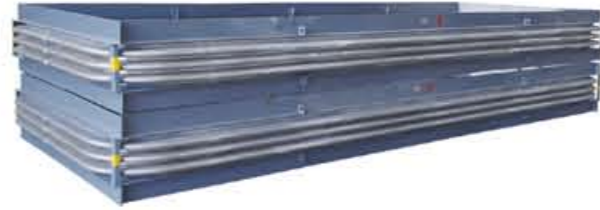
矩形金属补偿器
Rectangular Metallic Compensator

圆形复式非金属补偿器
Rounded Duplex Type Non-metallic
Compensator

圆形复式非金属补偿器
Rounded Duplex Type Non-metallic
Compensator

矩形金属补偿器
Rectangular Metallic Compensator

矩形圆角金属补偿器
Rectangular Fillet Metallic Compensator

矩形非金属补偿器
Rectangular Non-metallic Compensator

矩形非金属补偿器
Rectangular Non-metallic Compensator

矩形CE波补偿器
Rectangular CE Compensator

矩形金属补偿器
Rectangular Metallic Compensator

脱硫非金属补偿器(整体硫化)
Non-ferrous Desulfurization Compensator
(Integral Vulcanization)

脱硫非金属补偿器
Non-metallic Compensator
for Desulfurization

压紧式无推力旋转补偿器
Pressure type non-thrust
Rotary Compensator

注填式无推力旋转补偿器
Filling type non-thrust
Rotary Compensator

注填压紧复合式无推力旋转补偿器
Compound type non-thrust Rotary
Compensator with Filling and Pressing

压紧式套筒补偿器
Compact Sleeve
Compensator

注填式单（双）向套筒补偿器
Filling type Single (double)
to Sleeve Compensator

注填式单（双）向套筒补偿器
Filling type Single (double)
to Sleeve Compensator

自维护式无推力旋转补偿器
Self-maintaining non-thrust
Rotary Compensator

高温高压无推力旋转补偿器
High Temperature and High Pressure
non-thrust Rotary Compensator

注填式万向球形补偿器
Filling type Universal
Spherical Compensator

注填压紧复合式套筒补偿器
Filling and Pressing Compound
Sleeve Compensator

直埋套筒补偿器
Straight-Buried
Sleeve Compensator

压紧式直流无推力套筒补偿器
Pressure type DC Brushless
Sleeve Compensator

压紧式万向球形补偿器
Pressure type Universal
Spherical Compensator

注填压紧复合式万向球形补偿器
Compound Universal Spherical
Compensator with filling and Pressing

直埋密封式套筒补偿器
Straight-buried Sealed
Sleeve Compensator

注填压紧复合式直流无推力套筒补偿器
Compound DC non-thrust Sleeve
Compensator with Filling and Pressing

三维球形补偿器
Three-dimensional
Spherical Compensator

AY型压盖松套补偿接头
AY Type Pressed Cover Loosened
Sleeve Compensating Joint

AF型压法兰松套补偿接头
AY Type Pressed Flange Loosened
Sleeve Compensating Joint

BY型压盖松套限位补偿接头
BY Type Pressed Cover Loosened Sleeve
Limit Compensating Joint

BF型单法兰松套限位补偿接头
BF Type Single Flange Loosened Sleeve
Limit Compensating Joint

B2F型双法兰松套限位补偿接头
B2F Type Double Flanges Loosened Sleeve
Limit Compensating Joint

CF型单法兰松套传力补偿接头
CF Type Single Flange Loosened Sleeve
Load Transfer Compensating Joint

C2F型双法兰松套传力补偿接头
C2F Type Double Flanges Loosened Sleeve
Load Transfer Compensating Joint

CC2F型可拆双法兰松套传力补偿接头
CC2F Type Detachable Double Flanges Loosened
Sleeve Load Transfer Compensating Joint

D型大挠度松套补偿接头
D Type Large Deflection Loosened Sleeve
Compensating Joint

小孔消声器
Small hole Silencer

排气消音器
Exhaust Silencer

管道吹扫消音器
Pipe blowing Silencer

管道消音器
Pipe Silencer

除尘风机消音器
Dedusting fan Silencer

风机消音器
Draught Silencer

阻火器
Flame Arrester

样本选用说明
Instruction on Specimen Selection

◎ 产品执行标准 Executing Standards for Products：

严格按照美国膨胀节制造商会标准《EJMA》和国家标准《GB/T12777－2008金属波纹管膨胀节通用技术条件》、《GB/T14525－2010波纹金属软管通用技术条件》、《GB/16749－1997压力容器波纹膨胀节》、《GB/T15700－1995聚四氟乙烯波纹补偿器通用技术条件》、《JB/T 12235－2015 非金属补偿器》、《D－LD2000烟风煤粉管道典型部件手册》、《CCS中国船级社》执行。

The American Expansion Joint Manufacturer Association Standard, EJMA, as well as the national standards, GB/T 12777—2008 General Technical Conditions for Metallic Bellow Expansion Joints, GB/T 14525—2010 General Technical Conditions for Bellow Metallic Hoses, GB/16749—1997 Pressure Vessels Bellow Expansion Joints, GB/T 15700—1994 General Technical Conditions for Polytetrafluoroethylene Bellow Compensators, JB/T 12235—2015 Non—metallic compensator, D—LD 2000 General Pamphlet for Smoke Flue and Coal Dust Duct Components and CCS China Classification Society, have been strictly followed and executed.

◎ 膨胀节的压力范围 Pressure range of expansion joint：

样本中各类膨胀节的压力是t＝20℃时的设计压力Pd(MPa)。我公司生产的各类膨胀节的压力范围通常是从真空到10 MPa，如有特殊的超高压力要求时，我们也可进行专门的结构设计。

一般工作压力P≤设计压力Pd。我们对每件产品出厂前，每道工序均进行100%的压力试验和其它要求的检测，满足标准要求后才能出厂。

The pressure of different expansion joints in the sample is the designed pressure Pd(MPa) at t = 20℃. The pressure scope of different expansion joints pro—duced by our company is generally vacuum state to 10 MPa. If there is special requirement on ultra—high pressure, we also can design the structure specially. General working pressure P is less than or equal to the designed pressure Pd. We implement 100% pressure test and test of other requirements on each pro—cedure completely before each product is delivered out of the factory, and the product can be left from the factory after they meet the requirements.

◎ 膨胀节的温度范围 Pressure Scopes of Expansion Joints：

一般膨胀节的波纹管是用薄壁的奥氏体不锈钢材料（06Cr19Ni10、1Cr18Ni9Ti）制成。依据客户不同的工况条件也可采用其它材料制造。例如，在催化裂化装置中就采用B315材料。当接管、内衬筒的材质为碳钢时，膨胀节的工作温度范围为－20℃~420℃；当接管、内衬筒的材质为不锈钢（与波纹管相同时）时，产品的温度范围为－196℃~700℃。

The bellows for general expansion joints are made by use of the thin—wall Austenite stainless steel materials (06Cr19Ni10, 1Cr18Ni9Ti). Other materials can also be used according to different working conditions of clients for manufacturing. For instance, B315 material is just used in catalytic cracking units. When the materials of adaptor tubes and internal linings are carbon steel, the working temperature scope of expansion joints shall be –20℃~420℃; when the materials of adaptor tubes and internal linings are stainless steel (the same as bellows), the temperature scope of the products shall be –196℃~700℃.

◎ 膨胀节设计参数的修正系数 Corrective Parameters of Expansion Joint Design Parameters：

样本中所列各种参数，其设计条件是：温度t=20℃,使用疲劳寿命[N]＝1000次（外压型[N]＝100次）。当实际工作温度T≠20℃,疲劳寿命N≠1000次时，须用温度对补偿量的修正系数ft、温度对刚度的修正系数fk、疲劳寿命对补偿量的修正系数fn进行修正，即用样本中的额定值乘以修正系数。

The design conditions for various parameters listed in the specimens shall be: the temperature t = 20℃, the use fatigue life [t] = 1000 times (the external pressure type [N] = 100 times). When the actual working temperature t ≠ 1000 times, the corrective coefficient of the temperature to the compensation value ft, the corrective coefficient of the temperature to the rigidity fk and the corrective coefficient of the fatigue life to the compensation value fn, shall be used for correction, namely, the nominal values in the specimens shall be multiplied by the corrective coefficients.

（1）温度对补偿量的修正系数ft值 Corrective coefficient of the temperature to the compensation coefficient ft：

温度T ℃ Temperatur	–200	–150	–100	–50	20	50	100	150	200	250	300	350
ft	0.932	0.942	0.956	0.979	1	1.001	1.002	1.003	1.004	1.007	1.025	1.047

（2）温度对刚度的修正系数fk值 Corrective coefficient of the temperature to the rigidity fk：

温度T ℃ Temperatur	–200	–150	–100	–50	20	50	100	150	200	250	300	350
fk	1.07	1.06	1.05	1.03	1	0.99	0.97	0.96	0.94	0.92	0.9	0.88

（3）疲劳寿命对补偿量的修正系数fn值 Corrective coefficient of the fatigue life to the movement fn：

疲劳寿命N次 N Times of Fatigue Life		100	100	300	500	1000	2000	3000	5000
fn	无铠装环 Non–armored Ring	1.65	1.43	1.32	1.17	1	0.87	0.79	0.71
	有铠装环 Armored Ring	2.1	1.67	1.48	1.26	1	0.81	0.71	0.6

◎ 位移量的合成 Synthesis of Displacements

样本中给出的轴向、横向、角向补偿量（X_0、Y_0、θ_0）均为膨胀节各单向位移的最大量值，实际情况中常常同时出现两种或三种的位移，这时补偿量的选取应符合下列关系式：

$$\frac{X_1}{X_0} + \frac{Y_1}{Y_0} + \frac{\theta_1}{\theta_0} \leq 1,$$ 式中的X_1、Y_1、θ_1均为实际位移量。

The axial, lateral and angular compensation values (X0, Y0, Θ0) given in the specimens are all the maximum values of various single di—rection displacements of the expansion joints, whereas in real situations, there are often two or three types of displacement, of which time the selection of compensation values shall meet the following relation:
, in this term, Xi, Yi, Θi are all the actual displacement values.

◎ 膨胀节的预变形 Pre-deformation of Expansion Joints

为了使膨胀节处于良好的工作位置和减少对管架的受力，可对膨胀节在安装前进行预变形。

1. 对轴向型膨胀节的预变形：

对它的预变形即预拉或预压。用户需要时请告之，我们可在产品出厂前进行预变形。预变形量△X(mm)由下式决定：

To position the expansion joints in good working positions and reduce the force to the pipe support, the expansion joints can have predefor—mation before their installation.
1. Pre—deformation to the axial type expansion joints:
The pre—deformation to it is also pre—pulling or pre—compression. Users shall inform us when using it and we can also have pre—deforma—tion before the products are shipped out of the factory. The pre—deformation value $\triangle X(m,m)$ shall be determined by the following term:
by the following term:

$$\triangle X = X \left(\frac{1}{2} - \frac{T_0 - T_{max}}{T_{max} - T_{min}} \right)$$

当：△X为正值时，表示预拉；

当：△X为负值时，表示预压；

X—轴向位移量（mm）

T_0—安装时的温度（℃）

Tmax—管道最高温度（℃）

Tmin—管道最低温度（℃）

2.对横向型或角向型膨胀节的预变形即"冷紧"：

冷紧量可取实际位移量的一半，即$\frac{1}{2}Y_0$或$\frac{1}{2}\theta_0$，冷紧方向与实际位移方向相反。一般横向位移量很大时须进行"冷紧"，较小时可不进行。

When: △X is positive, it indicates pre–pulling;
X – Axial Displacement (mm)
T_0 – The temperature at installation (℃)
T_{max} – The highest temperature at the pipe (℃)
2. The pre–deformation for the lateral or angular type expansion joints is also "cold tightening"；
The cold tightening volume can take a half of the actual displacement, i.e., or , where the cold tightening direction shall reverse the actual displacement direction. Generally,, when the displacement is very big, "cold tightening" shall be taken, while when the displacement is relatively small, "cold tightening" can be omitted.

◎ 膨胀节的联接型式 Connection Type of Expansion Joints

膨胀节联接形式有两种，一种是接管直接焊接，另一种是法兰联接。如非标产品它们的连接尺寸、连接形式由用户根据工况要求给出。

There are two expansion joint connection types, the first is the adaptor tube direct welding and the other is the flange connection. In the case of non—standard products, their connection sizes and connection forms shall be given by users according to the working conditions.

◎ 产品代号标注 Product Code Identification

$$AG \cdot \square\square \cdot Pd \cdot DN (a \times b) \times n \cdot B \cdot J(F)-L$$

本公司产品代号
Our Corporate Product Code

膨胀节类型代号
Expansion Joint Type Code

设计压力
Design Pressure

公称通径
Inside Nominal Diameter

安装长度
Installation Length

接管J、法兰F
Adaptor Tube J, Flange F

材质要求
Material Requirement

波数（补偿量）
Number of Waves (Compensation Value)

方形接口长边尺寸a
Square Interface Longer Side Size a

方形接口短边尺寸b
Square Interface Shorter Side Size b
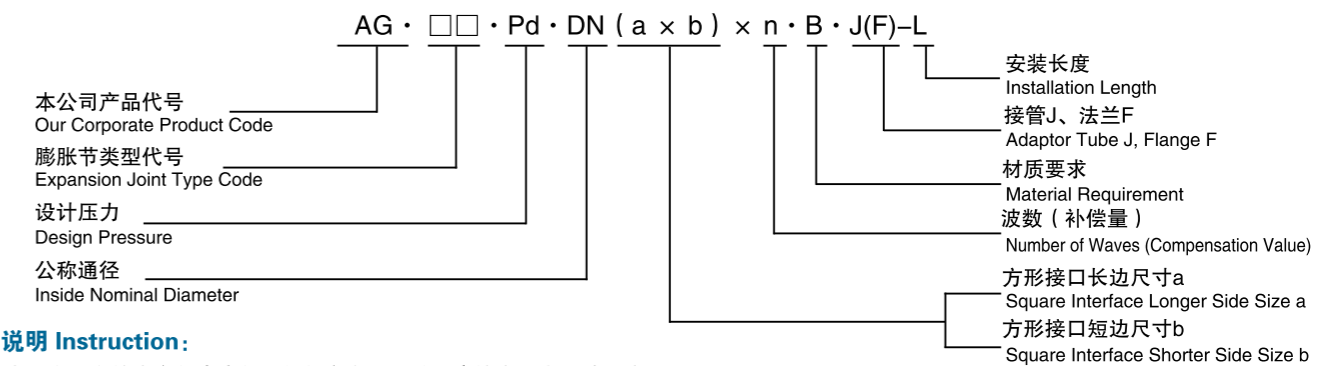
◎ 说明 Instruction：

本册中所有技术参数表内数据仅供参考，可按用户技术要求设计生产。

The data in the table of all technical parameters used in this pamphlet shall only serve as a reference, and designs and manufacturing can be based on users' technical requirement.

通用型（TB型）
General Type (TB Type)

◎ 结构简图 Structural Sketch
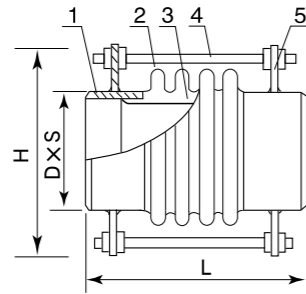
1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 导流管 Sleeve
4 – 拉杆 Rod
5 – 耳板 Lugs

◎ 产品结构特点 Product Structural Features

此类膨胀节是由一个波纹管和两个端接管构成。它通过波纹管的柔性变形来吸收管线轴向位移（也有少量横向、角向位移），端接管或直接与管道接管焊接，或焊上法兰再与管道法兰联接。膨胀节上的小拉杆主要是运输过程中的刚性支承或作为产品预变形调整用，不是承力件。该类膨胀节结构简单、价格低，因而凡是在管线上可能的地方应优先予以考虑。

This type of expansion joints is constituted of one bellow and two end adaptor tubes. It absorbs the pipeline axial displacement (there are also small amounts of lateral and angular displacement) through the flexible deformation of bellows, where the ends are connected to tubes or directly welded with pipeline adaptor tubes, or connected after being welded to flanges. The small pull rods on the expansion joints are for use in the rigid supporting during the transportation process or as the adjustment for product pre–deformation, not as a load–bearing member. This type of expansion joints is simple in structure and low in cost, thus is preferred for consideration in all possible positions on pipelines.

◎ 技术参数表 Technical Parameter Table

| 公称通径 Nominal Diameter DN mm	波纹管 Bellow		补偿量 Movement		刚度 Rigidity N/mm		径向外形最大尺寸 Radial Shape Maximum Size H mm	总长 Total Length L mm 连接形式 Connection Pattern	
	波数 Number of Bellows n	有效面积 Effective Area cm²	轴向 Axial X_0 mm	横向 Y_0 Lateral Y_0 mm	轴向 K_{x0} Axial mm	横向 K_{y0} Lateral K_{y0} mm		接管 Nozzle J	法兰 Flange F
设计压力Pd=1.6MPa(16kgf/cm²)疲劳寿命[N]=1000次 设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.									
300	4	1081	16	2.1	2945	29319	495	426	450
	8		32	8.4	1472	3665		570	594
350	4	1276	16	1.9	3229	37297	577	426	450
	8		32	7.7	1614	4741		570	594
400	4	1626	16	1.7	3690	55262	626	426	450
	8		32	6.7	1845	6908		570	594
450	4	2011	16	1.5	4145	76764	678	426	450
	8		32	6.0	2072	9596		570	594
500	4	2437	16	1.4	4600	103250	729	426	450
	8		32	5.4	2300	12906		570	594
600	4	3484	27	3.3	2908	33590	830	576	600
	8		54	13	1454	4199		816	840
700	4	4754	31	3.2	2656	41870	980	576	
	6		46	7.1	1771	12406		696	
800	4	6055	30	2.8	2924	58704	1080	576	
	6		46	6.2	1949	17394		96	
900	4	7512	30	2.5	3205	79817	1180	676	
	6		45	5.5	2136	23649		796	
1000	4	9314	32	2.4	4104	126735	1280	676	
	6		48	5.3	2736	37551		796	
1100	4	11103	32	2.1	4773	164662	1380	676	
	6		47	4.8	2982	48789		796	
1200	4	13050	32	2.0	4843	209568	1480	676	
	6		47	4.4	3229	62094		796	

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us: 0523–88681509

复式轴向型（FLZ型）
Duplex Axial Type (FLZ Type)

◎ 结构简图 Structural Sketch
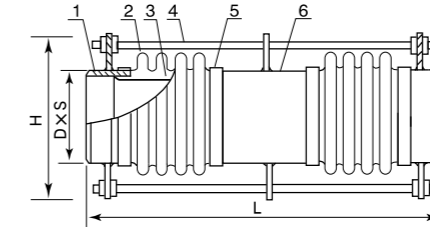
1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 导流管 Sleeve
4 – 拉杆 Rod
5 – 加强环 Reinforcing Rings
6 – 中间接管 Middle Nozzle

◎ 产品结构特点 Product Structural Features

该类膨胀节是在单式轴向型波纹管膨胀节的基础上发展起来的（此类型号膨胀节有小拉杆复式轴向型、带座复式轴向型），由两段波纹管、短中间接管及长拉杆等零件构成，只吸收轴向位移量。它的长拉杆不是承力构件。

This type of expansion joints have been developed based on the single axial type bellow expansion joints (which type of expansion joints have small pull rod duplex axial type and the duplex axial type with seats), comprised of components such as two segments of bellows, the short middle adaptor tubes and long pull rods, etc., that only absorb axial displacement. Its long pull rod is not a load bearing component.

◎ 技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波纹管 Bellow		补偿量 Movement		刚度 Rigidity N/mm		径向外形最大尺寸 Radial Shape Maximum Size H mm	总长Total Length L mm 连接形式 Connection Pattern	
	波数 Number of Bellows n	有效面积 Effective Area cm²	轴向 Axial X_0 mm	横向 Lateral Y_0 mm	轴向 Axial K_{x0} mm	横向 Lateral K_{y0} N/mm		接管 Nozzle J	法兰 Flange F
设计压力Pd=0.6MPa(6kgf/cm²)疲劳寿命[N]=1000次 设计温度t=20℃ The design pressure Pd = 0.6 MPa (6 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.									
200	16	547	244	/	106	/	460	1150	1170
250		779	241		124		530		
300		1104	308		110		580		
350		1432	306		123		660	1300	1320
400		1787	303		136		720		
450		2198	298		150		780		
500		2642	294		163		850		
600		3759	431		209		1000	1800	1824
设计压力Pd=1.0MPa(10kgf/cm²)疲劳寿命[N]=1000次 设计温度t=20℃ The design pressure Pd = 1.0 MPa (10 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.									
200	16	551	201	/	174	/	460	1150	1170
250		798	195		211		530		
300		1109	252		180		580		
350		1437	248		204		660	1300	1320
400		1793	243		227		720		
450		2205	238		252		780		
500		2649	233		276		850		
600		3772			368		1000	1800	1824
设计压力Pd=1.6MPa(16kgf/cm²)疲劳寿命[N]=1000次 设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.									
200	16	551	211	/	372	/	460	1150	1170
250		798	205		450		530		
300		1109	257		407		580		
350		1437	253		461		660	1300	1320
400		1793	248		514		720		
450		2205	243		570		780		
500		2649	239		625		850		
600		3772	336		679		1000	1800	1824

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情来电咨询：0523–88681509
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无约束型（WYS型）
Non-restrictive Type (WYS Type)

◎ 结构简图 Structural Sketch

1 – 接管 Nozzle
2 – 焊环 Annular Plate
3 – 波纹管 Bellow
4 – 外护套 Cover
5 – 导向环 Guide Ring Plate
6 – 导流筒 Sleeve
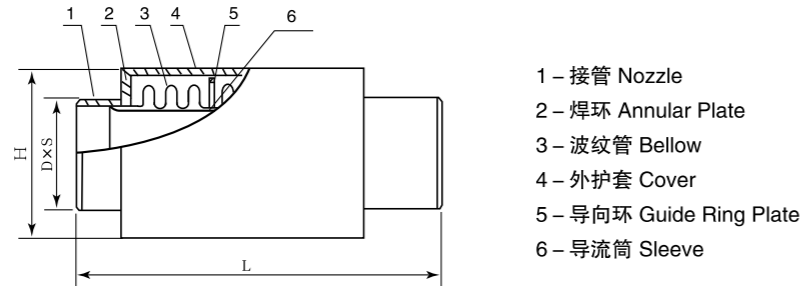
◎ 产品结构特点 Product Structural Features

此类膨胀节实现了管架间距"无约束"的最后目标，是在单式轴向型、复式拉杆轴向型、复式带座轴向型的基础上研发起来的，不仅具有柱状稳定性，还具有自导向能力。能够克服安装误差，具有体积小，安全可靠的特点，可以消除以往轴向型膨胀节易发生的扭曲和失稳等常见现象。

This type of expansion joints have achieved the final target of "non-restrictive" of pipe support spacing, which has been developed based on the single axial type, the duplex pull rod axial type and the duplex axial type with seats, which not only possesses the columnar stability but also has the self-guiding capacity. It is able to conquer errors with features such as small in volume, safe and reliable, able to eliminate common phenomena such as distortion and non-stability easily happened in axial type expansion joints in the past.

◎ 技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	有效面积 Effective Area A cm²	补偿量 Movement X_O mm	刚度 Rigidity K_XO N/mm	保扩套外径 External Sheath Outer Diameter H mm	端管尺寸 End Pipe Size DXS mm	产品总长 Total Product Length L mm
设计压力Pd=1.6MPa(16kgf/cm²)疲劳寿命［N］=1000 次设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.						
50	56	60	49	102	57X3.5	430
65	79	96	53	127	76X4	560
80	82	108	44	133	89X4.5	620
100	154	120	65	159	108X4.5	620
125	180	120	66	192	133X4.5	610
150	300	144	66	245	159X5	690
200	538	150	78	325	219X6	810
250	783	210	95	377	273X7	945
300	1080	210	80	426	325X8	960
350	1274	210	105	465	377X8	800
400	1625	150	158	530	426X8	600
450	2009	180	130	600	478X8	790
500	2445	210	117	630	529X8	995
600	3494	210	128	750	630X8	1010
700	4754	210	133	860	720X10	1100
800	6090	240	146	980	820X10	1150
900	7620	240	206	1090	920X10	1155
1000	9383	270	185	1190	1020X10	1265

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
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外压式轴向型（ZWY型）
External Pressure Axial Type (ZWY Type)

◎ 结构简图 Structural Sketch

1 – 接管 Nozzle
2 – 环板 Annular Plate
3 – 导流管 Sleeve
4 – 外护罩 Cover
5 – 波纹管 Bellow
6 – 拉杆 Tie Rod
7 – 长接管 Long Nozzle
8 – 疏水口 Condensate Trap

◎ 产品结构特点 Product Structural Features

该类膨胀节的波纹管两端分别与外筒、内筒相连、波纹管波数较多。受外压作用时，它能吸收较大的轴向位移。

The both ends of the bellow for this type of expansion joints are connected to the outer cylinder and the inner cylinder respectively, which has relatively more number of bellow waves. When compressed under external pressures, it can absorb relatively large axial displacement.
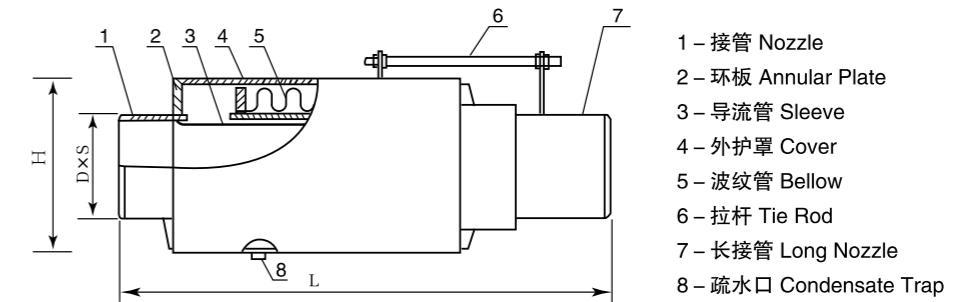
◎ 技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波纹管 Bellow		轴向 Compensation Value		径向外形最大尺寸 Radial Shape Maximum Size H mm	总长 Total Length L mm	
	波数 Number of Bellows n	有效面积 Effective Area cm²	补偿量 Movement X_O mm	刚度 Rigidity K_XO N/mm		连接形式 Connection Pattern	
						接管 Nozzle J	法兰 Flange F
设计压力Pd=1.6MPa(16kgf/cm²)疲劳寿命［N］=1000 次设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.							
300	16	1290	197	369	600	1820	1840
400	16	2009	187	467	710	1840	1860
450	16	2435	184	516	768	1840	1860
500	12	3473	286	586	975	2405	2425
600	12	4766	278	780	1090	2540	1560
700	12	6068	287	817	1190	2540	2560
800	12	7528	290	863	1290	2540	
900	12	9348	438	678	1460	2685	
1000	12	11141	438	719	1560	2685	
1100	12	13090	432	760	1660	2685	
1200	12	15197	432	801	1760	2685	
1300	12	17460	430	846	1860	2685	
1400	12	19881	426	891	1960	2685	
1500	12	22458	422	938	2060	2685	

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

小拉杆横向型（DLH型）
Small Pull Rod Lateral Type (DLH Type)

◎结构简图 Structural Sketch

1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 拉杆 Tie Rod
4 – 耳板 Lugs
5 – 螺母 Nut
6 – 中间接管 Middle Nozzle
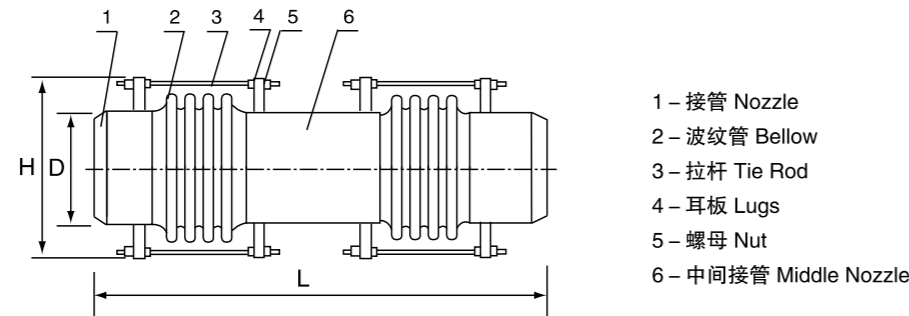
◎产品结构特点 Product Structural Features

该类膨胀节由两端波纹管、中间接管及带有限位螺母的小拉杆等零件组成，它在吸收横向位移的同时还吸收轴向位移。小拉杆不能承受内压推力。

This type of expansion joints are composed of components such as the two ends bellows, the middle adaptor tubes and the small pull rod with stop nuts, which can absorb axial displacement while absorbing lateral displacement. The small pull rod cannot bear internal pressure pushes.

◎技术参数表 Technical Parameter Table

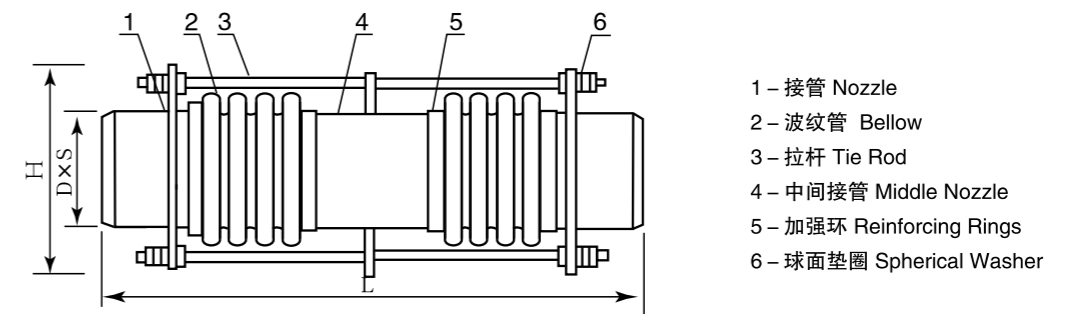	公称通径 Nominal Diameter DN mm	波数 number of bellows n	有效面积 Effective Area A cm²	轴向 Axial 补偿量 movement X_0 mm	轴向 Axial 刚度 Rigidity KX_0 N/mm	Y—横向补偿量（mm） Ky—横向刚度（N/mm） Y – Lateral Compensation Value (mm), Ky – Lateral Rigidity (N/mm) 产品总长 Total Product Length L mm										径向外形 最大尺寸 Radial Shape Maximum Size H mm
					1500		2000		2500		3000		3500			
					Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0		
设计压力 P_d=1.0MPa(10kgf/cm2)疲劳寿命［N］=1000次 设计温度t=20℃. The design pressure Pd = 1.0 MPa (10 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.																
400		1620	41	958	67	134	111	54	155	29	200	18			676	
450		2005	40	1074	59	185	98	74	138	40	177	25			728	
500		2428	40	1190	53	249	89	100	124	53	160	33	262	24	779	
600	8 (4+4)	3473	71	781	54	379	104	126	156	62	209	37	252	31	880	
700		4747	80	731	52	486	100	162	150	80	201	47	221	43	1150	
800		6046	79	792	46	671	88	224	132	110	176	65	196	57	1250	
900		7503	78	854	41	897	78	299	117	147	157	87	155	169	1350	
1000		9315	69	2021	32	2530	66	879	92	432	123	256			1480	
设计压力 P_d=1.6MPa(16kgf/cm2)疲劳寿命［N］=1000次 设计温度t=20℃. The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.																
400		1623	32	1845	52	258	86	103	121	55	156	34			676	
450		2010	32	2072	46	359	77	144	108	77	139	48			728	
500		2437	31	2300	42	482	69	193	97	103	125	64			779	
600	8 (4+4)	3484	55	1453	41	709	80	236	120	116	160	69	201	45	880	
700		4754	62	1328	40	884	77	295	116	145	155	86	194	57	1010	
800		6055	61	1462	35	1240	68	413	101	203	135	120	169	79	1110	
900		7512	60	1602	31	1685	60	526	90	276	120	164	150	108	1210	
1000		9314	64	2052	30	2676	57	892	86	439	115	260	144	172	1340	

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

大拉杆横向型（DLH型）
Large Pull Rod Lateral Type (DLH Type)

◎结构简图 Structural Sketch

1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 拉杆 Tie Rod
4 – 中间接管 Middle Nozzle
5 – 加强环 Reinforcing Rings
6 – 球面垫圈 Spherical Washer

◎产品结构特点 Product Structural Features

该膨胀节是由两个波纹管，长中间接管以及大拉杆等零件构成，它能吸收管系任意平面内的横向位移。位移时大拉杆上的球面螺母绕球面垫圈转动，同时大拉杆还承受内压推力的能力。

This type of expansion joints are composed by components such as two bellows, the long middle adaptor tube and the large pull rod, which can absorb the lateral displacement in any plane of the tube system. During displacement, the spherical surface nut can rotate around the spherical surface washer on the large pull rod, while the large pull rod shall have the capacity to bear the internal pressure pushes.

◎技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of bellows n	有效面积 Effective Area cm²	Y—横向补偿量（mm） Ky—横向刚度（N/mm） Y–Lateral Compensation Value (mm), Ky–Lateral Rigidity (N/mm) 产品总长 Total Product Length L mm										径向外形 最大尺寸 Radial Shape Maximum Size H mm
			1500		2000		2500		3000		3500			
			Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0	Y_0	Ky_0		
设计压力 P_d=1.6MPa(16kgf/cm2)疲劳寿命［N］=1000次 设计温度t=20℃. The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.														
400		1626	52	258	86	103	121	55	156	34			700 × 760
450		2011	46	359	77	144	108	77	139	48			700 × 750
500		2437	42	482	69	193	97	103	125	64			810 × 890
600	8 (4+4)	3484	41	709	80	236	120	116	160	69	201	45	900 × 980
700		4754	40	884	77	295	116	145	155	86	194	57	970
800		6055	35	1240	68	413	101	203	135	120	169	79	1070
900		7512	31	1685	60	562	90	276	120	164	150	108	1170
1000		9315	30	2676	57	892	86	439	115	260	144	172	1300
设计压力 P_d=2.5MPa(25kgf/cm2)疲劳寿命［N］=1000次 设计温度t=20℃. The design pressure Pd = 2.5 MPa (25 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.														
200		535	94	58	147	25	201	14					500 × 560
250		779	76	102	118	45	161	25	204	16			540 × 600
300		1075	76	130	121	56	166	31	211	20			570 × 630
350	8 (4+4)	1269	62	209	103	84	144	45	186	28			670 × 730
400		1626	53	304	89	122	125	65	161	40			700 × 760
450		2011	47	421	78	169	109	90	141	56			770 × 750
500		2428	43	566	71	227	99	121	128	75			810 × 890
600		3477	35	1243	68	414	102	204	136	121	171	180	900 × 980

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

角向型（JXH型）
Angular Type (JXH Type)

◎结构简图 Structural Sketch
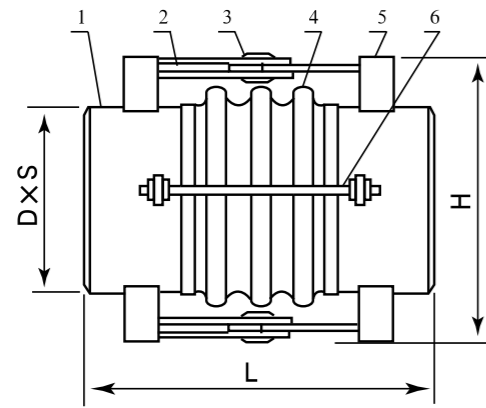
1 – 接管 Nozzle
2 – 铰链板 Hinge Plate
3 – 销轴 Hinge Pin
4 – 波纹管 Bellow
5 – 立板 Standing Plate
6 – 小拉杆 Transport Tie Rod

◎产品结构特点 Product Structural Features

　　此类膨胀节由接管、波纹管、万向环及铰链板组合构成，它可以吸收任意平面的角向位移。吸收位移时应有两个或三个组合使用。此膨胀节具有承受内压推力的能力。

This type of expansion joints is comprised of the adaptor tubes where a pair of hinges connecting the bellow and the adaptor tubes, which can only absorb the angular displacement on the single plane. When absorbing displacement, two or three angular type expansion joints shall be combined for using. The hinges of the expansion joints have the capacity to bear the internal pressure pushes.

◎技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of bellows n	角向 Angle		单位压力摩擦力矩 Unit Pressure Friction Torque M r N·m/MPa	径向外形最大尺寸 Radial Shape Maximum Size H mm	总长 Total Length L mm	
		补偿量 Θo (°) movement	刚度 Rigidity N.m/(°)			连接形式 Connection Pattern	
						接管 J Nozzle J	法兰 F Flange F
设计压力Pd =1.6MPa (16kgf/cm2)　疲劳寿命［N］= 1000次　设计温度t =20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.							
200		2.5	225	560		650	670
250		2.5	400	620			674
300		2.5	922	710		750	774
350		2.2	1379	760			
400		1.9	1942	810			
450		1.7	2671	860		850	874
500	4	1.6	3545	930			
600		2.2	3150	1090		1000	1024
700		2.2	3507	1190		1100	1124
800		1.5	4917	1290			
900		1.8	6687	1410		1200	1224
1000		1.6	10618	1550			
1100		1.6	13796	1690		1300	1424
1200		1.4	17557	1790		1400	

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

铰链横向型（FJH型）
Hinged Lateral Type (FJH Type)

◎结构简图 Structural Sketch
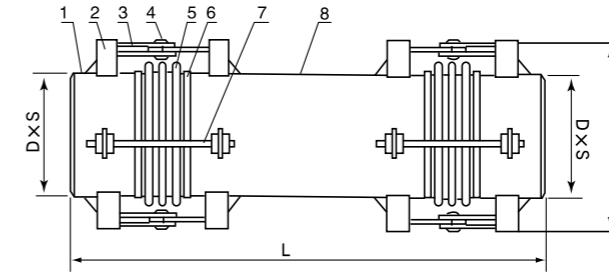
1 – 接管 Nozzle
2 – 立板 Standing Plate
3 – 铰链板 Hinge Plate
4 – 销轴 Hinge Pin
5 – 波纹管 Bellow
6 – 加强环 Reinforcing Rings
7 – 小拉杆 Transport Tie Rod
8 – 中间接管 Short Nozzle

◎产品结构特点 Product Structural Features

　　该类膨胀节是由两个角向型膨胀节用长的中间接管组合而成的。它可以吸收单平面方向上的横向挠曲位移。它们的铰链轴可以承受内压力的推力。

This type of expansion joints is composed of the combination of long middle adaptor tubes for the two angular type expansion joints. It can absorb the lateral deflection displacement along the single plane direction. Its hinge axis can bear the internal pressure pushes.

◎技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of Bellows n	产品总长 Total Product Length L mm										角向刚度 Angular Rigidity K$_{\theta O}$ N·m/(°)	径向外形尺寸 Radial Shape Size H mm
		1500		2000		2500		3000		3500			
		Y$_O$一横向补偿量（mm）　　L1一两段波纹管中心距（mm） YH–Lateral Compensation Value (mm), L1–Center Spacing of Two Bellow Segments											
		Y$_O$	L$_1$	Y$_O$	L$_1$	Y$_O$	L$_1$	Y$_O$	L$_1$	Y$_O$	L$_1$		
设计压力Pd=1.6MPa (16kgf/cm²)　疲劳寿命［N］= 1000次　设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.													
300				± 55		± 76		± 98		± 120		922	740
350			870	± 48	1250	± 67	1750	± 86	2250	± 106	2750	1379	760
400				± 42		± 58		± 75		± 91		1942	810
450	8（4+4）		850	± 34	1150	± 49	1650	± 64	2150	± 79	2650	2671	860
500				± 32		± 46		± 60		± 74		3545	930
600						± 58	1500	± 77	2000	± 96	2500	3150	1090
700						± 54	1400	± 73	1900	± 92	2400	3507	1190
800						± 37		± 50		± 63		4917	1290
设计压力Pd =2.5MPa (25kgf/cm²)　疲劳寿命［N］= 1000次　设计温度t=20℃ The design pressure Pd = 2.5 MPa (25 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.													
		1500		2000		2500		3000		3500			
200				± 57	1300	± 79	1800	± 100	2600			476	560
250				± 57		± 79		± 100				859	650
300				± 57	1250	± 79	1750	± 102	2250	± 125	2750	1087	750
350	8（4+4）			± 46	1200	± 65	1700	± 85	2250	± 104	2700	1623	800
400				± 40	1150	± 58	1650	± 75	2150	± 93	2650	2282	850
450						± 45	1500	± 59	2000	± 74	2500	3134	900
500						± 42		± 56		± 70		4155	1000
600						± 46	1400	± 63	1900	± 80	2400	5508	1140

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

万向角型（DW型）
Universal Angle (DW Type)

◎ 结构简图 Structural Sketch
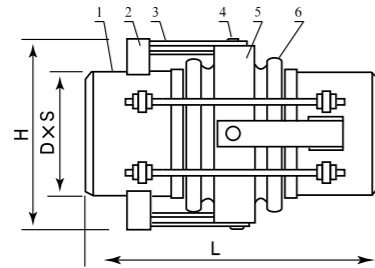
1 – 接管 Nozzle
2 – 耳板 Lugs
3 – 铰链板 Hinge Plate
4 – 销轴 Hinge Pin
5 – 万向环 Gimbal Rings
6 – 波纹管 Bellow

◎ 产品结构特点 Product Structural Features

此类膨胀节有一个万向环，在万向环的周向有两对相互垂直的铰链结构，因此它能吸收任意平面的角位移。通常吸收位移时，应有两个或三个组合使用。

This kind of expansion has a universal ring, and there are two pairs of vertical hinge structures in the circumferential ring. So it can absorb the angular displacement of any plane. Usually when the displacement is absorbed, two or three combinations should be used.

◎ 技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of bellows n	角向 Angle		单位压力摩擦力矩 Unit Pressure Friction Torque M r N·m/MPa	径向外形最大尺寸 Radial Shape Maximum Size H mm	总长 Total Length L mm	
		补偿量 Θo Movement ±(°)	刚度 Rigidity N.m(°)			连接形式 Connection Pattern	
						接管 J Nozzle J	法兰 F Flange F
设计压力Pd =1.6MPa (16kgf/cm2) 疲劳寿命［N］=1000次 设计温度t =20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm2), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.							
200		2.5	225		560	650	670
250		2.5	400		710		674
300		2.5	922		810	700	774
350		2.2	1379		900		
400		1.9	1942		980		
450	4	1.7	2671		1150	900	874
500		1.6	3545		1280		
600		2.2	3150		1350	950	1024
700		2.2	3507		1400	1000	1124
800		1.5	4917		1500		
900		1.8	6687		1730	1100	1224
1000		1.6	10618		2000		
设计压力Pd =2.5MPa (25kgf/cm²) 疲劳寿命［N］=1000次 设计温度t =20℃ The design pressure Pd = 1.6 MPa (25 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.							
200		2.5	476		560	700	720
250		2.5	859		720		724
300		2.6	1087		820	750	774
350		2.2	1623		900	800	824
400	4	2.0	2282		1050	850	874
450		1.7	3134		1160	1000	1024
500		1.6	4155		1260		
600		1.9	5508		1360	1200	1224

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

万向铰链横向型（FWH型）
Universal Hinged Lateral Type (FWH Type)

◎ 结构简图 Structural Sketch
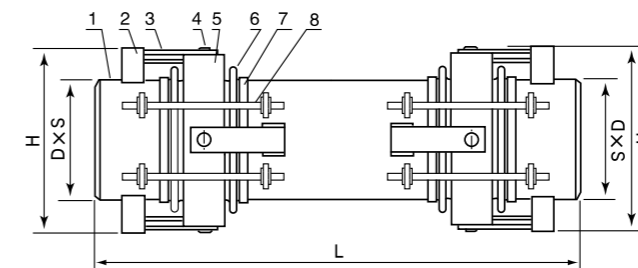
1 – 接管 Nozzle
2 – 立板 Standing Plate
3 – 铰链板 Hinge Plate
4 – 销轴 Hinge Pin
5 – 万向环 Gimbal Rings
6 – 波纹管 Bellow
7 – 加强环 Reinforcing Rings
8 – 小拉杆 Transport Tie Rod

◎ 产品结构特点 Product Structural Features

该膨胀节是由两个万向型膨胀节用长的中间接管组合而成的。它可以吸收任意方向上的横向挠曲位移。它们的铰链轴可以承受内压力的推力。

This type of expansion joints is composed of the combination of long middle adaptor tubes of two universal expansion joints. It can absorb the lateral deflection displacement along any direction. Its hinge axis can bear the internal pressure pushes.

◎ 技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of Bellows n	设计压力Pd =1.0MPa (10kgf/cm²) 疲劳寿命［N］= 1000次 设计温度t =20℃ The design pressure Pd = 1.0 MPa (10 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.												角向刚度 Angular Rigidity K_θo N·m'(°)	径向外形尺寸 Radial Shape Size H mm
		Y_0—横向补偿量（mm） K_{y0}—横向刚度（N/mm） $Y0$–Lateral Compensation Value (mm), $Ky0$–Lateral Rigidity (N/mm)													
		产品总长 Total Product Length L mm													
		1500		2000		2500		3000		3500		4000			
		Y_0	L_1	Y_0	L_1	Y_0	L_1	Y_0	L_1	Y_0	L_1	Y_0	L_1		
300		±48	850	±75	1350	±103	1850	±131	2350					478	700
350		±39	800	±64	1300	±88	1800	±112	2300					714	760
400		±34		±54		±75		±96		±117	2800			1003	870
450				±48	1250	±67	1750	±86	2250	±106	2750			1378	970
500	8 (4+4)			±44		±61		±79		±96		±113	3250	1827	1000
600				±58	1100	±84	1600	±110	2100	±136	2600	±162	3100	2986	1100
700				±55	1050	±81	1550	±107	2050	±134	2550	±160	3050	1982	1230
800				±68	1500	±91	2000	±114	2500	±136	3000			2661	1360
900				±58		±77		±96		±115				3560	1600
1000				±60	1900	±75	2400	±91	2900					4360	1750
设计压力Pd =1.6MPa (16kgf/cm²) 疲劳寿命［N］= 1000次 设计温度t =20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.															
400		±42	1250	±58	1750	±75	2250	±91	2750					1942	980
450		±34	1150	±49	1650	±64	2150	±79	2650					2671	1150
500		±32		±46	1500	±60	2000	±74	2500					3545	1280
600	8 (4+4)			±58	1400	±77	1900	±96	2400	±115	3000			3150	1350
700				±54	1300	±73	1800	±92	2300	±111	2900			3507	1400
800				±37		±50		±63		±76	2800			4917	1500
900				±41		±57		±72		±88				6687	1730
1000				±50		±64		±78						10618	2000

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

直埋I型（ZMBI型）
Direct Embedded I Type (ZMB I Type)

◎结构简图 Structural Sketch
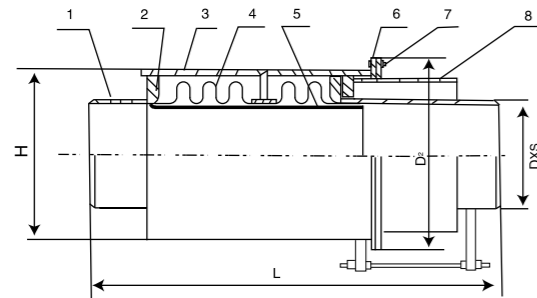
1 – 短接管 Short Nozzle
2 – 定向法兰 Guide Flange
3 – 外壳 Cover
4 – 工作波纹管 Working Bellow
5 – 导流筒 Sleeve
6 – 刮泥圈 Stripper
7 – 拉杆 Tie Rod
8 – 保温保护筒 Heat Preservation Cover

◎**产品结构特点 Product Structural Features**

此类膨胀节是在无约束型膨胀节的基础上发展起来的，它除了保留无约束型膨胀节强力的支撑和定向性能外，还具有抗过压保护功能。

This type of expansion joints have been developed based on the non–restrictive type expansion joints, which, other than the strong support and fixed direc–tion abilities of the non–restrictive type expansion joints, also has the overpressure resistant protection function.

◎**技术参数表 Technical Parameter Table**

产品规格型号 Product Specs and Model No.	公称通径 Nominal Diameter DN mm	轴向补偿量 Axial Movement X_0 mm	轴向刚度 Axial Rigidity K_{QH} N/mm	径向外形尺寸 Radial Shape Maximum Size H mm	端管尺寸 End Pipe Size DXS mm	产品长度 Product Length L mm
ZMBI400–1.6/120	400	120	135	530	426×8	590
ZMBI400–1.6/150		150	108			651
ZMBI400–1.6/180		180	89			713
ZMBI400–1.6/210		210	76			778
ZMBI450–1.6/120	450	120	132	580	480×8	670
ZMBI450–1.6/150		150	105			730
ZMBI450–1.6/180		180	88.2			820
ZMBI450–1.6/210		210	75.4			910
ZMBI500–1.6/120	500	120	140	630	529×8	620
ZMBI500–1.6/150		150	113			700
ZMBI500–1.6/180		180	94			840
ZMBI500–1.6/210		210	80			1210
ZMBI500–1.6/240		240	70			1350
ZMBI500–1.6/270		270	62.6			1390
ZMBI500–1.6/300		300	55.7			1420
ZMBI600–1.6/120	600	120	153	750	630×8	730
ZMBI600–1.6/150		150	122			810
ZMBI600–1.6/180		180	102			1050
ZMBI600–1.6/210		210	87			1170
ZMBI600–1.6/240		240	76.6			1290
ZMBI600–1.6/270		270	67.3			1310
ZMBI600–1.6/300		300	61.5			1410

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

直埋II型（ZMBII型）
Direct Embedded II Type (ZMB II type)

◎结构简图 Structural Sketch
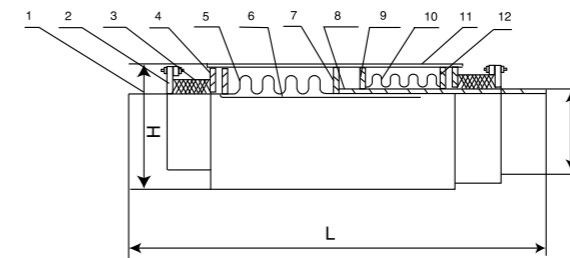
1–接管 Nozzle
2–定向法兰 Guide Flange
3–保温保护筒 Heat Preservation Cover
4–焊环 Annular plate
5–工作波纹管 Working bellow
6–导流筒 Sleeve
7–导向环板1 Guide Ring Plate 1
8–接管 Nozzle
9–导向环板2 Guide Ring Plate 2
10–波纹管 Bellow
11–外壳 Cover
12–压紧法兰 Compressed Flange

◎**产品结构特点 Product Structural Features**

此类膨胀节采用了外压柔性密封结构和膨胀石墨高温注剂密封结构，阻止了地表层水的渗入，可以避免地表水对波纹管的外部腐蚀，因此，其使用寿命更长。

在此基础上，我们还生产了直埋密封双向型（ZMIII型）波纹管膨胀节，可满足客户需要双向补偿的工况要求。

This type of expansion joints have used the external pressure flexible sealed structure and the expanded graphite high temperature injection agent sealed structure that obstruct the penetration of ground water, able to avoid the external corrosion of bellows by ground water, thus its life of use will be longer. Based on this, we have also produced the directly embedded sealed dual–direction type (ZM III Type) bellow expansion joints, able to meet the working condition requirement of clients that demand for dual–direction compensation.

◎**技术参数表 Technical Parameter Table**

产品规格型号 Product Specs and Model No.	公称通径 Nominal Diameter DN mm	轴向补偿量 Axial Movement X_0 mm	轴向刚度 Axial Rigidity K_{QH} N/mm	外形尺寸 Radial Shape Maximum Size H mm	端管尺寸 End Pipe Size DXS mm	产品长度 Product Length L mm
ZMBⅡ500–1.6/120	500	120	140	650	529×8	900
ZMBⅡ500–1.6/150		150	110			1150
ZMBⅡ500–1.6/180		180	94			1330
ZMBⅡ500–1.6/210		210	84			1500
ZMBⅡ600–1.6/180	600	180	100	750	630×8	1360
ZMBⅡ600–1.6/210		210	87			1520
ZMBⅡ600–1.6/240		240	76			1710
ZMBⅡ600–1.6/270		270	67			1900
ZMBⅡ700–1.6/210	700	210	90	860	720×10	1640
ZMBⅡ700–1.6/240		240	78			1740
ZMBⅡ700–1.6/270		270	69			1930
ZMBⅡ700–1.6/300		300	63			2100
ZMBⅡ700–1.6/330		330	57			2280
ZMBⅡ800–1.6/210	800	210	110	980	820×10	1560
ZMBⅡ800–1.6/240		240	100			1760
ZMBⅡ800–1.6/270		270	89			1950
ZMBⅡ800–1.6/300		300	81			2130
ZMBⅡ800–1.6/330		330	74			2300
ZMBⅡ900–1.6/210	900	210	150	1090	920×10	1540
ZMBⅡ900–1.6/240		240	140			1770
ZMBⅡ900–1.6/270		270	120			1980
ZMBⅡ900–1.6/300		300	110			2150
ZMBⅡ900–1.6/330		330	96			2320
ZMBⅡ1000–1.6/210	1000	210	160	1100	1020×12	1590
ZMBⅡ1000–1.6/240		240	140			1790
ZMBⅡ1000–1.6/270		270	120			1990
ZMBⅡ1000–1.6/300		300	110			2170
ZMBⅡ1000–1.6/330		330	100			2300

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523–88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

直管旁通压力平衡型（ZPP型）
Straight Tube Bypass Pressure Balanced Type (ZPP Type)

◎结构简图 Structural Sketch
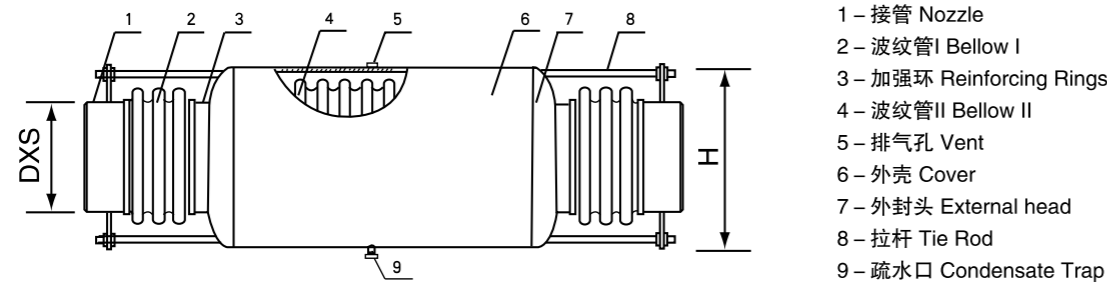
1 – 接管 Nozzle
2 – 波纹管I Bellow I
3 – 加强环 Reinforcing Rings
4 – 波纹管II Bellow II
5 – 排气孔 Vent
6 – 外壳 Cover
7 – 外封头 External head
8 – 拉杆 Tie Rod
9 – 疏水口 Condensate Trap

◎产品结构特点 Product Structural Features

1. 此类膨胀节具有吸收内压推力的能力，自平衡性较ZYP型优越；刚度小，导向性好；外形尺寸小、经济性好；产品安装无方向性要求。

1.This type of expansion joints have the ability to absorb internal pressure pushes, which self–balancing performance is better than the ZYP type; small in rigidity, good in guidance quality; small in shape size, good in economy; the product installation has no orientation requirement.

◎技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波数 Number of Bellows n	轴向补偿量 Axial Movement X_0 mm	轴向刚度 Axial Rigidity K_{X0} N/mm	径向外形尺寸 Radial Shape Maximum Size H mm	产品长度 Total Length L mm	
					连接形式 Connection Pattern	
					接管 Nozzle J	法兰 Flange F
设计压力P_d = 1.6a(16f/cm²)疲劳寿命［N］=1000次　设计温度t = 20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.						
200	16	78	1309	426	1554	1578
	32	156	655		2178	2200
250	16	75	1602	529	1648	1672
	32	150	801		2265	2290
300	16	98	1347	630	1887	1910
	32	196	674		2612	2636
350	16	95	1535	670	1982	2010
	32	190	770		2705	2730
400	16	93	1726	720	2100	2124
	32	186	863		2827	2852
450	16	91	1921	820	2146	2170
	32	182	961		2867	2890
500	16	90	2112	920	2241	2265
	32	180	1056		2962	2986
600	16	132	2390	1120	2991	3015
	32	264	1195		4142	4166
700	12	130	3471	1220	3255	3280
	24	260	1736		4480	4504
800	12	128	3821	1320	3434	3458
	24	256	1911		4658	4682
900	12	126	4188	1520	3643	3667
	24	252	2094		4896	4920
1000	12	144	4712	1620	3842	3866
	24	288	2365		5104	5128
1100	12	141	5112	1720	4000	4024
	24	282	2556		5261	5285
1200	12	139	5517	1920	4160	4184

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

直管压力平衡型（ZYP型）
Straight Tube Pressure Balanced Type (ZYP Type)

◎结构简图 Structural Sketch
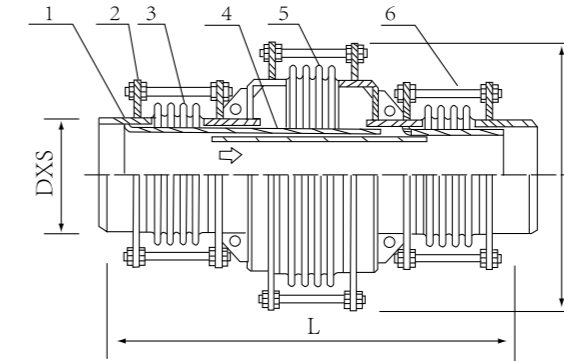
1 – 接管 Nozzle
2 – 耳板 Lugs
3 – 小波纹管 Small Bellow
4 – 导流筒 Sleeve
5 – 大波纹管 Large Bellow
6 – 拉杆 Tie Rod

◎产品结构特点 Product Structural Features

此类膨胀节的两端各有一个工作波纹管，中间有一个平衡波纹管，膨胀节通过受力构件（大拉杆或舌管）来承受内压推力，因此管系只需中间固定支架。此类膨胀节只能吸收轴向位移。

Each of the two ends of this type of expansion joints has a working bellow, and there is a balanced bellow in its middle, the expansion joints bear the internal pressure pushes through the stress bearing elements (large pull rod or tongue pipes), therefore the pipe system only needs the central fixing support. This type of expansion joints only absorbs axial displacement.

◎技术参数表 Technical Parameter Table

公称通径 Nominal Diameter DN mm	波纹管 Bellow		轴向补偿量 Axial Movement X_0 mm	轴向刚度 Axial Rigidity K_{X0} N/mm	径向外形尺寸 Radial Shape Maximum Size H mm	产品长度 Total Length L mm	
	波数 Number of Bellows n	n1/ 2n2 n1一大管波数 n2一小管波数 n1–Number of Large Tube Waves n2–Number of Small Tube Waves				连接形式 Connection Pattern	
						接管 Nozzle J	法兰 Flange F
设计压力Pd=0.6Mpa(6kgf/cm²)疲劳寿命【N】=1000次　设计温度t=20℃ The design pressure Pd = 1.6 MPa (16 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.							
600	12	4/8	53	4410	1220	2250	2274
	18	6/12	80	2940		2600	2624
	24	8/16	106	2200		2950	2974
700	12	4/8	54	4945	1365	2250	2274
	18	6/12	80	3297		2600	2624
	24	8/16	108	2473		2950	2974
800	12	4/8	45	7228	1520	2250	2274
	18	6/12	68	4819		2600	2624
	24	8/16	90	3614		2950	2974
900	12	4/8	55	4628	1670	2250	2274
	18	6/12	83	3085		2600	2624
	24	8/16	110	2314		2950	2974
1000	12	4/8	54	5042	1840	2250	2274
	18	6/12	82	3362		2600	2624
	24	8/16	108	2521		2950	2974

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

曲管压力平衡型（QYP型）
Curved Tube Pressure Balanced Type (QYP Type)

◎结构简图 Structural Sketch
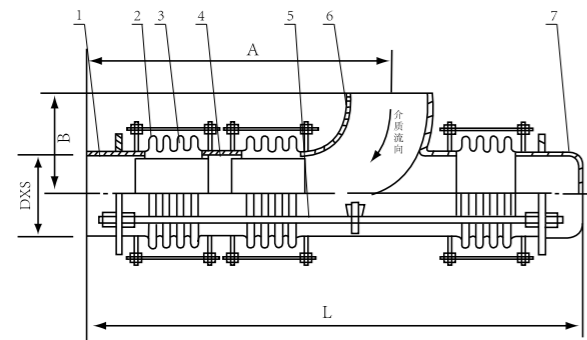
1 – 接管 Nozzle
2 – 小拉杆 Transport Tie Rod
3 – 波纹管 Bellow
4 – 中间接管 Middle Nozzle
5 – 大拉杆 Tie Rod
6 – 曲管 Curved Nozzle
7 – 封头 Head

◎产品结构特点 Product Structural Features

该类膨胀节的前部通道端有两个工作波纹管，可以吸收来自弯管段产生的横向位移；后部（平衡端）有一个平衡波纹管，它可以吸收来自直管段轴向位移。当弯管段产生横向位移时，大拉杆上球面螺母绕球面垫圈转动，同时大拉杆承受由内压的推力，因此该膨胀节常用于泵、罐、压缩机、汽轮机出口处，以减少对上述设备的作用力。

The front passage end of this type of expansion joints has two working bellows, able to absorb the lateral displacement generated from the curved tube segment; which rear part (balanced end) has a balanced bellow, able to absorb the axial displacement generated from the straight tube segment. When the curved tube segment generates a lateral displacement, the spherical surface nut on the large pull rod rotates around the spherical surface washer, while the large pull rod shall bear the internal pressure pushes, thus this type of expansion joints is generally used at the openings of pumps, cans, compressors and turbines, to reduce the stress laid upon the abovementioned equipment.

◎技术参数表 Technical Parameter Table

| 公称通径 Nominal Diameter DN mm	通道端波数 Number of Bellows at Passage End n	平衡端波数 Number of Bellows at Balanced End n	补偿量 Movement		轴向单波刚度 Axial Single Wave Rigidity K_{x0} mm	横向总刚度 Lateral Total Rigidity K_{y0} mm	尺寸 Size		产品总长 L mm Total Product Length	
			轴向 Axial X_0 mm	横向 Lateral Y_0 mm			A	B	联接型式 Connection Pattern	
							mm		接管 Nozzle J	法兰 Flange F
设计压力Pd=0.6Mpa(6kgf/cm²)疲劳寿命【N】=3000次 设计温度t=20℃工作温度T≤420℃ The design pressure Pd = 0.6 MPa (6 kgf/cm²), the fatigue life [N] = 1000 times and the design temperature t = 20 ℃.										
700	8 （4+4）	6	20	20	2651	154	2288	700	3765	3777
800					2811	208	2388	800	3940	3952
900					2974	176	2688	900	4315	4327
1000	10 （5+5）	7	30	30	4106	236	2890	1000	4702	4714
1100					4382	211	3198	1100	5085	5097
1200					4680	265	3298	1200	5260	5272
1300					4985	242	3648	1300	5735	5747
1400					4021	226	3748	1400	5910	5922
1500					4261	209	4048	1500	6295	6307

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

高温轴向型（GWB型）
High Temperature Axial Type (GWB Type)

◎结构简图 Structural Sketch
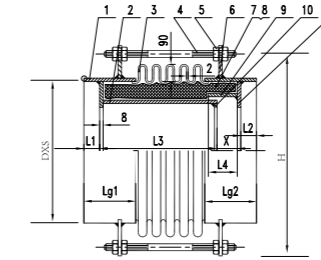
1 – 接管 Nozzle
2 – 导流筒 Sleeve
3 – 波纹管 Bellow
4 – 螺柱 Studs
5 – 螺母 Nut
6 – 耳板 Lugs
7 – 丝网 Wire Cloth
8 – 填料 Filler
9 – 导流筒 Sleeve
10 – 环板 Annular Plate
11 – 环板 Annular Plate

◎产品结构特点 Product Structural Features

1.此类膨胀节由耐高温金属材料及隔温材料组成，主要运用于补偿输送微压粉尘气体、烟、煤气及其它气体管道的挠性部件，尤其在冶炼、水泥等行业中得到了广泛应用。

2.膨胀节的工作温度等级及相应的材质见技术参数表，采用特殊隔温材料后可达到1300℃。

1.This type of expansion joints is composed of high temperature resistant metallic materials and thermal insulation materials, which is mainly used in transporting micro–pressure dusty gas, smoke, coal gas and other gas duct deflective components, especially widely used in industries such as smelting and cement, etc.
2.The working temperature grades and corresponding materials for the expansion joints are shown in the Technical Parameter Table, which, by use of special thermal insulation materials, can reach 1300℃.

◎技术参数表 Technical Parameter Table

| 公称通径 Nominal Diameter DN mm	产品型号 Product Model No.	补偿量 Movement X mm	刚度 Rigidity Kx N/mm	导向筒内径 Draft Tube Inner Diameter d1 mm	法兰螺栓孔 Flange Bolt Hole			焊接接管外径×厚度 Welding Adaptor Tube Outer Diameter× Thickness D×S mm	产品总长 Total Product Length		总宽 Total Width L mm
					数量 Quantity n	直径 Diameter d mm	中心圆直径 Central Circle Diameter D2 mm		接管 Nozzle J mm	法兰 Flange F mm	
600	0.5GWB600×2E–J(F)	43	463	502	16	13	702	630×10	768	780	892
	0.5GWB600×4E–J(F)	87	232						888	900	
	0.5GWB600×6E–J(F)	130	154						1008	1020	
700	0.5GWB700×2E–J(F)	45	498	596	24	22	820	724×10	768	780	1000
	0.5GWB700×4E–J(F)	91	249						888	900	
	0.5GWB700×6E–J(F)	137	166						1008	1020	
800	0.5GWB800×2E–J(F)	46	534	696	24	22	920	824×10	768	780	1100
	0.5GWB800×4E–J(F)	92	267						888	900	
	0.5GWB800×6E–J(F)	138	178						1008	1020	
900	0.5GWB900×2E–J(F)	46	572	796	24	22	1020	924×10	768	780	1200
	0.5GWB900×4E–J(F)	92	286						888	900	
	0.5GWB900×6E–J(F)	138	190						1008	1020	
1000	0.5GWB1000×2E–J(F)	49	630	896	24	22	1120	1024×10	768	780	1328
	0.5GWB1000×4E–J(F)	98	315						888	900	
	0.5GWB1000×6E–J(F)	148	210						1008	1020	
1100	0.5GWB1100×2E–J(F)	49	679	996	40	26	1220	1124×10	768	780	1448
	0.5GWB1100×4E–J(F)	97	340						888	900	
	0.5GWB1100×6E–J(F)	146	226						1008	1020	
1200	0.5GWB1200×2E–J(F)	48	730	1096	40	26	1320	1224×10	768	780	1565
	0.5GWB1200×4E–J(F)	96	365						888	900	
	0.5GWB1200×6E–J(F)	144	243						1008	1020	

波纹管材质0Cr17Ni12MO2 工作压力≤0.049MPa(0.5kgf/cm2) 工作温度≤600℃ 使用寿命1000次 表内"E"为材质要求
The material of the bellow is 0Cr17Nil2M02, the working pressure≤0.049 MPa (0.5kgf/cm2), the working temperature ≤600℃ and the life of use is 1000 times. The "E" in the table refers to the material requirement.

本公司可以生产除本表以外的更大（或更小）规格的此类膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

方形通用型（FTB型 ）
General Square Type (FTB Type)

◎ 结构简图 Structural Sketch
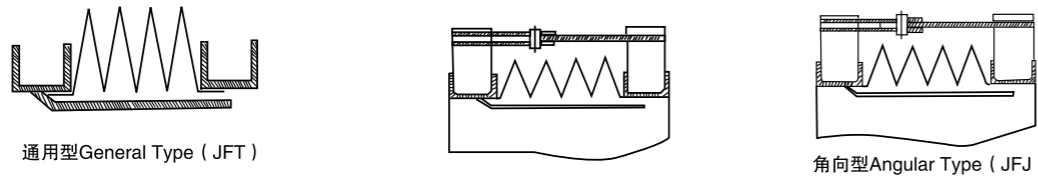
1.方形产品
Square Products
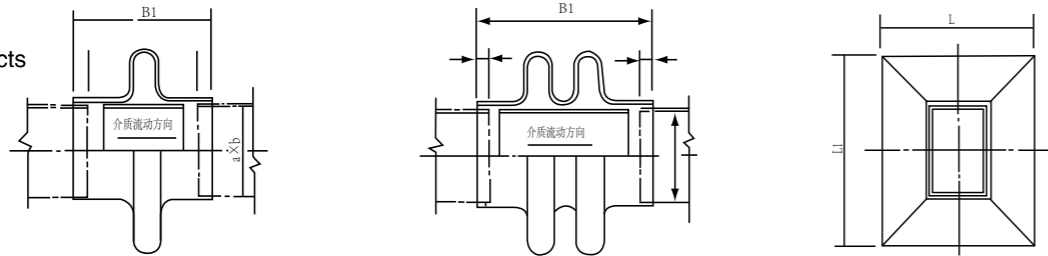
2.矩形产品 Rectangular Products
以下列出几种常见结构的类型名称、代号及应用示意图
In the following the types and names of several common structures, their codes and application schematic diagrams are given:
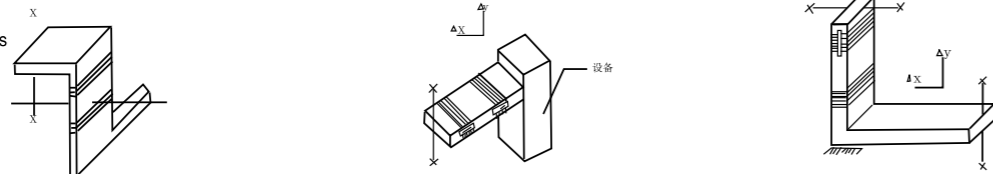
结构示意图
Structural Sketch

通用型General Type（JFT）

角向型Angular Type（JFJ）

应用示意图
Application Schematic Diagrams

二个通用型组合，用于吸收三个方向的位移
Combination of two general types, used in absorbing displacement in three directions

滑槽型组合用于架空水平管线，能吸收二个方向的位移，滑槽结构能承受中间管段的重量。
The chute combination is used in overhead horizontal pipelines, able to absorb displacement in two directions, while the chute structure is able to bear the weight of the central pipe segment.

通用型与角向型组合用于垂直管线，能吸收二个方向中的位移，铰链能承受中间管段的重量。
The combination of the general type and the angular type is used in perpendicular pipelines, able to absorb displacement in two directions, while the hinges can bear the weight of the central pipe segment.

◎ 波型代号及技术参数 Wave Type Codes and Technical Parameters

| 波形及参数 Wave Forms and Parameters					通用型参数 General Type Parameters		
波形 Wave Form	拐角 Turning Corner	波距 Pitch of Waves	波高 Height of Waves	波数 Number of Waves	轴向补偿量Axial Compensation Value	总长 Total Length	径向最大 Axial Maximum Value
UI	CE圆角 （翻边圆角） CE Rounded Corner (Roll-up Rounded Corner)	80	71	1	±8	280	(a+280) × (b+280)
				2	±16	360	
				3	±24	440	
				4	±32	520	
				5	±40	600	
				6	±48	680	
UII	普通圆角 General Rounded Corner	80	71	1	±8	280	
				2	±16	360	
				3	±24	440	
				4	±32	520	
UV	单斜角 Single Oblique Angle	90	120	1	±18	290	(a+380) × (b+380)
				2	±36	380	
				3	±54	470	
				4	±72	560	
UVI	双斜角 Double Oblique Angles	90	120	1	±18	290	
				2	±36	380	
				3	±54	470	
V6	像机角 Camera Angle	75	140	1	±17	350	(a+420) × (b+420)
				2	±34	425	
				3	±51	500	
				4	±68	575	
				5	±85	650	
单波轴向刚度 Single Wave Axial Rigidity：0.22×(a+b)N/mm							

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Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

煤粉管道三向型（FS型）
Pulverized Coal Piping Three-way Type (FS Type)

◎ 结构简图 Structural Sketch
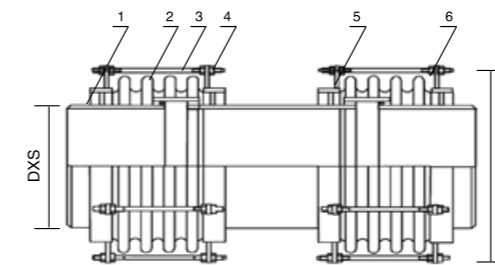
1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 限位螺杆 Limit Screw
4 – 中间接管 Middle Nozzle
5 – 环板 Annular Plate
6 – 限位螺母(有些产品没有)
Limit Nut

◎ 产品结构特点 Product Structural Features

　　此类膨胀节具有耐高温，不漏粉，不积粉，位移刚度小；能够吸收任意方向位移，挠性好，保证锅炉及管系膨胀自如;安装维护方便，吊架简单，使用寿命长，综合投资省，从根本上解决了煤粉泄漏的问题，保证了机组的正常运行。
This type of expansion joints have the abilities of high temperature resistance, no powder leakage, no powder accumulation and small displacement rigidity; it is able to absorb displacement in any direction, good in deflection and ensure free boiler and pipeline system expansion; the installation and maintenance are convenient, the suspension and support are easy, the life of use is long and the comprehensive investment is cost-effective, which have all solved the coal dust leakage problem and ensured the normal operation of machine units.

◎ 技术参数表 Technical Parameters

产品代号 Product Code 接管连接－J Adaptor Tube Connection-J 法兰连接－F Flange Connection-F 产品总长－L Total Product Length-L	公称通径 Nominal Diameter DN φ mm	轴向补偿量 Axial Movement X₀ mm	轴向刚度 Axial Rigidity K_{X0} N/mm	a—系数 Coefficient Ym—横向最大补偿量 Lateral Maximum Compensation Value mm / Ky0—横向刚度 Lateral Rigidity（N/mm）								径向外形最大尺寸 Radial Shape Maximum Size H Φ mm	接管端面尺寸 Nozzle End Face Size（d X s） 法兰尺寸 Flange Size（JB81-59）
				L=1500		L=2000		L=2500		L=3000			
				a	Ym / Ky0	a	Ym / Ky0	a	Ym / Ky0	a	Ym / Ky0		
FS350X8-J/F-L	350	140	215	1.25	200 / 27	1.33	300 / 12	1.38	400 / 7	1.36	500 / 4	580	Φ377 X8
FS350X12-J/F-L		220	143	1.75	200 / 18	1.83	300 / 8	1.88	400 / 5	1.9	500 / 3		Φ445 12-Φ23
FS400X8-J/F-L	400	140	236	1.15	200 / 36	1.2	300 / 16	1.25	400 / 9	1.24	500 / 6	687	Φ426 X8
FS400X12-J/F-L		210	158	1.69	200 / 24	2.37	300 / 6	1.78	400 / 6	1.8	500 / 4		Φ495 16-Φ23
FS450X8-J/F-L	450	200	302	1.4	200 / 35	1.47	300 / 25	1.5	400 / 14	1.56	500 / 9	700	Φ478 X8
FS450X12-J/F-L		300	202	2.07	200 / 36		300 / 16	2.13	400 / 9	2.2	500 / 6		Φ550 16-Φ23
FS500X8-J/F-L	500	200	321	1.25	200 / 70	1.37	300 / 31	1.38	400 / 18	1.4	500 / 11	806	Φ529 X8
FS500X12-J/F-L		300	214	1.7	200 / 45	1.7	300 / 12	1.95	400 / 12	2	500 / 7		Φ600 16-Φ23
FS600X8-J/F-L	600	200	352	1.1	200 / 99	1.1	300 / 45	1.2	400 / 25	1.22	500 / 16	920	Φ630 X8
FS600X12-J/F-L		300	235	1.5	200 / 65	1.5	300 / 29	1.78	400 / 17	1.72	500 / 11		Φ705 20-Φ25

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

空冷管道大拉杆横向型(KLD型)
Air Cooling Piping Large Pull Rod Lateral Type (KLD Type)

◎ 结构简图 Structural Sketch
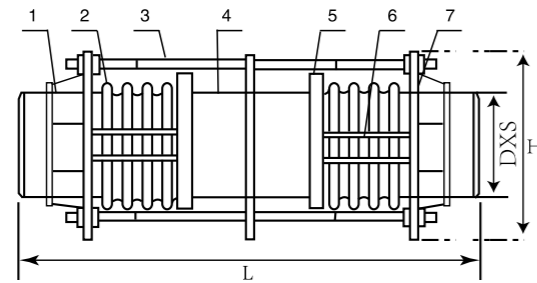
1 – 接管 Nozzle
2 – 波纹管 Bellow
3 – 大拉杆 Tie Rod
4 – 中间接管 Middle Nozzle
5 – 加强环 Reinforcing Rings
6 – 小拉杆 Transport Tie Rod
7 – 耳板 Lugs

◎ 产品结构特点 Product Structural Features

此类型膨胀节由两个波纹管，长中间接管以及大拉杆等零件构成，它能吸收管系任意平面内的横向位移。位移时大拉杆上的球面螺母绕球面垫圈转动，同时大拉杆还具有承受内压推力的能力。

This type of expansion joints is comprised of parts such as two bellows, a long middle adaptor tube and a large pull rod, etc., able to absorb the lateral displacement on any plane. During displacement, the spherical surface nut rotates around the spherical surface washer, while the large pull rod has also the ability to bear the internal pressure pushes.

◎ 技术参数表 Technical Parameters

1	膨胀节种类 Species of expansion joint		横向 所有方向
2	公称直径 Nominal diameter		DN 3000
3	公称压力 Nominal pressure		0.49/FV
4	膨胀节类型 Type of expansion joint		KDH3000×8—5000–J
5	设计依据 Design basis		AD–Merkblatter/EJMA
6	流动介质 Flow media		饱和蒸汽
7	设计温度 Design temperature	℃	120
8	角向位移补偿 Angular displacement compensation	deg	1.5°
9	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	33500
10	波数 number of bellows		4波+4波
11	使用寿命 Life of use		min262800
12	焊接端管尺寸 Welding end pipe size	mm	3020×12
13	膨胀节长度（包括焊接端口） Length of expansion joint (including welding terminals)	mm	5000
14	波纹管材料 Bellow material		1.4571or1.4541

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Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

空冷管道铰链万向型(KLJ型)
Air Cooling Piping Hinged Universal Type (KLJ Type)

◎ 结构简图 Structural Sketch
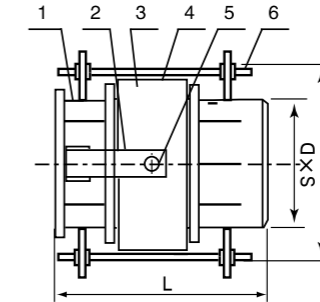
1 – 接管 Nozzle
2 – 铰链板 Hinge Plate
3 – 波纹管 Bellow
4 – 万向环 Gimbal Rings
5 – 销轴 Hinge Pin
6 – 拉杆 Tie Rod

◎ 产品结构特点 Product Structural Features

此类型膨胀节由接管、波纹管及接管相连的一对铰链构成，它只能吸收单平面的角向位移。吸收位移时应有两个或三个角向型膨胀节组合使用。膨胀节的铰链具有承受内压推力的能力。

This type of expansion joints is comprised of adaptor tubes, bellows and a pair of hinges connected to the adaptor tubes, which is only able to absorb the angular displacement on the single plane. When absorbing displacement, there shall be two or three angular type expansion joints combined for use. The hinges of the expansion joints have the ability to bear the internal pressure pushes.

◎ 技术参数表 Technical Parameters

序号 No.	类型 Type	单位 Unit	项目 Item 1(DN6000)	项目 Item 2(DN6000)
1	膨胀节种类 Species of expansion joint		DN6000角向	DN6000万向
2	公称直径 Nominal diameter	mm	DN6000	DN6000
3	公称压力 Nominal pressure	bar	1	1
4	膨胀节类型 Type of expansion joint		KJL6000–2400	KJW6000–2400
5	设计依据 Design basis		EJMA	EJMA
6	流动介质 Flow media		饱和蒸汽	饱和蒸汽
7	设计内部压力（最大／最小） Designed inner pressure (maximum / minimum)	bar(a)	1.50/完全真空	1.50/完全真空
8	设计温度 Design temperature	℃	120	120
9	角向位移补偿 Angular displacement compensation	deg.	approx.+/–2.5	approx.+/–3.5
10	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	59690	59690
11	层数 Number of layers		3	3
12	波数 Number of bellows		4	4
13	疲劳寿命 Fatigue life		Min.2000	Min.2000
14	焊接端管尺寸 Welding end pipe size	mm	6020×16	6020×16
15	膨胀节长度（包括焊接端管） Length of expansion joint (including welding end pipes)	mm	2400	2400
16	膨胀节材料 Material for expansion joint		SUS321	SUS321

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Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

空冷管道角向万向型 Air Cooling Pipe Angular Universal Type

序号No.	类型 Type	单位Unit	项目Item 1(DN6000)	项目Item 2(DN6000)
1	膨胀节种类 Species of expansion joint		角向	万向
2	公称直径 Nominal diameter	mm	DN3000	DN3000
3	公称压力 Nominal pressure	bar	1	1
4	膨胀节类型（投标方型号）Type of expansion joint (Model No. of Bidder)		KJL6000–2400	KJW6000–2400
5	设计依据 Design basis		EJMA	EJMA
6	流动介质 Flow media		饱和蒸汽	饱和蒸汽
7	设计内部压力（最大／最小）Design inner pressure (maximum / minimum)	bar(a)	1.50/完全真空	1.50/完全真空
8	设计温度 Design temperature	℃	120	120
9	角向位移补偿 Angular displacement compensation	deg.	approx.+/−2.5	approx.+/−3.5
10	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	28274	28274
11	层数 Number of layers		3	3
12	波数 Number of bellows		4	4
13	疲劳寿命 Fatigue life		Min.2000	Min.2000
14	焊接端管尺寸 Welding end pipe size	mm	3020×12	3020×12
15	膨胀节长度（包括焊接端管）Length of expansion joint (including welding end pipes)	mm	2000	2000
16	膨胀节材料 Material for expansion joint		SUS321	SUS321

空冷管道角向型 Air Cooling Piping Angular Type

1	膨胀节种类 Species of expansion joint		角向 Angular
2	公称直径 Nominal diameter		DN 3000
3	公称压力 Nominal pressure		1
4	膨胀节类型 Type of expansion joint		KJX3000×4—1400–J
5	设计依据 Design basis		AD–Merkblatter/EJMA
6	流动介质 Flow media		饱和蒸汽
7	设计温度 Design temperature	℃	/120
8	角向位移补偿 Angular displacement compensation	deg	+/−3.0
9	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	33500
10	波数 Number of bellows		4波
11	疲劳寿命 Fatigue life		1000
12	焊接端管尺寸 Welding end pipe size	mm	3020×12
13	膨胀节长度（包括焊接端口）Length of expansion joint (including welding interfaces)	mm	1400
14	波纹管材料 Materials for bellows		1.4571or1.4541

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Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523–88681509

空冷管道轴向型 Air Cooling Piping Axial Type

| 1	膨胀节种类 Species of expansion joint		轴向 Angular
2	公称直径 Nominal diameter		DN 6000
3	公称压力 Nominal pressure		1
4	膨胀节类型 Type of expansion joint		KZB1.5/6000×3—600–J
5	设计依据 Design basis		AD–Merkblatter/EJMA
6	设计温度 Design temperature	℃	120
7	轴向位移补偿 Axial displacement compensation	mm	+/−30
8	角向位移补偿 Angular displacement compensation	deg.	+/−1
9	轴向弹性系数要求 Axial elasticity coefficient requirement	N/mm	2000
10	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	150000
11	波数 Number of bellows		4波
12	使用寿命 Life of use	h	min.262800
13	焊接端管尺寸 Welding end pipe size	mm	6020×16
14	膨胀节长度（包括焊接端口）Length of expansion joint (including welding interfaces)	mm	600
15	波纹管材料 Materials for bellows		1.4571or1.4541

空冷管道轴向型 Air Cooling Piping Axial Type

1	膨胀节种类 Species of expansion joint		轴向 Angular
2	公称直径 Nominal diameter DN		DN 2200
3	公称压力 Nominal pressure PN		1
4	膨胀节类型 Type of expansion joint		KZB1.5/2200×2—400–J
5	设计依据 Design basis		AD–Merkblatter/EJMA
6	设计温度 Design temperature	℃	120
7	轴向位移补偿 Axial displacement compensation	mm	± 10.0
8	角向位移补偿 Angular displacement compensation	deg.	+/−1
9	轴向弹性系数要求 Axial elasticity coefficient requirement	N/mm	500
10	角向弹性系数要求 Angular elasticity coefficient requirement	Nm/1°	8194
11	波数 Number of bellows		2波
12	使用寿命 Life of use	h	min.262800
13	焊接端管尺寸 Welding end pipe size	mm	2220×10
14	膨胀节长度（包括焊接端口）Length of expansion joint (including welding interfaces)	mm	400
15	波纹管材料 Materials for bellows		1.4571or1.4541

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四氟补偿器(SFB型)
Tetrafluoro Compensator (SFB Type)

◎ 结构简图 Structural Sketch
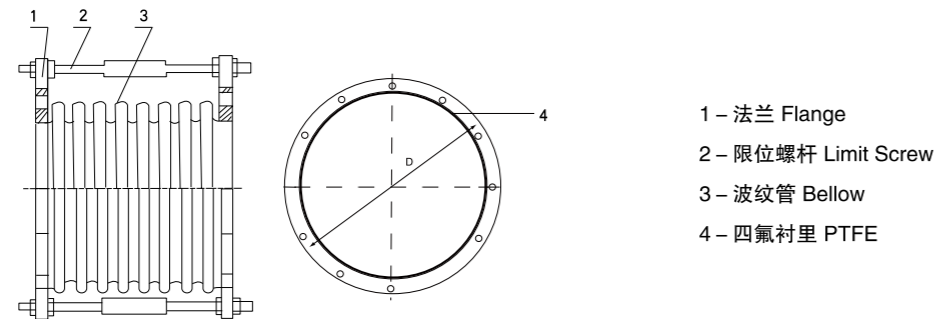
1 – 法兰 Flange
2 – 限位螺杆 Limit Screw
3 – 波纹管 Bellow
4 – 四氟衬里 PTFE

◎ 产品结构特点 Product Structural Features

　　此类补偿器可以用来消除管道、容器或设备等因气候变化而引起的伸缩或因其他原因而导致的热膨胀或位移，作为一种缓震器。它可安装在泵口的进出口或其他高频机械的两端以减轻或消除其振动，提高管路的使用寿命与密封性能。解决了金属补偿器所不能解决的问题，降低了企业成本，提高了生产效益。此外，它还可以用来吸收设计与实际安装的偏差。具有工作可靠、结构紧凑、补偿能力强、能抗各种介质腐蚀和使用寿命长等优点。

This type of compensators can be used to eliminate the extension caused by pipelines, vessels etc. due to climate changes or the thermal expansion or displacement caused by other reasons, as a type of cushion devices. It can be installed at the inlet and outlet of a pump opening or both ends of other high frequency machines, to dampen or eliminate their vibration and improve the life of use and sealing performance of pipelines. It has solved problems that metallic compensators cannot deal with, reduced corporate cost and improved production benefits. In addition, it can also be used to absorb the deviation of actual installation from designs, possessing advantages as reliable working, compact structure, strong compensating ability, capable to resist various media corrosions and long life of use, etc.

◎ 技术参数表 Technical Parameters

规格 Specs DN mm	三波最大补偿能力 Three-wave Maximum Compensating Volume 轴向 Axial ΔX mm	横向Lateral ΔY mm 02-1	横向Lateral ΔY mm 02-2	角向 Angular Δθ	内压 Inner Pressure TF02-1	内压 Inner Pressure TF02-2	K pa	三波长 Three-wave Length L mm	PN0.6Mpa K	PN0.6Mpa n-M	PN1.0Mpa K	PN1.0Mpa n-M
100	26	25	33		0.5	0.6	28	95	170		180	8-M16
124	29			20	0.4	0.5	24	105	200		210	
150	32	20	26				18	115	225	8-M16	240	12-M20
200	40				0.35	0.4	17	125	280		295	
250	42	20	27		0.3	0.35	14	135	335	12-M16	350	
300	44						13	145	395	12-M20	400	
350	46				0.2	0.25		150	445		460	
400							11	160	495	16-M20	515	16-M22
450	48	12	16	15	0.1	0.1		180	550		565	20-M22
500					0.08			200	600	20-M24	620	20-M27
600	49							220	705	24-M24	725	
700					0.05	0.06	10	240	810	24-M27		
800	50	10	13					260	920			
900							9	280	1020	24-M27		
1000	52				0.03	0.035		300	1120	28-M27		
1200		8	10				7	320				

连接法兰尺寸 Connection Flange Size HG5010-58/HGJ45-92(HG20593-93/97)

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船用型补偿器(CBC型)
Marine type Compensator (CBC Type)

◎ 结构简图 Structural Sketch
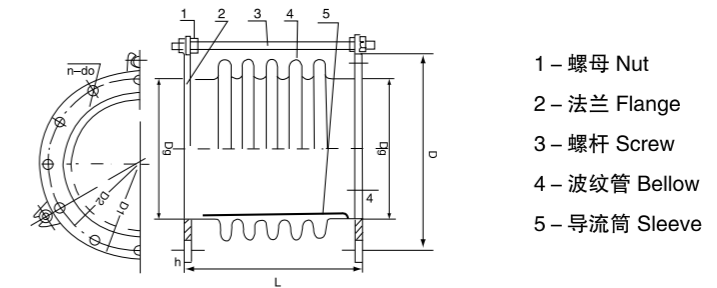
1 – 螺母 Nut
2 – 法兰 Flange
3 – 螺杆 Screw
4 – 波纹管 Bellow
5 – 导流筒 Sleeve

◎ 产品结构特点 Product Structural Features

主要用于内燃机排气管路，作为管路热胀冷缩的补偿装置。在系统中能承受管路热胀应力和脉动冲引起的振动，其它管路亦可参照使用。

It is mainly used in the exhaust pipe of internal combustion engine as the compensation device for pipe thermal expansion and shrinkage. In the system, the vibration caused by thermal expansion and pulsation of the pipeline can be borne by it, and other pipes can be used as reference.

公称压力 Nominal pressure　　　　Pg=0.05MPa；　0.1MPa
公称通径 Nominal diameter　　　　Dg=65~1500mm
使用温度 Use temperature　　　　t≤550℃

1.用于国内船舶的波形膨胀节的法兰（GB613-81），连接尺寸Dg≤500mm，符合GB573-65，Dg＞500mm符合GB2506-81。
2.用于出口船舶的波形膨胀节的法兰（GBM33-81），连接尺寸Dg≤500mm，符合ISO2084-1974。
3.用于出口船舶的波形膨胀节的法兰（GBM1033-81），连接尺寸Dg≤500mm。符合JISB2211-1977,Dg＞500mm符合JISF7805F-1976。
4.国家标准不锈钢波形膨胀节，GB12522-90法兰连接尺寸符合ISO2084-74公称压力0.05MPa和0.1MPa二档，补偿量优于上述三项标准。

1. Flange of the corrugated expansion joint for domestic vessels (GB 613-81), the connection dimension Dg≤500mm, conforming to GB573-65, Dg ＞ 500mm conforming to GB2506-81.
2. Flange of the corrugated expansion joint for export vessels（GBM33-81）,the connection dimension Dg≤500mm, conforming to ISO2084-1974.
3. Flange of the corrugated expansion joint for domestic vessels (GB 613-81), the connection dimension Dg≤500mm, conforming to JISB2211-1977, Dg ＞ 500mm conforming to JISF7805F-1976
4. The national standard stainless steel waveform expansion section, GB12522-90 flange connection dimension conforms to the ISO2084-74, nominal pressure 0.05MPa and 0.1MPa, and the compensation amount is better than the above three criteria.

◎ 技术参数表 Technical Parameters

通径 DN	d	L	Z	GB613-81 D1	GB613-81 D2	GB613-81 b	GB613-81 d0	GB613-81 n	GB613-81 Th	船用 D1	船用 D2	船用 b	船用 d0	船用 n	船用 Th	船用 D1	船用 D2	船用 b	船用 d0	船用 n	船用 Th	Δ	F cm²	K N/mm
300	318	280	3	430	386	22		14	M20	440	395	22		12	M20	430	390	16		12	M20	24	1051	351
		380	5																			40		
350	360	280	3	480	436			16		490	445					480	435					24	1307	371
		380	5																			40		
400	410	280	3	530	486					540	495			16		540	495					24	1647	472
		380	5																			40		
450	460	280	3	580	536	16		18		595	560	16		16	23	605	555	16	23	16	M20	24	2026	481
		380	5																			40		
500	510	280	3	635	591			20		645	600			20		655	605					24	2440	468
		380	5																			40		
600	610	280	3	755	705	26			M24	755	705	26			M24	710	670					24	3399	526
		380	5																			40		
700	711	280	3	860	810			24		860	810			24		815	775					24	4528	552
		380	5																			40		
800	813	280	3	975	920	30			M27	975	920	30			M27	915	875			20		24	5826	538

本公司可以生产除本表以外的更大（或更小）规格的此类型膨胀节。技术参数可以根据客户要求重新做设计调整。详情可来电咨询：0523-88681509
Our company can produce the expansion joint with larger (or smaller) specifications except the type in this table. Technical parameters can be adjusted and designed according to customer requirements. For more details, please call us：0523-88681509

非金属膨胀节
Non-metallic Expansion Joint

◎ 结构简图 Structural Sketch

YXD 型 Type

FXD 型 Type
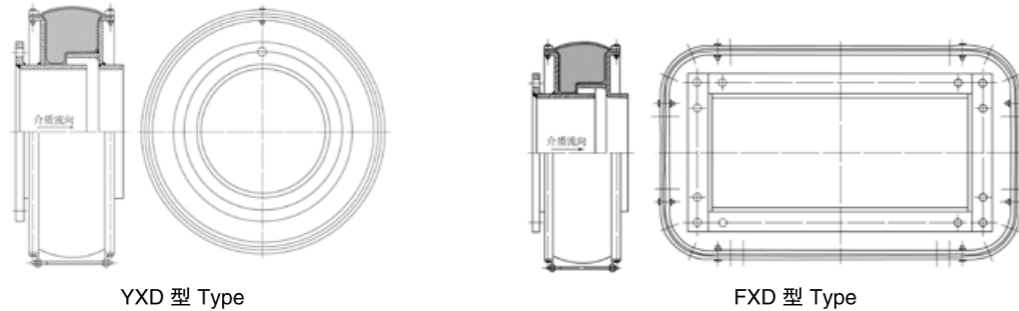
◎ 产品结构特点 Product Structural Features

纤维膨胀节的主要特点主要有以下几个方面：

1.补偿热膨胀，可以补偿多维方向，大大优于只能一维补偿的金属膨胀节。2.由于在管道连接过程中，系统误差在所难免，纤维膨胀节能较好的消除安装误差。3.纤维织物，保温棉本身具有吸声、隔震动传递的功能，能有效地减少锅炉、风机等系统的噪声和震动。4.由于主体材料为纤维织物，无力的传递。用纤维膨胀节可简化设计，避免使用大的支座，可节省大量的材料和劳动力。5.使用的氟塑料、有机硅材料具有较好的耐高温和耐腐蚀性能。6.密封性好，有比较完善的生产装配系统，纤维膨胀节基本无泄漏。

Compensating for thermal expansion, able to compensate multi-dimensional aspects, greatly better than the metallic expansion joints that can only compensate for one dimension. 2. As during the pipe connection process, systematic errors are hardly to be avoided, the fiber expansion joints can well eliminate installation errors. 3. The insulated cotton of the fiber fabrics itself has the sound absorption and vibration transmission insulation functions, effectively reducing the systematic noise and vibration of boilers, blowers, etc. 4. As the main material is fiber fabrics, there is no force transmission. By use of fiber expansion, designs can be simplified to avoid the use of large supports, greatly saving a large volume of materials and labor. 5. The used fluoroplastics and organosilicone materials have relatively good high temperature resistance and corrosion resistance abilities. 6. There is good sealing property, relatively complete production assembly system and basically no leakage will occur on the fiber expansion joints.

◎ 技术参数表 Technical Parameters

序号 No.	代号 Code	结构 Structure	备注 Notes
1	FXD	方形柔性位移膨胀节 Square Flexible Displacement Expansion Joint	若需加套管或其它要求，可参看结构图例选定在代号后标"X"一结构例中的顺序 If a sleeve or other requirement shall be added, the structural sketch can be referred to select the sequence in the structural example after the code affixed "X" item.
2	YXD	圆形柔性位移膨胀节 Rounded Flexible Displacement Expansion Joint	同上 Same as above
3	TXD	单圈式柔性位移膨胀节 Single Circular Type Flexible Displacement Expansion Joint	同上 Same as above
4	FXD	双圈式柔性位移膨胀节 Double Circular Type Flexible Displacement Expansion Joint	同上 Same as above
5	JXD	角向式柔性位移膨胀节 Angular Type Flexible Displacement Expansion Joint	角向补偿量a=1/2arctg△X/D △X-轴向补偿量 D-通径 The angular compensating value a = 1/2arctg △X/D, △X = Axial compensating value, D = Diameter

◎ 类别代号 Types and Codes

序号 No.	代号 Code	使用温度 Used Temperature ℃	圆带材料代号 Round Belt Material Code	防磨套材质 Anti-abrasion Sleeve Material	接管法兰材质 Adaptor Tube Flange Material
1	I	<80	QI	Q235-A	Q235-A
2	II	<160	QII	Q235-A	Q235-A
3	III	<280	QIII	Q235-A	Q235-A
4	IV	<400	QIV	20	20
5	V	<800	QV	1Cr18Ni9Ti	1Cr18Ni9Ti

补偿器的公称通径单位mm,对圆形载面注公称直径DN，对矩形载面注长×宽（即内壁A×B）.
The unit of the nominal diameters of compensators is mm, the rounded carrier planes are noted with the nominal diameter DN and the rectangular cross-sections are noted with length × width (i.e., the inner wall A×B).

◎ 基本参数表 Table of Basic Parameters

数据 Data / 项目 Item 温度等级 Temperature Grade	工作温度 Working Temperature ℃			工作压力 Working Pressure KPa		烟风道气体流速 M/S
	长期耐温 Long-term Temperature Resistance	短期冲击 Short-term Impact	耐寒 Cold Resistance	常态 Normal	冲击 Impact	
I	< 80	120	-20	-5~+5	-10~+10	8~15
II	80~160	260	-40	-10~+10	-25~+25	8~20
III	160~280	380	-60	-10~+10	-25~+25	8~20
IV	280~400	500	-60	-10~+10	-25~+25	8~20
V	400~800	1000	-60	-10~+10	-25~+25	8~20

◎ 非金属圈带轴向长度与补偿位移数值
Axial Length and Compensating Displacement Values of Non-metallic Circular Belts

非金属圈带由多层复合材料制成，吸收轴向位移和侧向位移是按圈带的轴向长度而定。
The non-metallic circular belts are made of multi-layer complex materials, in which the absorption of axial displacement and lateral displacement is determined as per the axial lengths of the circular belts.

位移量 Displacement / 圈带自由长度 Free Length of Circular Belt	140	160	180	200	220	240	260	280	300	350	400	450
轴向位移（-X/+X） Axial Displacement	-42/+11	-48/+13	-56/+15	-60/+17	-66/+19	-72/+21	-78/+23	-84/+26	-84/+30	-90/+35	-105/+40	-135/+45
径向位移（-Y/+Y）Radial Displacement — 圆形 Round	±21	±24	±28	±30	±33	±36	±39	±42	±45	±53	±60	±66
径向位移（-Y/+Y）Radial Displacement — 方形 Square	±9/±5	±10/±6	±11/±7	±12/±8	±13/±9	±14/±10	±16/±11	±18/±12	±20/±13	±25/±17	±30/±21	±35/±25

位移量 Displacement / 圈带自由长度 Free Length of Circular Belt	500	550	600	650	700	750	800	850	900
轴向位移 Axial Displacement（-X/+X）	-150/+50	-165/+55	-180/+60	-195/+65	-210/+70	-225/+75	-240/+80	-255/+85	-270/+90
径向位移 Radial Displacement（-Y/+Y）— 圆形 Round	±75	±83	±90	±98	±105	±112	±120	±128	±135
径向位移 Radial Displacement（-Y/+Y）— 方形 Square	±40/±30	±45/±35	±50/±40	±55/±45	±60/±50	±65/±55	±70/±60	±75/±65	±80/±70

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无推力自密封旋转补偿器
No thrust self-sealing rotary compensator

◎ **结构与特点 Structure and characteristics**

本公司研制开发的专利产品无推力旋转补偿器（AGXB），采用目前最先进可靠的自压密封技术和双重组合密封结构，该产品设计合理、结构独特、无推力、自密封、补偿量大，具有各类补偿器所有优点，广泛应用于供热、供水、燃气、石化、电力、冶金、纺织、建筑等领域。

Non-thrust rotary compensator (AGXB), the patent product developed by our company, uses the most advanced and reliable self-pressure sealing technology and dual combination seal structure. The product has reasonable deign and advantages of all kinds of compensator such as unique structure, zero thrust, self-sealing, and large amount of compensation, and is widely applied in heating, water supply, gas, petrochemical, electric power, metallurgy, textile, construction and other fields.

无推力自密封旋转补偿器：该产品采用组合式密封填料结构，并在转动管端面增设了滑动平面轴承密封装置，当内压升高后密封效果越好，使得该产品具有双重密封、补偿量大、性能稳定、密封可靠、使用寿命长、转动力矩小、维护方便等优点。

No thrust self-sealing rotary compensator: The product adopts the combined packing structure and the sliding plane bearing sealing device is added on the rotary tube end face. When the inner pressure is raised, the sealing effect is better, which makes the product have the advantages of double sealing, large amount of compensation, stable performance, reliable sealing, long service life, small rotational torque and convenient maintenance, etc.

无推力免维护旋转补偿器：该产品采用组合式密封填料结构，并在转动管端面增设了滑动平面轴承密封装置，当内压升高后密封效果越好，使得该产品具有双重密封，能在补偿器密封状态下有自动跟踪的密封力，无需施加人为予紧力，对种种原因造成密封间隙的情况下，均可及时自补密封，密封圈不易被腐蚀、风化而质变。高温、高压运行状态长时间不产生泄露。

No thrust self-sealing rotary compensator: The product adopts the combined packing structure and the sliding plane bearing sealing device is added on the rotary tube end face. When the inner pressure is raised, the sealing effect is better, which makes the product has a dual seal which can automatically track the sealing force under the sealing state of the compensator. No artificial tightening force can be applied to. For sealing clearance from a variety of reasons, all can be self-sealing in time. Sealing ring is not easy to have quality change because of corrode and weathering. High temperature and high pressure running state for long time do not produce leakage.

无推力免维护带压堵漏旋转补偿器：补偿器主要密封原理为自密封方式，即环面密封确保本工程要求参数的密封要求，端面密封确保本工程要求参数的自主密封，即随着介质压力的升高自主密封能力随之提高。补偿器还采用带压加注密封填料技术，以保证补偿器在不停产情况下在线维护，确保整个系统在高温、高压运行状态长时间不产生泄露。

No thrust rotary compensator with leakage-stoppage under stress and maintenance free: The main sealing principle of the compensator is the self-sealing method, namely ring face seal, to ensure the sealing parameter requirement of this project. End face seal shall meet the self-sealing required by the parameter requirement of this project, namely with the increase of the pressure of the medium, the self-sealing capacity increases. The compensator also adopts filling technology with pressurized packing to ensure that the compensator is maintained online without stopping production, ensuring that the whole system is not leaking during high temperature and high pressure operation.

压紧式旋转补偿器：由旋转内筒、填料压盖、紧固法兰、导向定心环、成型柔性石墨密封填料、密封压环、密封座外壳、端接管、螺栓、螺母构成。该产品特点无推力、补偿量大、不泄漏。

Compacting rotary compensator: It is composed of rotating inner tube, packing gland, fastening flange, guiding centring ring, forming flexible graphite sealing packing, sealing ring, sealing seat shell, end pipe, bolt and nut. The product features no thrust, large compensation and no leakage.

注填式旋转补偿器：由旋转内筒、密封座外壳、导向定心环、密封环、注填堵漏装置、注填特种填料、端接管构成。该产品特点无推力，补偿量大，密封性能优越，使用寿命长，可在线维护保养。

Filling rotary compensator: It is composed of rotating inner cylinder, sealing seat shell, guide ring, sealing ring, filling and plugging device, filling special packing and end taking. The product features no thrust, large amount of compensation, superior sealing performance, long service life, and can be maintained online.

注填压紧复合式旋转补偿器：由旋转内筒、填料压盖、紧固法兰、导向定心环、成型柔性石墨密封填料、注填特种填料、注填堵漏装置、密封压环、密封座外壳、端接管、螺栓、螺母构成。该产品特点无推力、补偿量大，耐温耐压，双保险，不泄漏，并可在正常运行中维护保养和注入柔性密封填料。

Compound rotary compensator with filling pressure and compacting: It is composed of rotating inner barrel, packing gland, fastening flange, guide centering ring, forming flexible graphite packing, special packing, filling injection and fill plugging device, sealing ring, sealing socket shell, end pipe, bolts and nuts. The product features no thrust, large compensation, temperature resistance, double insurance, no leakage, and can be maintained and injected the flexible packing in normal operation.

自维护式旋转补偿器：由旋转内筒、填料压盖、紧固法兰、弹簧法兰、弹簧、导向定心环、成型柔性石墨密封填料、密封压环、密封座外壳、端接管、螺栓、螺母构成。该产品特点无推力、自维护、补偿量大、不泄漏。

Self-maintaining rotary compensator: It is composed of rotating inner tube, packing gland, fastening flange, spring flange, spring, guide centering ring, forming flexible graphite seal packing, sealing ring, sealing seat shell, end pipe, bolts and nuts. The product features no thrust, self-maintenance, large compensation and no leakage.

高温高压自压密封旋转补偿器：高温高压自压密封旋转补偿器由于使用环境比较恶劣，要求较高，所以本公司按用户提供的技术要求，专门设计制造。产品特点是材料根据设计温度、压力、介质选用低合金钢无缝钢管或整体锻件及性能优良的耐高温、耐高压、耐磨损、高强度复合密封材料，采用特殊结构、特殊生产工艺及特殊生产技术制造，耐高温、耐高压、无推力、自密封、补偿量大、不泄漏。

High temperature high-pressure self-sealing rotary compensator: Due to the poor use of environment, high temperature and high pressure self-sealing rotary compensator has a higher demand. Therefore, the company specially design and manufacture the product according to the technical requirements provided by the user. The product has its characteristic that is according to the design temperature, pressure and medium, these materials shall be selected such as low alloy steel seamless pipe, solid forging, and the sealing material with excellent performance of resistance to high temperature, high pressure resistance, wear resistance and high strength composite. And the product has special structure, and is manufactured by special production process and special production technology, featuring high temperature resistance, high pressure, no thrust, self-sealing, large compensation and no leakage.

★ 需特别说明的是常规的旋转补偿器为节约成本、加工方便采用变径管为接口，而变径管在热网管道中会产生涡流、流阻，对管线的流速、流量、压力均会产生影响，且接口尺寸、形位公差误差大，很难保证管道焊接质量，因此本公司无推力旋转补偿器系列产品均将变径管接口改为与管道公称通径相一致的直管接口，从根本上杜绝了这类问题的产生，经使用深受用户好评。

It is necessary to specify that the conventional rotary compensator uses the variable diameter tube as the interface for cost reduction and machining convenience. However, the variable diameter tube will generate eddy current and flow resistance in the heat network pipe, which will affect the flow rate, quantity of flow and pressure of the pipeline. And the interface size and the tolerance error are large, so it is difficult to guarantee the welding quality of the pipe. Therefore, the company's non-thrust rotary compensator series products all change the variable diameter pipe interface to the direct pipe interface that is consistent with the pipe nominal diameter, which makes this kind of problem be completely eliminated, and has been well received by users.
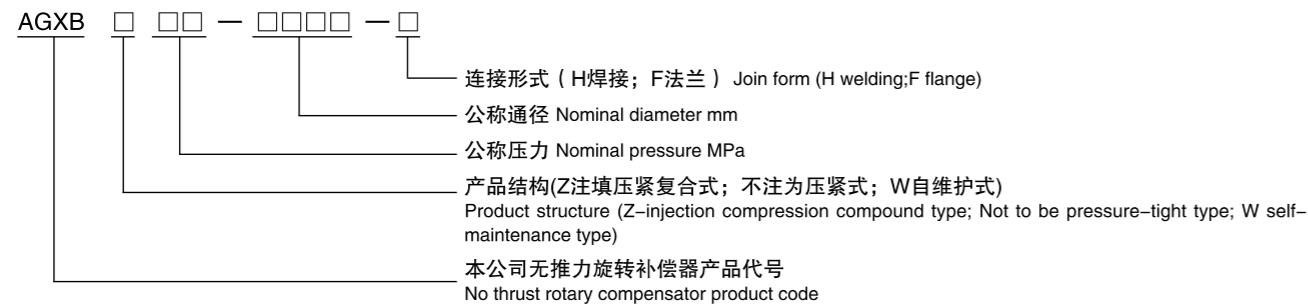
◎ **适用范围 Scope of application**

该产品适用于各种走向的管道（如直线、转角、平行及地理过渡至架空等）辅设，其作用是补偿热力管道因热胀冷缩引起的位移量。

The product is suitable for the various kinds of pipeline (such as line, corner, parallel and geographical transition to overhead), which is used to compensate the displacement caused by thermal expansion of thermal pipe.

◎ 本公司产品代号 Product code

产品代号表示形式为 Product code form is:

AGXB □ □□ — □□□□ — □

连接形式（H焊接；F法兰）Join form (H welding; F flange)

公称通径 Nominal diameter mm

公称压力 Nominal pressure MPa

产品结构(Z注填压紧复合式；不注为压紧式；W自维护式)
Product structure (Z-injection compression compound type; Not to be pressure-tight type; W self-maintenance type)

本公司无推力旋转补偿器产品代号
No thrust rotary compensator product code

例：公称通径500mm，公称压力2.5MPa，法兰连接的压紧式无推力旋转补偿器，产品代号为：AGXB2.5-500-F。
Example: nominal diameter 500mm, nominal pressure 2.5mpa, flanged joint non-thrust rotary compensator, product code: AGXB2.5-500-F.

◎ 产品主要性能指标 Product main performance index

工作压力：0.6–30 MPa

工作温度：–50℃–650℃

适用介质：热水、蒸汽、冷却水、循环水、其它流体

组合最大补偿量：1800mm

密封材料摩擦系数：≤0.15

使用寿命：可达30年以上

Working pressure: 0.6-30 MPa

Working temperature: – 50 ℃ to 650 ℃

Applicable media: hot water, steam, cooling water, circulating water, other fluids

Combined maximum compensation: 1800mm

Friction coefficient of sealing material: ≤0.15

Service life: up to 30 years

◎ 订货须知 Ordering instructions

1、提供公称通径、工作压力、工作温度、补偿量、流体介质及所需的产品型号和数量；

2、提供接管材质要求：根据使用情况和设计参数选定，一般与管道材质相同(20#或Q235B)，如用户另有特殊要求可定制；

3、接口连接型式本公司常规产品为焊接式，如需法兰连接请提供法兰标准；

4、高温或低温、高压或负压或管线复杂、产品另有特殊要求本公司均可专门设计供货。

1. Provide the nominal size, work pressure, working temperature, compensation quantity, fluid media and required product models and quantities;

2. Material requirements of connecting tube: according to the usage and design parameters, it is generally the same as the pipe material (20# or Q235B), which can be customized if the user has special request.

3. Interface connection form: the normal product of the company is welding, please provide flange standard if you need flanges for connection;

4. High temperature or low temperature, high pressure or negative pressure or complex pipeline, or special requirement for the product, the company can design the supply specially.

◎ 无推力旋转补偿器的补偿原理、安装布置形式及要点
The compensation principle of non-thrust rotary compensator, and its installation layout and key points

旋转补偿器补偿原理是通过成双旋转筒及其之间的连接管段[力(偶)臂L]构成回转力偶，环绕回转中心O，依靠补偿器两端管道的热胀推力来进行补偿的（见图1、图4）。

Compensation principle of rotating compensator forms a rotary couple through the double rotating drums and the connection section [force (even) arm L] between them, around the rotary center O, and depends on thermal thrust compensator on both ends of pipeline to compensate (see figure 1, figure 4).

旋转补偿器在管线中的安装布置形式主要分为Π型组合和Ω型组合。Π型组合的安装适应性较广，对直线、平行、转角走向的管道均可布置，Ω型组合主要在直管道上安装布置。

Installation form of rotating compensator in pipeline is mainly divided into Π combination and Ω combination. Π type combination has a wide adaptability such as straight line, parallel, and pipelines with corner, and type Ω combination is mainly installed on the straight pipes.

1、Π型组合补偿原理及要点 Compensation principle and key points of Π type combination

该组合由二只旋转补偿器和力偶臂L构成回转力偶，当布置在两固定支架间中心，依靠补偿器两端管道方向相对、大小相等的热胀推力F，推动力偶臂L两端环绕回转中心O沿圆周方向旋转θ角（θ角由小变大），以达到吸收两端方向相对、大小相等的热胀量Δ1、Δ2；当布置不在两固定支架间中心而偏向管道相对较短的一端，力偶臂L的中心O则偏向较短的一端环绕旋转，以达到吸收两端方向相对、大小不等的热胀量Δ1、Δ2（见图1、图2）。旋转补偿器的臂高H=2×1.5DN+产品长度（特殊情况可适当加长或缩短）。

The combination forms a rotary couple by two rotary compensators and force arm L. When it is in the center of two fixed bracket, relying on the thermal expansion force F of pipes on both ends of the compensator which have opposite directions but equal magnitude and promote both ends of couple arm L around rotary center O and along the circumferential direction to form θ Angle (θ Angle changes from small to big), in order to absorb the heat expansion Δ1 and Δ2 on both ends which have opposite direction but equal magnitude; When it is not in the center of two fixed bracket but inclines to the relatively short end of the pipe, the center O of the couple arm L shall rotate around the shorter end in order to absorb the heat expansion Δ1 and Δ2 on both ends which have opposite direction but equal magnitude(see figure 1, figure 2).The arm height of rotary compensator HH=2×1.5DN+product length (In special cases it can be extended or shortened appropriately).
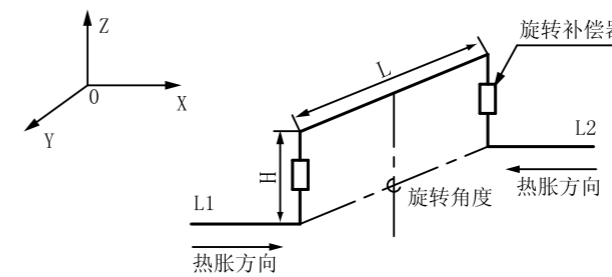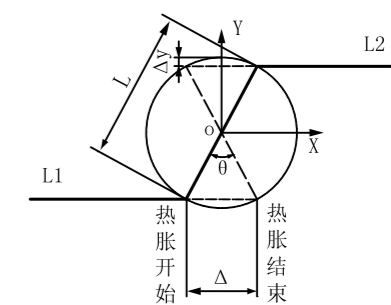

图1 Π型组合补偿器立体图(平行布置)　　　　　图2 Π型组合补偿器平面图

由图2可推出计算公式：

$$L = \Delta x / 2\sin(\theta/2)$$

Δx: 补偿量等于两端管道热胀量之和，即 Δx=Δ1+Δ2

$$\sin(\theta/2) = \Delta x / 2L$$

$$\theta/2 = \arcsin(\Delta x / 2L)$$

$$\theta = 2\arcsin(\Delta x / 2L)$$

应当注意的是Π型组合在吸收热伸长时，当力偶臂旋转到θ/2处，管道将出现最大的离心径向摆动量Δy(见图3)，因此离补偿器第一只导向支架的布置距离要加大，参见表一，同时必须在靠近补偿器两侧管道下面安装平面滑动支架，以承担补偿器及管道重量。

径向摆动量Δy计算公式为：

$$y = \sqrt{(L/2)^2 - (\Delta/2)^2}$$

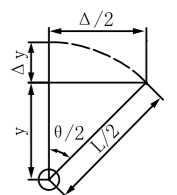$$\Delta y = (L/2) - y$$

$$\Delta y max = L/2[1 - \cos(\theta/2)]$$

图3 径向摆动量Δy

The calculation formula can be calculated from FIG. 2

$L=\Delta x/2\sin(\theta/2)$

Δx: The sum of compensation amount equals the sum of heat expansion pipeline on both ends, namely $\Delta x = \Delta 1 +\Delta 2\sin(\theta/2)=\Delta x/2L$

$\theta/2= \arcsin(\Delta x/2L)$

$\theta = 2\arcsin(\Delta x/2L)$

It should be noted that Ⅱ type combination extends when absorbing heat and when arm of couple rotates to the point of $\theta/2$, the pipeline will appear the biggest radial swing centrifugal momentum Δy (see figure 3).Therefore, the distance from the first guide bracket of the compensator should be increased, as shown in table 1. At the same time, a plane sliding bracket must be installed near the side of the compensator to bear the compensator and pipe weight.

Radial throwing Δy calculation formula is:

$y= \sqrt{(L/2)^2-(\Delta/2)^2}$

$\Delta y=(L/2)-y$

$\Delta ymax=L/2[1-\cos(\theta/2)]$

鉴于径向摆动值△y的过大对旋转补偿器正常运行构成的危害，所以应控制此值越小越好，本公司要求最大摆动量△y不宜超过80mm。

Given too large Δy radial swing value will be harmful to the normal operation of the rotary compensator, so the value should be controlled and should be as small as possible, the company requires maximum momentum Δy should not be more than 80 mm.

表一 Ⅱ型、Ω型组合补偿器两侧导向支架离补偿器的距离（m）
Table 1 Distance of guide bracket of the two sides of Ⅱ and Ω combination compensator from the compensator (m)

公称通径 Nominal Diameter	≤100	≤200	≤350	≤500	600	700	800	>800
Ⅱ型组合 Ⅱ-type combination	≥20	≥25	≥30	≥35	≥40	≥45	≥50	≥55
Ω型组合（上向） Ω-type combination (upward)	≤4	≤8	≤12	≤16	≤20	≤24	≤28	≤32
Ω型组合（下向） Ω-type combination (downward)	≤8	≤14	≤20	≤26	≤32	≤38	≤44	≤50

另外从图2可看出Ⅱ型组合吸收热胀量随着摆动旋转角θ或力偶臂L的加大而增加，但旋转角过大，径向摆动△y值和摩擦推力就随之加大，此外θ角越大，补偿器密封材料的寿命越短，对大管径这种情况更加明显，故补偿量设计应合理，同时对旋转角应加以限制，参见表二。

In addition you can see from figure 2, absorption expansion amount of Ⅱ type combination increases with the increase of wing rotation Angle θ or couple arm L, but while the rotation Angle is too big, Radial swing Δy value and the friction force will be increasing. In addition, the larger the Angle θ, the shorter the life of the compensator sealing material. For the large pipe diameter, the situation is more obvious. Therefore, the design of compensation should be reasonable and the rotation Angle should be restricted, as shown in table 2.

表二 Ⅱ型、Ω型组合旋转角θ的极大值[θmax]
The maximum value [θ maximum] of rotation Angle θ of Ⅱ, Ω combination type

公称通径 Nominal Diameter	≤200	250-350	400-450	500-600	700-800	>800
Ⅱ型组合 Ⅱ-type combination	≤50°	≤45°	≤40°	≤35°	≤30°	≤25°
Ω型组合 Ω-type combination	≤60°					

Ⅱ型组合一般情况下应根据自然地形、补偿量的大小和安装条件来设计布置。如条件许可，旋转角θ可适当取小，L值取大一些，以减小径向摆动量△y，保证补偿器正常工作，使用寿命更长。

In general, the design and layout shall be made according to natural terrain, size of compensation and installation conditions. If conditions permit, rotation Angle θ can be appropriately small and L takes larger value, to reduce the radial momentum △y, to guarantee the normal work of the compensator and longer service life.

2、Ω型组合补偿原理及要点

该组合由三只旋转补偿器和两力臂L1'、L2'构成两对力偶，分别在直线管道的两侧对称布置，依靠受热管道两端热胀推力F推动两力臂L1'、L2'的一端作相对同步旋转，使θ角和补偿间距B由大变小，以达到吸收两端管道热伸长量量△1、△2（见图4、图5）。旋转补偿器的臂宽H=2×(2×1.5DN+产品长度)。

2. Principle and key points of Ω type combination compensation
The combination consists of three rotary compensator and arm L1 'and L2 ' which constitute two pairs of couples. It has the symmetrical arrangement on both sides of the straight line, and relies on heating pipe at both ends of the thermal expansion thrust F to promote the two arm L1 ', L2 ' one end of the relative synchronous rotation, so that the θ angle and compensation spacing B are going to be smaller, in order to absorb the heat elongation △1 and △2 at both ends of the tube(see Figure 4, Figure 5).

图4 Ω型组合补偿器立体图（直线布置）
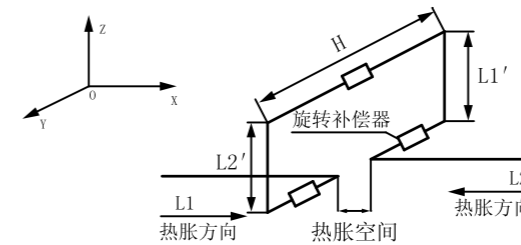Figure 4 Ω type combination compensator stereogram (linear arrangement)

图5 Ω型组合补偿器正面图
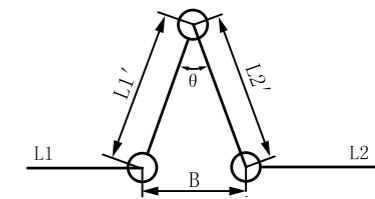Figure 5 Positive figure of Ω type combined compensator

如图5所示，它是一个等腰三角形，由此可推出计算公式：

$B=2L\sin(\theta/2)$ $L=B/2\sin(\theta/2)$ $\theta=2\arcsin(B/2L)$

应当注意的是设计时B值存在一个最小值Bmin，设管道外径为Dw，左右两侧管段热胀量之和为△x，即△x=△1+△2，两侧管段单边保温层厚度之和为δ，即δ=δ1+δ2，

则Bmin=△x+Dw+δ+施工空间（一般取≥70mm）

由图5可知Ω型组合补偿器虽不存在径向摆动值，但由于重心较高，可能会摆动，所以必须在靠近补偿器左右两侧设计导向支架（参见表一），以增加稳定性，同时还可看到旋转角θ的大小直接反映了补偿量的大小，θ值越大，补偿量越大，但为了减小补偿器的轴向推力，延长使用寿命，故补偿量设计要合理，同时对旋转角θ应加以限制，参见表二。

As shown in fig.5, it is an isosceles triangle, thus the calculation formula can be introduced:
$B=2L\sin(\theta/2)$ $L=B/2\sin(\theta/2)$ $\theta=2\arcsin(B/2L)$
It should be noted that there is a minimum value Bmin for the B value in the design. If the diameter of the pipeline is Dw, and thermal sum of both sides of the section is △x, namely △△x=△1+2,the sum of the thickness of the unilateral insulation layer on both sides is δ, namely δ=δ1+δ2，
Then Bmin=△x+Dw+δ + construction space (generally take ≥70mm)
We can see from Figure 5,the Ω combination type compensator has no radial swing value, but because of the high center of gravity, it might swing, So you have to design the guide bracket near the compensator (see table 1), in order to increase stability. At the same time, you can also see that the size of the rotation Angle θ directly reflects the size of the compensation, and the larger the theta value, the larger the compensation. But in order to reduce the axial thrust of the compensator and prolong the service life, the compensation design should be reasonable, while the rotation Angle θ should be limited, as shown in table 2.

3、Ⅱ型、Ω型组合长距离补偿导向支架的间距

因旋转补偿器的补偿量特别大，所以固定支架间距也随之增大，其间距一般由设计管段的补偿量大小所决定，为避免长距离管道挠曲失稳，就需在一定距离内安装导向支架（参见表三），同时为减小管段运行的摩擦阻力，在导向支架上应安放滚动支座。

3.Ⅱ, Ω type combination---the space between guide bracket compensated in a long distance
Because the compensation of the rotary compensator is particularly large, the spacing of the fixed stents increases and the spacing is usually determined by the amount of compensation in the design pipe segment. In order to avoid deflection and instability of long distance pipeline, the guide bracket should be installed at a certain distance (see table 3).At the same time, to reduce the friction resistance in the running of the tube, rolling support should be placed on the guide bracket.

表三 Π型、Ω型组合长距离补偿导向支架间距
Π，Ω type combination———the space between guide bracket compensated in a long distance

公称通径 Nominal Diameter	≤150	≤250	≤350	≤500	600	700	>800
间距（m） Spacing(m)	≤50	≤60	≤70	≤80	≤100	≤120	≤140

4、产品补偿量设计

　　旋转补偿器的作用是吸收热力管道的热位移，因此补偿器的最大补偿量应确保大于热力管道的热胀量，故管道热胀量设计是否合理是非常重要的。

　　管道安装受热时的热膨胀量计算公式为：

　　Δx=α×(L1+L2)×(t2−t1) (m)

　　式中：

　　Δx–管段热伸长量（m）　α–管材的线膨胀系数m／(m.℃)见表四　　L1–左侧直管长度(m)

　　L2–右侧直管长度(m)　　t1–管道安装设计温度℃（可取用20℃）　　t2–管道内介质温度℃

4. Product compensation design

The function of the rotary compensator is to absorb the thermal displacement of the heat pipe, so the maximum compensation of the com–pensator should be greater than the thermal expansion of the heat pipe, so it is very important that the design of pipe thermal expansion is reasonable.

The formula for calculating the thermal expansion of piping during heating is:

Δx=α×(L1+L2)×(t2−t1) (m)

In the formula:

Δ X–section thermal elongation (m)

α –the linear expansion coefficient of alpha pipe m/(m. ℃) are shown in table 4 L1– left straight pipe length (m)

L2–right straight pipe length (m)

T1 – piping design temperature ℃ (can take 20 ℃)

T2 – the medium temperature ℃ within piping

表四 常用钢材的线膨胀系数[α／×10^{-6}m／(m.℃)]
Table 4 linear expansion coefficient of commonly used steel

钢 种 Steel species	设计温度 Design temperature ／℃								
	100	150	200	250	300	350	400	450	500
Q235–A	12.20	12.60	13.00	13.23	13.45	–	–	–	–
10#	11.90	12.25	12.60	12.70	12.80	12.90	13.00	13.50	–
20#、20g	11.16	11.64	12.12	12.45	12.78	13.31	13,83	13.88	13.93
16Mn、16Mng	8.31	9.65	10.99	11.60	12.31	12.77	13.33	13.47	13.71
15MnV、15MnVg	8.31	9.65	10.99	11.60	12.31	12.77	13.22	13.47	13.71

◎ 产品相关技术参数（压紧式） Technical parameters of the product (Compression type)

公称通径 Nominal Diameter DN (mm)	补偿量 Compensation Amount Δx (mm)	接管外径 Outer Diameter of Connection Pipe d(mm)	最大外径 Max. Outer Diameter D(mm)	产品长度L(mm) The Length of the Product	转矩 torque M(KN .m)			
					内压 internal pressure （MPa）			
					1.0	1.6	2.5	4.0
100	0–1000	108	230	310	0.62	0.96	2.5	2.23
125	0–1000	133	260	310	1.15	2.0	3.13	4.68
150	0–1200	159	285	310	1.81	2.86	4.35	6.97
200	0–1200	219	375	330	2.52	4.10	5.93	9.49
250	0–1500	273	425	360	5.0	7.60	11.61	18.65
300	0–1800	325	480	360	7.61	12.10	17.48	27.56
350	0–1800	377	530	360	9.79	15.85	22.50	36.32
400	0–1800	426	580	360	12.89	20.15	29.84	47.60
450	0–1800	480	630	360	18.20	29.15	42.21	67.52
500	0–1800	530	690	370	24.97	38.96	57.12	91.58
600	0–1800	630	790	370	31.20	50.00	70.23	113.60
700	0–1800	720	910	410	38.12	54.80	86.70	138.50
800	0–1800	820	1015	450	45.90	72.45	105.20	168.30
900	0–1800	920	1130	480	53.60	87.62	124.50	197.00
1000	0–1800	1020	1235	480	62.50	100	145.00	230.00

● 法兰连接按GB/T 9119–2000标准供货，也可根据用户要求按其它标准供货。

Flange connection is supplied according to GB/T 9119–2000 standard, and also can be supplied according to other standards.

◎ 应用算例 The application example

　　例1、某热网工作压力1.6MPa，工作温度350°，选用φ325×8/20#钢管，保温层单边厚度为100mm，两固定支架间距260米，拟选用Π型组合旋转补偿器，求结构尺寸、径向摆动值及工作时最大摩擦力。

　　解：

　　(1) 结构尺寸。根据θ≤［θmax］要求，查表2得Π型组合DN300管旋转角的极大值θmax≤45°

　　管道热胀量Δx=α×（L1+L2）×（t2−t1）=13.31×10^{-6}×（130+130）×（350−20）=1.142m

　　要满足补偿管道热胀量Δx，且要求旋转角θmax≤45°：

　　则Lmin=Δx/2sin（θ/2)=1.142/sin(45°/2)=1.492m

　　取L=2m,则θ=2arcsin(Δx/2L)=2arcsin［1.142/(2x2)］=33.2°＜45°满足其设计要求。

Case 1, a heat–supply network work pressure is 1.6 MPa, working temperature is 350°, select the φ325 x 8/20 # steel tube, unilat–eral thickness of thermal insulation layer is 100 mm, spacing of two fixed supports is 260 meters, propose to choose Π type combi–nation rotating compensator, ask to calculate its structure size, radial swing value and maximum friction at work.
Answer:

(1) Structural dimensions. According to θ≤［θmax],from table 2 ,we can take that The maximum value of the rotation Angle of DN300 tube of Π type combination θmax≤45.

Amount of thermal expansion of pipe Δx=α×（L1+L2）×（t2−t1）=13.31×10^{-6}×（130+130）×（350−20）=1.142m

To meet the amount of thermal expansion Δ x of compensation pipeline, and require rotation Angle θmax≤45°

So Lmin=Δx/2sin（θ/2)=1.142/sin(45°/2)=1.492m

Take L = 2 m, t θ = 2arcsin(Δx/2L) = 2arcsin［1.142/(2x2)］=33.2°＜45 to satisfy the requirements of the design.

(2) 摆动值

Δy=L/2[1−cos(θ /2)]=2/2[1−cos(33.2° /2)]=0.0416m即41.60mm

所以安装时要考虑径向摆动，旋转补偿器附近不能设导向支架。

(3) 旋转最大摩擦力

查产品相关技术参数表

当公称通径为DN300，蒸汽工作压力1.6MPa时转矩为12.10KN.m

M=F L则F=M/L=12.10/2=6.05KN=0.62T

(4) Π型组合旋转补偿器安装示意图如图6：
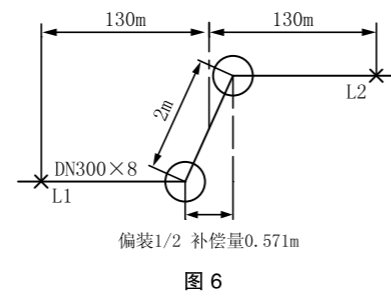
Swing value

Δy=L/2[1−cos(θ /2)]=2/2[1−cos(33.2° /2)]=0.0416m namely 41.60mm

So when the installation you should consider radial swing and rotary compensator cannot be set near the guide bracket.

(3) the maximum friction of the rotation

Check the technical parameters of the product

When the nominal diameter is DN300 and the steam working pressure is 1.6MPa, the torque is 12.10KN.m

M=F L so F=M/L=12.10/2=6.05KN=0.62T

(4)The installation of rotating compensator of Π type combination diagram is as shown in figure 6:

偏装1/2 补偿量0.571m

图 6

例2、某热网工作压力2.5MPa，工作温度300℃，选用φ426×9/20#钢管，保温层单边厚度150mm，两固定支架间距200米，拟选用Ω型组合旋转补偿器，求结构尺寸和工作时最大摩擦力。

解：

(1)结构尺寸。关系式 B = 2Lsin(θ /2)

Bmin=Δx+Dw+δ +0.07=12.78×10^{−6}×200×（300−20）+0.426+0.15×2+0.07=1.5117m

取B=1.52m，即2Lsin(θ /2) = 1.52

根据θ ≤[θ max]要求，查表2得Ω组合旋转角θ 的极大值θ max≤60°，取旋转角θ max≤50°

即Lmin=1.52/2sin(50°/2)=1.7984m

取L=1.9m,则θ = 2arcsin(B/2L)=2arcsin[1.52/(2×1.9)]=47.2°<50° 满足其设计要求。
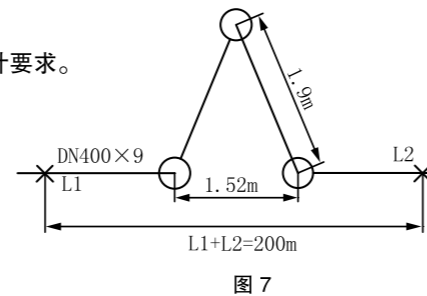
(2) 旋转最大摩擦力

查产品相关技术参数表

当公称通径为DN400，蒸汽工作压力2.5MPa时转矩为29.84KN.m

M=F L则F=M/L=29.84/1.9=15.71KN=1.60T

(3) Ω型组合旋转补偿器安装示意图如图7：

图 7

Example 2, a heat network working pressure is 2.5MPa, operating temperature is 300 ℃,take φ426x9/20# steel pipe, unilateral thickness of insulation layer is 150mm, two fixed bracket spacing is 200 meters, the selection of Ω−type combination rotary compen−sator, to find the size of the structure and working maximum friction.

Solution:

(1) Structural dimensions. Equation B = 2Lsin (theta /2)

Bmin=Δx+Dw+δ +0.07=12.78×10−6×200×（300−20）+0.426+0.15×2+0.07=1.5117m

Take B=1.52m，namely 2Lsin(θ /2) = 1.52

According to θ ≤[θ max], and look up Table 2 to find the maximum of Ω combination rotation Angle θ , θ max≤60° ,Take a rotation Angle θ max≤50°

Namely Lmin=1.52/2sin(50° /2)=1.7984m

Take L=1.9m,则θ = 2arcsin(B/2L)=2arcsin[1.52/(2×1.9)]=47.2° <50° Meet its design requirements.

(2) The maximum friction of the rotation

Check the technical parameters of the product

When the nominal diameter is DN400 and the steam working pressure is 2.5MPa, the torque is 29.84KN.m

M=F L so F=M/L=29.84/1.9=15.71KN=1.60T

(3) Ω−type combined rotary compensator installation schematic diagram 7:

◎ 产品具体安装布置及说明 The application example

一、布置形式"AGXB–Π1"型
Arrange forms "AGXB–Π1"

（1）L1段与L2段平行错位两端同时补偿。

(1) Parallel misalignment of L1 and L2 segments simultaneously compensates.

（2）L1段与L2段成一条直线两端同时补偿。

(2) The L1 and L2 segments form a straight line, and both ends are compensated simultaneously.
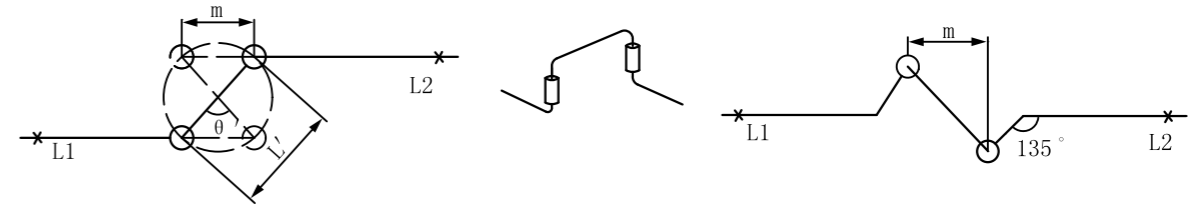
注明：L'为最小偏差值，要求θ '=2arcsin(Δx/2L')≤ θ ， θ 为表二规定的旋转角极大值。

Note: L' is minimum deviation value， θ '=2arcsin(Δx/2L')≤ θ , θ is max. value of the rotation Angle given in table 2.

（3）L1段较长，L2段较短并成夹角90°，只能L1段补偿。

L1 segment is longer, L2 segment is shorter and forms an Angle of 90° , can only be compensated by L1 segment.

（4）L1段与L2段夹角成30°左右两端同时补偿，但L1段、L2段不能过长。

The Angle between L1 and L2 is 30° , compensated by both sides, but L1 and L2 cannot be too long.

说明：AGXB–Π1型旋转补偿器特点补偿量大，造价低，对固定支架推力小，适用面广。对L1段与L2段的高度、平行度要求不高，但有一定径向位移，安装时如果空间条件允许，为了减小径向摆动量，降低轴向推力，旋转角θ 可适当取小，L臂长适当取大些，以保证补偿器正常工作，使用寿命更长。一般L臂长推荐取以下值（特殊工况可适当增减）：

Description: AGXB–Π1 rotating compensator is characteristic of large amount of compensation, low cost, small thrust to the fixed support, and wide application. The requirements to the height and parallelism of L1 and L2 segments are not high, but there is some radial displace−ment. When installed, if space conditions permit, in order to reduce the radial swing momentum and the axial thrust, the rotation Angle θ can be appropriately small, and the L arm length is appropriately larger, to ensure that the compensator works normally and the service life is longer. The general L arm length recommends the following values (special working conditions can be appropriately increased or de−creased):

公称通径 Nominal Diameter	≤80	≤125	≤200	≤350	≤450	≤600	≤800	>800
L值（m） L value (m)	2	2.5	3	3.5	4	4.5	5.5	6

如L臂较长，应增设在L臂上的平面滑动支架，以减小补偿器的轴向压力和弯头应力。另外如果L1或L2管段上有自然补偿的小弯管段如小方型等，但又不能满足整个管段的补偿要求，只要其刚度不是太小，也可用"Π"型组合旋转补偿。

If L arm is longer, the plane sliding bracket on L arm should be added to reduce the axial pressure and bending stress of the compensator. In addition, if there are small square segments such as Small Square and so on with natural compensation in L1 or L2 pipe segment, but they cannot meet the compensation requirements of the whole pipe section, as long as its rigidity is not too small, also can use "Π" type combination rotation compensation.

安装时注意事项：

1、补偿器应偏装m距离，偏装量m等于补偿量的1/2，即△x/2，严禁装反，旋转角θ的极大值应按表二的要求设计，以使管路美观，同时减少因"倒流"而引起的压力损失。

2、根据补偿器臂长L计算出最大径向摆动量，安装时管道托座在支柱上必须有足够的移动位置，以防管子从支座上径向脱落。

3、导向支架必须设在远离补偿器2-3个支架以外，以保证补偿器正常工作。

Precautions for installation:

1. The compensator should be offset by m distance. The partial volume m is equal to 1/2 of the compensation, namely △ x / 2. It is forbidden to put wrong. The maximum value of rotation Angle θ should be designed according to the requirement of the table 2, in order to make pipeline beautiful, at the same time reduce the pressure loss caused by the "backflow".

2. Calculate the maximum radial swing momentum based on the arm length L of the compensator. When installing, the pipe bracket must have sufficient moving position on the strut to prevent the pipe from falling out of the support.

3. The guide bracket shall be located away from the compensator 2-3 brackets to ensure the normal work of the compensator.

二、布置形式"AGXB-Π2"型
Arrange forms "AGXB-Π2"

(1)L1段较长，L2段较短。只能L1段补偿。
L1 is longer and L2 is shorter. Only L1 can compensate.
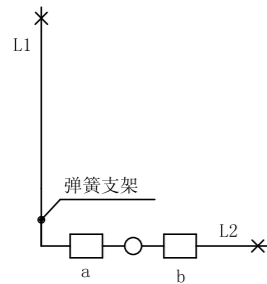
(2)L1段较短，L2段较长，只能L2段补偿。
L1 is shorter and L2 is longer. Only L2 can compensate
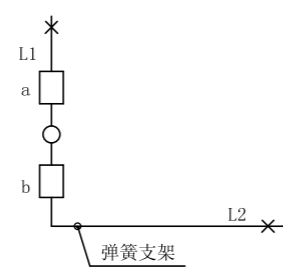
说明：

1、该形式一般布置在L1与L2段成90°，而且L1和L2高低差大于3倍管道外径D。

2、长管段补偿器必须与该管段在同一水平面上。如（1）中补偿器a与L1，(2)中补偿器b与L2。

3、管道左右转都可以布置，但应在在长管段上设弹簧支架（图示位置）。

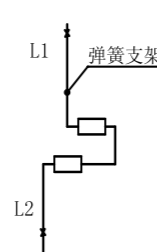4、安装时偏装量m等于补偿量的1/2，即△x/2。

Description:

1. the form of general layout in L1 and L2 segment into 90°, and L1 and L2 height difference is more than 3 times the pipe diameter D.

2. The long pipe segment compensator must be at the same level as the pipe segment. Such as (1) compensator a and L1, (2) compensator b and L2.

3. The pipes can be arranged in both left and right sides, but the spring brackets shall be set in the long tube section (graphic location).

4. When installing, the partial volume m is equal to 1/2 of the compensation, namely △ x / 2.

三、布置形式"AGXB-Π3"型
Arrange forms "AGXB-Π3"

（1）L1段与L2段在同一方向、同一直线上，两端同时补偿。
the L1 segment and L2 segment are in the same direction, the same line, and both ends are compensated simultaneously.
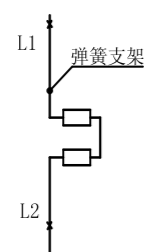
（2）L1段与L2段在同一方向不在一条直线上，两段同时补偿。
the L1 and L2 segments are not in the same direction in the same direction, and the two paragraphs are compensated simultaneously.

说明：

1、该形式一般布置在L1、L2段管线在同一方向上，L1和L2段高低差大于4倍管道外径D。

2、补偿器可以任意安装在管道的左右侧，但上管道必须安装弹簧支架。如补偿量过大时，上下支柱都必须设弹簧支架。

3、安装时偏装量m等于补偿量的1/2，即△x/2。

Description:

1. This form is usually arranged in the same direction of L1 and L2 sections. The difference between L1 and L2 is greater than 4 times the pipe diameter D.

2. The compensator may be installed on the left and right side of the pipe, but the upper pipe must be installed with spring support. If the amount of compensation is too large, the upper and lower pillars must have a spring bracket.

3. When installing, the partial volume m is equal to 1/2 of the compensation, namely △ x / 2.

四、布置形式"AGXB-Π4"型
Arrange forms "AGXB-Π4"

（1）L1段与L2段平行，成上下关系，
　　 L1段在L2段左边，两段同时补偿。
The L1 and L2 segment are parallel to each other，
The L1 segment is on the left side of L2 segment, and the two paragraphs are compensated simultaneously.
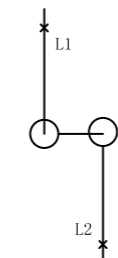
（2）L1段与L2段平行，成上下关系，
　　 L1段在L2段右边，两段同时补偿。
The L1 and L2 segments are parallel to each other
The L1 segment is on the right side of L2, and the two are compensated simultaneously.

说明：
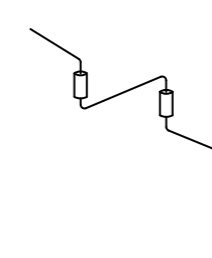
1、该形式一般布置在L1、L2段管线在同一方向上，不在一条直线且有高低差，L1和L2段高低差一般应大于6倍的管道外径D加2倍的产品长度以上。

2、L臂较长时，可以在L臂上设平面滑动支架。

3、安装时偏装量m等于补偿量的1/2，即△x/2。

Description:

1. This form is usually arranged in the same direction as L1 and L2 sections, not in a straight line and has a height difference. The difference between L1 and L2 is generally greater than 6 times of pipeline diameter D plus 2 times product length.

2. When the L arm is longer, a plane sliding bracket can be set on the L arm.

3. When installing, the partial volume m is equal to 1/2 of the compensation, namely △ x / 2.

五、布置形式"AGXB-Π5"型
Arrange forms "AGXB-Π5"

L1段在L2段的左侧，两段同时补偿。
L1 segment is on the left side of L2 segment, and the two paragraphs are compensated simultaneously.
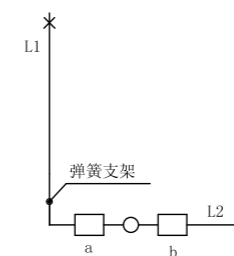
（2）L1段在L2段的右侧，两段同时补偿。
L1 is in the right side of L2 segment, and the two paragraphs are compensated simultaneously.

说明：
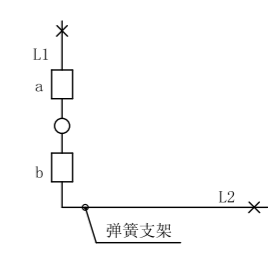
1、该形式一般布置在L1、L2段管线在同一方向上，不在一条直线且有高低差，L1和L2段高低差应大于4倍的管道外径D。

2、上管道必须安装弹簧支架。如补偿量过大时，上下支柱都必须设弹簧支架。

3、安装时偏装量m等于补偿量的1/2，即△x/2。

Description:

1. This form is usually arranged in the same direction as L1 and L2 sections, not in a straight line and has a height difference. The difference between L1 and L2 is generally greater than 4 times of pipeline diameter D.

2. The upper pipe must be installed with spring support. If the amount of compensation is too large, the upper and lower pillars must have a spring bracket.

3. When installing, the partial volume m is equal to 1/2 of the compensation, namely △ x / 2.

六、布置形式"AGXB–Ω1"型
　　Arrange forms "AGXB–Ω1"

"AGXB–Ω1"型一般在不可以布置成"AGXB–∏"型时再使用。因为该形式气流压力损失大，造价高，占用空间大，管段左右占用空间应大于4倍的管道外径D加产品长度，上部空间由设计计算的L值大小决定。

"AGXB – Ω 1" type is used when the arrange from "AGXB–∏" cannot be achieved. Because the pressure loss of the form is large, the cost is high and the space is large. The space should be more than four times the length of the pipe outside diameter D plus the product length. The upper space shall be determined by the L value of the design calculation.

（1）L1段和L2段在一条直线上。
The L1 and L2 segments are on a straight line.
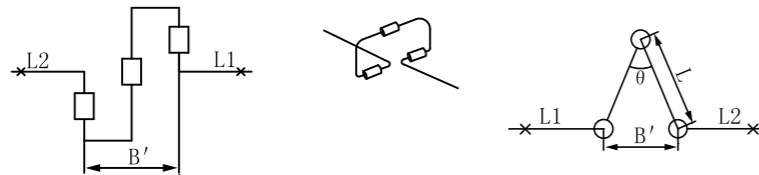
注明：B'为最小偏差值。
Note: B' is the minimum deviation value.

说明：

1、安装时应调整好最小偏差值B'距离，即B'≥补偿量△x+管道外径Dw+保温层双边厚度δ+施工空间（一般取70mm）。

2、根据工况情况，可选择上、下向或左、右向布置。

Description:

1. Minimum deviation value B 'distance should be adjusted at installation time.
Namely B'≥ compensation amount △x+ pipe diameter Dw + insulation layer bilateral thickness δ + construction space（Generally take 70 mm）。

2. According to the working conditions, select upper, bottom or left and right direction.

七、布置形式"AGXB–Ω2"型
　　Arrange forms "AGXB–Ω2"

"AGXB–Ω2"型同样一般在不可以布置成"AGXB–∏"型时再使用。因为该形式也是气流压力损失大，造价高，占用空间大，管段左右占用空间应大于5倍的管道外径D加产品长度，上部空间由设计计算的L值大小决定。

"AGXB – Ω 2" type is used when the arrange from "AGXB–∏" cannot be achieved. Because the pressure loss of this form is also large, the cost is high and the space is large. The space should be more than five times the length of the pipe outside diameter D plus the product length. The upper space shall be determined by the L value of the design calculation.

（1）L1段与L2段不在同一直线上。　注明：B'为最小偏差值。
L1 and L2 are not on the same line. Note: B' is the minimum deviation value.
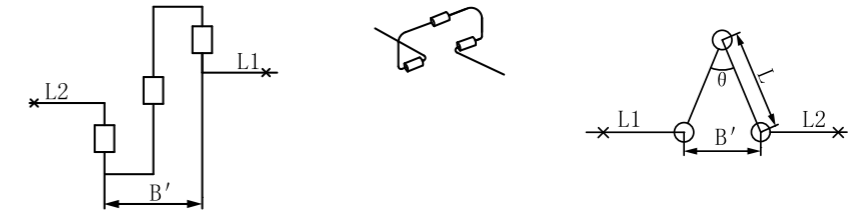
注明：B'为最小偏差值。
Note: B' is the minimum deviation value.

说明：

1、因L1与L2段不在同一直线上，所以补偿量增大，可在特殊情况下需要大补偿量时使用。

2、安装时应调整好最小偏差值B'距离，即B'≥补偿量△x+管道外径Dw+保温层双边厚度δ+施工空间（一般取70mm）。

3、根据工况情况，可选择上、下向或左、右向布置。

Description:

1. Because L1 and L2 are not in the same line, so the compensation amount is increased, this can be used when large compensation is required under special circumstances.

2. Minimum deviation value B 'distance should be adjusted at installation time.
Namely B'≥ compensation amount △x+ pipe diameter Dw + insulation layer bilateral thickness δ + construction space（Generally take 70 mm）。

3. According to the working conditions, select upper, bottom or left and right direction.

　　以上是本公司专利产品无推力旋转补偿器在热网中的一般布置形式，现场可以根据实际情况选用，当用于地下直埋管道补偿时，补偿器应置于铁箱式沉井中。如有不清楚之处，可以直接与本公司联系，本公司可以帮助设计选型。

The above is the general layout of the patented product––– no thrust rotary compensator––– in the heat network. It can be selected according to the actual situation of the site, and the compensator should be placed in the iron box caisson when it is compensated for underground direct buried pipeline. If there is not clear, you can contact the company directly. Our company can help design the selection.

◎其它相关说明 Other related instructions

1、安装注意事项 Installation considerations

（1）补偿器安装时应进行预偏装，"∏"型预偏装量为旋转角θ的一半或补偿量△x的1/2，并注意偏装方向，严禁装反；另应根据臂长L和旋转角θ计算出最大的离心径向摆动量△y，安装时靠近补偿器的管道支架必须保证有足够的径向位移位置；"Ω"型组合应调整好B距离。

（2）注填压紧式应检查注料口螺塞是否松动，如发现松动，应予以拧紧，并检查压注口内杆螺母标记应在关闭位置。

（3）补偿器的介质流向应从内管端进入，由壳体端流出，并应与管道介质流向取向一致。

（4）补偿器与管道及转臂连接应同轴，焊接时应用防护罩保护旋转内管。

（5）固定支架和滑动支架应按设计规定设置，导向支架应保证管道运行时自由伸缩，不得使管道偏离中心。

（6）每个补偿段只允许设置一组补偿器，补偿器在管系中，不得使其承担管道重量。

（7）严寒季节安装焊接时，应对所焊部位管端进行预热，以防止焊接后产生冷脆性。

（8）在管道进行水压试验之前，必须检查主、次固定管架是否按设计要求与管道的承载构件焊接牢固；对于气体介质管道，要考虑到注水时是否要增设临时管架。试压时，无论是分段或整体试压，管道的始端、尾端及拐弯处均需有效固定，以防应力伸长破坏固定点。

（9）水压试验应分段进行，试验合格后方可进行整体系统试压，试验压力为1.5倍工作压力或按设计部门规定的试验压力。升压时应按试验压力10%的梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升压时的应力变化。

（10）试压过程中若发现个别补偿器有渗漏，应对压盖法兰增加预紧力或加注密封填料。

（11）管道系统升温时，应按工作温度10%梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升温时的应力变化。

（12）在高架管道中安装使用补偿器应考虑焊接维修用工作平台，以便日后维修与保养补偿器之用。

（13）补偿器在运输、存放和安装时，应防止碰撞，宜存放在清洁、干燥和无腐蚀的地方。

(1) When installing, the compensator shall be mounted on the side in advance, "Π" type partial charge in advance is half of the rotation Angle θ or1/2 of the compensation amount △ x. Pay attention to the direction of installation, and do not install reversely; Calculate the maximum radial swing centrifugal momentum △ y based on arm length L and rotation Angle θ . When installed, must ensure there is sufficient radial displacement position for the pipe holder near the compensator. "Ω" combination type B distance should be adjusted.

(2) Filling and compaction type should check whether the screw plug is loose, if it is loose, it should be tightened and check that the screw nut should be closed.

(3) The media flow of the compensator should be entered from the internal pipe end and shall flow out from the end of the shell, and should be consistent with the flow direction of the pipe.

(4) The compensator shall be the same shaft as the pipe and the rotor connection, and the protective cover shall be applied to protect the rotating inner tube when welding.

(5) The fixed support and sliding bracket shall be set according to the design specification. The guide bracket shall ensure that the pipe is free and telescopic during operation, so that the pipeline shall not deviate from the center.

(6) Only one set of compensators is allowed in each compensation section, and the compensator is not allowed to bear the pipe weight in the piping system.

(7) During the installation of welding in the cold season, preheat the pipe ends of the welded part to prevent the cold brittleness after welding.

(8) Before the water pressure test is carried out in the pipeline, it is necessary to check whether the main and secondary fixed pipe frame is welded firmly to the bearing member of the pipeline according to the design requirements; for the gas dielectric pipe, it is important to consider whether to add a temporary tube holder. During the test pressure, the beginning, end and corner of the pipe should be fixed effectively, in case the stress elongation breaks the fixed point.

(9) The water pressure test should be performed in sections. The test pressure of the whole system can be carried out after the test. The test pressure is 1.5 times the pressure of work or the test pressure according to the design department. When the pressure is increased, the 10% gradient of the test pressure should be increased slowly by step by step, and stay for 20 minutes to allow the pipe to adapt to the stress change during the unpressured.

(10) If the individual compensator is found to be leaking during the test, the pre–tightening force or sealing filler should be added to the gland flange.

(11) When the piping system is heating up, the 10% gradient of the work temperature should be increased gradually, and then it will stay for 20 minutes so that the pipe can adapt to the stress change during heating.

(12) The installation and use of compensators in elevated pipelines should consider welding and maintenance work platforms for future maintenance and maintenance of compensators.

(13) When the compensator is transported, stored and installed, the collision should be prevented and stored in a clean, dry and non–corrosive place.

2、使用及维修

正常情况下使用寿命30年以上，如发现极个别补偿器泄漏，可在不停产状态下稍紧压盖螺栓或加注密封填料即可止漏。

Use and maintenance

Normally, the service life is more than 30 years. If a very individual compensator is found, it can stop the leakage by pressing the bolt or sealing filler under non–shutdown mode.

套筒补偿器
Sleeve compensator

本公司套筒补偿器（AGTB）是在老的套筒补偿器的基础上研制成功的一种新型补偿产品，其结构主要由内套筒（芯管）、外壳、密封装置及密封填料等组成，该套筒补偿器克服了老的套筒补偿器易泄漏、检修频繁、推力大的缺点，广泛在各行各业管网上使用。

直埋套筒补偿器（AGZMTB）各项性能特点与套筒补偿器相同，该产品是针对特殊工况即地下直埋管网的补偿而专门设计制造。

The sleeve compensator (AGTB) is a new type of compensation product which is developed on the basis of the old sleeve compensator. Its structure is mainly composed of inner sleeve (core tube), enclosure, sealing device and sealing filler, etc. This sleeve compensator overcomes the shortcomings of the old sleeve compensator for leakage, frequent overhaul and large thrust, and is widely used in various industries.

The performance characteristics of the straight buried sleeve compensator (AGZMTB) are the same as that of the sleeve compensator, which is specially designed and manufactured for the compensation of the special working condition namely the underground direct buried pipe network.

压紧式套筒补偿器
Compression sleeve compensator

注填式单向套筒补偿器
Filling type one–way sleeve compensator

直埋式套筒补偿器
Direct buried sleeve compensator

注填式双向套筒补偿器
Injection type two–way sleeve compensator

◎产品特点 Product features

1、设计紧凑，安装方便。

2、补偿能力大，投资费用低。直埋套筒补偿器采用先进的注压密封技术实现长期可靠密封免维护，可直接埋入地下，无需设立检修井。双向套筒补偿器可分别补偿两端相连管道的热变形量，补偿能力更大。

3、伸缩芯管表面采用耐磨高硬光滑保护涂层技术，提高抗磨损、耐腐蚀能力，大大降低了伸缩芯管的轴向运动阻力。

4、采用回弹性好、耐高温、防腐蚀、抗老化的柔性石墨复合密封材料，具有足够的密封面长度，保证了产品可靠密封。

5、芯管伸入外壳部分的末端设有牢固的防脱结构，保证当伸缩到极限位置不被拉开，使产品更具安全性。

6、内、外套筒间设有导向轴瓦，能承受管道侧向力，提高了内外套的定位、导向性能和工作稳定性。

7、针对直埋套筒补偿器安装在地下特殊使用环境，在产品结构设计上增设了防护套管、防护挡板，有效地减少了地下水和砂土进入补偿器的密封面，同时更有利于保温和产品正常工作。

8、安全性能高，使用寿命长，可达30年以上。

9、维修方便，可在正常工作情况下带温、带压进行检修。

1. Compact design and convenient installation.

2. Large compensation ability and low investment cost. The direct buried sleeve compensator adopts advanced injection sealing technology to realize the long–term reliable sealing and maintenance, which can be buried directly underground without the need to set up the main tenance well. The two – way sleeve compensator can compensate the heat deformation of the two connected pipes respectively, and the compensation ability is greater.

3. The surface of the retractable tube adopts wear–resistant and high hard smooth protective coating technology, which improves wear re sistance and corrosion resistance, and greatly reduces the axial movement resistance of the retractable core tube.

4. Flexible graphite composite sealing materials with good resilience, high temperature resistance, anti–corrosion and anti–aging, with suf ficient sealing length, ensure reliable sealing of products.

5. The core tube extends into the end of the shell part with a strong anti–stripping structure, which guarantees that the product will be more secure when stretching to the limit position.

6. The inner and outer sleeve is equipped with a guide bearing, which can withstand the lateral force of the pipeline and improve the posi tioning, guiding performance and working stability of the inner and outer sleeve.

7. In view of the buried sleeve compensator installed in underground special use environment, add the protective sleeve on the product structure design, protective barrier, effectively reduce the groundwater and soil into the sealing face of the compensator, at the same time, more conducive to heat preservation and products to work properly.

8. High safety performance, long service life, more than 30 years.

9. The maintenance is convenient, and can be carried out with temperature and pressure during normal working conditions.

◎ 适用范围 Scope of application

主要适用于管网中直线管道的辅设，其作用是补偿热力管道因热胀冷缩引起的轴向伸缩位移。

This paper mainly applies to the auxiliary setting of the straight pipe line in the pipe network, and its function is to compensate the axial expansion displacement caused by the thermal expansion of the thermal pipe.

◎ 产品专业术语 Product terminology

1、单向套筒补偿器：具有一个芯管构成的补偿器。

2、双向套筒补偿器：具有二个相对安装的芯管构成的补偿器。

3、直埋套筒补偿器：直接埋入地下安装在地下直埋管网中的补偿器。

1. One–way sleeve compensator: a compensator with a core tube.

2. Bidirectional sleeve compensator: a compensator with two relative mounting core tubes.

3. Direct buried sleeve compensator: a compensator directly embedded in the underground pipe network.

◎ 产品代号 Product code

AGTB □ □ — □□ — □□□□ — □

连接形式（H焊接；F法兰）Join form (H welding; F flange)
公称通径 Nominal diameter mm
公称压力 Nominal pressure
单、双向（S双向；不注为单向）Single, two–way (S two–way; one–way, if not noted)
产品结构（Z注填式；不注为压紧式）Product structure (Z filling type; Compression type, if not noted)
本公司套筒补偿器产品代号 The product code of the company's sleeve compensator

AGZMTB □ □ — □□ — □□□□ — □

连接形式（H焊接；F法兰）Join form (H welding;F flange)
公称通径 Nominal diameter mm
公称压力 Nominal pressure MPa
单、双向（S双向；不注为单向）Single, two–way (S two–way; one–way, if not noted)
产品结构（Z注填式；不注为压紧式）Product structure (Z filling type; Compression type, if not noted)
本公司直埋套筒补偿器产品代号 The product code of the company's directly buried sleeve compensator

例：公称通径500mm，公称压力2.5MPa，法兰连接的单向压紧式套筒补偿器，产品代号为：AGTB2.5–500–F。

Example: the nominal diameter of 500mm, nominal pressure 2.5mpa, the unidirectional compression sleeve compensator with flange con-nection, the product code is: AGTB2.5–500–F.

◎ 产品结构图 Product structure diagram

单向套筒补偿器 one–way sleeve compensator
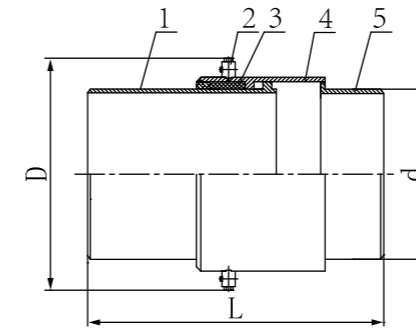
1、芯管 2、注填堵漏装置 3、注填特种填料
4、密封座 5、端接管注填式

1. Core tube 2, filling and plugging device 3, filling special packing 4, sealing seat 5, end pipe filling type
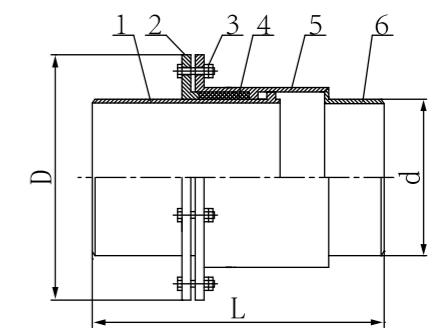
1、芯管 2、填料压盖 3、紧固件
4、柔性石墨填料 5、密封座 6、端接管压紧式

1. Core tube 2, filling and plugging device 3, filling special packing 4, sealing seat 5, end pipe filling type

2、双向套筒补偿器 Two–way sleeve compensator
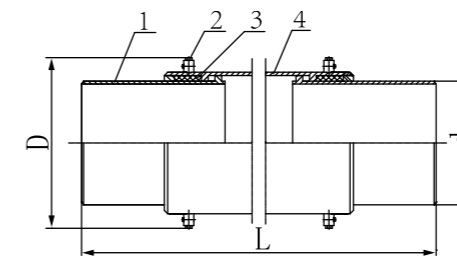
1、芯管 2、注填堵漏装置
3、注填特种填料 4、密封座注填式

1. Core tube 2, filling and plugging device 3, filling special filler 4, sealing seat filling type
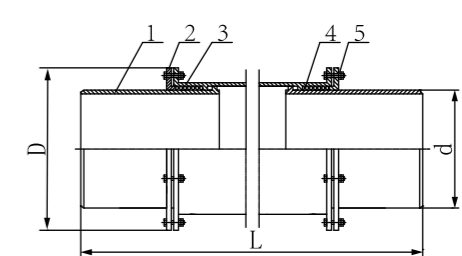
1、芯管 2、填料压盖
3、密封座 4、柔性石墨填料 5、紧固件压紧式

1. Core tube 2, packing gland 3, sealing seat 4, flexible graphite packing 5, fastener compression type

3、直埋套筒补偿器 The directly buried sleeve compensator
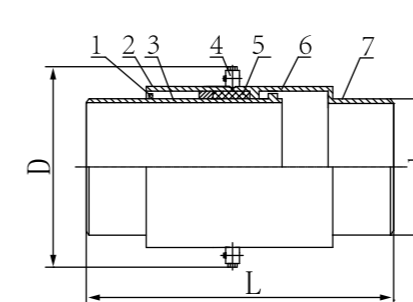
1、挡板 2、外护套 3、芯管 4、注填堵漏装
5、注填特种填料 6、密封座 7、端接管注填式

1. Baffle 2, outer sheath 3, core tube 4, filling block 5, filling special packing 6, sealing seat 7, end pipe filling type
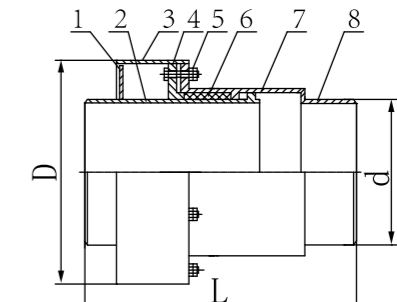
1、挡板 2、芯管 3、外护套 4、压盖
5、紧固件 6、柔性石墨填料 7、密封座 8、端接管压紧式

1. Baffle 2, core tube 3, outer sheath 4, pressure cover 5, fastener 6, flexible graphite packing 7, seal seat 8, end pipe compression type

◎ **产品主要性能指标 Product main performance index**

工作压力：0.6–30MPa

工作温度：–50℃–650℃

最大补偿量：单向500mm 双向1000mm

适用介质：热水、蒸汽、冷却水、循环水、其它流体

密封材料摩擦系数：≤0.15

使用寿命：可达30年以上

Working pressure: 0.6–30MPa

Working temperature: – 50 ℃ to 650 ℃

Maximum compensation: one – way 500mm two–way 1000mm

Applicable media: hot water, steam, cooling water, circulating water, other fluids

Friction coefficient of sealing material: ≤0.15

Service life: up to 30 years

◎ **订货须知 Ordering instructions**

1、提供公称通径、工作压力、工作温度、补偿量、流体介质及所需的产品型号和数量；

2、提供接管材质要求：根据使用情况和设计参数选定，一般与管道材质相同(20#或Q235B)，对芯管抗腐蚀能力有较高要求时选用不锈钢，如用户另有特殊要求可定制；

3、接口连接型式本公司常规产品为焊接式，如需法兰连接请提供法兰标准；

4、高温或低温、高压或负压或管线复杂、产品另有特殊要求本公司均可专门设计供货。

1. Provide the nominal size, work pressure, working temperature, compensation quantity, fluid media and required product models and quantities;

2. Material requirements of joint pipes: According to the usage and design parameters, it is generally the same as the pipeline material (20# or Q235B), and the stainless steel should be used when the corrosion resistance need of the core tube is high. If the user has special request, it can be customized.

3. The normal products of the interface connection type are welded, and flange standard should be provided for flange connection.

4. High temperature or low temperature, high pressure or negative pressure or complex pipeline, or special requirement for the product, the company can design the supply specially.

◎ **套筒补偿器的补偿原理 Compensation principle of sleeve compensator**

套筒补偿器工作原理是通过热力管道的热胀推力推动伸缩芯管在密封结构内沿管道轴线方向作相对直线伸缩运动来吸收热力管道轴向热位移，从而达到释放管道的热应力，保证管道的安全运行。

Sleeve compensator working principle: through the thermal expansion thrust of the thermal pipe, push the expansion core tube along the pipeline axis in the seal structure, the axial thermal displacement of the heat pipe is absorbed by the relative linear expansion motion, so as to achieve thermal stress release pipe, guarantee the safe operation of pipeline.

◎ **安装设计要点 Installation design highlights**

1、在管道的盲端、弯头、变截面处或装有各种阀门的部位或侧支管道进入主管道入口处，均都应设置主固定管架，由于在管线中安装套筒补偿器，在使用介质压力的作用下，上述各部位均承受盲板力作用，故在主固定管架强度和刚度设计时应予以充分地考虑。

2、在管网设计中除主固定管架之外，在两固定管架之间，根据需要设计若干个次固定管架，将管道分隔成若干个相对独立的单元，并计算典型单元管段工作膨胀量（参见无推力旋转补偿器补偿量计算部分），选择其补偿量相适应的补偿器，产品补偿量必须大于计算的管道补偿量，实行分区段补偿，且每区段只允许安装一个套筒补偿器。

3、因整条管道使用了若干个补偿器，尤其是次固定管架相邻两侧的补偿器的摩擦阻力值和管道与中间滑动管架之间的滑动摩擦阻力存在着不平衡性，由于这种不平衡力的存在，就要次固定管架能够承受足够的侧向推力，一般这种侧向推力的大小建议按所选择补偿器自身摩擦阻力的70%予以考虑。

4、因套筒补偿器在使用介质压力的作用下，会产生盲板力，为避免管道挠曲失稳、管线偏移，应按设计规定设置导向支架，同时为减小管段运行的摩擦阻力，在导向支架上应安放滚动支座。

5、套筒补偿器在管线中的安装位置应按设计要求进行安装，不可随意调整，单向补偿器外壳一侧距管道固定支架的距离不得大于4倍管道直径，伸缩管一侧距导向支架的距离不得大于6倍管道直径，以减少该管段的挠度变形。双向补偿器为保证两边补偿量相等，必须将补偿器安装在两固定支架中间。

6、用于地下直埋管道时，应设置补偿器井（直埋套筒补偿器除外），将补偿器安装在井中，并应两侧设置滑动管架支撑。

7、补偿器在管系中，任何时候不得使其承担管道重量。

8、本公司生产的补偿器其安装长度已留有室外最低温度的收缩量，均可按最大产品长度安装，无需预拉伸或预压缩。

1. In the blind end of the pipe, elbow and variable section or parts equipped with various valves or at the entrance where the side branch ducts enter into the main pipeline, all of them should set the main fixture. Due to the installation of a sleeve compensator in the pipeline, under the action of medium pressure, all of the above parts have the effect of blind plate force, so the strength and stiffness of the main fixture should be fully considered.

2. In the design of the pipe network, in addition to the main fixed pipe frame, between the two fixed pipe racks, a number of secondary fixed pipe racks are designed to separate the pipes into a number of relatively independent units. And calculate the expansion amount of typical unit pipe segment (see the calculation part of the compensator compensation for non–thrust rotary compensator), select the compensator which compensates for it. The product compensation must be greater than the calculated amount of pipe compensation, and the partition section compensates, and only one sleeve compensator is allowed per section.

3. As a number of compensators have been used for the entire pipeline, in particular, the friction resistance value of the compensator on both sides of the secondary fixed pipe support and sliding friction resistance between the intermediate sliding tube support are unbalance, because of this imbalance, the secondary fixed pipe support is required to withstand enough lateral thrust, generally, the size of this lateral thrust is considered as a consideration of 70% of the friction resistance of the compensator itself.

4. Because of under the action of the pressure of the medium, the sleeve compensator can produce blind plate force. In order to avoid buckling of pipe and pipeline deviation, guide bracket should be set according to design rules. At the same time, to reduce the friction resistance in the running of the tube, rolling support should be placed on the guide bracket.

5. The installation position of the sleeve compensator in the pipeline shall be installed according to the design requirements, you can't make any adjustments. The distance between the shell side of one–way compensator and pipe fixed support is not greater than 4 times the diameter of the pipe, and the distance of the telescopic tube to the guide bracket shall not be greater than 6 times the diameter of the pipe, in order to reduce the deflection of the pipe section. Two – way compensators shall ensure equal compensation for both sides, so the compensator must be installed between two fixed supports.

6. When used for underground pipe laying, the compensator well (except for buried sleeve compensator) shall be set up, and the compensator shall be installed in the well and shall be supported on both sides by sliding pipe support.

7. The compensator shall not bear the weight of the pipe at any time in the piping.

8. The installation length of the compensator produced by our company has left the outdoor minimum temperature shrinkage, and the compensator can be installed according to the maximum product length, without prestretching or pre–compression.

◎ **产品相关技术参数（注填式套筒补偿器）Technical parameters of products (filling type sleeve compensator)**

公称通径 Nominal Diameter DN (mm)	补偿量△x (mm) Compensation Value		接管外径 Adaptor Tube Outer Diameter d(mm)	最大外径 Maximum Outer Diameter D(mm)	产品长度 L(mm) Total Product Length		单向摩擦力KN Unidirectional friction	
	单向 A one–way	双向 Two–way			单向 A one–way	双向 Two–way	1.6MPa	2.5MPa
50	150	300	57	230	610	1070	1.72	3.25
65	150	300	76	250	610	1070	2.68	4.16
80	150	300	89	265	610	1070	3.42	5.18
100	150	300	108	280	610	1070	4.51	8.37
125	150	300	133	310	610	1070	5.23	10.52
150	250	500	159	335	810	1470	7.89	12.65
200	250	500	219	415	810	1470	13.10	21.17
250	250	500	273	465	860	1540	19.50	24.69
300	250	500	325	520	860	1540	24.72	39.20
350	250	500	377	570	860	1540	29.15	43.63
400	300	600	426	620	970	1760	37.63	59.34
450	300	600	480	670	970	1760	44.59	67.89
500	300	600	530	730	990	1800	52.16	76.59
600	300	600	630	830	990	1800	59.47	92.16
700	400	800	720	930	1280	2340	65.12	113.48
800	400	800	820	1030	1280	2340	78.37	139.12
900	400	800	920	1135	1280	2340	96.53	157.49
1000	500	1000	1020	1235	1550	2840	133.50	202.41
1100	500	1000	1120	1340	1550	2840	147.21	229.14
1200	500	1000	1220	1440	1550	2840	158.32	236.95

注：双向摩擦力是此表中单向的2倍
Note: Two–way friction is 2 times larger than the one–way in this table

● 法兰连接按GB/T 9119–2000标准供货，也可根据用户要求按其它标准供货。

Flange connection is supplied according to GB/T 9119–2000 standard, and can be supplied according to other standards.
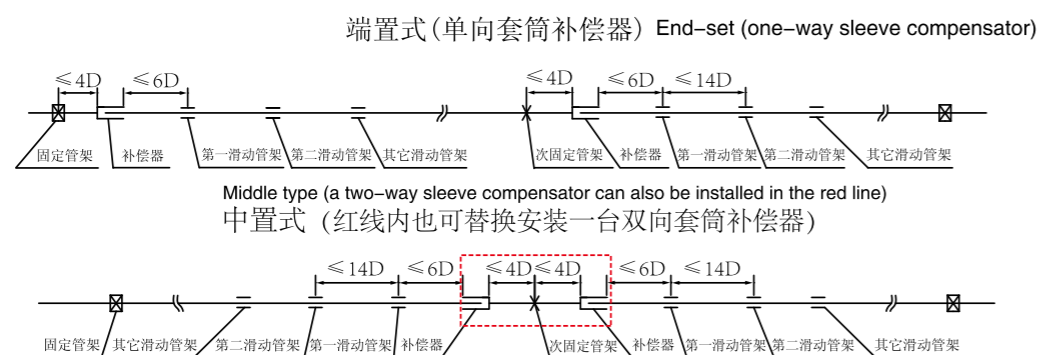
◎ **产品布置形式及安装维护注意事项** Product layout and installation maintenance precautions

（一）常用布置形式

根据补偿器在管线中的不同位置可分为端置式、中置式可参照下图：

General layout
According to the different position of the compensator in the pipeline, it can be divided into the end-setting type and the middle type , see the below:

端置式（单向套筒补偿器）End-set (one-way sleeve compensator)

| ≤4D | ≤6D | | ≤4D | ≤6D | ≤14D |
| 固定管架 | 补偿器 | 第一滑动管架 | 第二滑动管架 | 其它滑动管架 | 次固定管架 | 补偿器 | 第一滑动管架 | 第二滑动管架 | 其它滑动管架 |

Middle type (a two-way sleeve compensator can also be installed in the red line)
中置式（红线内也可替换安装一台双向套筒补偿器）

◎ **安装维护注意事项** Installation and maintenance precautions

1、安装前应检查补偿器的型号、规格是否与管道施工设计图纸相符，伸缩管表面有无损伤，注填式应检查注料口螺塞是否松动，如发现松动，应予以拧紧，并检查压注口内杆螺母标记应在关闭位置，若补偿器补偿量大装有固定杆应先予以拆除。

2、补偿器在管线中的安装位置应按设计要求进行安装，不可随意调整，单向补偿器外壳一侧距管道固定支架的距离不得大于4倍管道直径，伸缩管一侧距导向支架的距离不得大于6倍管道直径，以减少该管段的挠度变形。

3、双向补偿器为了保证两边补偿量相等应将补偿器布置在两固定支架中间。

4、单向补偿器安装方向：端置式宜按管道介质流向从伸缩管端进入，由壳体端流出；中置式宜与管道热胀方向取向一致。

5、固定支架和滑动支架应按设计规定设置，导向支架应保证补偿器运行时自由伸缩，不得偏离管道中心。

6、补偿器与管道连接应同轴，同轴度应不大于3mm，可采用先将管道连接好后再取样截掉与补偿器长度相等的管段的方法来安装补偿器，严禁以补偿器的变形来强行调校相接管道的安装超差，以免影响补偿器的正常工作，增加管道设备支撑结构载荷。

7、补偿器在安装过程中应对伸缩管部件加强保护，不得用硬件划伤金属表面，在补偿器与管道对焊时不得在伸缩管滑动部位引弧、搭铁线。

8、及时清除附着在伸缩管表面的沙粒或脏物，在管道做保温防护前应对补偿器做简易保护，不得裸露，以防止认为地碰、砸、刮伤，保温材料不得阻碍滑动部件的正常工作。

9、严寒季节安装焊接时，应对所焊部位管端进行预热，以防止焊接后产生冷脆性。

10、补偿器在管道进行水压试验之前，必须检查主、次固定管架是否按设计要求与管道的承载构件焊接牢固；对于气体介质管道，要考虑到注水时是否要增设临时管架。试压时无论是分段或整体试压，管道的始端、尾端及拐弯处均需有效固定，以防应力伸长破坏固定点。

11、水压试验应分段进行，试验合格后方可进行整体系统试压，试验压力为1.5倍工作压力或按设计部门规定的试验压力。升压时应按试验压力10%的梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升压时的应力变化。

12、试压过程中若发现补偿器有渗漏现象应对压盖法兰增加预紧力或加注密封填料。

13、管道系统升温时，应按工作温度10%梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升温时的应力变化。

14、在高架管道中安装使用补偿器应考虑焊接维修用工作平台，以便日后维修与保养补偿器之用。

15、补偿器在运输、存放和安装时，应防止碰撞，宜存放在清洁、干燥和无腐蚀的地方。

1. Before installation, check whether the model and specification of the compensator are in conformity with the design drawings of the pipeline. Whether there is any damage on the surface of the telescopic pipe, check whether the plug of the filling type is loose. If loose, it should be tightened. Nut mark of the inner rod of pressure injection opening should be at the closed position. If the compensator is large, the fixed rod should be removed first.

2. The installation position of the compensator in the pipeline shall be installed according to the design requirements, you can't make any adjustments. The distance between the shell side of one-way compensator and pipe fixed support is not 4 times greater than the diameter of the pipe, and the distance of the telescopic tube to the guide bracket shall not be 6 times greater than the diameter of the pipe, in order to reduce the deflection of the pipe section.

3. In order to ensure equal compensation on both sides, the compensator should be placed between two fixed supports.

4. Installation direction of unidirectional compensator: The pipe flow of the terminal type enters from the telescopic pipe end and flows out from the end of the shell. The middle setting should have the same direction as the pipe thermal expansion.

5. The fixed support and sliding bracket shall be set according to the design rules. The guide bracket shall ensure that the compensator is free to scale when run, and shall not deviate from the center of the pipe.

6. The compensator and pipe connection should be coaxial, and the coaxial degree should not be greater than 3mm. The compensator can be installed by connecting the pipe before sampling the pipe segment with the equal length of the compensator. It is strictly forbidden to use the compensator to adjust the installation of the connecting pipe, in order to avoid affecting the normal work of the compensator, increase the load of the pipe equipment supporting structure.

7. During installation of compensator, the protection of telescopic pipe parts should be strengthened. It is not allowed to use hardware to scratch the metal surface. It is not allowed to draw the arc and the wire in the retractable pipe when the compensator is welded to the pipe.

8. Remove sand or dirt attached to the surface of the telescopic tube in time. Before the pipe is insulated, the compensator shall be protected simply and shall not be exposed. To prevent artificially touching, smashing, scraping, and the insulation material shall not impede the normal work of sliding parts.

9. During the installation of welding in the cold season, preheat the pipe ends of the welded part to prevent the cold brittleness after welding.

10. Before the water pressure test of compensator in the pipeline, it is necessary to check whether the main and secondary fixed pipe frame is welded firmly to the pipe bearing member. For the gas dielectric pipe, it is important to consider whether to add a temporary tube holder. Whether it is the subsection or the whole test pressure, the beginning, end and corner of the pipe need to be fixed effectively in case the stress elongation destroys the fixed point.

11. The water pressure test should be performed in sections. The test pressure of the whole system can be carried out after the test. The test pressure is 1.5 times the pressure of work or the test pressure according to the design department. When the pressure is increased, the 10% gradient of the test pressure should be increased slowly by step by step, and stay for 20 minutes to allow the pipe to adapt to the stress change during the unpressured.

12. In the process of pressure test, if the compensator is found to be leaking, the gland flange should be increased the pre-tightening force or added sealing filler.

13. When the piping system is heating up, the 10% of gradient of the work temperature should be increased gradually, and then it will stay for 20 minutes so that the pipe can adapt to the stress change during heating.

14. The installation and use of compensators in elevated pipelines should consider welding and maintenance work platforms for future maintenance and maintenance of compensators.

15. When the compensator is transported, stored and installed, the collision should be prevented and stored in a clean, dry and non-corrosive place.

直流无推力套筒补偿器
Dc non–thrust sleeve compensator

压紧式
Compression type

注填压紧复合式
Compound type with filling and compression

直流无推力套筒补偿器（AGZLTB）是本公司针对普通套筒补偿器存有轴向推力而研制改进的一种新型补偿装置。

该产品结构设计是在单向套筒补偿器的原理上利用流体力学的平衡原理在伸缩内套筒与壳体之间设计了一环形活塞式平衡腔，活塞端面积与管道内截面积相等，其作用在凸台活塞端面的力与作用在管道端面(即盲板处) 的力大小相等、方向相反，使管道内介质压力所产生的流体反推力互相抵消，保持了管道的平衡状态，从而消除了由补偿器引起的轴向力。

The dc non–thrust sleeve compensator (AGZLTB) is a new kind of compensation device for the development and improvement of the axial thrust of the normal sleeve compensator.

The structure design of this product is based on the principle of a one–way sleeve compensator, which USES the equilibrium principle of flu–id mechanics to design a ring piston type balance cavity between the telescopic sleeve and the shell. The area of the piston is the same as the area of the pipe. The force acting on the end of a convex piston is equal and opposite to the force on the end of the pipe. The fluid thrust generated by the medium pressure in the pipeline counteracts each other and maintains the equilibrium state of the pipe, thus eliminating the axial force caused by the compensator.

◎产品特点 Product features

1、设计合理，结构紧凑，安装方便。

2、不产生内压推力或盲板力，补偿能力大，投资费用低。

3、伸缩芯管表面采用耐磨高硬光滑保护涂层技术，提高抗磨损、耐腐蚀能力，大大降低了伸缩芯管的轴向运动阻力。

4、采用回弹性好、耐高温、防腐蚀、抗老化的柔性石墨复合密封材料，具有足够的密封面长度，采用先进的密封技术，保证了产品长期可靠密封。

5、两端内、外套筒间设有导向轴瓦，能承受管道侧向力，提高了内外套的定位、导向性能和工作稳定性。

6、运行可靠，安全性能高，使用寿命长，可达30年以上。

7、维修方便，如发现极个别补偿器泄漏，可在不停产状态下稍紧压盖螺栓或加注密封填料即可止漏。

1.Compact and reasonable design and convenient installation.

2. Do not produce internal pressure thrust or blind plate force, with high compensation ability, and low investment cost.

3. The surface of the retractable tube adopts wear–resistant and high hard smooth protective coating technology, which improves wear resistance and corrosion resistance, and greatly reduces the axial movement resistance of the retractable core tube.

4. Flexible graphite composite sealing materials with good resilience, high temperature resistance, anti–corrosion and anti–aging, with suf ficient sealing length, ensure reliable sealing of products.

5. The inner of both ends and outer sleeve is equipped with a guide bearing, which can withstand the lateral force of the pipeline and im prove the positioning, guiding performance and working stability of the inner and outer sleeve.

6. High safety performance, long service life, more than 30 years.

7. The maintenance is convenient, and can be carried out with temperature and pressure during normal working conditions.

◎适用范围 Scope of application

主要适用于城市供热管网及地形复杂难以架设固定管道支座的管道轴向补偿。

This paper mainly applies to the urban heating pipe network, and the shaft compensate of the pipeline which is located at the complicated terrain and is difficult to erect the fixed pipe support.

◎产品代号 Product code

产品代号表示形式为 Product code form is：

AGZLTB □ □□ — □□□□—□

连接形式（H焊接；F法兰） Join form (H welding; F flange)

公称通径 Nominal diameter mm

公称压力 Nominal pressure MPa

产品结构(Z注填压紧复合式；不注为压紧式)
Product structure (Z filling type; Compression type, if not noted)

本公司直流无推力套筒补偿器产品代号
The product code of the company's Dc non–thrust sleeve compensator

例：公称通径500mm，公称压力2.5MPa，法兰连接的直流无推力套筒补偿器，

产品代号为：AGZLTB2.5—500—F。

Example: nominal diameter 500mm, nominal pressure 2.5 MPa, flange connected dc non–thrust sleeve compensator,
Product code: AGZLTB2.5—500—F.

◎产品主要性能指标 Product main performance index

工作压力：0.6–10 MPa

工作温度：–50℃–650℃

最大补偿量：500mm

适用介质：热水、蒸汽、冷却水、循环水、其它流体

密封材料摩擦系数：≤0.15

使用寿命：可达30年以上

Working pressure: 0.6–10 MPa

Working temperature: –50℃–650℃

Maximum compensation: 500mm

Applicable media: hot water, steam, cooling water, circulating water, other fluids

Friction coefficient of sealing material: ≤0.15

Service life: up to 30 years

◎订货须知 Ordering instructions

1、提供公称通径、工作压力、工作温度、补偿量、流体介质及所需的产品型号和数量；

2、提供接管材质要求：根据使用情况和设计参数选定，一般与管道材质相同(20#或Q235B)，对芯管抗腐蚀能力有较高要求时选用不锈钢，如用户另有特殊要求可定制；

3、接口连接型式本公司常规产品为焊接式，如需法兰连接请提供法兰标准；

4、高温或低温、高压或负压或管线复杂、产品另有特殊要求本公司均可专门设计供货。

1. Provide the nominal size, work pressure, working temperature, compensation quantity, fluid media and required product models and quantities;

2. Material requirements of joint pipes: According to the usage and design parameters, it is generally the same as the pipeline material (20# or Q235B), and the stainless steel should be used when the corrosion resistance need of the core tube is high. If the user has special request, it can be customized.

3. The normal products of the interface connection type are welded, and flange standard should be provided for flange connection.

4. High temperature or low temperature, high pressure or negative pressure or complex pipeline, or special requirement for the product, the company can design the supply specially.

◎直流无推力套筒补偿器的补偿原理 Compensation principle of dc non–thrust sleeve compensator

直流无推力套筒补偿器工作原理是通过热力管道的热胀推力推动伸缩芯管在密封结构内沿管道轴线方向作相对直线伸缩运动来吸收热力管道轴向热位移，从而达到释放管道的热应力，保证管道的安全运行。

Dc non–thrust sleeve compensator working principle: through the thermal expansion thrust of the thermal pipe, push the expansion core tube along the pipeline axis in the seal structure, the axial thermal displacement of the heat pipe is absorbed by the relative linear expan–sion motion, so as to achieve the release of thermal stress of pipe, guarantee the safe operation of pipeline.

◎ 安装设计要点、产品布置形式及安装维护注意事项
Installation design points, product layout and installation maintenance considerations

基本与单向套筒补偿器相同，重点区别是由于直流无推力套筒补偿器对主固定支架不产生附加的轴向推力，故设计主固定支架强度时无需计算补偿器内压推力，另外为避免直流无推力套筒补偿器自身重量使管道下垂，建议在其补偿器外壳下面安装支架支承。

Basically the same as a one-way sleeve compensator, the key difference is that the dc non-thrust sleeve compensator does not generate additional axial thrust for the main fixed bracket. Therefore, it is not needed to calculate the internal thrust of the compensator when designing the main fixed support strength. In addition, it is recommended to install bracket support under the shell of its compensator to avoid the weight of the dc non-thrust sleeve of the compensator itself.

◎ 产品相关技术参数（注填压紧复合式）
Technical parameters of products (filling type sleeve compensator)

公称通径 Inside Nominal Diameter DN (mm)	补偿量 Compensation Value Δx (mm)	接管外径 Adaptor Tube Outer Diameter d(mm)	最大外径 Maximum Outer Diameter D(mm)	产品长度 Total Product Length L(mm)
50	200	57	250	1460
65	200	76	280	1460
80	200	89	300	1460
100	200	108	320	1480
125	200	133	360	1480
150	300	159	390	1910
200	300	219	495	1970
250	300	273	570	1970
300	300	325	640	1970
350	300	377	720	1970
400	400	426	780	2410
450	400	478	865	2410
500	400	530	935	2430
600	400	630	1080	2430
700	400	720	1240	2450
800	500	820	1380	2880
900	500	920	1520	2900
1000	500	1020	1665	2900

● 法兰连接按GB/T 9119-2000标准供货，也可根据用户要求按其它标准供货。
Flange connection is supplied according to GB/T 9119-2000 standard, and can be supplied according to other standards.

万向球形补偿器
Universal spherical compensator

万向球形补偿器（AGWQB）是本公司在普通球形补偿器的基础上，研制改进的一种新型补偿装置，其功能是利用补偿器球体的角位移及旋转来吸收或补偿热力管道因热胀冷缩所产生的一个或多个方向上的尺寸变化或位移。

The universal spherical compensator (AGWQB) is a new type of compensation device based on the general spherical compensator. Its function is to use the angular displacement and rotation of the compensator sphere to absorb or compensate the dimensional change or displacement in one or more directions produced by thermal expansion condensation.

◎ 产品特点 Product features

1、设计安装简单方便，布置形式多样，有水平、垂直、倾斜等。
2、补偿量大，占用空间小，一般距离200-500米安装一组，所需补偿器和固定支架数量少，投资费用低。
3、球体可绕球心任意旋转，同时还可向任何方向折屈，可进行多个方向补偿。
4、自身平衡内压推力或盲板力，对固定支架作用力小，管道不存在失稳、水锤现象。
5、安全性能高，密封性能好，且具有耐高温、耐高压、抗腐蚀、回弹率高、摩擦系数小、使用寿命长，可达30年以上。
6、整体焊接，球体采用高强度结构，产品强度大大提高。
7、球体表面采用耐磨高硬光滑保护涂层技术，提高抗磨损、耐腐蚀能力，大大降低了球体转动摩擦阻力。
8、维修方便，可实现在正常工作情况下带温、带压随时进行检修。

1. The design and installation is simple and convenient, with various forms, such as horizontal, vertical and oblique.
2. Large amount of compensation, small footprint, general distance of 200 to 500 meters, the number of needed compensators and fixed supports is low, and investment costs are low.
3. The ball can be rotated around the center of the ball and can bend in any direction and compensate in several directions.
4. Self-balancing pressure or blind plate force, the force of fixed support is small, and the pipeline does not have unstable and water hammer phenomenon.
5. High safety performance, good sealing performance, high temperature resistance, high pressure, anti-corrosion, high resilience, small friction coefficient and long service life, can reach up to 30 years.
6. Overall welding, the ball adopts high strength structure and the product strength is greatly improved.
7. The surface of the ball adopts wear-resistant and high hard smooth protective coating technology, which improves wear resistance and corrosion resistance, and greatly reduces the friction resistance of the ball.
8. The maintenance is convenient, and can be carried out with temperature and pressure during normal working conditions.

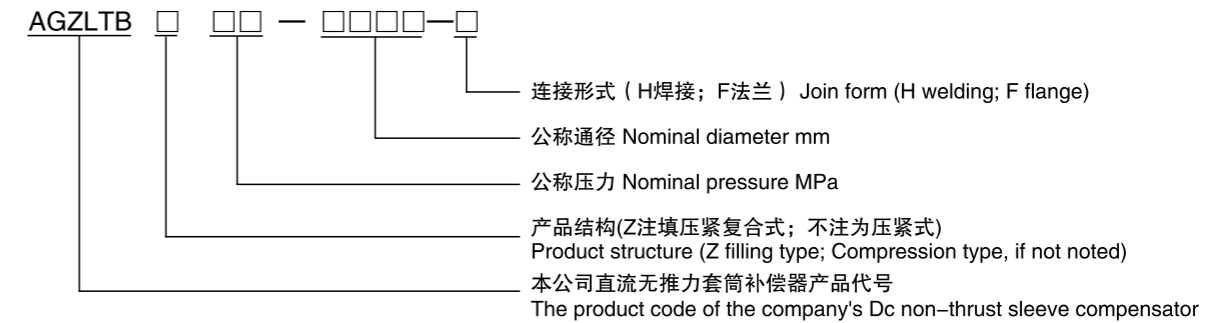## ◎ 适用范围 Scope of application

1、管网拐弯处。
2、地形复杂的山区或城市管网。
3、由于地基下沉或地震等原因引起管道变形的管网。
4、补偿量大而空间位置又受到限制的管网。
5、管线长，又要求压力损失小的管网。
6、跨过道路或桥梁等有特殊要求的管网。
7、需要限制接管载荷的敏感设备的进出口管道。
8、在管道中需要采用活动关节(万向接头)的管网。
9、特殊场合解决因各种原因而引起的管道变形。

1. Pipe net turning corner
2. The mountainous with complex terrain or city network
3. A pipe network with pipe deformation due to subsoil subsidence or earthquake
4. A pipe network with large compensation and limited space position
5. Pipeline is long and requires lower pressure loss
6. A network of pipes which cross the road or bridge and have special requirements
7. Import and export pipeline of Sensitive devices that need to limit take-over load
8. The pipe network which need the movable joint (universal joint) in the pipeline
9. Solve piping distortion caused by various causes in special occasions

◎ 产品代号 Product code

AGWQB □ □□ — □□□□ — □ — □

连接形式（H焊接；F法兰）Join form (H welding;F flange)

额定轴向折屈角° Nominal axial fold and bending angle°

公称通径 Nominal diameter mm

公称压力 Nominal pressure MPa

产品结构（Z注填式；不注为压紧式）
Product structure (Z filling type; Compression type, if not noted)

本公司万向球形补偿器产品代号
Product code of the company's universal spherical compensator

例：公称通径500mm，公称压力2.5MPa，额定轴向折屈角为30°，法兰连接的压紧式万向球形补偿器，产品代号为：AGWQB2.5–500–30°–F。
Example: nominal diameter 500 mm, nominal pressure 2.5 MPa, nominal axial fold bend Angle 30 °, flange connection compression type universal spherical compensator, product code: AGWQB2.5–500–30 ° F.

◎ 产品结构简图 A simplified product structure

1、端接管 2、壳体 3、注填堵漏装置
4、注填特种填料 5、球体内加强板 6、球体
注填式万向球形补偿器结构图

1. end joint tube 2, shell 3, filling and plugging device 4, filling special packing 5, ball strengthening plate 6, ball
Injection type universal spherical compensator structure diagram

1、端接管 2、壳体 3、柔性石墨填料
4、填料压盖 5、球体内加强板 6、球体
压紧式万向球形补偿器结构图

1. end joint tube 2, shell 3, flexible graphite packing 4, packing gland 5, ball strengthening plate 6, ball
The compact universal spherical compensator structure diagram

◎ 产品主要性能指标 Product main performance index

工作压力：0.6–30 MPa
工作温度：–50℃–650℃
折 屈 角：±15°
适用介质：热水、蒸汽、冷却水、循环水、其它流体
密封材料摩擦系数：≤0.15
使用寿命：可达30年以上

Work pressure: 0.6–30 MPa
Working temperature: –50℃–650℃
Fold bending Angle: ±15°
Applicable media: hot water, steam, cooling water, circulating water, other fluids
Friction coefficient of sealing material: ≤0.15
Service life: up to 30 years

◎ 订货须知 Ordering instructions

1、提供公称通径、工作压力、工作温度、折屈角、流体介质及所需的产品型号和数量；

2、提供接管材质要求：根据使用情况和设计参数选定，一般与管道材质相同(20#或Q235B)，对芯管抗腐蚀能力有较高要求时选用不锈钢，如用户另有特殊要求可定制；

3、接口连接型式本公司常规产品为焊接式，如需法兰连接请提供法兰标准；

4、高温或低温、高压或负压或管线复杂、产品另有特殊要求本公司均可专门设计供货。

1. Provide the nominal size, work pressure, working temperature, fold bending Angle , fluid media and required product models and quantities.
2. Material requirements of joint pipes: According to the usage and design parameters, it is generally the same as the pipeline material (20# or Q235B), and the stainless steel should be used when the corrosion resistance need of the core tube is high. If the user has special request, it can be customized.
3. The normal products of the interface connection type are welded, and flange standard should be provided for flange connection.
4. High temperature or low temperature, high pressure or negative pressure or complex pipeline, or special requirement for the product, the company can design the supply specially.

◎ 万向球形补偿器的补偿原理 Compensation principle of universal spherical compensator

球形补偿器工作原理是通过热力管道的热胀推力推动球头以球体回转中心自由转动，以达到吸收热力管道热位移，从而达到释放管道的热应力，保证管道的安全运行。其工作原理见图1：

Spherical compensator working principle: through the thermal expansion thrust of the thermal pipe, push the ball to rotate freely at the center of the sphere, the axial thermal displacement of the heat pipe is absorbed, so as to release achieve thermal stress of pipe, guarantee the safe operation of pipeline. Its working principle is shown in figure 1:

图1 球形补偿器工作原理图
FIG. 1 working principle diagram of spherical compensator

由图1可推出最小球心距L计算公式：

$$L_{min} = \Delta x / 2\sin(\theta/2)$$

另由图可知当球型补偿器球体角位移至0.5θ折屈角时，补偿器存有最大径向摆动y值，故当补偿器垂直布置时，补偿器相邻的滑动管架应选用弹簧支吊架；当补偿器水平布置时，补偿器相邻的滑动管架应选用平面滑动管架，最大摆动y值计算公式为：

$$y= L [1-\cos(\theta/2)]$$

The formula for calculating the minimum pitch L calculation is shown in figure 1:

$$L_{min} = \Delta x / 2\sin(\theta/2)$$

In addition, it can be seen that when sphere Angle of spherical compensator moves to 0.5θ fold bending Angle, the compensator has the maximum radial oscillation y value, Therefore, when the compensator is arranged vertically, the sliding pipe rack adjacent to the compensator should be used for spring hanger. When the compensator level is arranged, the sliding pipe rack adjacent to the compensator shall choose the plane sliding pipe rack, and the maximum swinging y value calculation formula is:

$$y= L [1-\cos(\theta/2)]$$

◎ 安装设计要点 Installation design highlights

1、设计时一般先计算最小球心距L长，最小球心距L应根据预先设计的折屈角θ及补偿量Δx（参见无推力旋转补偿器补偿量计算部分）计算选取。由最小球心距计算公式可知当许用的最大折屈角θmax一定时，吸收热胀量随着球心距L的加大而增加，为了使正常工作的折屈角θ＜θmax，应使实际球心距长度大于计算长度，一般取计算值的1.3倍左右，而且还要参照实际布置空间的大小，使其尽量靠近弯头以减小弯头的弯矩载荷。

2、球头的最大折屈角 θ 本公司设计为 ±15° ，试算一下当 θ ≤15° 时能否满足管道补偿要求，如果满足则可按图2形式布置无需预拉；反之则应按图3形式布置，应对球补进行预拉，调整球头到所需初始安装角度，同时还需注意安装的球体角位移折屈角 θ 不超过产品规定的角度，试算一下应使初始安装角度能够满足管道补偿要求。

1. Indesign, the minimum pitch length is generally calculated first. The minimum centre distance L should be calculated according to the advanced and designed fold bending Angle θ and compensation amount Δ x (see no thrust rotating compensator compensation quantity calculation part) . It can be seen from the calculation formula of the minimum spherical distance that when the maximum Angle of fold bending Angle θ max is certain, the absorption of thermal expansion increases with the increase of pitch L, in order to get the θ < θ max under normal working condition, the length of the actual ball distance should be greater than the length of calculation. The average calculation value is about 1.3 times, and the size of the actual layout space should be taken as close to the elbow as possible to reduce the bending moment load of the elbow.

2. The maximum fold bending Angle θ of the ball is ±15° , try work it out whether when θ ≤15° can meet the requirements of pipeline compensation, if satisfied, it can be arranged according to figure 2 without prepositioning; if not satisfied, it can be arranged according to figure 3 with prepositioning; Adjust the ball head to the required initial installation Angle, it is also important to note that the ball angular displacement fold bending angle θ is not exceeding the specified Angle of the product. Try to calculate the initial installation Angle to meet the pipe compensation requirements.
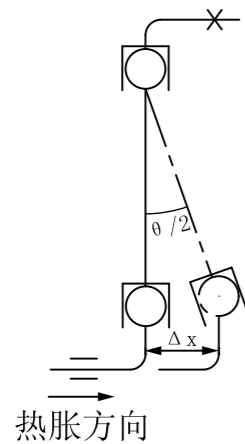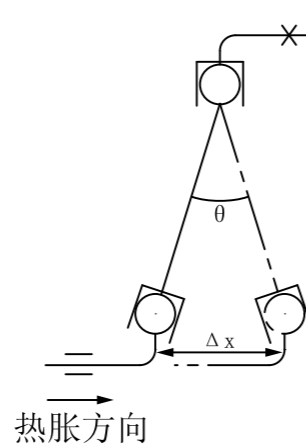

图2 零预折屈角
FIG. 2 zero prefolding bending Angle

图3 初预折屈角
FIG. 3 preliminary fold bending Angle

3、球形补偿器必须两只或三只组合使用，才可起补偿作用。单只球型补偿器没有补偿能力，只能作万向活动接头使用。

4、一个补偿段只允许设置一组补偿器，不允许在一个补偿段内与其它类型的补偿器混用。

5、严禁用本补偿器承受管道自身的重量。

6、因球型补偿器补偿量大，所以固定支架的个数相应减少，需补偿的管段增长，为避免长距离管道挠曲失稳、管线偏移，应设置增加导向支架，同时为减小管段运行的摩擦阻力，在导向支架上应安放滚动支座。

3. Spherical compensators must be used by two or three combinations to compensate. Single ball compensator has no compensation ability and can only be used for universal contact.

4. A compensation section is only allowed to set up a set of compensators and that are not allowed to be mixed with other types of compensators in a compensation section.

5. It is strictly forbidden to bear the weight of the pipe with this compensator.

6. Due to the large compensation amount of spherical compensator, the number of fixed supports should be decreased accordingly. The growth of the pipe that needs to be compensated, in order to avoid deflection instability and pipeline deviation of long distance pipeline, an increase guide bracket should be set. At the same time, to reduce the friction resistance in the running of the tube, rolling support should be placed on the guide bracket.

◎ 产品相关技术参数（注填式）Technical parameters of the product (Filling type)

公称通径 Inside Nominal Diameter DN (mm)	接口管径 Interface Pipe Diameter d(mm)	最大外径 Maximum Outer Diameter D(mm)	产品长度 Total Product Length L(mm)	摩擦力矩(KN.M) Friction torque			
				1.0 MPa	1.6 MPa	2.5 MPa	4.0 MPa
50	57	255	200	0.07	0.12	0.23	0.29
65	76	280	220	0.14	0.23	0.41	0.58
80	89	300	240	0.32	0.51	0.82	1.28
100	108	335	260	0.54	0.86	1.34	2.16
125	133	385	300	1.04	1.67	2.61	4.18
150	159	415	340	1.52	2.43	3.80	6.08
200	219	495	400	2.16	3.46	5.39	8.63
250	273	570	475	5.29	8.46	12.44	19.90
300	325	640	570	7.85	12.56	18.47	29.56
350	377	700	600	10.40	16.63	24.46	39.13
400	426	790	720	13.37	21.40	31.46	50.34
450	480	870	770	24.32	38.91	57.22	91.56
500	530	940	830	26.02	41.63	61.21	97.94
600	630	1090	960	45.07	72.11	106.05	169.67
700	720	1240	1120	70.91	113.45	166.83	266.93
800	820	1400	1280	92.55	148.08	265.82	348.42
900	920	1510	1380	124.95	199.90	293.97	470.36
1000	1020	1710	1600	153.26	245.21	360.60	576.95

● 法兰连接按GB/T 9119-2000标准供货，也可根据用户要求按其它标准供货。

Flange connection is supplied according to GB/T 9119-2000 standard, and can be supplied according to other standards.

◎ 产品布置形式及安装维护注意事项 Product layout and installation maintenance precautions

（一）球型补偿器一般可分为垂直布置和水平布置。根据补偿器在管线中不同的位置可分为端置式、中置式可参照下图：

(一) Spherical compensators can be divided into vertical layout and horizontal layout. According to the different position of the compensator in the pipeline, it can be divided into the end-setting type and the middle type, see the below:
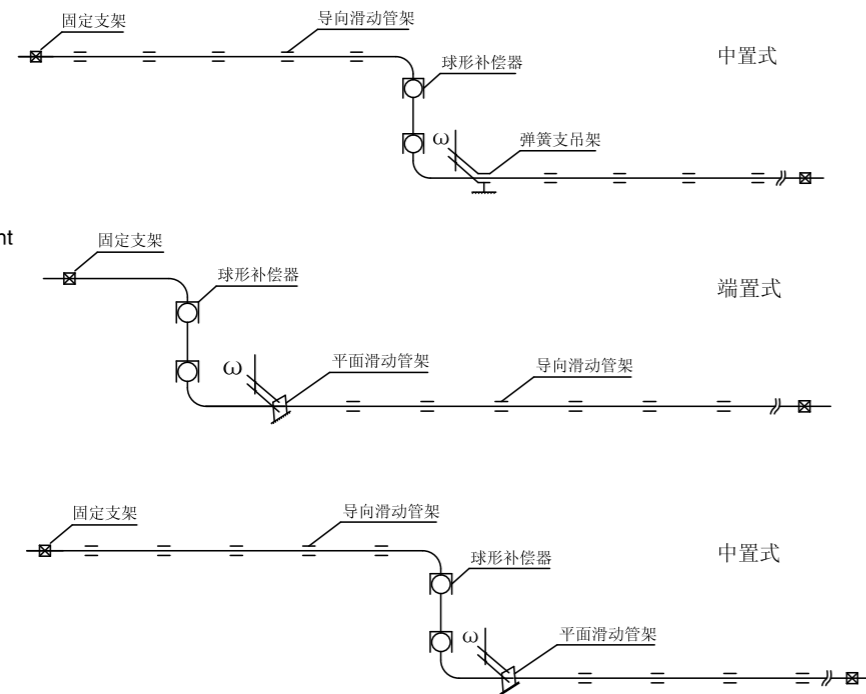
1、垂直布置
Vertical arrangement
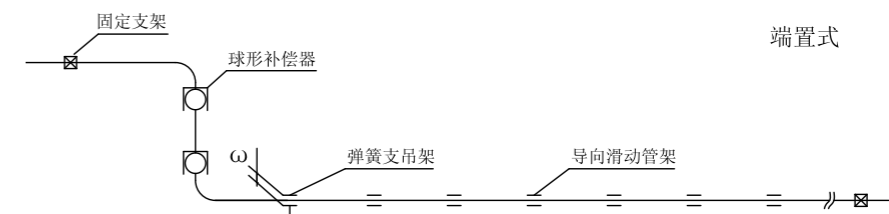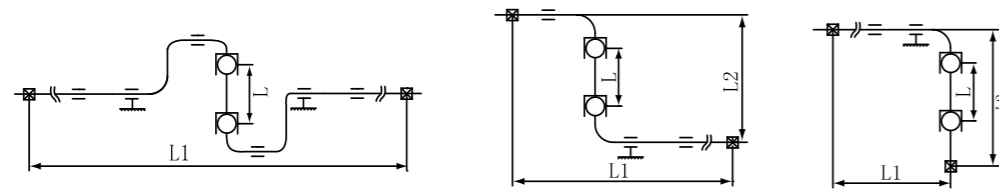
2、水平布置
Horizontal arrangement

（二）产品具体应用
球形补偿器常用于"┐"、"Z"形管道段，有单向补偿和多位补偿之分。
(1)用于单向补偿，常见的管道具体布置方法如图所示：

Product specific application
Spherical compensator is often used to "┐", "Z" shaped pipe section. There are one-way compensation and multiple compensations.
For one-way compensation, the specific layout of the pipeline is as shown in the figure:

单向补偿适用于L2管段较短（L2≤7m）的管道，主要用于吸收或补偿L1管段的热变形量。
(2)用于两位补偿，常见的管道具体布置方法如图所示：

One - way compensation applies to L2 pipe (L2≤7m) which is shorter, mainly used to absorb or compensate the heat deformation of L1 pipe segment.
For two compensations, the specific layout of the pipeline is shown in the figure:
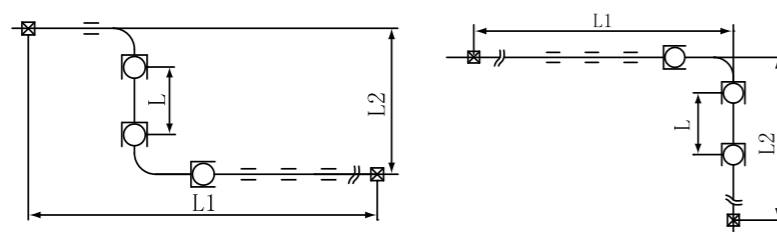
两位补偿适用于L2稍长（L2≤15m）的管段，由三只球形补偿器构成一组，安装在L2管段上的两只球形补偿器主要用于吸收或补偿L1管段的热变形量，安装在L1管段的球形补偿器和L2管道上相邻的球形补偿器构成一组，主要用于吸收或补偿L2管段的热变形量，在条件许可的情况下，两球补的球心距L尽可能取大一些，以增大其补偿能力。
(3)用于空间多位补偿，常见的管道具体布置方法如图所示：

The two compensations are applicable to longer pipe of L2 (L2≤15m), and a set is composed of three spherical compensators. The two spherical compensators installed on the L2 pipe segment are mainly used to absorb or compensate the thermal deformation of L1 pipe segment. The spherical compensator installed in the L1 pipe segment and the spherical compensators adjacent to the L2 pipeline constitute a group, mainly used to absorb or compensate the thermal deformation of L2 pipe segment. In the case of conditional permission, the ball distance between the two balls should be as large as possible to increase its compensation ability.
For the space multi-compensation, the detailed layout of the pipeline is as shown in the figure:
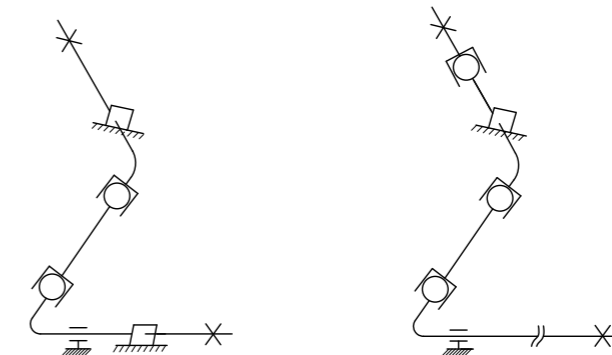
空间多位补偿主要解决管道在三维方向上的热变形，适用于管系较为复杂的场合，便于安装和使用。
以上是本公司AGWQB型万向球形补偿器在热网中的一般布置形式，现场可以根据实际情况选用，当用于地下直埋管网时，需将球形补偿器安装到补偿器井中。如有不清楚之处，可以直接与本公司联系，本公司可以帮助设计选型。

The space multiple compensation mainly solves the heat deformation of the pipe in the three-dimensional direction, which is suitable for the installation and use of the more complicated cases.
The above is the general layout of AGWQB universal spherical compensator in the heat network. It can be selected according to the actual situation of the site, and the spherical compensator must be installed in the compensator well when it is compensated for underground direct buried pipeline. If there is not clear, you can contact the company directly. Our company can help design the selection.

（三）安装维护注意事项
　　1、球形补偿器可垂直布置和水平布置。当垂直布置时球头应向下，以便防止灰尘和雨水进入球头和轴球瓦的工作面；当水平布置时，为避免球形补偿器自身重量使管道下垂，建议设置平台，在球形补偿器下面或在球型补偿器间的管段下面安装低摩擦滑动支座支承。
　　2、球形补偿器安装时，应根据可能出现的最低气温和安装时的温度将球体调整到所需要安装的角度，并与球心距管段组成一体，再安装到管道中，且球形补偿器要尽可能靠近球头，使实际球心距长度大于计算的球心距，对于需初预折屈角的产品，应注意折屈方向。
　　3、球形补偿器与管道连接应同轴，与管道安装必须符合国家关于热力管道安装施工的有关技术规范要求。
　　4、当补偿器垂直布置时，补偿器相邻的滑动管架应选用弹簧支吊架；当补偿器水平布置时，补偿器相邻的滑动管架应选用平面滑动管架。
　　5、球形补偿器的固定支架和滑动支架应按设计规定设置，导向支架应保证管道运行时自由伸缩，不得偏离中心，靠近补偿器的管道支架必须保证有足够的径向位移位置。
　　6、球型补偿器的介质流向应从球头端进入，由壳体端流出，并应与管道介质流向取向一致。
　　7、严寒季节安装焊接时，应对所焊部位管端进行预热，以防止焊接后产生冷脆性。
　　8、注填式球形补偿器安装后，应检查注料口螺塞是否松动，如发现松动，应予以拧紧，并检查压注口内杆螺母标记应在关闭位置。
　　9、球形补偿器在管道进行水压试验之前，必须检查主、次固定管架是否按设计要求与管道的承载构件焊接牢固；对于气体介质管道，要考虑到注水时是否要增设临时管架。试压时，无论是分段或整体试压，管道的始端、尾端及拐弯处均需有效固定，以防应力伸长破坏固定点。

10、水压试验应分段进行，试验合格后方可进行整体系统试压，试验压力为1.5倍工作压力或按设计部门规定的试验压力。升压时应按试验压力10%的梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升压时的应力变化。

11、试压过程中若发现补偿器有渗漏现象应对压盖法兰增加预紧力或加注密封填料，即可止漏。

12、管道系统升温时，应按工作温度10%梯度缓慢逐级梯增，并停留20分钟，以便让管道适应升温时的应力变化。

13、在高架管道中安装使用球形补偿器应考虑焊接维修用工作平台，以便日后维修与保养补偿器之用。

14、球形补偿器在运输、存放和安装时，应防止碰撞，注意保护球面，不应使其受到损伤并保持球面清洁。

1. Spherical compensator can be arranged vertically and horizontally. The ball head should be downward when the vertical arrangement is arranged to prevent dust and rainwater from entering the ball head and the working face of the shaft. When horizontal arrangement, to avoid the spherical compensator itself weight causes the pipe to sag, it is recommended to set the platform, under the ball type compensator or under the pipe section of the ball type compensator to install low friction sliding support.

2. When the spherical compensator is installed, the ball should be adjusted to the Angle required to be installed according to the possible minimum temperature and the temperature of the installation. And with the center of the ball and the tube, it is installed in the pipeline. And the spherical compensator should be as close to the bend as possible, and the actual distance of the ball distance is greater than the calculated center distance. For products that require initial folding bending Angle, pay attention to bending direction.

3. The spherical compensator and pipe connection shall be coaxial, and the installation of the pipe must conform to the relevant technical specification requirements of the state regarding the installation and construction of thermal piping.

4. When the compensator is arranged vertically, spring support should be selected for the sliding pipe rack adjacent to the compensator. When the compensator level is arranged, the sliding pipe rack adjacent to the compensator shall use the plane slip pipe rack.

5. The fixed support and sliding bracket of the spherical compensator shall be set according to the design specification. Guide bracket shall ensure that the pipe runs freely and is not deviated from the center. Sufficient radial displacement position must be ensured for the pipe bracket near the compensator.

6. The pipe flow of the ball type compensator enters from the telescopic pipe end and flows out from the end of the shell, and should have the same direction as the pipe thermal expansion.

7. When welding in the cold season, preheat the pipe ends of the welded part to prevent the cold brittleness after welding.

8. Filling ball type compensator should check whether the screw plug is loose, if it is loose, it should be tightened and check that the screw nut should be closed.

9. Before the water pressure test for ball type compensator is carried out in the pipeline, it is necessary to check whether the main and secondary fixed pipe frame is welded firmly to the bearing member of the pipeline according to the design requirements; for the gas dielectric pipe, it is important to consider whether to add a temporary tube holder. During the test pressure, the beginning, end and corner of the pipe should be fixed effectively, in case the stress elongation breaks the fixed point.

10. The water pressure test should be performed in sections. The test pressure of the whole system can be carried out after the test. The test pressure is 1.5 times the pressure of work or the test pressure according to the design department. When the pressure is increased, the 10% gradient of the test pressure should be increased slowly by step by step, and stay for 20 minutes to allow the pipe to adapt to the stress change during the unpressured.

11. If the individual compensator is found to be leaking during the test, the pre-tightening force or sealing filler should be added to the gland flange, you can stop the leak.

12. When the piping system is heating up, the 10% of gradient of the work temperature should be increased gradually, and then it will stay for 20 minutes so that the pipe can adapt to the stress change during heating.

13. The installation and use of compensators in elevated pipelines should consider welding and maintenance work platforms for future maintenance and maintenance of compensators.

14. When the ball type compensator is transported, stored and installed, the collision should be prevented and pay attention to the protection of the sphere and should not damage it and keep the sphere clean.

三维球形补偿器
Three-dimensional spherical compensator

三维球形补偿器（AGSWB）是本公司针对电厂锅炉煤粉管道的具体补偿特点，参照国内外先进技术推出的新型煤粉管道补偿器，满足了短安装距、多方位、大补偿的特殊要求。

该产品由二个球形结构元件和一个套筒结构元件所组成。球形结构元件作径向挠曲的角向位移，套筒结构元件作轴向位移。当两独立结构元件组合成一体时并形成能同时吸收三维膨胀量的肘节结构，吸收任意方向位移。

The three-dimensional spherical compensator (AGSWB) is a new pulverized coal pipe compensator, which aims at the specific compensation characteristics of coal powder pipe in power plant boiler and refer to domestic and foreign advanced technology, and meets the special requirement of short mounting distance, multi-bearing and large compensation.

The product consists of two spherical structural elements and a sleeve structure element. The spherical structure element is the angular displacement of radial deflection, and the sleeve structure element is axial displacement. When the two independent structural elements are combined together and form the cubital structure which can absorb the three-dimensional expansion amount at the same time, and absorb any direction displacement.

◎产品特点 Product features

1、结构紧凑，安装方便，占用空间小；2、偏转角度大，轴向位移大，短安装距，能有效地吸收锅炉较大的向下位移量；3、对设备不产生二次应力，运行可靠，满足了锅炉煤粉管道的三维补偿需要；4、采用回弹性好、耐高温、防腐蚀密封材料，具有足够的密封面长度，保证了产品可靠密封；5、安全性能高，使用寿命长；6、维修方便，可实现在正常工作情况下随时进行检修。

1. Compact structure, convenient installation and small footprint; 2. Large deflection Angle, large axial displacement and short mounting distance, can effectively absorb the larger downward displacement of the boiler; 3. No secondary stress is produced for the equipment, and the operation is reliable, which satisfies the three-dimensional compensation needs of the boiler coal powder pipe.4. Adopt resilient, high temperature and anti-corrosion sealing material with sufficient sealing length to ensure reliable sealing of products; 5. High safety performance and long service life;6. Maintenance is convenient and can be serviced at any time under normal working conditions.

◎适用范围 Scope of application

主要适用于电厂锅炉煤粉管道，其作用是吸收锅炉炉膛向下热胀量和炉膛的横向膨胀及送粉管道的热位移。

It is mainly applied to coal pulverized coal pipe in power plant, and its function is to absorb the heat of the boiler furnace and the horizontal expansion of the furnace and the heat displacement of the feed pipe.

◎产品主要性能指标 Product main performance index

1、适用介质：气粉混合物；2、工作温度：≤450℃；3、工作压力：≤0.6MPa；4、角向位移：±8°。

1. Applicable media: air powder mixture;2, work temperature: ≤450℃;3. Work pressure: ≤0.6MPa;4, Angle displacement: ±8°.

◎ 安装注意事项 Installation considerations

1、安装前，应先检查补偿器是否完好，内套筒、球体的工作表面有无损伤；2、补偿器要尽可能靠近燃烧器入口安装，使其主要吸收锅炉及煤粉管道的任意方向位移；3、补偿器安装应在其两边分别设置恒力吊架及固定支架，以保证补偿器正常工作；4、补偿器一般装设在燃烧器的水平或垂直送粉管道上。如水平安装，主要吸收锅炉向下位移量，即补偿器补偿角向位移量，此时应选用角向位移大、轴向位移小的补偿器，如垂直安装，主要也是吸收锅炉向下位移量，即补偿器补偿轴向位移量，此时应选用轴向位移大、角向位移小的补偿器；5、设计选型时，应尽可能增加补偿器的长度，减少角度补偿。

1. Before installation, check whether the compensator is in good condition and the working surface of the inner sleeve or sphere is damaged; 2. The compensator should be installed as close to the burner entrance as possible to make it mainly absorb the random displacement of the boiler and coal powder pipe; 3. The compensator installation shall be installed on both sides of the compensator to ensure the normal work of the compensator. 4. The compensator is usually installed in the horizontal or vertical feeder line of the burner. If horizontal installation, it mainly absorbs the downward displacement of the boiler, namely the displacement of the compensation Angle of the compensator, at this time, the Angle displacement of large and compensator which has small axial displacement should be selected. If vertical installation, it mainly absorbs the downward displacement of the boiler, namely the displacement of the compensation Angle of the compensator, at this time, the axial displacement of large and compensator which has small angular displacement should be selected; 5. During design selection, the length of the compensator should be increased to reduce the Angle compensation.

◎ 产品相关技术参数 Related technical parameters of product

公称通径 Inside Nominal Diameter DN (mm)	轴向位移量 Axial Displacement Compensation Δx (mm)	接管外径 Adaptor Tube Outer Diameter d(mm)	最大外径 Maximum Outer Diameter D(mm)	产品长度 Total Product Length L(mm)
DN 200	100	219	385	1200
DN250	100	273	450	1200
DN300	150	325	510	1300
DN350	150	377	560	1300
DN400	200	426	620	1400
DN450	200	480	680	1400
DN500	300	530	730	1500
DN600	350	630	840	2000

注：1、表内数据仅供参考，本公司可按用户技术数据及要求设计生产。 2、角向位移、轴向位移补偿量大，产品长度需相应加长。

Note: 1. The data in the table is for reference only. The company can design and manufacture according to user technical data and requirements. 2. The offset of angular displacement and axial displacement is large, and the length of the product needs to be lengthened accordingly.

膨胀节主要零件材料的选用
Selection of main parts materials of Expansion joint

◎ 根据介质条件选择波纹管材料
Selection of bellows materials according to medium conditions

介质或应用装置 Media or applications	波纹管材料 Corrugated pipe material	备　注（相当于国内材料牌号）Remarks(equivalent to the domestic material number)
水（氯离子含量≤25ppm）Water (chloride ion content)	SUS304	SUS304 Be equal to 相当于0Cr18Ni9 SUS304L Be equal to 相当于00Cr19Ni10 SUS316 Be equal to 相当于0Cr17 Ni12MO2 SUS316L Be equal to 相当于0Cr17 Ni14 MO2 SUS312 Be equal to 相当于0Cr18 Ni11Ti INCONEL600 Be equal to 相当于GH600
蒸 汽 Steam	SUS316、316L	
空 气 Air	SUS304	
热空气 Hot air	SUS316、316L	
二氧化碳 Carbon dioxide	SUS316、316L	
石 油 Petroleum	SUS316、316L	
海 水 Seawater	SUS316、316L(内衬聚四氟乙烯)、254MO Lined PTFE	
煤气、液化石油气 Gas, liquefied petroleum gas	SUS304、304、316、316L	
热交换装置 Heat exchanger	SUS304、304L、316、316L、321、INCONEL600、625 INCOLOY800、800H、825	
催化、裂化高温装置 Catalytic, cracking high temperature device	SUS321、B315、INCONEL600、625 INCOLOY800H	

◎ 根据工作温度选择波纹管、内衬筒、接管、法兰材料
According to the working temperature selection of corrugated pipe, tube, pipe, flange lining material

零件 Spare parts ＼ 工作温度℃ Work temperature	−45~−5	>−5~350	>350~450	>450~600	>600
波纹管 Bellow	304、316	304、316	304、316、321	321、INCONEL	INCOLOY、B315
内衬筒 Lining tube	16Mn、20	Q235−A/B、20	16MnR、20g	304、316	304、321
接管、法兰 Adapter、flange					

膨胀节零件材料的选择须按照具体工况条件，以上述两个原则为主，辅以其它条件、因素全面考虑进行。

The selection of parts materials for expansion joints shall be based on the conditions of the specific working conditions, and the above two principles shall be given priority to, supplemented by other conditions and factors.

各类膨胀节对管系及管架设计的要求
Design requirements of piping and pipe rack of various expansion joints

　　合理地设计管路系统的支座，是保证膨胀节正常发挥作用的必要条件，不同类型的膨胀节对于管系的支座有不同的要求。

The reasonable design of the base of the piping system is necessary to ensure the normal functioning of the expansion section. Different types of expansion joints have different requirements for the support of the piping system.

◎ 轴向型膨胀节 Axial expansion joint

　　1.安装轴向型膨胀节的管段，在管道的盲端、弯头、变截面处、装有截止阀或减压阀的部位及侧支管线进入主管线的入口处，都要设置固定支架。管道处这些部位外，可设计中间固定支架。主固定支架要考虑波纹管静压推力（Fp）和变形弹性力（Fx）的作用。中间固定支架不考虑压力推力的作用。

　　(1) 静压推力计算公式：

　　　　　式中：F_p—— 轴向压力推力（N）

$F_p = 100 \times P \cdot A$ 　　　　　A—— 波纹管的有效面积（cm^2）

　　　　　　　　　　P—— 此管架管道的最高压力(Mpa)

　　(2) 轴向弹性计算公式：

　　　　　式中：F_x—— 轴向弹性力（N）

$F_X = f \cdot K_x \cdot X$ 　　　　　K_x—— 轴向刚度（N/mm）

　　　　　　　　　　X—— 实际轴向补偿量（mm）

　　　　　　　　　　f—— 系数、有预变形时f=1/2（f=0.5）；无预变形时f=1

　　2.在管段的两个固定管架之间，仅能设置一个轴向型的膨胀节。

　　3.固定支架和导向支架的分布，推荐按右图配置：

　　D为管道的公称通径，膨胀节一端应靠近固定支架，

　　两固定支架之间间距过长，须设置导向支架，距离如图所示：

1.Install the pipe section of the axial expansion section. Fixed brackets shall be installed at the blind end of the pipe, the bend, the variable section, the position of the cut–off valve or the pressure reducing valve and the side branch line into the entrance of the line. In these parts of the pipeline, the intermediate fixed support is designed. The main fixing bracket should consider the effect of the hydrostatic thrust (Fp) and the deformation elastic force (Fx). The intermediate fixed bracket does not consider the effect of pressure thrust.

Static thrust calculation formula

　　In the formula: Fp – axial pressure thrust (N)

$F_p = 100 \times P \cdot A$ 　　　　A – effective area of bellows (cm^2)

　　　　　　　　P – the maximum pressure of the pipe rack (Mpa)

Axial elastic calculation formula:

　　In the formula: Fx – axial elastic force (N)

$F_x = f \cdot K_x \cdot X$ 　　　　Kx – axial stiffness (N/mm)

　　　　　　　　X – actual axial compensation (mm)

　　　　　　　　F –– Coefficient, when predeformation is expected f=1/2 (f = 0.5);F =1 without predeformation

2. Between the two fixed pipe racks in the pipe section, only one axial type expansion section can be set.

3. The distribution of fixed support and guide bracket shall be recommended to be configured according to the right image:

D is the nominal size of the pipe, and the end of the expansion section should be close to the fixed bracket.

The distance between the two fixed supports is too long, and the guide bracket shall be set. The distance is as shown in the picture:
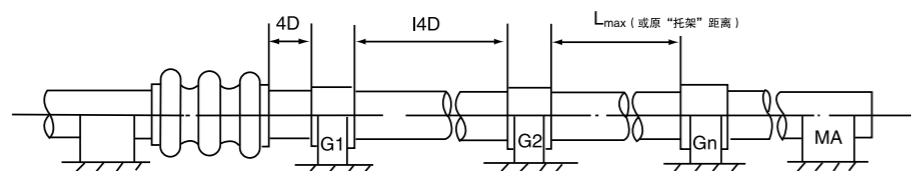
Lmax为其它导向支架的最大间距，可按下面公式计算：

$$L_{max} = 0.0157\sqrt{E \cdot I / (P \cdot A \pm K_x \cdot X_o)}$$

　　式中：L_{max}——最大的导向间距（m）

　　　　　E——管道材料弹性模量（N/cm^2）

　　　　　I——管道断面惯性距（cm4）

　　　　　K_x——膨胀节轴向刚度（N/mm）

　　　　　X_o——膨胀节额定位移量（mm）

　　当膨胀节压缩变形时，符号为"+"；拉伸变形时，符号位"–"。若管道壁厚按标准壁厚设计时。Lmax可按有关标准选取。

According to the working temperature selection of corrugated pipe, tube, pipe, flange lining material

$$L_{max} = 0.0157\sqrt{E \cdot I / (P \cdot A \pm K_x \cdot X_o)}$$

In the formula:Lmax – maximum guide spacing (m)

E – elastic modulus of pipeline materials (N/cm^2)

 I – pipe section inertial distance (cm^4)

Kx – axial stiffness of expansion joints (N/mm)

Xo – nominal displacement of expansion section (mm)

When the expansion section compresses deformation, the symbol is "+"; When drawing deformation, symbol bit "–" If the pipe wall thickness according to the standard wall thickness design. Lmax can be selected according to the relevant criteria.

◎ 横向型及角下型膨胀节 Transverse type and angular expansion joint

　　1.装在管道弯头附近的横向型膨胀节，

　　两端各设一导向支架，其中一个是平面导向支架，

　　其上下活动间隙公式计算：

$$\varepsilon = L - \triangle X - \sqrt{L^2 - \triangle y^2}$$

　　　　式中：ε——活动间隙（mm）

　　　　　　　L——膨胀节有效长度(mm)

　　　　　　　$\triangle X$——不包括L长度在内的垂直管段的热膨胀量（mm）

　　　　　　　$\triangle y$——水平管段热膨胀量（mm）

　　2.角向型膨胀节宜两个或三个为一组配套使用，用以吸收管道的横向位移。对Z型和L型管段的两个固定支架之间，只允许安装一个横向型膨胀节或一组角向型膨胀节。此时，平面铰链销的轴线必须垂直于弯曲管段形成的平面（一组万向角型膨胀节或万向铰链横向型膨胀节不受此限制）。装有一组铰链膨胀节的管段，其平面导向支座的间隙 ε 亦可按上式计算，只是L长度应是两膨胀节铰链之间的距离，△X是整个垂直管段的热膨胀量。

　　3.膨胀节两端的导向支座应接近膨胀节，支座的形式应使膨胀节能定向位移。

1. The horizontal expansion section in the vicinity of the pipe bend,
The two ends have a guide bracket, one of which is the planar guide bracket.
Its upper and lower active gap formulas are calculated:

$$\varepsilon = L - \triangle X - \sqrt{L^2 - \triangle y^2}$$

In the formula: ε ––activity gap (mm)

length of expansion joint(mm)

△ X – thermal expansion of vertical section of pipe (mm).not including L length

△ y – level section thermal expansion amount (mm)

2. The angular expansion joint should be used for two or three sets to absorb the transverse displacement of the pipe. Between the two fixed brackets for the Z and L segments, only one horizontal expansion joint or one set of angular expansion joints is allowed. At this point, the axis of the plane hinge pin must be perpendicular to the plane formed in the curved pipe segment (a group of universal angular expansion joints or universal hinge lateral expansion joints are not subject to this restriction).Joint section equipped with a set of hinged expansion , the gap of its planar guide support can be calculated as above, just L length should be the distance between the two expansion joint hinge, △ X is the thermal expansion of the vertical section.

3. The guide support at both ends of the expansion section should be close to the expansion section, and the form of support should be used to deflate the expansion energy.

膨胀节的安装和试压注意事项
Design requirements of piping and pipe rack of various expansion joints

1.安装前，应先检查波纹管膨胀节的型号、规格及管道的支座配置必须符合设计要求。

2.轴向补偿类型的波纹管膨胀节只吸收管线的挠性位移在安装时与管道应保持同心度。

3.对带内衬筒的膨胀节，应注意使内衬筒方向和介质流动方向一致（按膨胀节的流向标志安装）。

4.平面角向型膨胀节的铰链转动平面应与位移平面一致

5.需要进行"冷紧"的膨胀节，其预变形所用的辅助构件，应在管系安装完毕后拆除。

6.管系安装完毕应立即拆除膨胀节上用作安装运输保护的辅助定位机构及紧固件，并按设计要求将限位装置调到规定的位置，使管系在环境条件下有充分的补偿能力。

7.除设计要求预拉压或"冷紧"的预变形外，严禁用使波纹管变形的方法来调整管道的安装偏差，以免影响膨胀节的正常功能，降低使用寿命和增加管系、设备接管及支承构件的载荷。

8.膨胀节所有的活动元件不得被外部构件卡死或限制其活动部位正常动作。

9.安装过程中不允许焊渣飞溅到波纹管表面和使波纹管受到其它机械损伤。

10.对用于气体介质的膨胀节及其连接管道，作水压试验时，要考虑充水时是否需要对膨胀节的接管加设临时支架以承重。

11.水压试验用水必须洁净，无腐蚀性，并控制水中的氯离子的含量不超过25ppm。

12.水压试验结束后，应尽快排净波纹中的积水，并迅速将波壳的内表面吹干。

1. Before installation, the type, specification and support configuration of the bellows expansion section hall be checked and must meet the design requirements.

2. The axial compensating type of bellows expansion section only absorbs the flexible displacement of the pipeline and should maintain the same degree of concentricity with the pipe during installation.

3. In the expansion section of the tube with lining, the direction of the tube and the flow direction of the media should be considered in accordance with the flow direction of the expansion section.

4. The hinge rotation plane of the plane angular expansion joint shall be consistent with the displacement plane.

5. The "cold tight" expansion section and its auxiliary components used for predeformation shall be dismantled after the piping installation is completed.

6. After the installation of the piping, the auxiliary positioning mechanism and fasteners for the installation and transportation protection should be immediately dismantled. According to the design requirement, the limit device is transferred to the specified position so that the pipe system can be fully compensated under environmental conditions.

7. In addition to the design requirements for pre-tension or "cold tight" predeformation,it is forbidden to use the corrugated pipe deformation of pipe method to adjust the deviation, so as not to affect the normal function of the expansion joint, reduce the service life and increase the piping, equipment and supporting member to take over the load.

8. All movable elements of the expansion joint shall not be jammed by external components or shall not restrict the normal motion of the activity part.

9. During installation, the welding slag is not allowed to splash into the corrugated pipe surface and damaged by other mechanical.

10.For the expansion section of the gas medium and its connection pipe, when the water pressure test is made, it is necessary to consider whether it is necessary to set up a temporary bracket for the expansion joints to bear the weight when filling water.

11. Water pressure test must be clean, non-corrosive, and control the content of chlorine ions in the water does not exceed 25ppm.

12. After the hydrostatic test is over, the water should be discharged as soon as possible, and the inner surface of the wave shell should be blown dry quickly.
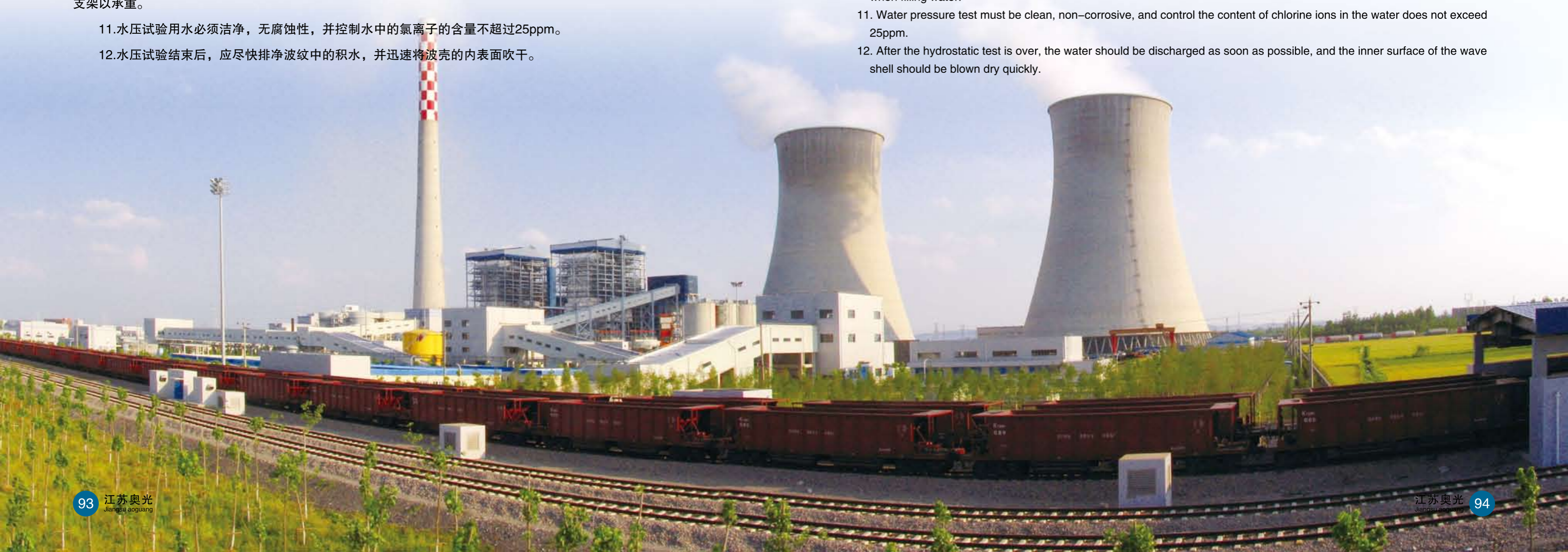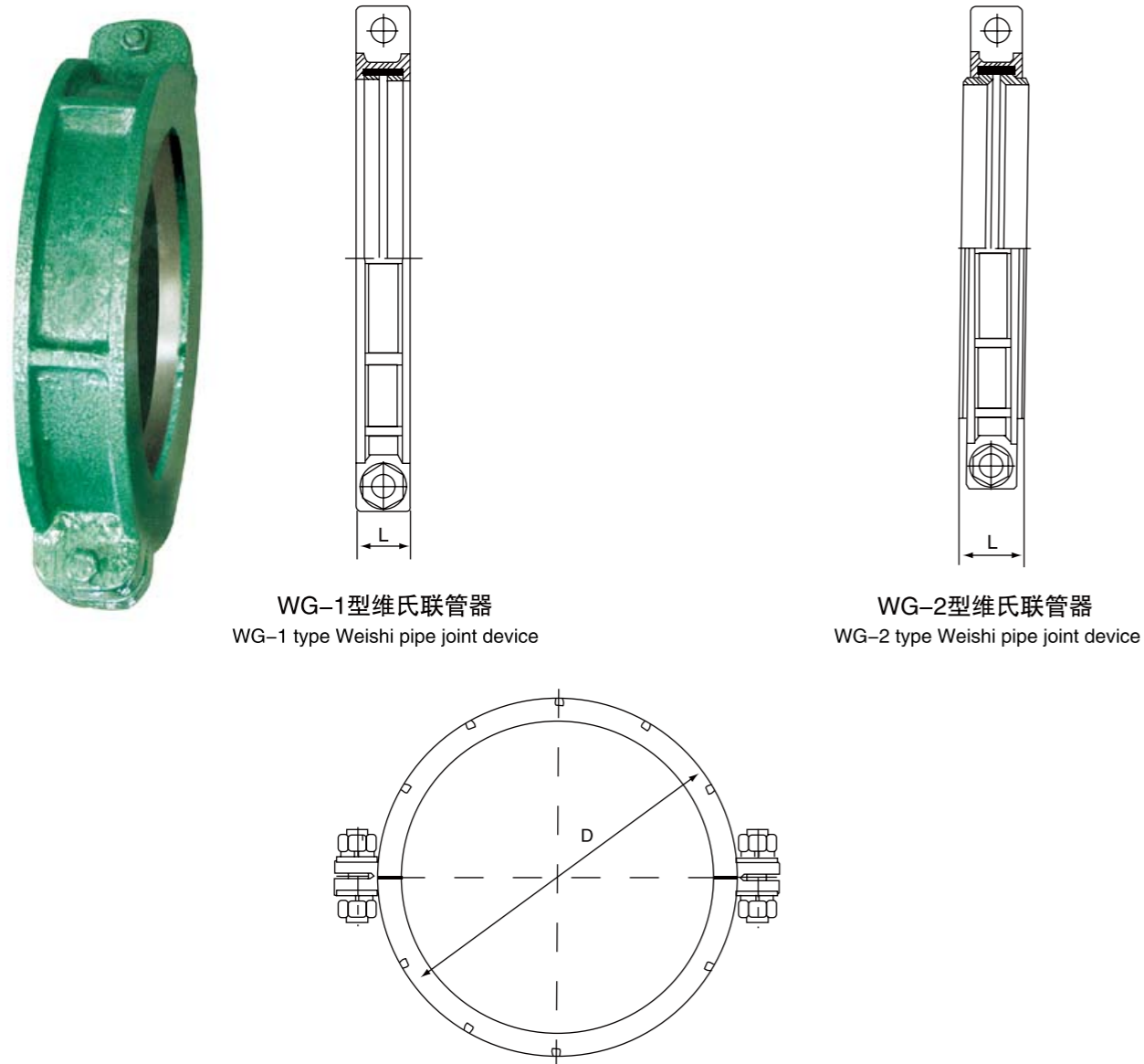
WG型维氏联管器
WG type Weishi pipe joint device

◎ **产品结构特点 Product structure characteristics**

WG型维氏联管器主要功能及工作原理与LG型洛氏联管相似，是利用密封圈的自紧力和介质压力进行密封的，结构紧凑，维护方便，重量轻，适用电站等锅炉煤粉管道以及其它具有多维变形补偿的场合。

The main function and working principle of WG Weishi pipe joint device is similar to the LG type Luoshi pipe joint device. It is sealed with the self–tightening force and medium pressure of the sealing ring, featuring compact structure, convenient maintenance and light weight. It can be applied to coal pulverized coal piping and other occasions with multi–dimensional deformation compensation.

◎ **结构简图 The structure diagram**

WG–1型维氏联管器
WG–1 type Weishi pipe joint device

WG–2型维氏联管器
WG–2 type Weishi pipe joint device

◎ **安装使用注意事项 Installation instructions**

1、在安装壳体时注意两半圆的同心度；
2、WG–1型联管器中的两只焊接圈分别焊在两连接管道端口的外圈上，焊接圈的两端平面须凸出管道端平面6 – 8mm留于焊接，堆焊高度须低于焊接圈的端平面。
3、密封圈须待焊接处冷却后装配；
4、密封圈在安装时严禁用尖锐物件碰击。

1. Note the concentricity of the two semicircle when installing the shell;
2. Two welding rings in the WG–1 coupling are welded to the outer ring of two connected pipe ends. The end plane of the welding ring shall be kept at the end of the pipe with the end of the pipe 6–8mm for welding, and the welding height shall be below the end plane of the welding ring.
3.The sealing ring shall be installed after the welding is cooled.
4. The sealing ring is strictly forbidden to hit with sharp objects during installation.

◎ **技术参数表 Technical parameter list**

角向补偿量：±2°　　　轴向补偿量：10mm　　　工作压力：0.35Mpa
Angular compensation：±2°　Axial compensation：10mm　Operating pressure：0.35Mpa

工作温度：　≤220℃　　适用介质：气（液）体，固体及其它混合物
Working temperature：≤220℃　Applicable media: gas (liquid) body, solid and other mixtures

型号 Model	接管外径 Adaptor Tube Outer Diameter d(mm)	壳体外径D Outer diameter of Shell mm	安装长度Lmm Installation Length	
			WG–1型 Type	WG–2型 Type
WG–10"	273	359	67	95
WG–12"	324	410	73	100
WG–14"	356	438	79	105
WG–377"	377	459	79	105
WG–16"	406	505	86	112
WG–426"	426	533	86	112
WG–17"	432	540	86	112
WG–450"	450	560	86	112
WG–18"	457	565	86	112
WG–480"	480	590	86	112
WG–20"	508	622	89	115
WG–530"	530	660	89	115
WG–22"	559	700	89	115
WG–580"	580	715	89	115
WG–24"	610	725	89	115
WG–630"	630	745	89	115
WG–650"	650	766	89	115
WG–30"	762	875	92	120
WG–1020"	1020	1190	130	160

LG型洛氏联管器
LG type Luoshi pipe joint device

◎ **产品结构特点** Product structure characteristics

LG型洛氏联管器，用于火力发电厂等锅炉送粉管路系统，其作用是补偿煤粉管道因热胀冷缩所引起的多维方向上的变形量，使锅炉冷壁与送粉管道相对胀缩自由灵活，对设备不产生二次应力，本产品主要利用两端伸缩管的角向位移和轴向位移来吸收多维方向的变形。

LG type Luoshi pipe joint device, used in boiler feed piping system for coal-fired power plants, its function is to compensate the deformation of the coal pulverized pipe in multidimensional direction caused by heat expansion and contraction, and to make the cooling wall of the boiler and the feeding pipe are relatively free and flexible. No secondary stress on the device and this product mainly uses the angular displacement and axial displacement of the two end telescopic tubes to absorb the multi-dimensional deformation.

◎ **安装使用注意事项** Installation instructions

1、本产品的密封件为特殊橡胶制品，在管连接焊接时，焊接温度对密封件影响较大，故在连接焊接时须采取降温保护措施。

2、两端伸缩管镀铬表面须保持清洁，不得有锐器碰伤现象，否则影响密封性能。

3、本产品在使用若干年后发现密封圈处有泄漏现象，可均匀地拧紧法兰拉杆螺母，便可排除泄漏。若拧紧法兰螺母不能排除泄漏时，可能密封圈材料老化，应更换密封圈。

1. The sealing parts of this product are special rubber products. When connecting the welding, the welding temperature has a great influence on the sealing parts, so it is necessary to take the cooling protection measures when connecting welding.
2. The chrome surface of the telescopic pipe at both ends shall be kept clean, and no sharp device shall be damaged, otherwise the sealing performance shall be affected.
3. After years of use, this product will find leakage in the sealing ring, and tighten the flange rod nut evenly to eliminate leakage. If the flange nut cannot be shut out, the sealing ring material may be aged and the sealing ring should be replaced.

◎ **技术参数表** Technical parameter list

介质压力：0.35Mpa
工作温度：≤220℃
角向补偿量：±4°
轴向补偿量：40mm
适用介质：气（液）体，固体及其它混合物

Medium pressure：0.35Mpa
Working temperature：≤220℃
Angular compensation：±4°
Axial compensation：40mm
Applicable media: gas (liquid) body, solid and other mixtures

型号 Model	接管外径 Adaptor Tube Outer Diameter d(mm)	最大外径 Maximum Outer Diamenter D(mm)	安装长度Lmm Installation Length
LG-219	219	350	700
LG-10"	273	400	700
LG-12"	324	460	700
LG-377	377	505	700
LG-426	426	560	750
LG-17"	432	570	750
LG-450	450	585	750
LG-18"	457	593	750
LG-480	480	618	750
LG-500	500	632	800
LG-20"	508	645	800
LG-530	530	666	800
LG-22"	559	705	800
LG-580	580	725	800
LG-24"	610	750	844
LG-630	630	768	844
LG-650	650	790	844
LG-30"	762	902	844

矩形手动风门
Rectangular Manual Air Door

矩形电动风门
Rectangular Electric Air Door

烟气脱硫挡板门
Flue Gas Desulfurization Damper

固定支座
Fixed Support

隔热型滑动支座
Heat Insulation Type
Sliding Support

弯头滑动导向支座
Elbow Type
Sliding Support

双轴方风门
biaxiality Square Air Door

圆形风门
Rounded Air Door

手动、电动风门
Manual / Electric Air Door

恒力弹簧支吊架
Constant Force Spring
Suspension and Support

固定支座
Fixed Support

弹簧支吊架
Spring Suspension and Support

闸板阀
Sluice Valve

双缸电动隔绝风门
Double Cylinder Electric
Isolation Air Door

可调缩孔
Adjustable Shrinkage Hole

恒力弹簧支吊架
Constant Force Spring
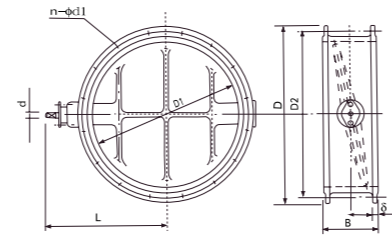Suspension and Support

可变弹簧组件
Variable Spring
Components

恒力弹簧支吊架
Constant Force Spring
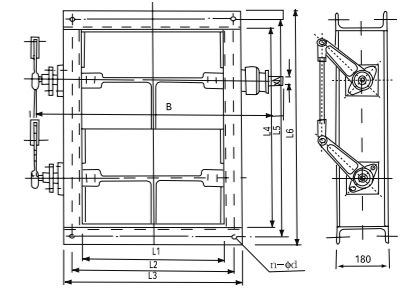Suspension and Support

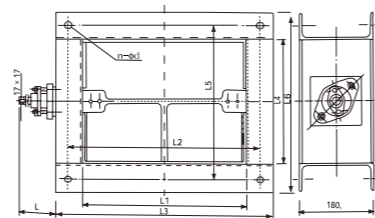**滚动支架**
Rolling Support

圆风门 / Circular damper

标号 Marking	公称通径 Inside Nominal Diameter DN	D	D₁	D₂	B	L	δ	d	d₁	螺栓孔数 (n) Bolt Hole Number	重量 Weight kg
					mm						
DD4101	100	195	100	160	80	177	14	Φ15	14	4	7.2
DD4102	150	250	150	215	80	238	14			8	12.3
DD4103	200	305	200	270		270	16				16.1
DD4104	250	365	260	370		300	16		14		21.1
DD4105	300	430	310	385	90	342	18			12	45.4
DD4106	350	480	360	435	90	367	18	17×17			51.2
DD4107	400	535	410	490		392					64.1
DD4108	450	585	460	540	180	417				16	70.8
DD4109	500	645	520	600	180	447	20				82.9
DD4110	600	745	620	700		497	20		18		99.6
DD4111	700	850	710	800		570					178.9
DD4112	800	950	810	900		620				20	603
DD4113	900	1050	910	1000	260	670	22				232.7
DD4114	1000	1150	1010	1100	260	720	22	32×32			267.1
DD4115	1100	1250	1110	1200		790				24	362
DD4116	1200	1350	1210	1300		840			22		408
DD4117	1300	1450	1310	1400	300	890	24			24	446
DD4118	1400	1550	1410	1500	300	940	24			28	484

单轴方风门 / Single shaft square damper

标号 Marking	公称通径 Inside Nominal Diameter DN	L₁	L₂	L₃	L₄	L₅	L₆	L	d	螺栓孔数 (n) Bolt Hole Number	重量 Weight kg
								mm			
DD4201	300×400	390	460	526	300	360	436			18	55.7
DD4202	300×500	490	560	626						20	64
DD4203	300×600	590	660	726						22	70.2
DD4204	300×700	690	760	826						24	77.4
DD4205	400×500	490	560	626	400	460	536	124	14	22	71.1
DD4206	400×600	590	660	726						24	77.4
DD4207	400×700	690	760	826						26	84.6
DD4208	400×800	790	860	926						28	97.4
DD4209	500×600	590	660	726	500	560	636			26	88.6
DD4210	500×800	790	860	926						30	109.7
DD4211	500×1900	890	960	1026						32	116.9
DD4212	500×1000	990	1074	1126					18	28	123.8

双轴方风门 / Biaxial square damper

标号 Marking	公称通径 Inside Nominal Diameter DN	L₁	L₂	L₃	L₄	L₅	L₆	B	D	螺栓孔数 (n) Bolt Hole Number	重量 Weight kg
							mm				
DD4213	600×700	690	760	826	600	660	736	1079.5	14	30	130.3
DD4214	600×800	790	860	926		660		1179.5		32	141.4
DD4215	600×900	890	974	1026				1279.5		28	153.4
DD4216	700×500	490	560	626	700	674		879.5	18		119
DD4217	700×700	690	760	826		760	836	1079.5			137.5
DD4218	700×800	790	874	926	700	774		1179.5	14	32	153.5
DD4219	800×800	790	874	1344			936	1631		30	166
DD4220	800×1200	1190	1274	1744	800	874		2031	18	32	251.8
DD4221	800×1600	1590	1674	526			954	779.5		38	313.8
DD4222	900×400	390	460	826		960	1036	1079.5	14	44	160.7
DD4223	900×700	690	774	1344	900			1079.5		30	157.9
DD4224	900×1200	1190	1274	726		974	1054	1631		38	271.3
DD4225	1000×600	590	674	826				979.5		30	156.9
DD4226	1000×700	690	774	944			1136	1079.5	18	32	171.1
DD4227	1000×800	790	874	1144	100	1074		1231		34	237.9
DD4228	1000×1000	990	1074	1144			1154	1431		36	260.4

三轴方风门 / Three-axis square damper

标号 Marking	公称通径 Inside Nominal Diameter DN	L₁	L₂	L₃	L₄	L₅	L₆	B	螺栓孔数 (n) Bolt Hole Number	重量 Weight kg
							mm			
DD4229	1200×600	1200	1274	1354	590	674	744	1031	34	238.6
DD4230	1200×700				690	774	844	1131	36	253.4
DD4231	1200×800				790	874	944	1231	38	294.6
DD4232	1200×1000				990	1074	1144	1431	40	324.4
DD4233	1200×1200				1190	1274	1344	1631	44	348.4
DD4234	1400×700	1400	1474	1554	690	774	844	1131	40	282.4
DD4235	1400×800				790	874	944	1231		321.2
DD4236	1400×900				890	974	1044	1331	42	336.3
DD4237	1400×1000				990	1074	1144	1431	44	351.2
DD4238	1400×1200				1190	1274	1344	1631	48	387.2
DD4239	1500×800				790	874	944	1231		334.7
DD4240	1500×900				890	974	1044	1331	42	349.9
DD4241	1500×1000	1500	1574	1654	990	1074	1144	1431	44	364.8
DD4242	1500×1200				1190	1274	1344	1631	48	406.8

四轴方风门
Four–axis square damper

标 号 Marking	公称通径 Inside Nominal Diameter DN	L₁	L₂	L₃	L₄	L₅	L₆	B	D	螺栓孔数 (n) Bolt Hole Number	重 量 Weight kg
		mm									
DD4243	1600×1000	1600	1674	1764	990	1074	1154	1633	18	46	544.2
DD4244	1600×1200				1190	1274	1354	1833		50	581
DD4245	1600×1400		1678		1390	1478	1554	2033		46	623.1
DD4246	1600×1600				1590	1678	1754	2233	22		692.9
DD4247	1800×900	1800	1874	1964	890	974	1054	1533		48	554.4
DD4248	1800×1000				990	1074	1154	1633	18	50	573.6
DD4249	1800×1200				1190	1278	1354	1833		46	622.4
DD4250	1800×1400		1878		1390	1478	1554	2033		50	672.5
DD4251	1800×1800				1790	1878	1954	2433		56	801.7
DD4252	2000×1000	2000			990	1080	1154	1633		46	597.4
DD4253	2000×1300				1290	1380	1454	1933		50	679.1
DD4254	2000×1600		2080		1590	1680	1754	2233		56	768.8
DD4255	2000×1800				1790	1880	1954	2433		58	846.2
DD4256	2000×2000			2164	1990	2080	2154	2633	22	60	879

五轴方风门
Five–axis square damper

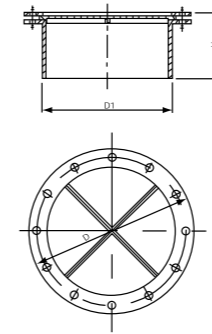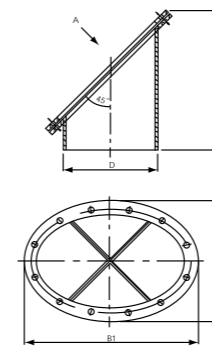| 标 号 Marking	公称通径 Inside Nominal Diameter DN	L₁	L₂	L₃	L₄	L₅	L₆	B	螺栓孔数 (n) Bolt Hole Number	重 量 Weight kg
		mm								
DD4257	2200×1200	2200	2280	2364	1190	1280	1354	1833	52	744.4
DD4258	2200×1400				1390	1480	1554	2033	56	801.3
DD4259	2200×1600				1590	1680	1754	2233	60	880.5
DD4260	2200×1800				1790	1880	1954	2433	62	950.6
DD4261	2200×2000				1990	2080	2154	2633	64	991.4
DD4262	2400×1200	2400	2480	2564	1190	1280	1354	1833	54	785.9
DD4263	2400×1400				1390	1480	1554	2033	58	850.6
DD4264	2400×1600				1590	1680	1754	2233	62	925
DD4265	2400×1800				1790	1880	1954	2433	64	1017.4
DD4266	2400×2000				1990	2080	2154	2633	66	1054.9

说明

本系列圆形防爆门为膜板形式，其利用当内部介质爆炸压力达到规定值时冲破膜板排放而泄压的原理设计。膜板爆破压力较高，可用在制粉系统上，用来避免设备和管道在介质爆炸时不受损坏。

本系列圆形防爆门按公称通径区分，编制规格定DN300~DN1000等8种。

Instruction

This series of circular explosion–proof door is a membrane plate, which is designed to break through the discharge of membrane plate when the pressure of internal medium explosion reaches the regulation value. Diaphragm plate blasting pressure is high, can be used in the powder system, to avoid the equipment and the pipe not to be damaged when the medium explodes.
The series of circular explosion–proof doors are divided according to the nominal size, and there are 8 kinds, such as DN300~ DN1000, etc.


圆形防爆门

标 号 Marking	公称通径 Inside Nominal Diameter DN	D	D₁	H	重 量 Weight kg
		mm			
D–LD2000–49001	300	427	325	221	18.1
D–LD2000–49002	400	528	426		24.2
D–LD2000–49003	500	645	530		35.6
D–LD2000–49004	600	745	630	223	42.4
D–LD2000–49005	700	843	720		52.4
D–LD2000–49006	800	943	820		59.6
D–LD2000–49007	900	1043	920		66.8
D–LD2000–49008	1000	1153	1020	225	86.0

说明

本系列斜面防爆门为膜板形式，其利用当内部介质爆炸压力达到规定值时冲破膜板排放而泄压的原理设计。膜板爆破压力较高，可用在制粉系统上，用来避免设备和管道在介质爆炸时不受损坏。

本系列圆形防爆门按公称通径区分，编制规格定DN300~DN1000等8种。

Instruction

This series of slope explosion–proof door is a membrane plate, which is designed to break through the discharge of membrane plate when the pressure of internal medium explosion reaches the regulation value. Diaphragm plate blasting pressure is high, can be used in the powder system, to avoid the equipment and the pipe not to be damaged when the medium explodes.
The series of circular explosion–proof doors are divided according to the nominal size, and there are 8 kinds, such as DN300~ DN1000, etc.

斜面防爆门

标 号 Marking	公称通径 Inside Nominal Diameter DN	D	B	B₁	H	重 量 Weight kg
		mm				
D–LD2000–49201	300	325	427	563	572	27.2
D–LD2000–49202	400	426	528	706	673	38.0
D–LD2000–49203	500	530	645	866	782	58.4
D–LD2000–49204	600	630	745	1008	882	72.1
D–LD2000–49205	700	720	843	1142	976	93.2
D–LD2000–49206	800	820	943	1285	1075	111.1
D–LD2000–49207	900	920	1053	1424	1174	130.0
D–LD2000–49208	1000	1020	1153	1578	1279	154.3

隔 热 管 托
Thermal insulation pipe bracket
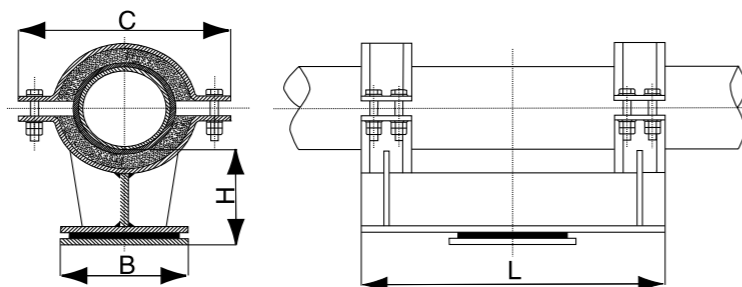
◎ AGHT1-20~100隔热型滑动管托 Thermal insulation pipe bracket

1.1产品的结构图 Product Structure Chart
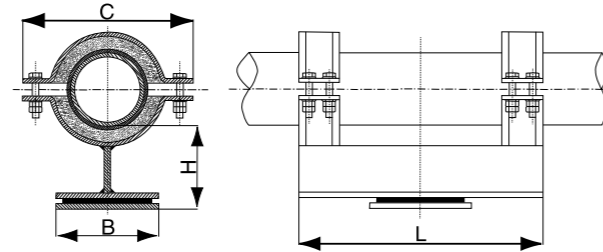
1.2产品的参数表 Parameter table of the product

型号 Model	φ管道外径 Pipe diameter		H	L				B	C	最大垂直载荷 Maximum Vertical load
	A系列 series	B系列 series								
AGHT1-25	33.7	32	100	200	250	300	400	100	174	630
AGHT1-32	42.4	38							180	630
AGHT1-40	48.3	45							187	630
AGHT1-50	60.3	57							200	975
AGHT1-65	76.1	76							218	1500
AGHT1-80	88.9	89						150	231	1900
AGHT1-100	114.3	108							250	3070

◎ AGHT1-125~1000隔热型滑动管托 Thermal insulation pipe bracket

2.2产品的参数表 Parameter table of the product

型号 Model	φ管道外径 Pipe diameter		H	L				B	C	最大垂直载荷 Maximum Vertical load
	A系列 series	B系列 series								
AGHT1-125	139.7	133	150	200	250	300	400	150	289	4620
AGHT1-150	168.3	159						160	315	6500
AGHT1-200	219.1	219						200	379	1200
AGHT1-250	273	273		250	300	400	500	200	433	18500
AGHT1-300	323	325						200	485	25800
AGHT1-350	355.6	377	200	300	400	500	600	250	547	36500
AGHT1-400	406.4	426						250	596	48700
AGHT1-450	457	480						300	650	60000
AGHT1-500	508	530		350	400	500	600	300	710	77500
AGHT1-600	610	630		400	500	600	700	300	810	122000

◎ AGHT2-20~100隔热型导向管托 Thermal insulation pipe bracket

3.1产品的结构图 Product Structure Chart
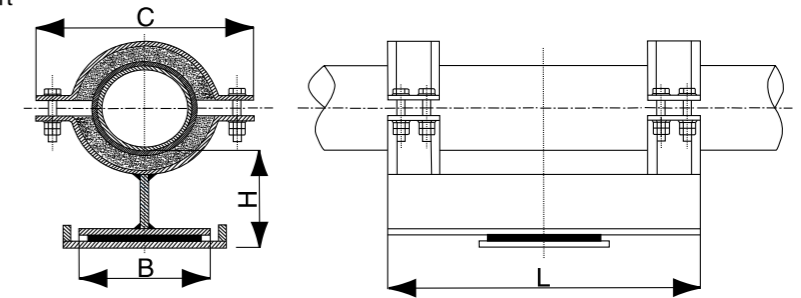
3.2产品的参数表 Parameter table of the product

型号 Model	φ管道外径 Pipe diameter		H	L				B	C	最大垂直载荷 Maximum Vertical load	最大容许侧向载荷 Maximum allowable lateral load
	A系列 series	B系列 series									
AGHT2-25	33.7	32	100	200	250	300	400	100	174	630	3000
AGHT2-32	42.4	38							180	630	
AGHT2-40	48.3	45							187	630	
AGHT2-50	60.3	57							200	975	
AGHT2-65	76.1	76							218	1500	
AGHT2-80	88.9	89						150	231	1900	
AGHT2-100	114.3	108							250	3070	

◎ AGHT2-125~1000隔热型导向管托 Thermal insulation pipe bracket

4.1产品的结构图 Product Structure Chart

型号 Model	φ管道外径 Pipe diameter		H	L				B	C	最大垂直载荷 Maximum Vertical load	最大容许侧向载荷 Maximum allowable lateral load
	A系列 series	B系列 series									
AGHT1-125	139.7	133	150	200	250	300	400	150	289	4620	
AGHT1-150	168.3	159						160	315	6500	
AGHT1-200	219.1	219						200	379	1200	
AGHT1-250	273	273		250	300	400	500	200	433	18500	
AGHT1-300	323	325						200	485	25800	
AGHT1-350	355.6	377	200	300	400	500	600	250	547	36500	
AGHT1-400	406.4	426						250	596	48700	
AGHT1-450	457	480						300	650	60000	
AGHT1-500	508	530		350	400	500	600	300	710	77500	
AGHT1-600	610	630		400	500	600	700	300	810	122000	

恒力弹簧支吊架
Constant force spring support

◎ 主题内容与适用范围 Subject content and scope of application

本标准规定了恒力弹簧支吊架的系列范围、选用方法以及制造和检验要求。

本标准适用于位移范围为50~400mm、载荷范围为123.5~315991N（12.6~32244kgf）的恒力弹簧支吊架。

This standard specifies the range, selection method and manufacturing and inspection requirements of the constant force spring support hanger.
This standard is applicable to the constant force spring support hanger with a range of 50~400mm and load range of 123.5~315991N (12.6 ~ 32244kgf).

◎ 引用标准 Reference standard

GB 1239 普通圆柱螺旋弹簧

GB 1804 公差与配合 未注公差尺寸的级限偏差

JB 2633 锅炉锻件技术条件

GB 985 手工电弧焊焊接接头的基本型式与尺寸

GB 1239 Ordinary cylindrical helical spring
GB 1804 Tolerance and limit deviation without tolerance size
JB 2633 Technical conditions of boiler forgings
GB 985 Basic type and size of manual arc welding joint

恒力支吊架
Constant force spring support

◎ 结构／型式 Structure/type

3.1 恒力弹簧支吊架主要由圆柱螺旋弹簧、固定框架、回转框架及运动机构、调节装置、弹簧罩等组成。其典型结构如图1。

3.2 恒力弹簧支吊架分类及型式符合表1规定。

3.1 The constant force spring support is composed of cylindrical helical spring, fixed frame, rotating frame and motion mechanism, adjusting device and spring cover. Its typical structure is shown in figure 1.

3.2 The classification and type of constant force spring support bracket are in accordance with table 1.

位移向上示意图

恒力支吊架
Constant force spring support

1、载荷； 2、位移指示牌； 3、调整螺栓； 4、回转框架； 5、生根螺栓； 6、固定框架； 7、拉板； 8、滚轮； 9、拉杆螺栓； 10、弹簧； 11、主轴； 12、固定销轴； 13、吊紧螺栓； 14、螺母； 15、松紧螺母； 16、载荷螺栓

1. Load; 2. Displacement indicator; 3. Adjusting bolts;4. Rotating frame;5. Rooting bolt;6. Fixed frame;7. Pull plate;8. Scroll wheel;9. Pull bolt;10. Spring;11. Spindle;12. Fixed pin shaft;13. Lifting bolts;14. Nuts;15. Elastic nut;16. Load bolts
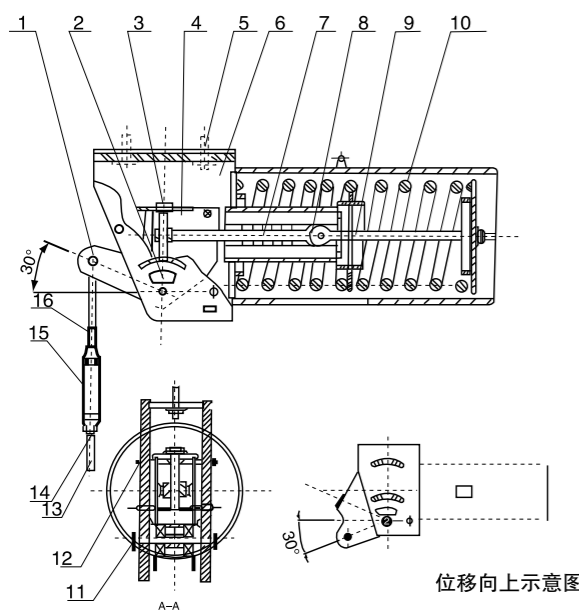
图1 恒力弹簧支吊架典型结构图
Constant force spring support

VS 可变弹簧支吊架
VS variable spring support hanger

◎ 用途和使用范围 Use and using range

由化工部基建局批准，上海化工设计院编制设计，本厂按照 CD42B5－82标准生产的可变弹簧支吊架分为七种类型共616种规格。

本支吊架用于化工、电力、冶金、石油和纺织等工业上在运行中产生位移的各种管道。

本支吊架最佳位移量为30、60、90、120mm。适用荷载范围210～142500N，使用温度范围为－40～＋120℃。

Approved by the ministry of chemical industry and construction bureau, designed by Shanghai chemical institute, the factory produces variable spring support hanger according to cd42b5–82 standard, which is divided into seven types, 616 kinds of specifications.
This bracket is used in chemical, electric, metallurgy, petroleum and textile industries, and the various pipelines that produce displacement in operation.
The optimal displacement of this support is 30, 60, 90 and 120mm. Applicable load range 210~ 142500N, , using temperature range 40 ~ + 120 ℃.

◎ 结构型式 The structural type

本支吊架根据安装型式分为A、B、C、D、E、F、G 七种类别。

A 型：悬挂式螺纹型弹簧吊，主要用于悬挂在钢梁、管道和楼板下，吊杆与吊架采用螺纹联接；

B 型：悬挂式双耳型弹簧吊；

C 型：主要用于悬挂在梁或是楼板下，吊杆与吊架采用螺纹连接；

D 型：搁置式上调节型弹簧吊，适用安装在钢梁上，由螺纹调节安装高度，吊杆与吊架负荷管采用螺纹连接；

E 型 搁置式上调节型弹簧吊，适用于安装在钢梁上，由花篮螺丝调节安装高度，吊杆与吊架花篮螺丝采用螺纹连接；

F 型：支撑式弹簧支吊架，主要安装在基础、楼板或梁上，由荷重板支承管道。

荷重板分普通荷重板和带滚轮荷重板两种。对水平位移量较大或不允许油较大摩擦力的管道，宜采用带滚轮荷重板。

G 型：并联悬挂式螺纹型弹簧吊，适用管道的上方不能直接悬挂弹簧吊架或没有足够的高度以解决管道水平位移处。

According to the installation type, this support hanger is divided into seven categories: A, B, C, D, E, F and G.
Type A: suspended threaded spring hoisting, mainly used for suspension of steel beams, pipes and floor boards, and threaded joints of derrick and hanger;
Type B: suspended double ear spring suspension;
Type C: mainly used for hanging on the beam or floor, the derrick and hanger are connected by thread.
Type D: The suspended type of spring suspension, suitable for installation on the steel beam, the height of the installation is adjusted by the thread, and the lifting rod is threaded with the hanger load pipe.
Type E: suspended type of spring suspension, suitable for installation on the steel beam, the installation height is adjusted by the basket screw, and the lifting rod and the hanger basket screw are thread connection;
Type F: supporting spring suspension, mainly installed on the foundation, floor or beam, supported by the load plate.
The load plate is divided into the ordinary load plate and the load roller. For piping with large horizontal displacement or large friction force, it should be used with roller load plate.
Type G: Parallel suspension types thread type spring hoisting, apply to the top of the pipe cannot directly hang the spring hanger or not enough space to solve the horizontal displacement of the pipe.

◎ 型号表示方法 Model presentation method

VS XX X XX

吊架代号
Hanger code

最佳位移量
Optimum displacement

弹簧编号
Spring number

类型
Type
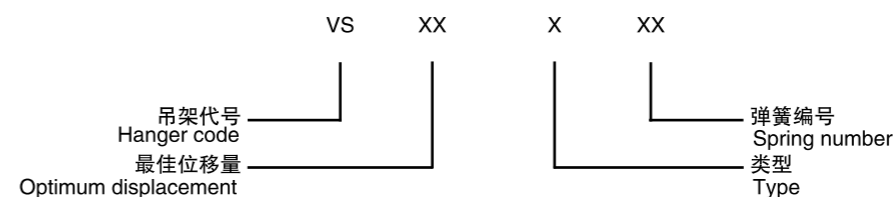
如：CS30A07

订货时请按此要求书写。同时，在合同上需注明工作载荷、位移方向、位移大小和安装载荷等。F型支架选用带滚轮的荷重板时，应在型号后用括号加以注明。

Such as: CS30A07
Please write when ordering. At the same time, it is necessary to indicate the working load, displacement direction, displacement size and installation load on the contract. The F type bracket is chosen with the load roller, should be marked with brackets after the model.

可变弹簧支吊架
Variable spring support hanger

整定式弹簧支吊架
The integral spring support hanger

◎ **用途和选用范围 Use and selection**

本支吊架广泛用于在运行中产生热位移的管道系统及其设备装置。本吊架适用载荷范围为200-210000N，位移量为40、45、80、90mm，使用温度范围：－40℃~120℃。

The suspension frame is widely used in the piping system and equipment that produce thermal displacement during operation. Load range of this hanger is 200-210000N, displacement is 40, 45, 80, 90 mm, use temperature scope: – 40 ℃ ~ 120 ℃.
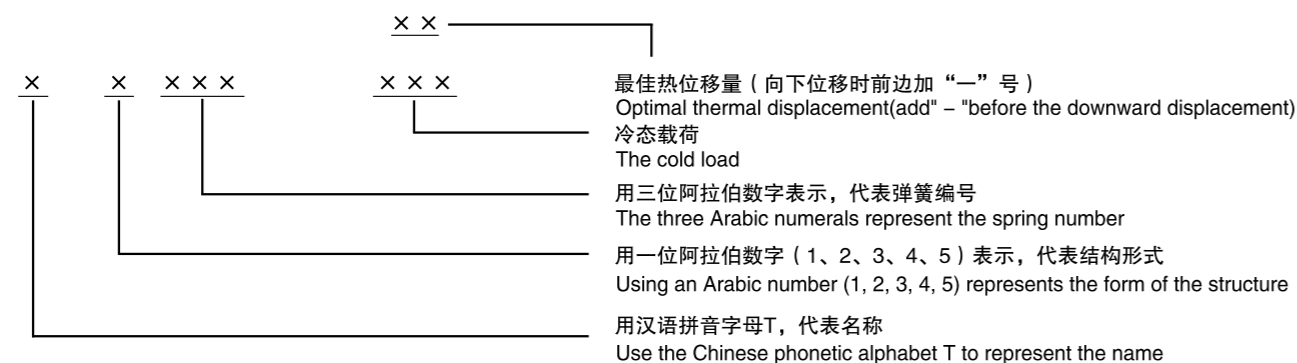
◎ **结构形式和表示方法 Structural form and presentation method**

支吊架分五种结构形式：T1型为单板连接弹簧吊架，T2型为双板连接弹簧吊架，T3型为上下连接弹簧吊架，这三种形式弹簧吊架适用于安装在钢梁或底板上；T4型为弹簧支架用于搁置在基础、楼板或钢梁上；T5型为横担式弹簧支架，适用于管道上方不能直接悬挂弹簧吊架和没有足够的高度以及要解决水平位移处。

Five kinds of structure forms: the T1 type is single plate connecting spring suspension, the T2 type is a double-plate connecting spring hanger, the T3 type is the upper and lower connecting spring hanger, these three form spring suspension is suitable for installation on steel beam or floor; The T4 type is a spring bracket for use on the base, floor or steel girder. The T5 type is the transverse – borne spring bracket, apply to the top of the pipe cannot directly suspend the spring hanger and not enough height and to solve horizontal displacement.

本支吊架型号由下述几个部分组成：
The model of this support is composed of the following parts:

最佳热位移量（向下位移时前边加"一"号）
Optimal thermal displacement(add" – "before the downward displacement)
冷态载荷
The cold load
用三位阿拉伯数字表示，代表弹簧编号
The three Arabic numerals represent the spring number
用一位阿拉伯数字（1、2、3、4、5）表示，代表结构形式
Using an Arabic number (1, 2, 3, 4, 5) represents the form of the structure
用汉语拼音字母T，代表名称
Use the Chinese phonetic alphabet T to represent the name

◎ **安装、使用时应注意事项 Precautions for installation and use**

1、支吊架在出厂时是锁定在标志牌"C"位置上（冷态荷重处）。
2、管道运行时，支吊架的指示板应指在标志牌"H"位置上。
3、运行前管道作水压试验时支吊架呈锁定状态，水压试验后拔下锁定销。
4、运行时检查指示板是否指在铭牌"H"处（允许误差510mm）一否则应作相应调整。

1. The hanger is locked in the sign "C" position when leaving the factory (cold loading).
2. When the pipe runs, the indicator plate of the hanger shall refer to the position of "H" of the sign.
3. When the pre–running pipe is used for hydraulic test, the hanger frame is locked. After the hydraulic test, the lock pin is removed.
4. Check the indicator board at run time to refer to the "H" of the nameplate (allowable error of 510mm) or otherwise adjust accordingly.

GZ型滚动支座
GZ rolling support

GZ型管道滚动支座是本公司自行设计制造的一种较先进的管道承重装置。
GZ rolling support is a kind of advanced pipe bearing device designed and manufactured by our company.

◎ **应用范围 Application scope**

本产品广泛用于炼油、石油、化工、化肥、发电、机械、制冷、等各行业的热水管、蒸汽管、泥浆管、除灰管等有位移的各种承重管道。

This product is widely used for various load–bearing pipelines with displacement such as hot water pipe, steam pipe, mud pipe, ash tube, etc. in oil refining, petroleum, chemical, fertilizer, power generation, machinery, refrigeration, and other industries.

◎ **性能及特点 Performance and features**

1、结构简单、安装方便、无需维修、节省土建支柱的投资；2、摩擦阻力小，管道在位移时没有阻滞停顿现象，管道运行工作时平稳安全可靠。

1. Simple structure, convenient installation, no maintenance and saving investment in civil support; 2. The friction resistance is small, the pipe has no stop–motion in the displacement, and the pipeline runs smoothly and safely.

◎ **产品结构和规格 Product structure and specification**
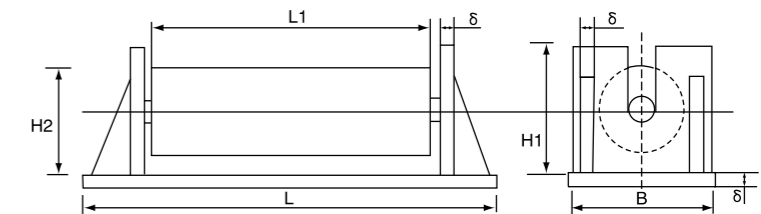
◎ **产品相关技术参数 Product related technical parameters**

管径 Pipe dia	L	B	L1	δ	H1	H2
Φ159	280	130	160	10	100	80
Φ219	300	140	180	10	100	80
Φ273	370	150	240	10	115	85
Φ325	420	160	290	12	145	105
Φ377	430	160	300	12	145	105
Φ426	480	170	330	12	145	105
Φ480	500	180	350	12	155	105
Φ530	530	180	380	12	185	130
Φ630	600	190	450	12	185	130

注：表内数据仅供参考，本公司也可按用户提供的技术数据及要求设计生产。
Note: the data in the table is for reference only. The company can also design and produce according to the technical data provided by the user.
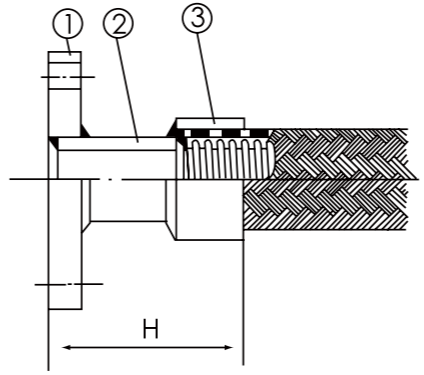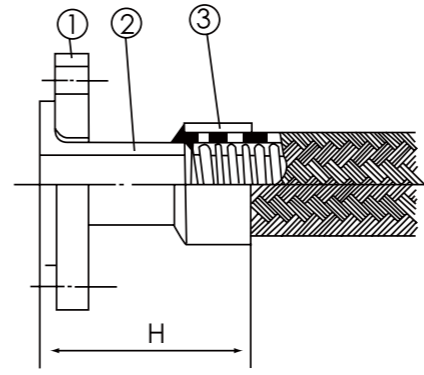
◎ **安装维护注意事项 Installation and maintenance precautions**

1、安装时必须检查滚动体转动是否灵活，轴向窜动不得大于1.2mm。
2、在正常工作情况下，一般不需要保养，如发现滚动体转动不灵活或卡死现象，可对滚动体两端轴承进行检查保养，并加入高温润滑脂。

1. When installing, it is necessary to check whether the rolling body is flexible and the axial movement must not be greater than 1.2 mm.
2. Under normal working condition, generally do not need maintenance. If it is found that the rolling body is not flexible or the card dies, it can check and maintain the bearing on both ends of the rolling body and add high temperature grease.
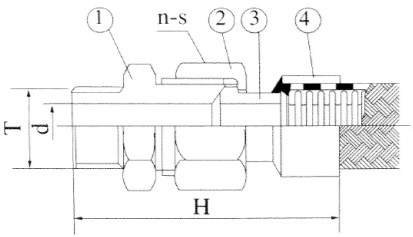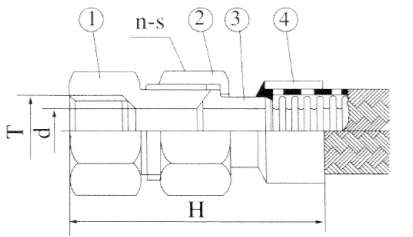
不锈钢金属软管系列参数及规格
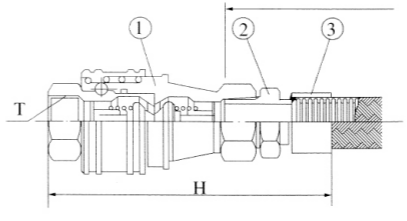## Series parameters and specifications of Stainless steel flexible metal hose

结构型式 Dimension			尺寸参数 Size parameters			
			公称通径 DN Inside Nominal Diameter		H mm	法兰尺寸执行的标准 Standard of flange size execution
			A mm	B mm	FL1	FL2	

			A mm	B mm	FL1	FL2	
			10	0.375			
			15	0.5		70	
			20	0.75	60		
			25	1			
			32	1.25		100	
			40	1.5		105	
			50	2	70	115	
			65	2.5	75	125	
			80	3	80	130	
			100	4	90	145	
			125	5	95	155	
			150	6			
			200	8	110	170	
			250	10		175	
			300	12	135	200	
			350	14	150	215	
			400	16	160	235	
			450	18	170	250	
			500	20	180	260	
			600	24	200	280	
			700	28	22	300	
			800	32	240	320	
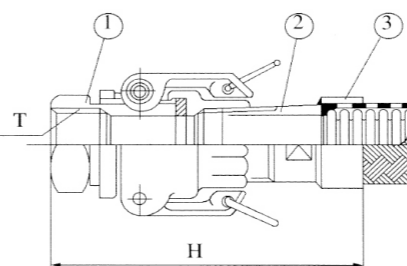
结构：平焊法兰、带长接管。
特点：密封性好，应用广泛
材质：①②碳钢/不锈钢
　　　③不锈钢

Structure: flat welding flange, with long pipe.
Features: good sealing and wide application
Material: ①②carbon steel/ ③stainless steel

结构：松套法兰，长接管式密封座。
特点：密封性好，安装方便，应用广泛。
材质：①②碳钢/不锈钢
　　　③不锈钢

Structure: Loose sleeve flange, long nozzle type seal seat.
Features: Good sealing, convenient installation and wide application.
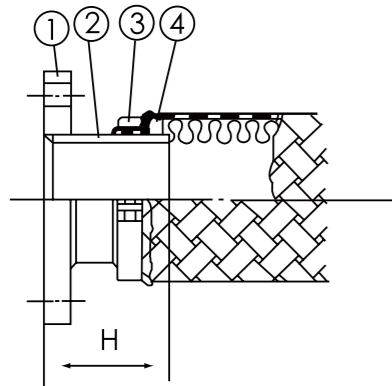Material: ①②Carbon steel/ stainless steel, ③stainless steel

法兰尺寸可按下列管法兰标准制造：

Flange size can be manufactured according to the following flange standard:

1、中国 China：
GB9119.9121-88
JB81、83-94
HG5010-5023-58
HGJ44-76-91
SH3406-92

2、西德 West Germany:
DIN2500

3、美国 America
ANSIB 16.5

4、日本 Japan
JIS B2210-84

不锈钢金属软管系列参数及规格
Series parameters and specifications of Stainless steel flexible metal hose

结构：环形活接与转接头组合
特点：转接头将球锥型联接转换成通道性强的外锥管螺纹。
材质：①②碳钢/不锈钢。③④不锈钢

Structure: Ring live connection and rotary joint combination
Characteristic: The rotary joint converts the spherical cone-shaped joint into a channel-strong outer cone pipe thread.
Material: ①② carbon steel/stainless steel. ③④ Stainless Steel

公称通径 DN Inside Nominal Diameter		螺纹 T Thread		d	n-s	H	
A mm	B inch	R	NPR			BRM	BRF
6	1/8	1/8	1/8	6	6-17	65	60
8	1/4	1/4	1/4	8	6-19	70	65
10	3/8	3/8	3/8	10	6-24	75	70
15	1/2	1/2	1/2	14	6-27	80	75
20	3/4	3/4	3/4	20	6-36	90	80
25	1	1	1	24	6-41	95	90
32	1 1/4	1 1/4	1 1/4	32	8-50	110	100

结构：环形活接头与转接头组合
特点：转接头将球锥型联接转换成通道性强的内锥管螺纹。
材质：①②碳钢/不锈钢。③④不锈钢

Structure: Ring live joint and rotary joint combination
The rotary joint converts the cone type join into a channel strong inner taper pipe thread.
Material: ①② carbon steel/stainless steel. ③④ Stainless Steel

结构：内锥（60°）活接头与接头组合
特点：转化成通用性强的外锥管螺纹（惠氏或布氏）联接方便快捷。
材质：①②碳钢/不锈钢。③④不锈钢

Structure: inner cone live joint (60°) and joint assembly
Characteristic: It is converted into a strong external taper pipe thread (Huishi or Bushi), and the connection is convenient and fast.
Material: ①② carbon steel/stainless steel. ③④ Stainless Steel

公称通径 DN Inside Nominal Diameter		螺纹 T Thread		d	n-s	H	
A mm	B inch	R	NPR			DNM	DNF
4		1/4	1/4	5.5	6-19	60	56
6	1/8	1/4	1/4	5.5	6-19	60	56
8	1/4	3/8	3/8	8.5	6-22	68	62
10	3/8	3/8	3/8	8.5	6-22	68	62
12	1/2	1/2	1/2	11.5	6-27	80	70
15	1/2	1/2	1/2	16.5	6-36	92	80
20	3/4	3/4	3/4	16.5	6-36	92	80
25	1	1	1	22.5	6-41	105	95
32	1 1/4	1 1/4	1 1/4	28.5	8-50	112	102
40	1 1/2	1 1/2	1 1/2	34.5	8-60	126	115
50	2	2	2	46.5	8-70	142	125
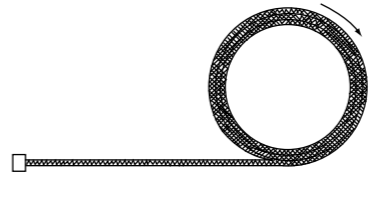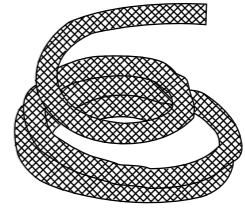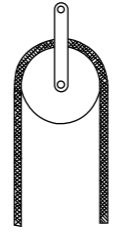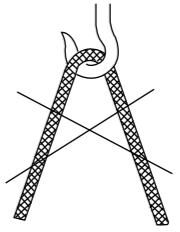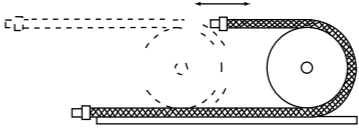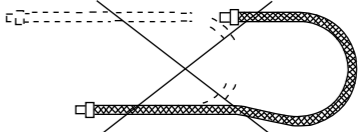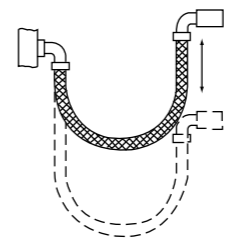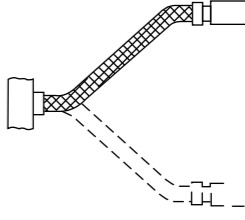
结构：内锥（60°）活接头与接头组合
特点：转化成通用性强的内锥管螺纹（惠氏或布氏）联接方便快捷。
材质：①②碳钢/不锈钢。③④不锈钢

Structure: inner cone live joint (60°) and joint assembly
Characteristic: It is converted into a strong external taper pipe thread (Huishi or Bushi), and the connection is convenient and fast.
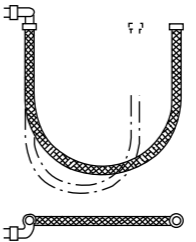Material: ①② carbon steel/stainless steel. ③④ Stainless Steel

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不锈钢金属软管系列参数及规格
Series parameters and specifications of Stainless steel flexible metal hose

结构：带自封快换接头与外锥管螺纹（SM）接头组合
特点：实现快速联接，管内介质可自封不流出端为通用性强的内锥管螺纹。
材质：①碳钢/不锈钢。②③不锈钢

Structure: With self-proclaimed quick-change connector and external cone pipe thread (SM) Joint combination.
Features: Fast connection, the end which the internal medium can be self-sealing and non-flowing, is the , internal taper pipe thread with strong universality.
Material: ① carbon steel/stainless steel. ②③ Stainless Steel

公称通径 DN Inside Nominal Diameter		螺纹 T Thread	H	
	B inch	Rc	KH	KLN
10	3/8	3/8	125	
15	1/2	1/2	130	120
20	3/4	3/4	135	128
25	1	1	140	136
32	1 1/4	1 1/4	145	141
40	1 1/2	1 1/2	150	147
50	2	2	155	157
65	2 1/2	2 1/2	160	170
80	3	3	170	180
100	4	4		190

结构：拉杆式快速接头与外锥管螺纹（SM）接头组合。
特点：快接头快速简便，出端为通用性强的内锥管螺纹。
材质：①铜/铝/碳钢/不锈钢。②③不锈钢。

Structure: Pull rod quick joint and external taper pipe thread (SM) joint.
Features: Fast connection, the end is the internal taper pipe thread with strong universality.
① copper/aluminum/carbon steel/stainless steel. ②③ stainless steel

结构：前端外锥面是活扣接头联接的密封面后端的螺旋面与活扣接头实现扣接。
特点：实现快速扣接、密封可靠。
材质：①②碳钢/不锈钢。

Structure: The outer cone of the front end is the surface formed between the loose joints and the spiral surface of on the back end of the cover connected by loose joints.
Features: quick fastener, reliable sealing.
Material: ①② carbon steel/stainless steel.

公称通径 DN Inside Nominal Diameter	d	H	
		KZX	KZS
40	40	100	115
50	50	110	125
65	63	120	135
80	75	135	140
100	102	150	150
125	125	155	160
150	150	155	160

结构：密封座带有两瓜或三瓜的活扣套与锥面接头的螺旋面扣接。密封座内有密封橡胶圈。
特点：实现螺旋式快速扣接。
材质：①③④不锈钢。②橡料。

Structure: Seal seat with two – or three–melon buckle sleeve with screw – face joint. The seal seat has an enclosed rubber ring.
Features: To achieve a fast spiral fastening.
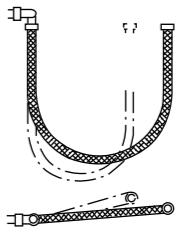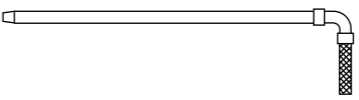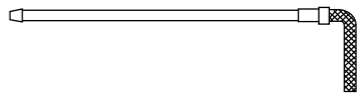Material: ①③④ stainless steel ② rubber.

不锈钢金属软管系列参数及规格
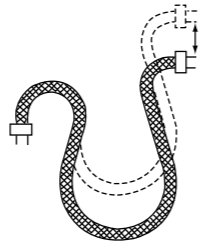### Series parameters and specifications of Stainless steel flexible metal hose
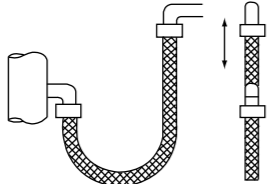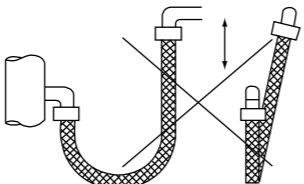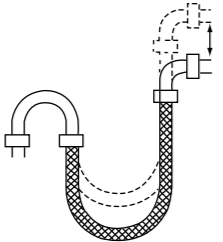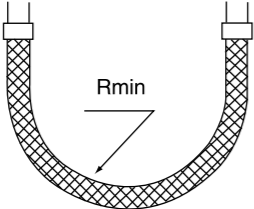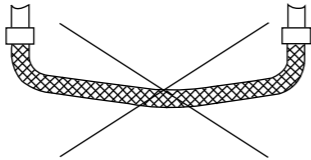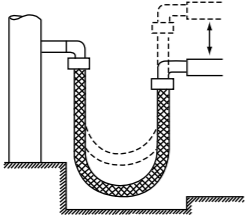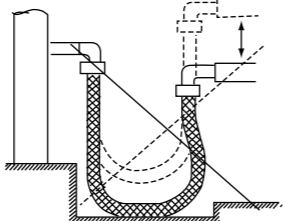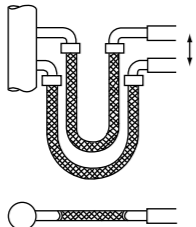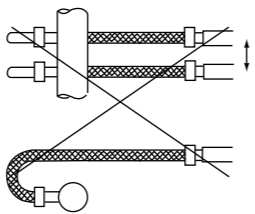
结构型式 Dimension	尺寸参数 Size parameters			
	公称通径 DN Inside Nominal Diameter	H mm		法兰尺寸执行的标准 Standard of flange size execution
	A mm	B mm	FL3	FL4	

结构：平焊法兰、夹固式钢带网套
特点：应用广泛、夹固力强、承压好、抗震性好，防护性好
材质：①③④碳钢/不锈钢
　　　②不锈钢

Structure: flat welding flange, clamping steel belt net
Features: wide application, strong clamping force, good pressure, shock resistance and good protection
Material: ①③④ carbon steel/stainless Steel
　　　②stainless steel

结构：松套法兰、夹固式钢带网套
特点：安装方便、夹固力强、承压好、抗震性好、防护性好。
材质：①③④碳钢/不锈钢
　　　②不锈钢

Structure: loose flange, clamping steel belt net
Features: Easy installation, strong clamping force, good pressure, good seismic resistance and good protection.
Material: ①③④ carbon steel/stainless Steel
　　　②Stainless Steel

A mm	B mm	FL3	FL4	法兰尺寸执行的标准
65	2.5	90	95	法兰尺寸可按下列管法兰标准制造： Flange size can be manufactured according to the following flange standard: 1、中国 China GB9119.9121–88 JB81、83–94 HG5010–5023–58 HGJ44–76–91 SH3406–92 2、西德 West Germany DIN2500 3、美国 America ANSIB 16.5 4、日本 Japan JIS B2210–84
80	3	100	105	
100	4	110	115	
125	5	120	125	
150	6	120	125	
200	8	140	150	
250	10	160	170	
300	12	180	190	
350	14	200	210	
400	16	220	230	
450	18	240	250	
500	20	260	270	
600	34	280	290	
700	28	300	310	
800	32	320	330	

安装指南
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正确 Correct	错误 Incorrect
为保持允许的弯曲半径，应将盘卷在一起的软管立起，引拉展开使用。 In order to keep the allowed bending radius,coiling hose should be put vertically,then expansioned to use.	被盘卷在一起的软管，请不要直接引拉其中的一端使用。 Dont use coiling hose directly.
使用半圆形滑轮，以保持其允许的弯曲半径。 Use semi–rowed pulley to keep suitable bending radius.	极度的弯曲，将使软管损坏。 Extreme bending can damage the hose.
采用和软管运动同步的旋转滚轮，以避免不适当的弯曲。 Use rotary roller with same speed of hose.	软管长度选择过长，会产生不规则的弯曲，是必须注意的。 Select suitable length of hose avoiding irregular bending.
在小的弯曲部分，采用刚性弯头，以保证软管的弯曲半径。 Use fixed angle fitting at small bending part to keep suitable bending radius.	不适当的弯曲，会降低软管的使用寿命。 Unappropriate bending will shorten life of hose.
使用刚性弯头连接，使软管两端点的运动在一条直线上。 Use fixed angle fitting keeping two end of hose moving on one line.	在扭曲下运动，会降低软管的使用寿命。 It will shorten life of hose moving under twist.
在弯曲部分采用刚性弯头，使软管成直线配管状。 Keep the hose in a line by using fixed angle fitting at bending part.	过度的弯曲，会使软管受到损伤。 Extreme bending will damage hose.

安装指南
Installing Guide

正确 Correct	错误 Incorrect
软管的运动方向与软管的安装应保持在一个平面。 Hose should move with one plane.	在扭曲下运动，会降低软管的使用寿命。 It will shorten life of hose moving under twist.
采用刚性弯头连接，以保证软管运动时的弯曲半径。 Rigid angle fitting is used to keep suitble bending radius.	过小的弯曲，会使软管受到损伤。 Too small bending will damage hose.
软管安装，应保证允许的最小弯曲半径。 When assembling hose,Min.bending radius should be guaranted.	软管的长度选择过短，会产生软管过小的弯曲，这是不允许的。 Too short hose will damage hose.
运动时，软管应避免与其它物体发生摩擦。 Avoidiing rubbing with other objects when moving.	运动时，软管受到其它物体的阻碍，会产生破坏。 Rubbing will damage hose when moving.
软管的运动方向与软管的安装应保持在一个平面。 Use fixed angle fitting keeping two end of hose moving on one line.	不在一个平面内运动的软管，会降低使用寿命。 It will shorten life of hose moving under twist.

05
Product Outgoing
产品出库

循环水管道膨胀节

储罐抗震金属软管

循环水管道膨胀节

精于专·匠于心·品于行
PERFECT IN PROFESSIONAL · ARTISAN IN MIND · PRODUCT IN QUALITY

成熟的工艺、严谨的作风和完善的质量体系，全面保证从原料采购、产品制造到销售发运，每一个环节得以高效而规范的运行，与市场同类产品的质量和服务相比，都赢得了客户的赞誉。

Sophisticated techniques, strict management and perfect quality system ensures high efficiency of raw materila purchasing,manufacture and sales. Comparing with similare products, it obtains customers favour.

质量是企业的生命，让用户满意是我们永恒的追求。我们以近乎苛刻的质检制度，不断地以国际标准的要求对每一道工序进行检测，以确保高质量的产品送到客户手中。

Quality is essential to any enterprise.Our everlasting goal is to satisfy our client. We have a very strict quality control system to test every procedure with different international standards. Only with such a constant tests can we ensure the quality of our products and can we ensure that all our clients gets are first–rate products.

專業 成就卓越品质

Professional spirit leads to superior quality

电厂空冷岛补偿器

无推力套筒补偿器

电厂曲管压力平衡型补偿器

我们在精心雕琢每一件产品的同时也是塑造自我，您在选择我们的同时，得到的也是我们的承诺。

We also mould ourselves while we carve every products meliculously,youhave got our promise mhile you choose our .

出口非金属补偿器

电厂万向铰链型补偿器

非金属补偿器／隔热管托到货现场

良好的生产环境
制造出一流的产品

In excellent producting environment
The first-grade products are created

信心的保障之源

Confidence in the source protection

以一流品质获取市场信任、以优秀服务赢得客户满意
以持续改进寻求企业发展、以卓越管理树立企业品牌

In order to gain market confidence class quality with excellent
service to win customer satisfaction,
To seek continuous improvement of enterprise development,
in order to establish a corporate brand management excellence

强劲的人才优越

Strong talent

优势的人力资源是我们发展的前进动力，拥有来自行内精英
的技术人才，强大的研发团队和先进的企业经营理念，促使
了我们在创新不仅拥有国际一流的生产设备，更保障了我们
不断前进发展。

The advantage of the human resource is the momentum of our development,
with technical personnel from within the line of the elite, strong R & D team
and advanced business philosophy, we had to not only has the international
first-class production equipment in the innovation, but also to protect the us
going development.

先进的国际化设备

Advanced international equipment

来自国际著名的设备，生产工艺流程自动化，性能均达到
国际先进水平

From the international famous equipment, production process automation,
performance reached the international advanced level

ENTERPRISE
LOOK FORWARD
企业展望

公司全体员工精诚团结、奋力拼搏、攻坚克难，在市场经济人潮中，抢占市场高地，
用自己的智慧、勤劳、汗水奠定了坚实的发展基础

All the employees of the company are sincere, hardworking. They overcome difficulties and capture
market heights in the market economy, and have laid a solid foundation for development with their
wisdom, industry and sweat.

AoGr

奥光管业

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