MANUFACTURER OF
EXPANSION JOINTS AND HOSES
Flexible solutions for your pipe system

Expansion joints and hoses

Corrugated expansion joints | Lens expansion joints | Rubber expansion joints | Fabric expansion joints | Special expansion joints and plant engineering | Hoses

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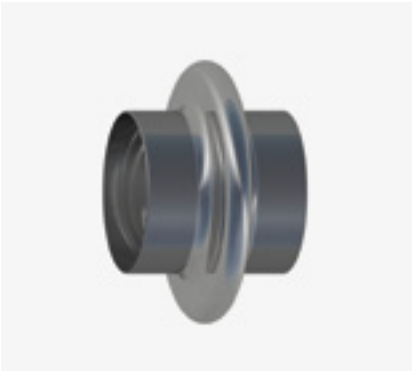

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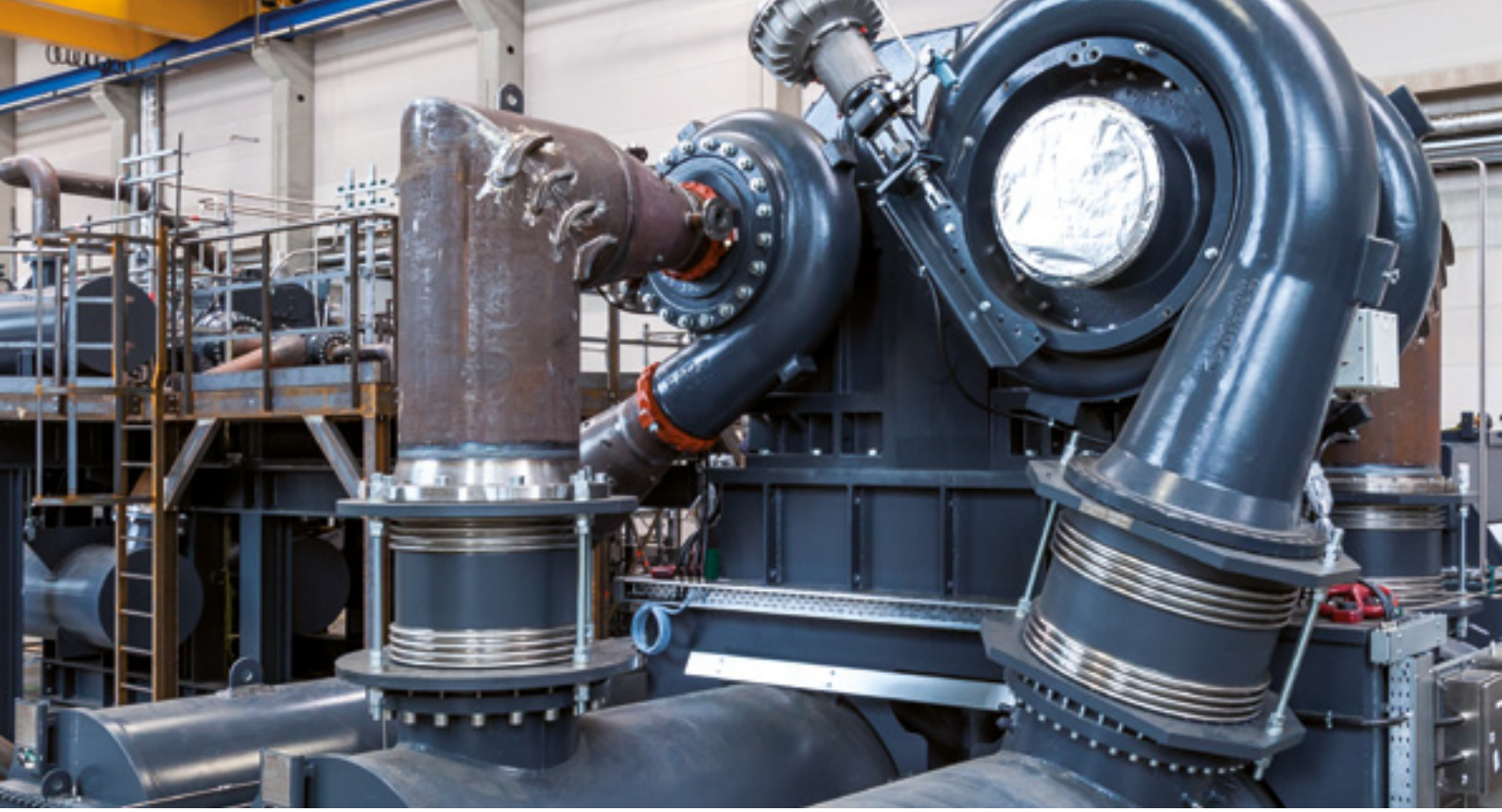


Flexible solutions for your pipe system!

HKS is one of Europe's leading manufacturers of expansion joints and hoses. The product range of the group of companies covers a wide range from simple standard expansion joints to individually tailored special expansion joints. HKS expansion joints and hoses are used in over 50 countries worldwide.

HKS is excellently positioned in the tension triangle of quality – performance – delivery date: Meeting the highest quality standards goes hand in hand with attractive, competitive prices as well as short-term delivery dates made possible by extensive stockholding.

HKS manufactures for you:

- Corrugated expansion joints made of various stainless steel alloys from DN 20 to DN 2800
- Lens expansion joints made of all malleable and weldable steels, unlimited size
- Rubber and PTFE expansion joints from DN 20 to DN 3600
- Fabric expansion joints, unlimited size
- Metal hoses made of stainless steel from DN 6 to DN 300
- Rubber hoses from DN 10 to DN 200
- Hydraulic hoses
- Components for plant engineering and pipeline construction
- Special expansion joints

Areas of application for expansion joints

HKS designs and manufactures expansion joints which are used in various standard situations but can also always be built to the individual requirements of our customers.

- Absorption of temperature-related length changes in pipe systems (axial, lateral, angular)
- Reduction of forces and moments in connections
- Compensation of relative movement between system parts
- Absorption of foundation and floor settling
- Damping of vibrations and structure-borne sound
- Compensation of installation inaccuracies
- Accessory parts for valves

Stable business relations through quality

Quality management has been at the centre of all operations since foundation of the company in 1981. It is the basis for a high level of customer satisfaction, for safety and for environmental protection. All organisational units of HKS have been certified in line with EN ISO 9001. Our two production sites are accredited welding fabricators according to ISO 3834-2. Regular customer audits repeatedly confirm the success of our quality management.

Approvals

- Current welding certification (TÜV HP0)
- Certification to PED category III module H
- Various product approvals and approval certificates from independent classification bodies such as ABS, DVGW, Germanischer Lloyd, RMRS, DNV and ASME U-Designator

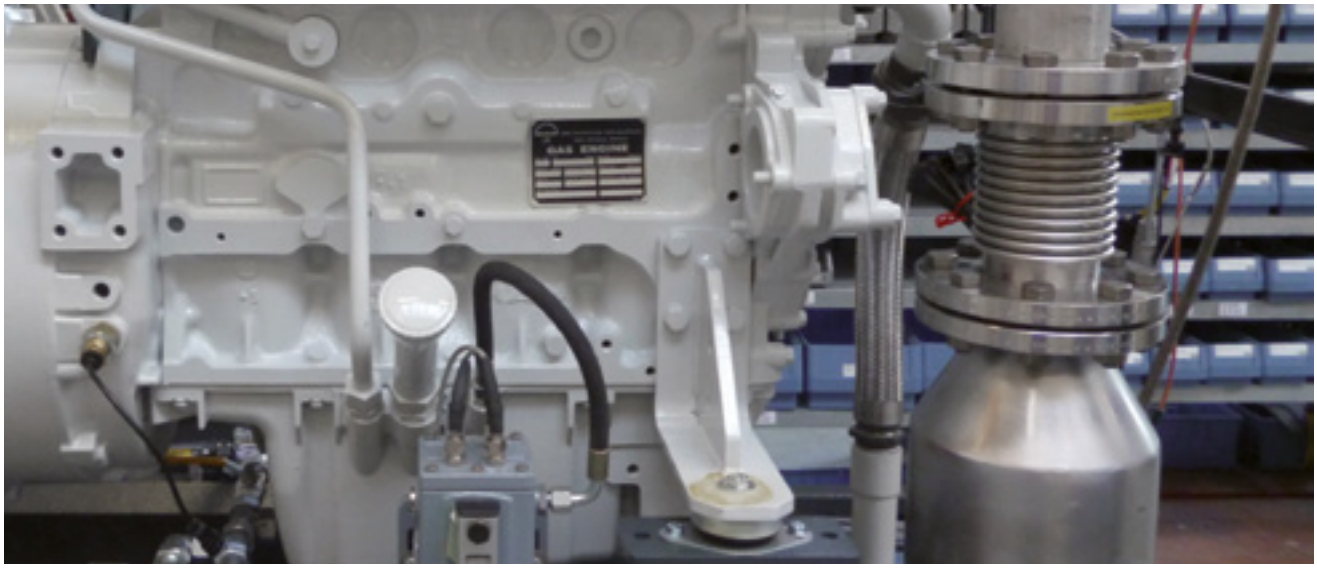
Our products can be certified by official institutions such as TÜV and classification bodies already at the factory.

Always to the current state of the art

The engineers at HKS provide extensive advice during preparation of the offer and concept for your project. Our specialist departments are constantly working on the further development and optimisation of the product range, developing solutions for any application. This is proven by the excellent cooperation with customers from plant engineering, mechanical engineering and ship building, from power station and pipeline construction, with diesel engine manufacturers, with the chemical and food processing industry, in some cases for many years.

In the past five years, the HKS Group supplied over 2,300 customers, including Alstom, Atlas Copco, Caterpillar, Siemens, ThyssenKrupp Steel and many others.

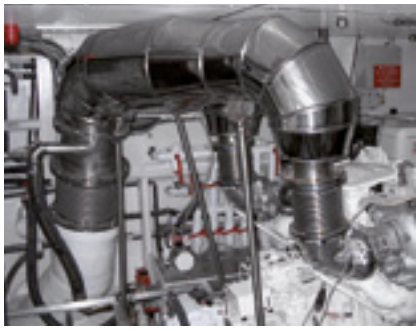
3M
Speedglas



Corrugated expansion joints

HKS designs and manufactures corrugated expansion joints from the simplest standard expansion joints to highly complex expansion joints which are designed especially on the basis of individual customer requirements. Corrugated expansion joints are single or multi-layered stainless steel expansion joints with a high level of expansion absorption and a low spring rate. They are used as flexible pipe connections in mechanical engineering, power unit and pipeline construction, in district heating and exhaust pipes as well as in industrial and sprinkler systems.

Our expansion joints are under continuous further development to meet the current state of the art and the high requirements of the industry. HKS products comply with the highest quality requirements. This is proven by various certifications and approvals from classification bodies as well as by customer audits. For best possible dimensioning of the expansion joints, HKS uses the AD-2000 data sheets, EJMA, EN 14917, EN 13445, ASME Section VIII App. 26 and the finite elements method as the basis for calculations.



Areas of application

Application examples for HKS corrugated expansion joints are versatile and flexible. Options for movement with large expansions and at the same time a low adjustment force rate are suitable for many industries with different media and temperatures.

- Plant engineering
- Mechanical engineering
- Ship building
- Power station construction
- Engine building
- Pipeline construction
- Chemical industry
- Food processing industry

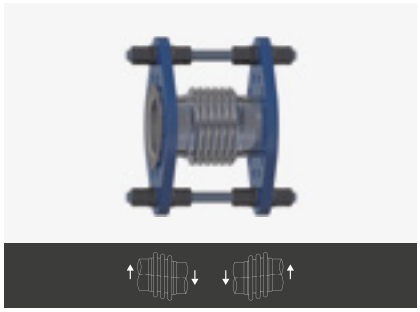
The main tasks are:

- Absorbing expansions
- Absorbing movement
- Damping oscillations and vibrations
- Compensation of installation inaccuracies
- Compensating for settling of buildings

Model variants

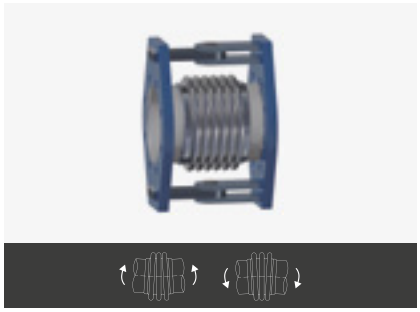
Axial expansion joint (example Type AN B-B)

› With swivel flanges, fixed flanges or welding ends
› Nominal diameters DN 20 – DN 2800 [1)]
› Pressure stages DN 1 – DN 40 [2)]
› Low adjustment force rates and high movement absorption



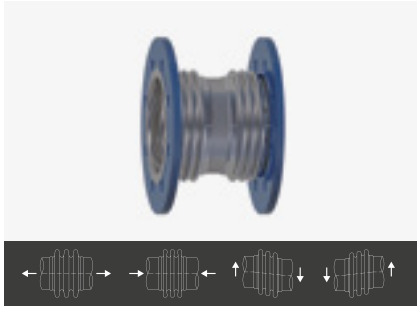
Lateral expansion joint (e.g. Type RN B-B)

› With swivel flanges, fixed flanges or welding ends
› Nominal diameters DN 20 – DN 2800 [1)]
› Pressure stages DN 1 – DN 40 [2)]
› With tie rod systems (tension rods or joints)
› With single joint movable on one side
› With tension rod or cardan joint moveable in all directions
› Tie rods absorb axial reaction forces



Angular expansion joint (example Type WN F-F)

› With swivel flanges, fixed flanges or welding ends
› Nominal diameters DN 20 – DN 2800 [1)]
› Pressure stages DN 1 – DN 40 [2)]
› With single joints movable on one side
› With cardan joints moveable in all directions
› Joints absorb axial reaction forces
› Large bending angles and compact lengths



Universal expansion joints (example Type AM B-B)

› With swivel flanges or welding ends
› Nominal diameters DN 20 – DN 2800 [1)]
› Pressure stages DN 1 – DN 40 [2)]
› With middle pipe
› High movement absorption and low adjustment force rates possible also in lateral direction

1) Nominal diameters deviating from the standard have to be individually tailored by HKS
2) nominal pressures and special requirements (exhaust gas) deviating from the standard have to be individually tailored by HKS

The bellows of an expansion joint

The metal bellows as a flexible basic elements has a high level of flexibility due to its continuous convolution. A high level of pressure resistance also has to be ensured. The bellows can be single or multi-layered. Wall thickness, number of layers, convolution geometry and number of convolutions are the adjustment parameters for designing an expansion joint (movement absorption, spring stiffness, convolution stability and column instability). The multiple walls divide the pressure load on the overall wall into several individual layers which offers the advantage of significantly increasing flexibility and lowering stiffness of the spring and therefore the adjustment forces.

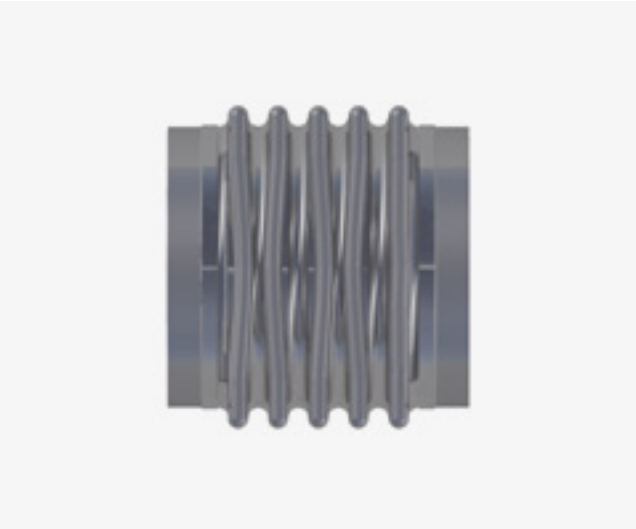
Single-ply

Double-ply

Multi-ply

Stability limits (crease and column instability) have to be taken into account when designing metal bellows. Column instability has to be taken into account for long expansion joints with small bellows diameters. The component tends to buckle. With larger bellows diameters, deformation of the individual convolution may occur. Stability of the convolution has to be taken into account here.

Column instability of a steel expansion joint



Inplane instability of a steel expansion joint

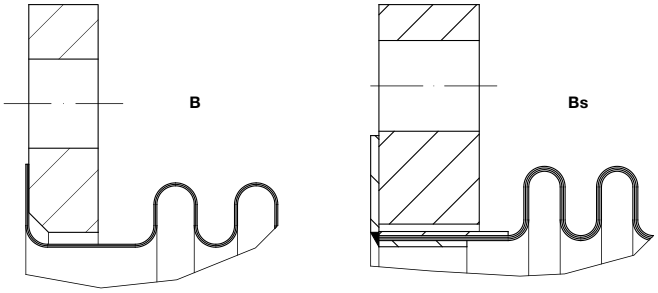
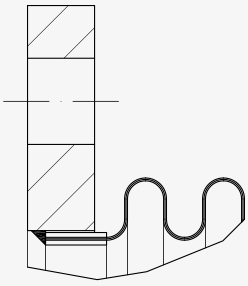
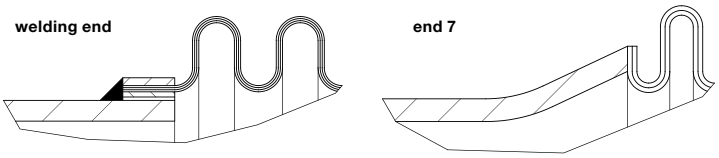
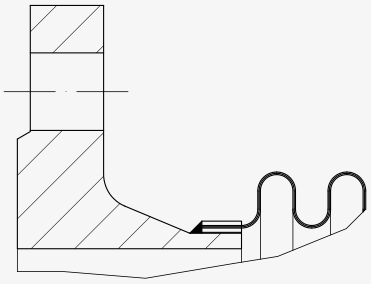
A temperature of 20 °C, the nominal pressure, the movement absorption and service life of 1000 stress cycles are normally used as a standardised basis for calculating the metal bellows of an expansion joint. A stress cycle is a complete, repeating oscillation of the bellows (zero position – max. positive deflection – zero position – max. negative deflection – zero position). Corrosion, high frequency vibrations, resonances, strong temperature changes and pressure surges are additional influencing factors.

Bellows materials:

Material group	Material designation	Properties	Application options
Standard	X6CrNiTi18-10 1.4541	good resistance against aggressive media, high ductility, weld decay resistance from Ti content	paper and textile industry, petrochemical industry, film and photography chemicals, food processing industry, chemical apparatus engineering
Stainless steel	X6CrNiMoTi17-12-2 1.4571 X2CrNiMo17-12-2 1.4404	high ductility, high level of resistance to pitting from Mo content	water supply and processing, breweries, cellulose and dye industry, pharmaceutical industry, exhaust technology
Heat resistant steel	X15CrNiSi20-12 1.4828 X8CrNiTi18-10 1.4878	good to very good high temperature stability	steel and smelting industry, cement kilns, brick kilns, glass manufacturing, heat transmissions, exhaust technology
Nickel-base alloy	NiCr22Mo9Nb 2.4856 NiCr21Mo 2.4858	excellent oxidation resistance, very good resistance to atmospheres containing sulphur (acids), heat resistant	engine and turbine building, acid production, oil and gas production, flue gas desulphurisation plants, valve technology

Connection types

HKS expansion joints are equipped with flanges or welding ends for integration into pipe systems. All connections are manufactured to EN 1092-1 as a standard and comply with standardised dimensions. The following connections are used for axial and universal expansion joints.

Abbr. designation	Drawing	Description
B / Bs		› rotating swivel flange › B = press collar without welding seam › Bs = collar disc with welding seam and front ring
F		› welded-on fixed flange with reinforcing front rings
R		› welding end = welded-on weld end with reinforcing front rings › end 7 = welded-on conical weld end
V		› welded-on welding neck flange with reinforcing front rings

Flanges for lateral expansion joints are equipped with accommodations for tension rods. On angular expansion joints, the flanges are equipped with an accommodation for the joint tensioners. All connections are standardised and fit the standard commercial flanges (EN 1092-1) and pipes (EN 10216ff – 10217ff).

Standard flange

Flange with tabs for tension rods
(lateral expansion joint)

Flange with tabs for joint connection
(angular expansion joint)

Flanges made of unalloyed steel are treated with a corrosion protection coating. Components made of stainless steel are used where higher durability is required. Special shapes, other materials, galvanising or hotgalvanising, special paints and coatings are possible on request.

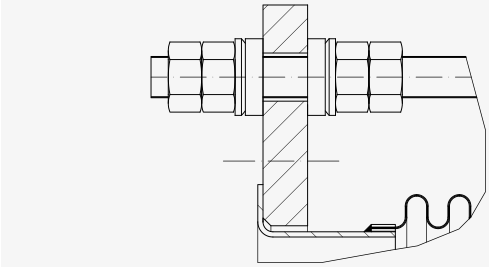
Flange and pipe materials:

Material group	Material designation	
	Flanges	Pipes
Standard	S235JR 1.0038	S235JR 1.0038
High-temperature steel	P265GH (HII) 1.0425 16Mo3 1.5415	P235GH-TC1 1.0305 (St 35.8I) 16Mo3 1.5415
Stainless steel	X6CrNiTi18-10 1.4541 X6CrNiMoTi17-12-2 1.4571	X6CrNiTi18-10 1.4541 X6CrNiMoTi17-12-2 1.4571
Heat resistant steel	X15CrNiSi20-12 1.4828 X8CrNiTi18-10 1.4878	X15CrNiSi20-12 1.4828 X8CrNiTi18-10 1.4878

Tie rods

For lateral and angular expansion joints, tie rod elements are used for absorbing the axial reaction forces. The fixed bearings of the pipe system only have to absorb adjustment forces and moments.

RN F-F



Tension rod connection (vacuum)

Tension rods

Lateral expansion joints are equipped with tension rods (generally threaded rods) for absorbing the reaction forces. These are supported by spherical and conical washers. The spherical and conical washers are fixed with two locknuts. Internal bearings are used in expansion joints with negative pressure (vacuum, outside pressure). This ensures that the expansion joint can only make vertical displacement movements. Tensioning elements made of unalloyed steel are usually electro-galvanised. Components made of stainless steel are used where higher durability is required. Other materials, hot galvanising, special paints and coatings are possible on request.

LM F-F

KN F-F

Hinged tensioners

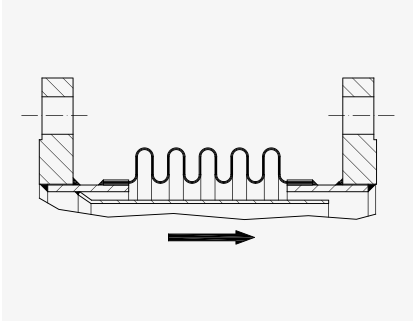
If the expansions to be absorbed in a pipe system are high to very high, expansion joints with joint tensioners are used. This can be lateral expansion joints and for very high expansions the mainly used angular expansion joints. Double bolt joint tensioners are used for lateral expansion joints which only absorb lateral movement in one plane. (see figure LM FF). When using ball-and-socket joints or cardan joints, all-around lateral movements on the circular plane are also possible. Compensation with two angular expansion joints instead of one lateral expansion joint offers the advantage that an intermediate pipe of practically any length can be used between the two angular expansion joints. This increases the permitted movement absorption proportionally to the length of the intermediate pipe. Angular expansion joints are also equipped with joint tensioners. Versions with a joint on one side are twoshear connections with tabs and bolts. The joint absorbs the axial reaction forces and only allows movements in one plane. Cardan joints are used for angular expansion joints with all-around movement. The joints are connected with a box (see figure KN F/F) or ring in this case. Joint connections made of unalloyed steel are treated with a corrosion protection coating. Components made of stainless steel are used where higher durability is required. Other materials, special paints and coatings are possible on request.

Materials for connecting parts

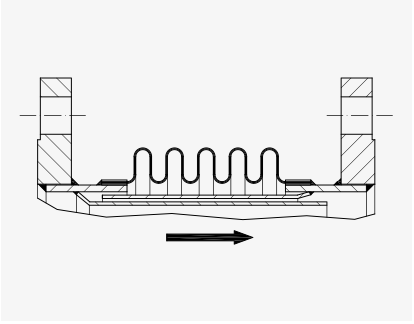
Material group	Material designation			
	Moulded parts/tabs	Spherical/conical washers	Tension rods/nuts	Joints
Standard (unalloyed steel))	S235JR 1.0038	C15 1.0401	5.6, 8.8 / 5, 8	S235JR 1.0038
High-temperature steel	16Mo3 1.5415	42 CrMo4 1.7225	42CrMo4 1.7225	16Mo3 1.5415
Stainless steel	X6CrNiTi18-10 1.4541 X6CrNiMoTi17-12-2 1.4571	X8CrNiS18-9 1.4305	A2 A4	X6CrNiTi18-10 1.4541 X6CrNiMoTi17-12-2 1.4571

Inner sleeves

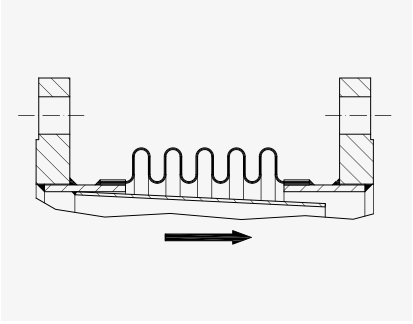
The high flow velocities can result in resonances of the bellows element or turbulences through redirection of flow. To minimise these effects and to transport the fluid with as little swirling as possible, inner sleeves are welded into the expansion joint. For media with a high risk of wear (abrasion), thebellows can be protected with an inner sleeve with an appropriate wall thickness. Depending on the application, inner sleeves are made of unalloyed (e.g. S235JR, P265GH), stainless (e.g. 1.4541, 1.4571) or wear resistant steel (e.g. HARDOX, XAR). Cylindrical inner sleeves are used for axial expansions. Telescopic inner sleeves are used to ensure function with high levels of movement absorption. Angular and lateral expansion joints are equipped with conical inner sleeves to still allow movement of the expansion joint.



Axial expansion joint with cylindrical inner sleeve



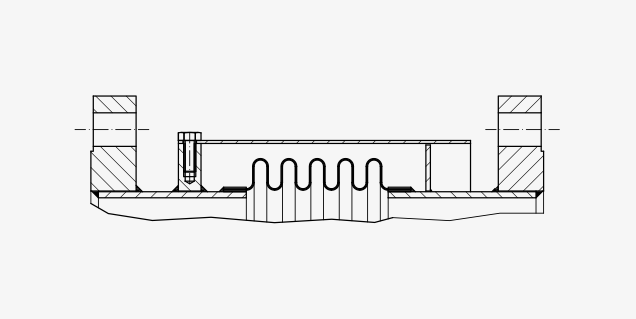
Axial expansion joint with telescopic inner sleeve



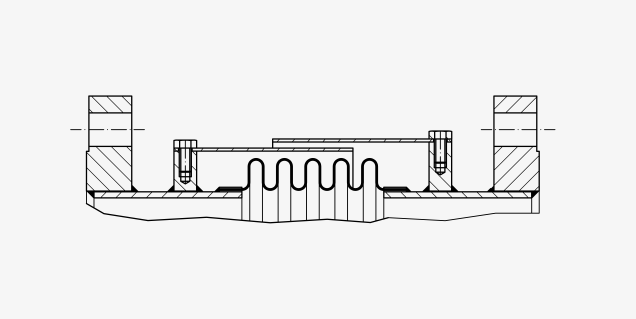
Lateral expansion joint with conical inner sleeve

Protective pipes

Protective pipes mounted on the outside protect the bellows against aggressive environmental media and mechanical damage. They can be screwed in or welded on. Applications are e.g. for district heating.



Expansion joints with removable protective pipe

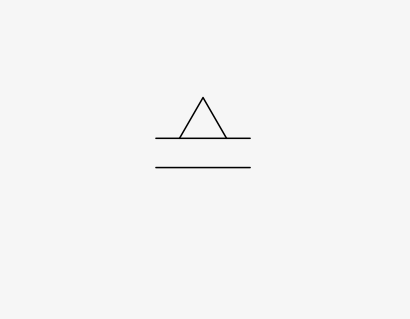


Expansion joint with telescopic protective pipe

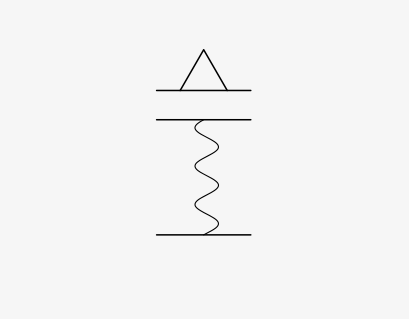
Installation in pipe systems

Expansion joints are used in piping systems to compensate for expansions. Combinations of several expansion joints for absorbing system specific movements have to be specially designed. This changes the stress on fixpoints and guides compared to an uncompensated system. On request, our HKS specialists can develop and manufacture individual system solutions as well as optimum arrangements of the system components ready for installation. The fixed bearings absorb additional reaction forces from the effective cross section and from the spring rate.

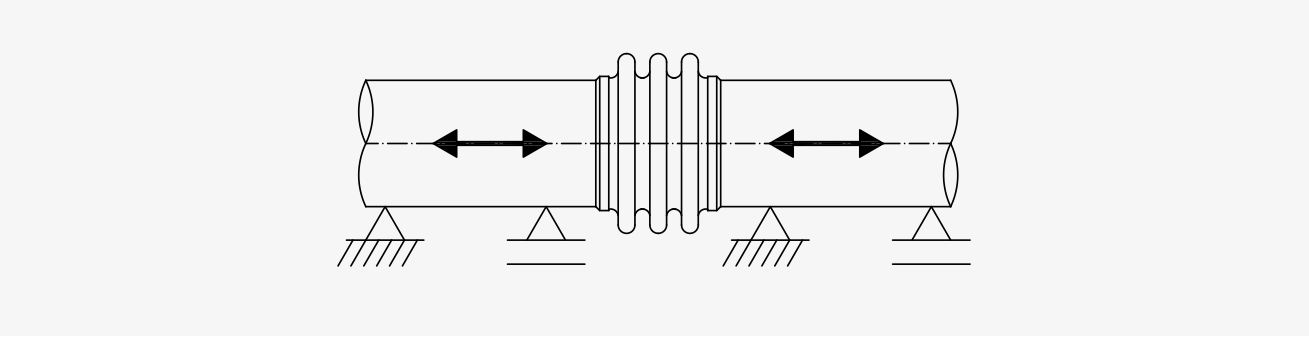
Fixed bearing



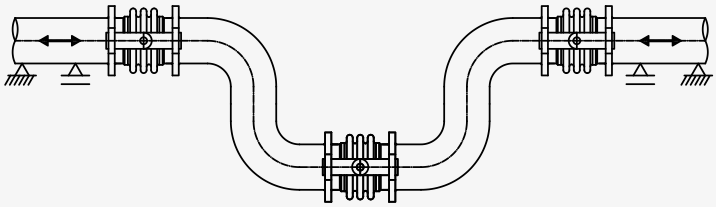
Floating bearing



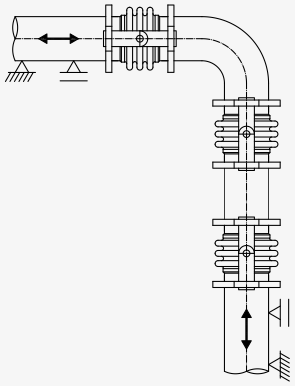
Spring bearing

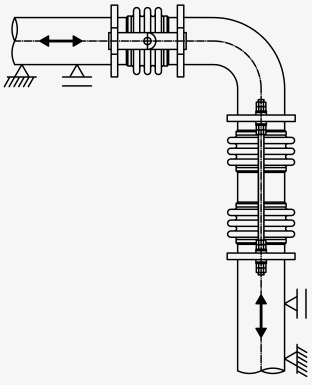


Absorption of axial expansion along the pipe axis using an axial expansion joint

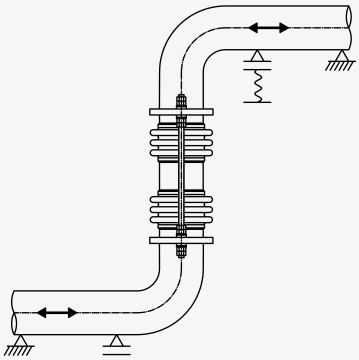


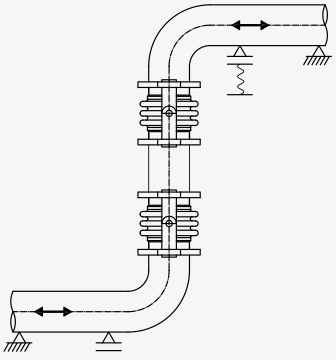
Axial expansions acting in a U-shaped arrangement are deflected in three angular movements (three hinges)**. This design is intended for absorbing large axial expansions in the pipe.**





Axial expansions acting in an L-shaped arrangement are deflected in three angular movements (left) **or alternatively in one angular and one lateral movement** (right)**.**





Axial expansions are deflected in one lateral movement (left) **or alternatively in two angular movements** (right)**. The axes of rotation have to be placed at 90 degrees to the axial direction of expansion. Correct support of the piping system has to be ensured.**

Design of corrugated expansion joints

The selection of an expansion joint is essentially determined by the expansion, the routing of the piping and the room situation. Expansion joints have to be selected in line with the basic movement Types (axial, lateral, angular). The use of expansion joints produces forces and moments which have to be absorbed by the fixed bearings of the piping system. Furthermore, superimposition of movements, temperature influences and increased stress cycles can lead to individual adaptations in dimensioning. On request, our HKS specialists can provide support for selecting the best possible expansion joint.

Thermal expansion of pipes

The thermal expansion caused by temperature change in pipes is one of the most frequent areas of application for expansion joints. The calculation of thermal expansion depends on the materials, the length of the piping and the temperature difference.

$$\Delta L(\Delta T) = L \times \alpha \times T$$

ΔL(ΔT) = change in length depending on temperature difference [mm]
L = length of piping [mm]
α = coefficient of thermal expansion [1/K]
T = temperature difference [K]

Material	Length expansion coefficient α× 10-6 [1/K] between 20 °C and				
	100 °C	200 °C	300 °C	400 °C	500 °C
Ferritic steel	12.5	13.0	13.6	14.1	14.3
X6CrNiTi18-10 (1.4541)	16.0	16.5	17.0	17.5	18.0
X6CrNiMoTi17-12-2 (1.4571)	16.5	17.5	18.0	18.5	19.0
X2CrNiMo17-12-2 (1.4404)	16.0	16.5	17.0	17.5	18.0
Copper	15.5	16.0	16.5	17.0	17.5
Aluminium (AlMg3)	23.7	24.5	25.3	26.3	27.2
PE	200	-	-	-	-
PP	180	-	-	-	-
PVC	80	-	-	-	-

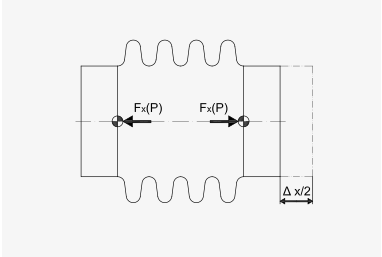
Forces and moments of expansion joints

Axial expansion joints:

The **axial reaction force** is the force in direction of the axis resulting from the operating pressure and the effective cross section.

$$F_x(P) = A_e \times P \times 10$$

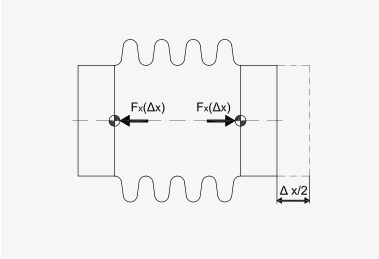
$F_x(P)$ = axial pressure force [N]
A_e = effective cross section [cm²]
P = operating pressure [bar]



The **axial adjustment force** is the force required for axial deflection from the rest position. It is calculated from the axial adjustment force rate of the bellows and the movement absorption. The direction of stress (tensile force + or pressure force -) has to be taken into account.

$$F_x(\Delta x) = \pm C_{\Delta x} \times \frac{\Delta x}{2}$$

$F_x(\Delta x)$ = axial adjustment force [N]
$C_{\Delta x}$ = axial adjustment force rate [N/mm]
Δx = axial movement absorption [mm]



Addition of both forces yields the axial overall force. The signs have to be taken into account.

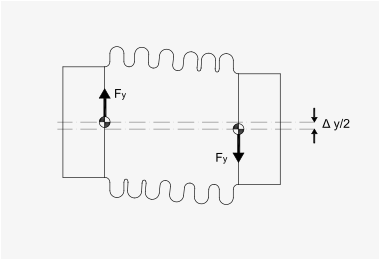
$$F_x = F_x(P) \pm F_x(\Delta x)$$

Lateral expansion joints:

The **lateral adjustment force** is the force required for lateral deflection from the rest position. It is calculated from the lateral adjustment force rate of the bellows and the lateral movement absorption.

$$F_y(\Delta y) = \pm C_{\Delta y} \times \frac{\Delta y}{2}$$

$F_y(\Delta y)$ = lateral adjustment force [N]
$C_{\Delta y}$ = lateral adjustment force rate [N/mm]
Δy = lateral movement absorption [mm]

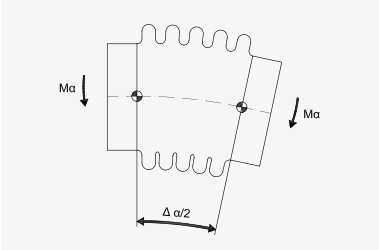


Angular expansion joints:

The **angular adjustment moment** is the force required for angular deflection from the rest position. It is calculated from the angular adjustment force rate and the angular movement absorption.

$$M_\alpha(\Delta\alpha) = C_{\Delta\alpha} \times \frac{\Delta\alpha}{2}$$

$M_\alpha(\Delta\alpha)$ = angular adjustment moment [Nm]
$C_{\Delta\alpha}$ = angular adjustment force rate [Nm/Degrees]
$\Delta\alpha$ = angular movement absorption [Degrees]



Derating method

All table values were determined with 1000 nominal stress cycles with nominal operating load. The design was based on the respective nominal pressure PN and a design temperature of 20 °C for the standard bellows material 1.4541.

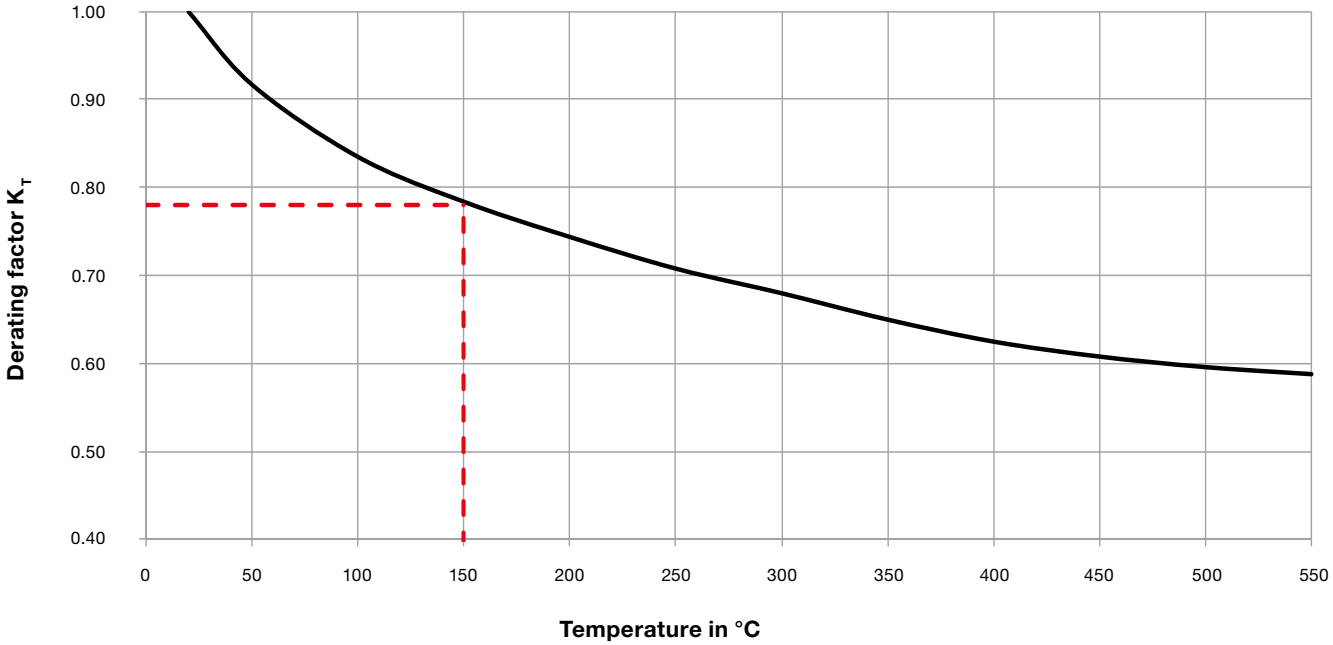
Operating conditions usually differ from these standard conditions. The table values are simply adapted to the actual operating conditions using derating or correction factors. For example, higher operating temperatures decrease the strength of a material and reduce the permitted operating pressure. Following the Wöhler curve (S-N curve), the movement absorption reduces as the number of stress cycles increases.

Temperature influence on the permitted nominal pressure

$$P(T) = PN \times K_T$$

P(T) = maximum permitted operating pressure at design temperature [bar]
PN = nominal pressure [bar]
K_T = temperature derating factor

Temperature derating diagram



Temperature derating factor K_T of the 1% expansion limit for 1.4541												
Temperature [°C]	20	50	100	150	200	250	300	350	400	450	500	550
K_T	1.00	0.91	0.83	0.78	0.74	0.71	0.67	0.64	0.62	0.61	0.60	0.59

Influence of the number of stress cycles on the movement absorption

Axial

$$\Delta x(N) = \Delta x \times K_N$$

Lateral

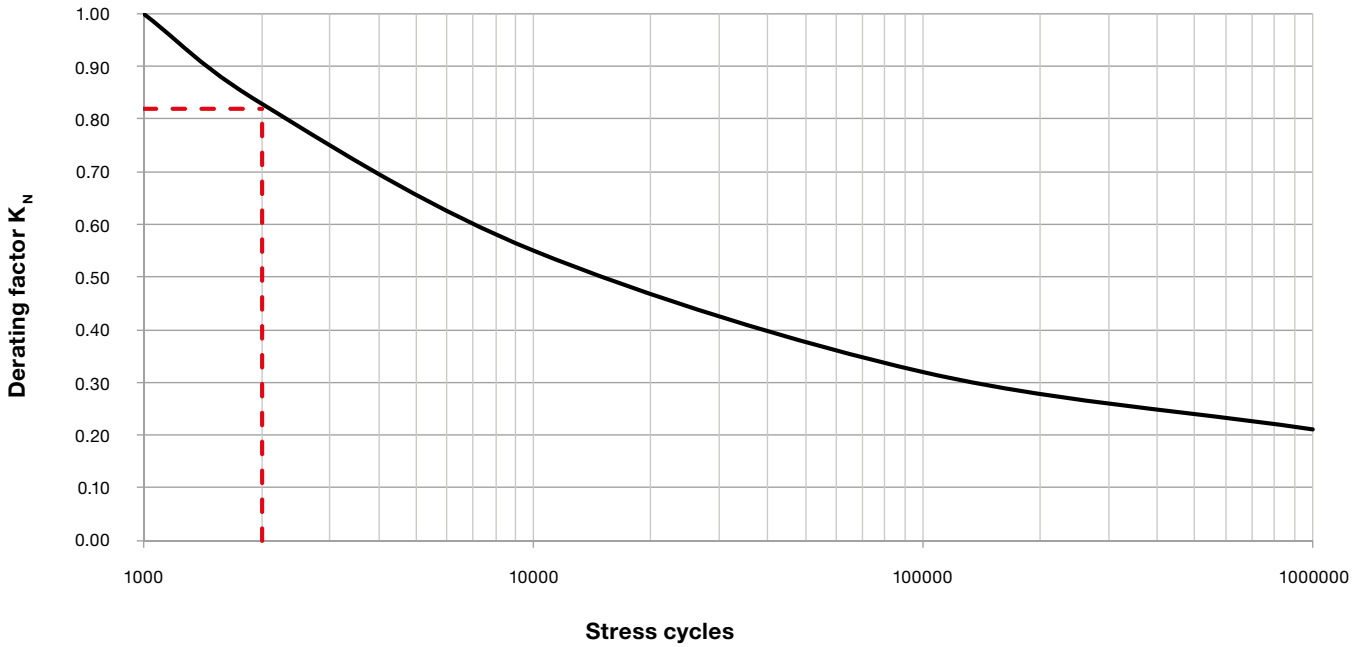
$$\Delta y(N) = \Delta y \times K_N$$

Angular

$$\Delta \alpha(N) = \Delta \alpha \times K_N$$

Δx(N); Δy(N), Δα(N) = maximum permitted movement absorption at design conditions [mm]
Δx; Δy; Δα = nominal movement absorption from table values [mm]
KN = temperature derating factor for movement at design number of stress cycles

Stress cycle derating diagram



Stress cycle derating factor K_N							
Number of stress cycles	1000	2000	10000	20000	100000	500000	1000000
K_N	1.00	0.83	0.55	0.46	0.32	0.23	0.2

Example for selecting an expansion joint

The thermal expansion of a piping system during operation is to be absorbed by axial expansion joints. A pipe DN 300 is to be installed between two fixpoints with a centre distance of 20 m. The pipes are made of unalloyed ferritic steel (e.g. P235GH). Water with an operating temperature of 150 °C and an operating pressure of 5 bar flows through the pipe. The pipe is installed at an ambient temperature of at least 10 °C. For optimum use of the full movement absorption, the expansion joint is mounted with a preset load. The entire system is subject to the Pressure Equipment Directive (97/23/EC). We want to find a suitable expansion joint with swivel flanges and the associated horizontal pretensioning and reaction forces.

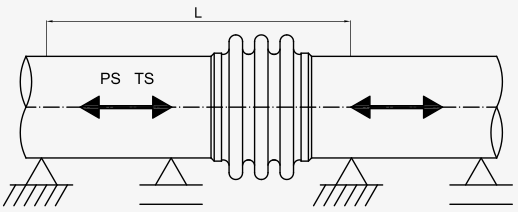
Operating data:

PS = 5 bar (operating pressure)

TS = 150 °C (operating temperature)

L = 20 m (length of pipe section)

T_0 = 10 °C (installation temperature)



Thermal expansion of the pipe section

$\Delta L(\Delta T) = L \times \alpha \times \Delta T$ — Length change due to temperature difference

ΔT = 150 °C – 10 °C = 140 K — Temperature difference

$\alpha = 13 \times 10^{-6}\ K^{-1}$ — Coefficient of thermal expansion for ferritic steel up to 200 °C

L = 20 m — relevant calculation length between the fixed points

$\Delta L(140\ K) = 20000\ mm \times 13 \times 10^{-6}\ K^{-1} \times 140\ K = 36.4\ mm$

Temperature-dependent pressure derating

$P(T) = PN \times K_T = 5\ bar$ — Permitted operating pressure due to operating temperature

K_T = 0.78 — Temperature derating factor (intermediate values have to be interpolated linearly)

$PN_{req} = P(T) / K_T = 5\ bar / 0.78 = 6.41\ bar$ — Required nominal pressure at 20 °C according to table

Stress cycle dependent reduction of movement absorption

Expansion joints which are subject to the Pressure Equipment Directive 97/23/ EC (PED) have to be dimensioned, manufactured and tested according to a set of rules (e.g. AD2000, EN14917, EN13445, EN13480). AD2000 data sheet B13 stipulates that a stress cycle safety of SL=2 has to be taken into account for the permitted number of stress cycles. Approx. 1000 stress cycles result over a period of 20 years with weekly startup and shutdown of the system. The permitted movement absorption is derated due to the higher required number of stress cycles of 2000.

$\Delta x(N) = \Delta x \times K_N = 36.4\ mm$ — Permitted movement absorption due to number of stress cycles

K_N = 0.83 — Stress cycle dependent derating factor for 2000 stress cycles

$\Delta x_{req} = \Delta x(N) / K_N = 36.4\ mm / 0.83 = 44\ mm$ — Required movement absorption at 20 °C according to table

Selection according to catalogue

Axial expansion joint with swivel flange DN 300

PN_{req} = 6,41 bar **Δx_{req} = 44 mm**

Expansion joints from the next pressure stage or higher have to be selected. The movement absorption has to be at least 44 mm.

For example, an existing AN 0300 / 010 / A050 / B / B-250 with the following data: axial expansion joint (AN) with Nominal diameter DN 300 with swivel flanges (B / B) on both sides and a length of 250 mm.

PN10	Nominal pressure 10 bar at 20 °C
Δx = 50 mm	Permitted axial movement absorption at 20 °C and 1000 stress cycles
$C_{\Delta x}$ = 658 N/mm	Axial adjustment force rate
A_e = 954 cm²	Efficient bellows diameter

Determining the reaction forces

Reaction force resulting from the operating pressure:

$F_x(P) = A_e \times PS \times 10$ Axial reaction force due to operating pressure

A_e = 954 cm²	Efficient bellows diameter
PS = 5 bar	Operating pressure

$F_x(P) = 954 \times 5 \times 10 = 47700\ N = 47.7\ kN$

To make best possible use of the movement absorption, the expansion joint is installed with a preset load (pretensioned). The axial adjustment force results from the axial adjustment force rate (spring rate) and the movement.

$F_x(\Delta x) = \pm C_{\Delta x} \times \Delta x / 2$

$C_{\Delta x}$ = 658 N/mm	Axial adjustment force rate
Δx = 36.4 mm	Existing axial movement

$F_x(\Delta x) = \pm 658 \times 36.4/2 = 11976\ N = 12\ kN$

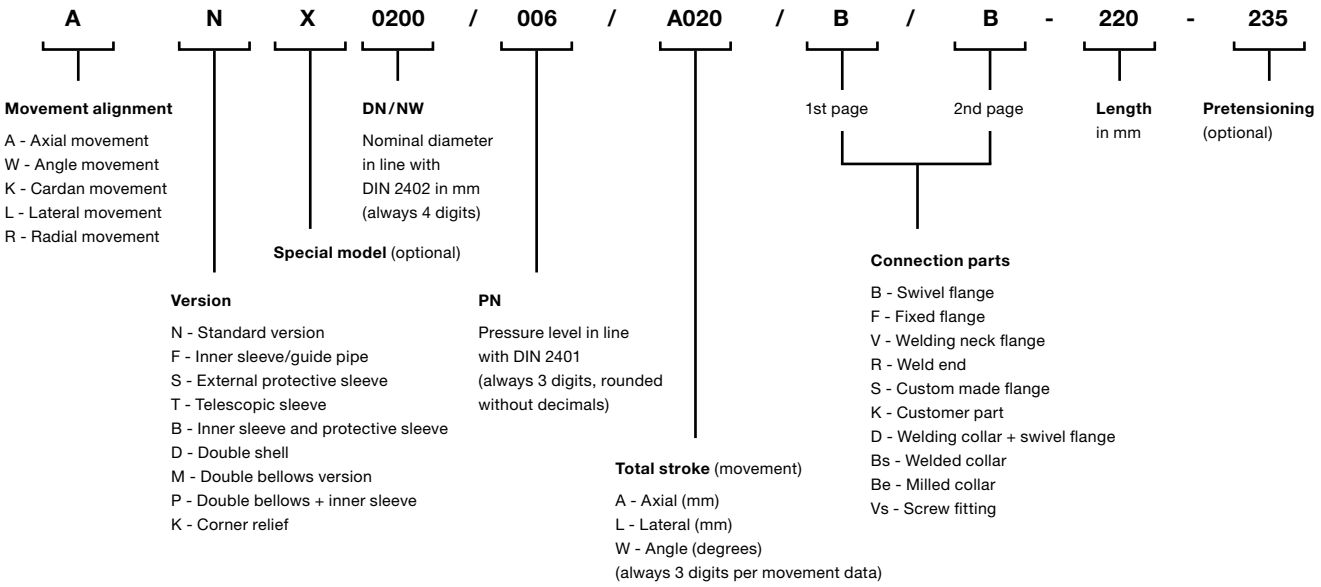
A preset load of approx. 12 kN has to be applied for installation of the expansion joint. After releasing the preset load, this force acts on the fixed bearings as a tensile force.

$F_x = F_x(P) + F_x(\Delta x)$

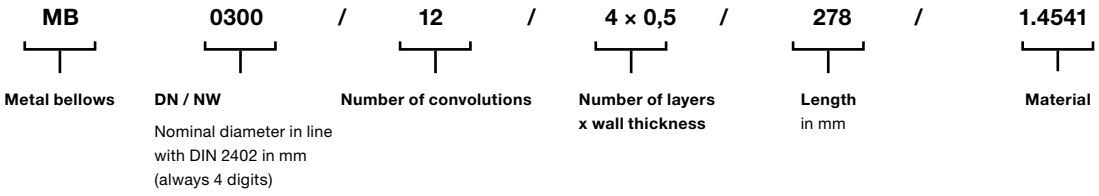
$F_x = 47700\ N + 11976\ N = 59676\ N = 59.7\ kN$

During operation, the expansion joint exerts an axial pressure force of approx. 59.7 kN on the anchor points. The dead weight of the pipes and additional parts as well as friction forces of plain bearings have to be taken into account for the dimensions of bearings. Loads have to be considered separately on the test bench.

HKS type designations for corrugated expansion joints



HKS type designation for metal bellows



AXIAL EXPANSION JOINT with swivel flanges **Type AN B-B**

TYPE AN B-B ≥ DN 100

TYPE AN B-B ≤ DN 80

Design type AN B-B

HKS axial expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with rotating, standardised swivel flanges in line with EN 1092-1 type 02.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows/collar	Flange	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo · Incoloy 825)		-196 °C bis 450 °C

1) Chemical resistance depends on temperature and medium and has to be tested or requested.
2) Take into account the pressure derating factors of the nominal pressures through operating temperature.
3) Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve

› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS

› With special coating, galvanised or hot galvanised

› Connection variants with weld end or fixed flanges

Tasks

› Absorption of axial movements

› Low-vibration and low-noise connection of pipes

› Compensation of installation inaccuracies

› Reduction of forces and moments in connections

Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building

› Food processing industry

› Gas and water supply, building and heating technology

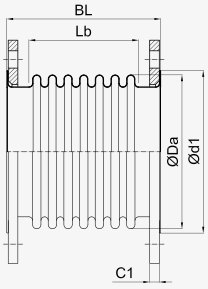
› Energy and offshore technology, oil and gas production

› Chemical and pharmaceutical industry, acid-production

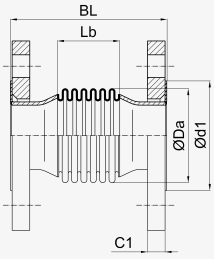
› Paper, textile, cellulose and paint industry

› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows			Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
AXIAL EXPANSION JOINT with swivel flanges · **type AN B-B · nominal pressure PN 2.5**												
50	21	105	3.5	6	90	16	84	44	42.5	4	138	582
50	43	150	3.6	6	90	16	84	88	42.5	17	69	73
50	62	185	3.8	6	90	16	84	124	42.5	34	49	26
65	27	100	4.4	6	110	16	105	41	66.4	3	106	813
65	61	150	4.7	6	110	16	105	90	66.4	19	49	77
65	75	220	5.5	6	110	16	105	160	65.5	43	105	52
80	26	115	6.8	6	128	18	117	53	86.1	4	157	937
80	65	220	7.4	6	128	18	118	158	86.6	32	101	67
80	99	300	8.5	6	128	18	118	240	86	75	105	30
100	48	150	6.9	6	148	18	142	93	127	11	94	267
100	76	205	7.2	6	148	18	142	146	127	28	60	69
100	100	255	7.9	6	148	18	142	194	127	50	69	45
125	49	140	9.1	6	178	20	174	74	191	7	86	571
125	89	200	9.4	6	178	20	174	134	191	25	48	98
125	145	375	14	6	178	20	176	269	191	83	102	52
150	48	170	11	6	202	20	207	66	274	5	91	1104
150	84	220	11	6	202	20	207	115	274	17	52	206
150	168	385	16	6	202	20	209	276	274	82	94	64
200	64	180	15	6	258	22	265	72	457	6	70	1164
200	114	235	15	6	258	22	264	126	455	19	43	231
200	192	370	22	6	258	22	266	260	456	69	88	113
250	72	190	19	6	312	24	321	77	689	6	73	1624
250	124	245	20	6	312	24	319	135	685	18	46	329
250	210	395	28	6	312	24	322	276	687	65	94	161
300	57	180	25	6	365	24	375	62	954	3	95	4609
300	133	260	26	6	365	24	372	143	946	18	48	424
300	226	415	36	6	365	24	374	292	948	63	99	211
350	62	155	35	6	415	26	410	66	1145	3	88	4379
350	124	220	36	6	415	26	409	132	1144	14	45	559
350	228	360	46	6	415	26	412	264	1145	52	96	300
400	84	225	43	6	465	28	464	95	1481	6	134	4233
400	126	270	44	6	465	28	464	142	1481	13	89	1255
400	190	395	49	6	465	28	464	264	1481	38	89	360
450	72	210	52	6	520	30	519	77	1863	3	163	9792
450	144	290	54	6	520	30	519	154	1863	15	82	1224
450	227	370	60	6	520	30	515	264	1845	41	90	451
500	78	220	56	6	570	30	576	83	2299	3	140	8908
500	156	300	58	6	570	30	576	166	2299	15	70	1114
500	234	395	65	6	570	30	571	256	2276	37	86	571
600	81	235	73	6	670	32	681	87	3263	3	144	11961
600	136	290	75	6	670	32	681	144	3263	10	86	2584

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows			Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
600	224	410	83	6	670	32	681	263	3259	30	91	816
700	86	255	108	6	775	40	781	92	4361	3	169	16907
700	172	350	112	6	775	40	781	183	4361	14	85	2114
700	230	410	119	6	775	40	788	247	4401	25	91	1251
800	96	285	148	6	880	44	897	102	5729	3	215	22524
800	160	350	152	6	880	44	897	170	5729	10	129	4866
800	224	420	156	6	880	44	897	238	5729	20	92	1773
900	96	290	178	6	980	48	999	102	7168	3	233	30574
900	160	360	182	6	980	48	999	170	7168	9	140	6604
900	224	430	187	6	980	48	999	238	7168	18	100	2407
1000	98	305	207	6	1080	52	1101	108	8779	3	257	36926
1000	131	345	210	6	1080	52	1101	144	8779	5	193	15578
1000	238	455	223	6	1080	52	1102	255	8784	19	86	2212
1200	114	340	275	6	1280	60	1319	122	12618	3	324	53127
1200	190	420	284	6	1280	60	1319	202	12618	10	195	11476
1200	228	460	285	6	1280	60	1304	243	12471	14	122	4912
1400	109	345	383	6	1480	72	1519	122	16949	2	403	88783
1400	181	430	393	6	1480	72	1519	202	16949	8	242	19178
1400	228	470	394	6	1480	72	1502	243	16760	12	159	8652
AXIAL EXPANSION JOINT with swivel flanges · **type AN B-B · nominal pressure PN 6**												
50	21	105	3.5	6	90	16	84	44	42.5	4	138	582
50	35	135	3.6	6	90	16	84	73	42.5	11	83	126
50	49	210	4.2	6	90	16	84	146	41.8	32	163	61
65	26	100	4.4	6	110	16	105	41	66.4	3	106	813
65	45	155	4.6	6	110	16	100	96	62.8	15	84	111
65	66	205	5.3	6	110	16	105	142	65.5	34	119	75
80	25	115	6.8	6	128	18	117	53	86.1	4	157	937
80	47	175	7.2	6	128	18	118	116	86.6	17	138	170
80	79	230	8.1	6	128	18	118	169	85.5	42	139	80
100	52	165	7	6	148	18	141	106	127	14	86	186
100	63	185	7.4	6	148	18	142	125	127	20	107	168
100	87	280	9.2	6	148	18	144	213	127	48	173	93
125	37	125	9	6	178	20	174	60	191	4	108	1115
125	69	210	9.8	6	178	20	174	108	191	15	91	283
125	98	290	12	6	178	20	176	185	191	38	149	158
150	47	190	11	6	202	20	207	84	274	7	151	1118
150	72	240	11	6	202	20	205	135	271	17	109	310
150	131	360	18	6	202	20	210	263	274	61	221	168
200	49	185	15	6	258	22	265	74	456	4	150	2408
200	80	240	16	6	258	22	262	129	450	14	105	540
200	141	340	25	6	258	22	267	240	455	46	222	334
250	51	190	20	6	312	24	318	79	683	4	182	3844
250	87	250	21	6	312	24	317	138	680	13	111	762
250	147	350	29	6	312	24	322	242	686	40	196	438

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows			Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
300	64	225	27	6	365	24	375	106	954	6	222	3596
300	90	270	28	6	365	24	375	149	954	12	159	1311
300	133	345	33	6	365	24	374	222	947	28	180	661
350	58	185	37	6	415	26	410	92	1145	4	254	6656
350	109	275	39	6	415	26	408	183	1137	17	147	956
350	165	335	49	6	415	26	411	248	1141	35	201	712
400	60	195	43	6	465	28	462	96	1473	4	275	8366
400	106	265	45	6	465	28	462	168	1473	13	157	1561
400	174	380	58	6	465	28	463	260	1470	34	211	874
450	63	240	55	6	520	30	520	106	1863	4	365	11625
450	111	320	58	6	520	30	520	185	1863	14	209	2169
450	204	385	75	6	520	30	522	261	1863	36	221	1153
500	70	250	59	6	570	30	574	114	2288	4	347	11739
500	124	335	63	6	570	30	574	199	2288	15	199	2191
500	200	405	82	6	570	30	579	278	2299	34	253	1442
600	79	290	86	6	670	32	684	152	3268	6	553	14912
600	127	380	92	6	670	32	684	244	3268	15	346	3641
600	209	385	97	6	670	32	681	250	3251	27	202	2006
700	70	280	121	6	775	40	790	128	4401	3	661	33891
700	124	380	129	6	775	40	790	224	4401	12	378	6324
700	221	415	137	6	775	40	784	263	4364	25	212	2560
800	69	310	166	6	880	44	899	144	5729	3	1092	57589
800	114	350	176	6	880	44	900	184	5729	8	669	21598
800	224	420	177	6	880	44	893	252	5684	22	216	3685
900	72	290	200	6	980	48	1005	111	7194	2	1095	123392
900	120	360	212	6	980	48	1005	184	7194	7	657	26653
900	224	435	224	6	980	48	999	259	7143	20	253	5145
1000	83	300	234	6	1080	52	1115	117	8875	3	955	119469
1000	111	340	241	6	1080	52	1115	156	8875	5	717	50401
1000	204	420	253	6	1080	52	1109	233	8822	14	337	10452
1200	90	335	368	6	1295	60	1321	129	12618	3	1032	150837
1200	180	460	395	6	1295	60	1321	257	12618	12	516	18855
1200	228	470	409	6	1295	60	1322	264	12618	15	368	12693
1400	85	365	558	6	1510	72	1521	129	16949	2	1291	253285
1400	171	490	589	6	1510	72	1521	257	16949	9	646	31661
1400	228	500	611	6	1510	72	1522	264	16949	13	455	21094
AXIAL EXPANSION JOINT with swivel flanges · **type AN B-B · nominal pressure PN 10**												
50	27	120	6.1	16	102	20	84	59	42.5	7	104	246
50	36	150	6.3	16	102	20	84	87	42.1	14	126	136
50	42	190	6.6	16	102	20	84	129	41.8	24	185	89
65	20	95	7.1	16	122	20	105	33	66.4	2	133	1588

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows			Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
65	34	135	7.5	16	122	20	105	76	65.5	9	223	490
65	47	165	7.7	16	122	20	105	104	65.5	17	162	189
80	24	115	8.1	16	138	20	117	53	86.1	4	157	937
80	44	160	8.6	16	138	20	118	99	86	13	185	311
80	56	180	9	16	138	20	118	121	85.5	21	194	217
100	31	130	9.5	16	158	22	142	66	127	5	132	731
100	49	220	11	16	158	22	142	154	127	19	215	220
100	82	305	14	16	158	22	145	238	127	51	341	146
125	37	140	12	16	188	22	174	76	191	6	178	1122
125	49	170	13	16	188	22	173	107	189	11	144	457
125	89	275	17	16	188	22	177	205	191	38	301	262
150	39	160	16	16	212	24	207	86	274	5	269	1894
150	67	195	17	16	212	24	207	124	273	14	168	573
150	99	315	22	16	212	24	210	202	274	35	288	368
200	47	170	21	10	268	24	262	94	451	6	254	2473
200	85	270	24	10	268	24	264	159	453	18	213	731
200	115	310	28	10	268	24	268	197	456	31	264	596
250	57	240	28	10	320	26	322	123	689	7	307	2690
250	86	265	30	10	320	26	322	147	689	14	229	1388
250	138	380	41	10	320	26	325	264	688	41	355	667
300	50	250	35	10	370	26	377	135	954	6	658	6630
300	92	365	39	10	370	26	377	247	954	21	359	1076
300	134	335	43	10	370	26	377	218	949	27	295	1124
350	63	230	51	10	430	30	407	140	1133	7	345	3845
350	103	280	53	10	430	30	405	191	1126	17	257	1524
350	155	365	67	10	430	30	414	268	1144	36	362	1099
400	52	225	65	10	482	32	466	126	1481	5	699	12446
400	104	350	71	10	482	32	466	252	1481	20	350	1556
400	164	380	83	10	482	32	466	280	1474	35	377	1351
450	71	270	80	10	532	36	521	164	1863	7	531	7089
450	107	350	85	10	532	36	521	245	1863	17	354	2101
450	166	465	116	10	532	36	523	352	1854	40	649	1854
500	78	290	96	10	585	38	575	176	2286	8	514	7305
500	104	345	99	10	585	38	575	234	2286	15	386	3082
500	181	405	115	10	585	38	574	288	2274	32	387	2022
600	76	350	134	10	685	42	684	188	3268	7	851	15137
600	114	445	142	10	685	42	684	281	3268	16	567	4485
600	193	425	152	10	685	42	679	299	3232	29	402	2773
700	63	285	196	10	800	50	792	140	4401	3	1697	73569
700	114	420	215	10	800	50	787	279	4371	14	1007	10839
700	198	420	215	10	800	50	787	279	4371	24	393	4232
AXIAL EXPANSION JOINT with swivel flanges · **type AN B-B · nominal pressure PN 16**												
50	23	115	6.1	16	102	20	84	52	42.5	5	118	367
50	28	130	6.2	16	102	20	84	70	42.1	8	158	265

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows			Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
50	33	165	6.5	16	102	20	84	104	41.8	15	231	173
65	24	115	7.1	16	122	20	100	56	62.8	4	144	556
65	29	125	7.4	16	122	20	105	66	65.5	6	254	731
65	37	145	7.6	16	122	20	105	85	65.5	11	198	344
80	22	130	8.1	16	138	20	114	68	83.2	4	211	741
80	32	135	8.4	16	138	20	118	75	86	7	247	736
80	44	160	8.8	16	138	20	118	97	85.5	13	243	424
100	34	160	9.8	16	158	22	141	96	127	8	206	546
100	43	180	11	16	158	22	142	116	127	13	249	452
100	57	210	12	16	158	22	144	144	127	21	324	378
125	24	130	13	16	188	22	174	63	191	3	394	3682
125	42	175	13	16	188	22	174	110	190	9	237	720
125	59	240	15	16	188	22	175	172	190	21	370	453
150	26	180	17	16	212	24	208	71	274	3	539	5677
150	50	210	17	16	212	24	206	141	272	12	303	791
150	68	265	19	16	212	24	208	154	272	18	333	731
200	34	215	24	16	268	26	267	100	457	4	737	6419
200	61	295	26	16	268	26	267	180	457	15	410	1101
200	97	320	31	16	268	26	268	206	453	27	440	903
250	36	235	35	16	320	29	323	106	689	4	795	9295
250	58	300	36	16	320	29	323	170	689	11	497	2270
250	105	345	43	16	320	29	324	216	684	25	468	1309
300	31	225	45	16	378	32	376	90	952	2	1019	23048
300	81	415	54	16	378	32	377	279	954	21	598	1404
300	124	435	69	16	378	32	381	300	954	35	697	1416
350	32	200	64	16	438	35	408	96	1134	2	1094	25676
350	84	375	74	16	438	35	412	273	1145	20	597	1753
350	135	425	91	16	438	35	415	317	1142	37	685	1488
400	50	265	86	16	490	38	466	156	1481	5	1064	12361
400	90	395	93	16	490	38	465	286	1477	19	613	2114
400	137	415	111	16	490	38	470	300	1481	31	698	2193
450	57	290	109	16	550	42	521	168	1862	6	979	12327
450	95	400	116	16	550	42	521	280	1860	18	603	2728
450	151	445	138	16	550	42	524	320	1857	33	691	2391
500	52	255	146	16	610	46	573	124	2273	3	1230	35165
500	104	380	155	16	610	46	573	247	2273	15	615	4396
500	144	405	175	16	610	46	582	272	2299	24	707	4193

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

AXIAL EXPANSION JOINT for low pressure (PN1) **Type AN B-B**

TYPE AN B-B ≥ DN 100

Tasks

- Absorption of axial movements
- Low-vibration and low-noise connection of pipes
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical and plant engineering, engine and ship building
- Gas supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

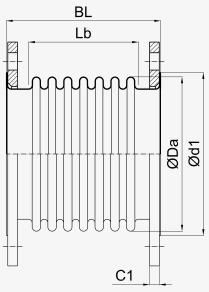
Design type AN B-B

HKS axial expansion joint with compact size, consisting of multi-convolution and multi-layered metal bellows with rotating, standardised swivel flanges according to DIN 86044.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows/collar	Flange	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C [4]
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12) 1.4878 (X8CrNiTi18-10)		bis 900 °C [5] bis 800 °C
Nickel-base alloy	2.4858 (NiCr21Mo · Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Exhaust gases from an operating pressure of 0.5 bar to max. 550 °C
5. Exhaust gases from an operating pressure of 0.5 bar to max. 1000 °C

DN 100 - DN 2400



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- Flanges in line with EN 1092-1, ASME, JIS, BS
- With special coating, galvanised or hot galvanised
- Connection variants with weld end or fixed flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange in line with DIN 86044		Bellows			Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				Outer diameter of collar durchm.	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
AXIAL EXPANSION JOINT with swivel flanges · **type AN B-B · nominal pressure PN 1**													
100	39	140	5.8	148	14	140	80	126	8	124	473	236	378
100	86	235	6.2	148	14	140	172	126	38	57	47	122	90
100	119	300	6.4	148	14	140	238	126	74	42	18	91	48
125	58	130	7	178	14	172	89	190	11	79	362	163	285
125	117	225	7.5	178	14	172	178	190	44	40	46	88	77
125	149	300	7.9	178	14	170	252	187	81	35	20	72	44
150	49	150	7.9	202	14	205	66	272	5	100	1196	172	488
150	122	250	8.6	202	14	205	164	272	35	40	77	80	91
150	184	340	11	202	14	205	255	271	84	41	33	57	41
175	51	360	13	232	16	234	69	360	5	109	1569	130	405
175	129	365	19	232	16	234	172	360	34	44	101	71	88
175	186	370	23	232	16	234	250	360	72	46	51	55	47
200	67	160	12	258	16	263	72	455	6	75	1244	123	412
200	117	210	12	258	16	263	126	455	20	43	233	78	149
200	186	340	15	258	16	263	258	454	66	46	60	53	50
250	72	160	14	312	16	319	77	686	6	79	1741	112	432
250	144	235	15	312	16	319	154	686	24	40	218	63	121
250	206	355	18	312	16	319	275	685	63	49	85	48	52
300	51	160	19	365	16	374	63	952	3	208	9712	151	842
300	138	265	21	365	16	374	167	952	21	78	513	67	141
300	210	365	23	365	16	372	271	947	54	54	133	47	60
350	56	160	24	415	16	408	68	1141	3	202	9735	133	758
350	132	250	26	415	16	408	157	1141	18	87	767	68	166
350	210	385	28	415	16	403	292	1126	53	62	157	47	61
400	63	170	27	465	16	462	71	1476	3	193	10823	119	734
400	106	210	28	465	16	462	118	1476	9	116	2338	81	298
400	212	330	31	465	16	462	236	1476	38	58	293	44	82
450	72	170	31	520	16	517	77	1857	3	175	10508	105	668
450	120	220	32	520	16	517	128	1857	10	105	2270	70	268
450	216	325	35	520	16	517	231	1857	34	59	390	42	90
500	78	175	34	570	16	574	83	2292	3	149	9501	90	589
500	130	230	36	570	16	574	138	2292	11	90	2053	60	235
500	234	345	39	570	16	574	249	2292	35	50	352	36	78
550	79	185	48	620	20	627	84	2755	3	148	11009	84	596
550	132	240	49	620	20	627	140	2755	10	89	2378	56	238
550	237	355	53	620	20	625	252	2746	33	54	442	35	83
600	81	190	52	670	20	680	87	3260	3	147	12239	80	599
600	136	245	54	670	20	680	144	3260	10	89	2644	53	239
600	244	360	57	670	20	675	260	3235	32	61	553	36	90
650	84	190	52	720	20	730	89	3785	3	158	14403	79	624
650	140	250	54	720	20	730	148	3785	9	95	3111	53	249
650	252	370	58	720	20	725	267	3758	32	65	651	36	93

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange in line with DIN 86044		Bellows			Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				Outer diameter of collar durchm.	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	d1	C1	Da	Lb	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
700	86	195	60	775	20	786	92	4391	3	139	13941	70	577
700	144	255	62	775	20	786	152	4391	9	83	3012	46	229
700	230	345	66	775	20	786	244	4391	24	52	736	31	95
800	96	205	71	880	20	895	102	5715	3	229	24019	73	614
800	128	240	73	880	20	895	136	5715	6	172	10133	58	365
800	224	340	79	880	20	893	238	5702	20	106	2020	37	135
900	96	205	80	980	20	1000	102	7179	3	223	29264	67	633
900	128	240	82	980	20	1000	136	7179	6	167	12346	53	375
900	224	340	88	980	20	994	238	7134	18	117	2792	37	150
1000	102	210	89	1080	20	1110	108	8859	3	192	27706	58	572
1000	136	245	92	1080	20	1112	144	8875	6	136	11048	44	327
1000	204	320	97	1080	20	1106	216	8825	13	108	3891	35	171
1100	108	215	98	1180	20	1216	114	10697	3	197	30925	56	576
1100	144	255	102	1180	20	1218	152	10715	6	140	12345	42	328
1100	216	330	107	1180	20	1210	228	10642	14	118	4592	34	178
1200	114	220	107	1280	20	1316	120	12608	3	213	35511	55	590
1200	152	260	111	1280	20	1318	160	12628	6	151	14179	42	336
1200	228	340	116	1280	20	1310	240	12549	14	127	5271	34	182
1300	114	220	115	1380	20	1416	120	14677	3	228	44227	55	633
1300	152	260	119	1380	20	1416	160	14677	5	171	18659	43	373
1300	228	340	124	1380	20	1410	240	14613	13	136	6562	34	195
1400	114	220	123	1480	20	1516	120	16903	3	242	54251	55	676
1400	152	260	128	1480	20	1516	160	16903	5	182	22887	43	398
1400	190	300	132	1480	20	1516	200	16903	8	146	11719	36	264
1500	120	230	126	1580	20	1620	126	19335	3	230	53458	51	640
1500	160	270	131	1580	20	1620	168	19335	5	173	22553	40	377
1500	200	310	135	1580	20	1620	210	19335	8	138	11547	33	250
1600	120	230	128	1690	20	1720	126	21878	3	243	63915	50	667
1600	160	270	133	1690	20	1720	168	21878	5	183	26965	39	393
1600	200	310	138	1690	20	1720	210	21878	8	146	13806	32	261
1800	120	230	157	1890	20	1920	126	27436	2	269	88710	49	741
1800	160	270	163	1890	20	1920	168	27436	4	202	37425	39	437
1800	200	310	169	1890	20	1920	210	27436	7	162	19162	32	290
2000	134	255	183	2090	20	2120	152	33615	3	492	137898	58	794
2000	179	305	191	2090	20	2120	202	33615	5	369	58176	45	468
2000	224	355	198	2090	20	2120	252	33615	9	295	29786	37	310
2200	132	255	200	2295	20	2320	152	40429	2	533	179684	57	858
2200	177	305	208	2295	20	2320	202	40429	5	400	75805	44	506
2200	221	355	217	2295	20	2320	252	40429	8	320	38812	37	336
2400	131	255	218	2495	20	2520	152	47870	2	573	229144	56	928
2400	174	305	226	2495	20	2520	202	47870	4	430	96670	44	547
2400	218	355	236	2495	20	2520	252	47870	7	344	49495	37	363

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

HKs

AXIAL EXPANSION JOINT with fixed flanges **Type AN F-F**

TYPE AN F-F ≥ DN 100

TYPE AN F-F ≤ DN 80

Design type AN F-F

HKS axial expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01.

Materialcombination [1]	Bauteil		Permitted operating temperature TS [2]
	Metal bellows	Flange	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo · Incoloy 825)		-196 °C bis 450 °C

1) Chemical resistance depends on temperature and medium and has to be tested or requested.
2) Take into account the pressure derating factors of the nominal pressures through operating temperature.
3) Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve

› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS

› With special coating, galvanised or hot galvanised

› Connection variants with weld end or swivel flanges

Tasks

› Absorption of axial movements

› Low-vibration and low-noise connection of pipes

› Compensation of installation inaccuracies

› Reduction of forces and moments in connections

Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building

› Food processing industry

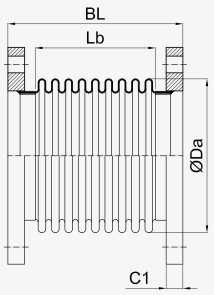
› Gas, water supply, building and heating technology

› Energy and offshore technology, oil and gas production

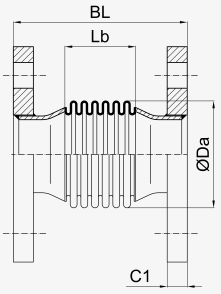
› Chemical and pharmaceutical industry, acid production

› Paper, textile, cellulose and paint industry Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
AXIAL EXPANSION JOINT with fixed flanges · **type AN F-F · nominal pressure PN 2.5**											
50	21	105	3.5	6	16	84	44	42.5	4	138	582
50	43	150	3.6	6	16	84	88	42.5	17	69	73
50	62	185	3.7	6	16	84	124	42.5	34	49	26
65	27	100	4.3	6	16	105	41	66.4	3	106	813
65	61	150	4.5	6	16	105	90	66.4	19	49	77
65	75	220	5.4	6	16	105	160	65.5	43	105	52
80	26	115	6.6	6	18	117	53	86.1	4	157	937
80	65	220	7.3	6	18	118	158	86.6	32	101	67
80	99	305	8.3	6	18	118	240	86	75	105	30
100	54	150	7.1	6	18	142	93	125	13	76	211
100	84	205	7.4	6	18	141	146	125	32	49	56
100	103	240	7.9	6	18	142	180	125	48	61	45
125	54	135	9.3	6	20	174	74	189	8	72	472
125	92	195	9.7	6	20	172	134	187	26	45	91
125	154	360	14	6	20	175	269	188	89	91	45
150	53	160	11	6	20	207	66	271	6	78	933
150	93	210	11	6	20	207	115	271	19	45	175
150	169	350	16	6	20	208	258	271	78	88	68
200	67	170	16	6	22	265	72	453	6	61	1011
200	113	225	16	6	22	261	126	447	19	43	229
200	192	340	21	6	22	266	240	453	64	82	122
250	72	180	20	6	24	321	77	684	6	65	1425
250	124	235	21	6	24	317	135	676	18	46	323
250	212	355	28	6	24	323	255	684	60	86	173
300	57	170	26	6	24	375	62	948	3	85	4080
300	133	250	27	6	24	370	143	935	18	49	422
300	229	375	36	6	24	375	269	945	59	91	226
350	62	140	36	6	26	408	66	1136	3	84	4146
350	124	210	37	6	26	407	132	1132	14	45	551
350	228	340	46	6	26	411	264	1138	52	89	276
400	88	210	44	6	28	464	95	1474	6	121	3812
400	132	255	45	6	28	464	142	1474	14	81	1130
400	191	345	49	6	28	462	264	1467	38	90	359
450	72	165	52	6	30	510	76	1823	3	106	6410
450	144	240	53	6	30	510	152	1823	15	53	802
450	216	355	61	6	30	518	238	1847	35	80	497
500	78	200	58	6	30	576	83	2291	3	128	8150
500	156	285	60	6	30	576	166	2291	15	64	1019
500	208	345	66	6	30	575	228	2282	29	77	644
600	81	220	76	6	32	678	87	3240	3	147	12133

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
600	136	275	78	6	32	678	144	3240	10	88	2621
600	229	395	85	6	32	679	263	3242	31	89	790
700	86	240	110	6	40	779	92	4336	3	170	16911
700	172	330	114	6	40	779	183	4336	14	85	2114
700	230	395	121	6	40	788	247	4389	25	84	1159
800	96	265	151	6	44	897	102	5712	3	203	21271
800	160	330	155	6	44	897	170	5712	10	122	4595
800	224	400	160	6	44	897	238	5712	20	87	1675
900	96	270	182	6	48	997	102	7138	3	232	30388
900	160	340	187	6	48	997	170	7138	9	140	6564
900	224	410	192	6	48	997	238	7138	18	100	2393
1000	102	285	213	6	52	1099	108	8747	3	255	36494
1000	136	320	215	6	52	1099	144	8747	6	192	15396
1000	238	435	238	6	52	1113	259	8857	19	107	2694
1200	114	315	287	2.5	60	1317	122	12585	3	319	52047
1200	190	395	296	2.5	60	1317	202	12585	10	191	11243
1200	228	440	309	2.5	60	1319	246	12598	14	135	5353
1400	111	340	386	2.5	72	1518	122	16921	3	385	84679
1400	186	420	397	2.5	72	1518	202	16921	8	231	18291
1400	260	500	407	2.5	72	1518	283	16921	16	165	6666
AXIAL EXPANSION JOINT with fixed flanges · **type AN F-F · nominal pressure PN 6**											
50	21	105	3.5	6	16	84	44	42.5	4	138	582
50	35	135	3.5	6	16	84	73	42.5	11	83	126
50	49	210	4.1	6	16	84	146	41.8	32	163	61
65	26	100	4.3	6	16	105	41	66.4	3	106	813
65	45	155	4.5	6	16	100	96	62.8	15	84	111
65	66	205	5.2	6	16	105	142	65.5	34	119	75
80	25	115	6.6	6	18	117	53	86.1	4	157	937
80	47	180	7.1	6	18	118	116	86.6	17	138	170
80	79	235	7.9	6	18	118	169	85.5	42	139	80
100	52	165	7.2	6	18	139	106	123	14	85	179
100	64	185	7.5	6	18	141	125	124	21	102	155
100	88	255	9	6	18	143	198	125	46	161	98
125	39	120	9.2	6	20	173	60	188	4	93	950
125	70	170	9.8	6	20	172	108	187	16	88	269
125	97	260	12	6	20	176	168	189	35	138	176
150	51	180	11	6	20	207	84	271	7	130	947
150	71	210	12	6	20	207	118	270	15	96	355
150	133	355	18	6	20	209	263	269	62	214	159
200	50	170	16	6	22	263	74	449	5	148	2324
200	80	225	17	6	22	260	129	443	14	104	527
200	152	335	25	6	22	268	240	451	50	194	290
250	51	180	20	6	24	316	79	673	4	181	3771

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
250	87	240	21	6	24	315	138	671	13	112	756
250	147	345	29	6	24	320	242	677	40	195	430
300	69	215	28	6	24	375	106	948	7	199	3196
300	96	255	29	6	24	375	149	948	13	142	1165
300	134	305	33	6	24	376	200	947	25	162	734
350	60	170	37	6	26	409	92	1135	4	245	6368
350	109	260	40	6	26	405	183	1124	17	148	952
350	165	330	48	6	26	409	248	1129	35	201	701
400	61	180	44	6	28	460	96	1459	4	273	8254
400	107	250	46	6	28	460	168	1459	13	156	1541
400	176	350	56	6	28	465	234	1471	31	189	969
450	67	225	56	6	30	520	106	1856	4	333	10573
450	117	305	59	6	30	520	185	1856	14	191	1973
450	210	380	74	6	30	521	261	1852	37	211	1094
500	71	235	61	6	30	572	114	2271	5	346	11612
500	125	320	64	6	30	572	199	2271	15	198	2167
500	210	395	81	6	30	579	278	2291	35	233	1325
600	87	280	81	6	32	673	148	3210	6	336	9394
600	140	370	85	6	32	673	237	3210	17	210	2294
600	209	380	96	6	32	679	250	3231	27	201	1988
700	74	275	119	6	40	790	128	4389	4	616	31483
700	130	370	128	6	40	790	224	4389	12	352	5875
700	221	410	135	6	40	782	263	4341	26	211	2540
800	83	300	160	6	44	896	141	5699	4	595	32624
800	134	340	165	6	44	892	178	5667	9	364	12419
800	224	420	185	6	44	900	258	5715	22	264	4338
900	75	280	197	6	48	1005	111	7179	2	1030	115832
900	126	355	210	6	48	1005	184	7179	8	618	25020
900	224	430	222	6	48	1000	259	7141	20	224	4545
1000	86	295	231	6	52	1115	117	8859	3	903	112707
1000	115	335	239	6	52	1115	156	8859	5	677	47549
1000	204	410	251	6	52	1107	233	8789	14	336	10395
1200	93	325	364	6	60	1321	129	12596	3	983	143400
1200	186	455	392	6	60	1321	257	12596	12	492	17925
1200	228	460	409	6	60	1321	264	12589	15	357	12315
1400	88	355	554	6	72	1521	129	16926	2	1221	239375
1400	176	485	586	6	72	1521	257	16926	10	611	29922
1400	225	525	588	6	72	1508	300	16772	15	448	15954
AXIAL EXPANSION JOINT with fixed flanges · **type AN F-F · nominal pressure PN 10**											
50	27	125	6	16	20	84	59	42.5	7	104	246
50	36	150	6,2	16	20	84	87	42,1	14	126	136

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
50	42	195	6.5	16	20	84	129	41.8	24	185	89
65	20	100	6.9	16	20	105	33	66.4	2	133	1588
65	34	140	7.3	16	20	105	76	65.5	9	223	490
65	47	170	7.5	16	20	105	104	65.5	17	162	189
80	24	120	7.9	16	20	117	53	86.1	4	157	937
80	44	165	8.4	16	20	118	99	86	13	185	311
80	56	185	8.8	16	20	118	121	85.5	21	194	217
100	32	130	9.3	16	22	140	66	124	5	128	687
100	50	205	11	16	22	142	140	125	18	192	234
100	84	285	13	16	22	145	221	125	49	302	148
125	39	140	12	16	22	173	76	188	6	160	987
125	48	170	12	16	22	170	107	184	11	145	448
125	93	270	16	16	22	176	205	187	41	276	236
150	42	155	16	16	24	207	86	271	6	231	1610
150	67	190	17	16	24	205	124	267	14	166	556
150	101	310	21	16	24	209	202	269	36	274	344
200	47	165	21	10	24	260	94	444	6	253	2415
200	85	230	23	10	24	262	159	445	18	214	722
200	114	305	28	10	24	266	197	448	31	266	589
250	60	235	28	10	26	321	123	683	8	279	2423
250	92	260	30	10	26	322	147	684	15	203	1225
250	137	375	41	10	26	323	264	678	41	356	661
300	51	245	35	10	26	377	135	948	6	591	5917
300	97	360	39	10	26	376	247	947	22	332	989
300	134	330	42	10	26	375	218	938	28	293	1106
350	64	225	49	10	30	405	140	1121	7	343	3786
350	103	275	52	10	30	403	191	1114	17	256	1501
350	155	360	65	10	30	412	268	1132	36	360	1082
400	55	220	63	10	32	466	126	1474	5	636	11261
400	106	345	69	10	32	464	252	1470	20	339	1495
400	164	345	79	10	32	468	252	1474	31	345	1528
450	75	265	78	10	36	521	164	1856	8	486	6461
450	112	345	83	10	36	520	245	1854	18	330	1945
450	168	425	111	10	36	525	320	1856	36	596	2060
500	79	285	93	10	38	573	176	2270	8	512	7225
500	106	340	96	10	38	573	234	2270	15	384	3048
500	182	365	111	10	38	578	256	2281	28	343	2280
600	80	345	131	10	42	684	188	3258	7	789	13996
600	121	440	140	10	42	684	281	3258	17	526	4147
600	194	425	150	10	42	683	266	3242	26	358	3139
700	76	270	185	10	50	790	135	4383	4	901	41715
700	153	405	202	10	50	790	269	4383	18	451	5215
700	205	415	211	10	50	787	279	4356	25	373	4002

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C1	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
AXIAL EXPANSION JOINT with fixed flanges · **type AN F-F · nominal pressure PN 16**											
50	23	115	6	16	20	84	52	42.5	5	118	367
50	28	135	6.1	16	20	84	70	42.1	8	158	265
50	33	170	6.4	16	20	84	104	41.8	15	231	173
65	24	120	7	16	20	100	56	62.8	4	144	556
65	29	130	7.3	16	20	105	66	65.5	6	254	731
65	37	150	7.4	16	20	105	85	65.5	11	198	344
80	22	135	8	16	20	114	68	83.2	4	211	741
80	32	140	8.3	16	20	118	75	86	7	247	736
80	44	160	8.6	16	20	118	97	85.5	13	243	424
100	33	160	9.5	16	22	139	96	123	8	207	533
100	44	260	12	16	22	144	198	125	22	487	298
100	57	210	11	16	22	143	144	124	21	315	357
125	24	125	12	16	22	172	63	186	3	403	3658
125	41	175	13	16	22	172	110	185	9	238	704
125	59	220	14	16	22	176	155	188	19	332	498
150	27	140	16	16	24	207	71	270	3	497	5150
150	49	210	17	16	24	204	141	266	12	304	776
150	68	225	19	16	24	206	154	266	18	330	709
200	36	210	24	16	26	267	100	453	5	652	5628
200	63	290	26	16	26	265	180	451	15	388	1029
200	96	295	30	16	26	269	183	453	24	396	1028
250	39	235	34	16	29	323	106	684	4	708	8224
250	62	295	36	16	29	323	170	684	11	443	2008
250	105	345	43	16	29	322	216	675	25	465	1284
300	31	220	44	16	32	374	90	941	2	1013	22656
300	82	410	53	16	32	375	279	942	21	601	1393
300	131	430	68	16	32	381	300	947	37	642	1297
350	33	195	62	16	35	406	96	1122	2	1088	25279
350	85	370	72	16	35	411	273	1134	20	588	1709
350	135	415	88	16	35	413	317	1130	37	682	1465
400	53	260	83	16	38	466	156	1474	6	969	11200
400	90	390	90	16	38	463	286	1463	19	616	2102
400	144	410	108	16	38	470	300	1474	33	644	2012
450	58	280	106	16	42	519	168	1848	6	966	12076
450	94	395	113	16	42	518	280	1844	18	605	2716
450	151	440	135	16	42	522	320	1842	33	688	2363
500	52	250	142	16	46	571	124	2256	3	1226	34784
500	105	370	152	16	46	571	247	2256	16	613	4348
500	151	400	172	16	46	582	272	2291	25	655	3869

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

AXIAL EXPANSION JOINT with welding neck flanges **Type AN V-V**

TYPE AN V-V ≥ DN 100

TYPE AN V-V ≤ DN 80

Design type AN V-V

HKS axial expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised welding neck flanges in line with EN 1092-1 type 11.

Materialcombination [1]	Bauteil		Permitted operating temperature TS [2]
	Metal bellows	Flange	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1) Chemical resistance depends on temperature and medium and has to be tested or requested.
2) Take into account the pressure derating factors of the nominal pressures through operating temperature.
3) Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve

› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS

› With special coating, galvanised or hot galvanised

› Connection variants with weld end, swivel or fixed flanges

Tasks

› Absorption of axial movements

› Low-vibration and low-noise connection of pipes

› Compensation of installation inaccuracies

› Reduction of forces and moments in connections

Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building

› Food processing industry

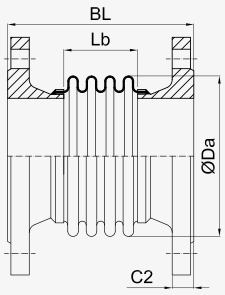
› Gas, water supply, building and heating technology

› Energy and offshore technology, oil and gas production

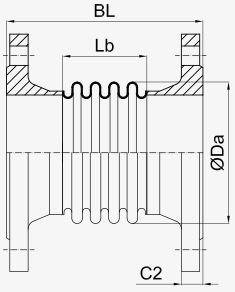
› Chemical and pharmaceutical industry, acid production

› Paper, textile, cellulose and paint industry Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
AXIAL EXPANSION JOINT with welding neck flanges · **type AN V-V · nominal pressure PN 2.5**											
50	25	130	3	6	14	84	52	42.5	5	118	367
50	47	175	3.2	6	14	84	95	42.5	20	64	58
50	62	200	3.3	6	14	84	124	42.5	34	49	26
65	27	120	3.7	6	14	105	41	66.4	3	106	813
65	61	170	3.9	6	14	105	90	66.4	19	49	77
65	75	240	4.8	6	14	105	160	65.5	43	105	52
80	26	140	6	6	16	117	53	86.1	4	157	937
80	65	245	6.6	6	16	118	158	86.6	32	101	67
80	94	315	7.6	6	16	118	229	86	68	110	35
100	48	210	7.7	6	16	142	119	132	14	122	215
100	91	390	8.8	6	16	142	300	132	70	106	30
100	128	435	11	6	16	143	345	133	113	136	29
125	49	185	11	6	18	174	89	196	9	108	509
125	96	325	12	6	18	174	228	197	46	92	67
125	150	465	15	6	18	176	370	199	116	132	37
150	52	180	13	6	18	207	82	280	7	104	824
150	99	300	14	6	18	207	202	281	35	93	122
150	168	460	20	6	18	209	365	284	107	159	65
200	73	200	19	6	20	265	90	465	9	75	814
200	135	280	21	6	20	265	168	466	30	64	201
200	191	430	26	6	20	266	320	468	83	108	94
250	80	220	26	6	22	321	96	698	8	77	1112
250	156	420	30	6	22	321	300	700	52	104	154
250	220	475	37	6	22	323	352	705	86	137	149
300	73	205	33	6	22	375	82	965	5	92	2545
300	134	290	34	6	22	372	164	958	20	55	377
300	225	460	44	6	22	376	336	969	71	114	187
350	83	215	43	6	22	410	88	1158	6	84	2375
350	150	325	46	6	22	410	202	1159	26	81	437
350	228	440	54	6	22	412	312	1164	61	114	261
400	66	200	49	6	22	464	70	1496	3	105	6155
400	132	270	50	6	22	464	140	1496	14	53	770
400	212	400	57	6	22	465	269	1500	43	94	373
450	72	205	57	6	22	518	76	1877	3	97	6074
450	151	310	61	6	22	519	180	1881	18	88	975
450	224	395	66	6	22	520	264	1884	40	93	478
500	77	220	66	6	24	576	83	2319	3	171	11023
500	154	305	69	6	24	576	166	2319	15	86	1378
500	222	430	79	6	24	577	290	2325	39	143	753
600	81	230	94	6	30	682	87	3291	3	167	14042

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
600	163	315	97	6	30	682	173	3291	14	84	1756
600	228	435	103	6	30	681	292	3287	34	98	722
700	79	245	115	6	30	788	93	4430	3	292	28893
700	158	340	120	6	30	788	185	4430	12	146	3612
700	237	430	125	6	30	788	278	4430	29	98	1071
800	94	255	138	6	30	897	102	5762	3	256	26977
800	158	325	142	6	30	897	170	5762	10	154	5827
800	252	425	148	6	30	897	272	5762	26	96	1423
900	96	250	169	6	30	1002	102	7231	3	247	32657
900	160	320	174	6	30	1002	170	7231	9	148	7054
900	256	420	181	6	30	1002	272	7231	24	93	1723
1000	98	260	212	6	30	1113	110	8920	3	353	50398
1000	164	330	218	6	30	1113	182	8920	9	212	10886
1000	230	405	225	6	30	1113	255	8920	18	152	3968
1200	107	310	226	2.5	32	1319	122	12672	3	379	62348
1200	143	350	230	2.5	32	1319	162	12672	6	284	26303
1200	251	470	243	2.5	32	1319	283	12672	18	163	4908
1400	100	315	286	2.5	38	1519	122	17011	2	473	104415
1400	133	355	291	2.5	38	1519	162	17011	4	355	44050
1400	233	475	306	2.5	38	1519	283	17011	14	203	8220
AXIAL EXPANSION JOINT with welding neck flanges · **type AN V-V · nominal pressure PN 6**											
50	24	130	3	6	14	84	52	42.5	5	118	367
50	35	150	3.1	6	14	84	73	42.5	11	83	126
50	49	225	3.7	6	14	84	146	41.8	32	163	61
65	26	120	3.7	6	14	105	41	66.4	3	106	813
65	45	175	3.9	6	14	100	96	62.8	15	84	111
65	66	220	4.6	6	14	105	142	65.5	34	119	75
80	25	140	6	6	16	117	53	86.1	4	157	937
80	51	215	6.5	6	16	118	127	86.6	20	126	131
80	79	255	7.3	6	16	118	169	85.5	42	139	80
100	37	185	7.6	6	16	142	93	132	8	156	457
100	58	295	8.3	6	16	141	204	131	30	167	100
100	89	395	11	6	16	144	304	134	69	247	68
125	39	170	11	6	18	174	74	196	6	129	879
125	67	300	12	6	18	174	203	197	28	194	177
125	99	415	16	6	18	176	317	200	65	293	111
150	39	165	12	6	18	207	66	280	4	130	1609
150	87	485	19	6	18	209	387	283	59	356	129
150	132	460	21	6	18	210	364	286	83	302	125
200	54	205	20	6	20	265	92	465	6	161	1686
200	92	265	21	6	20	266	154	467	19	154	579
200	141	415	29	6	20	268	306	472	58	279	270
250	48	200	26	6	22	321	79	699	4	209	4528
250	98	320	29	6	22	321	200	699	21	161	537

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
250	148	365	34	6	22	323	242	705	39	199	457
300	66	230	34	6	22	375	104	966	6	161	2731
300	121	275	36	6	22	374	152	963	17	123	988
300	176	465	50	6	22	378	339	976	56	274	444
350	70	240	44	6	22	407	112	1151	6	170	2970
350	124	310	48	6	22	409	186	1157	19	151	962
350	167	375	54	6	22	411	248	1163	35	202	727
400	57	230	51	6	22	464	96	1498	4	317	9820
400	120	375	56	6	22	465	244	1500	22	212	1018
400	174	365	61	6	22	466	234	1505	31	197	1030
450	66	235	59	6	22	519	104	1882	4	283	9375
450	115	315	62	6	22	519	182	1882	14	162	1750
450	183	410	73	6	22	521	280	1890	34	229	1055
500	67	250	69	6	24	577	114	2322	4	395	13546
500	147	340	75	6	24	577	203	2325	18	204	2193
500	220	450	90	6	24	579	310	2331	41	250	1156
600	72	260	97	6	30	683	119	3295	4	391	17526
600	145	380	103	6	30	683	237	3295	17	196	2191
600	223	430	121	6	30	685	290	3309	33	264	1980
700	79	315	124	6	30	790	160	4437	5	666	22034
700	142	440	134	6	30	790	288	4437	18	370	3778
700	217	415	137	6	30	790	263	4442	25	220	2708
800	94	330	149	6	30	899	176	5770	6	581	20662
800	182	405	158	6	30	899	250	5773	17	275	4881
800	256	450	174	6	30	900	296	5782	29	243	3058
900	100	335	181	6	34	1004	176	7240	6	566	25262
900	170	450	209	6	34	1005	295	7252	17	528	8424
900	231	450	209	6	34	1005	295	7252	23	311	4955
1000	77	320	225	6	38	1114	152	8934	3	1158	85455
1000	136	430	242	6	38	1114	266	8934	11	662	15945
1000	235	435	251	6	38	1115	272	8940	19	303	7001
1200	84	380	339	6	42	1320	168	12688	3	1237	106141
1200	162	465	362	6	42	1321	257	12696	10	643	23638
1200	219	465	362	6	42	1321	257	12696	14	379	13926
1400	79	400	531	6	56	1520	168	17030	3	1562	179882
1400	139	525	556	6	56	1520	294	17030	9	893	33564
1400	238	530	568	6	56	1521	300	17039	16	404	14637
AXIAL EXPANSION JOINT with welding neck flanges · **type AN V-V · nominal pressure PN 10**											
50	27	150	5.3	16	18	84	59	42.5	7	104	246
50	32	170	5.4	16	18	84	78	42.1	11	140	186
50	42	220	5.8	16	18	84	129	41.8	24	185	89

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
65	25	135	6.2	16	18	105	41	66.4	3	106	813
65	34	170	6.6	16	18	105	76	65.5	9	223	490
65	47	195	6.9	16	18	105	104	65.5	17	162	189
80	19	145	8	16	20	117	42	86.1	2	197	1829
80	44	200	8.5	16	20	118	99	86	13	185	311
80	56	225	8.9	16	20	118	121	85.5	21	194	217
100	30	185	9.9	16	20	142	80	132	6	182	726
100	54	295	12	16	20	143	188	133	25	275	199
100	78	395	14	16	20	144	288	134	57	387	119
125	30	190	14	16	22	174	76	197	4	275	1785
125	55	285	15	16	22	174	172	197	19	233	297
125	92	410	20	16	22	177	298	201	57	425	184
150	38	195	17	16	22	207	84	281	5	222	1678
150	68	270	19	16	22	206	159	280	19	213	452
150	102	395	24	16	22	210	283	286	50	388	264
200	44	220	26	10	24	265	94	466	5	296	2977
200	84	305	28	10	24	266	179	468	20	250	703
200	114	385	34	10	24	267	262	470	40	353	463
250	57	260	35	10	26	321	120	700	7	259	2396
250	92	325	38	10	26	322	189	703	19	260	974
250	132	475	50	10	26	325	336	710	49	472	566
300	49	245	40	10	26	373	106	962	4	342	5580
300	91	315	44	10	26	376	178	970	15	282	1651
300	144	490	59	10	26	379	353	976	48	473	708
350	72	300	57	10	26	411	163	1162	10	320	2686
350	111	380	63	10	26	412	244	1165	23	337	1256
350	151	485	75	10	26	413	349	1168	45	472	866
400	55	270	67	10	26	464	122	1497	5	442	8473
400	118	400	75	10	26	464	256	1498	23	346	1509
400	161	480	89	10	26	468	336	1511	41	455	1161
450	62	310	81	10	28	521	164	1887	6	710	9599
450	114	365	85	10	28	521	221	1889	17	355	2621
450	171	475	101	10	28	523	330	1896	38	443	1470
500	73	325	93	10	28	578	176	2326	7	594	8585
500	117	445	99	10	28	575	292	2316	20	392	2032
500	180	470	115	10	28	579	320	2331	35	430	1866
600	80	350	121	10	30	684	183	3299	7	590	11165
600	144	485	141	10	30	685	320	3308	23	529	3263
600	192	500	148	10	30	683	332	3298	32	445	2542
700	75	370	175	10	35	790	197	4442	6	1061	23222
700	145	475	191	10	35	791	303	4447	19	553	5134
700	204	485	200	10	35	792	314	4449	28	422	3652
AXIAL EXPANSION JOINT with welding neck flanges · **type AN V-V · nominal pressure PN 16**											
50	23	145	5.2	16	18	84	52	42.5	5	118	367

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
50	28	160	5.3	16	18	84	70	42.1	8	158	265
50	33	195	5.6	16	18	84	104	41.8	15	231	173
65	24	150	6.3	16	18	100	56	62.8	4	144	556
65	29	160	6.6	16	18	105	66	65.5	6	254	731
65	37	175	6.7	16	18	105	85	65.5	11	198	344
80	22	170	8.1	16	20	114	68	83.2	4	211	741
80	32	175	8.4	16	20	118	75	86	7	247	736
80	44	200	8.7	16	20	118	97	85.5	13	243	424
100	34	230	11	16	20	142	123	132	10	264	442
100	47	315	12	16	20	143	210	133	25	461	266
100	64	395	14	16	20	145	289	135	47	681	210
125	27	190	14	16	22	173	76	196	4	298	1919
125	45	290	15	16	22	175	176	198	16	378	460
125	74	355	18	16	22	177	242	201	37	523	343
150	30	200	18	16	22	207	86	281	4	404	2928
150	52	350	21	16	22	209	240	283	21	575	542
150	75	370	23	16	22	210	260	285	34	558	448
200	35	220	26	16	24	266	96	467	4	494	4772
200	62	365	30	16	24	265	240	465	20	516	795
200	96	400	35	16	24	268	274	471	35	588	706
250	35	245	37	16	26	320	102	696	3	597	7621
250	69	450	46	16	26	323	308	705	23	786	1115
250	108	530	60	16	26	327	390	714	46	973	872
300	47	315	51	16	28	377	157	971	6	807	6077
300	80	505	60	16	28	377	348	971	26	748	1144
300	121	565	77	16	28	381	408	984	46	938	1058
350	53	335	74	16	30	412	168	1164	7	721	5673
350	96	475	84	16	30	412	308	1166	25	665	1567
350	126	570	101	16	30	416	404	1176	43	940	1298
400	51	325	91	16	32	466	152	1502	5	797	9998
400	93	355	94	16	32	463	182	1495	12	430	3698
400	133	560	123	16	32	470	390	1519	39	917	1749
450	57	365	111	16	34	521	196	1890	7	1151	10805
450	106	455	120	16	34	522	288	1893	20	638	2778
450	130	440	122	16	34	521	270	1890	23	584	2891
500	48	320	140	16	36	578	150	2329	4	1344	26564
500	97	470	150	16	36	578	300	2329	17	672	3321
500	142	510	173	16	36	582	340	2346	29	892	3455
AXIAL EXPANSION JOINT with welding neck flanges · **type AN V-V · nominal pressure PN 25**											
50	16	140	5.9	40	20	84	44	42.1	3	252	1084
50	20	150	5.9	40	20	84	52	42.1	4	210	628

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

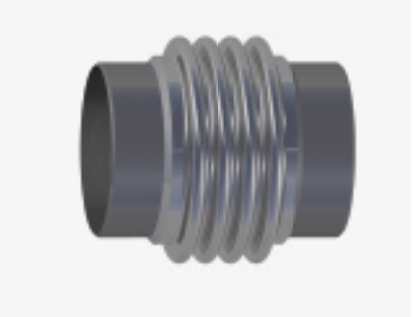
Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange		Bellows			Lateral movement absorption	Adjustment forcerate	
				Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	C2	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	cm²	mm	N/mm	N/mm
50	24	175	6.1	40	20	84	78	41.8	8	308	410
65	20	155	7.7	40	22	105	48	65.5	3	356	2006
65	28	170	7.9	40	22	105	66	65.5	6	254	731
65	32	165	7.9	40	22	105	59	65.1	6	234	855
80	20	175	10	40	24	118	55	86	3	462	2553
80	28	195	11	40	24	118	77	86	6	330	931
80	31	190	11	40	24	118	73	85.5	7	323	1004
100	25	225	14	40	24	141	96	131	6	356	982
100	36	295	15	40	24	143	165	133	15	587	547
100	52	370	17	40	24	145	238	135	31	826	376
125	24	235	20	40	26	175	96	198	4	692	2829
125	39	355	22	40	26	175	219	198	17	740	586
125	53	360	23	40	26	177	221	200	24	744	583
150	29	255	26	40	28	207	106	281	5	594	2851
150	43	355	28	40	28	209	203	283	15	679	895
150	64	455	34	40	28	212	303	288	33	1077	646
200	26	260	38	25	30	267	100	468	3	1112	9930
200	52	305	39	25	30	267	143	469	10	532	2334
200	78	460	51	25	30	271	298	478	31	1174	1208
250	28	285	53	25	32	322	106	701	3	1228	14615
250	50	370	56	25	32	322	191	701	10	682	2506
250	81	395	61	25	32	325	216	710	19	733	2128
300	26	300	70	25	34	377	116	973	2	2140	29534
300	59	440	76	25	34	377	256	973	14	973	2774
300	86	410	79	25	34	378	227	975	18	762	2756
350	36	350	107	25	38	412	149	1166	4	1589	15972
350	69	380	109	25	38	410	180	1160	10	761	5246
350	102	545	128	25	38	415	346	1173	30	1159	2173
400	36	380	137	25	40	463	156	1494	4	1803	21124
400	77	465	144	25	40	466	242	1505	14	828	4088
400	108	550	161	25	40	470	330	1518	27	1106	2942
450	42	370	168	25	46	523	150	1898	4	2392	38509
450	85	520	181	25	46	523	300	1898	17	1196	4814
450	115	540	190	25	46	525	320	1905	24	1074	3813
500	40	380	210	25	48	580	128	2338	3	2504	68208
500	80	510	222	25	48	580	256	2338	12	1252	8526
500	121	560	235	25	48	582	306	2343	22	1025	4897

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

SK 100

AXIAL EXPANSION JOINT with welding ends **Type AN R-R**

TYPE AN R-R ≥ DN 100



TYPE AN R-R ≤ DN 80

Design type AN R-R

HKS axial expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (weld end) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Flange	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1) Chemical resistance depends on temperature and medium and has to be tested or requested.
2) Take into account the pressure derating factors of the nominal pressures through operating temperature.
3) Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve

› External protective sleeve or telescopic inner sleeve

On customer request:

› With 30° groove or special dimensions

› With special coating, galvanised or hot galvanised

› Connection variants with swivel, fixed, welding neck flanges or screw fitting (threaded nipple, fittings)

Tasks

› Absorption of axial movements

› Low-vibration and low-noise connection of pipes

› Compensation of installation inaccuracies

› Reduction of forces and moments in connections

Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building

› Food processing industry

› Gas, water supply, building and heating technology

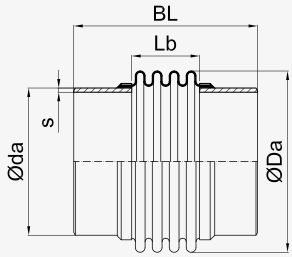
› Energy and offshore technology, oil and gas production

› Chemical and pharmaceutical industry, acid production

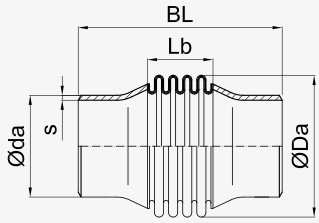
› Paper, textile, cellulose and paint industry

› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 2.5**											
50	25	155	0.6	60.3	2.9	84	52	42.5	5	118	367
50	47	195	0.7	60.3	2.9	84	95	42.5	20	64	58
50	62	225	0.8	60.3	2.9	84	124	42.5	34	49	26
65	27	140	0.7	76.1	2.9	105	41	66.4	3	106	813
65	61	190	0.9	76.1	2.9	105	90	66.4	19	49	77
65	75	260	1.8	76.1	2.9	105	160	65.5	43	105	52
80	26	155	0.9	88.9	3.2	117	53	86.1	4	157	937
80	65	260	1.6	88.9	3.2	118	158	86.6	32	101	67
80	94	330	2.5	88.9	3.2	118	229	86	68	110	35
100	48	220	1.8	114.3	3.6	142	119	132	14	122	215
100	91	400	3	114.3	3.6	142	300	132	70	106	30
100	128	445	4.7	114.3	3.6	143	345	133	113	136	29
125	49	190	2.3	139.7	4.0	174	89	196	9	108	509
125	96	330	3.5	139.7	4.0	174	228	197	46	92	67
125	150	470	6.8	139.7	4.0	176	370	199	116	132	37
150	52	195	3.1	168.3	4.5	207	82	280	7	104	824
150	99	315	4.4	168.3	4.5	207	202	281	35	93	122
150	168	475	11	168.3	4.5	209	365	284	107	159	65
200	73	210	5.5	219.1	6.3	265	90	465	9	75	814
200	135	290	7.1	219.1	6.3	265	168	466	30	64	201
200	191	440	13	219.1	6.3	266	320	468	83	108	94
250	80	220	7	273	6.3	321	96	698	8	77	1112
250	156	420	12	273	6.3	321	300	700	52	104	154
250	220	475	19	273	6.3	323	352	705	86	137	149
300	73	215	9.4	323.9	7.1	375	82	965	5	92	2545
300	134	295	11	323.9	7.1	372	164	958	20	55	377
300	225	470	20	323.9	7.1	376	336	969	71	114	187
350	83	230	13	355.6	8.0	410	88	1158	6	84	2375
350	150	345	15	355.6	8.0	410	202	1159	26	81	437
350	228	455	23	355.6	8.0	412	312	1164	61	114	261
400	66	220	15	406.4	8.0	464	70	1496	3	105	6155
400	132	290	16	406.4	8.0	464	140	1496	14	53	770
400	212	420	23	406.4	8.0	465	269	1500	43	94	373
450	72	235	18	457	8.0	518	76	1877	3	97	6074
450	151	340	21	457	8.0	519	180	1881	18	88	975
450	224	425	26	457	8.0	520	264	1884	40	93	478
500	77	245	20	508	8.0	576	83	2319	3	171	11023
500	154	325	23	508	8.0	576	166	2319	15	86	1378
500	222	450	34	508	8.0	577	290	2325	39	143	753
600	81	250	25	610	8.0	682	87	3291	3	167	14042

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
600	163	335	28	610	8.0	682	173	3291	14	84	1756
600	228	455	34	610	8.0	681	292	3287	34	98	722
700	79	255	30	711	8.0	788	93	4430	3	292	28893
700	158	345	35	711	8.0	788	185	4430	12	146	3612
700	237	440	40	711	8.0	788	278	4430	29	98	1071
800	94	265	35	813	8.0	897	102	5762	3	256	26977
800	158	330	39	813	8.0	897	170	5762	10	154	5827
800	252	435	45	813	8.0	897	272	5762	26	96	1423
900	96	265	39	914	8.0	1002	102	7231	3	247	32657
900	160	330	44	914	8.0	1002	170	7231	9	148	7054
900	256	435	51	914	8.0	1002	272	7231	24	93	1723
1000	98	270	46	1016	8.0	1113	110	8920	3	353	50398
1000	164	345	53	1016	8.0	1113	182	8920	9	212	10886
1000	230	415	60	1016	8.0	1113	255	8920	18	152	3968
1200	107	285	56	1219	8.0	1319	122	12672	3	379	62348
1200	143	325	61	1219	8.0	1319	162	12672	6	284	26303
1200	251	445	73	1219	8.0	1319	283	12672	18	163	4908
1400	100	285	65	1422	8.0	1519	122	17011	2	473	104415
1400	133	325	70	1422	8.0	1519	162	17011	4	355	44050
1400	233	445	85	1422	8.0	1519	283	17011	14	203	8220
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 6**											
50	24	155	0.6	60.3	2.9	84	52	42.5	5	118	367
50	35	175	0.7	60.3	2.9	84	73	42.5	11	83	126
50	49	250	1.2	60.3	2.9	84	146	41.8	32	163	61
65	26	140	0.7	76.1	2.9	105	41	66.4	3	106	813
65	45	195	0.9	76.1	2.9	100	96	62.8	15	84	111
65	66	245	1.6	76.1	2.9	105	142	65.5	34	119	75
80	25	155	0.9	88.9	3.2	117	53	86.1	4	157	937
80	51	230	1.4	88.9	3.2	118	127	86.6	20	126	131
80	79	270	2.2	88.9	3.2	118	169	85.5	42	139	80
100	37	195	1.7	114.3	3.6	142	93	132	8	156	457
100	58	305	2.4	114.3	3.6	141	204	131	30	167	100
100	89	405	4.5	114.3	3.6	144	304	134	69	247	68
125	39	175	2.2	139.7	4.0	174	74	196	6	129	879
125	67	305	3.6	139.7	4.0	174	203	197	28	194	177
125	99	420	7.1	139.7	4.0	176	317	200	65	293	111
150	39	175	3	168.3	4.5	207	66	280	4	130	1609
150	87	500	9.1	168.3	4.5	209	387	283	59	356	129
150	132	475	12	168.3	4.5	210	364	286	83	302	125
200	54	215	5.9	219.1	6.3	265	92	465	6	161	1686
200	92	275	7.6	219.1	6.3	266	154	467	19	154	579
200	141	425	16	219.1	6.3	268	306	472	58	279	270
250	48	200	7.1	273	6.3	321	79	699	4	209	4528
250	98	320	9.7	273	6.3	321	200	699	21	161	537

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
250	148	365	15	273	6.3	323	242	705	39	199	457
300	66	235	11	323.9	7.1	375	104	966	6	161	2731
300	121	285	13	323.9	7.1	374	152	963	17	123	988
300	176	470	26	323.9	7.1	378	339	976	56	274	444
350	70	255	13	355.6	8.0	407	112	1151	6	170	2970
350	124	325	17	355.6	8.0	409	186	1157	19	151	962
350	167	390	23	355.6	8.0	411	248	1163	35	202	727
400	57	250	16	406.4	8.0	464	96	1498	4	317	9820
400	120	395	22	406.4	8.0	465	244	1500	22	212	1018
400	174	385	27	406.4	8.0	466	234	1505	31	197	1030
450	66	265	20	457	8.0	519	104	1882	4	283	9375
450	115	345	22	457	8.0	519	182	1882	14	162	1750
450	183	440	34	457	8.0	521	280	1890	34	229	1055
500	67	275	23	508	8.0	577	114	2322	4	395	13546
500	147	365	29	508	8.0	577	203	2325	18	204	2193
500	220	470	44	508	8.0	579	310	2331	41	250	1156
600	72	280	28	610	8.0	683	119	3295	4	391	17526
600	145	400	34	610	8.0	683	237	3295	17	196	2191
600	223	450	52	610	8.0	685	290	3309	33	264	1980
700	79	320	39	711	8.0	790	160	4437	5	666	22034
700	142	450	49	711	8.0	790	288	4437	18	370	3778
700	217	425	52	711	8.0	790	263	4442	25	220	2708
800	94	340	45	813	8.0	899	176	5770	6	581	20662
800	182	410	55	813	8.0	899	250	5773	17	275	4881
800	256	460	71	813	8.0	900	296	5782	29	243	3058
900	100	340	52	914	8.0	1004	176	7240	6	566	25262
900	170	455	79	914	8.0	1005	295	7252	17	528	8424
900	231	455	79	914	8.0	1005	295	7252	23	311	4955
1000	77	315	60	1016	8.0	1114	152	8934	3	1158	85455
1000	136	430	77	1016	8.0	1114	266	8934	11	662	15945
1000	235	435	86	1016	8.0	1115	272	8940	19	303	7001
1200	84	330	83	1219	10.0	1320	168	12688	3	1237	106141
1200	162	420	106	1219	10.0	1321	257	12696	10	643	23638
1200	219	420	106	1219	10.0	1321	257	12696	14	379	13926
1400	79	330	96	1422	10.0	1520	168	17030	3	1562	179882
1400	139	455	120	1422	10.0	1520	294	17030	9	893	33564
1400	238	460	132	1422	10.0	1521	300	17039	16	404	14637
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 10**											
50	27	160	0.6	60.3	2.9	84	59	42.5	7	104	246
50	32	180	0.7	60.3	2.9	84	78	42.1	11	140	186
50	42	230	1.1	60.3	2.9	84	129	41.8	24	185	89
65	25	140	0.7	76.1	2.9	105	41	66.4	3	106	813

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
65	34	175	1.1	76.1	2.9	105	76	65.5	9	223	490
65	47	205	1.3	76.1	2.9	105	104	65.5	17	162	189
80	19	145	0.9	88.9	3.2	117	42	86.1	2	197	1829
80	44	200	1.4	88.9	3.2	118	99	86	13	185	311
80	56	220	1.8	88.9	3.2	118	121	85.5	21	194	217
100	30	180	1.7	114.3	3.6	142	80	132	6	182	726
100	54	290	2.9	114.3	3.6	143	188	133	25	275	199
100	78	390	4.9	114.3	3.6	144	288	134	57	387	119
125	30	180	2.4	139.7	4.0	174	76	197	4	275	1785
125	55	275	3.4	139.7	4.0	174	172	197	19	233	297
125	92	400	7.8	139.7	4.0	177	298	201	57	425	184
150	38	195	3.3	168.3	4.5	207	84	281	5	222	1678
150	68	270	4.6	168.3	4.5	206	159	280	19	213	452
150	102	395	9.7	168.3	4.5	210	283	286	50	388	264
200	44	215	6.2	219.1	6.3	265	94	466	5	296	2977
200	84	300	8.8	219.1	6.3	266	179	468	20	250	703
200	114	385	14	219.1	6.3	267	262	470	40	353	463
250	57	240	8.2	273	6.3	321	120	700	7	259	2396
250	92	310	12	273	6.3	322	189	703	19	260	974
250	132	460	24	273	6.3	325	336	710	49	472	566
300	49	240	11	323.9	7.1	373	106	962	4	342	5580
300	91	310	15	323.9	7.1	376	178	970	15	282	1651
300	144	485	30	323.9	7.1	379	353	976	48	473	708
350	72	305	16	355.6	8.0	411	163	1162	10	320	2686
350	111	385	22	355.6	8.0	412	244	1165	23	337	1256
350	151	490	34	355.6	8.0	413	349	1168	45	472	866
400	55	275	18	406.4	8.0	464	122	1497	5	442	8473
400	118	410	26	406.4	8.0	464	256	1498	23	346	1509
400	161	490	40	406.4	8.0	468	336	1511	41	455	1161
450	62	325	25	457	8.0	521	164	1887	6	710	9599
450	114	380	29	457	8.0	521	221	1889	17	355	2621
450	171	490	45	457	8.0	523	330	1896	38	443	1470
500	73	335	28	508	8.0	578	176	2326	7	594	8585
500	117	455	34	508	8.0	575	292	2316	20	392	2032
500	180	480	50	508	8.0	579	320	2331	35	430	1866
600	80	345	34	610	8.0	684	183	3299	7	590	11165
600	144	480	54	610	8.0	685	320	3308	23	529	3263
600	192	495	61	610	8.0	683	332	3298	32	445	2542
700	75	360	51	711	10.0	790	197	4442	6	1061	23222
700	145	465	67	711	10.0	791	303	4447	19	553	5134
700	204	475	76	711	10.0	792	314	4449	28	422	3652
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 16**											
50	23	155	0.6	60.3	2.9	84	52	42.5	5	118	367
50	28	170	0.7	60.3	2.9	84	70	42.1	8	158	265

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
50	33	205	1	60.3	2.9	84	104	41.8	15	231	173
65	24	155	0.7	76.1	2.9	100	56	62.8	4	144	556
65	29	165	1	76.1	2.9	105	66	65.5	6	254	731
65	37	185	1.2	76.1	2.9	105	85	65.5	11	198	344
80	22	170	0.9	88.9	3.2	114	68	83.2	4	211	741
80	32	175	1.2	88.9	3.2	118	75	86	7	247	736
80	44	200	1.6	88.9	3.2	118	97	85.5	13	243	424
100	34	225	2	114.3	3.6	142	123	132	10	264	442
100	47	310	3.4	114.3	3.6	143	210	133	25	461	266
100	64	390	5.7	114.3	3.6	145	289	135	47	681	210
125	27	180	2.4	139.7	4.0	173	76	196	4	298	1919
125	45	280	3.7	139.7	4.0	175	176	198	16	378	460
125	74	345	6.8	139.7	4.0	177	242	201	37	523	343
150	30	200	3.6	168.3	4.5	207	86	281	4	404	2928
150	52	350	6.7	168.3	4.5	209	240	283	21	575	542
150	75	370	8.9	168.3	4.5	210	260	285	34	558	448
200	35	220	6.6	219.1	6.3	266	96	467	4	494	4772
200	62	360	11	219.1	6.3	265	240	465	20	516	795
200	96	395	16	219.1	6.3	268	274	471	35	588	706
250	35	225	8.2	273	6.3	320	102	696	3	597	7621
250	69	430	17	273	6.3	323	308	705	23	786	1115
250	108	510	31	273	6.3	327	390	714	46	973	872
300	47	290	14	323.9	7.1	377	157	971	6	807	6077
300	80	480	24	323.9	7.1	377	348	971	26	748	1144
300	121	540	40	323.9	7.1	381	408	984	46	938	1058
350	53	310	18	355.6	8.0	412	168	1164	7	721	5673
350	96	450	28	355.6	8.0	412	308	1166	25	665	1567
350	126	545	45	355.6	8.0	416	404	1176	43	940	1298
400	51	305	21	406.4	8.0	466	152	1502	5	797	9998
400	93	335	23	406.4	8.0	463	182	1495	12	430	3698
400	133	540	52	406.4	8.0	470	390	1519	39	917	1749
450	57	360	29	457	8.0	521	196	1890	7	1151	10805
450	106	450	37	457	8.0	522	288	1893	20	638	2778
450	130	430	40	457	8.0	521	270	1890	23	584	2891
500	48	310	29	508	8.0	578	150	2329	4	1344	26564
500	97	460	39	508	8.0	578	300	2329	17	672	3321
500	142	500	62	508	8.0	582	340	2346	29	892	3455
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 25**											
50	16	145	0.6	60.3	2.9	84	44	42.1	3	252	1084
50	20	155	0.6	60.3	2.9	84	52	42.1	4	210	628
50	24	180	0.9	60.3	2.9	84	78	41.8	8	308	410

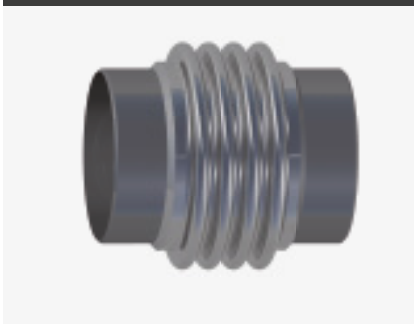
Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment forcerate	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral
DN	Δx	BL	G	do	s	Da	Lb	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
65	20	150	0.9	76.1	2.9	105	48	65.5	3	356	2006
65	28	165	1	76.1	2.9	105	66	65.5	6	254	731
65	32	160	1.1	76.1	2.9	105	59	65.1	6	234	855
80	20	155	1.1	88.9	3.2	118	55	86	3	462	2553
80	28	180	1.3	88.9	3.2	118	77	86	6	330	931
80	31	175	1.4	88.9	3.2	118	73	85.5	7	323	1004
100	25	195	1.9	114.3	3.6	141	96	131	6	356	982
100	36	265	3	114.3	3.6	143	165	133	15	587	547
100	52	340	5	114.3	3.6	145	238	135	31	826	376
125	24	200	2.9	139.7	4.0	175	96	198	4	692	2829
125	39	320	4.8	139.7	4.0	175	219	198	17	740	586
125	53	320	6.2	139.7	4.0	177	221	200	24	744	583
150	29	215	4	168.3	4.5	207	106	281	5	594	2851
150	43	315	6.1	168.3	4.5	209	203	283	15	679	895
150	64	415	12	168.3	4.5	212	303	288	33	1077	646
200	26	220	7.2	219.1	6.3	267	100	468	3	1112	9930
200	52	265	8.6	219.1	6.3	267	143	469	10	532	2334
200	78	420	21	219.1	6.3	271	298	478	31	1174	1208
250	28	230	9.8	273	7.1	322	106	701	3	1228	14615
250	50	310	13	273	7.1	322	191	701	10	682	2506
250	81	340	18	273	7.1	325	216	710	19	733	2128
300	26	250	15	323.9	8.0	377	116	973	2	2140	29534
300	59	385	21	323.9	8.0	377	256	973	14	973	2774
300	86	360	23	323.9	8.0	378	227	975	18	762	2756
350	36	290	19	355.6	8.0	412	149	1166	4	1589	15972
350	69	320	21	355.6	8.0	410	180	1160	10	761	5246
350	102	485	40	355.6	8.0	415	346	1173	30	1159	2173
400	36	310	25	406.4	10.0	463	156	1494	4	1803	21124
400	77	395	32	406.4	10.0	466	242	1505	14	828	4088
400	108	480	49	406.4	10.0	470	330	1518	27	1106	2942
450	42	310	34	457	10.0	523	150	1898	4	2392	38509
450	85	460	46	457	10.0	523	300	1898	17	1196	4814
450	115	480	56	457	10.0	525	320	1905	24	1074	3813
500	40	290	36	508	10.0	580	128	2338	3	2504	68208
500	80	420	48	508	10.0	580	256	2338	12	1252	8526
500	121	470	61	508	10.0	582	306	2343	22	1025	4897

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

AXIAL EXPANSION JOINT for low pressure (PN1) **Type AN R-R**

TYPE AN R-R ≥ DN 100



Tasks

- Absorption of axial movements
- Low-vibration and low-noise connection of pipes
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical and plant engineering, engine and ship building
- Gas supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

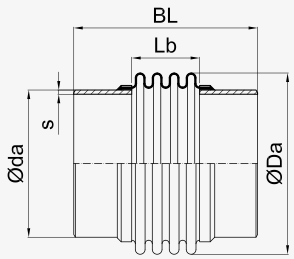
Design type AN R-R

HKS axial expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Pipe	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C [4]
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12) 1.4878 (X8CrNiTi18-10)		bis 900 °C [5] bis 800 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Exhaust gases from an operating pressure of 0.5 bar to max. 550 °C
5. Exhaust gases from an operating pressure of 0.5 bar to max. 1000 °C

DN 100 - DN 2400



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- With 30° groove or special dimensions
- With special coating, galvanised or hot galvanised
- Connection variants with swivel, fixed or welding neck flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
AXIAL EXPANSION JOINT with welding ends · **type AN R-R · nominal pressure PN 1**													
100	44	210	1.4	114.3	2.0	142	106	132	11	137	307	260	319
100	88	315	1.8	114.3	2.0	142	212	132	47	69	39	135	83
100	121	395	2.1	114.3	2.0	142	291	132	90	50	15	99	44
125	67	220	1.8	139.7	2.0	174	119	196	16	81	215	165	220
125	118	310	2.3	139.7	2.0	174	208	196	51	46	41	96	73
125	152	370	2.6	139.7	2.0	174	267	196	85	36	19	76	45
150	64	210	2.2	168.3	2.0	207	99	280	11	87	477	167	320
150	119	295	2.7	168.3	2.0	207	181	280	37	48	78	94	98
150	168	450	4.5	168.3	2.0	207	336	281	99	56	27	66	37
175	65	215	2.5	196	2.0	234	104	367	10	103	677	169	355
175	119	310	3.9	196	2.0	234	196	368	35	87	159	96	107
175	173	390	3.8	196	2.0	234	276	367	73	39	36	66	52
200	76	210	2.9	219.1	2.0	265	90	465	9	75	814	137	371
200	152	300	3.7	219.1	2.0	265	180	465	37	38	102	71	96
200	213	455	6.2	219.1	2.0	265	332	465	96	45	37	51	37
250	67	200	3.4	273	2.0	321	77	698	5	97	2172	149	579
250	152	295	4.5	273	2.0	321	173	698	29	43	191	70	120
250	211	435	7.4	273	2.0	321	314	699	73	53	71	51	48
300	76	215	4.3	323.9	2.0	375	82	965	5	92	2545	130	562
300	153	295	5.4	323.9	2.0	375	164	965	23	46	319	68	147
300	211	355	6.2	323.9	2.0	375	225	965	45	34	123	50	78
350	83	230	4.9	355.6	2.0	410	88	1158	6	84	2375	115	503
350	145	295	5.9	355.6	2.0	410	154	1158	19	48	444	68	170
350	208	360	6.9	355.6	2.0	410	220	1158	39	34	152	48	84
400	66	220	5.6	406.4	2.0	464	70	1496	3	105	6155	132	831
400	132	290	6.8	406.4	2.0	464	140	1496	14	53	770	69	219
400	220	385	8.4	406.4	2.0	464	232	1496	38	32	167	42	80
450	67	240	7.2	457	2.0	519	77	1881	3	204	12374	146	932
450	158	340	9.8	457	2.0	519	180	1881	19	88	975	66	180
450	226	420	12	457	2.0	519	256	1881	39	61	335	46	89
500	78	245	11	508	3.0	576	83	2319	3	171	11023	122	802
500	156	330	13	508	3.0	576	166	2319	15	86	1378	63	209
500	234	410	15	508	3.0	576	249	2319	35	57	409	43	94
550	79	245	12	559	3.0	629	84	2784	3	169	12698	114	811
550	158	330	14	559	3.0	629	168	2784	14	85	1588	59	211
550	237	415	17	559	3.0	629	252	2784	33	57	471	40	95
600	81	250	13	610	3.0	682	87	3291	3	167	14042	107	807
600	163	335	16	610	3.0	682	173	3291	14	84	1756	56	210
600	244	420	19	610	3.0	682	260	3291	32	56	521	37	94
650	84	250	14	660	3.0	732	89	3819	3	179	16499	106	839
650	140	310	16	660	3.0	732	148	3819	9	108	3564	66	312
650	224	400	19	660	3.0	732	237	3819	25	67	871	42	124

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows			Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
700	86	255	15	711	3.0	788	92	4428	3	156	15826	93	770
700	144	315	18	711	3.0	788	152	4428	9	94	3419	58	286
700	230	405	21	711	3.0	788	244	4428	24	59	835	36	113
800	96	265	19	813	3.0	897	102	5762	3	256	26977	96	807
800	160	330	23	813	3.0	897	170	5762	10	154	5827	59	299
800	256	435	29	813	3.0	897	272	5762	27	96	1423	37	118
900	96	265	22	914	3.0	1002	102	7231	3	247	32657	87	823
900	160	330	26	914	3.0	1002	170	7231	9	148	7054	54	305
900	256	435	33	914	3.0	1002	272	7231	24	93	1723	34	121
1000	102	270	25	1016	3.0	1112	108	8917	3	210	30635	73	728
1000	170	340	30	1016	3.0	1112	180	8917	9	126	6618	45	269
1000	238	415	36	1016	3.0	1112	252	8917	18	90	2412	32	139
1100	108	275	27	1120	3.0	1218	114	10761	3	216	34081	70	723
1100	180	350	34	1120	3.0	1218	190	10761	9	130	7362	43	267
1100	252	430	40	1120	3.0	1218	266	10761	19	93	2683	31	137
1200	114	280	30	1220	3.0	1318	120	12678	3	233	39088	69	738
1200	190	360	37	1220	3.0	1318	200	12678	9	140	8443	43	273
1200	266	440	44	1220	3.0	1318	280	12678	19	100	3077	31	140
1300	114	280	32	1320	3.0	1418	120	14752	3	249	48631	69	792
1300	152	320	36	1320	3.0	1418	160	14752	5	187	20517	52	451
1300	228	400	44	1320	3.0	1418	240	14752	13	125	6079	35	204
1400	114	280	35	1420	3.0	1518	120	16984	3	265	59599	69	845
1400	152	320	39	1420	3.0	1518	160	16984	5	199	25144	52	482
1400	228	400	47	1420	3.0	1518	240	16984	12	133	7450	35	218
1500	120	290	38	1520	3.0	1622	126	19421	3	251	58496	63	794
1500	160	330	42	1520	3.0	1622	168	19421	5	188	24678	48	452
1500	240	415	51	1520	3.0	1622	252	19421	12	126	7312	32	204
1600	120	290	40	1620	3.0	1722	126	21970	3	265	69889	63	841
1600	160	330	45	1620	3.0	1722	168	21970	5	199	29485	48	479
1600	240	415	55	1620	3.0	1722	252	21970	12	133	8737	32	217
1800	120	290	45	1820	3.0	1922	126	27539	2	293	96886	62	934
1800	160	330	50	1820	3.0	1922	168	27539	4	220	40874	47	532
1800	240	415	61	1820	3.0	1922	252	27539	10	147	12111	32	241
2000	128	315	63	2020	4.0	2123	152	33742	3	534	150369	72	991
2000	171	365	70	2020	4.0	2123	202	33742	5	401	63437	54	564
2000	256	465	85	2020	4.0	2123	303	33742	12	267	18797	37	255
2200	126	315	69	2220	4.0	2323	152	40568	2	578	195770	71	1079
2200	168	365	77	2220	4.0	2323	202	40568	4	434	82591	54	614
2200	210	415	86	2220	4.0	2323	252	40568	7	347	42287	44	398
2400	125	315	75	2420	4.0	2523	152	48022	2	622	249522	71	1167
2400	166	365	84	2420	4.0	2523	202	48022	4	467	105267	54	664
2400	208	415	93	2420	4.0	2523	252	48022	7	374	53897	43	431

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

UNIVERSAL EXPANSION JOINT with swivel flanges **Type AM B-B**

TYPE AM B-B ≥ DN 100

TYPE AM B-B ≤ DN 80

Design type AM B-B

HKS universal expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with middle pipe made of standard pipes in line with EN 10216/10217 ff or rolled from sheet metal in line with EN 10028 ff and rotating, standardised swivel flanges in line with EN 1092-1 type 02.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows, collar	Flange, middle pipe	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve

› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS

› With special coating, galvanised or hot galvanised

› Connection variants with weld end or fixed flanges

Tasks

› Absorption of axial and lateral movements

› Low-vibration and low-noise connection ofpipes

› Compensation of installation inaccuracies

› Reduction of forces and moments in connections

Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building

› Food processing industry

› Gas, water supply, building and heating technology

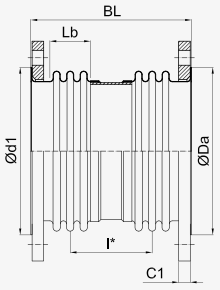
› Energy and offshore technology, oil and gas production

› Chemical and pharmaceutical industry, acid production

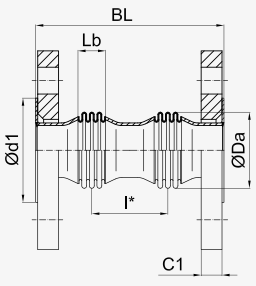
› Paper, textile, cellulose and paint industry

› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows				Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
UNIVERSAL EXPANSION JOINT with swivel flanges · **type AM B-B · nominal pressure PN 2.5**													
50	21	155	3.6	6	90	16	84	22	71	42.5	16	138	70
50	37	350	4.3	6	90	16	84	44	243	42.1	105	126	6
50	46	540	5.1	6	90	16	84	69	408	41.8	222	173	3
65	33	160	4.6	6	110	16	105	25	74	66.4	20	89	65
65	53	350	5.3	6	110	16	100	56	230	62.8	112	72	6
65	71	535	6.6	6	110	16	105	76	400	65.5	265	112	3
80	31	175	7	6	128	18	117	32	81	86.1	18	131	103
80	65	360	7.7	6	128	18	114	90	209	83.2	98	79	9
80	90	550	9.5	6	128	18	118	109	378	86	260	116	5
100	41	190	7.4	6	148	18	142	40	89	127	21	110	104
100	69	370	8.4	6	148	18	142	66	246	127	107	66	9
100	100	565	9.9	6	148	18	142	97	406	127	263	69	4
125	60	205	9.9	6	178	20	174	45	94	191	26	72	91
125	97	395	12	6	178	20	174	92	201	191	92	75	21
125	131	585	14	6	178	20	174	128	353	190	228	87	9
150	74	255	12	6	202	20	207	50	104	274	30	61	91
150	99	425	13	6	202	20	207	66	255	274	97	46	12
150	144	600	17	6	202	20	207	124	373	273	224	84	11
200	100	275	17	6	258	22	265	54	114	457	32	47	96
200	132	455	19	6	258	22	264	92	252	455	105	63	28
200	181	630	25	6	258	22	267	120	400	457	203	92	17
250	108	290	21	6	312	24	321	58	117	689	30	49	143
250	149	475	26	6	312	24	321	120	240	689	87	94	66
250	188	660	33	6	312	24	322	147	397	689	192	115	31
300	115	305	28	6	365	24	375	62	126	954	29	48	168
300	164	505	34	6	365	24	375	128	257	954	87	93	79
300	207	700	42	6	365	24	376	156	420	954	190	113	38
350	114	295	40	6	415	26	410	68	137	1145	29	93	333
350	151	500	43	6	415	26	410	90	319	1145	84	70	49
350	200	725	51	6	415	26	411	116	516	1145	163	81	22
400	126	345	47	6	465	28	464	71	145	1481	30	89	366
400	168	550	52	6	465	28	464	95	324	1481	80	67	59
400	224	755	64	6	465	28	465	150	470	1481	179	117	49
450	144	370	58	6	520	30	519	77	156	1863	32	82	363
450	162	565	65	6	520	30	519	104	324	1863	80	111	121
450	227	780	72	6	520	30	515	132	542	1845	160	90	35
500	156	380	63	6	570	30	576	83	162	2299	33	70	354
500	205	590	77	6	570	30	577	116	336	2299	82	138	171
500	262	800	93	6	570	30	578	178	497	2299	185	149	85

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows				Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
600	156	405	85	6	670	32	682	88	167	3268	29	127	859
600	207	615	92	6	670	32	682	117	346	3268	74	95	159
600	237	825	112	6	670	32	684	154	534	3268	139	180	128
700	172	430	123	6	775	40	788	93	172	4401	28	121	1037
700	230	640	131	6	775	40	788	124	353	4401	70	91	195
700	265	860	162	6	775	40	790	162	542	4401	130	172	160
800	192	465	163	6	880	44	897	102	182	5729	28	108	1068
800	256	665	186	6	880	44	898	140	340	5729	69	117	349
800	315	875	211	6	880	44	899	178	528	5729	127	154	194
900	192	475	195	6	980	48	999	102	182	7168	25	117	1449
900	247	685	214	6	980	48	1003	138	357	7194	63	130	443
900	320	895	253	6	980	48	1004	178	538	7194	115	150	229
1000	204	500	234	6	1080	52	1113	110	189	8875	25	150	2130
1000	278	710	275	6	1080	52	1114	186	336	8875	62	201	913
1000	340	920	295	6	1080	52	1114	188	548	8875	113	131	236
1200	181	530	326	2.5	1280	60	1320	124	203	12618	20	361	6225
1200	241	740	338	2.5	1280	60	1320	165	374	12618	52	271	1454
1200	302	955	360	2.5	1280	60	1320	206	546	12618	98	217	557
1400	171	555	430	2.5	1480	72	1520	124	203	16949	16	454	10508
1400	228	765	457	2.5	1480	72	1520	165	374	16949	43	340	2454
1400	285	980	484	2.5	1480	72	1520	206	546	16949	80	272	940
UNIVERSAL EXPANSION JOINT with swivel flanges · **type AM B-B · nominal pressure PN 6**													
50	21	155	3.6	6	90	16	84	22	71	42.5	16	138	70
50	36	350	4.3	6	90	16	84	44	243	42.1	102	126	6
50	46	540	5.1	6	90	16	84	69	408	41.8	222	173	3
65	32	160	4.6	6	110	16	105	25	74	66.4	20	89	65
65	45	345	5.3	6	110	16	100	48	237	62.8	100	84	6
65	61	535	6.5	6	110	16	105	66	405	65.5	235	127	4
80	30	175	7	6	128	18	117	32	81	86.1	17	131	103
80	62	365	8.4	6	128	18	118	77	226	86	104	165	17
80	71	550	9.3	6	128	18	118	88	402	86	227	145	5
100	40	190	7.4	6	148	18	142	40	89	127	20	110	104
100	70	385	10	6	148	18	143	105	215	127	85	234	38
100	87	580	12	6	148	18	144	107	406	127	225	173	9
125	56	205	9.9	6	178	20	174	45	94	191	24	72	91
125	86	405	14	6	178	20	175	100	199	191	79	185	52
125	108	605	17	6	178	20	176	124	383	191	207	199	16
150	57	260	12	6	202	20	207	51	105	274	23	126	184
150	83	445	15	6	202	20	208	71	270	274	97	136	32
150	121	630	21	6	202	20	210	122	411	274	211	240	24
200	66	285	18	6	258	22	265	57	116	457	23	176	348
200	93	465	21	6	258	22	266	96	256	457	75	172	73
200	126	650	27	6	258	22	267	104	444	457	178	192	28

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange			Bellows				Lateral movement absorption nominal	Adjustment force rate	
				Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	PN	d1	C1	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	-	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
250	71	295	23	6	312	24	321	60	120	689	20	188	527
250	127	485	29	6	312	24	323	85	284	689	84	145	76
250	146	680	39	6	312	24	324	137	436	689	169	269	60
300	78	315	31	6	365	24	375	64	128	954	20	185	628
300	110	505	36	6	365	24	376	108	273	954	64	182	141
300	152	700	46	6	365	24	377	116	471	954	153	201	54
350	87	300	41	6	415	26	410	69	138	1144	22	175	612
350	101	510	47	6	415	26	411	93	322	1145	68	208	142
350	165	725	59	6	415	26	411	124	514	1141	165	201	55
400	83	355	51	6	465	28	465	74	148	1481	20	268	1060
400	130	555	64	6	465	28	466	152	281	1481	60	292	317
400	178	750	81	6	465	28	468	140	490	1481	151	341	131
450	95	375	62	6	520	30	520	80	159	1863	22	243	1050
450	141	575	77	6	520	30	521	111	340	1863	77	260	257
450	182	780	90	6	520	30	522	116	536	1863	122	249	101
500	89	380	74	6	570	30	578	88	167	2299	19	456	2174
500	124	590	83	6	570	30	578	89	373	2299	63	298	306
500	194	800	93	6	570	30	576	120	555	2290	124	194	91
600	96	400	96	6	670	32	684	92	171	3268	18	461	2983
600	127	610	107	6	670	32	684	122	351	3268	53	346	559
600	209	825	122	6	670	32	681	125	564	3251	111	202	129

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

UNIVERSAL EXPANSION JOINT for low pressure (PN1) **Type AM B-B**

TYPE AM B-B ≥ DN 100

Tasks

- Absorption of axial and lateral movements
- Low-vibration and low-noise connection of pipes
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical and plant engineering, engine and ship building
- Gas supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

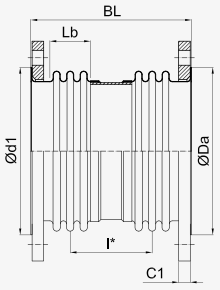
Design type AM B-B

HKS universal expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with middle pipe made of standard pipes in line with EN 10216/10217 ff or rolled from sheet metal in line with EN 10028 ff and rotating, standardised swivel flanges in line with DIN 86044.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows/collar	Flange, middle pipe	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C [4]
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12) 1.4878 (X8CrNiTi18-10)		bis 900 °C [5] bis 800 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Exhaust gases from an operating pressure of 0.5 bar to max. 550 °C
5. Exhaust gases from an operating pressure of 0.5 bar to max. 1000 °C

DN 100 - DN 2400



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- Flanges in line with EN 1092-1, ASME, JIS, BS
- With special coating, galvanised or hot galvanised
- Connection variants with weld end or fixed flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange in line with DIN 86044		Bellows				Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				Outer diameter of collar	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	d1	C1	Da	Lb	l*	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
UNIVERSAL EXPANSION JOINT with swivel flanges · **type AM B-B · nominal pressure PN 1**														
100	39	180	6	148	14	140	40	89	126	20	124	116	104	408
100	79	320	6.7	148	14	140	80	189	126	88	62	14	54	106
100	119	460	7.3	148	14	140	119	288	126	203	42	4	36	47
125	58	195	7.3	178	14	172	45	94	190	25	79	100	72	311
125	117	335	8.2	178	14	172	89	193	190	107	40	12	38	81
125	153	480	9.6	178	14	172	152	272	189	190	51	8	34	43
150	73	245	8.5	202	14	205	50	104	272	29	67	99	56	259
150	147	480	11	202	14	205	99	288	272	176	34	7	25	59
150	196	665	13	202	14	205	136	436	271	358	39	4	21	35
175	77	255	12	232	16	234	52	106	360	27	73	135	53	271
175	155	485	14	232	16	234	104	288	360	160	37	10	25	63
175	186	715	17	232	16	234	125	494	360	309	46	5	20	43
200	100	265	13	258	16	263	54	114	455	32	50	103	40	219
200	160	500	17	258	16	263	111	290	454	146	54	18	26	71
200	186	730	19	258	16	263	129	503	454	293	46	6	19	44
250	108	270	16	312	16	319	58	117	686	30	53	153	36	230
250	176	500	20	312	16	319	118	282	685	125	57	30	24	76
250	206	720	23	312	16	319	138	487	685	254	49	9	18	48
300	103	295	22	365	16	374	63	127	952	27	104	360	41	285
300	207	490	26	365	16	374	125	259	952	112	52	44	22	76
300	241	685	29	365	16	374	146	435	952	214	45	14	16	48
350	113	275	28	415	16	408	68	137	1141	29	101	361	39	270
350	189	495	32	415	16	408	112	312	1141	110	61	44	21	90
350	246	695	35	415	16	406	157	466	1133	229	50	16	16	48
400	127	290	31	465	16	462	71	145	1476	31	97	395	34	260
400	169	460	34	465	16	462	95	294	1476	75	73	76	22	128
400	219	635	38	465	16	457	142	421	1459	166	63	32	18	68
450	144	310	36	520	16	517	77	156	1857	33	88	390	30	234
450	192	450	39	520	16	517	103	272	1857	70	66	100	21	122
450	240	590	42	520	16	517	128	388	1857	121	53	40	16	75
500	156	355	40	570	16	574	83	162	2292	33	75	378	25	201
500	208	490	43	570	16	574	111	270	2292	70	56	106	18	107
500	251	625	46	570	16	568	138	378	2267	120	59	57	16	77
550	158	365	54	620	20	627	84	164	2755	31	74	443	23	204
550	211	500	58	620	20	627	112	272	2755	65	56	125	16	109
550	240	635	61	620	20	617	140	410	2709	119	69	69	16	84
600	163	370	59	670	20	680	87	166	3260	30	74	505	22	205
600	217	505	63	670	20	680	116	275	3260	63	56	143	16	110
600	242	645	66	670	20	668	144	384	3199	109	75	98	16	90
650	168	375	64	720	20	730	89	168	3785	29	79	609	22	214
650	200	655	71	720	20	711	148	418	3683	93	112	145	19	111
650	224	515	68	720	20	730	119	278	3785	61	59	173	16	114

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

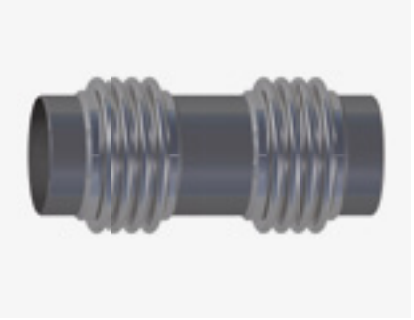
Nominal diameter	Axial movement absorption nominal	Length	Weight	Flange in line with DIN 86044		Bellows				Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				Outer diameter of collar	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	d1	C1	Da	Lb	l*	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
700	172	380	68	775	20	786	92	171	4391	28	70	603	19	199
700	230	530	74	775	20	786	122	291	4391	61	52	162	14	105
700	268	680	78	775	20	772	152	412	4309	106	74	114	14	88
800	192	405	82	880	20	895	102	182	5715	29	115	1139	21	221
800	256	535	89	880	20	895	136	281	5715	60	86	367	15	122
800	320	670	96	880	20	895	170	380	5715	99	69	163	12	77
900	192	405	92	980	20	1000	102	182	7179	25	112	1387	19	228
900	256	550	101	980	20	1000	136	296	7179	55	84	406	14	124
900	320	700	109	980	20	1000	170	410	7179	93	67	172	11	78
1000	204	415	103	1080	20	1112	108	188	8875	25	91	1298	16	199
1000	272	570	113	1080	20	1112	144	304	8875	55	68	385	12	109
1000	340	720	123	1080	20	1110	180	420	8859	92	58	173	9	70
1100	216	430	114	1180	20	1216	114	194	10697	25	99	1597	16	207
1100	288	585	125	1180	20	1216	152	312	10697	55	74	479	12	112
1100	360	740	136	1180	20	1216	190	430	10697	92	60	205	9	70
1200	228	445	123	1280	20	1316	120	200	12608	25	107	1903	16	212
1200	304	605	135	1280	20	1316	160	320	12608	55	80	577	11	115
1200	380	765	147	1280	20	1316	200	440	12608	93	64	248	9	72
1300	228	445	133	1380	20	1418	120	200	14699	23	108	2243	15	220
1300	304	605	146	1380	20	1418	160	320	14699	51	81	680	11	120
1300	380	765	160	1380	20	1418	200	440	14699	86	65	292	9	75
1400	228	445	143	1480	20	1518	120	200	16926	21	115	2752	15	235
1400	304	615	158	1480	20	1518	160	330	16926	49	86	788	11	127
1400	380	785	173	1480	20	1518	200	460	16926	83	69	329	8	79
1500	240	455	154	1580	20	1622	126	206	19360	21	109	2812	14	223
1500	320	630	170	1580	20	1622	168	338	19360	49	82	814	10	120
1500	400	805	185	1580	20	1618	210	470	19310	84	73	381	8	80
1600	240	455	164	1690	20	1722	126	206	21904	20	116	3362	14	235
1600	320	640	183	1690	20	1722	168	348	21904	48	87	923	10	126
1600	400	825	200	1690	20	1720	210	490	21878	82	73	399	8	80
1800	240	455	184	1890	20	1922	126	206	27465	18	128	4668	14	261
1800	320	650	206	1890	20	1922	168	358	27465	44	96	1215	10	138
1800	400	845	226	1890	20	1920	210	510	27436	75	81	513	8	88
2000	279	510	218	2090	20	2123	152	231	33654	21	231	8088	16	279
2000	372	680	241	2090	20	2123	202	351	33654	44	173	2701	12	154
2000	465	850	265	2090	20	2123	252	472	33654	75	139	1215	9	98
2200	275	510	239	2295	20	2323	152	231	40471	19	250	10541	16	303
2200	367	690	266	2295	20	2323	202	361	40471	41	188	3346	12	166
2200	458	870	294	2295	20	2323	252	492	40471	71	150	1468	9	104
2400	272	510	260	2495	20	2523	152	231	47917	17	270	13444	16	328
2400	362	700	291	2495	20	2523	202	371	47917	38	202	4062	11	178
2400	453	890	323	2495	20	2523	252	512	47917	68	162	1739	9	111

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

M2
M3

UNVERSAL EXPANSION JOINT with welding ends **Type AM R-R**

TYPE AM R-R ≥ DN 100



TYPE AM R-R ≤ DN 80

Tasks

- Absorption of axial and lateral movements
- Low-vibration and low-noise connection of pipes
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- Food processing industry
- Gas, water supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical and pharmaceutical industry, acid production
- Paper, textile, cellulose and paint industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

Design type AM R-R

HKS universal expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with welding ends (pipe nozzles) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Welding end, middle pipe	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

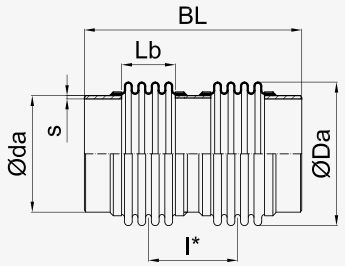
Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

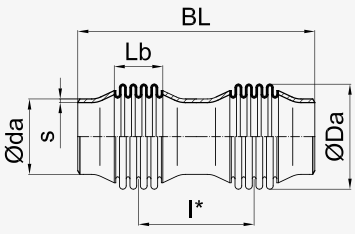
On customer request:

- With 30° groove or special dimensions
- With special coating, galvanised or hot galvanised
- Connection variants with swivel, fixed, welding neck flanges or screw fitting (threaded nipple, fittings)

DN 100 - DN 1400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows				Lateral movement absorption	Adjustment force rate	
				External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
UNIVERSAL EXPANSION JOINT with welding ends · **type AM R-R · nominal pressure PN 2.5**												
50	21	195	0.8	60.3	2.9	84	22	71	42.5	16	138	70
50	43	295	1.1	60.3	2.9	84	44	148	42.5	69	69	9
50	58	390	1.5	60.3	2.9	84	59	228	42.5	146	52	3
65	33	200	1	76.1	2.9	105	25	74	66.4	20	89	65
65	55	385	2	76.1	2.9	105	41	240	66.4	111	53	4
65	71	570	3.4	76.1	2.9	105	76	395	65.5	261	112	3
80	31	215	1.3	88.9	3.2	117	32	81	86.1	18	131	103
80	65	400	2.1	88.9	3.2	114	90	209	83.2	98	79	9
80	90	585	4.2	88.9	3.2	118	109	373	86	256	116	5
100	43	260	2.5	114.3	3.6	142	53	102	132	24	137	99
100	77	425	4	114.3	3.6	142	97	226	132	100	122	19
100	123	600	6.4	114.3	3.6	143	165	335	133	229	142	10
125	49	240	3.2	139.7	4.0	174	45	94	196	21	108	140
125	83	425	5.6	139.7	4.0	174	77	247	197	101	100	20
125	137	630	9.3	139.7	4.0	176	168	358	199	225	146	14
150	63	265	4.5	168.3	4.5	207	50	104	280	25	87	132
150	99	460	7.3	168.3	4.5	207	101	245	281	96	93	26
150	140	655	12	168.3	4.5	208	182	362	283	192	155	20
200	87	290	8.1	219.1	6.3	265	54	114	465	29	62	132
200	116	485	14	219.1	6.3	265	92	272	465	100	81	31
200	157	680	21	219.1	6.3	266	159	398	468	193	141	26
250	97	300	11	273	6.3	321	58	117	698	27	65	191
250	125	500	17	273	6.3	321	120	260	700	79	130	80
250	174	705	26	273	6.3	322	168	413	703	180	146	37
300	110	320	15	323.9	7.1	375	62	126	965	28	62	220
300	146	520	24	323.9	7.1	375	104	284	966	90	81	59
300	214	725	37	323.9	7.1	377	157	436	971	204	118	37
350	124	345	19	355.6	8.0	410	66	136	1158	31	56	205
350	157	545	28	355.6	8.0	411	163	242	1162	68	160	175
350	210	750	46	355.6	8.0	412	144	464	1164	189	124	42
400	112	370	24	406.4	8.0	464	71	145	1497	27	114	471
400	149	570	38	406.4	8.0	464	95	324	1497	80	85	75
400	221	770	51	406.4	8.0	465	175	445	1502	169	137	63
450	129	395	29	457	8.0	519	77	156	1881	29	102	459
450	173	590	43	457	8.0	519	103	327	1881	80	77	83
450	267	790	61	457	8.0	520	164	463	1883	177	110	59
500	154	410	32	508	8.0	576	83	162	2319	33	86	438
500	214	605	45	508	8.0	577	171	270	2322	73	132	235
500	266	800	67	508	8.0	577	174	464	2325	172	119	78
600	163	415	39	610	8.0	682	87	166	3291	30	84	579
600	195	625	59	610	8.0	683	148	313	3295	68	157	312

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

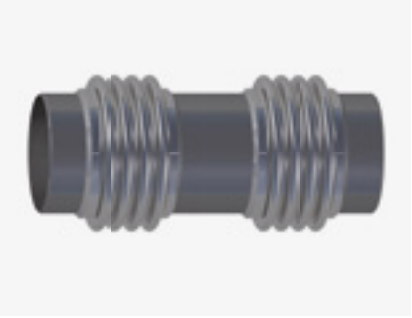
Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows				Lateral movement absorption	Adjustment force rate	
				External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
600	245	830	87	610	8.0	683	151	516	3298	134	141	108
700	158	425	48	711	8.0	788	93	172	4430	25	146	1263
700	210	635	72	711	8.0	788	124	348	4430	69	110	245
700	286	850	112	711	8.0	790	164	524	4442	127	176	176
800	189	445	56	813	8.0	897	102	182	5762	28	128	1279
800	256	655	91	813	8.0	898	140	355	5769	71	144	399
800	320	870	130	813	8.0	899	180	530	5776	128	154	195
900	189	445	64	914	8.0	999	102	182	7209	25	137	1707
900	256	670	106	914	8.0	1003	140	370	7239	65	139	446
900	320	895	152	914	8.0	1004	180	555	7246	118	149	215
1000	197	460	76	1016	8.0	1113	110	189	8920	24	177	2519
1000	263	700	116	1016	8.0	1113	146	390	8920	66	133	471
1000	340	930	171	1016	8.0	1114	188	578	8930	118	159	261
1200	209	485	92	1219	8.0	1317	122	201	12654	23	200	3540
1200	278	715	137	1219	8.0	1317	162	391	12654	64	150	744
1200	377	955	204	1219	8.0	1320	208	583	12684	115	171	389
1400	206	570	131	1422	8.0	1520	165	244	17021	23	408	6397
1400	280	775	195	1422	8.0	1520	167	446	17025	61	266	1379
1400	351	980	243	1422	8.0	1520	208	608	17025	102	213	599
UNIVERSAL EXPANSION JOINT with welding ends · **type AM R-R · nominal pressure PN 6**												
50	21	195	0.8	60.3	2.9	84	22	71	42.5	16	138	70
50	35	295	1.2	60.3	2.9	84	37	156	42.5	61	83	9
50	46	390	1.8	60.3	2.9	84	69	218	41.8	108	173	10
65	32	200	1	76.1	2.9	105	25	74	66.4	20	89	65
65	45	385	1.9	76.1	2.9	100	48	237	62.8	100	84	6
65	61	575	3.4	76.1	2.9	105	66	405	65.5	235	127	4
80	30	215	1.3	88.9	3.2	117	32	81	86.1	17	131	103
80	57	400	2.8	88.9	3.2	118	62	236	86	104	148	15
80	79	585	4.4	88.9	3.2	118	85	399	85.5	253	139	5
100	31	230	2.4	114.3	3.6	142	40	89	132	15	182	178
100	57	415	3.8	114.3	3.6	142	96	215	132	70	166	29
100	89	605	6.7	114.3	3.6	144	152	352	134	178	247	16
125	47	240	3.2	139.7	4.0	174	45	94	196	20	108	140
125	78	450	6.2	139.7	4.0	175	96	251	198	93	177	34
125	100	650	11	139.7	4.0	176	159	388	200	182	293	24
150	59	265	4.5	168.3	4.5	207	50	104	280	23	87	132
150	82	470	9	168.3	4.5	208	110	249	283	79	258	71
150	103	680	14	168.3	4.5	209	111	455	283	202	194	17
200	65	295	8.5	219.1	6.3	265	56	115	465	22	134	278
200	92	495	16	219.1	6.3	266	77	296	467	90	154	51
200	121	700	24	219.1	6.3	267	104	474	470	187	214	28
250	72	300	11	273	6.3	321	59	118	699	20	140	406
250	100	515	19	273	6.3	322	123	272	701	67	216	122
250	131	735	30	273	6.3	323	106	506	703	175	172	30
300	67	325	16	323.9	7.1	375	64	128	968	17	249	858

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows				Lateral movement absorption	Adjustment force rate	
				External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	l*	Ae	Δy	CΔx	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm
300	118	545	28	323.9	7.1	376	111	301	970	77	225	147
300	145	770	44	323.9	7.1	378	168	468	975	147	359	98
350	77	350	21	355.6	8.0	410	69	138	1160	20	223	795
350	124	575	35	355.6	8.0	409	93	337	1157	87	151	95
350	163	800	52	355.6	8.0	411	149	508	1163	171	240	67
400	85	370	25	406.4	8.0	464	72	147	1498	20	211	862
400	121	600	44	406.4	8.0	465	100	350	1502	77	239	181
400	157	830	63	406.4	8.0	466	130	550	1505	162	256	80
450	84	400	31	457	8.0	520	80	159	1884	19	315	1374
450	141	635	51	457	8.0	520	108	363	1886	82	213	188
450	183	860	73	457	8.0	521	140	560	1890	164	229	87
500	100	415	35	508	8.0	577	86	165	2322	21	263	1308
500	154	655	54	508	8.0	578	176	315	2326	63	297	401
500	189	900	86	508	8.0	579	216	520	2332	134	381	198
600	84	425	47	610	8.0	684	92	171	3299	15	590	3860
600	168	680	68	610	8.0	684	183	337	3299	62	295	496
600	208	940	109	610	8.0	685	224	554	3308	133	378	246

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

UNVERSAL EXPANSION JOINT for low pressure (PN1) **Type AM R-R**

TYPE AM R-R ≥ DN 100



Tasks

- Absorption of axial and lateral movements
- Low-vibration and low-noise connection of pipes
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical and plant engineering, engine and ship building
- Gas supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

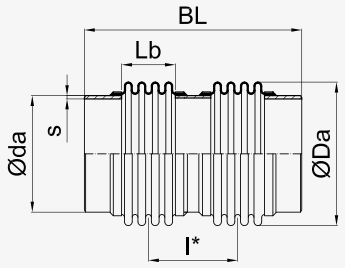
Design type AM R-R

HKS universal expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with welding ends (pipe nozzles) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Welding end, middle pipe	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C [4]
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12) 1.4878 (X8CrNiTi18-10)		bis 900 °C [5] bis 800 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Exhaust gases from an operating pressure of 0.5 bar to max. 550 °C
5. Exhaust gases from an operating pressure of 0.5 bar to max. 1000 °C

DN 100 - DN 2400



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- With 30° groove or special dimensions
- With special coating, galvanised or hot galvanised
- Connection variants with swivel, fixed or welding neck flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows				Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	l*	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
UNIVERSAL EXPANSION JOINT with welding ends · **type AM R-R · nominal pressure PN 1**														
100	44	260	1.9	114.3	2.0	142	53	102	132	25	137	99	112	337
100	77	385	2.5	114.3	2.0	142	93	192	132	83	78	17	63	108
100	121	545	3.2	114.3	2.0	142	146	295	132	200	50	5	41	45
125	67	270	2.4	139.7	2.0	174	60	109	196	32	81	77	74	242
125	101	420	3.3	139.7	2.0	174	89	228	196	110	54	13	42	92
125	152	570	4.2	139.7	2.0	174	134	333	196	241	36	4	28	42
150	64	265	2.9	168.3	2.0	207	50	104	280	25	87	132	71	333
150	108	430	4.1	168.3	2.0	207	82	237	280	104	52	16	37	104
150	168	610	6.1	168.3	2.0	207	168	328	281	209	56	9	31	42
175	65	270	3.4	196	2.0	234	52	106	367	23	103	196	71	366
175	108	455	5	196	2.0	234	86	256	367	99	62	22	36	111
175	173	640	6.6	196	2.0	234	138	387	367	238	39	6	23	45
200	91	290	4.1	219.1	2.0	265	54	114	465	31	62	132	49	275
200	152	470	5.9	219.1	2.0	265	90	260	465	114	38	16	26	86
200	190	655	8.7	219.1	2.0	265	148	387	465	229	51	10	23	47
250	101	300	5.1	273	2.0	321	58	117	698	28	65	191	44	283
250	169	475	7.3	273	2.0	321	96	256	698	101	39	25	24	91
250	211	675	11	273	2.0	321	157	396	699	211	53	15	21	49
300	90	320	7	323.9	2.0	375	63	127	966	23	134	468	53	368
300	150	500	11	323.9	2.0	375	104	264	966	85	81	68	29	122
300	210	685	14	323.9	2.0	375	146	405	966	186	58	21	20	60
350	103	345	8.6	355.6	2.0	410	68	137	1159	26	121	437	46	328
350	172	525	12	355.6	2.0	410	112	272	1159	91	73	69	26	111
350	241	705	16	355.6	2.0	410	157	406	1159	193	52	22	18	55
400	116	370	11	406.4	2.0	464	71	145	1497	28	114	471	40	308
400	194	550	15	406.4	2.0	464	118	278	1497	91	68	80	23	106
400	272	725	19	406.4	2.0	464	166	405	1497	189	49	27	16	53
450	135	395	13	457	2.0	519	77	156	1881	31	102	459	35	275
450	181	555	17	457	2.0	519	103	292	1881	74	77	103	23	134
450	271	730	21	457	2.0	519	154	413	1881	160	51	34	15	62
500	156	410	17	508	3.0	576	83	162	2319	33	86	438	30	241
500	208	575	21	508	3.0	576	111	300	2319	75	65	101	19	118
500	260	740	25	508	3.0	576	138	438	2319	132	52	39	14	71
550	158	410	18	559	3.0	629	84	164	2784	31	85	511	28	244
550	211	575	23	559	3.0	629	112	302	2784	70	64	118	18	120
550	264	740	28	559	3.0	629	140	440	2784	123	51	45	13	72
600	163	415	20	610	3.0	682	87	166	3291	30	84	579	26	244
600	217	585	26	610	3.0	682	116	305	3291	68	63	135	17	120
600	272	750	31	610	3.0	682	144	444	3291	119	51	52	13	72
650	168	420	22	660	3.0	732	89	168	3819	29	90	697	26	254
650	224	590	28	660	3.0	732	119	308	3819	66	67	163	17	125
650	280	760	34	660	3.0	732	148	448	3819	115	54	63	13	75

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Nominal diameter	Axial movement absorption nominal	Length	Weight	Welding end		Bellows				Lateral movement absorption	Adjustment force rate		Characteristic frequency of the bellows	
				External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter		Axial	Lateral	Axial	Lateral
DN	Δx	BL	G	da	s	Da	Lb	l*	Ae	Δy	CΔx	CΔy	fΔx	fΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	mm	N/mm	N/mm	Hz	Hz
700	172	425	24	711	3.0	788	92	171	4428	28	78	684	23	236
700	230	585	30	711	3.0	788	122	301	4428	62	59	172	15	118
700	288	765	37	711	3.0	788	152	452	4428	111	47	63	11	70
800	192	445	31	813	3.0	897	102	182	5762	28	128	1279	25	261
800	256	615	39	813	3.0	897	136	316	5762	65	96	331	17	134
800	320	790	47	813	3.0	897	170	460	5762	113	77	127	13	81
900	192	445	35	914	3.0	1002	102	182	7231	25	124	1548	23	268
900	256	625	45	914	3.0	1002	136	326	7231	59	93	378	15	136
900	320	800	55	914	3.0	1002	170	470	7231	103	74	148	11	82
1000	204	460	41	1016	3.0	1112	108	188	8917	25	105	1518	19	239
1000	272	640	52	1016	3.0	1112	144	334	8917	59	79	378	13	122
1000	340	820	63	1016	3.0	1112	180	480	8917	101	63	149	10	74
1100	216	470	45	1120	3.0	1218	114	194	10761	25	108	1759	19	239
1100	288	655	58	1120	3.0	1218	152	342	10761	58	81	445	12	122
1100	360	840	70	1120	3.0	1218	190	490	10761	101	65	176	9	74
1200	228	480	49	1220	3.0	1318	120	200	12678	25	117	2094	18	244
1200	304	670	63	1220	3.0	1318	160	350	12678	59	88	537	12	125
1200	380	860	77	1220	3.0	1318	200	500	12678	101	70	214	9	76
1300	228	480	53	1320	3.0	1418	120	200	14752	23	125	2606	18	262
1300	304	680	69	1320	3.0	1418	160	360	14752	56	94	634	12	132
1300	380	880	84	1320	3.0	1418	200	520	14752	97	75	247	9	80
1400	228	480	57	1420	3.0	1518	120	200	16984	21	133	3193	18	279
1400	304	690	75	1420	3.0	1518	160	370	16984	53	100	738	12	140
1400	380	900	92	1420	3.0	1518	200	540	16984	93	80	282	9	84
1500	240	495	63	1520	3.0	1622	126	206	19421	21	126	3243	17	264
1500	320	710	82	1520	3.0	1622	168	378	19421	54	94	763	11	132
1500	400	920	101	1520	3.0	1622	210	550	19421	94	76	293	8	80
1600	240	495	67	1620	3.0	1722	126	206	21970	20	133	3875	17	279
1600	320	720	88	1620	3.0	1722	168	388	21970	52	100	868	11	138
1600	400	940	109	1620	3.0	1722	210	570	21970	91	80	327	8	83
1800	240	495	75	1820	3.0	1922	126	206	27539	18	147	5372	17	310
1800	320	730	99	1820	3.0	1922	168	398	27539	47	110	1146	11	152
1800	400	960	124	1820	3.0	1922	210	590	27539	83	88	424	8	91
2000	256	545	102	2020	4.0	2123	152	231	33742	19	267	9382	19	333
2000	342	765	131	2020	4.0	2123	202	401	33742	47	201	2458	13	170
2000	427	985	160	2020	4.0	2123	252	572	33742	87	161	987	10	103
2200	253	545	112	2220	4.0	2323	152	231	40568	17	289	12214	19	362
2200	337	775	145	2220	4.0	2323	202	411	40568	44	217	3058	13	183
2200	421	1005	178	2220	4.0	2323	252	592	40568	81	174	1205	10	110
2400	250	545	122	2420	4.0	2523	152	231	48022	16	311	15568	19	392
2400	333	785	160	2420	4.0	2523	202	421	48022	41	234	3728	13	196
2400	417	1025	197	2420	4.0	2523	252	612	48022	77	187	1442	9	118

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 2.5 - PN 16 and a design temperature of 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately. Δx and Δy have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

LATERAL EXPANSION JOINT with swivel flanges **Type RN B-B**

TYPE RN B-B ≥ DN 100

TYPE RN B-B ≤ DN 80

Design type RN B-B

HKS lateral expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with rotating, standardised swivel flanges in line with EN 1092-1 type 02 and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Component			Permitted operating temperature TS [2]
	Metal bellows, collar	Flange	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	8.8 [5]	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or fixed flanges

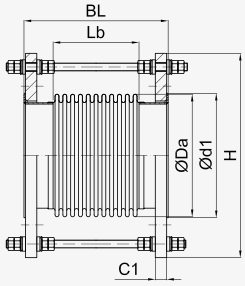
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

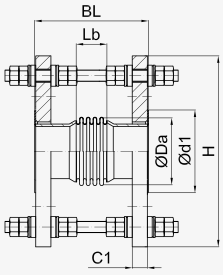
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange			Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	d1	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with swivel flanges · **type RN B-B · nominal pressure PN 6**											
50	7	120	7.1	262	6	90	16	84	59	42.5	246
50	18	175	7.5	262	6	90	16	84	112	41.8	137
50	28	200	7.7	262	6	90	16	84	138	41.8	73
65	7	120	8.8	282	6	110	16	105	59	65.1	855
65	21	175	9.2	282	6	110	16	105	113	65.5	146
65	34	205	9.4	282	6	110	16	105	142	65.5	75
80	8	150	12	312	6	128	18	114	90	83.2	313
80	22	185	13	312	6	128	18	118	124	86	159
80	39	235	13	312	6	128	18	118	175	86	78
100	5	125	13	332	6	148	18	142	66	127	731
100	23	210	13	332	6	148	18	142	150	127	133
100	36	250	14	332	6	148	18	142	188	127	106
125	10	155	18	362	6	178	20	174	89	191	331
125	22	260	19	362	6	178	20	174	156	191	236
125	42	320	21	362	6	178	20	175	216	191	138
150	14	220	21	387	6	202	20	207	118	274	408
150	34	305	23	387	6	202	20	208	201	274	226
150	52	345	26	387	6	202	20	208	250	272	168
200	11	220	29	442	6	258	22	265	111	456	714
200	31	310	33	442	6	258	22	265	198	455	353
200	54	365	39	442	6	258	22	267	262	453	269
250	13	250	40	503	6	312	24	317	138	680	762
250	39	365	49	503	6	312	24	323	260	689	420
250	52	400	54	503	6	312	24	324	297	689	371
300	16	290	55	580	6	365	24	375	170	954	878
300	37	385	65	580	6	365	24	376	274	952	534
300	51	425	71	580	6	365	24	378	312	954	461
350	14	250	72	630	6	415	26	410	160	1145	1242
350	35	355	82	630	6	415	26	412	269	1144	660
350	48	425	90	630	6	415	26	413	308	1145	576
400	16	290	108	680	6	465	28	460	192	1465	1176
400	34	405	121	680	6	465	28	464	282	1474	805
400	46	445	129	680	6	465	28	465	322	1473	726
LATERAL EXPANSION JOINT with swivel flanges · **type RN B-B · nominal pressure PN 10**											
50	7	120	11	287	16	102	20	84	59	42.5	246
50	18	175	12	287	16	102	20	84	112	41.8	137
50	24	190	12	287	16	102	20	84	129	41.8	89
65	5	110	14	307	16	122	20	105	49	66.4	471
65	11	145	14	307	16	122	20	105	85	65.5	344
65	17	165	14	307	16	122	20	105	104	65.5	189
80	6	140	15	322	16	138	20	114	79	83.2	467
80	14	170	16	322	16	138	20	118	109	86	320
80	21	190	16	322	16	138	20	118	131	86	185

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 16 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange			Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	d1	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
100	7	145	18	342	16	158	22	142	80	127	423
100	21	230	19	342	16	158	22	141	168	126	194
100	32	260	20	342	16	158	22	143	195	127	167
125	8	155	22	372	16	188	22	174	92	191	649
125	24	235	24	372	16	188	22	175	166	191	293
125	44	295	26	372	16	188	22	176	224	190	220
150	11	190	29	407	16	212	24	207	121	274	691
150	35	330	34	407	16	212	24	210	220	274	367
150	48	365	37	407	16	212	24	211	255	274	297
200	12	205	40	480	10	268	24	262	132	451	902
200	32	330	47	480	10	268	24	268	216	457	562
200	49	415	54	480	10	268	24	270	302	457	449
250	13	280	54	535	10	320	26	322	164	689	1135
250	37	410	65	535	10	320	26	324	297	689	625
250	44	405	67	535	10	320	26	322	288	680	608
300	16	295	67	597	10	370	26	373	178	945	1361
300	39	395	81	597	10	370	26	378	278	949	881
300	51	470	95	597	10	370	26	381	354	954	858
LATERAL EXPANSION JOINT with swivel flanges · **type RN B-B · nominal pressure PN 16**											
50	5	115	11	287	16	102	20	84	52	42.5	367
50	10	145	12	287	16	102	20	84	86	41.8	299
50	15	165	12	287	16	102	20	84	104	41.8	173
65	3	110	14	307	16	122	20	100	48	62.8	883
65	6	125	14	307	16	122	20	105	66	65.5	731
65	11	145	14	307	16	122	20	105	85	65.5	344
80	4	130	15	322	16	138	20	114	68	83.2	741
80	9	150	16	322	16	138	20	118	88	86	624
80	13	160	16	322	16	138	20	118	97	85.5	424
100	6	145	18	342	16	158	22	142	82	127	818
100	15	185	19	342	16	158	22	144	122	127	494
100	35	285	22	342	16	158	22	145	219	127	241
125	9	175	23	378	16	188	22	174	110	190	720
125	15	200	24	378	16	188	22	175	133	191	589
125	41	330	30	378	16	188	22	179	260	191	347
150	10	235	32	425	16	212	24	208	124	274	1060
150	26	330	37	425	16	212	24	210	220	274	600
150	37	370	40	425	16	212	24	212	260	274	479
200	15	295	46	480	16	268	26	267	180	457	1101
200	26	355	51	480	16	268	26	266	238	453	783
200	34	370	55	480	16	268	26	270	256	457	741
250	11	300	67	557	16	320	29	323	170	689	2270
250	24	415	73	557	16	320	29	321	286	684	982
250	42	440	86	557	16	320	29	326	312	686	899

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 16 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

NEBEZPEČÍ
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LATERAL EXPANSION JOINT with fixed flanges **Type RN F-F**

TYPE RN F-F ≥ DN 100

TYPE RN F-F ≤ DN 80

Design type RN F-F

HKS lateral expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01 and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Component			Permitted operating temperature TS [2]
	Metal bellows	Flange	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	8.8 [5]	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or swivel flanges

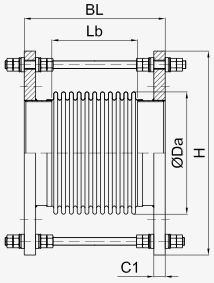
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

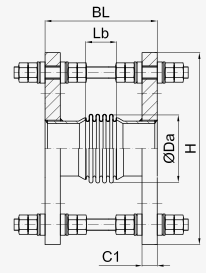
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with fixed flanges · **type RN F-F · nominal pressure PN 6**										
50	7	120	7.1	262	6	16	84	59	42.5	246
50	18	175	7.6	262	6	16	84	112	41.8	137
50	28	200	7.8	262	6	16	84	138	41.8	73
65	7	120	8.2	282	6	16	105	57	66.4	297
65	21	175	8.9	282	6	16	105	113	65.5	146
65	34	205	9.2	282	6	16	105	142	65.5	75
80	8	155	12	312	6	18	114	90	83.2	313
80	23	200	13	312	6	18	118	137	86.6	103
80	34	225	13	312	6	18	118	164	86	95
100	12	150	13	332	6	18	142	93	125	211
100	21	195	14	332	6	18	142	136	125	143
100	43	270	15	332	6	18	143	210	125	104
125	13	200	19	362	6	20	174	107	189	339
125	27	235	19	362	6	20	173	172	187	169
125	50	335	22	362	6	20	176	241	189	131
150	15	210	21	387	6	20	207	118	270	355
150	33	305	23	387	6	20	206	212	269	196
150	55	405	26	387	6	20	207	313	269	132
200	14	225	29	442	6	22	260	129	443	527
200	36	360	35	442	6	22	267	260	453	321
200	57	380	39	442	6	22	266	281	450	247
250	13	240	41	503	6	24	315	138	671	756
250	39	400	49	503	6	24	323	297	684	375
250	54	400	53	503	6	24	323	297	681	352
300	13	255	56	580	6	24	375	149	948	1165
300	37	380	64	580	6	24	374	274	941	531
300	51	420	70	580	6	24	376	312	941	467
350	14	235	72	630	6	26	409	160	1135	1189
350	37	420	89	630	6	26	413	308	1139	867
350	57	435	95	630	6	26	414	322	1139	558
400	13	250	108	680	6	28	460	168	1459	1541
400	31	370	119	680	6	28	466	256	1474	886
400	43	410	127	680	6	28	467	295	1474	768
450	14	305	132	735	6	30	520	185	1856	1973
450	32	365	140	735	6	30	517	276	1842	1024
450	39	410	149	735	6	30	522	288	1856	1029
500	15	320	142	785	6	30	572	199	2271	2167
500	29	385	152	785	6	30	574	267	2274	1310
500	40	430	161	785	6	30	575	308	2272	1140
600	13	340	190	907	6	32	673	208	3210	3424
600	27	410	202	907	6	32	679	278	3233	1793

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	cm²	N/mm
600	37	430	222	907	6	32	686	299	3258	1973
700	9	340	291	1028	6	40	790	192	4389	9329
700	23	405	301	1028	6	40	789	260	4382	2596
700	27	420	312	1028	6	40	788	271	4367	2478
800	10	375	370	1143	6	44	896	212	5699	9667
800	18	445	378	1143	6	44	896	282	5699	4078
800	23	445	380	1143	6	44	892	285	5666	3052
LATERAL EXPANSION JOINT with fixed flanges · **type RN F-F · nominal pressure PN 10**										
50	7	125	11	287	16	20	84	59	42.5	246
50	16	170	12	287	16	20	84	104	41.8	173
50	24	195	12	287	16	20	84	129	41.8	89
65	5	120	13	307	16	20	100	56	62.8	556
65	11	150	14	307	16	20	105	85	65.5	344
65	17	170	14	307	16	20	105	104	65.5	189
80	6	135	15	322	16	20	118	67	87	429
80	14	175	16	322	16	20	118	109	86	320
80	21	195	16	322	16	20	118	131	86	185
100	10	160	18	342	16	22	142	96	125	410
100	23	235	19	342	16	22	143	173	125	204
100	39	280	21	342	16	22	144	219	125	148
125	11	170	22	372	16	22	170	107	184	448
125	30	255	24	372	16	22	176	190	189	269
125	49	340	27	372	16	22	177	276	189	188
150	12	190	28	407	16	24	207	121	271	587
150	31	345	32	407	16	24	208	240	270	292
150	47	390	35	407	16	24	210	280	271	250
200	12	200	39	480	10	24	260	132	444	880
200	35	400	48	480	10	24	267	292	453	427
200	52	410	54	480	10	24	270	302	453	396
250	11	255	53	535	10	26	321	143	683	1526
250	33	420	63	535	10	26	323	308	684	629
250	47	430	70	535	10	26	326	318	684	592
300	13	285	66	597	10	26	373	173	940	1450
300	33	400	78	597	10	26	378	288	948	887
300	39	390	80	597	10	26	376	278	939	867
350	14	270	94	657	10	30	405	186	1121	1598
350	30	370	107	657	10	30	413	282	1139	1126
350	42	415	116	657	10	30	415	327	1139	949
400	13	295	141	705	10	32	466	202	1474	2750
400	30	390	153	705	10	32	467	295	1474	1299
400	36	410	161	705	10	32	469	313	1474	1435
450	14	320	180	767	10	36	521	218	1856	2726
450	27	390	193	767	10	36	522	288	1856	1740
450	36	425	211	767	10	36	525	320	1856	2060
500	11	310	207	822	10	38	573	205	2270	4550

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	cm²	N/mm
500	25	385	221	822	10	38	579	278	2291	2240
500	33	450	244	822	10	38	582	306	2291	2718
600	9	330	286	948	10	42	673	213	3206	7322
600	23	445	308	948	10	42	685	288	3258	3006
600	26	425	311	948	10	42	683	266	3242	3139
700	10	365	445	1087	10	50	790	230	4387	10532
700	18	405	455	1087	10	50	790	269	4383	5215
700	25	415	464	1087	10	50	787	279	4356	4002
LATERAL EXPANSION JOINT with fixed flanges · **type RN F-F · nominal pressure PN 16**										
50	3	110	11	287	16	20	84	44	42.5	582
50	8	135	11	287	16	20	84	70	42.1	265
50	15	170	12	287	16	20	84	104	41.8	173
65	3	115	13	307	16	20	100	48	62.8	883
65	6	130	14	307	16	20	105	66	65.5	731
65	11	150	14	307	16	20	105	85	65.5	344
80	3	120	15	322	16	20	114	56	83.2	1281
80	8	150	15	322	16	20	118	85	86.6	441
80	13	160	16	322	16	20	118	97	85.5	424
100	8	160	18	342	16	22	139	96	123	533
100	22	260	20	342	16	22	144	198	125	298
100	34	300	22	342	16	22	145	236	125	253
125	9	175	23	378	16	22	172	110	185	704
125	20	250	25	378	16	22	176	185	189	430
125	34	305	27	378	16	22	176	240	187	321
150	10	190	31	425	16	24	207	124	270	961
150	28	355	36	425	16	24	209	250	271	448
150	40	365	40	425	16	24	211	260	270	428
200	12	270	45	480	16	26	267	160	453	1374
200	24	330	50	480	16	26	267	216	451	857
200	42	385	58	480	16	26	271	273	452	684
250	9	275	66	557	16	29	323	149	684	2997
250	29	415	79	557	16	29	325	288	684	1121
250	42	440	85	557	16	29	324	312	677	890
300	8	290	91	628	16	32	374	157	941	4228
300	28	435	107	628	16	32	379	303	948	1425
300	37	430	114	628	16	32	381	300	947	1297
350	8	265	122	688	16	35	406	168	1122	4717
350	26	395	139	688	16	35	414	295	1139	1827
350	37	415	147	688	16	35	413	317	1130	1465
400	8	285	184	732	16	38	466	182	1474	7053
400	19	345	191	732	16	38	466	242	1470	2494
400	33	410	209	732	16	38	470	300	1474	2012

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	cm²	N/mm
450	9	310	243	808	16	42	519	196	1848	7605
450	23	415	261	808	16	42	523	300	1856	2873
450	33	440	272	808	16	42	522	320	1842	2363
500	8	320	307	883	16	46	570	210	2255	8986
500	19	405	316	883	16	46	569	278	2247	3340
500	30	435	338	883	16	46	579	306	2276	3062
600	12	380	501	1032	16	55	686	233	3258	10729
600	19	445	512	1032	16	55	686	299	3258	5048
600	22	450	512	1032	16	55	680	303	3223	4369
LATERAL EXPANSION JOINT with fixed flanges · **type RN F-F · nominal pressure PN 25**										
50	3	110	11	287	40	20	84	44	42.1	1084
50	6	135	11	287	40	20	84	69	41.8	584
50	8	145	11	287	40	20	84	78	41.8	410
65	2	105	15	307	40	22	105	38	65.5	3918
65	4	125	15	307	40	22	105	57	65.5	1161
65	6	135	15	307	40	22	105	66	65.5	731
80	3	125	18	322	40	24	118	55	86	2553
80	5	135	18	322	40	24	118	66	86	1478
80	7	140	18	322	40	24	118	73	85.5	1004
100	7	165	24	363	40	26	140	98	123	861
100	25	275	27	363	40	26	145	202	125	401
100	36	340	29	363	40	26	146	270	125	299
125	9	200	34	410	40	28	169	128	182	907
125	20	285	37	410	40	28	175	212	187	569
125	31	330	40	410	40	28	177	255	187	475
150	11	230	43	440	40	30	208	148	271	1191
150	25	360	49	440	40	30	211	234	271	792
150	38	405	53	440	40	30	213	279	270	620
200	10	255	64	512	25	32	267	167	453	2286
200	24	340	70	512	25	32	266	251	447	1145
200	39	425	82	512	25	32	273	295	451	988
250	9	270	92	593	25	35	322	176	681	3575
250	22	360	100	593	25	35	323	264	678	1650
250	40	480	118	593	25	35	326	336	677	1290
300	8	275	128	677	25	38	373	186	936	5238
300	19	355	139	677	25	38	379	252	948	2462
300	34	430	157	677	25	38	383	322	948	1900
350	12	315	180	747	25	42	405	205	1116	4249
350	19	380	190	747	25	42	412	268	1132	2720
350	30	425	208	747	25	42	418	308	1139	2548
400	10	320	285	788	25	48	468	196	1473	8381
400	19	405	292	788	25	48	464	280	1461	3339
400	30	450	314	788	25	48	472	320	1474	3023
450	13	365	385	862	25	54	525	224	1856	9016
450	21	430	395	862	25	54	525	288	1856	4242

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	cm²	N/mm
450	30	485	411	862	25	54	525	340	1846	3474
500	14	390	458	922	25	58	581	238	2284	9165
500	20	425	460	922	25	58	574	272	2254	5330
500	27	480	482	922	25	58	582	324	2282	4521

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with welding ends **Type RN R-R**

TYPE RN R-R ≥ DN 100

TYPE RN R-R ≤ DN 80

Design type RN R-R

HKS lateral expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Component			Permitted operating temperature TS [2]
	Metal bellows	Pipe tabs	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	8.8 [5]	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› With 30° groove or special dimensions
› With special coating, galvanised or hot galvanised
› Connection variants with swivel, fixed or welding neck flanges

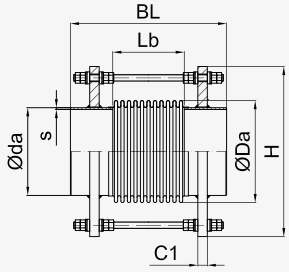
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

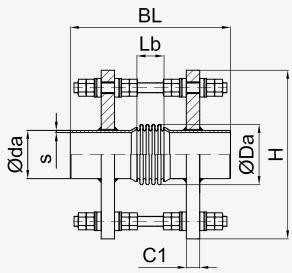
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with welding ends · **type RN R-R · nominal pressure PN 6**										
50	5	285	3.1	206	60.3	2.9	84	52	42.5	367
50	17	325	3.4	206	60.3	2.9	84	95	42.1	102
50	28	370	3.8	206	60.3	2.9	84	138	41.8	73
65	7	290	3.8	227	76.1	2.9	105	57	66.4	297
65	18	335	4.5	227	76.1	2.9	105	104	65.5	189
65	34	375	4.8	227	76.1	2.9	105	142	65.5	75
80	6	310	4.6	236	88.9	3.2	114	79	83.2	467
80	23	370	5.1	240	88.9	3.2	118	137	86.6	103
80	39	405	5.8	240	88.9	3.2	118	175	86	78
100	6	310	6.5	264	114.3	3.6	142	80	132	726
100	27	420	7.3	264	114.3	3.6	142	191	132	115
100	45	475	8.3	265	114.3	3.6	143	245	133	89
125	12	335	8.5	296	139.7	4.0	174	104	196	321
125	33	450	10	296	139.7	4.0	174	219	197	142
125	53	515	12	297	139.7	4.0	175	283	198	110
150	10	330	11	329	168.3	4.5	207	99	280	477
150	43	485	15	330	168.3	4.5	208	255	283	184
150	61	540	17	331	168.3	4.5	209	308	284	152
200	13	360	18	387	219.1	6.3	265	129	465	615
200	36	470	22	388	219.1	6.3	266	238	467	305
200	63	575	29	390	219.1	6.3	268	346	472	237
250	12	380	30	449	273	6.3	321	138	699	845
250	29	475	34	450	273	6.3	322	231	703	534
250	47	565	39	451	273	6.3	323	324	704	337
300	12	385	40	514	323.9	7.1	374	146	963	1067
300	36	540	50	517	323.9	7.1	377	297	972	610
300	52	600	56	518	323.9	7.1	378	360	975	481
350	16	425	49	550	355.6	8.0	410	183	1160	1114
350	34	535	57	552	355.6	8.0	412	293	1165	727
350	51	600	65	553	355.6	8.0	413	359	1169	558
400	16	435	66	604	406.4	8.0	464	192	1498	1228
400	35	550	77	606	406.4	8.0	466	308	1504	806
400	45	590	85	607	406.4	8.0	467	349	1508	776
450	16	455	77	660	457	8.0	520	212	1884	1902
450	33	545	86	661	457	8.0	521	304	1889	1009
450	43	585	95	662	457	8.0	522	346	1893	957
500	18	470	86	717	508	8.0	577	228	2322	1694
500	32	540	96	718	508	8.0	578	296	2326	1213
500	41	550	104	719	508	8.0	579	310	2331	1156
600	14	495	136	836	610	8.0	684	244	3299	4710
600	24	500	140	836	610	8.0	684	250	3304	2376

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	N/mm
600	39	575	152	835	610	8.0	683	322	3297	1577
700	14	510	170	958	711	8.0	790	256	4437	5380
700	25	545	176	958	711	8.0	790	292	4440	2439
700	34	555	188	959	711	8.0	791	305	4448	2251
800	16	545	228	1067	813	8.0	899	282	5770	5045
800	23	545	231	1067	813	8.0	899	285	5773	3270
800	29	560	245	1068	813	8.0	900	296	5782	3058
LATERAL EXPANSION JOINT with welding ends · **type RN R-R · nominal pressure PN 10**										
50	5	285	3.1	206	60.3	2.9	84	52	42.5	367
50	14	320	3.3	206	60.3	2.9	84	87	42.1	136
50	24	360	3.8	206	60.3	2.9	84	129	41.8	89
65	5	280	3.8	227	76.1	2.9	105	49	66.4	471
65	11	315	4.3	227	76.1	2.9	105	85	65.5	344
65	17	335	4.5	227	76.1	2.9	105	104	65.5	189
80	6	300	4.6	240	88.9	3.2	118	67	87	429
80	13	335	4.9	240	88.9	3.2	118	106	86.6	226
80	21	360	5.4	240	88.9	3.2	118	131	86	185
100	8	325	6.5	264	114.3	3.6	142	93	132	457
100	22	405	7.6	265	114.3	3.6	143	173	133	252
100	38	460	8.7	266	114.3	3.6	144	228	134	161
125	12	355	8.8	296	139.7	4.0	174	122	197	436
125	30	445	11	297	139.7	4.0	175	216	199	241
125	39	480	13	298	139.7	4.0	176	247	200	236
150	15	395	15	329	168.3	4.5	207	155	281	503
150	37	505	19	331	168.3	4.5	209	264	284	283
150	50	525	21	332	168.3	4.5	210	283	286	264
200	10	375	25	405	219.1	6.3	265	132	466	1085
200	30	520	30	407	219.1	6.3	267	280	468	453
200	58	635	40	410	219.1	6.3	270	395	475	382
250	14	425	34	462	273	6.3	322	184	701	1142
250	28	540	38	463	273	6.3	323	297	703	635
250	42	605	45	464	273	6.3	324	365	707	553
300	14	445	53	528	323.9	7.1	376	195	969	1359
300	27	565	59	528	323.9	7.1	376	314	969	795
300	48	605	70	531	323.9	7.1	379	353	976	708
350	13	435	61	563	355.6	8.0	411	186	1162	1799
350	36	610	76	565	355.6	8.0	413	359	1169	937
350	45	600	79	565	355.6	8.0	413	349	1168	866
400	12	435	67	602	406.4	8.0	462	196	1491	2267
400	32	590	85	607	406.4	8.0	467	349	1508	1305
400	41	590	102	608	406.4	8.0	468	336	1511	1161
450	15	495	103	673	457	8.0	521	245	1887	2845
450	29	540	112	674	457	8.0	522	288	1892	1684
450	38	580	121	675	457	8.0	523	330	1896	1470
500	14	485	114	730	508	8.0	578	234	2326	3622

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	N/mm
500	26	530	124	730	508	8.0	578	278	2327	2150
500	35	570	133	731	508	8.0	579	320	2331	1866
600	11	510	174	852	610	8.0	684	250	3304	8522
600	23	580	186	853	610	8.0	685	320	3308	3263
600	32	595	192	851	610	8.0	683	332	3298	2542
700	11	525	234	982	711	10.0	790	263	4442	9797
700	15	530	240	983	711	10.0	791	269	4447	7310
700	28	575	255	984	711	10.0	792	314	4449	3652
LATERAL EXPANSION JOINT with welding ends · **type RN R-R · nominal pressure PN 16**										
50	5	285	3.1	206	60.3	2.9	84	52	42.5	367
50	10	315	3.5	206	60.3	2.9	84	86	41.8	299
50	15	335	3.6	206	60.3	2.9	84	104	41.8	173
65	3	280	3.8	222	76.1	2.9	100	48	62.8	883
65	6	295	4.1	227	76.1	2.9	105	66	65.5	731
65	11	315	4.3	227	76.1	2.9	105	85	65.5	344
80	4	300	4.5	236	88.9	3.2	114	68	83.2	741
80	9	320	5	240	88.9	3.2	118	88	86	624
80	13	330	5.2	240	88.9	3.2	118	97	85.5	424
100	8	350	8.4	264	114.3	3.6	142	109	132	615
100	25	450	9.9	265	114.3	3.6	143	210	133	266
100	37	500	12	266	114.3	3.6	144	256	134	217
125	10	355	12	303	139.7	4.0	175	112	198	908
125	23	435	14	304	139.7	4.0	176	194	200	486
125	34	500	16	305	139.7	4.0	177	258	201	355
150	9	360	17	347	168.3	4.5	207	121	281	1067
150	22	450	19	349	168.3	4.5	209	207	284	583
150	44	540	24	351	168.3	4.5	211	297	287	400
200	15	450	32	407	219.1	6.3	267	200	468	1242
200	29	530	37	408	219.1	6.3	268	281	472	731
200	44	600	42	410	219.1	6.3	270	348	474	563
250	9	415	41	470	273	6.3	318	164	692	2061
250	27	550	51	476	273	6.3	324	297	707	1031
250	41	620	58	478	273	6.3	326	366	710	795
300	14	485	68	545	323.9	7.1	377	224	971	2085
300	27	575	76	546	323.9	7.1	378	312	974	1283
300	46	670	92	549	323.9	7.1	381	408	984	1058
350	12	480	77	580	355.6	8.0	412	216	1164	2669
350	25	570	86	580	355.6	8.0	412	308	1166	1567
350	34	615	103	607	355.6	8.0	415	354	1174	1387
400	12	480	90	616	406.4	8.0	464	227	1497	3205
400	27	615	111	620	406.4	8.0	468	364	1512	2248
400	33	620	112	619	406.4	8.0	467	370	1508	1681

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

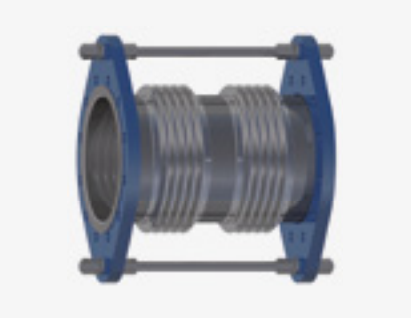
Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	N/mm
450	12	515	132	689	457	8.0	521	252	1890	5084
450	25	620	151	691	457	8.0	523	360	1898	2786
450	31	625	152	690	457	8.0	522	365	1891	2134
500	14	530	149	746	508	8.0	578	270	2329	4555
500	21	555	182	773	508	8.0	581	292	2339	4153
500	29	600	197	774	508	8.0	582	340	2346	3455
600	13	530	228	872	610	10.0	680	256	3282	7778
600	19	590	234	871	610	10.0	679	320	3275	4222
600	25	610	253	878	610	10.0	686	336	3313	4044
LATERAL EXPANSION JOINT with welding ends · **type RN R-R · nominal pressure PN 25**										
50	4	295	3.9	206	60.3	2.9	84	52	42.1	628
50	6	300	3.4	206	60.3	2.9	84	69	41.8	584
50	8	310	3.4	206	60.3	2.9	84	78	41.8	410
65	3	295	4.9	225	76.1	2.9	103	53	64.1	2028
65	4	305	5	225	76.1	2.9	103	63	64.1	1174
65	6	305	5.1	227	76.1	2.9	105	66	65.5	731
80	3	295	5.9	240	88.9	3.2	118	55	86	2553
80	5	305	6	240	88.9	3.2	118	66	86	1478
80	7	315	6.2	240	88.9	3.2	118	73	85.5	1004
100	8	370	9.2	270	114.3	3.6	142	126	132	741
100	20	435	11	272	114.3	3.6	144	192	134	514
100	42	550	14	274	114.3	3.6	146	306	137	306
125	10	395	16	314	139.7	4.0	174	144	197	884
125	21	455	19	317	139.7	4.0	177	203	201	731
125	37	570	23	319	139.7	4.0	179	320	203	442
150	9	390	20	346	168.3	4.5	206	141	279	1322
150	25	510	25	350	168.3	4.5	210	260	285	705
150	37	610	29	351	168.3	4.5	211	361	287	518
200	11	440	38	419	219.1	6.3	267	180	468	1703
200	20	500	42	419	219.1	6.3	267	238	470	1269
200	38	635	54	423	219.1	6.3	271	372	478	911
250	9	450	54	488	273	7.1	320	191	697	2834
250	26	610	73	493	273	7.1	325	336	710	1400
250	34	610	78	495	273	7.1	327	338	714	1356
300	9	480	87	569	323.9	8.0	377	209	973	5065
300	23	600	99	571	323.9	8.0	379	328	979	2116
300	35	680	111	573	323.9	8.0	381	408	984	1578
350	10	495	97	604	355.6	8.0	412	224	1166	4733
350	24	620	111	605	355.6	8.0	413	349	1168	2157
350	34	685	133	608	355.6	8.0	416	404	1178	1877
400	13	515	158	656	406.4	10.0	464	242	1496	4708
400	20	555	171	661	406.4	10.0	469	284	1513	3413
400	27	600	181	662	406.4	10.0	470	330	1518	2942
450	13	540	186	715	457	10.0	523	270	1898	6603
450	23	625	204	717	457	10.0	525	352	1906	4241

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	cm²	N/mm
450	26	645	217	719	457	10.0	527	374	1913	4710
500	12	530	203	771	508	10.0	579	256	2332	9028
500	18	590	210	771	508	10.0	579	320	2331	4661
500	22	620	247	774	508	10.0	582	340	2346	5162

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with swivel flanges **Type RM B-B**

TYPE RM B-B ≥ DN 100



TYPE RM B-B ≤ DN 80

Design type RM B-B

HKS lateral expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with middle pipe made of standard pipes in line with EN 10216/10217 ff or rolled from sheet metal in line with EN 10028 ff and rotating, standardised swivel flanges in line with EN 1092-1 type 02 and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Component			Permitted operating temperature TS [2]
	Metal bellows, collar	Flange, middle pipe	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	8.8 [5]	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8 and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or fixed flanges

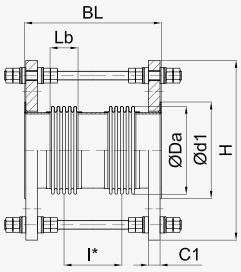
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

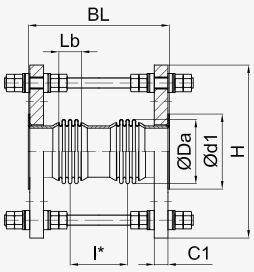
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 400



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange			Bellows				Lateral adjustment force rate
					Borehole patter nacc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	d1	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with swivel flanges · **type RM B-B · nominal pressure PN 6**												
50	51	250	7.6	262	6	90	16	84	30	160	42.5	11
50	102	345	8	262	6	90	16	84	37	247	42.5	4
50	199	550	8.9	262	6	90	16	84	44	444	42.1	2
65	53	235	9	282	6	110	16	105	33	143	66.4	14
65	106	390	9.8	282	6	110	16	100	40	290	62.8	5
65	206	580	12	282	6	110	16	105	48	473	65.5	4
80	54	320	13	312	6	128	18	114	45	215	83.2	18
80	101	400	14	312	6	128	18	118	55	285	86	16
80	203	580	15	312	6	128	18	118	66	456	86	6
100	50	290	14	332	6	148	18	142	40	190	127	25
100	102	405	15	332	6	148	18	141	53	293	127	8
100	205	660	17	332	6	148	18	143	130	465	127	8
125	51	285	19	362	6	178	20	174	45	175	191	28
125	100	465	21	362	6	178	20	174	61	301	191	15
125	205	635	23	362	6	178	20	175	80	450	191	8
150	51	360	22	387	6	202	20	207	51	206	274	51
150	101	485	24	387	6	202	20	205	68	313	271	19
150	200	725	27	387	6	202	20	207	86	536	273	9
200	51	400	32	442	6	258	22	265	57	232	457	94
200	100	520	34	442	6	258	22	265	76	336	457	34
200	202	730	39	442	6	258	22	265	99	519	455	17
250	50	380	45	503	6	312	24	319	82	182	683	162
250	100	525	49	503	6	312	24	321	105	305	686	77
250	215	810	57	503	6	312	24	323	130	575	689	29
300	50	430	60	580	6	365	24	375	85	225	954	160
300	101	590	71	580	6	365	24	377	114	364	954	114
300	205	905	73	580	6	365	24	374	111	671	947	24
350	51	430	78	630	6	415	26	408	92	247	1137	168
350	100	605	82	630	6	415	26	408	92	422	1137	59
350	201	955	92	630	6	415	26	408	116	746	1138	25
400	51	470	118	680	6	465	28	461	122	247	1467	279
400	102	715	132	680	6	465	28	466	152	442	1481	136
400	201	950	141	680	6	465	28	463	130	700	1470	40
LATERAL EXPANSION JOINT with swivel flanges · **type RM B-B · nominal pressure PN 10**												
50	51	255	12	287	16	102	20	84	30	165	42.5	11
50	103	395	13	287	16	102	20	84	35	300	42.1	5
50	204	560	13	287	16	102	20	84	44	454	42.1	2
65	53	285	14	307	16	122	20	100	32	192	62.8	14
65	106	415	15	307	16	122	20	105	38	318	65.5	10
65	205	585	16	307	16	122	20	105	48	478	65.5	4
80	54	320	16	322	16	138	20	114	45	215	83.2	18
80	102	450	17	322	16	138	20	118	44	344	86	14
80	204	660	19	322	16	138	20	118	55	545	86	5

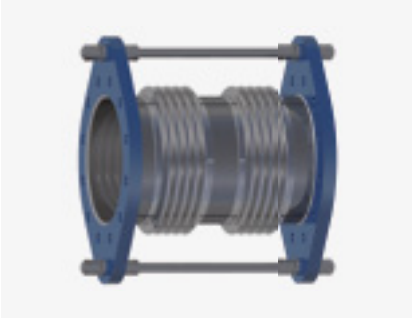
Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 16 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange			Bellows				Lateral adjustment force rate
					Borehole patter nacc. to EN 1092	Collar diameter	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	d1	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	mm	cm²	N/mm
100	51	310	19	342	16	158	22	142	40	205	127	21
100	102	470	21	342	16	158	22	142	55	355	127	11
100	204	735	23	342	16	158	22	143	101	571	127	7
125	51	325	24	372	16	188	22	174	46	216	191	39
125	101	435	25	372	16	188	22	174	64	304	190	23
125	200	665	28	372	16	188	22	175	83	513	191	11
150	50	365	31	407	16	212	24	207	52	242	274	66
150	101	510	32	407	16	212	24	206	69	369	272	24
150	203	705	37	407	16	212	24	208	96	496	273	18
200	51	415	45	480	10	268	24	266	77	227	457	117
200	102	560	48	480	10	268	24	264	80	370	453	45
200	203	815	53	480	10	268	24	265	102	602	453	22
250	52	420	59	535	10	320	26	320	84	219	684	197
250	101	595	65	535	10	320	26	321	108	373	684	89
250	204	835	74	535	10	320	26	324	114	604	689	39
300	51	445	74	597	10	370	26	373	89	239	945	240
300	102	645	81	597	10	370	26	374	114	414	945	106
300	203	900	92	597	10	370	26	378	120	660	954	45
LATERAL EXPANSION JOINT with swivel flanges · **type RM B-B · nominal pressure PN 16**												
50	51	300	12	287	16	102	20	84	22	217	42.5	8
50	103	395	13	287	16	102	20	84	35	300	42.1	5
50	201	665	14	287	16	102	20	84	43	563	41.8	3
65	52	340	15	307	16	122	20	100	24	254	62.8	11
65	101	490	16	307	16	122	20	105	29	399	65.5	8
65	204	705	17	307	16	122	20	105	38	608	65.5	3
80	50	360	16	322	16	138	20	114	34	264	83.2	16
80	102	475	17	322	16	138	20	118	43	373	86.6	8
80	204	775	19	322	16	138	20	118	44	669	86	4
100	50	310	20	342	16	158	22	142	58	188	127	56
100	105	455	23	342	16	158	22	144	80	310	127	34
100	203	690	24	342	16	158	22	142	96	526	125	12
125	53	370	26	378	16	188	22	175	64	239	191	66
125	103	490	27	378	16	188	22	175	67	357	191	27
125	197	745	30	378	16	188	22	175	86	591	190	13
150	53	395	35	425	16	212	24	206	71	256	272	79
150	101	565	39	425	16	212	24	209	76	381	274	45
150	201	790	44	425	16	212	24	208	100	580	271	22
200	51	425	50	480	16	268	26	264	82	227	452	188
200	102	610	57	480	16	268	26	268	108	388	457	95
200	200	870	65	480	16	268	26	270	116	636	457	44
250	53	480	74	557	16	320	29	320	87	267	683	221
250	105	705	84	557	16	320	29	324	114	459	689	111
250	209	1090	94	557	16	320	29	324	114	844	689	34

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 16 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with fixed flanges **Type RM F-F**

TYPE RM F-F ≥ DN 100



TYPE RM F-F ≤ DN 80

Design type RM F-F

HKS lateral expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with middle pipe made of standard pipes in line with EN 10216/10217 ff or rolled from sheet metal in line with EN 10028 ff and standardised fixed flanges in line with EN 1092-1 type 01 and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Bauteil			Permitted operating temperature TS [2]
	Metal bellows, collar	Flange, middle pipe	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	8.8 [5]	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or fixed flanges

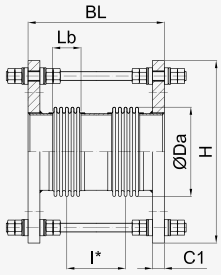
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

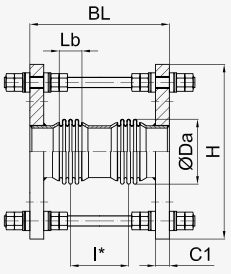
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with fixed flanges · **type RM F-F · nominal pressure PN 6**											
50	51	250	7.7	262	6	16	84	30	160	42.5	11
50	102	345	8.1	262	6	16	84	37	247	42.5	4
50	199	550	9	262	6	16	84	44	444	42.1	2
65	51	230	8.8	282	6	16	105	33	138	66.4	15
65	102	380	9.5	282	6	16	100	40	280	62.8	6
65	200	565	11	282	6	16	105	48	458	65.5	4
80	52	275	13	312	6	18	117	42	167	86.1	19
80	100	410	14	312	6	18	118	53	293	86.6	10
80	201	545	15	312	6	18	118	62	422	86	5
100	52	275	14	332	6	18	139	53	163	123	25
100	102	415	16	332	6	18	142	84	269	125	18
100	202	555	17	332	6	18	142	87	407	125	7
125	52	285	20	362	6	20	173	61	161	188	44
125	101	445	22	362	6	20	174	78	273	189	21
125	206	590	23	362	6	20	172	80	450	186	8
150	51	340	23	387	6	20	207	69	179	271	74
150	102	430	25	387	6	20	208	71	266	271	28
150	205	615	27	387	6	20	206	92	427	267	14
200	52	360	33	442	6	22	265	76	186	451	97
200	102	475	36	442	6	22	263	99	279	447	57
200	203	700	41	442	6	22	265	123	478	449	25
250	51	385	45	503	6	24	321	80	205	683	127
250	104	520	50	503	6	24	319	105	315	677	72
250	215	730	56	503	6	24	323	110	520	684	29
300	51	420	61	580	6	24	374	85	225	943	155
300	101	570	70	580	6	24	377	114	349	948	110
300	200	750	75	580	6	24	377	116	526	946	41
350	54	415	78	630	6	26	405	92	247	1124	167
350	103	550	87	630	6	26	412	122	347	1139	123
350	202	765	93	630	6	26	409	124	559	1129	46
400	50	460	119	680	6	28	465	98	248	1474	265
400	100	595	129	680	6	28	466	128	353	1474	149
400	202	855	142	680	6	28	467	134	604	1474	66
450	50	475	141	735	6	30	519	106	251	1853	303
450	100	585	147	735	6	30	516	108	388	1840	132
450	203	915	162	735	6	30	517	138	688	1842	55
500	51	505	153	785	6	30	571	114	269	2265	346
500	101	635	165	785	6	30	578	119	399	2291	184
500	202	900	184	785	6	30	575	154	624	2272	91
600	51	560	206	907	6	32	673	119	309	3210	430
600	101	695	222	907	6	32	684	124	439	3258	219

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
600	200	980	249	907	6	32	680	160	690	3232	110
700	50	615	317	1028	6	40	790	128	338	4389	719
700	102	750	329	1028	6	40	789	130	470	4382	258
700	201	1150	374	1028	6	40	788	202	802	4369	139
800	51	655	401	1143	6	44	896	141	351	5699	832
800	100	820	438	1143	6	44	900	184	474	5715	484
800	201	1095	454	1143	6	44	900	148	788	5715	134
LATERAL EXPANSION JOINT with fixed flanges · **type RM F-F · nominal pressure PN 10**											
50	51	260	12	287	16	20	84	30	165	42.5	11
50	102	350	12	287	16	20	84	44	244	42.1	6
50	203	600	13	287	16	20	84	52	482	41.8	3
65	52	285	14	307	16	20	100	32	187	62.8	15
65	103	370	15	307	16	20	105	48	258	65.5	12
65	202	575	16	307	16	20	105	49	459	65.1	3
80	51	305	16	322	16	20	118	43	198	86.6	27
80	103	415	17	322	16	20	118	55	295	86	15
80	203	555	18	322	16	20	118	61	431	85.5	6
100	51	305	20	342	16	22	141	55	185	125	34
100	102	420	21	342	16	22	143	58	298	125	18
100	200	620	22	342	16	22	141	58	498	123	5
125	50	310	24	372	16	22	174	63	183	188	59
125	101	425	25	372	16	22	172	64	299	185	23
125	202	665	27	372	16	22	173	83	518	186	10
150	50	335	30	407	16	24	204	69	199	266	76
150	102	495	33	407	16	24	208	73	313	271	36
150	202	710	38	407	16	24	210	100	500	271	23
200	51	380	43	480	10	24	257	76	236	436	100
200	100	530	49	480	10	24	267	82	342	453	64
200	206	750	55	480	10	24	267	108	533	450	29
250	51	410	59	535	10	26	318	84	214	674	201
250	102	540	64	535	10	26	323	88	338	682	88
250	201	800	73	535	10	26	323	114	574	681	40
300	51	440	75	597	10	26	377	92	237	948	296
300	101	580	83	597	10	26	376	120	350	942	152
300	200	900	100	597	10	26	380	154	634	948	74
350	50	415	104	657	10	30	412	98	228	1139	350
350	100	575	113	657	10	30	413	103	383	1139	162
350	199	945	127	657	10	30	411	154	704	1133	60
400	51	505	151	705	10	32	464	126	286	1470	364
400	107	700	165	705	10	32	467	134	474	1474	180
400	200	990	183	705	10	32	469	142	752	1474	90
450	50	475	191	767	10	36	516	111	261	1836	484
450	100	690	210	767	10	36	522	144	444	1856	236
450	200	1010	233	767	10	36	524	152	752	1856	105

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
500	51	475	227	822	10	38	573	124	244	2265	747
500	103	685	254	822	10	38	581	162	412	2291	363
500	210	1025	285	822	10	38	582	170	710	2291	149
600	50	595	323	948	10	42	685	128	308	3258	932
600	102	775	354	948	10	42	687	168	448	3258	448
600	202	1090	392	948	10	42	688	176	756	3258	191
700	51	605	482	1087	10	50	790	135	335	4383	1066
700	102	800	520	1087	10	50	791	176	486	4376	534
700	201	1120	571	1087	10	50	794	184	794	4389	227
LATERAL EXPANSION JOINT with fixed flanges · **type RM F-F · nominal pressure PN 16**											
50	52	265	12	287	16	20	84	35	165	42.1	16
50	102	410	13	287	16	20	84	43	303	41.8	8
50	202	610	13	287	16	20	84	52	492	41.8	3
65	52	275	15	307	16	20	105	38	173	65.5	31
65	103	420	15	307	16	20	103	53	303	64.1	10
65	199	695	17	307	16	20	105	39	589	65.1	3
80	51	310	16	322	16	20	118	43	203	86.6	26
80	102	465	17	322	16	20	118	44	354	86	13
80	202	635	18	322	16	20	118	49	524	85.5	5
100	51	310	20	342	16	22	140	58	188	123	54
100	103	465	21	342	16	22	141	75	325	123	24
100	202	720	24	342	16	22	142	94	564	124	10
125	50	340	25	378	16	22	174	64	214	188	70
125	101	475	27	378	16	22	173	67	347	186	28
125	200	680	31	378	16	22	176	92	522	187	18
150	51	380	35	425	16	24	204	71	241	266	87
150	102	540	38	425	16	24	209	76	356	271	44
150	200	805	46	425	16	24	212	108	588	271	32
200	50	435	53	480	16	26	268	87	237	453	274
200	100	590	56	480	16	26	267	108	368	451	96
200	201	915	66	480	16	26	269	137	667	453	42
250	51	495	78	557	16	29	324	92	277	684	334
250	101	660	83	557	16	29	324	114	419	684	119
250	209	1065	99	557	16	29	325	144	794	684	49
300	51	525	106	628	16	32	378	96	296	948	406
300	101	710	114	628	16	32	377	120	460	945	144
300	202	1115	135	628	16	32	379	152	832	948	63
350	51	495	138	688	16	35	413	103	293	1139	460
350	101	690	151	688	16	35	415	109	479	1139	217
350	200	995	165	688	16	35	414	136	756	1136	74
400	51	520	202	732	16	38	467	108	308	1474	527
400	101	700	209	732	16	38	460	108	488	1449	177

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
400	200	1060	236	732	16	38	466	142	812	1466	86
450	51	545	265	808	16	42	520	116	316	1848	627
450	100	740	285	808	16	42	524	122	502	1856	293
450	204	1060	316	808	16	42	522	160	780	1842	131
500	51	595	333	883	16	46	571	124	344	2256	717
500	100	750	355	883	16	46	581	130	490	2290	333
500	201	1120	391	883	16	46	574	170	820	2254	155
600	50	655	538	1032	16	55	686	133	373	3258	1167
600	101	855	561	1032	16	55	683	135	575	3240	396
600	200	1225	637	1032	16	55	690	186	886	3258	245
LATERAL EXPANSION JOINT with fixed flanges · **type RM F-F · nominal pressure PN 25**											
50	50	305	12	287	40	20	84	35	205	41.8	22
50	99	460	13	287	40	20	85	43	353	42.4	11
50	204	700	14	287	40	20	85	51	581	42.4	4
65	51	315	16	307	40	22	105	29	219	65.5	26
65	101	495	17	307	40	22	105	30	400	65.1	7
65	199	790	19	307	40	22	103	42	682	64.1	3
80	51	305	19	322	40	24	118	37	202	85.5	43
80	102	480	20	322	40	24	118	37	377	85.5	13
80	201	830	22	322	40	24	118	37	727	85.5	4
100	51	345	27	363	40	26	141	60	215	123	67
100	104	560	30	363	40	26	145	84	404	125	40
100	204	805	32	363	40	26	145	101	631	125	14
125	51	370	37	410	40	28	173	69	224	185	106
125	102	540	41	410	40	28	177	92	372	188	53
125	201	800	43	410	40	28	176	74	649	187	15
150	51	430	47	440	40	30	208	74	274	271	113
150	101	655	51	440	40	30	209	96	476	271	53
150	200	910	58	440	40	30	210	128	698	268	30
200	51	495	71	512	25	32	267	84	324	453	198
200	102	630	75	512	25	32	267	87	457	451	80
200	201	990	87	512	25	32	269	114	784	453	37
250	50	480	102	593	25	35	323	92	292	681	323
250	101	715	115	593	25	35	326	98	473	684	143
250	205	1185	130	593	25	35	325	120	920	684	44
300	52	545	144	677	25	38	374	96	346	936	374
300	101	765	160	677	25	38	379	126	536	948	179
300	201	1255	182	677	25	38	373	152	1002	930	60
350	51	575	197	747	25	42	405	103	363	1116	441
350	101	730	211	747	25	42	414	109	509	1136	201
350	200	1135	241	747	25	42	416	144	874	1139	92
400	50	600	308	788	25	48	468	112	362	1473	695
400	101	865	327	788	25	48	464	140	600	1461	239
400	201	1130	366	788	25	48	472	160	840	1474	145
450	51	610	415	862	25	54	525	128	338	1856	1103

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
450	101	790	430	862	25	54	522	128	518	1842	369
450	200	1195	482	862	25	54	525	170	880	1846	171
500	51	625	489	922	25	58	581	136	336	2284	1272
500	100	830	522	922	25	58	584	144	534	2291	570
500	201	1275	568	922	25	58	577	180	940	2259	194

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with welding ends **Type RM R-R**

TYPE RM R-R ≥ DN 100

TYPE RM R-R ≤ DN 80

Design type RM R-R

HKS lateral expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with middle pipe and welding ends (pipe nozzle) made of standard pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and tension rods for absorbing the axial reaction forces.

Materialcombination [1]	Component			Permitted operating temperature TS [2]
	Metal bellows	pipe	Tension rods [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	8.8 [5]	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		A4 [4]	-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		[4]	bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		[4]	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.
   Placement of the inner fixing only under operating conditions with vacuum (negative pressure).
5. Standard version with threaded rods/nuts made of 8.8/8 and spherical/conical washers made of case-hardened steel. All components are galvanised.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› With 30° groove or special dimensions
› With special coating, galvanised or hot galvanised
› Connection variants with swivel, fixed or welding neck flanges

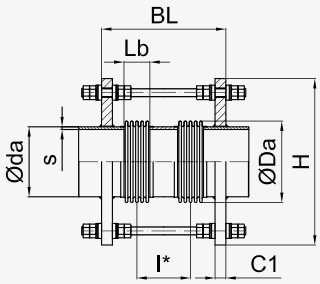
Tasks

› Absorption of all-around lateral movements
› Low-vibration and low-noise connection of pipes
› Compensation of installation inaccuracies
› Reduction of forces and moments in connections

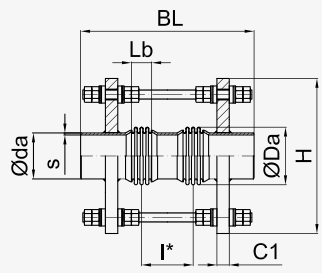
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas and water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 1800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences. The figures include inner and outer tie rods for operating conditions with excess pressure and negative pressure. The inner tie rod is omitted when only inner excess pressure is present.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with welding ends · **type RM R-R · nominal pressure PN 6**											
50	51	420	3.7	206	60.3	2.9	84	30	160	42.5	11
50	102	515	4	206	60.3	2.9	84	37	247	42.5	4
50	201	725	5	206	60.3	2.9	84	44	449	42.1	2
65	51	400	4.4	227	76.1	2.9	105	33	138	66.4	15
65	101	525	5.4	227	76.1	2.9	105	48	248	65.5	12
65	202	740	6.6	227	76.1	2.9	105	49	459	65.1	3
80	52	435	5.4	240	88.9	3.2	118	45	160	87	19
80	102	525	6.3	240	88.9	3.2	118	62	232	86	15
80	202	675	7.4	240	88.9	3.2	118	75	370	86	5
100	50	465	7.7	264	114.3	3.6	142	66	166	132	32
100	99	590	9.3	264	114.3	3.6	142	69	289	132	17
100	201	780	12	264	114.3	3.6	142	83	468	132	6
125	51	460	11	296	139.7	4.0	174	62	167	197	54
125	100	560	13	297	139.7	4.0	175	80	250	198	27
125	202	815	16	297	139.7	4.0	175	96	486	198	10
150	52	470	14	328	168.3	4.5	206	68	168	280	66
150	97	605	17	330	168.3	4.5	208	88	283	282	37
150	201	840	22	331	168.3	4.5	209	92	517	283	16
200	51	510	23	385	219.1	6.3	263	74	204	461	81
200	100	665	28	387	219.1	6.3	265	94	339	465	39
200	201	850	36	389	219.1	6.3	267	100	520	468	19
250	51	550	36	446	273	6.3	318	79	229	692	104
250	101	720	43	449	273	6.3	321	100	380	699	49
250	204	955	55	451	273	6.3	323	106	606	703	21
300	51	575	50	510	323.9	7.1	370	84	249	954	128
300	100	765	60	513	323.9	7.1	373	106	416	962	60
300	200	1005	76	515	323.9	7.1	375	112	652	966	26
350	51	585	60	550	355.6	8.0	410	92	252	1160	188
350	101	805	74	551	355.6	8.0	411	116	446	1162	82
350	200	1015	93	551	355.6	8.0	411	124	649	1163	35
400	50	595	79	604	406.4	8.0	464	96	256	1498	220
400	101	820	96	605	406.4	8.0	465	122	457	1500	95
400	200	1070	121	606	406.4	8.0	466	130	700	1505	50
450	50	625	89	654	457	8.0	514	104	279	1863	264
450	101	845	108	657	457	8.0	517	132	472	1874	112
450	200	1095	138	661	457	8.0	521	140	715	1890	54
500	50	630	102	717	508	8.0	577	114	274	2322	369
500	101	925	133	718	508	8.0	578	146	536	2326	180
500	201	1120	161	719	508	8.0	579	155	725	2331	70
600	51	635	149	833	610	8.0	681	121	261	3285	561
600	108	880	180	835	610	8.0	683	154	474	3294	224

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
600	201	1245	232	835	610	8.0	683	161	831	3297	78
700	51	680	196	958	711	8.0	790	130	300	4440	816
700	101	905	221	954	711	8.0	786	162	492	4414	293
700	202	1350	296	959	711	8.0	791	168	928	4447	96
800	47	685	220	1062	813	8.0	894	143	293	5742	1122
800	98	990	311	1068	813	8.0	900	184	544	5781	521
800	201	1380	386	1069	813	8.0	901	190	930	5789	136
900	50	845	327	1189	914	8.0	997	141	441	7188	1020
900	100	1115	371	1189	914	8.0	997	176	676	7188	351
900	200	1500	461	1192	914	8.0	1000	184	1054	7213	121
1000	51	865	388	1306	1016	8.0	1114	152	452	8934	1553
1000	100	1140	440	1306	1016	8.0	1114	190	690	8934	540
1000	200	1475	507	1300	1016	8.0	1108	233	983	8880	216
1200	50	845	578	1537	1219	10.0	1321	172	402	12696	2283
1200	100	1100	648	1537	1219	10.0	1321	214	614	12696	795
1200	202	1665	847	1539	1219	10.0	1323	222	1172	12712	299
1400	50	915	724	1739	1422	10.0	1523	178	468	17058	3793
1400	100	1360	869	1738	1422	10.0	1522	220	870	17053	1301
1400	200	1865	1054	1739	1422	10.0	1523	222	1372	17058	367
1600	51	1100	960	1942	1626	10.0	1726	184	634	22102	4428
1600	100	1480	1108	1942	1626	10.0	1726	230	970	22102	1527
1600	200	2000	1365	1944	1626	10.0	1728	240	1480	22128	569
1800	50	1055	1143	2144	1829	12.0	1928	192	582	27760	6841
1800	101	1430	1340	2144	1829	12.0	1928	240	910	27760	2267
1800	201	2010	1645	2144	1829	12.0	1928	288	1438	27760	764
LATERAL EXPANSION JOINT with welding ends · **type RM R-R · nominal pressure PN 10**											
50	52	430	3.8	206	60.3	2.9	84	35	165	42.1	16
50	102	520	4.1	206	60.3	2.9	84	44	244	42.1	6
50	201	760	5.3	206	60.3	2.9	84	52	477	41.8	3
65	51	435	4.8	227	76.1	2.9	105	38	168	65.5	33
65	103	535	5.4	227	76.1	2.9	105	48	258	65.5	12
65	202	740	6.6	227	76.1	2.9	105	49	459	65.1	3
80	50	460	5.9	240	88.9	3.2	118	44	184	86	46
80	101	575	6.8	240	88.9	3.2	118	55	290	86	15
80	203	720	7.9	240	88.9	3.2	118	61	431	85.5	6
100	51	485	8.1	263	114.3	3.6	141	53	203	131	29
100	100	690	11	264	114.3	3.6	142	68	388	132	13
100	201	880	13	263	114.3	3.6	141	69	579	131	5
125	51	485	11	293	139.7	4.0	171	62	192	194	55
125	100	690	14	296	139.7	4.0	174	78	378	197	22
125	201	870	17	298	139.7	4.0	176	84	554	199	12
150	51	550	18	329	168.3	4.5	207	69	239	281	77
150	101	755	22	330	168.3	4.5	208	88	423	282	33
150	200	875	25	330	168.3	4.5	208	92	542	282	16
200	50	550	30	404	219.1	6.3	264	76	236	464	105

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
200	100	745	37	405	219.1	6.3	265	96	406	466	46
200	202	995	46	406	219.1	6.3	266	123	633	467	25
250	50	615	42	462	273	6.3	322	82	292	701	166
250	100	805	49	461	273	6.3	321	102	462	699	57
250	201	1080	62	462	273	6.3	322	130	710	701	31
300	50	645	65	528	323.9	7.1	376	87	307	969	200
300	100	870	76	525	323.9	7.1	373	108	508	962	69
300	200	1065	90	529	323.9	7.1	377	116	696	971	40
350	51	655	76	562	355.6	8.0	410	93	313	1159	214
350	101	810	88	564	355.6	8.0	412	122	437	1165	128
350	201	1150	115	565	355.6	8.0	413	128	768	1169	57
400	50	725	93	606	406.4	8.0	466	101	381	1502	386
400	100	965	110	606	406.4	8.0	466	126	596	1502	127
400	201	1080	125	605	406.4	8.0	465	135	705	1501	70
450	50	740	125	673	457	8.0	521	109	379	1887	434
450	101	975	144	673	457	8.0	521	136	586	1887	147
450	200	1170	168	674	457	8.0	522	144	774	1892	77
500	50	725	137	730	508	8.0	578	117	357	2326	500
500	101	975	158	727	508	8.0	575	146	576	2316	171
500	201	1140	190	731	508	8.0	579	160	730	2331	118
600	48	830	211	852	610	8.0	684	125	445	3304	872
600	101	990	234	853	610	8.0	685	160	570	3308	335
600	203	1265	272	851	610	8.0	683	166	836	3298	132
700	50	775	282	983	711	10.0	791	135	380	4447	1174
700	99	1010	319	983	711	10.0	791	168	578	4447	410
700	201	1475	413	985	711	10.0	793	176	1036	4456	174
800	50	865	381	1093	813	10.0	901	152	442	5789	1859
800	100	1140	434	1093	813	10.0	901	190	680	5789	637
800	201	1465	503	1094	813	10.0	902	192	1002	5792	210
900	50	885	528	1222	914	15.0	1006	152	462	7261	2098
900	100	1170	614	1222	914	15.0	1006	190	710	7261	720
900	202	1525	737	1223	914	15.0	1007	192	1062	7264	228
1000	50	890	607	1308	1016	15.0	1116	160	450	8951	2319
1000	101	1170	700	1308	1016	15.0	1116	200	690	8951	800
1000	200	1615	858	1302	1016	15.0	1110	202	1132	8897	259
1200	50	940	807	1540	1219	15.0	1324	184	474	12728	4157
1200	100	1240	933	1540	1219	15.0	1324	230	730	12728	1426
1200	200	1715	1135	1540	1219	15.0	1324	276	1156	12728	481
LATERAL EXPANSION JOINT with welding ends · **type RM R-R · nominal pressure PN 16**											
50	52	430	3.8	206	60.3	2.9	84	35	165	42.1	16
50	102	575	4.5	206	60.3	2.9	84	43	303	41.8	8
50	202	775	5.3	206	60.3	2.9	84	52	492	41.8	3

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

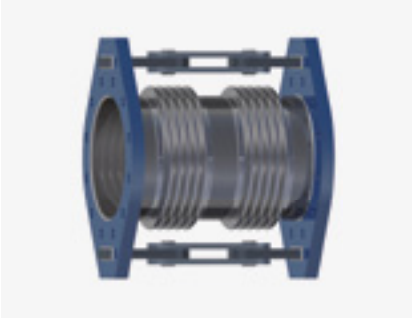
Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
65	51	465	4.9	225	76.1	2.9	103	42	192	64.1	31
65	101	550	5.6	227	76.1	2.9	105	39	279	65.1	10
65	201	835	6.9	225	76.1	2.9	103	53	553	64.1	4
80	51	475	5.8	240	88.9	3.2	118	43	203	86.6	26
80	101	625	7	240	88.9	3.2	118	44	349	86	13
80	202	805	8.4	240	88.9	3.2	118	49	524	85.5	5
100	51	510	11	263	114.3	3.6	141	56	216	131	43
100	102	695	13	265	114.3	3.6	143	72	382	133	21
100	200	880	15	265	114.3	3.6	143	75	565	133	9
125	51	520	14	302	139.7	4.0	174	64	214	197	73
125	101	775	18	303	139.7	4.0	175	80	455	198	25
125	202	1030	22	303	139.7	4.0	175	83	703	199	10
150	50	590	21	348	168.3	4.5	208	71	281	282	94
150	101	790	24	346	168.3	4.5	206	88	458	280	32
150	201	960	30	350	168.3	4.5	210	101	616	286	26
200	50	670	40	407	219.1	6.3	267	80	340	468	176
200	101	880	46	407	219.1	6.3	267	100	530	468	59
200	201	1055	55	408	219.1	6.3	268	88	718	472	29
250	51	720	55	475	273	6.3	323	85	385	703	217
250	100	945	64	475	273	6.3	323	106	586	703	76
250	201	1140	75	476	273	6.3	324	114	774	707	39
300	50	750	83	545	323.9	7.1	377	90	400	971	269
300	101	995	96	545	323.9	7.1	377	112	622	971	90
300	201	1210	112	546	323.9	7.1	378	120	830	974	47
350	51	755	97	579	355.6	8.0	411	96	396	1163	296
350	101	990	112	579	355.6	8.0	411	120	610	1163	102
350	201	1350	140	580	355.6	8.0	412	154	934	1166	57
400	50	830	121	618	406.4	8.0	466	104	474	1505	476
400	100	1110	143	618	406.4	8.0	466	130	730	1505	162
400	201	1460	173	619	406.4	8.0	467	134	1074	1508	60
450	50	745	156	690	457	8.0	522	116	371	1893	679
450	99	970	175	690	457	8.0	522	144	564	1893	237
450	196	1395	221	692	457	8.0	524	152	982	1899	106
500	51	770	173	744	508	8.0	576	124	384	2318	752
500	101	1070	230	772	508	8.0	580	160	650	2338	346
500	200	1365	262	773	508	8.0	581	162	942	2339	119
600	50	855	288	878	610	10.0	686	133	453	3314	1245
600	100	1135	328	878	610	10.0	686	166	696	3314	426
600	201	1480	381	878	610	10.0	686	168	1038	3313	141
700	50	890	364	1007	711	10.0	791	140	480	4446	1486
700	101	1200	417	1007	711	10.0	791	174	754	4446	485
700	201	1710	501	1005	711	10.0	789	209	1229	4433	167
LATERAL EXPANSION JOINT with welding ends · **type RM R-R · nominal pressure PN 25**											
50	50	470	4	206	60.3	2.9	84	35	205	41.8	22
50	102	645	5.7	207	60.3	2.9	85	43	363	42.4	10

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
50	204	875	6.6	207	60.3	2.9	85	51	581	42.4	4
65	51	490	6	227	76.1	2.9	105	29	219	65.5	26
65	101	670	7	227	76.1	2.9	105	30	400	65.1	7
65	202	975	8.5	225	76.1	2.9	103	42	692	64.1	3
80	51	480	7.2	240	88.9	3.2	118	37	202	85.5	43
80	102	655	8.4	240	88.9	3.2	118	37	377	85.5	13
80	201	1005	11	240	88.9	3.2	118	37	727	85.5	4
100	50	545	12	271	114.3	3.6	143	58	248	133	61
100	100	875	15	271	114.3	3.6	143	72	562	133	19
100	199	1170	18	271	114.3	3.6	143	75	855	133	8
125	51	620	19	315	139.7	4.0	175	64	304	198	70
125	100	920	24	316	139.7	4.0	176	84	584	199	35
125	200	1155	27	316	139.7	4.0	176	86	816	199	12
150	51	700	26	349	168.3	4.5	209	74	374	283	119
150	100	905	30	349	168.3	4.5	209	92	562	283	43
150	202	1100	35	350	168.3	4.5	210	100	750	286	23
200	50	700	47	418	219.1	6.3	266	80	360	467	164
200	100	1010	58	419	219.1	6.3	267	104	644	470	75
200	200	1310	69	420	219.1	6.3	268	108	938	472	29
250	50	820	73	491	273	7.1	323	88	468	705	279
250	100	1100	86	491	273	7.1	323	110	730	705	92
250	200	1430	103	492	273	7.1	324	114	1054	707	36
300	50	855	110	569	323.9	8.0	377	93	493	973	337
300	100	1155	128	569	323.9	8.0	377	116	766	973	113
300	201	1510	152	570	323.9	8.0	378	120	1120	975	42
350	51	845	136	606	355.6	8.0	414	108	458	1173	620
350	100	1110	154	606	355.6	8.0	414	134	694	1173	217
350	200	1445	178	607	355.6	8.0	415	136	1026	1174	71
400	50	845	197	660	406.4	10.0	468	112	462	1512	742
400	101	1130	224	660	406.4	10.0	468	140	720	1512	246
400	201	1475	260	661	406.4	10.0	469	142	1062	1513	81
450	50	850	219	715	457	10.0	523	120	460	1898	835
450	100	1120	248	715	457	10.0	523	150	700	1898	291
450	200	1680	306	711	457	10.0	519	180	1230	1882	95
500	51	765	262	774	508	10.0	582	136	346	2344	1355
500	100	1080	302	774	508	10.0	582	170	630	2346	490
500	201	1590	340	770	508	10.0	578	204	1114	2326	162

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH / 8.8. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with fixed flanges **Type LM F-F**

TYPE LM F-F ≥ DN 100



TYPE LM F-F ≤ DN 80

Tasks

- Absorption of one-sided lateral movements
- Reduction of tensions in the pipe system
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- Food processing industry
- Gas, water supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical and pharmaceutical industry, acid production
- Paper, textile, cellulose and paint industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

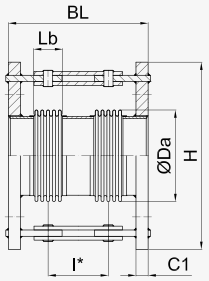
Design type LM F-F

HKS lateral expansion joint with compact design, consisting of two multi-convolution and multi-layered metal bellows with middle pipe made of standard pipes in line with EN 10216/10217 ff or rolled from sheet metal in line with EN 10028 ff and standardised fixed flanges in line with EN 1092-1 type 01 and double joint tensioners for absorbing the axial reaction forces.

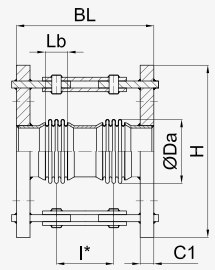
Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows, collar	Flange, middle pipe, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

DN 100 - DN 800



DN 50 - DN 80



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- Flanges in line with ASME, JIS, BS
- With special coating, galvanised or hot galvanised
- Connection variants with weld end or fixed flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with fixed flanges · **type LM F-F · nominal pressure PN 6**											
50	51	250	8.6	256	6	16	84	30	160	42.5	11
50	102	345	9.2	256	6	16	84	37	247	42.5	4
50	199	550	11	256	6	16	84	44	444	42.1	2
65	51	230	9.9	276	6	16	105	33	138	66.4	15
65	102	380	11	276	6	16	100	40	280	62.8	6
65	200	565	13	276	6	16	105	48	458	65.5	4
80	52	275	14	306	6	18	117	42	167	86.1	19
80	100	410	15	306	6	18	118	53	293	86.6	10
80	201	545	17	306	6	18	118	62	422	86	5
100	52	275	16	326	6	18	139	53	163	123	25
100	102	415	17	326	6	18	142	84	269	125	18
100	202	555	19	326	6	18	142	87	407	125	7
125	52	285	21	356	6	20	173	61	161	188	44
125	101	445	23	356	6	20	174	78	273	189	21
125	206	590	25	356	6	20	172	80	450	186	8
150	51	340	25	381	6	20	207	69	179	271	74
150	102	430	27	381	6	20	208	71	266	271	28
150	205	615	30	381	6	20	206	92	427	267	14
200	52	360	39	448	6	22	265	76	186	451	97
200	102	475	43	448	6	22	263	99	279	447	57
200	203	700	49	448	6	22	265	123	478	449	25
250	51	385	56	517	6	24	321	80	205	683	127
250	104	520	62	517	6	24	319	105	315	677	72
250	215	730	71	517	6	24	323	110	520	684	29
300	51	420	75	592	6	24	374	85	225	943	155
300	101	570	87	592	6	24	377	114	349	948	110
300	200	750	95	592	6	24	377	116	526	946	41
350	54	415	93	642	6	26	405	92	247	1124	167
350	103	550	105	642	6	26	412	122	347	1139	123
350	202	765	114	642	6	26	409	124	559	1129	46
400	50	460	123	700	6	28	465	98	248	1474	265
400	100	595	136	700	6	28	466	128	353	1474	149
400	202	855	155	700	6	28	467	134	604	1474	66
450	50	475	147	755	6	30	519	106	251	1853	303
450	100	585	155	755	6	30	516	108	388	1840	132
450	203	915	178	755	6	30	517	138	688	1842	55
500	51	505	162	805	6	30	571	114	269	2265	346
500	101	635	177	805	6	30	578	119	399	2291	184
500	202	900	202	805	6	30	575	154	624	2272	91
600	51	560	249	955	6	32	673	119	309	3210	430
600	101	695	273	955	6	32	684	124	439	3258	219

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
600	200	980	312	955	6	32	680	160	690	3232	110
700	50	615	398	1082	6	40	790	128	338	4389	719
700	102	750	419	1082	6	40	789	130	470	4382	258
700	201	1150	493	1082	6	40	788	202	802	4369	139
800	51	655	502	1197	6	44	896	141	351	5699	832
800	100	820	550	1197	6	44	900	184	474	5715	484
800	201	1095	585	1197	6	44	900	148	788	5715	134
LATERAL EXPANSION JOINT with fixed flanges · **type LM F-F · nominal pressure PN 10**											
50	51	260	13	281	16	20	84	30	165	42.5	11
50	102	350	14	281	16	20	84	44	244	42.1	6
50	203	600	16	281	16	20	84	52	482	41.8	3
65	52	285	15	301	16	20	100	32	187	62.8	15
65	103	370	16	301	16	20	105	48	258	65.5	12
65	202	575	18	301	16	20	105	49	459	65.1	3
80	51	305	17	316	16	20	118	43	198	86.6	27
80	103	415	18	316	16	20	118	55	295	86	15
80	203	555	20	316	16	20	118	61	431	85.5	6
100	51	305	21	336	16	22	141	55	185	125	34
100	102	420	23	336	16	22	143	58	298	125	18
100	200	620	25	336	16	22	141	58	498	123	5
125	50	310	26	366	16	22	174	63	183	188	59
125	101	425	27	366	16	22	172	64	299	185	23
125	202	665	31	366	16	22	173	83	518	186	10
150	50	335	36	413	16	24	204	69	199	266	76
150	102	495	40	413	16	24	208	73	313	271	36
150	202	710	47	413	16	24	210	100	500	271	23
200	51	380	51	482	10	24	257	76	236	436	100
200	100	530	58	482	10	24	267	82	342	453	64
200	206	750	67	482	10	24	267	108	533	450	29
250	51	410	74	547	10	26	318	84	214	674	201
250	102	540	81	547	10	26	323	88	338	682	88
250	201	800	94	547	10	26	323	114	574	681	40
300	51	440	96	605	10	26	377	92	237	948	296
300	101	580	108	605	10	26	376	120	350	942	152
300	200	900	132	605	10	26	380	154	634	948	74
350	50	415	126	665	10	30	412	98	228	1139	350
350	100	575	138	665	10	30	413	103	383	1139	162
350	199	945	161	665	10	30	411	154	704	1133	60
400	51	505	177	755	10	32	464	126	286	1470	364
400	107	700	199	755	10	32	467	134	474	1474	180
400	200	990	227	755	10	32	469	142	752	1474	90
450	50	475	221	815	10	36	516	111	261	1836	484
450	100	690	250	815	10	36	522	144	444	1856	236
450	200	1010	288	815	10	36	524	152	752	1856	105

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
500	51	475	261	870	10	38	573	124	244	2265	747
500	103	685	297	870	10	38	581	162	412	2291	363
500	210	1025	344	870	10	38	582	170	710	2291	149
600	50	595	394	1002	10	42	685	128	308	3258	932
600	102	775	437	1002	10	42	687	168	448	3258	448
600	202	1090	497	1002	10	42	688	176	756	3258	191
700	51	605	580	1135	10	50	790	135	335	4383	1066
700	102	800	637	1135	10	50	791	176	486	4376	534
700	201	1120	716	1135	10	50	794	184	794	4389	227
LATERAL EXPANSION JOINT with fixed flanges · **type LM F-F · nominal pressure PN 16**											
50	52	265	13	281	16	20	84	35	165	42.1	16
50	102	410	14	281	16	20	84	43	303	41.8	8
50	202	610	16	281	16	20	84	52	492	41.8	3
65	52	275	16	301	16	20	105	38	173	65.5	31
65	103	420	17	301	16	20	103	53	303	64.1	10
65	199	695	19	301	16	20	105	39	589	65.1	3
80	51	310	18	316	16	20	118	43	203	86.6	26
80	102	465	20	316	16	20	118	44	354	86	13
80	202	635	21	316	16	20	118	49	524	85.5	5
100	51	310	22	336	16	22	140	58	188	123	54
100	103	465	24	336	16	22	141	75	325	123	24
100	202	720	27	336	16	22	142	94	564	124	10
125	50	340	30	378	16	22	174	64	214	188	70
125	101	475	32	378	16	22	173	67	347	186	28
125	200	680	38	378	16	22	176	92	522	187	18
150	51	380	43	427	16	24	204	71	241	266	87
150	102	540	48	427	16	24	209	76	356	271	44
150	200	805	59	427	16	24	212	108	588	271	32
200	50	435	67	492	16	26	268	87	237	453	274
200	100	590	74	492	16	26	267	108	368	451	96
200	201	915	89	492	16	26	269	137	667	453	42
250	51	495	100	565	16	29	324	92	277	684	334
250	101	660	109	565	16	29	324	114	419	684	119
250	209	1065	135	565	16	29	325	144	794	684	49
300	51	525	147	650	16	32	378	96	296	948	406
300	101	710	162	650	16	32	377	120	460	945	144
300	202	1115	197	650	16	32	379	152	832	948	63
350	51	495	179	710	16	35	413	103	293	1139	460
350	101	690	198	710	16	35	415	109	479	1139	217
350	200	995	223	710	16	35	414	136	756	1136	74
400	51	520	269	802	16	38	467	108	308	1474	527
400	101	700	290	802	16	38	460	108	488	1449	177

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
400	200	1060	344	802	16	38	466	142	812	1466	86
450	51	545	321	862	16	42	520	116	316	1848	627
450	100	740	355	862	16	42	524	122	502	1856	293
450	204	1060	408	862	16	42	522	160	780	1842	131
500	51	595	396	937	16	46	571	124	344	2256	717
500	100	750	428	937	16	46	581	130	490	2290	333
500	201	1120	490	937	16	46	574	170	820	2254	155
600	50	655	630	1080	16	55	686	133	373	3258	1167
600	101	855	671	1080	16	55	683	135	575	3240	396
600	200	1225	780	1080	16	55	690	186	886	3258	245
LATERAL EXPANSION JOINT with fixed flanges · **type LM F-F · nominal pressure PN 25**											
50	50	305	14	281	40	20	84	35	205	41.8	22
50	99	460	15	281	40	20	85	43	353	42.4	11
50	204	700	16	281	40	20	85	51	581	42.4	4
65	51	315	18	301	40	22	105	29	219	65.5	26
65	101	495	20	301	40	22	105	30	400	65.1	7
65	199	790	22	301	40	22	103	42	682	64.1	3
80	51	305	24	328	40	24	118	37	202	85.5	43
80	102	480	27	328	40	24	118	37	377	85.5	13
80	201	830	32	328	40	24	118	37	727	85.5	4
100	51	345	32	363	40	26	141	60	215	123	67
100	104	560	37	363	40	26	145	84	404	125	40
100	204	805	41	363	40	26	145	101	631	125	14
125	51	370	46	412	40	28	173	69	224	185	106
125	102	540	51	412	40	28	177	92	372	188	53
125	201	800	57	412	40	28	176	74	649	187	15
150	51	430	62	452	40	30	208	74	274	271	113
150	101	655	71	452	40	30	209	96	476	271	53
150	200	910	82	452	40	30	210	128	698	268	30
200	51	495	94	520	25	32	267	84	324	453	198
200	102	630	102	520	25	32	267	87	457	451	80
200	201	990	122	520	25	32	269	114	784	453	37
250	50	480	141	615	25	35	323	92	292	681	323
250	101	715	163	615	25	35	326	98	473	684	143
250	205	1185	196	615	25	35	325	120	920	684	44
300	52	545	230	707	25	38	374	96	346	936	374
300	101	765	261	707	25	38	379	126	536	948	179
300	201	1255	319	707	25	38	373	152	1002	930	60
350	51	575	288	777	25	42	405	103	363	1116	441
350	101	730	314	777	25	42	414	109	509	1136	201
350	200	1135	372	777	25	42	416	144	874	1139	92
400	50	600	363	842	25	48	468	112	362	1473	695
400	101	865	400	842	25	48	464	140	600	1461	239
400	201	1130	457	842	25	48	472	160	840	1474	145

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	PN	C1	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	-	mm	mm	mm	mm	cm²	N/mm
450	51	610	488	910	25	54	525	128	338	1856	1103
450	101	790	519	910	25	54	522	128	518	1842	369
450	200	1195	609	910	25	54	525	170	880	1846	171
500	51	625	566	970	25	58	581	136	336	2284	1272
500	100	830	618	970	25	58	584	144	534	2291	570
500	201	1275	704	970	25	58	577	180	940	2259	194

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

LATERAL EXPANSION JOINT with welding ends **Type LM R-R**

TYPE LM R-R ≥ DN 100

TYPE LM R-R ≤ DN 80

Tasks

- Absorption of one-sided lateral movements
- Reduction of tensions in the pipe system
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections

Areas of application

- Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
- Food processing industry
- Gas, water supply, building and heating technology
- Energy and offshore technology, oil and gas production
- Chemical and pharmaceutical industry, acid production
- Paper, textile, cellulose and paint industry
- Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

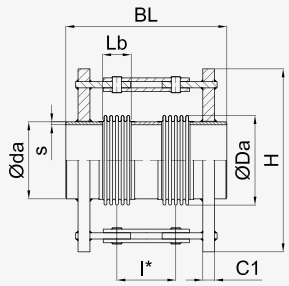
Design type LM R-R

HKS lateral expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with middle pipe and welding ends (pipe nozzle) made of standard pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and double joint tensioners for absorbing the axial reaction forces.

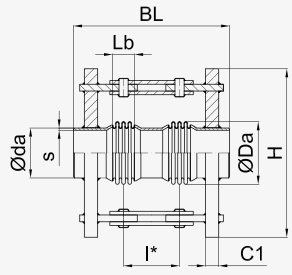
Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Welding end, middle pipe, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

DN 100 - DN 1800



DN 50 - DN 80



Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- External protective sleeve or telescopic inner sleeve

On customer request:

- With 30° groove or special dimensions
- With special coating, galvanised or hot galvanised
- Connection variants with swivel, fixed or welding neck flanges

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	Outside-durchmesser	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
LATERAL EXPANSION JOINT with welding ends · **type LM R-R · nominal pressure PN 6**											
50	51	400	5.3	200	60.3	2.9	84	30	160	42.5	11
50	102	495	6.1	200	60.3	2.9	84	37	247	42.5	4
50	201	705	7.8	200	60.3	2.9	84	44	449	42.1	2
65	51	385	6	221	76.1	2.9	105	33	138	66.4	15
65	101	510	7.5	221	76.1	2.9	105	48	248	65.5	12
65	202	720	9.5	221	76.1	2.9	105	49	459	65.1	3
80	52	420	7.2	234	88.9	3.2	118	45	160	87	19
80	102	510	8.5	234	88.9	3.2	118	62	232	86	15
80	202	655	11	234	88.9	3.2	118	75	370	86	5
100	50	465	9.7	258	114.3	3.6	142	66	166	132	32
100	99	590	12	258	114.3	3.6	142	69	289	132	17
100	201	780	15	258	114.3	3.6	142	83	468	132	6
125	51	460	13	290	139.7	4.0	174	62	167	197	54
125	100	560	15	291	139.7	4.0	175	80	250	198	27
125	202	815	19	291	139.7	4.0	175	96	486	198	10
150	52	470	17	322	168.3	4.5	206	68	168	280	66
150	97	605	20	324	168.3	4.5	208	88	283	282	37
150	201	840	27	325	168.3	4.5	209	92	517	283	16
200	51	510	29	391	219.1	6.3	263	74	204	461	81
200	100	665	36	393	219.1	6.3	265	94	339	465	39
200	201	860	50	395	219.1	6.3	267	100	520	468	19
250	51	550	49	460	273	6.3	318	79	229	692	104
250	101	720	59	463	273	6.3	321	100	380	699	49
250	204	955	74	465	273	6.3	323	106	606	703	21
300	51	575	67	522	323.9	7.1	370	84	249	954	128
300	100	765	81	525	323.9	7.1	373	106	416	962	60
300	200	1005	103	527	323.9	7.1	375	112	652	966	26
350	51	585	79	562	355.6	8.0	410	92	252	1160	188
350	101	805	97	563	355.6	8.0	411	116	446	1162	82
350	200	1015	120	563	355.6	8.0	411	124	649	1163	35
400	50	595	99	624	406.4	8.0	464	96	256	1498	220
400	101	820	122	625	406.4	8.0	465	122	457	1500	95
400	200	1070	154	626	406.4	8.0	466	130	700	1505	50
450	50	635	129	674	457	8.0	514	104	279	1863	264
450	101	855	154	677	457	8.0	517	132	472	1874	112
450	200	1105	191	681	457	8.0	521	140	715	1890	54
500	50	640	148	737	508	8.0	577	114	274	2322	369
500	101	935	186	738	508	8.0	578	146	536	2326	180
500	201	1130	220	739	508	8.0	579	155	725	2331	70
600	51	635	219	881	610	8.0	681	121	261	3285	561
600	108	890	290	883	610	8.0	683	154	474	3294	224

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	Outside-durchmesser	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
600	201	1255	363	883	610	8.0	683	161	831	3297	78
700	51	690	346	1012	711	8.0	790	130	300	4440	816
700	101	915	390	1008	711	8.0	786	162	492	4414	293
700	202	1360	501	1013	711	8.0	791	168	928	4447	96
800	47	695	397	1116	813	8.0	894	143	293	5742	1122
800	98	990	479	1122	813	8.0	900	184	544	5781	521
800	201	1380	586	1123	813	8.0	901	190	930	5789	136
900	50	855	596	1237	914	8.0	997	141	441	7188	1020
900	100	1125	670	1237	914	8.0	997	176	676	7188	351
900	200	1510	802	1240	914	8.0	1000	184	1054	7213	121
1000	51	875	694	1354	1016	8.0	1114	152	452	8934	1553
1000	100	1150	777	1354	1016	8.0	1114	190	690	8934	540
1000	200	1485	884	1348	1016	8.0	1108	233	983	8880	216
1200	50	855	1205	1641	1219	10.0	1321	172	402	12696	2283
1200	100	1110	1331	1641	1219	10.0	1321	214	614	12696	795
1200	202	1675	1658	1643	1219	10.0	1323	222	1172	12712	299
1400	50	935	1685	1843	1422	10.0	1523	178	468	17058	3793
1400	100	1380	1942	1842	1422	10.0	1522	220	870	17053	1301
1400	200	1885	2256	1843	1422	10.0	1523	222	1372	17058	367
1600	51	1120	2427	2086	1626	10.0	1726	184	634	22102	4428
1600	100	1500	2698	2086	1626	10.0	1726	230	970	22102	1527
1600	200	2020	3126	2088	1626	10.0	1728	240	1480	22128	569
1800	50	1075	3076	2328	1829	12.0	1928	192	582	27760	6841
1800	101	1450	3426	2328	1829	12.0	1928	240	910	27760	2267
1800	201	2030	3969	2328	1829	12.0	1928	288	1438	27760	764
LATERAL EXPANSION JOINT with welding ends · **type LM R-R · nominal pressure PN 10**											
50	52	410	5.4	200	60.3	2.9	84	35	165	42.1	16
50	102	500	6.1	200	60.3	2.9	84	44	244	42.1	6
50	201	740	8.2	200	60.3	2.9	84	52	477	41.8	3
65	51	420	6.7	221	76.1	2.9	105	38	168	65.5	33
65	103	520	7.6	221	76.1	2.9	105	48	258	65.5	12
65	202	720	9.5	221	76.1	2.9	105	49	459	65.1	3
80	50	440	7.8	234	88.9	3.2	118	44	184	86	46
80	101	560	9.1	234	88.9	3.2	118	55	290	86	15
80	203	705	11	234	88.9	3.2	118	61	431	85.5	6
100	51	485	11	257	114.3	3.6	141	53	203	131	29
100	100	690	14	258	114.3	3.6	142	68	388	132	13
100	201	880	17	257	114.3	3.6	141	69	579	131	5
125	51	485	14	287	139.7	4.0	171	62	192	194	55
125	100	690	18	290	139.7	4.0	174	78	378	197	22
125	201	870	22	292	139.7	4.0	176	84	554	199	12
150	51	550	25	335	168.3	4.5	207	69	239	281	77
150	101	755	31	336	168.3	4.5	208	88	423	282	33
150	200	875	35	336	168.3	4.5	208	92	542	282	16
200	50	550	41	406	219.1	6.3	264	76	236	464	105

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	Outside-durchmesser	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
200	100	745	50	407	219.1	6.3	265	96	406	466	46
200	202	995	63	408	219.1	6.3	266	123	633	467	25
250	50	625	67	474	273	6.3	322	82	292	701	166
250	100	805	71	473	273	6.3	321	102	462	699	57
250	201	1090	97	474	273	6.3	322	130	710	701	31
300	50	645	92	536	323.9	7.1	376	87	307	969	200
300	100	870	109	533	323.9	7.1	373	108	508	962	69
300	200	1065	130	537	323.9	7.1	377	116	696	971	40
350	51	655	105	570	355.6	8.0	410	93	313	1159	214
350	101	810	122	572	355.6	8.0	412	122	437	1165	128
350	201	1150	158	573	355.6	8.0	413	128	768	1169	57
400	50	745	167	656	406.4	8.0	466	101	381	1502	386
400	100	985	195	656	406.4	8.0	466	126	596	1502	127
400	201	1100	214	655	406.4	8.0	465	135	705	1501	70
450	50	750	201	721	457	8.0	521	109	379	1887	434
450	101	985	233	721	457	8.0	521	136	586	1887	147
450	200	1180	268	722	457	8.0	522	144	774	1892	77
500	50	735	260	800	508	8.0	578	117	357	2326	500
500	101	985	302	797	508	8.0	575	146	576	2316	171
500	201	1150	346	801	508	8.0	579	160	730	2331	118
600	48	840	357	906	610	8.0	684	125	445	3304	872
600	101	1000	393	907	610	8.0	685	160	570	3308	335
600	203	1275	453	905	610	8.0	683	166	836	3298	132
700	50	795	516	1031	711	10.0	791	135	380	4447	1174
700	99	1030	579	1031	711	10.0	791	168	578	4447	410
700	201	1495	725	1033	711	10.0	793	176	1036	4456	174
800	50	875	626	1141	813	10.0	901	152	442	5789	1859
800	100	1150	710	1141	813	10.0	901	190	680	5789	637
800	201	1475	815	1142	813	10.0	902	192	1002	5792	210
900	50	905	947	1286	914	15.0	1006	152	462	7261	2098
900	100	1190	1079	1286	914	15.0	1006	190	710	7261	720
900	202	1545	1261	1287	914	15.0	1007	192	1062	7264	228
1000	50	910	1263	1436	1016	15.0	1116	160	450	8951	2319
1000	101	1190	1419	1436	1016	15.0	1116	200	690	8951	800
1000	200	1635	1681	1430	1016	15.0	1110	202	1132	8897	259
1200	50	960	1651	1644	1219	15.0	1324	184	474	12728	4157
1200	100	1260	1851	1644	1219	15.0	1324	230	730	12728	1426
1200	200	1735	2172	1644	1219	15.0	1324	276	1156	12728	481
LATERAL EXPANSION JOINT with welding ends · **type LM R-R · nominal pressure PN 16**											
50	52	410	5.4	200	60.3	2.9	84	35	165	42.1	16
50	102	560	6.7	200	60.3	2.9	84	43	303	41.8	8
50	202	755	8.4	200	60.3	2.9	84	52	492	41.8	3

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	Outside-durchmesser	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
65	51	445	6.8	219	76.1	2.9	103	42	192	64.1	31
65	101	530	7.8	221	76.1	2.9	105	39	279	65.1	10
65	201	820	11	219	76.1	2.9	103	53	553	64.1	4
80	51	460	8.4	234	88.9	3.2	118	43	203	86.6	26
80	101	605	11	234	88.9	3.2	118	44	349	86	13
80	202	785	13	234	88.9	3.2	118	49	524	85.5	5
100	51	510	17	269	114.3	3.6	141	56	216	131	43
100	102	695	20	271	114.3	3.6	143	72	382	133	21
100	200	880	24	271	114.3	3.6	143	75	565	133	9
125	51	520	21	302	139.7	4.0	174	64	214	197	73
125	101	775	26	303	139.7	4.0	175	80	455	198	25
125	202	1030	32	303	139.7	4.0	175	83	703	199	10
150	50	590	32	350	168.3	4.5	208	71	281	282	94
150	101	790	38	348	168.3	4.5	206	88	458	280	32
150	201	960	46	352	168.3	4.5	210	101	616	286	26
200	50	670	59	419	219.1	6.3	267	80	340	468	176
200	101	880	70	419	219.1	6.3	267	100	530	468	59
200	201	1055	82	420	219.1	6.3	268	88	718	472	29
250	51	720	84	483	273	6.3	323	85	385	703	217
250	100	945	99	483	273	6.3	323	106	586	703	76
250	201	1140	116	484	273	6.3	324	114	774	707	39
300	50	750	135	567	323.9	7.1	377	90	400	971	269
300	101	995	158	567	323.9	7.1	377	112	622	971	90
300	201	1210	183	568	323.9	7.1	378	120	830	974	47
350	51	755	164	611	355.6	8.0	411	96	396	1163	296
350	101	990	193	611	355.6	8.0	411	120	610	1163	102
350	201	1350	241	612	355.6	8.0	412	154	934	1166	57
400	50	850	255	688	406.4	8.0	466	104	474	1505	476
400	100	1130	299	688	406.4	8.0	466	130	730	1505	162
400	201	1480	359	689	406.4	8.0	467	134	1074	1508	60
450	50	755	265	744	457	8.0	522	116	371	1893	679
450	99	980	303	744	457	8.0	522	144	564	1893	237
450	196	1405	383	746	457	8.0	524	152	982	1899	106
500	51	790	316	798	508	8.0	576	124	384	2318	752
500	101	1090	378	802	508	8.0	580	160	650	2338	346
500	200	1385	434	803	508	8.0	581	162	942	2339	119
600	50	875	503	926	610	10.0	686	133	453	3314	1245
600	100	1155	573	926	610	10.0	686	166	696	3314	426
600	201	1500	666	926	610	10.0	686	168	1038	3313	141
700	50	910	692	1071	711	10.0	791	140	480	4446	1486
700	101	1220	795	1071	711	10.0	791	174	754	4446	485
700	201	1730	964	1069	711	10.0	789	209	1229	4433	167
LATERAL EXPANSION JOINT with welding ends · **type LM R-R · nominal pressure PN 25**											
50	50	450	5.8	200	60.3	2.9	84	35	205	41.8	22
50	102	620	7.4	201	60.3	2.9	85	43	363	42.4	10

Nominal diameter	Lateral movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows				Lateral adjustment force rate
					External diameter	Wall thickness	Outside-durchmesser	Corrugated length	Bellows centre distance	Effective diameter	
DN	Δy	BL	G	H	da	s	Da	Lb	l*	Ae	CΔy
-	mm	mm	kg	mm	mm	mm	mm	mm	mm	cm²	N/mm
50	204	845	9.2	201	60.3	2.9	85	51	581	42.4	4
65	51	460	8.8	221	76.1	2.9	105	29	219	65.5	26
65	101	645	11	221	76.1	2.9	105	30	400	65.1	7
65	202	950	14	219	76.1	2.9	103	42	692	64.1	3
80	51	455	13	246	88.9	3.2	118	37	202	85.5	43
80	102	630	16	246	88.9	3.2	118	37	377	85.5	13
80	201	980	22	246	88.9	3.2	118	37	727	85.5	4
100	50	545	18	271	114.3	3.6	143	58	248	133	61
100	100	875	24	271	114.3	3.6	143	72	562	133	19
100	199	1170	30	271	114.3	3.6	143	75	855	133	8
125	51	620	31	317	139.7	4.0	175	64	304	198	70
125	100	920	40	318	139.7	4.0	176	84	584	199	35
125	200	1155	46	318	139.7	4.0	176	86	816	199	12
150	51	700	46	361	168.3	4.5	209	74	374	283	119
150	100	905	54	361	168.3	4.5	209	92	562	283	43
150	202	1100	63	362	168.3	4.5	210	100	750	286	23
200	50	700	76	426	219.1	6.3	266	80	360	467	164
200	100	1010	96	427	219.1	6.3	267	104	644	470	75
200	200	1310	115	428	219.1	6.3	268	108	938	472	29
250	50	830	135	513	273	7.1	323	88	468	705	279
250	100	1110	160	513	273	7.1	323	110	730	705	92
250	200	1440	191	514	273	7.1	324	114	1054	707	36
300	50	855	220	599	323.9	8.0	377	93	493	973	337
300	100	1155	262	599	323.9	8.0	377	116	766	973	113
300	201	1510	317	600	323.9	8.0	378	120	1120	975	42
350	51	845	250	636	355.6	8.0	414	108	458	1173	620
350	100	1110	289	636	355.6	8.0	414	134	694	1173	217
350	200	1445	341	637	355.6	8.0	415	136	1026	1174	71
400	50	855	289	690	406.4	10.0	468	112	462	1512	742
400	101	1140	340	690	406.4	10.0	468	140	720	1512	246
400	201	1485	404	691	406.4	10.0	469	142	1062	1513	81
450	50	870	393	763	457	10.0	523	120	460	1898	835
450	100	1140	452	763	457	10.0	523	150	700	1898	291
450	200	1700	573	759	457	10.0	519	180	1230	1882	95
500	51	785	530	862	508	10.0	582	136	346	2344	1355
500	100	1100	623	862	508	10.0	582	170	630	2346	490
500	201	1620	768	858	508	10.0	578	204	1114	2326	162

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

ANGULAR EXPANSION JOINT with fixed flanges **Type WN F-F**

TYPE WN F-F ≥ DN 100

TYPE WN F-F ≤ DN 80

Design type WN F-F

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01 and joint tensioners for absorbing the axial reaction forces.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Flange, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or swivel flanges

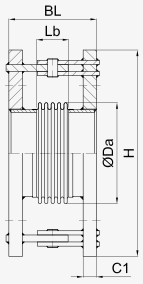
Tasks

› Absorption of one-sided angular movements
› Reduction of tensions in the pipe system
› Absorption of large movements in two-joint and three-joint pipe systems
› Reduction of forces and moments in connections

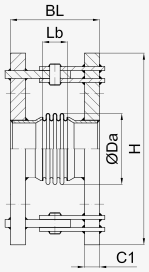
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
ANGULAR EXPANSION JOINT with fixed flanges · **type WN F-F · nominal pressure PN 6**										
50	19	90	7.3	256	6	16	84	30	42.5	3
50	33	115	7.4	256	6	16	84	52	42.5	2
50	42	140	7.7	256	6	16	84	78	42.1	2
65	17	95	8.6	276	6	16	105	33	66.4	3
65	26	110	8.7	276	6	16	105	49	66.4	2
65	37	125	8.8	276	6	16	100	64	62.8	3
80	18	105	12	306	6	18	118	43	86.6	10
80	27	130	13	306	6	18	118	64	86.6	7
80	41	160	13	306	6	18	118	95	86.6	5
100	17	140	14	326	6	18	142	80	125	4
100	29	140	14	326	6	18	142	83	125	5
100	39	175	15	326	6	18	143	116	125	7
125	18	120	18	356	6	20	173	60	188	5
125	27	185	19	356	6	20	174	92	189	7
125	37	240	20	356	6	20	175	144	189	13
150	15	195	22	381	6	20	207	101	271	9
150	25	200	23	381	6	20	208	106	271	12
150	34	235	23	381	6	20	208	141	271	18
200	14	175	33	448	6	22	265	76	453	30
200	22	210	34	448	6	22	265	113	453	20
200	33	290	41	448	6	22	268	195	453	38
250	13	180	47	517	6	24	321	80	684	48
250	19	220	48	517	6	24	321	120	684	32
250	32	315	54	517	6	24	323	212	684	68
300	14	215	64	592	6	24	375	106	948	53
300	20	260	66	592	6	24	376	152	948	62
300	29	330	72	592	6	24	377	224	948	94
350	14	195	81	642	6	26	410	116	1136	49
350	20	240	84	642	6	26	411	163	1139	68
350	27	320	90	642	6	26	412	240	1139	104
400	11	215	103	700	6	28	465	98	1474	149
400	16	265	108	700	6	28	465	150	1474	87
400	22	320	114	700	6	28	466	205	1474	106
450	10	230	127	755	6	30	520	108	1856	150
450	16	280	131	755	6	30	520	162	1856	100
450	24	365	138	755	6	30	521	245	1856	167
500	10	240	143	805	6	30	578	120	2291	208
500	15	305	154	805	6	30	579	186	2291	169
500	26	420	162	805	6	30	578	300	2291	294
600	9	255	212	955	6	32	684	125	3258	296

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
600	16	345	223	955	6	32	684	216	3258	216
600	20	420	241	955	6	32	685	288	3258	363
700	8	280	330	1082	6	40	788	132	4375	415
700	12	345	342	1082	6	40	788	197	4375	277
700	16	405	348	1082	6	40	790	256	4389	376
800	8	310	434	1197	6	44	900	148	5715	549
800	12	385	451	1197	6	44	900	222	5715	366
800	14	445	448	1197	6	44	896	282	5699	471
ANGULAR EXPANSION JOINT with fixed flanges · **type WN F-F · nominal pressure PN 10**										
50	19	95	12	281	16	20	84	30	42.5	3
50	28	120	12	281	16	20	84	52	42.5	2
50	39	145	12	281	16	20	84	78	41.8	4
65	17	100	14	301	16	20	100	32	62.8	5
65	26	115	14	301	16	20	100	48	62.8	3
65	32	120	14	301	16	20	100	56	62.8	3
80	14	100	15	316	16	20	118	34	87	6
80	24	120	15	316	16	20	118	56	87	4
80	35	165	16	316	16	20	118	99	86	7
100	19	120	19	336	16	22	142	55	125	10
100	26	145	19	336	16	22	142	82	125	7
100	38	185	20	336	16	22	143	120	125	12
125	18	125	22	366	16	22	173	61	188	11
125	27	155	23	366	16	22	174	94	189	12
125	36	200	25	366	16	22	176	138	189	20
150	17	135	31	413	16	24	207	69	271	22
150	25	215	34	413	16	24	208	110	271	21
150	33	270	37	413	16	24	210	160	271	31
200	14	190	45	482	10	24	267	80	453	31
200	22	225	46	482	10	24	266	116	453	32
200	33	300	52	482	10	24	268	195	453	63
250	13	195	61	547	10	26	322	85	682	52
250	19	235	62	547	10	26	321	123	683	53
250	31	355	77	547	10	26	326	244	684	113
300	14	230	79	605	10	26	377	116	948	95
300	20	270	82	605	10	26	377	160	948	87
300	26	330	89	605	10	26	378	216	948	143
350	14	210	108	665	10	30	411	124	1135	79
350	20	265	115	665	10	30	413	180	1139	121
350	25	320	119	665	10	30	413	231	1139	159
400	13	230	150	755	10	32	467	135	1474	161
400	19	280	155	755	10	32	467	188	1474	153
400	24	350	160	755	10	32	466	260	1474	238
450	13	250	191	815	10	36	522	145	1856	188
450	18	315	204	815	10	36	523	210	1856	213
450	24	395	225	815	10	36	525	288	1856	341

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
500	10	235	220	870	10	38	576	124	2277	285
500	15	300	234	870	10	38	580	192	2291	268
500	23	400	249	870	10	38	580	288	2291	451
600	9	285	320	1002	10	42	681	128	3236	562
600	14	415	345	1002	10	42	685	256	3258	408
600	18	425	358	1002	10	42	687	269	3258	513
700	8	275	483	1135	10	50	791	140	4378	795
700	12	345	501	1135	10	50	791	209	4378	530
700	16	420	524	1135	10	50	793	282	4389	669
ANGULAR EXPANSION JOINT with fixed flanges · **type WN F-F · nominal pressure PN 16**										
50	14	90	12	281	16	20	84	22	42.5	4
50	23	105	12	281	16	20	84	37	42.5	2
50	34	135	12	281	16	20	84	69	41.8	5
65	16	100	14	301	16	20	100	32	62.8	5
65	25	115	14	301	16	20	100	48	62.8	3
65	31	130	14	301	16	20	105	66	65.5	5
80	15	110	16	316	16	20	114	45	83.2	8
80	25	130	16	316	16	20	118	62	86	8
80	31	145	16	316	16	20	118	77	86	8
100	12	105	19	336	16	22	142	42	125	23
100	24	135	19	336	16	22	143	72	125	11
100	34	175	21	336	16	22	144	112	125	17
125	18	130	25	378	16	22	173	67	186	14
125	25	185	27	378	16	22	176	121	189	22
125	31	195	28	378	16	22	177	129	189	28
150	17	145	35	427	16	24	207	74	269	26
150	21	200	36	427	16	24	208	91	271	25
150	32	270	40	427	16	24	210	160	271	50
200	14	195	53	492	16	26	266	84	451	56
200	22	240	56	492	16	26	268	130	453	56
200	28	295	62	492	16	26	270	186	453	86
250	13	220	79	565	16	29	324	92	684	104
250	19	255	79	565	16	29	321	130	678	83
250	23	310	85	565	16	29	324	183	684	115
300	11	230	113	650	16	32	377	97	945	153
300	14	255	116	650	16	32	377	121	945	122
300	20	325	123	650	16	32	378	192	948	161
350	11	200	152	720	16	35	411	103	1134	230
350	14	225	155	720	16	35	411	128	1134	184
350	20	280	161	720	16	35	413	180	1139	204
400	10	220	211	802	16	38	468	112	1474	318
400	14	260	214	802	16	38	466	156	1474	397

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
400	19	295	221	802	16	38	467	188	1474	259
450	10	235	259	862	16	42	520	120	1844	419
450	15	310	266	862	16	42	519	196	1847	429
450	18	315	269	862	16	42	520	202	1846	330
500	10	255	331	937	16	46	581	130	2291	707
500	15	320	344	937	16	46	581	195	2291	471
500	19	380	354	937	16	46	580	256	2291	507
600	6	245	509	1080	16	55	683	101	3240	1545
600	13	350	534	1080	16	55	683	202	3240	773
600	18	410	549	1080	16	55	686	266	3258	738
ANGULAR EXPANSION JOINT with fixed flanges · **type WN F-F · nominal pressure PN 25**										
50	14	90	12	281	40	20	84	26	42.1	5
50	23	110	12	281	40	20	84	44	42.1	3
50	29	125	12	281	40	20	84	61	41.8	5
65	17	110	16	301	40	22	103	42	64.1	11
65	21	120	16	301	40	22	103	53	64.1	9
65	26	130	16	301	40	22	103	63	64.1	7
80	17	115	21	328	40	24	118	44	86	14
80	21	125	21	328	40	24	118	55	86	12
80	26	135	21	328	40	24	118	66	86	10
100	14	115	27	363	40	26	144	46	125	23
100	23	145	28	363	40	26	144	76	125	14
100	28	165	28	363	40	26	144	96	125	20
125	13	130	38	412	40	28	176	53	189	42
125	22	165	39	412	40	28	176	88	189	25
125	27	195	41	412	40	28	178	118	189	38
150	12	145	50	452	40	30	210	61	271	63
150	20	185	52	452	40	30	210	101	271	38
150	29	280	58	452	40	30	212	152	271	70
200	11	160	73	520	25	32	269	69	453	133
200	14	180	75	520	25	32	269	92	453	100
200	23	305	86	520	25	32	271	174	453	113
250	9	170	109	615	25	35	323	72	679	241
250	14	240	117	615	25	35	323	144	679	121
250	19	270	117	615	25	35	322	176	681	162
300	11	205	171	707	25	38	380	103	948	395
300	14	230	175	707	25	38	380	128	948	316
300	18	285	183	707	25	38	380	180	948	226
350	11	220	225	777	25	42	414	109	1137	457
350	14	250	230	777	25	42	414	136	1137	366
350	17	275	234	777	25	42	414	164	1137	305
400	8	220	289	842	25	48	470	90	1474	871
400	13	280	300	842	25	48	470	150	1474	523
400	17	320	303	842	25	48	468	196	1473	469
450	8	240	378	910	25	54	523	96	1848	1103

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
450	13	300	393	910	25	54	523	160	1848	662
450	17	380	403	910	25	54	519	240	1837	567
500	7	255	450	970	25	58	574	102	2256	1495
500	13	320	467	970	25	58	575	170	2259	870
500	18	390	485	970	25	58	581	238	2284	755

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

ANGULAR EXPANSION JOINT with welding ends **Type WN R-R**

TYPE WN R-R ≥ DN 100

TYPE WN R-R ≤ DN 80

Design type WN R-R

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and joint tensioners for absorbing the axial reaction forces.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Welding end, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› With 30° groove or special dimensions
› With special coating, galvanised or hot galvanised
› Connection variants with swivel, fixed or welding neck flanges

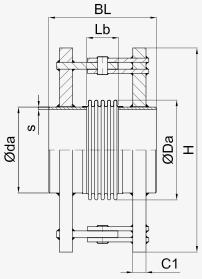
Tasks

› Absorption of one-sided angular movements
› Reduction of tensions in the pipe system
› Absorption of large movements in two-joint and three-joint pipe systems
› Reduction of forces and moments in connections

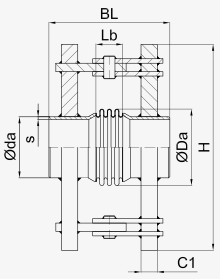
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas, water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
ANGULAR EXPANSION JOINT with welding ends · **type WN R-R · nominal pressure PN 6**										
50	19	260	3.9	200	60.3	2.9	84	30	42.5	3
50	28	275	4	200	60.3	2.9	84	44	42.5	2
50	38	290	4.1	200	60.3	2.9	84	59	42.5	2
65	17	265	4.8	221	76.1	2.9	105	33	66.4	3
65	26	280	4.9	221	76.1	2.9	105	49	66.4	2
65	37	295	4.8	216	76.1	2.9	100	64	62.8	3
80	19	275	5.6	234	88.9	3.2	118	45	87	5
80	29	300	5.8	234	88.9	3.2	118	67	87	3
80	41	325	6.2	234	88.9	3.2	118	95	86.6	5
100	18	285	7.4	258	114.3	3.6	142	53	132	10
100	27	310	7.6	258	114.3	3.6	142	80	132	7
100	38	340	8.1	258	114.3	3.6	142	111	132	8
125	18	290	9.6	290	139.7	4.0	174	60	196	9
125	30	355	11	290	139.7	4.0	174	122	197	10
125	37	375	12	291	139.7	4.0	175	144	198	13
150	17	295	13	323	168.3	4.5	207	66	280	11
150	27	350	14	323	168.3	4.5	207	118	281	13
150	33	370	15	324	168.3	4.5	208	141	282	17
200	14	305	22	393	219.1	6.3	265	74	465	26
200	25	365	24	394	219.1	6.3	266	135	467	23
200	33	465	33	395	219.1	6.3	267	225	469	45
250	13	320	37	463	273	6.3	321	79	699	41
250	22	380	39	463	273	6.3	321	140	700	44
250	30	460	46	465	273	6.3	323	220	705	62
300	14	345	50	526	323.9	7.1	374	104	963	47
300	23	440	57	528	323.9	7.1	376	200	970	68
300	29	470	60	529	323.9	7.1	377	228	972	102
350	11	330	57	558	355.6	8.0	406	90	1146	75
350	23	430	65	563	355.6	8.0	411	191	1163	82
350	28	485	69	564	355.6	8.0	412	244	1165	109
400	11	340	72	624	406.4	8.0	464	96	1498	132
400	18	420	80	626	406.4	8.0	466	177	1502	84
400	26	545	89	626	406.4	8.0	466	303	1502	167
450	10	355	100	680	457	8.0	520	106	1884	247
450	18	440	108	680	457	8.0	520	189	1886	128
450	24	500	114	681	457	8.0	521	249	1889	166
500	10	365	115	737	508	8.0	577	114	2322	255
500	18	450	121	737	508	8.0	577	199	2322	146
500	23	530	138	739	508	8.0	579	278	2332	229
600	11	400	171	881	610	8.0	681	148	3285	310

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
600	18	510	216	884	610	8.0	684	247	3301	269
600	23	580	233	885	610	8.0	685	320	3308	486
700	8	390	267	1012	711	8.0	790	130	4440	679
700	14	490	286	1012	711	8.0	790	230	4442	310
700	18	575	316	1014	711	8.0	792	314	4454	506
800	8	405	320	1121	813	8.0	899	144	5776	618
800	12	475	331	1121	813	8.0	899	214	5773	515
800	16	545	340	1121	813	8.0	899	282	5770	582
ANGULAR EXPANSION JOINT with welding ends · **type WN R-R · nominal pressure PN 10**										
50	19	260	3.9	200	60.3	2.9	84	30	42.5	3
50	28	275	4	200	60.3	2.9	84	44	42.5	2
50	36	325	4.6	200	60.3	2.9	84	95	41.8	3
65	17	265	4.5	216	76.1	2.9	100	32	62.8	5
65	26	280	4.7	216	76.1	2.9	100	48	62.8	3
65	36	305	5.4	221	76.1	2.9	105	76	65.5	5
80	16	275	5.4	230	88.9	3.2	114	45	83.2	8
80	25	300	5.5	230	88.9	3.2	114	68	83.2	5
80	35	330	6.4	234	88.9	3.2	118	99	86	7
100	17	285	7.8	258	114.3	3.6	142	53	132	10
100	26	310	8.1	258	114.3	3.6	142	80	132	7
100	32	330	8.4	258	114.3	3.6	142	97	132	9
125	18	290	9.8	287	139.7	4.0	171	60	194	11
125	23	310	11	290	139.7	4.0	174	77	197	11
125	31	345	12	291	139.7	4.0	175	112	198	17
150	17	310	18	335	168.3	4.5	207	68	281	22
150	27	360	20	335	168.3	4.5	207	121	281	23
150	32	395	22	337	168.3	4.5	209	154	284	30
200	14	315	30	407	219.1	6.3	265	76	466	48
200	25	380	33	408	219.1	6.3	266	139	468	42
200	34	500	40	410	219.1	6.3	268	260	472	91
250	13	330	48	473	273	6.3	321	80	699	78
250	22	400	52	474	273	6.3	322	147	703	66
250	28	480	59	476	273	6.3	324	228	707	103
300	14	360	66	536	323.9	7.1	376	108	969	135
300	20	405	70	536	323.9	7.1	376	156	970	87
300	29	505	83	539	323.9	7.1	379	252	979	172
350	14	370	76	571	355.6	8.0	411	116	1162	145
350	20	415	78	571	355.6	8.0	411	163	1162	103
350	25	480	89	573	355.6	8.0	413	231	1169	163
400	11	350	99	652	406.4	8.0	462	98	1491	252
400	19	420	104	652	406.4	8.0	462	171	1491	144
400	24	515	138	658	406.4	8.0	468	252	1512	250
450	11	400	143	721	457	8.0	521	136	1887	447
450	16	425	147	721	457	8.0	521	166	1889	248
450	21	500	164	723	457	8.0	523	240	1898	315

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
500	10	380	182	800	508	8.0	578	119	2326	390
500	15	440	191	800	508	8.0	578	178	2326	260
500	23	540	211	801	508	8.0	579	278	2332	384
600	9	400	255	907	610	8.0	685	128	3308	720
600	16	495	273	907	610	8.0	685	224	3308	412
600	20	560	285	907	610	8.0	685	288	3308	540
700	8	415	385	1031	711	10.0	791	135	4446	914
700	14	515	408	1031	711	10.0	791	236	4446	523
700	18	600	438	1033	711	10.0	793	317	4456	911
ANGULAR EXPANSION JOINT with welding ends · **type WN R-R · nominal pressure PN 16**										
50	19	265	3.9	200	60.3	2.9	84	35	42.1	4
50	28	285	4.1	200	60.3	2.9	84	52	42.1	3
50	34	300	4.3	200	60.3	2.9	84	69	41.8	5
65	16	265	4.5	216	76.1	2.9	100	32	62.8	5
65	25	280	4.7	216	76.1	2.9	100	48	62.8	3
65	31	295	5.3	221	76.1	2.9	105	66	65.5	5
80	15	270	5.9	234	88.9	3.2	118	38	86	12
80	25	295	6.2	234	88.9	3.2	118	62	86	8
80	31	310	6.5	234	88.9	3.2	118	77	86	8
100	15	295	9.6	256	114.3	3.6	140	53	130	13
100	23	335	13	270	114.3	3.6	142	96	132	13
100	29	355	13	271	114.3	3.6	143	116	133	17
125	15	300	15	300	139.7	4.0	172	61	195	22
125	22	350	16	302	139.7	4.0	174	110	197	20
125	31	365	17	304	139.7	4.0	176	124	200	30
150	14	310	21	349	168.3	4.5	207	69	281	40
150	22	345	22	349	168.3	4.5	207	104	281	27
150	34	405	26	352	168.3	4.5	210	162	286	54
200	12	330	39	417	219.1	6.3	265	77	465	85
200	20	370	41	418	219.1	6.3	266	119	468	49
200	28	425	46	420	219.1	6.3	268	173	472	83
250	10	335	53	478	273	6.3	318	82	692	160
250	18	395	56	478	273	6.3	318	143	692	92
250	22	405	59	483	273	6.3	323	152	704	109
300	11	355	89	567	323.9	7.1	377	92	972	254
300	14	375	91	567	323.9	7.1	377	114	972	203
300	20	420	95	567	323.9	7.1	377	160	972	145
350	11	360	108	612	355.6	8.0	412	98	1165	275
350	14	385	111	611	355.6	8.0	411	124	1163	186
350	20	440	119	613	355.6	8.0	413	180	1169	209
400	8	370	160	686	406.4	8.0	464	101	1497	540

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
400	14	450	170	686	406.4	8.0	464	177	1497	309
400	21	515	184	689	406.4	8.0	467	242	1508	333
450	8	360	181	744	457	8.0	522	87	1893	665
450	13	415	190	744	457	8.0	522	144	1893	399
450	23	545	216	746	457	8.0	524	274	1899	498
500	10	405	231	801	508	8.0	579	124	2332	864
500	15	465	241	801	508	8.0	579	185	2332	576
500	21	590	276	804	508	8.0	582	306	2346	646
600	6	380	317	923	610	10.0	683	100	3295	1392
600	11	450	332	923	610	10.0	683	166	3295	836
600	18	560	391	927	610	10.0	687	269	3316	812
ANGULAR EXPANSION JOINT with welding ends · **type WN R-R · nominal pressure PN 25**										
50	15	265	4	200	60.3	2.9	84	35	41.8	9
50	25	285	4.2	200	60.3	2.9	84	52	41.8	6
50	29	290	4.2	200	60.3	2.9	84	61	41.8	5
65	17	285	6.5	219	76.1	2.9	103	42	64.1	11
65	21	295	6.6	219	76.1	2.9	103	53	64.1	9
65	26	305	6.7	219	76.1	2.9	103	63	64.1	7
80	17	285	9.3	246	88.9	3.2	118	44	86	14
80	21	295	9.5	246	88.9	3.2	118	55	86	12
80	26	305	9.7	246	88.9	3.2	118	66	86	10
100	14	310	12	268	114.3	3.6	140	68	130	21
100	21	340	13	271	114.3	3.6	143	101	133	19
100	27	330	13	271	114.3	3.6	143	90	133	20
125	14	330	21	314	139.7	4.0	172	78	194	36
125	21	350	22	317	139.7	4.0	175	100	199	36
125	28	400	25	319	139.7	4.0	177	149	201	48
150	13	340	29	358	168.3	4.5	206	88	279	61
150	21	345	30	359	168.3	4.5	207	92	280	43
150	24	365	31	361	168.3	4.5	209	116	284	56
200	9	340	51	427	219.1	6.3	267	80	468	181
200	16	365	52	426	219.1	6.3	266	102	467	106
200	20	390	55	428	219.1	6.3	268	131	472	86
250	10	380	86	510	273	7.1	320	106	696	274
250	16	385	89	514	273	7.1	324	115	707	158
250	19	410	91	514	273	7.1	324	137	707	171
300	11	370	133	599	323.9	8.0	377	96	973	356
300	15	440	143	599	323.9	8.0	377	168	973	204
300	20	450	146	601	323.9	8.0	379	177	979	245
350	11	410	163	635	355.6	8.0	413	128	1169	490
350	14	415	165	636	355.6	8.0	414	134	1173	370
350	20	500	179	637	355.6	8.0	415	218	1174	410
400	8	390	185	686	406.4	10.0	464	108	1496	897
400	13	420	193	688	406.4	10.0	466	140	1505	496
400	16	450	197	688	406.4	10.0	466	168	1505	413

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
450	7	385	258	764	457	10.0	524	92	1899	1494
450	12	445	270	764	457	10.0	524	152	1899	897
450	17	505	282	764	457	10.0	524	213	1899	641
500	7	390	286	815	508	10.0	575	98	2316	1939
500	12	455	300	815	508	10.0	575	162	2316	1163
500	18	540	410	862	508	10.0	582	238	2346	830

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

ANGULAR EXPANSION JOINT with fixed flanges **Type KN F-F**

TYPE KN F-F ≥ DN 100

TYPE KN F-F ≤ DN 80

Design type KN F-F

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with standardised fixed flanges in line with EN 1092-1 type 01 and joint tensioners for absorbing the axial reaction forces.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Flange, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0038 (S235JR)	-10 °C bis 300 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› Flanges in line with ASME, JIS, BS
› With special coating, galvanised or hot galvanised
› Connection variants with weld end or swivel flanges

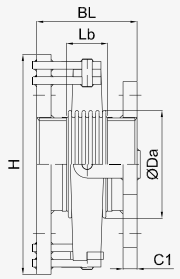
Tasks

› Absorption of all-around angular movements
› Reduction of tensions in the pipe system
› Absorption of large movements in two-joint and three-joint pipe systems
› Reduction of forces and moments in connections

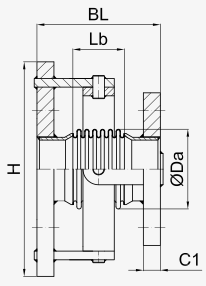
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas and water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN 100 - DN 700



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
ANGULAR EXPANSION JOINT with fixed flanges · **type KN F-F · nominal pressure PN 6**										
50	19	90	9	256	6	16	84	30	42.5	3
50	33	115	9.2	256	6	16	84	52	42.5	2
50	42	140	9.5	256	6	16	84	78	42.1	2
65	17	95	11	276	6	16	105	33	66.4	3
65	26	110	11	276	6	16	105	49	66.4	2
65	37	125	11	276	6	16	100	64	62.8	3
80	18	105	15	306	6	18	118	43	86.6	10
80	27	130	15	306	6	18	118	64	86.6	7
80	41	160	15	306	6	18	118	95	86.6	5
100	17	140	16	326	6	18	142	80	125	4
100	29	140	17	326	6	18	142	83	125	5
100	39	175	17	326	6	18	143	116	125	7
125	18	120	25	370	6	20	173	60	188	5
125	27	185	23	356	6	20	174	92	189	7
125	37	240	24	356	6	20	175	144	189	13
150	15	195	27	381	6	20	207	101	271	9
150	25	200	28	381	6	20	208	106	271	12
150	34	235	28	381	6	20	208	141	271	18
200	14	175	43	448	6	22	265	76	453	30
200	22	210	44	448	6	22	265	113	453	20
200	33	290	51	448	6	22	268	195	453	38
250	13	180	64	517	6	24	321	80	684	48
250	19	220	65	517	6	24	321	120	684	32
250	32	315	72	517	6	24	323	212	684	68
300	14	215	91	592	6	24	375	106	948	53
300	20	260	94	592	6	24	376	152	948	62
300	29	330	99	592	6	24	377	224	948	94
350	14	280	124	642	6	26	412	199	1139	67
350	20	240	126	656	6	26	411	163	1139	68
350	27	320	124	642	6	26	412	240	1139	104
400	11	215	165	720	6	28	465	98	1474	149
400	16	265	155	700	6	28	465	150	1474	87
400	22	320	161	700	6	28	466	205	1474	106
450	13	255	198	765	6	30	520	135	1856	120
450	18	315	195	755	6	30	521	194	1856	140
450	24	365	198	755	6	30	521	245	1856	167
500	10	240	278	865	6	30	578	120	2291	208
500	15	305	256	835	6	30	579	186	2291	169
500	26	420	235	805	6	30	578	300	2291	294
600	11	295	388	975	6	32	685	161	3258	288

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
600	16	345	360	955	6	32	684	216	3258	216
600	20	420	378	955	6	32	685	288	3258	363
700	9	415	571	1082	6	40	791	269	4389	312
700	12	345	610	1112	6	40	788	197	4375	277
700	16	405	557	1082	6	40	790	256	4389	376
ANGULAR EXPANSION JOINT with fixed flanges · **type KN F-F · nominal pressure PN 10**										
50	18	180	15	281	16	20	84	112	41.8	3
50	28	120	14	281	16	20	84	52	42.1	3
50	39	145	14	281	16	20	84	78	41.8	4
65	17	105	16	301	16	20	107	39	67.4	4
65	27	125	16	301	16	20	105	59	65.1	5
65	31	135	16	301	16	20	105	68	65.1	4
80	14	155	18	316	16	20	114	90	83.2	4
80	25	135	18	316	16	20	114	68	83.2	5
80	35	165	19	316	16	20	118	99	86	7
100	14	220	24	336	16	22	143	159	125	10
100	26	145	23	340	16	22	142	82	125	7
100	38	185	24	336	16	22	143	120	125	12
125	17	160	28	366	16	22	175	96	189	10
125	27	165	31	374	16	22	175	100	189	17
125	36	200	30	366	16	22	176	138	189	20
150	17	170	41	413	16	24	207	104	271	15
150	25	215	42	413	16	24	208	110	271	21
150	33	270	45	413	16	24	210	160	271	31
200	14	190	61	482	10	24	267	80	453	31
200	22	225	61	482	10	24	266	116	453	32
200	33	300	68	482	10	24	268	195	453	63
250	13	195	87	547	10	26	322	85	682	52
250	19	235	88	547	10	26	321	123	683	53
250	31	355	103	547	10	26	326	244	684	113
300	14	230	117	605	10	26	377	116	948	95
300	20	270	119	605	10	26	377	160	948	87
300	26	330	127	605	10	26	378	216	948	143
350	14	260	160	665	10	30	412	171	1139	96
350	20	265	179	685	10	30	413	180	1139	121
350	25	320	168	665	10	30	413	231	1139	159
400	13	320	239	755	10	32	468	224	1474	159
400	19	290	256	775	10	32	468	196	1474	182
400	24	350	237	755	10	32	466	260	1474	238
450	14	365	309	815	10	36	522	260	1856	234
450	18	315	331	835	10	36	523	210	1856	213
450	24	395	328	815	10	36	525	288	1856	341
500	10	340	395	892	10	38	573	234	2270	242
500	15	355	406	892	10	38	579	247	2291	282

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
500	23	400	420	892	10	38	580	288	2291	451
600	9	380	541	1002	10	42	681	224	3236	321
600	14	415	550	1002	10	42	685	256	3258	408
600	18	425	562	1002	10	42	687	269	3258	513
ANGULAR EXPANSION JOINT with fixed flanges · **type KN F-F · nominal pressure PN 16**										
50	17	125	14	281	16	20	84	61	42.1	3
50	23	110	14	281	16	20	84	44	42.1	3
50	34	135	14	281	16	20	84	69	41.8	5
65	9	120	16	301	16	20	100	56	62.8	3
65	16	135	17	301	16	20	105	68	65.1	4
65	31	140	17	301	16	20	103	73	64.1	6
80	8	165	24	328	16	20	118	97	85.5	6
80	16	140	23	328	16	20	118	74	86.6	6
80	23	140	24	328	16	20	118	75	86	6
100	10	195	28	348	16	22	143	130	125	12
100	27	155	28	348	16	22	144	92	125	12
100	34	175	29	348	16	22	144	112	125	17
125	19	215	36	378	16	22	177	148	189	24
125	25	185	34	378	16	22	176	121	189	22
125	31	195	36	378	16	22	177	129	189	28
150	16	160	51	437	16	24	207	92	269	21
150	21	200	49	427	16	24	208	91	271	25
150	32	270	53	427	16	24	210	160	271	50
200	14	195	75	492	16	26	266	84	451	56
200	22	240	78	492	16	26	268	130	453	56
200	28	295	84	492	16	26	270	186	453	86
250	13	220	122	575	16	29	324	92	684	104
250	19	255	115	565	16	29	321	130	678	83
250	23	310	121	565	16	29	324	183	684	115
300	11	275	178	650	16	32	377	146	945	102
300	17	275	178	650	16	32	378	144	948	127
300	20	325	183	650	16	32	378	192	948	161
350	8	345	256	720	16	35	415	245	1139	196
350	13	305	247	720	16	35	413	205	1139	179
350	21	320	253	720	16	35	415	218	1139	221
400	9	320	350	802	16	38	467	215	1474	226
400	13	340	350	802	16	38	466	234	1474	265
400	21	410	377	802	16	38	470	300	1474	393
450	10	360	435	862	16	42	524	244	1856	327
450	14	440	457	862	16	42	525	320	1856	461
450	17	385	438	862	16	42	523	270	1856	418

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Flange		Bellows			Angular adjustment force rate
					Borehole pattern acc. to EN 1092	Sheet thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	PN	C1	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	-	mm	mm	mm	cm²	Nm/Degrees
ANGULAR EXPANSION JOINT with fixed flanges · **type KN F-F · nominal pressure PN 25**										
50	10	120	14	281	40	20	84	52	42.1	3
50	21	135	14	281	40	20	84	69	41.8	5
50	29	125	15	281	40	20	84	61	41.8	5
65	9	145	19	301	40	22	105	59	65.1	5
65	14	155	19	301	40	22	103	73	64.1	6
65	23	140	19	301	40	22	105	57	65.5	6
80	13	165	27	328	40	24	118	77	86	8
80	17	145	27	328	40	24	114	59	82.7	18
80	21	140	27	328	40	24	118	55	86	12
100	11	195	36	363	40	26	144	125	125	18
100	20	160	35	363	40	26	143	90	125	16
100	32	190	36	363	40	26	145	118	125	26
125	11	210	53	412	40	28	176	135	189	30
125	21	225	54	412	40	28	177	148	189	39
125	27	240	56	412	40	28	179	160	189	47
150	11	240	73	452	40	30	210	160	271	50
150	21	255	75	452	40	30	211	128	271	48
150	29	280	76	452	40	30	212	152	271	70
200	12	240	110	520	25	32	268	152	453	80
200	18	250	113	520	25	32	270	163	453	98
200	23	305	118	520	25	32	271	174	453	113
250	8	405	196	615	25	35	327	260	684	195
250	14	360	186	615	25	35	325	216	684	181
250	19	290	179	615	25	35	326	147	684	188
300	7	380	311	707	25	38	381	272	948	274
300	12	330	298	707	25	38	379	227	948	253
300	18	350	307	707	25	38	381	245	948	305

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / S235JR. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

ANGULAR EXPANSION JOINT with welding ends **Type KN R-R**

TYPE KN R-R ≥ DN 100

TYPE KN R-R ≤ DN 80

Design type KN R-R

HKS angular expansion joint with compact design, consisting of multi-convolution and multi-layered metal bellows with welding ends (pipe nozzle) made of standardised pipes in line with EN 10216/10217 ff or rolled sheet metal in line with EN 10028 ff and joint tensioners for absorbing the axial reaction forces.

Materialcombination [1]	Component		Permitted operating temperature TS [2]
	Metal bellows	Welding end, joint tensioners [4]	
Standard [3]	1.4541 (X6CrNiTi18-10)	1.0345 (P235GH)	-10 °C bis 400 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)		-196 °C bis 550 °C
Heat resistant steel	1.4828 (X15CrNiSi20-12)		bis 900 °C
Nickel-base alloy	2.4858 (NiCr21Mo - Incoloy 825)		-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. Take into account the pressure derating factors of the nominal pressures through operating temperature.
3. Unalloyed steel components receive a base coat for corrosion protection.
4. Selection of the Material combination depending on installation and ambient conditions.

Special versions

On request, other expansion joints are available with other Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Expansions:

› Inner sleeve, telescopic inner sleeve or conical inner sleeve
› External protective sleeve or telescopic inner sleeve

On customer request:

› With 30° groove or special dimensions
› With special coating, galvanised or hot galvanised
› Connection variants with swivel, fixed or welding neck flanges

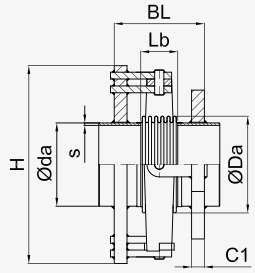
Tasks

› Absorption of all-around angular movements
› Reduction of tensions in the pipe system
› Absorption of large movements in two-joint and three-joint pipe systems
› Reduction of forces and moments in connections

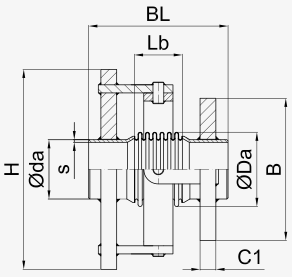
Areas of application

› Mechanical engineering, plant engineering, apparatus building, pipeline constructions and ship building
› Food processing industry
› Gas and water supply, building and heating technology
› Energy and offshore technology, oil and gas production
› Chemical and pharmaceutical industry, acid production
› Paper, textile, cellulose and paint industry
› Steel and smelting industry, cement and brick kilns, flue gas desulphurisation plants

DN100 - DN 800



DN 50 - DN 80



Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
ANGULAR EXPANSION JOINT with welding ends · **type KN R-R · nominal pressure PN 6**										
50	19	260	5.8	230	60.3	2.9	84	30	42.5	3
50	28	275	5.9	230	60.3	2.9	84	44	42.5	2
50	38	290	6.1	230	60.3	2.9	84	59	42.5	2
65	17	265	6.9	251	76.1	2.9	105	33	66.4	3
65	26	280	7.1	251	76.1	2.9	105	49	66.4	2
65	37	295	7	246	76.1	2.9	100	64	62.8	3
80	19	275	7.9	264	88.9	3.2	118	45	87	5
80	29	300	8.1	264	88.9	3.2	118	67	87	3
80	41	325	8.5	264	88.9	3.2	118	95	86.6	5
100	18	285	11	288	114.3	3.6	142	53	132	10
100	27	310	11	288	114.3	3.6	142	80	132	7
100	38	340	11	288	114.3	3.6	142	111	132	8
125	18	290	14	320	139.7	4.0	174	60	196	9
125	30	355	15	320	139.7	4.0	174	122	197	10
125	37	375	15	321	139.7	4.0	175	144	198	13
150	17	295	18	353	168.3	4.5	207	66	280	11
150	27	350	19	353	168.3	4.5	207	118	281	13
150	33	370	20	354	168.3	4.5	208	141	282	17
200	14	315	37	423	219.1	6.3	265	74	465	26
200	25	375	39	424	219.1	6.3	266	135	467	23
200	33	465	44	425	219.1	6.3	267	225	469	45
250	13	320	54	493	273	6.3	321	79	699	41
250	22	380	57	493	273	6.3	321	140	700	44
250	30	460	64	495	273	6.3	323	220	705	62
300	14	345	77	556	323.9	7.1	374	104	963	47
300	23	440	84	558	323.9	7.1	376	200	970	68
300	29	470	87	559	323.9	7.1	377	228	972	102
350	11	330	88	588	355.6	8.0	406	90	1146	75
350	23	440	108	593	355.6	8.0	411	191	1163	82
350	28	495	113	594	355.6	8.0	412	244	1165	109
400	11	350	131	654	406.4	8.0	464	96	1498	132
400	18	430	139	656	406.4	8.0	466	177	1502	84
400	26	555	148	656	406.4	8.0	466	303	1502	167
450	10	355	158	710	457	8.0	520	106	1884	247
450	18	440	165	710	457	8.0	520	189	1886	128
450	24	500	172	711	457	8.0	521	249	1889	166
500	10	365	187	767	508	8.0	577	114	2322	255
500	18	450	193	767	508	8.0	577	199	2322	146
500	23	530	210	769	508	8.0	579	278	2332	229
600	11	410	331	911	610	8.0	681	148	3285	310
600	18	510	350	914	610	8.0	684	247	3301	269

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
600	23	580	368	915	610	8.0	685	320	3308	486
700	8	390	487	1042	711	8.0	790	130	4440	679
700	14	490	491	1042	711	8.0	790	230	4442	310
700	18	575	522	1044	711	8.0	792	314	4454	506
800	10	450	720	1169	813	8.0	899	180	5776	495
800	12	485	671	1151	813	8.0	899	214	5773	515
800	16	555	658	1151	813	8.0	899	282	5770	582
ANGULAR EXPANSION JOINT with welding ends · **type KN R-R · nominal pressure PN 10**										
50	19	260	5.8	230	60.3	2.9	84	30	42.5	3
50	28	275	5.9	230	60.3	2.9	84	44	42.5	2
50	36	325	6.6	230	60.3	2.9	84	95	41.8	3
65	17	265	6.7	246	76.1	2.9	100	32	62.8	5
65	26	280	6.8	246	76.1	2.9	100	48	62.8	3
65	36	305	7.6	251	76.1	2.9	105	76	65.5	5
80	16	275	7.7	260	88.9	3.2	114	45	83.2	8
80	25	300	7.8	260	88.9	3.2	114	68	83.2	5
80	35	330	8.8	264	88.9	3.2	118	99	86	7
100	17	285	12	288	114.3	3.6	142	53	132	10
100	26	310	12	288	114.3	3.6	142	80	132	7
100	32	330	12	288	114.3	3.6	142	97	132	9
125	18	300	18	317	139.7	4.0	171	60	194	11
125	23	320	18	320	139.7	4.0	174	77	197	11
125	31	355	19	321	139.7	4.0	175	112	198	17
150	17	310	27	365	168.3	4.5	207	68	281	22
150	27	360	28	365	168.3	4.5	207	121	281	23
150	32	395	30	367	168.3	4.5	209	154	284	30
200	14	315	45	437	219.1	6.3	265	76	466	48
200	25	380	48	438	219.1	6.3	266	139	468	42
200	34	510	62	440	219.1	6.3	268	260	472	91
250	13	330	73	503	273	6.3	321	80	699	78
250	22	400	77	504	273	6.3	322	147	703	66
250	28	480	85	506	273	6.3	324	228	707	103
300	14	360	103	566	323.9	7.1	376	108	969	135
300	20	405	107	566	323.9	7.1	376	156	970	87
300	29	505	121	569	323.9	7.1	379	252	979	172
350	14	370	120	601	355.6	8.0	411	116	1162	145
350	20	415	123	601	355.6	8.0	411	163	1162	103
350	25	480	133	603	355.6	8.0	413	231	1169	163
400	11	360	182	682	406.4	8.0	462	98	1491	252
400	19	430	188	682	406.4	8.0	462	171	1491	144
400	24	515	209	688	406.4	8.0	468	252	1512	250
450	11	400	238	751	457	8.0	521	136	1887	447
450	16	425	243	751	457	8.0	521	166	1889	248
450	21	500	260	753	457	8.0	523	240	1898	315

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
500	10	390	342	830	508	8.0	578	119	2326	390
500	15	450	351	830	508	8.0	578	178	2326	260
500	23	550	372	831	508	8.0	579	278	2332	384
600	11	430	468	937	610	8.0	685	160	3308	576
600	16	495	465	937	610	8.0	685	224	3308	412
600	20	560	477	937	610	8.0	685	288	3308	540
700	8	520	692	1057	711	10.0	787	237	4423	457
700	14	515	735	1061	711	10.0	791	236	4446	523
700	18	600	727	1063	711	10.0	793	317	4456	911
ANGULAR EXPANSION JOINT with welding ends · **type KN R-R · nominal pressure PN 16**										
50	19	265	5.9	230	60.3	2.9	84	35	42.1	4
50	28	285	6.1	230	60.3	2.9	84	52	42.1	3
50	34	300	6.3	230	60.3	2.9	84	69	41.8	5
65	16	275	8.3	246	76.1	2.9	100	32	62.8	5
65	25	290	8.5	246	76.1	2.9	100	48	62.8	3
65	31	305	9	251	76.1	2.9	105	66	65.5	5
80	15	280	11	264	88.9	3.2	118	38	86	12
80	25	305	11	264	88.9	3.2	118	62	86	8
80	31	320	11	264	88.9	3.2	118	77	86	8
100	15	295	18	298	114.3	3.6	140	53	130	13
100	23	335	18	300	114.3	3.6	142	96	132	13
100	29	355	19	301	114.3	3.6	143	116	133	17
125	15	300	22	330	139.7	4.0	172	61	195	22
125	22	350	23	332	139.7	4.0	174	110	197	20
125	31	365	25	334	139.7	4.0	176	124	200	30
150	14	320	37	379	168.3	4.5	207	69	281	40
150	22	355	38	379	168.3	4.5	207	104	281	27
150	34	415	42	382	168.3	4.5	210	162	286	54
200	12	330	60	447	219.1	6.3	265	77	465	85
200	20	370	62	448	219.1	6.3	266	119	468	49
200	28	425	67	450	219.1	6.3	268	173	472	83
250	10	345	94	508	273	6.3	318	82	692	160
250	18	405	97	508	273	6.3	318	143	692	92
250	22	415	101	513	273	6.3	323	152	704	109
300	11	355	146	597	323.9	7.1	377	92	972	254
300	14	375	148	597	323.9	7.1	377	114	972	203
300	20	420	152	597	323.9	7.1	377	160	972	145
350	11	370	195	642	355.6	8.0	412	98	1165	275
350	14	395	198	641	355.6	8.0	411	124	1163	186
350	20	450	206	643	355.6	8.0	413	180	1169	209
400	8	370	276	716	406.4	8.0	464	101	1497	540
400	14	450	286	716	406.4	8.0	464	177	1497	309

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
400	21	515	301	719	406.4	8.0	467	242	1508	333
450	8	370	347	774	457	8.0	522	87	1893	665
450	13	425	345	774	457	8.0	522	144	1893	399
450	23	555	372	776	457	8.0	524	274	1899	498
500	10	430	401	830	508	8.0	578	150	2329	870
500	15	465	410	831	508	8.0	579	185	2332	576
500	21	590	446	834	508	8.0	582	306	2346	646
600	8	580	644	950	610	10.0	680	288	3282	659
600	14	525	641	953	610	10.0	683	233	3295	597
600	18	560	657	957	610	10.0	687	269	3316	812
ANGULAR EXPANSION JOINT with welding ends · **type KN R-R · nominal pressure PN 25**										
50	15	275	7.1	230	60.3	2.9	84	35	41.8	9
50	25	295	7.3	230	60.3	2.9	84	52	41.8	6
50	29	300	7.4	230	60.3	2.9	84	61	41.8	5
65	17	285	9.5	249	76.1	2.9	103	42	64.1	11
65	21	295	9.6	249	76.1	2.9	103	53	64.1	9
65	26	305	9.7	249	76.1	2.9	103	63	64.1	7
80	17	285	15	276	88.9	3.2	118	44	86	14
80	21	295	15	276	88.9	3.2	118	55	86	12
80	26	305	15	276	88.9	3.2	118	66	86	10
100	14	320	21	298	114.3	3.6	140	68	130	21
100	21	350	22	301	114.3	3.6	143	101	133	19
100	27	340	22	301	114.3	3.6	143	90	133	20
125	14	330	31	344	139.7	4.0	172	78	194	36
125	21	350	33	347	139.7	4.0	175	100	199	36
125	28	400	36	349	139.7	4.0	177	149	201	48
150	13	350	50	388	168.3	4.5	206	88	279	61
150	21	355	50	389	168.3	4.5	207	92	280	43
150	24	375	52	391	168.3	4.5	209	116	284	56
200	9	340	79	457	219.1	6.3	267	80	468	181
200	16	365	80	456	219.1	6.3	266	102	467	106
200	20	390	84	458	219.1	6.3	268	131	472	86
250	10	380	137	540	273	7.1	320	106	696	274
250	16	385	141	544	273	7.1	324	115	707	158
250	19	410	143	544	273	7.1	324	137	707	171
300	11	380	247	629	323.9	8.0	377	96	973	356
300	15	450	256	629	323.9	8.0	377	168	973	204
300	20	460	260	631	323.9	8.0	379	177	979	245
350	11	410	271	665	355.6	8.0	413	128	1169	490
350	14	415	274	666	355.6	8.0	414	134	1173	370
350	20	500	287	667	355.6	8.0	415	218	1174	410
400	10	425	339	716	406.4	10.0	464	134	1496	718
400	13	430	343	718	406.4	10.0	466	140	1505	496
400	16	460	348	718	406.4	10.0	466	168	1505	413

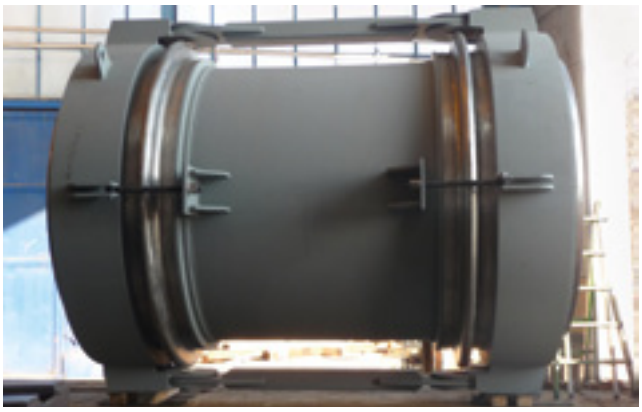
Nominal diameter	Angular movement absorption nominal	Length	Weight	Outside dimensions	Welding end		Bellows			Angular adjustment force rate
					External diameter	Wall thickness	External diameter	Corrugated length	Effective diameter	
DN	Δα	BL	G	H	da	s	Da	Lb	Ae	CΔα
-	Degrees	mm	kg	mm	mm	mm	mm	mm	cm²	Nm/Degrees
450	7	420	484	793	457	10.0	523	120	1898	1576
450	13	510	488	793	457	10.0	523	210	1898	901
450	17	515	490	794	457	10.0	524	213	1899	641
500	8	650	753	892	508	10.0	582	340	2346	868
500	12	495	673	889	508	10.0	579	192	2331	1157
500	18	550	723	892	508	10.0	582	238	2346	830

Design: All table values were determined with 1000 nominal stress cycles with nominal operating load. The design is based on operating (nominal) pressures PN 6 - PN 25 and design temperature 20 °C for the standard material combination 1.4541 / P235GH. For other materials, operating pressure and movement absorption have to be adapted with factors or requested separately.

Lens expansion joints

HKS designs and manufactures lens expansion joints from the simplest standard expansion joints to highly complex expansion joints designed especially on the basis of individual customer requirements. HKS lens expansion joints are very robust, single layer expansion joints. They have proven their suitability in decades of practical use and can – in contrast to the corrugated expansion joints – also be manufactured from unalloyed or low-alloy steel (P265GH, P355NL 2, 16Mo3, 13CrMo44). Other common materials such as duplex steel, nickel-base alloys and stainless and heat resistant steel. A round design is common for heat exchangers or pipelines. In addition to this, rectangular, oval, polygonal or special shapes are also possible. Depending on movement absorption, lens expansion joints are manufactured single-convolution or multi-convolution and with a wall thickness up to 10 mm.

Our expansion joints are under continuous further development to meet the current state of the art and the high requirements of the industry. This results in powerful and reliable lens expansion joints with excellent properties, a long service life and the highest quality to continue meeting the highest requirements even in the future. This has been proven by numerous certifications, approvals, acceptances and customer audits. In addition to the ISO 9001 quality management system, manufacturer's qualifications such as AD2000 HP0, ISO 3834-2, PED module H and ASME U-Designator (U-Stamp) are also in place. Our development and design department is available for technical consultation for our customers, engineering and solutions for project-oriented challenges. For optimum dimensioning of the lens expansion joints, we use sets of rules such as AD2000 data sheet B13, EN 13445, EN14917, EJMA, ASME Sec. VIII Div. I or finite element method (FEM).



Areas of application

Application examples for HKS lens expansion joints are versatile and flexible. The movement options with large expansions and the highly robust design are suitable for particularly rough and extreme ambient conditions in many industries with different media and temperatures. Our high-quality lens expansion joints are used in many branches of industry such as:

› Plant engineering

› Apparatus engineering

› Power station construction

› Pipeline construction

› Mechanical engineering

› Chemical industry

› Steel and iron industry

› Cement industry

The main tasks are:

› Absorbing expansions

› Absorbing movement

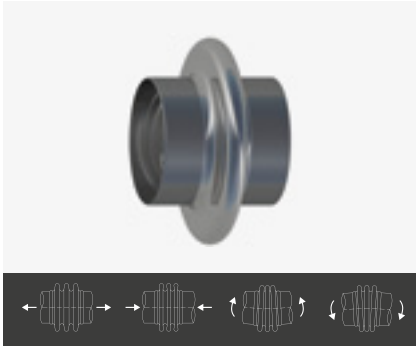
› Reduction of tensions

› Compensation of installation inaccuracies

› Compensating for settling of buildings

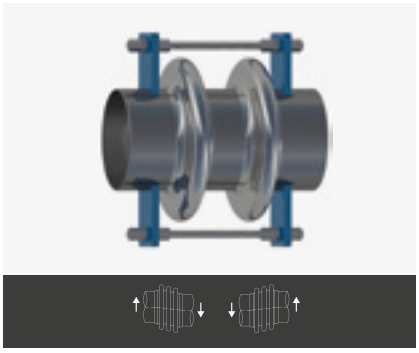
Model variants

HKS lens expansion joints have different designs (axial, lateral, angular and universal expansion joints), materials (depending on medium and temperature) and shapes (round, rectangular, oval).



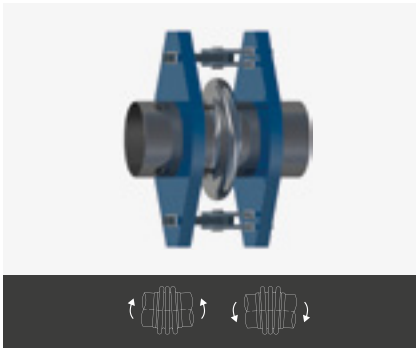
Axial expansion joints (e.g. type L-AN R-R)

- Absorption of axial and/or angular movement
- With swivel flanges, fixed flanges or welding ends
- Nominal diameters DN 32 – DN 6000 [1)]
- Pressure stages PN 1 – PN 63 [2)]
- In pipes they require fixed and floating bearings to absorb the axial reaction forces



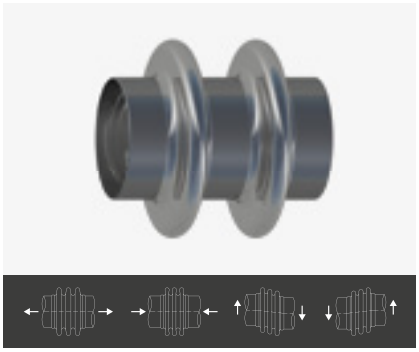
Lateral expansion joints (e.g. type L-RM R-R)

- Absorption of lateral movement
- With swivel flanges, fixed flanges or welding ends
- Nominal diameters DN 32 – DN 6000 [1)]
- Pressure stages PN 1 – PN 63 [2)]
- With tension rods or joint tensioners
- Tie rod absorbs axial reaction forces



Angular expansion joints (e.g. type L-WN R-R)

- Absorption of angular movement
- With fixed flanges or welding ends
- Nominal diameters DN 32 – DN 6000 [1)]
- Pressure stages PN 1 – PN 63 [2)]
- With single or cardan tension rod for one sided or all around movement absorption
- Large bending angles and compact length
- Tie rod absorbs axial reaction forces



Universal expansion joints (e.g. type L-AM R-R)

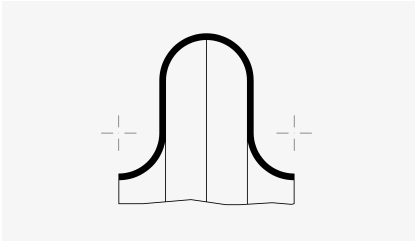
- Absorption of axial and/or lateral movement
- With swivel flanges, fixed flanges or welding ends
- Nominal diameters DN 32 – DN 6000 [1)]
- Pressure stages PN 1 – PN 63 [2)]
- In pipes they require fixed and floating bearings to absorb the axial reaction forces

1) Nominal diameters deviating from the standard have to be individually tailored by HKS.
2) Nominal pressures and special requirements (hot air, exhaust gas) deviating from the standard have to be individually tailored by HKS.

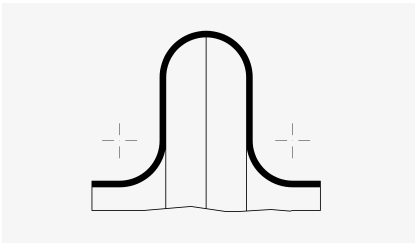
Round lens expansion joints

Lens expansion joints have a relatively large convolution height, a singleply and a wall thickness between 2 mm and 10 mm. In contrast to corrugated expansion joints, individual convolution (lenses) on round lens expansion joints are always made from two half convolution (half shells) and joined with a continuous welding seam (circumferential weld). Half convolutions are made of circular ring plates (round blanks) by forming their outer and inner edges through rolling bending (crimping) or pressing to produce an S-shaped profile. The convolution geometry depends on the operating data, the formability of the material and the production options.

Main shapes:



The most commonly used convolution shape for lens expansion joints consists of two joined half shells with outside convolution. They are manufactured as single-convolution or multi-convolution versions depending on movement absorption. Convolution heights and Geometrys can be designed in a great variety of ways, with service life and pressure resistance tailored to the exact operating conditions.

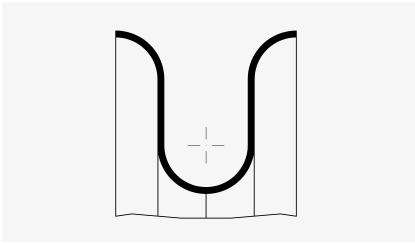


The manufacturing process of the half shells depends on the Nominal diameter.

DN 32 – DN 500	compression moulding (deep drawing) of the half shells
DN 550 – DN 6000	crimping (roll bending) of the half shells

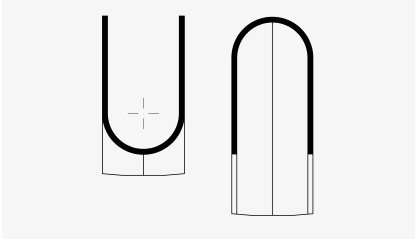
To move connecting welds on lenses on pipes or containers away from the areas with a high level of wear, cylindrical ends (L = 3×t) are additionally included. This allows the number of stress cycles (service life) to be increased with identical movement absorption.

Special shapes:

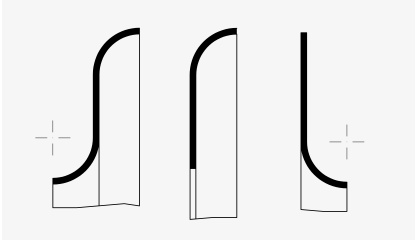


In addition to the main shape with outside convolution, different variants can be manufactured as special shapes.

If the installation conditions allow no convolution positioning on the outside, lens expansion joints can be produced with inside convolutions. In contrast to the previously described form, the continuous weld is then placed in the root of the convolution.



U-shaped convolutions without moulded pipe connection are another special design. Their opening can be placed facing inwards or outwards. This design is, for example, used on slide valves and extension valves or as a dust-free connection between two container bottoms.

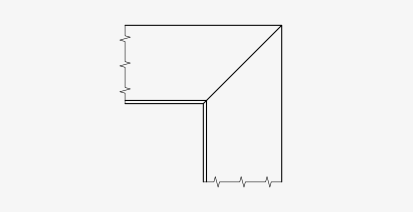


For special applications and installation situations, half shells with and without moulded pipe connections are required. For example as a sealing membrane or dust protection, in a heat exchanger shell with different outer diameters or as a collar.

Rectangular lens expansion joints

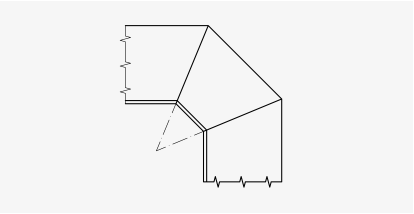
HKS rectangular expansion joints with lens design are not standardised and are individually tailored and manufactured depending on customer requirements. Convolution heights from 50 mm to 300 mm and lengths from 50 mm to 160 mm are common dimensions for individual U-shaped convolutions. The convolution dimension depends strongly on the manufacturing method, the material, the convolution radius and the wall thickness. So-called profile bars with one to three convolutions are produced with a press brake in several steps and joined to form a rectangular, square or oval expansion joint using different corner joining methods. The shape of the corner joint has a crucial influence on the existing tension condition in the critical corner areas and therefore also determines the service life of the expansion joint. The more closely the corner resembles a "round corner", the longer the service life under otherwise equal operating conditions. HKS offers five different corner joining methods.

Method I: Single mitre



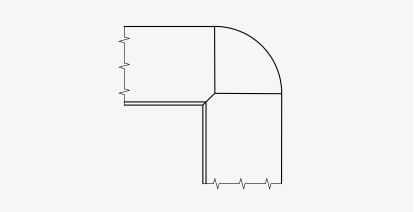
The most simple way of producing a corner joint is the single mitre with 45° mitre cuts on the profile bars. It is used for very low pressure and expansion levels.

Method II: Double mitre



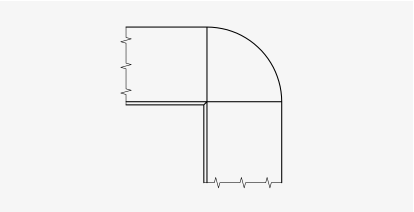
A more beneficial tension distribution in the corners compared to method II is the double mitre version with 22.5° mitre cuts. It is only rarely used, however, due to the elaborate connection.

Method III: Y mitre



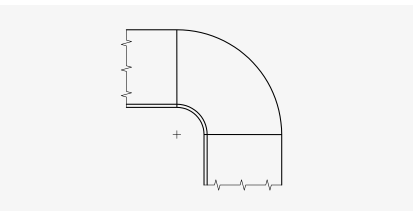
Rectangular on the inside (as method I) and rounded on the outside (inserted corner) is a very frequently applied joining method which is used for higher expansion levels. The channel connection can retain its rectangular shape here and tension distribution is better than with method I.

Method IV: Rounded outside



This version is comparable to profile III and is mainly used where small lengths are available. The disadvantage is in the area of the inner brim where only a small radius is available and where the tip of the inserted corner runs out. This creates high local tension peaks which lead to a reduced service life.

Method V: Fully rounded



With regard to tension distribution, the best choice is the version with rounded inside and outside by inserting a fully rounded corner. The disadvantage is that the channel also has to have a contour with rounded corners.

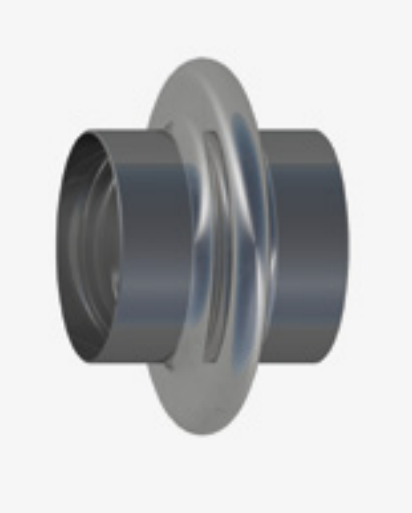
Frequently used materials in lens manufacturing

Material group	Material designation	
General structural steel	1.0038 1.0330 1.0338	S235JR DC01 DC04
High-temperature steel	1.0425 1.0473 1.5415 1.7335	P265GH P355GH 16Mo3 13CrMo4-5
Fine grained structural steel	1.0565 1.1106	P355NH P355NL2
Stainless austenitic steel	1.4301 1.4404 1.4529 1.4539 1.4541 1.4571	X5CrNi18-10 X2CrNiMo17-12-2 X1NiCrMoCuN25-20-7 X2NiCrMoCu25-20-5 X6CrNiTi18-10 X6CrNiMoTi17-12-2
Heat resistant steel	1.4828 1.4841 1.4876 1.4878	X15CrNiSi20-12 X15CrNiSi25-21 X10NiCrAlTi32-21 X8CrNiTi18-10
Duplex steel	1.4462	X2CrNiMoN22-5-3
Nickel-base alloy	2.4856 2.4858	NiCr22Mo9Nb NiCr21Mo

As a rule, lens expansion joint convolutions can be manufactured from all materials which are suitable for welding and cold forming. The table shows only a small selection of materials.

Connection types

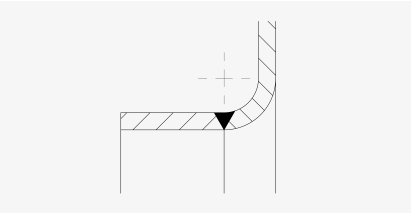
Lens expansion joints are manufactured to customer requirements, with or without connections. It is practical to include connections with flanges or welding ends for integration into heat exchangers, containers or pipelines.



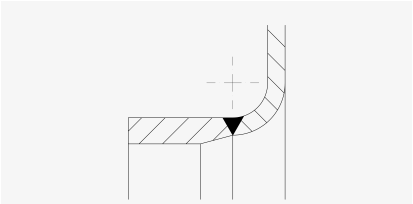
Welding ends

For most applications for lens expansion joints, the connections between the convolutions and the pipe connections are butt welded. One of the great advantages of butt welding is quality assurance. This refers to the verifiability of the welding seam quality using non-destructive testing such as X-ray, ultrasound, visual or dye penetration testing. For fillet welds, Xray testing is not possible and verification is limited to internal irregularities. If the component to be connected has a thicker wall than the lens convolution, it is usually tapered towards the connecting seam. One possible method is butt welding with a groove. The advantage of this is the geometrically available pool securing and therefore the improved and easier weldability. There is a higher risk of crevice corrosion, however. Fillet connections are also possible for lower strain areas, but the risk of crevice corrosion has to be taken into account here as well. The thickness of the walls to be connected should not be less than 2 mm.

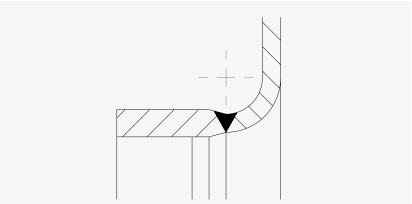
Butt welds



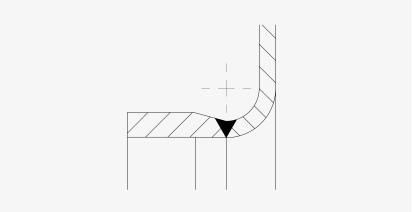
same thickness



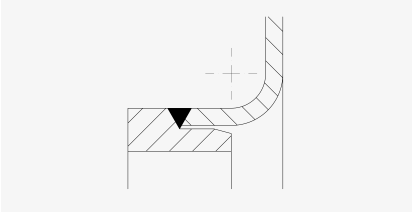
flush outside



centred

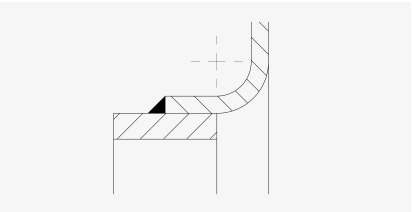


flush inside

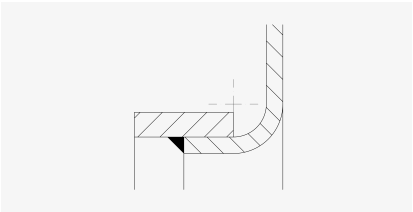


with groove

Fillet welds



outside



inside

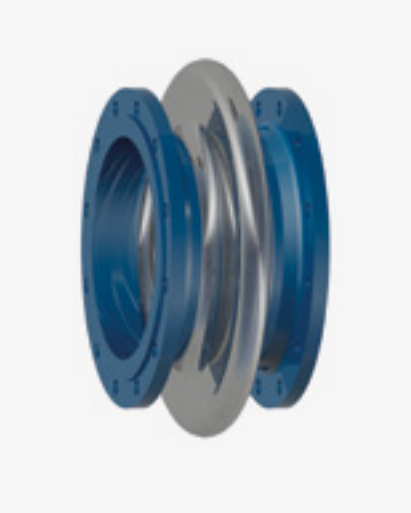
Flanges

The advantage of a flange connection is the ease of mounting. This makes it possible to replace an expansion joint regardless of the weather even under difficult installation conditions. This is significantly more complicated for expansion joints with welding ends.

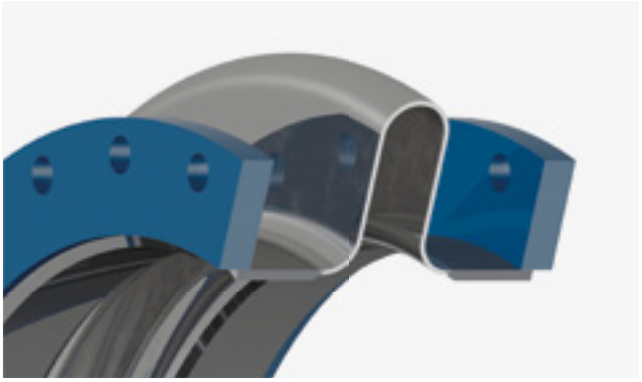
Flange connections are largely standardised through national and international standards (DIN, EN, ANSI, BS or JIS) or described by customers factory standards. On customer request, special flange connections with various requirements can be implemented. Flange types in line with EN 1092-1 are commonly used as a standard.

To ensure flange connections without screws or to create compact shapes or lengths, it is common practice to use combinations of fixed flanges with additional welding ends.

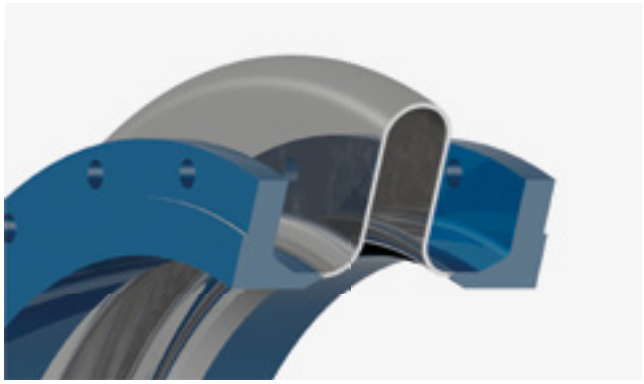
Materials are often selected in line with the bellows material used.



Swivel flange with collar and welding ends



Flat fixed flange with welding ends

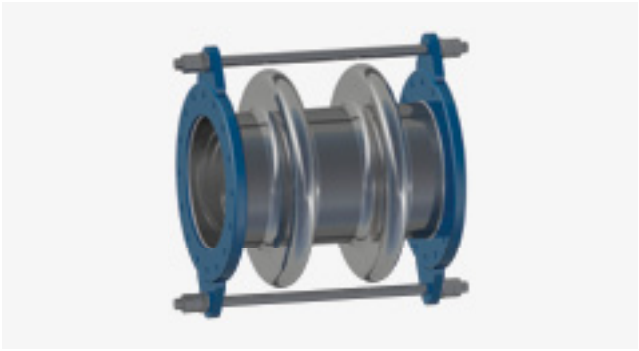


Welding neck flange

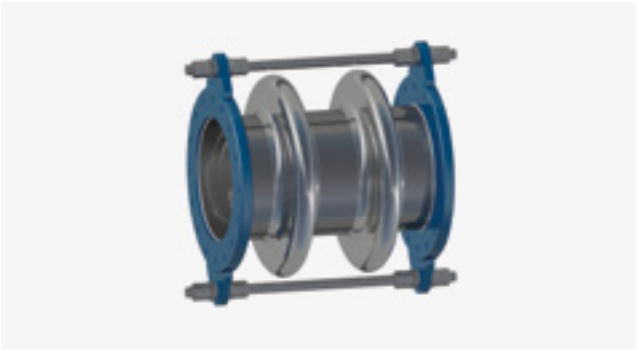
Angled flange

Tie rods

Under pressure (operating or test conditions), lens expansion joints develop an axial reaction force across the entire effective bellows cross section which puts additional stress on the neighbouring plain and fixed bearings. This bearing stress in the pipe system is drastically reduced by using lateral and/or angular expansion joints with tie rods. Only the adjustment forces and moments from the lateral or angular movement are additionally introduced into the pipe system and absorbed by lightweight fixed points.



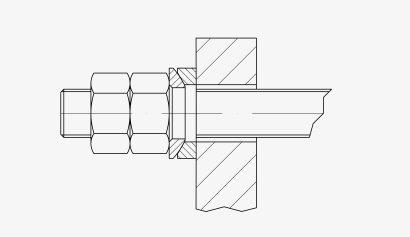
External tie rods



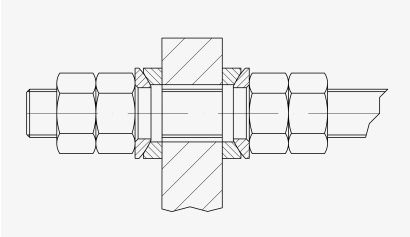
External and internal tie rods

Tension rods

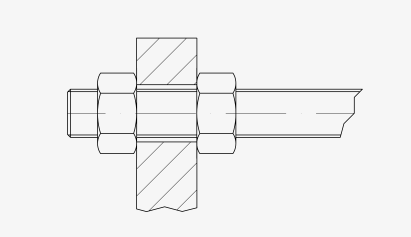
This type of tensioning is used for lateral expansion joints or can be used to limit the element length or serve as a pretensioning device on axial and universal expansion joints. Threaded rods are placed symmetrically around the circumference and supported with spherical washers, conical washers and nuts. For pretensioning or fixing the length, the version without spherical and conical washer is sufficient. For absorbing excess pressure (internal pressure), only external tensioning is required and additional internal tensioning for negative pressure (vacuum, external pressure). All metallic unalloyed or low-alloy components such as threaded rods, nuts, conical and spherical washers are galvanised or coated with an anti-rust primer. Components made of stainless highalloy steel are used where higher durability is required. Other materials, hot galvanising, special paints and coatings are possible on request.



External tensioning (without negative pressure)



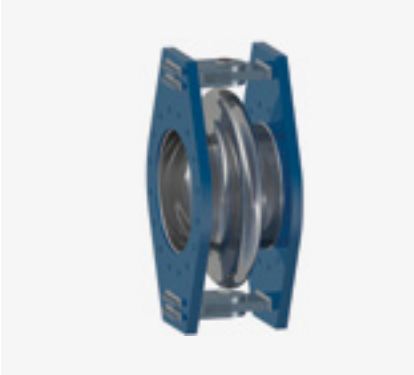
External and internal tensioning
(with negative pressure)



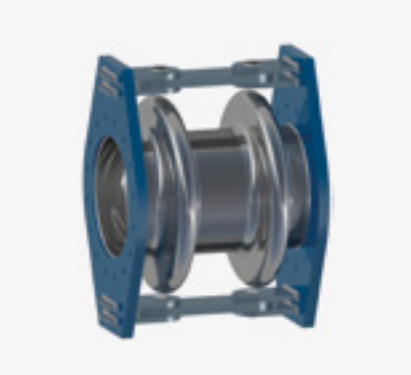
Pretensioning or length fixing

Materials for connecting parts

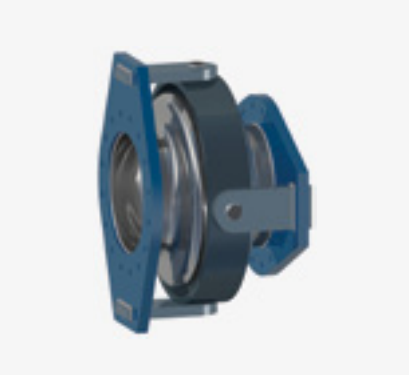
Material group	Material designation			
	Moulded parts/tabs	Spherical/conical washer	Tension rods/nuts	Joints
Standard (unalloyed steel)	1.0038 (S235JR)	1.0401 (C15)	5.6, 8.8 / 5, 8	1.0038 (S235JR)
High-temperature steel	1.5415 (16Mo3)	1.7225 (42CrMo4)	1.7225 (42CrMo4)	1.5415 (16Mo3)
Stainless steel	1.4301 (X5CrNi18-10) 1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2)	1.4305 (X8CrNiS18-9)	A2, A4	1.4301 (X5CrNi18-10) 1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2)



Single joint tensioners
(angular expansion joint for unilateral movement absorption)



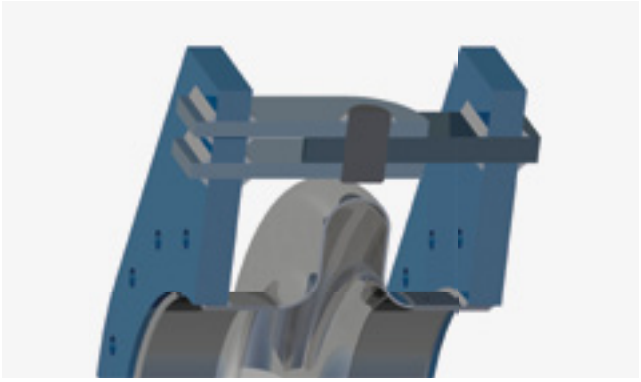
Double joint tensioners
(lateral expansion joint for unilateral movement absorption)



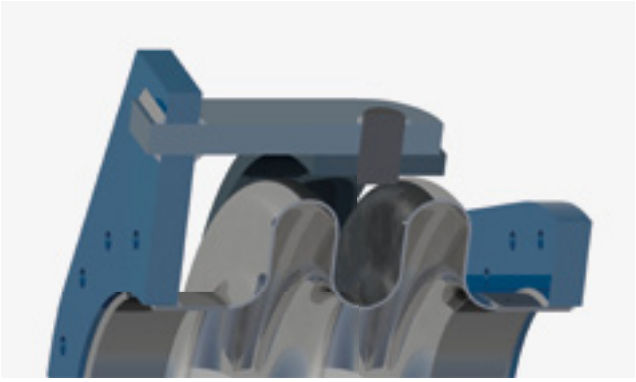
Cardan joint tensioners with ring
(angular expansion joint for all-around movement absorption)

Hinged tensioners

Single joint or cardan joint tensioners are installed on angular expansion joints for transferring axial reaction forces. The link joints are placed at the centre of the bellows axis in pairs and can absorb unilateral or allaround rotations. Single joint tensioners use an oval flange with connected tabs and bolts to form a two-shear connection which allows angular rotation only around the centre bolt axis. On cardan joint tensioners, the oval flanges are placed with tabs offset by 90° and connected with a gimbal ring or box. This allows an angular rotation around the bellows centre point in all directions. Lateral expansion joints are produced with double joint tensioners and an additional tab for unilateral movements and with cardan joint tensioners for all-around movements. The tensioning is generally placed externally and can also be placed on the inside, depending on expansion joint size, movement type, medium and ambient conditions. All metallic unalloyed components are galvanised or coated with an anti-rust primer. Versions mode from corrosion resistant materials or with special coatings are available on customer request.



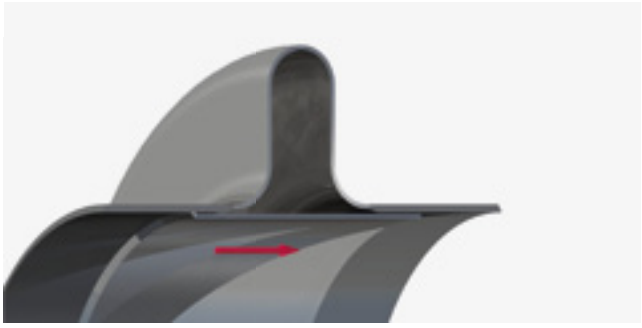
Detail of single joint tensioner



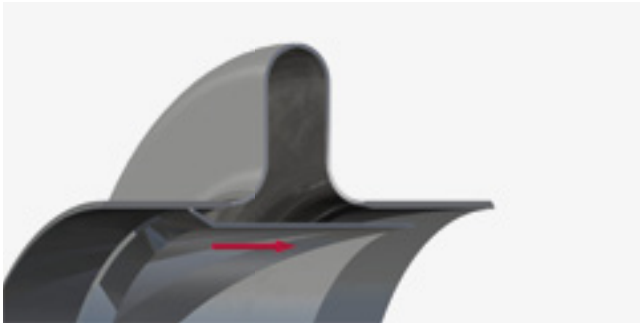
Detail of cardan joint tensioner

Inner sleeves

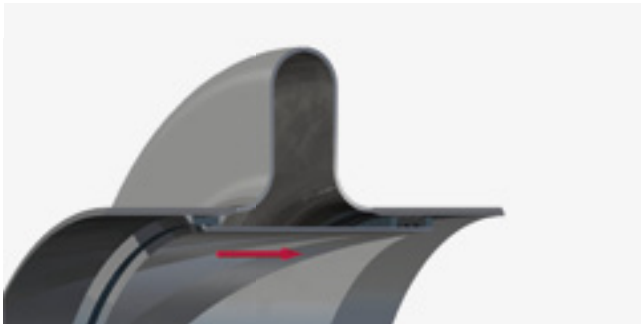
High flow velocities of the medium can cause turbulences and increased flow resistance (pressure loss) in piping with lens expansion joints. To minimise these effects and to transport the medium with as little swirling as possible, inner sleeves are placed into the expansion joint. For highly abrasive media, the lens convolution is protected by an inner sleeve with a suitable wall thickness, made from unalloyed (S235JR, P265GH), corrosion resistant (1.4541, 1.4571) or wear resistant steel (HARDOX®, XAR®), depending on the operating conditions. In operation, sufficient protection has to be ensured by covering the expansion joint convolutions and making the gap between inner sleeve and connecting pipe as small as possible. For this reason, a cylindrical inner sleeve is used for low axial movements and a telescopic inner sleeve for strong movements. Lateral and angular expansion joints are equipped with conical inner sleeves which still allow movement absorption and have a small air gap to the expansion joint even with maximum deflection. In all operating conditions, the movement absorption (axial, lateral, angular) of the lens expansion joint must not be affected by a guide pipe or inner sleeve. The cylindrical inner sleeves are fixed to the connecting parts (welding ends, welding neck flanges) with a fillet weld, directly or with a spacer ring, to ensure a continuous and even, radial clearance. Alternatively the connection can also be flared.



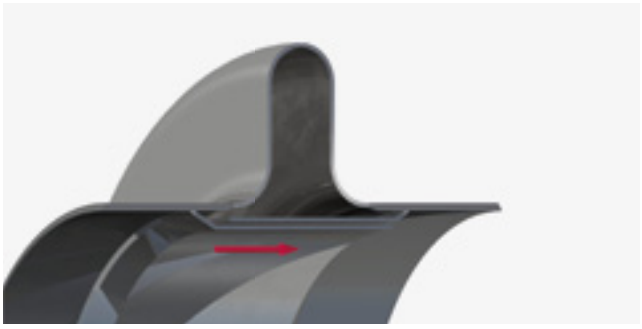
Cylindrical inner sleeve, plain



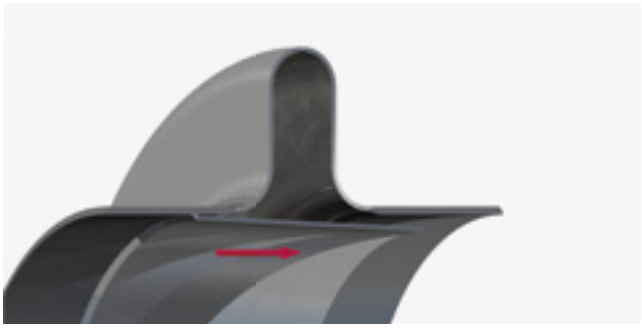
Cylindrical inner sleeve, flared



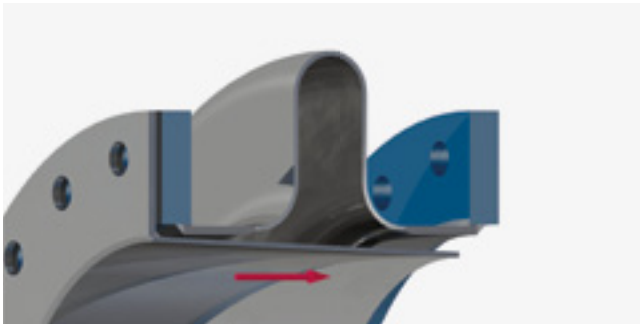
Cylindrical inner sleeve, with spacer ring



Telescopic inner sleeve



Conical inner sleeve



Superimposed inner sleeve

Quality standard

HKS has many decades of experience in the design and manufacturing of high-quality expansion joints. Experienced, trained specialist personnel and our extensive manufacturing options allows us to implement individual customer requests. A certified ISO 9001 quality management system, welder approval (AD 2000 HP0) and regular training of the welding personnel as well as over 70 different welding process tests allow us to manufacture expansion joints according to the Pressure Equipment Directive 97/23/EC. In addition to manufacturing, the testing of lens expansion joints has a high priority. Lens expansion joints which are not subject to the rules of the PED can be examined with different non-destructive test methods depending on customer requirements.

Welding seam testing by HKS and external testing bodies:

- VT visual test
- PT penetration test
- RT X-ray test
- UT ultrasound test
- MT magnetic particle test

In addition to welding seam testing, we offer various services for material testing in cooperation with a material testing association:

- Certification of resistance to intergranular corrosion (IGC)
- Certification of hot yield strength
- Notched bar impact testing at low temperatures
- UpDegreesing of quality certificate 3.1 into 3.2 (TÜV)

Dimensional tolerances

Lens expansion joints are subject to the general tolerances for welded constructions (ISO 13920) and are, as a rule, to be classified in tolerance class BF to CG. Tolerances for connection diameters are modelled on the common material standards for pipes. In this context it has to be noted that from a diameter of approx. 500 mm this is determined based on the circumference. For ovality, a tolerance of ± 0.5 % of the diameter is permitted. Lengths are defined separately and listed in the following table depending on nominal width and component length differently and following EN 14917 section 7.5.2.2. Component tolerances deviate for multi-convolution expansion joints or for very high convolutions. Smaller manufacturing tolerances can be implemented with greater manufacturing effort and are possible upon prior agreement.

Dimensional tolerances for overall length

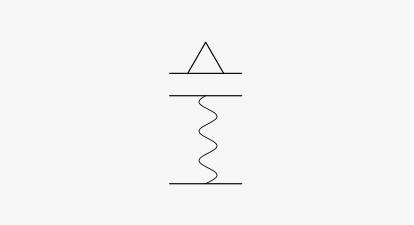
Nominal diameter DN	Length [mm]		
	< 400	400 - 1000	> 1000
≤ 500	± 3	± 4	± 5
550 - 1000	± 4	± 5	± 7
1100 - 2500	± 5	± 6	± 9
2600 - 4000	± 8	± 10	± 12
4100 - 6000	± 10	± 12	± 15

Installation in pipe systems

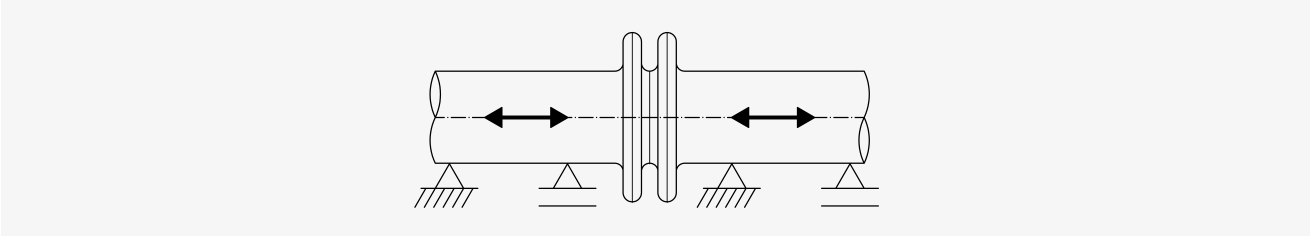
Expansion joints are used in piping systems to compensate for expansions. Combinations of several expansion joints for absorbing system specific movements have to be specially designed. This changes the stress on fixpoints and guides compared to an uncompensated system. On request, our HKS specialists can develop and manufacture individual system solutions as well as optimum arrangements of the system components ready for installation. The fixed bearings absorb additional reaction forces from the effective cross section and from the spring rate.

Fixed bearing

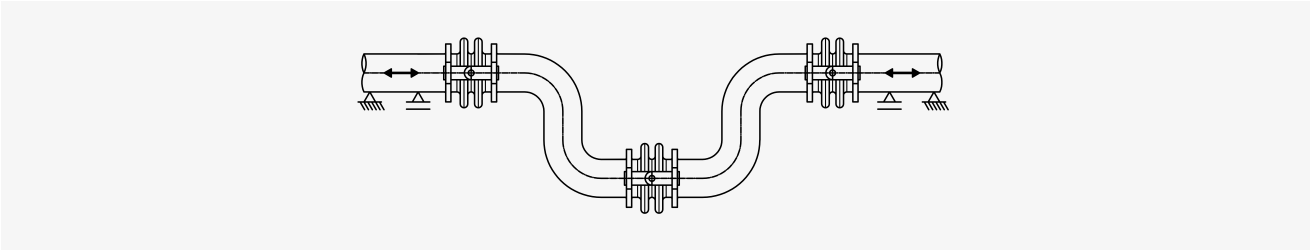
Floating bearing



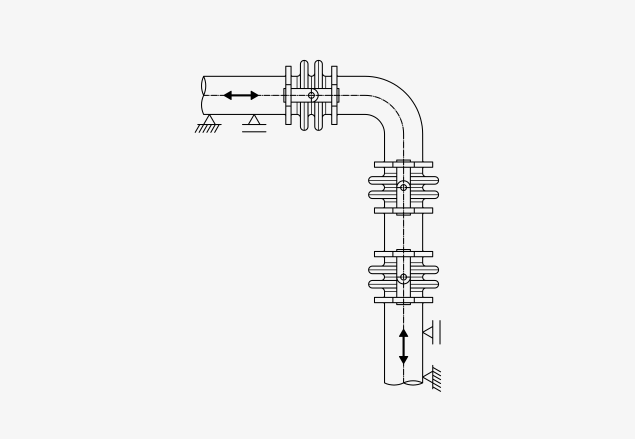
Spring bearing

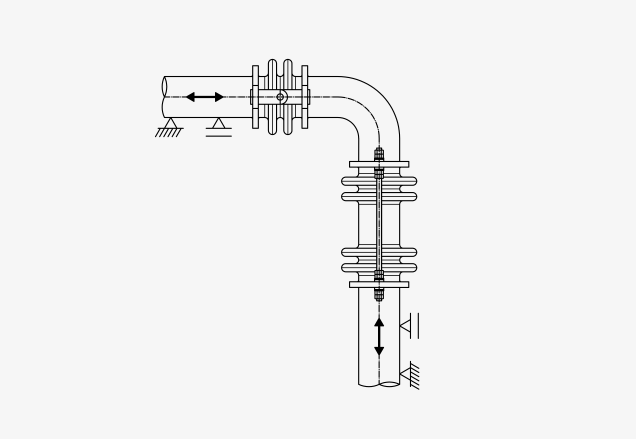


Absorption of axial expansion along the pipe axis using an axial expansion joint

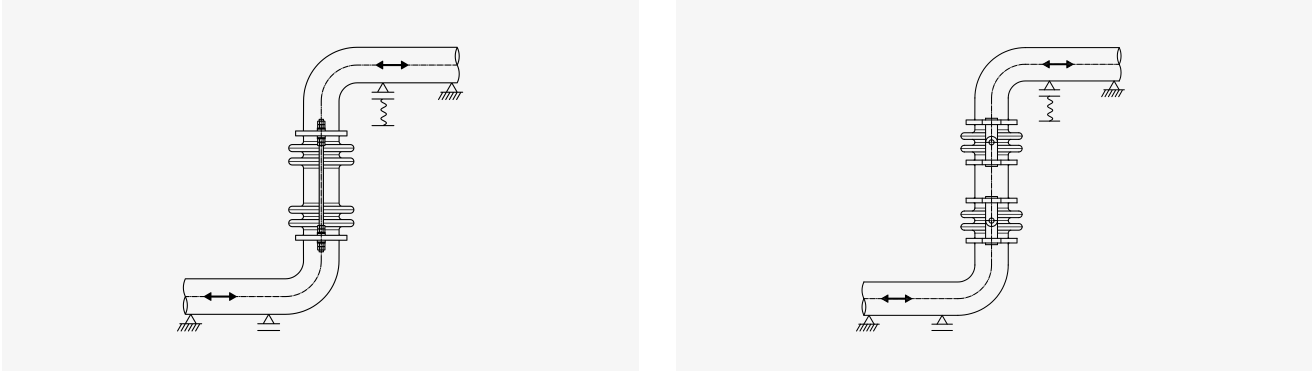


Axial expansions acting in a U-shaped arrangement are deflected in three angular movements (three hinges)**.**
This design is intended for absorbing large axial expansions in the pipe.





Axial expansions acting in an L-shaped arrangement are deflected in three angular movements (left) **or alternatively in one angular and one lateral movement** (right)**.**



Axial expansions are deflected in one lateral movement (left) **or alternatively in two angular movements** (right)**.**
The axes of rotation have to be placed at 90 degrees to the axial direction of expansion. Correct support of the piping system has to be ensured.

Design of lens expansion joints

The selection of an expansion joint is essentially determined by the expansion, the routing of the piping and the room situation. Expansion joints have to be selected in line with the basic movement types (axial, lateral, angular). In contrast to corrugated expansion joints, lens expansion joints are already possible with one convolution as a single bellows version, but they require at least three convolutions to absorb lateral movements. The use of expansion joints produces forces and moments which have to be absorbed by the fixed bearings of the piping system. Furthermore, superimposition of movements, temperature influences and increased stress cycles can lead to individual adaptations in dimensioning. For special applications in heat exchanger shells, we always recommend contacting our HKS specialists. On request, we are happy to support you with selecting the optimum expansion joint or to offer a customised product.

Thermal expansion of pipes

The thermal expansion caused by temperature change in pipes is one of the most frequent areas of application for expansion joints. The calculation of thermal expansion depends on the materials, the length of the piping and the temperature difference. For use in the shell of a shell-and-tube heat exchanger, the temperature and length differences between shell surface and tube bundle are the decisive factors.

$$\Delta L(\Delta T) = L \times \alpha \times T$$

ΔL(ΔT) = change in length depending on temperature difference [mm]
L = length of piping [mm]
α = coefficient of thermal expansion [1/K]
T = temperature difference [K]

Material	Length expansion coefficient α × 10-6 [1/K] between 20 °C and				
	100 °C	200 °C	300 °C	400 °C	500 °C
Ferritic steel	12.5	13.0	13.6	14.1	14.3
X6CrNiTi18-10 (1.4541)	16.0	16.5	17.0	17.5	18.0
X6CrNiMoTi17-12-2 (1.4571)	16.5	17.5	18.0	18.5	19.0
X2CrNiMo17-12-2 (1.4404)	16.0	16.5	17.0	17.5	18.0
Copper	15.5	16.0	16.5	17.0	17.5
Aluminium (AlMg3)	23.7	24.5	25.3	26.3	27.2
PE	200	-	-	-	-
PP	180	-	-	-	-
PVC	80	-	-	-	-

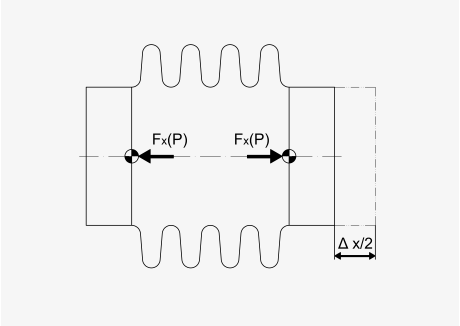
Forces and moments of expansion joints

Axial expansion joints:

The **axial reaction force** is the force in direction of the axis resulting from the operating pressure and the effective cross section.

$$F_x(P) = A_e \times P \times 10^{-2}$$

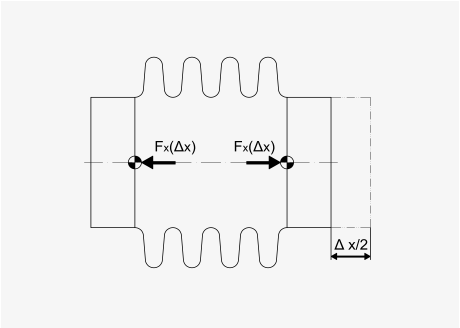
$F_x(P)$ = axial pressure force [kN]
A_e = effective cross section [cm²]
P = operating pressure [bar]



The **axial adjustment force** is the force required for axial deflection from the rest position. It is calculated from the axial adjustment force rate of the bellows and the movement absorption. The direction of stress (tensile force + or pressure force -) has to be taken into account.

$$F_x(\Delta x) = \pm C_{\Delta x} \times \frac{\Delta x}{2 \times N}$$

$F_x(\Delta x)$ = axial adjustment force [kN]
$C_{\Delta x}$ = axial adjustment force rate [kN/mm]
Δx = axial movement absorption [mm]
N = number of lens convolutions



Addition of both forces yields the axial overall force. The signs have to be taken into account.

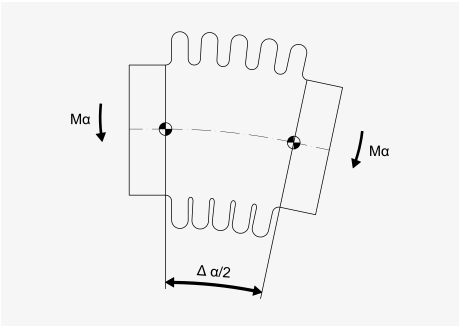
$$F_x = F_x(P) \pm F_x(\Delta x)$$

Angular expansion joints:

The **angular adjustment moment** is the force required for angular deflection from the rest position. It is calculated from the angular adjustment force rate and the angular movement absorption.

$$M_\alpha(\Delta\alpha) = C_{\Delta\alpha} \times \frac{\Delta\alpha}{2 \times N}$$

$M_\alpha(\Delta\alpha)$ = angular adjustment moment [kNm]
$C_{\Delta\alpha}$ = angular adjustment force rate [kNm/degrees
$\Delta\alpha$ = angular movement absorption [degrees]
N = number of lens convolutions



Taking into account operating conditions

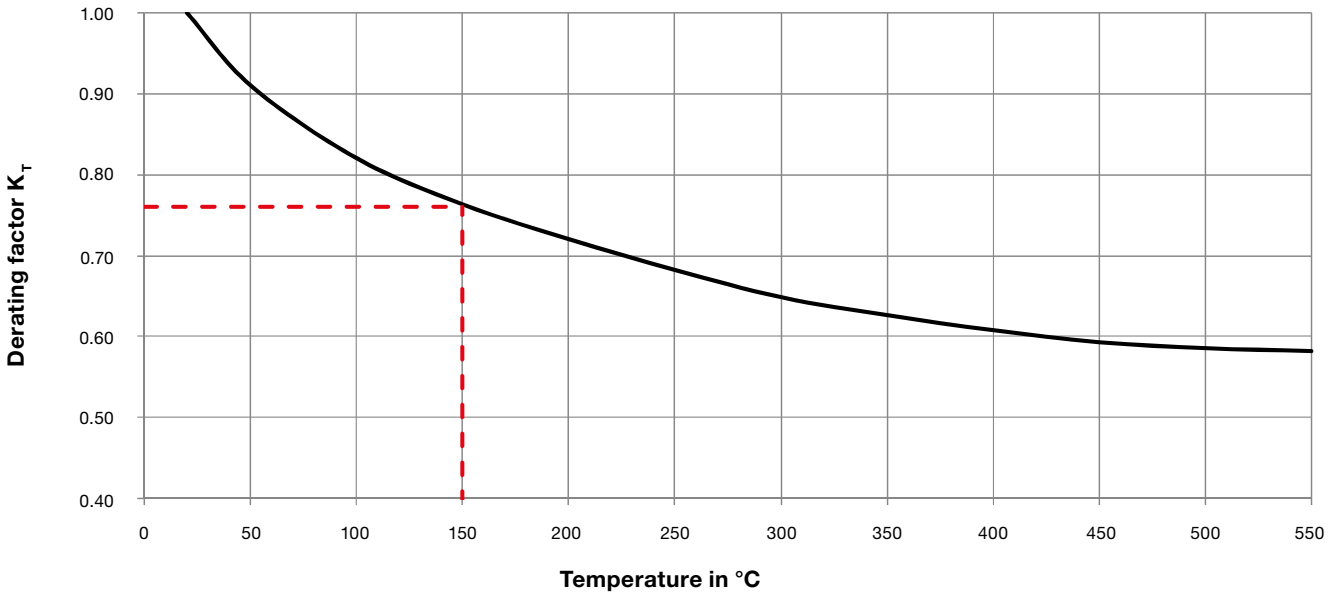
The table sheets contain the characteristic data for standard lens expansion joints. The lens selection only shows a very small part of the possible product range and is primarily intended to provide a general overview of the manufacturing options. All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, or EJMA unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. Operating conditions usually differ from these standard conditions. The table values can be adapted approximately to the actual operating conditions using derating or correction factors. For example, higher operating temperatures decrease the strength of a material and reduce the permitted operating pressure. Following the Wöhler curve (S-N curve), the movement absorption reduces as the number of stress cycles increases. The correction values are material-dependent and may only be applied to the table values.

Axial expansion joints:

$$P(T) = PS_{20\,°C} \times K_T$$

P(T) = maximum permitted operating pressure at design temperature [bar]
$PS_{20\,°C}$ = maximum permitted operating pressure at 20 °C [bar]
K_T = temperature derating factor

Temperature derating diagram



Temperature derating factor K_T for 1.4571												
Temperature [°C]	20	50	100	150	200	250	300	350	400	450	500	550
K_T	1.00	0.90	0.81	0.76	0.73	0.69	0.65	0.63	0.61	0.59	0.59	0.58

Influence of the number of stress cycles on the movement absorption

Axial

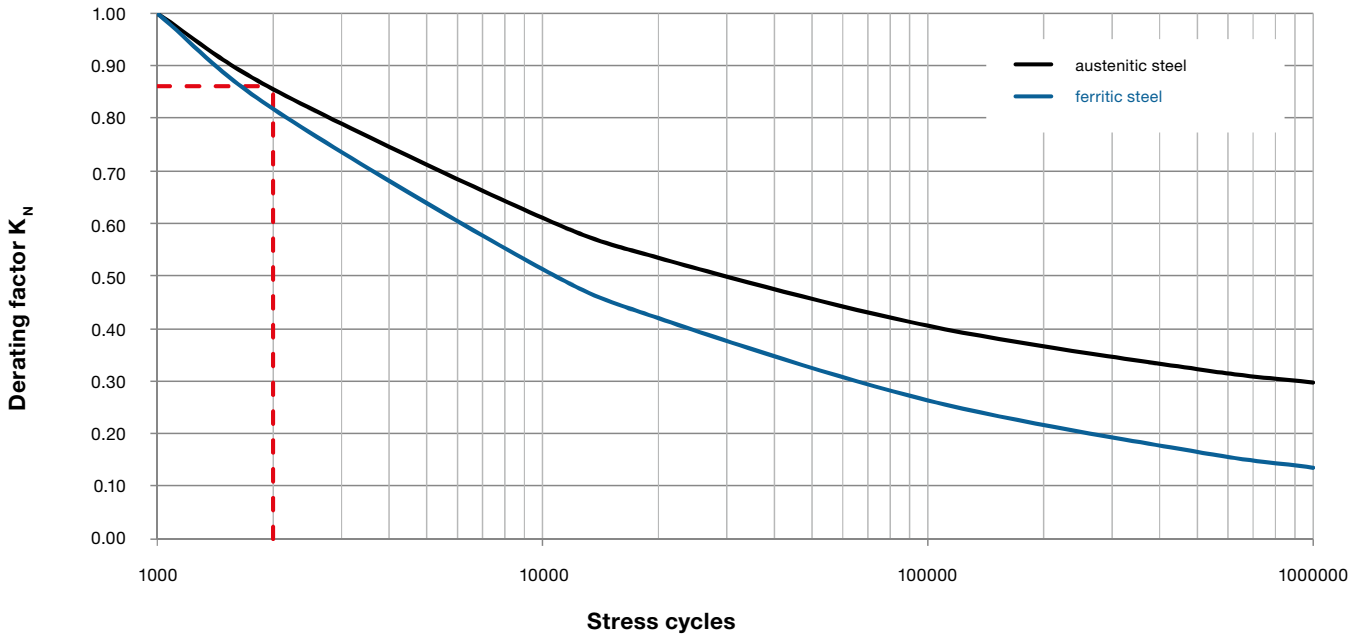
$$\Delta x(N) = \Delta x \times K_N$$

Angular

$$\Delta \alpha(N) = \Delta \alpha \times K_N$$

$\Delta x(N)$, $\Delta \alpha(N)$ = maximum permitted movement absorption at design conditions [mm]
Δx; $\Delta \alpha$ = nominal movement absorption from table values [mm]
K_N = temperature derating factor for movement at design number of stress cycles

Stress cycle derating diagram



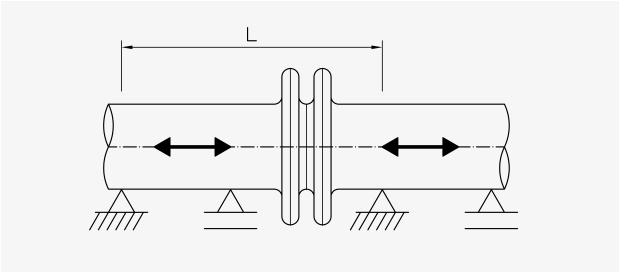
Stress cycle derating factor K_N								
number of stress cycles	1000	2000	5000	10000	20000	100000	500000	1000000
Austenitic steel	1.00	0.86	0.71	0.61	0.53	0.41	0.32	0.30
Ferritic steel	1.00	0.82	0.63	0.51	0.42	0.26	0.17	0.14

Example for selecting an expansion joint

The thermal expansion of a piping system during operation is to be absorbed by axial expansion joints. A pipe DN 350 is to be installed between two fixpoints with a centre distance of 12 m. The pipes are made of high-alloy austenitic steel (e.g. 1.4571). Water with an operating temperature of 150 °C and an operating pressure of 5 bar flows through the pipe. The piping is installed at an ambient temperature of at least 10 °C. The expansion joint is mounted into the pipe without any preset load. The entire system is subject to the Pressure Equipment Directive 97/23/EC). We are looking for a suitable lens expansion joint to be directly welded into the pipe and the associated horizontal reaction forces.

Operating data:

PS = 5 bar (operating pressure)
TS = 150 °C (operating temperature)
L = 12 m (length of pipe section)
T_0 = 10 °C (installation temperature)



Thermal expansion of the pipe section

$\Delta L(\Delta T) = L \times \alpha \times \Delta T$ — Length change due to temperature difference

ΔT = 150 °C – 10 °C = 140 K — Temperature difference
$\alpha = 17.5 \times 10^{-6}\ K^{-1}$ — Coefficient of thermal expansion for austenitic steel up to 200 °C
L = 12 m — Relevant calculation length between the fixpoints

$\Delta L(140\ K) = 12000\ mm \times 17{,}5 \times 10^{-6}\ K^{-1} \times 140\ K = 29.4\ mm$

Temperature-dependent pressure derating

$P(T) = PS_{20\,°C} \times K_T = 5\ bar$ — Permitted operating pressure due to operating temperature

K_T = 0.76 — Temperature derating factor (intermediate values have to be interpolated linearly)

$PS_{20\,°C,\,req} = P(T) / K_T = 5\ bar / 0.76 = 6.58\ bar$ — Required operating pressure at 20 °C according to table

Example for selecting an expansion joint

Expansion joints which are subject to the Pressure Equipment Directive 97/23/ EC (PED) have to be dimensioned, manufactured and tested according to a set of rules (e.g. AD2000, EN14917, EN13445, EN13480). AD2000 data sheet B13 stipulates that a stress cycle safety of SL= 5 has to be taken into account for the permitted number of stress cycles. Approx. 1000 stress cycles result over a period of 20 years with weekly startup and shutdown of the system. The permitted movement absorption is derated due to the higher required number of stress cycles of 5000.

$\Delta x(N) = \Delta x \times K_N = 29.4\ mm$ — Permitted movement absorption due to number of stress cycles

K_N = 0.71 — Stress cycle dependent derating factor for 5000 stress cycles

$\Delta x_{req} = \Delta x(N) / K_N = 29.4\ mm / 0.71 = 41.4\ mm$ — Required operating pressure at 20 °C according to table

Selection according to catalogue

Lens expansion joint DN 350

$PS_{20\ °C,\ req}$ = 6.58 bar **Δx_{req} = 41.4 mm**

For higher expansion absorption levels, the lens expansion joint is manufactured from multiple convolutions. As a result, the required expansion can be a multiple of the value specified in the tables, but the maximum permitted operating pressure at 20 °C has to be greater than the required value. Without a preset load on the expansion joint, only compression and a 50 % utilization of the expansion absorption can be used (41.4 mm / (50 % × 22 mm) = 3.76 convolutions -> 4 convolutions).

In the example an L-MB 0350 / 4 / 1 × 3 / 400 / 1.4571 with the following data:

Lens expansion joint with Nominal diameter DN 350 with 4 convolutions, a wall thickness of 3 mm and 400 mm length, made of material 1.4571 for direct welding into the piping 355.6 × 3.0 mm.

N = 4 number of lens convolutions
$PS_{20\ °C}$ = 7.9 bar maximum operating pressure at 20 °C
Δx = 22 mm permitted axial movement absorption at 20 °C and 1000 stress cycles
$C_{\Delta x}$ = 4.06 kN/mm axial adjustment force rate per convolution
A_e = 1679 cm² effective bellows cross section

Determining the reaction forces

Reaction force resulting from the operating pressure:

$F_x(P) = A_e \times PS \times 10^{-2}$ axial reaction force due to operating pressure

A_e = 1679 cm²	efficient bellows diameter
PS = 5 bar	operating pressure at operating temperature

$F_x(P) = 1679 \times 5 \times 10^{-2} = 83.95$ kN

To ensure best possible use of the movement absorption, expansion joints are usually installed with a preset load (pretensioned). The axial adjustment force results from the axial adjustment force rate (spring rate) and the movement. In this example, the pretensioning is omitted, therefore the axial movement is used in full forthe calculation ($\Delta x/2$ -> Δx).

$F_x(\Delta x) = \pm C_{\Delta x} \times \Delta x / N$

$C_{\Delta x}$ = 4.06 kN/mm	axial adjustment force rate per convolution
Δx = 29.4 mm	existing axial movement
N = 4	number of lens convolutions

$F_x(\Delta x) = \pm 4.06 \times 29.4 / 4 = 29.84$ kN

No preset load is required for installation of the expansion joint.

$F_x = F_x(P) + F_x(\Delta x)$
Fx = 83.95 kN + 29.84 kN = 113.79 kN

During operation, the expansion joint exerts an axial pressure force of approx. 114 kN on the anchor points. The dead weight of the pipes and additional parts as well as friction forces of plain bearings have to be taken into account for the dimensions of bearings. Loads have to be considered separately on the test bench.

HKS type designation for lens expansion joints

L- A F X 3000 / 003 / A070 / V / V - 1015 - 1045

Movement alignment
A – Axial movement
W – Angle movement
K – Cardan movement
L – Lateral movement
R – Radial movement

Version
N – Standard version
F – Inner sleeve/guide pipe
S – External protective sleeve
T – Telescopic sleeve
B – Inner sleeve and protective sleeve
D – Double shell
M – Double bellows version
P – Double bellows + inner sleeve
K – Corner relief

Special model (optional)

DN/NW
Nominal diameter in line with DIN 2402 in mm (always 4 digits)

PN
Pressure level in line with DIN 2401 (always 3 digits, rounded without decimals)

Total stroke (movement)
A – Axial (mm)
L – Lateral (mm)
W – Angle (degrees)
(always 3 digits per movement data)

1. Page / 2. Page

Connection parts
B – Swivel flange
F – Fixed flange
V – Welding neck flange
R – Weld end
S – Custom made flange
K – Customer part
D – Welding collar + swivel flange
Bs – Welded collar

Length in mm

Pretensioning (optional)

HKS type designation for rectangular lens expansion joints

L-RE T 0600 x 0400 / 001 / A120 / WF / WF - 775 - 835

Rectangular lens expansion joint

Version
N – Standard version
F – Inner sleeve/guide pipe
S – External protective sleeve
T – Telescopic sleeve
B – Inner sleeve and protective sleeve
D – Double shell
M – Double bellows version
P – Double bellows + inner sleeve

Connection dimensions in mm (always 2x4 digits)

PN
Pressure level in line with DIN 2401 (always 3 digits, rounded without decimals)

Total stroke (movement)
A – Axial (mm)
L – Lateral (mm)
W – Angle (degrees)
(always 3 digits per movement data)

1. Page / 2. Page

Connection parts
F – Fixed flange
R – Weld end
S – Custom made flange
K – Customer part
WF - angle flange

Length in mm

Pretensioning (optional)

HKS type designation for **metal bellows** (circular, rectangular, oval)

L- MB 1200 / 0,5 / 1 × 3 / 50 / 1.4404

Lenses
L – lenses (circular)
L-RE – lenses (rectangular)
L-OV – lenses (oval)

Metal bellows

DN / NW
Nominal diameter in line with DIN 2402 in mm (always 4 digits)

alternative:
0820 × 1370
connection dimensions in mm for rectangular or oval lens bellows (always 2 x 4 digits)

Number of convolutions
(0.5 in this case means: a half shell, only possible for lenses)

Number of layers x wall thickness

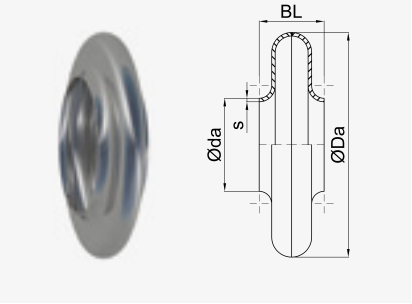
Length in mm

Material

LENS EXPANSION JOINT

Type L-MB

1 convolution



max. 7 convolutions

HKS lens expansion joints with round design up to Nominal diameter 500 consist of two moulded half shells forming one convolution, connected with a circumferential welding seam. The individual convolution create singleconvolution or multi-convolution lens expansion joints. The single-ply wall allows direct butt seam connections to standardised pipe sizes in line with EN 10216/10217 ff.

Materialcombination[1]	Bellows material	Permitted operating temperature TS[2]
Unalloyed steel	1.0425(P265GH)	-10 °C bis 400 °C
Low-alloy steel	1.5415(16Mo3)	bis 530 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)	-196 °C bis 550 °C
Heat resistant steel	1.4878 (X8CrNiTi18-10) 1.4828 (X15CrNiSi20-12)	bis 900 °C
Nickel-base alloy	2.4856 (NiCr22Mo9Nb - Alloy 625) 2.4858 (NiCr21Mo - Alloy 825)	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. The specified maximum permitted operating temperatures refer to the application in pressure vessels and can be < 0.5 bar higher in low pressure operation.

Individual versions

On request, expansion joints can be manufactured with individual dimensions far exceeding the standard specified in the tables. For example, a reduction of the convolution height reduces the movement absorption and increases the maximum permitted operating pressure. The lens expansion joint is individually tailored using these and other parameters. Our HKS specialists offer a suitable solution for any installation situation.

On customer request:

- With 30° groove or special dimensions
- Connection variants with swivel, fixed or welding neck flanges or welding ends
- As a universal expansion joint in double bellows version
- With tie rods as an angular or lateral expansion joint
- Heat treatment (normal or solution annealing)
- Temperature resistant special coatings
- Pickling of high-alloy, stainless steels
- Sandblasting of unalloyed or low-alloyed steels

Tasks

- Absorption of axial and/or angular movements
- Reduction of tensions as well as forces andmoments in connections
- Compensation of installation inaccuracies
- Compensating for settling of buildings

Areas of application

- Plant engineering
- Apparatus engineering (heat exchanger)
- Power station construction
- Pipeline construction
- Mechanical engineering
- Steel, iron and smelting industry
- Cement industry
- Flue gas desulphurisation plants
- Chemical and pharmaceutical industry, acid production

Installation in heat exchangers

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- Nozzle (threaded sleeve or nipple) for draining, venting or cleaning
- Heat resistant insulation of the convolution

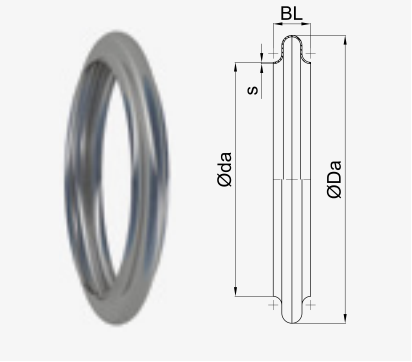
Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
32	42.4	145	60	2	2 - 3	16	4	4.7	2.8	3	66.1	1.36	0.07
40	48.3	145	60	2	2 - 3	20	3.8	4.4	2.5	2.9	70.4	1.98	0.1
50	60.3	185	60	2	2 - 3	10	5	5.3	4	3.6	115	0.85	0.07
50	60.3	250	60	2	2 - 3	2.8	10	5.8	9	4	185	0.17	0.03
65	76.1	185	60	2	2 - 3	10	4	4.4	3	3.5	130	1.06	0.08
65	76.1	270	60	2	2 - 3	3	11	6.8	10	4.6	230	0.2	0.04
80	88.9	145	56	2	2 - 3	53	2.8	2.3	2.2	1.8	104	36.7	1.65
80	88.9	350	60	2	2 - 3	1.2	17	8	15	5.5	372	0.08	0.03
100	114.3	185	60	2	2 - 3	34	4.4	2.9	3.6	2.4	172	19.8	1.46
100	114.3	350	100	2	2 - 3	3.8	16	7.5	12	4.4	417	0.23	0.07
125	139.7	220	80	2	2 - 3	30	4.7	2.6	3.8	2.1	249	28	2.93
125	139.7	350	90	2	2 - 3	2.9	15	7.1	13	5.4	464	0.31	0.09
150	168.3	275	80	2	2 - 4	17.6	8.3	3.6	6.7	3	379	9.89	1.63
150	168.3	400	80	2	2 - 4	3.4	19	6.8	15	4.2	626	0.39	0.14
175	193.7	300	80	2	2 - 4	16.7	9.1	3.6	7.3	3	471	10.1	1.97
175	193.7	435	90	2	2 - 4	2.9	22	6.6	17	4.5	767	0.32	0.13
200	219.1	350	100	3	2 - 4	24	9.8	3.4	8	2.8	623	18.5	4.9
200	219.1	480	106	3	2 - 4	5.6	19	6	13	4	944	1.01	0.51
250	273	435	100	3	2 - 6	15.1	15	4.4	12	3.6	968	9.44	3.88
250	273	525	100	3	2 - 6	6	20	5.4	13	3.6	1232	1.26	0.76
300	323.9	525	100	3	2 - 6	9.5	24	5.6	19	4.6	1396	5.03	3.02
300	323.9	600	106	3	2 - 6	5.2	25	6.1	17	4.1	1655	1.12	0.89
350	355.6	575	100	3	2 - 6	7.9	29	6	22	4.6	1679	4.06	2.93
350	355.6	650	110	3	2 - 6	5	28	6.3	18	4	1962	1.01	0.94
400	406.4	600	120	3	2 - 6	10.7	23	4.6	18	3.8	1966	7.99	6.26
400	406.4	700	126	3	2 - 6	5	26	5.4	18	3.6	2378	1.33	1.44
450	457	650	120	3	2 - 6	10.3	23	4.3	19	3.4	2381	8.21	7.56
450	457	750	126	3	2 - 6	4.7	46	7.4	37	6	2833	2.48	3.05
500	508	700	126	3	2 - 8	10.2	23	3.9	18	3.1	2837	9.29	9.93
500	508	800	126	3	2 - 8	4.6	48	7.3	39	5.9	3329	2.59	3.62

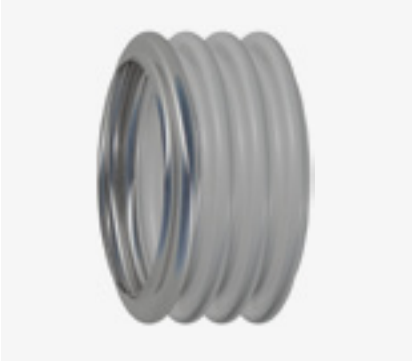
Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

LENS EXPANSION JOINT

1 convolution



max. 7 convolutions



HKS lens expansion joints with round design from Nominal diameter 550 consist of two flanged half shells forming one convolution, connected with a circumferential welding seam. The individual convolution create singleconvolution or multi-convolution lens expansion joints. The single-ply wall allows direct butt seam connections to standardised pipe sizes.

Materialcombination [1]	Bellows material	Permitted operating temperature TS [2]
Unalloyed steel	1.0425 (P265GH)	-10 °C bis 400 °C
Low-alloy steel	1.5415 (16Mo3)	bis 530 °C
Stainless steel	1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2) 1.4404 (X2CrNiMo17-12-2)	-196 °C bis 550 °C
Heat resistant steel	1.4878 (X8CrNiTi18-10) 1.4828 (X15CrNiSi20-12)	bis 900 °C
Nickel-base alloy	2.4856 (NiCr22Mo9Nb - Alloy 625) 2.4858 (NiCr21Mo - Alloy 825)	-196 °C bis 450 °C

1. Chemical resistance depends on temperature and medium and has to be tested or requested.
2. The specified maximum permitted operating temperatures refer to the application in pressure vessels and can be < 0.5 bar higher in low pressure operation.

Tasks

- Absorption of axial and/or angular movements
- Reduction of tensions as well as forces and moments in connections
- Compensation of installation inaccuracies
- Compensating for settling of buildings

Areas of application

- Plant engineering
- Apparatus engineering (heat exchanger)
- Power station construction
- Pipeline construction
- Mechanical engineering
- Steel, iron and smelting industry
- Cement industry
- Flue gas desulphurisation plants
- Chemical and pharmaceutical industry, acid production

Expansion joints with a nominal pressure ≤ 0.5 bar are not subject to the stipulations of the Pressure Equipment Directive (PED) 97/23/EC. Subject to deviations of the components from the ideal shape due to manufacturing (geometric imperfection). Observe manufacturer's information, installation information, load information and corrosive ambient influences.

Type L-MB

ANGULAR EXPANSION JOINT

LATERAL EXPANSION JOINT

Individual versions

On request, expansion joints can be manufactured with individual dimensions far exceeding the standard specified in the tables. For example, a reduction of the convolution height reduces the movement absorption and increases the maximum permitted operating pressure. The lens expansion joint is individually tailored using these and other parameters. Our HKS specialists offer a suitable solution for any installation situation.

On customer request:

- With 30° groove or special dimensions
- Connection variants with swivel, fixed or welding neck flanges or welding ends
- As a universal expansion joint in double bellows version and with middle pipe
- With tie rods as an angular or lateral expansion joint
- Heat treatment (normal or solution annealing)

Expansions:

- Inner sleeve, telescopic inner sleeve or conical inner sleeve
- Inner lining with wear protection material (HARDOX®)
- Length fixing with welded-in braces
- Nozzle (threaded sleeve or nipple) for draining, venting or cleaning
- Heat resistant insulation of the convolution

Surface treatments:

- Pickling of high-alloy, stainless steels
- Glass bead blasting of corrosion resistant steel
- Sandblasting of unalloyed or low-alloyed steels
- Temperature resistant special coatings
- Special custom rubber coating for highly corrosive media

Packaging and transport:

- Seafreight packaging in wooden boxes or airfreight packaging in wooden crate
- Heat treatment of the wooden packaging to IPPS standard possible
- VCI corrosion protection for transport with film (VALENO®) or oil (PERIGOL®)
- Special transport for large Nominal diameters with inclined support or escort vehicle
- Separating large nominal widths for transport in 2 x 180° or 3 x 120° segments and packaging in transport frames
- Managing of customs affairs or provision of export documents for deliveries to non-EU countries

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
550	558	850	120	2	2 - 8	2.8	38	6.8	25	4.2	3871	0.58	0.92
600	610	900	120	2	2 - 8	2.8	38	6.4	25	4.1	4454	0.63	1.11
650	660	950	120	2	2 - 8	2.8	39	6.2	26	3.9	5065	0.66	1.3
700	711	1000	120	2	2 - 8	2.8	40	6	27	3.8	5722	0.69	1.52
750	762	1050	120	2	2 - 8	2.8	41	5.7	27	3.6	6419	0.73	1.76
800	813	1100	120	2	2 - 8	2.8	42	5.5	28	3.4	7156	0.77	2.03
850	864	1150	120	2	2 - 8	2.8	42	5.4	28	3.3	7933	0.8	2.33
900	914	1200	120	2	2 - 8	2.8	43	5.1	29	3.2	8742	0.83	2.62
950	970	1250	120	2	2 - 8	2.9	43	4.8	28	3	9643	0.92	3.16
1000	1016	1300	120	2	2 - 8	2.8	45	4.8	30	3	10496	0.9	3.33
1050	1070	1380	120	2	2 - 8	2.3	52	5.4	35	3.3	11748	0.71	2.94
1100	1120	1430	120	2	2 - 8	2.3	53	5.3	35	3.3	12728	0.72	3.24
1150	1170	1480	120	2	2 - 8	2.3	54	5.1	36	3.2	13748	0.74	3.55
1200	1220	1530	120	2	2 - 8	2.3	54	4.9	36	3.1	14806	0.76	3.88
1250	1270	1580	120	2	2 - 8	2.3	55	4.8	36	3	15904	0.78	4.24
1300	1320	1630	120	2	2 - 8	2.2	56	4.7	38	3	17042	0.79	4.62
1350	1370	1680	120	2	2 - 8	2.2	56	4.6	38	3	18218	0.81	5.02
1400	1420	1730	120	2	2 - 8	2.2	57	4.5	38	2.8	19434	0.83	5.44
1450	1470	1780	120	2	2 - 8	2.2	57	4.3	39	2.7	20689	0.85	5.9
1500	1520	1830	120	2	2 - 8	2.2	58	4.2	39	2.6	21983	0.87	6.38
1550	1570	1880	120	2	2 - 8	2.2	58	4.1	39	2.6	23317	0.89	6.89
1600	1620	1950	120	2	2 - 8	1.9	64	4.5	44	2.7	24969	0.76	6.33
1650	1670	2000	120	2	2 - 8	1.9	64	4.3	43	2.7	26389	0.78	6.81
1700	1720	2050	120	2	2 - 8	1.9	64	4.2	43	2.6	27848	0.8	7.31
1750	1770	2100	120	2	2 - 8	1.9	64	4.1	43	2.5	29347	0.81	7.84
1800	1820	2150	120	2	2 - 8	1.8	65	4	45	2.5	30885	0.83	8.39
1850	1870	2200	120	2	2 - 8	1.8	65	3.9	45	2.5	32462	0.85	8.97
1900	1920	2250	120	2	2 - 8	1.8	65	3.9	44	2.4	34078	0.86	9.57
2000	2020	2400	120	2	2 - 8	1.3	83	4.6	57	2.8	38291	0.6	7.56
2100	2120	2500	120	2	2 - 8	1.3	83	4.5	56	2.7	41838	0.62	8.53
2200	2220	2600	120	2	2 - 8	1.3	83	4.2	56	2.6	45542	0.65	9.58
2300	2320	2700	120	2	2 - 8	1.2	83	4.1	59	2.6	49403	0.67	10.8
2400	2420	2800	120	2	2 - 8	1.2	84	3.9	58	2.5	53421	0.7	12
2500	2520	2900	120	2	2 - 8	1.2	83	3.8	58	2.4	57596	0.73	13.4
2600	2620	3000	120	2	2 - 8	1.1	83	3.5	60	2.4	61928	0.75	14.8
2700	2720	3100	120	2	2 - 8	1.1	82	3.4	59	2.3	66417	0.78	16.4
2800	2820	3200	120	2	2 - 8	1.1	82	3.3	59	2.1	71064	0.8	18
2900	2920	3300	120	2	2 - 8	1.1	82	3.2	59	2	75867	0.83	19.8
3000	3020	3400	120	2	2 - 8	1	81	3.1	61	2	80828	0.85	21.7
3100	3120	3500	120	2	2 - 8	1	81	3	60	2	85946	0.88	23.6

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
3200	3220	3600	120	2	2 - 8	1	80	2.8	60	1.9	91220	0.91	25.7
3300	3320	3700	120	2	2 - 8	1	80	2.7	60	1.9	96652	0.93	27.9
3400	3420	3800	120	2	2 - 8	1	80	2.6	59	1.8	102241	0.96	30.3
3500	3520	3900	120	2	2 - 8	0.9	79	2.6	62	1.8	107987	0.98	32.8
3600	3620	4000	120	2	2 - 8	0.9	79	2.5	61	1.8	113890	1.01	35.4
3700	3720	4100	120	2	2 - 8	0.9	79	2.4	61	1.7	119950	1.03	38.1
3800	3820	4200	120	2	2 - 8	0.9	78	2.4	61	1.7	126167	1.06	41
3900	3920	4300	120	2	2 - 8	0.9	78	2.3	60	1.6	132542	1.08	43.9
4000	4020	4400	120	2	2 - 8	0.9	78	2.3	60	1.6	139073	1.11	47.1

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
550	558	850	140	2.5	2.5 - 8	4.4	32	5.4	19	3.4	3865	1.25	1.99
600	610	900	140	2.5	2.5 - 8	4.5	32	5.1	20	3.3	4448	1.34	2.38
650	660	950	140	2.5	2.5 - 8	4.4	33	5	20	3.2	5059	1.39	2.75
700	711	1000	140	2.5	2.5 - 8	4.4	35	4.8	22	3.1	5715	1.45	3.19
750	762	1050	140	2.5	2.5 - 8	4.4	35	4.7	22	3	6412	1.52	3.69
800	813	1100	140	2.5	2.5 - 8	4.4	36	4.5	23	2.8	7149	1.59	4.21
850	864	1150	140	2.5	2.5 - 8	4.4	37	4.3	23	2.7	7925	1.65	4.79
900	914	1200	140	2.5	2.5 - 8	4.4	38	4.2	23	2.6	8734	1.7	5.37
950	970	1250	140	2.5	2.5 - 8	4.5	38	4	23	2.5	9634	1.87	6.42
1000	1016	1300	140	2.5	2.5 - 8	4.4	39	4	24	2.5	10487	1.84	6.82
1050	1070	1380	140	2.5	2.5 - 8	3.6	46	4.5	29	2.7	11738	1.44	6.04
1100	1120	1430	140	2.5	2.5 - 8	3.6	47	4.3	30	2.7	12718	1.47	6.6
1150	1170	1480	140	2.5	2.5 - 8	3.5	47	4.2	30	2.7	13737	1.5	7.19
1200	1220	1530	140	2.5	2.5 - 8	3.5	48	4.1	30	2.6	14795	1.52	7.83
1250	1270	1580	140	2.5	2.5 - 8	3.5	49	4	32	2.5	15893	1.55	8.51
1300	1320	1630	140	2.5	2.5 - 8	3.5	49	3.9	32	2.5	17030	1.58	9.23
1350	1370	1680	140	2.5	2.5 - 8	3.4	50	3.9	32	2.5	18206	1.61	10
1400	1420	1730	140	2.5	2.5 - 8	3.4	50	3.8	32	2.4	19421	1.64	10.8
1450	1470	1780	140	2.5	2.5 - 8	3.4	51	3.6	32	2.3	20676	1.67	11.7
1500	1520	1830	140	2.5	2.5 - 8	3.4	51	3.5	33	2.3	21970	1.71	12.6
1550	1570	1880	140	2.5	2.5 - 8	3.4	52	3.5	33	2.1	23303	1.74	13.5
1600	1620	1950	140	2.5	2.5 - 8	3	57	3.8	35	2.4	24955	1.48	12.4
1650	1670	2000	140	2.5	2.5 - 8	3	58	3.6	35	2.3	26375	1.52	13.3
1700	1720	2050	140	2.5	2.5 - 8	3	58	3.5	35	2.3	27833	1.55	14.3
1750	1770	2100	140	2.5	2.5 - 8	3	58	3.4	35	2.1	29332	1.58	15.3
1800	1820	2150	140	2.5	2.5 - 8	2.9	58	3.4	36	2.1	30869	1.61	16.4
1850	1870	2200	140	2.5	2.5 - 8	2.9	58	3.3	36	2	32446	1.64	17.5
1900	1920	2250	140	2.5	2.5 - 8	2.9	58	3.2	36	2	34062	1.67	18.6
2000	2020	2400	140	2.5	2.5 - 8	2.1	74	3.9	46	2.4	38273	1.16	14.7
2100	2120	2500	140	2.5	2.5 - 8	2	74	3.6	48	2.4	41819	1.21	16.6
2200	2220	2600	140	2.5	2.5 - 8	2	74	3.5	48	2.3	45523	1.25	18.6
2300	2320	2700	140	2.5	2.5 - 8	1.9	74	3.4	49	2.3	49383	1.29	20.7
2400	2420	2800	140	2.5	2.5 - 8	1.9	75	3.3	49	2.1	53400	1.34	23
2500	2520	2900	140	2.5	2.5 - 8	1.8	75	3.2	50	2.1	57575	1.38	25.6
2600	2620	3000	140	2.5	2.5 - 8	1.8	74	3.1	49	2	61906	1.43	28.3
2700	2720	3100	140	2.5	2.5 - 8	1.8	74	2.8	49	1.9	66395	1.48	31.2
2800	2820	3200	140	2.5	2.5 - 8	1.7	73	2.7	50	1.9	71040	1.53	34.3
2900	2920	3300	140	2.5	2.5 - 8	1.7	73	2.7	49	1.8	75843	1.57	37.7
3000	3020	3400	140	2.5	2.5 - 8	1.7	73	2.6	49	1.7	80803	1.62	41.2

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
3100	3120	3500	140	2.5	2.5 - 8	1.6	73	2.5	50	1.7	85920	1.67	44.9
3200	3220	3600	140	2.5	2.5 - 8	1.6	72	2.4	49	1.7	91194	1.72	48.9
3300	3320	3700	140	2.5	2.5 - 8	1.6	72	2.3	49	1.6	96625	1.76	53.1
3400	3420	3800	140	2.5	2.5 - 8	1.6	71	2.3	49	1.6	102213	1.81	57.5
3500	3520	3900	140	2.5	2.5 - 8	1.6	71	2.1	49	1.5	107958	1.86	62.1
3600	3620	4000	140	2.5	2.5 - 8	1.5	71	2.1	50	1.5	113860	1.91	67
3700	3720	4100	140	2.5	2.5 - 8	1.5	71	2	50	1.5	119919	1.95	72.1
3800	3820	4200	140	2.5	2.5 - 8	1.5	70	1.9	49	1.3	126136	2	77.5
3900	3920	4300	140	2.5	2.5 - 8	1.5	70	1.9	49	1.3	132509	2.05	83.1
4000	4020	4400	140	2.5	2.5 - 8	1.4	70	1.8	50	1.3	139040	2.09	89

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
700	711	1000	160	3	3 - 10	4.9	48	5.8	39	4.7	5708	4.15	9.06
750	762	1050	160	3	3 - 10	4.8	49	5.7	40	4.7	6405	4.27	10.3
800	813	1100	160	3	3 - 10	4.8	51	5.6	41	4.6	7141	4.4	11.7
850	864	1150	160	3	3 - 10	4.7	51	5.3	41	4.2	7917	4.51	13.1
900	914	1200	160	3	3 - 10	4.6	50	4.9	40	3.9	8726	4.55	14.4
950	970	1250	160	3	3 - 10	4.6	47	4.4	37	3.5	9625	4.85	16.6
1000	1016	1300	160	3	3 - 10	4.5	47	4.3	37	3.4	10478	4.71	17.5
1050	1070	1380	160	3	3 - 10	3.7	56	4.8	43	3.7	11729	3.63	15.2
1100	1120	1430	160	3	3 - 10	3.7	55	4.5	42	3.5	12708	3.69	16.5
1150	1170	1480	160	3	3 - 10	3.7	54	4.3	42	3.3	13727	3.75	18
1200	1220	1530	160	3	3 - 10	3.6	54	4.1	41	3.2	14785	3.81	19.6
1250	1270	1580	160	3	3 - 10	3.6	53	4	41	3	15882	3.87	21.2
1300	1320	1630	160	3	3 - 10	3.5	53	3.8	40	2.9	17018	3.92	22.9
1350	1370	1680	160	3	3 - 10	3.5	52	3.6	40	2.8	18194	3.96	24.5
1400	1420	1730	160	3	3 - 10	3.5	51	3.5	39	2.7	19409	4	26.3
1450	1470	1780	160	3	3 - 10	3.5	51	3.4	38	2.5	20663	4.03	28
1500	1520	1830	160	3	3 - 10	3.4	50	3.2	38	2.5	21957	4.06	29.8
1550	1570	1880	160	3	3 - 10	3.4	50	3.1	38	2.4	23290	4.1	31.8
1600	1620	1950	160	3	3 - 10	3.2	52	3.9	38	2.9	24941	3.72	30.8
1650	1670	2000	160	3	3 - 10	3.1	52	3.8	38	2.8	26360	3.78	33
1700	1720	2050	160	3	3 - 10	3.1	53	3.7	39	2.8	27819	3.86	35.5
1750	1770	2100	160	3	3 - 10	3.1	53	3.5	39	2.6	29316	3.92	37.7
1800	1820	2150	160	3	3 - 10	3.1	53	3.5	39	2.5	30853	3.98	40.1
1850	1870	2200	160	3	3 - 10	3.1	53	3.4	39	2.5	32430	4.04	42.6
1900	1920	2250	160	3	3 - 10	3	53	3.3	39	2.5	34045	4.1	45.2
2000	2020	2400	160	3	3 - 10	3	67	3.9	44	2.5	38256	4.21	50.6
2100	2120	2500	160	3	3 - 10	3	67	3.7	44	2.4	41801	4.31	56.4
2200	2220	2600	160	3	3 - 10	3	67	3.5	43	2.3	45504	4.4	62.4
2300	2320	2700	160	3	3 - 10	3	67	3.4	43	2.3	49363	4.49	68.7
2400	2420	2800	160	3	3 - 10	3	67	3.3	43	2.1	53380	4.56	75.3
2500	2520	2900	160	3	3 - 10	2.9	67	3.2	44	2	57553	4.69	83.2
2600	2620	3000	160	3	3 - 10	2.9	67	3	44	2	61884	4.82	91.6
2700	2720	3100	160	3	3 - 10	2.9	69	2.9	44	1.9	66372	4.95	101
2800	2820	3200	160	3	3 - 10	2.9	69	2.8	44	1.9	71017	5.07	110
2900	2920	3300	160	3	3 - 10	2.8	69	2.8	44	1.7	75819	5.18	120
3000	3020	3400	160	3	3 - 10	2.8	67	2.6	44	1.7	80778	5.3	130
3100	3120	3500	160	3	3 - 10	2.8	67	2.5	44	1.6	85894	5.41	141
3200	3220	3600	160	3	3 - 10	2.8	67	2.5	44	1.6	91167	5.52	152
3300	3320	3700	160	3	3 - 10	2.8	66	2.4	43	1.5	96597	5.65	165
3400	3420	3800	160	3	3 - 10	2.7	66	2.3	44	1.5	102184	5.79	179

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
3500	3520	3900	160	3	3 - 10	2.7	66	2.3	43	1.5	107929	5.93	193
3600	3620	4000	160	3	3 - 10	2.7	66	2.1	43	1.5	113830	6.06	207
3700	3720	4100	160	3	3 - 10	2.7	65	2.1	43	1.4	119889	6.2	223
3800	3820	4200	160	3	3 - 10	2.7	65	2	43	1.4	126104	6.33	239
3900	3920	4300	160	3	3 - 10	2.7	65	2	43	1.4	132477	6.46	256
4000	4020	4400	160	3	3 - 10	2.7	65	1.9	43	1.2	139007	6.59	273

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
700	711	1000	180	4	3 - 10	8.5	39	4.8	32	3.9	5695	9.44	20.6
750	762	1050	180	4	3 - 10	8.4	40	4.5	32	3.6	6391	9.69	23.4
800	813	1100	180	4	3 - 10	8.2	39	4.2	31	3.3	7126	9.95	26.3
850	864	1150	180	4	3 - 10	8.1	37	3.9	30	3.1	7902	10.2	29.4
900	914	1200	180	4	3 - 10	8	37	3.6	29	2.9	8709	10.3	32.2
950	970	1250	180	4	3 - 10	8.1	34	3.3	27	2.6	9608	10.9	37.1
1000	1016	1300	180	4	3 - 10	7.8	35	3.2	27	2.5	10460	10.5	38.8
1050	1070	1380	180	4	3 - 10	6.6	41	3.5	32	2.8	11710	8.15	34
1100	1120	1430	180	4	3 - 10	6.5	41	3.4	32	2.6	12688	8.24	36.9
1150	1170	1480	180	4	3 - 10	6.4	40	3.2	31	2.5	13706	8.39	40.2
1200	1220	1530	180	4	3 - 10	6.3	40	3.1	31	2.4	14763	8.52	43.7
1250	1270	1580	180	4	3 - 10	6.3	40	3	31	2.3	15860	8.63	47.2
1300	1320	1630	180	4	3 - 10	6.2	39	2.9	30	2.2	16995	8.73	50.8
1350	1370	1680	180	4	3 - 10	6.2	39	2.7	30	2.1	18170	8.82	54.5
1400	1420	1730	180	4	3 - 10	6.1	39	2.6	30	2	19384	8.89	58.3
1450	1470	1780	180	4	3 - 10	6.1	39	2.5	29	1.9	20638	8.95	62.1
1500	1520	1830	180	4	3 - 10	6	38	2.5	29	1.9	21931	9	66
1550	1570	1880	180	4	3 - 10	6	38	2.4	29	1.8	23263	9.08	70.3
1600	1620	1950	180	4	3 - 10	5.3	42	2.6	32	1.9	24913	7.82	65.1
1650	1670	2000	180	4	3 - 10	5.3	42	2.5	31	1.9	26331	7.89	69.2
1700	1720	2050	180	4	3 - 10	5.2	42	2.4	32	1.8	27789	8.03	74
1750	1770	2100	180	4	3 - 10	5.2	42	2.3	31	1.8	29286	8.17	78.9
1800	1820	2150	180	4	3 - 10	5.2	42	2.3	31	1.7	30822	8.3	84.1
1850	1870	2200	180	4	3 - 10	5.1	42	2.2	31	1.7	32398	8.42	89.4
1900	1920	2250	180	4	3 - 10	5.1	42	2.2	31	1.6	34013	8.55	94.9
2000	2020	2400	180	4	3 - 10	3.9	53	2.6	39	1.9	38221	5.94	75
2100	2120	2500	180	4	3 - 10	3.9	53	2.5	39	1.8	41765	6.13	84
2200	2220	2600	180	4	3 - 10	3.8	53	2.4	39	1.7	45466	6.31	93.5
2300	2320	2700	180	4	3 - 10	3.8	53	2.3	38	1.7	49324	6.48	104
2400	2420	2800	180	4	3 - 10	3.8	52	2.2	38	1.6	53339	6.65	115
2500	2520	2900	180	4	3 - 10	3.7	52	2.1	38	1.5	57511	6.81	126
2600	2620	3000	180	4	3 - 10	3.7	52	2	38	1.5	61840	6.96	138
2700	2720	3100	180	4	3 - 10	3.7	52	2	38	1.4	66326	7.11	150
2800	2820	3200	180	4	3 - 10	3.7	52	1.9	37	1.4	70969	7.25	163
2900	2920	3300	180	4	3 - 10	3.7	52	1.8	37	1.3	75770	7.42	178
3000	3020	3400	180	4	3 - 10	3.6	52	1.8	37	1.3	80727	7.61	194
3100	3120	3500	180	4	3 - 10	3.6	52	1.7	37	1.2	85842	7.8	210
3200	3220	3600	180	4	3 - 10	3.6	52	1.7	37	1.2	91113	7.99	228
3300	3320	3700	180	4	3 - 10	3.6	52	1.6	37	1.2	96542	8.17	246
3400	3420	3800	180	4	3 - 10	3.5	52	1.6	37	1.1	102128	8.35	265

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
3500	3520	3900	180	4	3 - 10	3.5	52	1.5	37	1.1	107871	8.53	285
3600	3620	4000	180	4	3 - 10	3.5	52	1.5	37	1.1	113770	8.7	306
3700	3720	4100	180	4	3 - 10	3.5	52	1.5	37	1	119827	8.88	328
3800	3820	4200	180	4	3 - 10	3.5	52	1.4	37	1	126041	9.05	351
3900	3920	4300	180	4	3 - 10	3.5	52	1.4	37	1	132413	9.25	376
4000	4020	4400	180	4	3 - 10	3.5	52	1.4	37	1	138941	9.45	402

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
1000	1016	1350	200	5	3 - 10	9	39	3.4	31	2.7	10899	12.5	49.4
1050	1070	1400	200	5	3 - 10	9.1	38	3.2	29	2.5	11883	13.1	55.7
1100	1120	1450	200	5	3 - 10	8.9	37	3	29	2.3	12868	13.1	60
1150	1170	1500	200	5	3 - 10	8.8	37	2.9	28	2.2	13893	13.2	64.5
1200	1220	1550	200	5	3 - 10	8.7	36	2.8	28	2.1	14958	13.4	70.1
1250	1270	1600	200	5	3 - 10	8.6	36	2.7	28	2	16061	13.6	75.9
1300	1320	1650	200	5	3 - 10	8.6	36	2.6	27	2	17204	13.8	81.9
1350	1370	1700	200	5	3 - 10	8.5	36	2.5	27	1.9	18386	14	88
1400	1420	1750	200	5	3 - 10	8.4	36	2.4	27	1.8	19607	14.1	94.3
1450	1470	1800	200	5	3 - 10	8.4	35	2.3	27	1.7	20868	14.3	101
1500	1520	1850	200	5	3 - 10	8.3	35	2.2	26	1.7	22168	14.4	108
1550	1570	1900	200	5	3 - 10	8.2	35	2.2	26	1.6	23507	14.5	114
1600	1620	1950	200	5	3 - 10	8.1	35	2.1	26	1.6	24885	14.6	121
1650	1670	2000	200	5	3 - 10	8.1	35	2	26	1.5	26303	14.7	129
1700	1720	2050	200	5	3 - 10	8	35	2	26	1.5	27760	14.9	137
1750	1770	2100	200	5	3 - 10	8	34	1.9	26	1.4	29256	15.2	147
1800	1820	2150	200	5	3 - 10	8	34	1.9	26	1.4	30791	15.4	156
1850	1870	2200	200	5	3 - 10	7.9	34	1.8	26	1.4	32366	15.7	166
1900	1920	2250	200	5	3 - 10	7.9	34	1.8	25	1.3	33980	15.9	176
2000	2020	2400	200	5	3 - 10	6.1	44	2.1	32	1.6	38187	11.1	140
2100	2120	2500	200	5	3 - 10	6	44	2	32	1.5	41729	11.4	157
2200	2220	2600	200	5	3 - 10	6	43	2	32	1.4	45428	11.8	174
2300	2320	2700	200	5	3 - 10	6	43	1.9	32	1.4	49284	12.1	193
2400	2420	2800	200	5	3 - 10	5.9	43	1.8	32	1.3	53298	12.4	213
2500	2520	2900	200	5	3 - 10	5.9	43	1.7	31	1.3	57468	12.7	234
2600	2620	3000	200	5	3 - 10	5.8	43	1.7	31	1.2	61796	13	255
2700	2720	3100	200	5	3 - 10	5.8	43	1.6	31	1.2	66280	13.2	278
2800	2820	3200	200	5	3 - 10	5.8	43	1.6	31	1.1	70922	13.5	302
2900	2920	3300	200	5	3 - 10	5.7	43	1.5	31	1.1	75721	13.8	329
3000	3020	3400	200	5	3 - 10	5.7	43	1.5	31	1	80677	14.1	358
3100	3120	3500	200	5	3 - 10	5.6	43	1.4	31	1	85790	14.5	389
3200	3220	3600	200	5	3 - 10	5.6	43	1.4	31	1	91060	14.8	421
3300	3320	3700	200	5	3 - 10	5.6	43	1.3	31	1	96487	15.2	455
3400	3420	3800	200	5	3 - 10	5.6	43	1.3	31	0.9	102071	15.5	490
3500	3520	3900	200	5	3 - 10	5.6	43	1.3	31	0.9	107812	15.8	527
3600	3620	4000	200	5	3 - 10	5.5	43	1.2	31	0.9	113711	16.2	566
3700	3720	4100	200	5	3 - 10	5.5	43	1.2	31	0.9	119766	16.5	606
3800	3820	4200	200	5	3 - 10	5.4	43	1.2	31	0.8	125979	16.8	648
3900	3920	4300	200	5	3 - 10	5.4	43	1.1	31	0.8	132348	17.2	695
4000	4020	4400	200	5	3 - 10	5.4	43	1.1	31	0.8	138875	17.5	743

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
1000	1016	1350	220	6	4 - 10	12.8	33	2.9	25	2.2	10881	21.7	86.2
1050	1070	1400	220	6	4 - 10	12.8	31	2.7	24	2.1	11863	22.6	96.3
1100	1120	1450	220	6	4 - 10	12.5	31	2.5	24	2	12848	22.6	104
1150	1170	1500	220	6	4 - 10	12.4	31	2.4	24	1.9	13873	22.6	111
1200	1220	1550	220	6	4 - 10	12.3	31	2.3	23	1.8	14936	23	121
1250	1270	1600	220	6	4 - 10	12.1	30	2.2	23	1.7	16039	23.3	130
1300	1320	1650	220	6	4 - 10	12.1	30	2.2	23	1.6	17181	23.6	140
1350	1370	1700	220	6	4 - 10	11.9	30	2.1	23	1.6	18362	23.9	151
1400	1420	1750	220	6	4 - 10	11.8	30	2	23	1.5	19582	24.1	161
1450	1470	1800	220	6	4 - 10	11.7	30	2	23	1.5	20842	24.3	172
1500	1520	1850	220	6	4 - 10	11.6	30	1.9	22	1.4	22141	24.5	183
1550	1570	1900	220	6	4 - 10	11.5	30	1.8	22	1.4	23480	24.6	194
1600	1620	1950	220	6	4 - 10	11.4	30	1.8	22	1.3	24857	24.7	205
1650	1670	2000	220	6	4 - 10	11.3	29	1.7	22	1.3	26274	24.8	217
1700	1720	2050	220	6	4 - 10	11.2	29	1.7	22	1.3	27730	25.3	232
1750	1770	2100	220	6	4 - 10	11.1	29	1.6	22	1.2	29225	25.7	248
1800	1820	2150	220	6	4 - 10	11.1	29	1.6	22	1.2	30760	26	263
1850	1870	2200	220	6	4 - 10	11	29	1.6	22	1.2	32334	26.4	280
1900	1920	2250	220	6	4 - 10	10.9	29	1.5	22	1.1	33947	26.8	297
2000	2020	2400	220	6	4 - 10	8.6	37	1.8	27	1.3	38152	18.6	235
2100	2120	2500	220	6	4 - 10	8.5	37	1.7	27	1.3	41693	19.2	262
2200	2220	2600	220	6	4 - 10	8.4	37	1.7	27	1.2	45390	19.7	292
2300	2320	2700	220	6	4 - 10	8.4	37	1.6	27	1.2	49245	20.3	323
2400	2420	2800	220	6	4 - 10	8.3	37	1.5	27	1.1	53257	20.7	356
2500	2520	2900	220	6	4 - 10	8.2	37	1.5	27	1.1	57426	21.2	390
2600	2620	3000	220	6	4 - 10	8.2	37	1.4	27	1	61752	21.7	427
2700	2720	3100	220	6	4 - 10	8.1	37	1.4	27	1	66235	22.1	464
2800	2820	3200	220	6	4 - 10	8	37	1.3	27	1	70875	22.5	504
2900	2920	3300	220	6	4 - 10	8	37	1.3	27	0.9	75672	23	548
3000	3020	3400	220	6	4 - 10	7.9	37	1.3	27	0.9	80626	23.6	597
3100	3120	3500	220	6	4 - 10	7.8	37	1.2	27	0.9	85738	24.2	648
3200	3220	3600	220	6	4 - 10	7.7	37	1.2	27	0.9	91006	24.7	701
3300	3320	3700	220	6	4 - 10	7.7	37	1.2	27	0.8	96432	25.3	758
3400	3420	3800	220	6	4 - 10	7.7	37	1.1	27	0.8	102014	25.8	816
3500	3520	3900	220	6	4 - 10	7.6	37	1.1	27	0.8	107754	26.4	878
3600	3620	4000	220	6	4 - 10	7.5	37	1.1	27	0.8	113651	26.9	942
3700	3720	4100	220	6	4 - 10	7.5	37	1	27	0.7	119705	27.4	1009
3800	3820	4200	220	6	4 - 10	7.4	37	1	27	0.7	125916	27.9	1079
3900	3920	4300	220	6	4 - 10	7.4	37	1	27	0.7	132284	28.5	1156
4000	4020	4400	220	6	4 - 10	7.3	37	1	27	0.7	138809	29.2	1237

Nominal diameter	Outer connection diameter	Outer convolution diameter	Length	Wall thickness		Maximum operating pressure at 20°C	Nominal pressure absorption per convolution				Effective diameter	Adjustment forces (spring rate)	
							Unpressurised		At PS20°C				
				nom.	min. - max.		Axial	Angular	Axial	Angular			
DN	da	Da	BL	s	s	PS20°C	Δx	Δα	Δx	Δα	Ae	CΔx	CΔα
-	mm	mm	mm	mm	mm	bar	mm	Degrees	mm	Degrees	cm²	kN/mm	kNm/Degrees
1500	1520	1850	240	8	4 - 10	19.2	23	1.4	17	1.1	22088	51.8	387
1550	1570	1900	240	8	4 - 10	19	23	1.4	17	1	23425	52.1	411
1600	1620	1950	240	8	4 - 10	18.8	22	1.3	16	1	24801	52.4	435
1650	1670	2000	240	8	4 - 10	18.6	22	1.3	16	1	26217	52.8	461
1700	1720	2050	240	8	4 - 10	18.4	22	1.3	16	0.9	27671	53.7	493
1750	1770	2100	240	8	4 - 10	18.3	22	1.2	16	0.9	29165	54.6	526
1800	1820	2150	240	8	4 - 10	18.1	22	1.2	16	0.9	30698	55.5	560
1850	1870	2200	240	8	4 - 10	18	23	1.2	16	0.9	32270	56.4	596
1900	1920	2250	240	8	4 - 10	17.9	23	1.2	16	0.8	33882	57.2	633
2000	2020	2400	240	8	4 - 10	14	29	1.4	21	1	38083	40.3	507
2100	2120	2500	240	8	4 - 10	14.4	29	1.3	21	1	41620	41.6	568
2200	2220	2600	240	8	4 - 10	14.2	29	1.3	21	0.9	45315	42.8	632
2300	2320	2700	240	8	4 - 10	14	29	1.2	21	0.9	49166	44	701
2400	2420	2800	240	8	4 - 10	13.9	29	1.2	21	0.8	53175	45.1	773
2500	2520	2900	240	8	4 - 10	13.7	29	1.1	21	0.8	57341	46.2	850
2600	2620	3000	240	8	4 - 10	13.6	29	1.1	21	0.8	61664	47.3	930
2700	2720	3100	240	8	4 - 10	13.4	29	1.1	21	0.8	66144	48.3	1014
2800	2820	3200	240	8	4 - 10	13.3	29	1	20	0.7	70781	49.2	1102
2900	2920	3300	240	8	4 - 10	13.2	29	1	20	0.7	75575	50.4	1200
3000	3020	3400	240	8	4 - 10	13	29	1	20	0.7	80526	51.6	1306
3100	3120	3500	240	8	4 - 10	12.9	29	0.9	20	0.7	85634	52.9	1418
3200	3220	3600	240	8	4 - 10	12.8	29	0.9	20	0.6	90899	54.1	1535
3300	3320	3700	240	8	4 - 10	12.6	29	0.9	20	0.6	96322	55.3	1658
3400	3420	3800	240	8	4 - 10	12.5	29	0.9	20	0.6	101901	56.5	1787
3500	3520	3900	240	8	4 - 10	12.4	29	0.8	20	0.6	107638	57.7	1921
3600	3620	4000	240	8	4 - 10	12.3	29	0.8	20	0.6	113531	58.8	2061
3700	3720	4100	240	8	4 - 10	12.1	29	0.8	20	0.6	119582	59.9	2207
3800	3820	4200	240	8	4 - 10	12.1	29	0.8	20	0.5	125790	61.1	2360
3900	3920	4300	240	8	4 - 10	11.9	29	0.8	20	0.5	132155	62.5	2531
4000	4020	4400	240	8	4 - 10	11.8	29	0.7	20	0.5	138677	63.9	2710

Design: All table values were determined with at least 1000 nominal stress cycles with a safety of SL = 1 according to AD 2000 data sheet B13, EJMA or EN 14917 unpressurised and the maximum operating pressure at 20 °C. The calculation was carried out with a design temperature of 20 °C for the material 1.4571 with a permitted test pressure at 20 °C corresponding to 1.43 times the maximum operating pressure. A wall thickness tolerance was taken into account with +/- 0.1 mm. The indicated permitted expansion absorption values Δx or Δα are differences between the expanded and the compressed state or between two directions of rotation. That means Δx=40 mm or +/-20 mm; Δα=7.0° or +/-3.5°. Δx and Δα have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

Special expansion joints and plant engineering
Components for plant engineering and pipeline construction

HKS metal bellows expansion joints are combined with piping components to form a complete system with precisely defined requirements taking into account defined general conditions. Joining, adapting and optimising the individual technical components creates a ready to install assembly.

We have been developing, planning and manufacturing system components for plant engineering and pipeline construction for over 30 years in the fields of process engineering, energy technology, supply technology, production technology and mechanical engineering. Correct and proper planning for the installation of HKS metal bellows expansion joints into the existing pipeline and system concept has a crucial influence on the long-term behaviour of pipes and valves. Planning for metal bellows expansion joints is treated with the same thoroughness as the actual pipes and valves.

Sectors of industry and trade

- Mechanical engineering, ship building and plant engineering
- Pipeline systems, exhaust technology
- Gas and water supply
- Energy and offshore technology
- Steel, printing and paper industry
- Chemical plants

Range of products and services for customer requirement

- Comprehensive product range of standardised components
- Development of complex solutions
- Calculation and manufacturing according to national and international regulations
- Manufacturing of special apparatus and custom designs for special applications according to customer requirements
- Processing of all weldable materials
- 2D and 3D CAD installation drawings
- Finite element analysis

Solutions

Extensive know-how and best service ensure individual system solutions on the highest technological level. Customer requirements are processed individually.

HKS is not striving for short-term success but rather for a long-term partnership with the aim of sustainable optimization for mutual benefit.

Pipe components

Approvals/testing

- Manufacturing in line with Pressure Equipment Directive 97/23/EC module H
- Quality management in line with EN ISO 9001
- Approvals from the notified bodies: ABS, BV, DNV, DVGW, GL, LRS, RINA, Roznador, TÜV
- ASME Code Sec. VIII Div.1, with U designator (U stamp)

Applied standards/guidelines

- Pressure Equipment Directive 97/23/EC
- Standards of EJMA (Expansion Joint Manufacturers Association, Inc.)
- AD 2000 data sheets
- EN 1092 – flanges
- EN 10216/17 – steel tubes
- EN 13445 – unfired pressure vessels
- EN 13480 – metallic industrial piping
- EN 14917 – metal bellows expansionjoints
- EN ISO 13920 – general tolerances for welding constructions
- ISO 2768 – general tolerances
- DIN 86044 – exhaust flanges ships
- ISO 15348 – metal bellows expansion joints
- Regulations from notified bodies
- ASTM standards
- EAC (GOST-R)

Special expansion joints

Deviating from the standard areas of application of HKS expansion joints in plants and pipeline construction, we use our long-standing experience to implement individually customised solutions to meet very special customer requirements. Reliability, highest quality and customer satisfaction are our priorities in this. HKS develops, designs and manufactures selected special solutions and expansion joints on the highest level. The following examples can convey an impression of our capabilities.

Expansion joints subject to external pressure loads with an adjustable spring system for use in a suction line in secondary metallurgy (steel production)

Alloy expansion joint for use in alloy gates in steel production

Penstock (gas nozzle) expansion joint for use in blast furnaces and very high operating temperatures

Stuffing box with corrugated expansion joint for use in oxygen lances in steel production

Sawtooth expansion joint with special convolution geometry for vertical installation and targeted carrying off of inner media

Corner balanced corrugated expansion joint with low fixpoint loads and inner deflector plates for flow optimisation for use between turbine and expansion joint

Rubber expansion joints

HKS rubber expansion joints are manufactured from high-quality materials and have proven their suitability in decades of practical application. The continuous new and further development of our rubber expansion joints ensures the constant adaptation to the current requirements of our customers. This results in powerful, reliable rubber expansion joints with excellent properties and a long service life. Our development and design department is available for technical consultation for our customers, engineering and solutions for project-oriented challenges.

Areas of application

The excellent material properties of rubber bellows allow for the absorption of high levels of deformation and vibrations. Application examples for HKS rubber expansion joints are therefore very versatile and flexible. The movement options with large expansions in all directions with a very compact design are recommended for use in many industries with a variety of different media and temperatures. The use of PTFE linings additionally achieves resistance against very aggressive media. Our highquality rubber expansion joints are used in many sectors of the food processing and chemical industries, plant engineering and mechanical engineering, engine and ship building, process engineering, pipeline construction and technical building systems.

The main tasks are

› Absorbing expansions

› Absorbing movement

› Damping vibrations, oscillations or noise

› Reduction of tensions

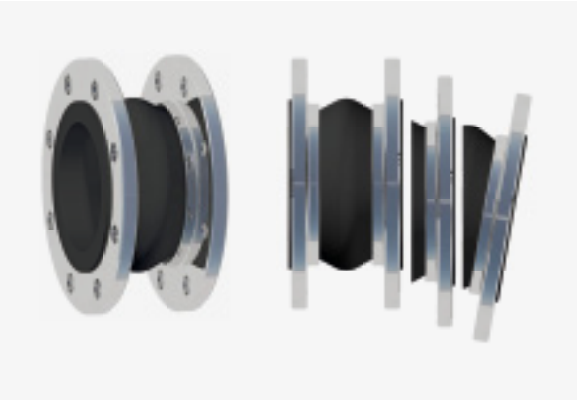
› Compensating for installation inaccuracies, and compensating for settling of buildings

In addition to the ISO 9001 quality management system, we have achieved a number of product approvals through recognised notified bodies and certification bodies such as DNV, GL, BV, ABS, LRS, RINA and RMRS. These are continuously adapted to the current market requirements with type approvals and flame resistance approvals to continue meeting the highest requirements in future.

Model variants

HKS rubber expansion joints are available in different models (**universal, lateral and angular expansion joints**), rubber bellows qualities (depending on medium) and the bellows design (depending on pressure and temperature).

Universal rubber expansion joints



Design:

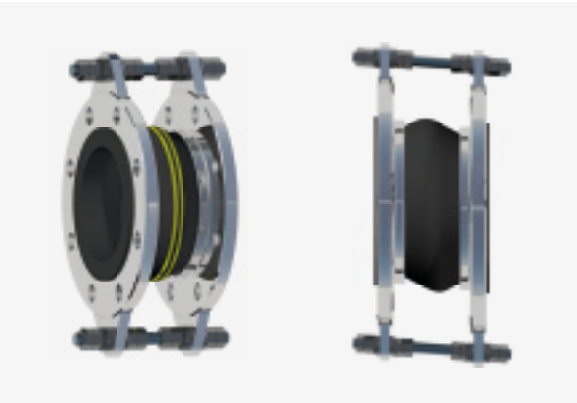
Rubber bellows with flange or threaded connection.

Movement absorption:

Absorbing axial, lateral and angular movement as well as combinations of all three movement types.

The universal rubber expansion joint absorbs the heat-cold expansion of a pipe section in all planes between two fixpoints. These have to be designed to withstand the pressure and spring forces of the universal rubber expansion joint, the friction forces of the guides and the flow forces.

Lateral rubber expansion joint



Design:

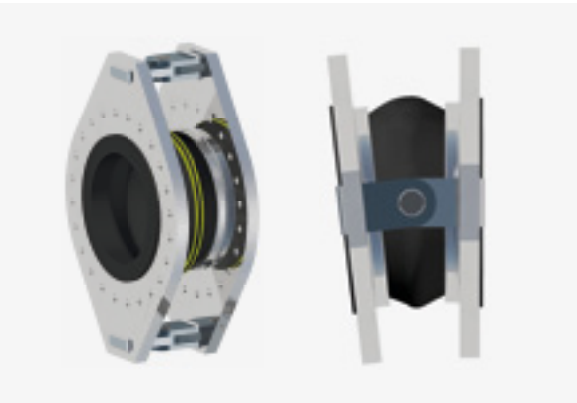
Rubber bellows with laterally movable tensioning (joints or threaded rods) and flange connection.

Movement absorption:

Absorption of lateral movement all around for threaded rods and unilateral for hinged tensioners.

Axial reaction forces are absorbed by the tie rods and the anchors are relieved. Lighter fixpoints than for universal expansion joints are required for absorbing adjustment and reaction forces. A much larger lateral movement absorption is possible with two bellows, one intermediate pipe and tensioners.

Angular rubber expansion joint



Design:

Rubber bellows with angular moving hinged tensioner and flange connection.

Movement absorption:

Absorption of angular movement Unilateral movement possible through single joint and all-around movement with cardan joint.

Axial reaction forces are absorbed by the hinged tensioners and the anchors are relieved. Lighter fixpoints than for universal expansion joints are required for absorbing adjustment and reaction forces.

Rubber bellows

The rubber bellows, the heart of the rubber expansion joint, is crucial to the movability. Reinforced with support liners (casing) and a barrelshaped bellows, axial, lateral and angular movements can be implemented even with small sizes. Pressurebearing fabric layers are vulcanised in between an inner and outer rubber layer. Depending on the application, a variety of different natural and synthetic rubber compounds (elastomers) are used for the rubber layer. To provide resistance to pressure and temperature, nylon, aramid and steel cord are used as support liners. In individual cases, additional PTFE liners are used to improve resistance to media. The rubber bellows are marked with a colour coding according to the rubber compound and support lining used.

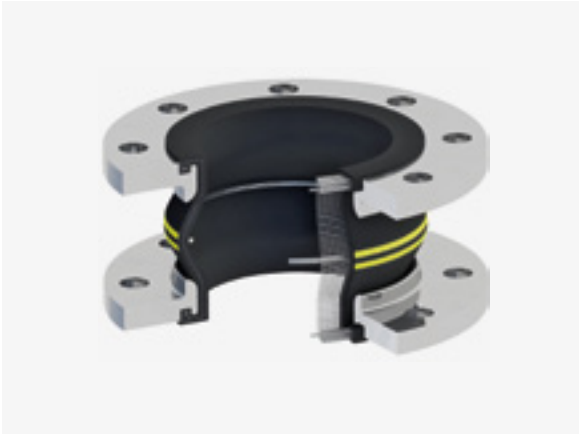
Material qualities

The actual elastomer materials listed in the table are the primary products for manufacturing a rubber compound. Vulcanised into a rubber bellows with strength support, filler materials and additives, the stated properties may differ. The permitted application and temperature ranges are stated in the detailed data sheets.

Designation	Properties and areas of application
CSM Chlorosulfonyl polyethylene rubber Hypalon®	› Very good chemical resistance, especially to many oxidising media, acids, bases, lyes and aggressive chemical wastewater › Good resistance to mineral oils and greases, even at higher temperatures › Good ozone, ageing and weather resistance › Temperature range (depending on media) -20 °C to +100 °C, briefly up to +110 °C
CR Chloroprene rubber Neoprene®, Bayprene®	› Good mechanical properties and elasticity › Resistant to different inorganic and organic chemicals, cold and hot water (swimming pool water), seawater, wastewater (lightly acidic or alkaline), also with low oil content, and cooling water with corrosion protection agents containing oil; impermeable to gas for hydrocarbons › Very good ozone, ageing and weather resistance › Temperature range (depending on media) -25 °C to +90 °C, briefly up to +100 °C
NBR Nitrile butadiene rubber Perbunan®, Buna-N®, Nipol®	› Very good resistance to fuels, mineral oils, lubricants, plant and animal fat as well as hydrocarbons › Resistance, elasticity and cold flexibility depends on acrylonitrile content › Impermeable to gas for hydrocarbons › Satisfactory ageing and weather resistance › Temperature range (depending on media) -20 °C to +90 °C, briefly up to +100 °C
HNBR Hydrogenated nitrile butadiene rubber Therban®, Zetpol®	› Very good resistance to oil and petrol, comparable to NBR › Hydrogenated form of NBR is less responsive and has better ageing and weather resistance as well as higher temperature resistance › Temperature range (depending on media) -35 °C to +100 °C, briefly up to +120 °C
IIR Isobutylene isoprene rubber (butyl rubber) Butyl, Bucar®	› Very good resistance to weak acids and lyes, saline solutions and suitable for drinking water according to German KTW guideline › No resistance to oil and grease › Very good ozone, ageing and weather resistance › Good elastic behaviour at very low temperatures › Temperature range (depending on media) -40 °C to +100 °C, briefly up to +120 °C
EPDM Ethylene propylene diene monomer rubber Keltan®, Nordel®, Vistalon®	› Good heat resistance even under constant stress from hot heating or cooling water, hot air or steam, alkaline wastewater and some oil-free chemicals; good gastight properties except hydrocarbons › Very good ozone, ageing and weather resistance › Temperature range (depending on media) -40 °C to +130 °C, briefly up to +150 °C
FPM Fluoro rubber Viton®	› Very high resistance to heat and chemicals as well as low gas permeability, also suitable for aggressive media › Very good resistance to oils, benzene, xylene, toluene, fuels with an aromatics content over 50 %, bio diesel, aromatic/chlorinated hydrocarbons and mineral acids. › Excellent ozone, ageing and weather resistance › Temperature range (depending on media) -20 °C to +180 °C, briefly up to +200 °C
CO (ECO) Chlorohydrin rubber (polyepichlorohydrin, possibly copolymer with ethylene oxide) Hydrin®	› High resistance to hydrocarbon compounds, oil, grease and bio fuel › Electrically dissipative › Good ozone and weather resistance › Temperature range (depending on media) -40 °C to +125 °C, briefly up to +150 °C

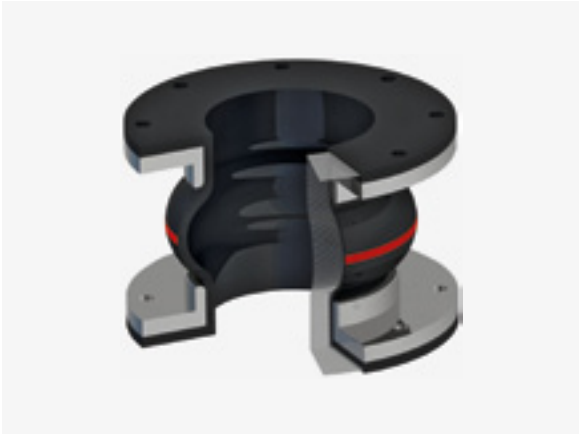
Connection types

Flanges are used for connection to pipes, pumps or containers, screw fittings only for small Nominal diameters. Flange connections are divided into two connection types. On the first type, the rubber bellows surrounds the flange into a continuous recess (groove) to form a rubber sealing collar. An additional seal is therefore not required for the connection with the counter flange. The second type is used for larger Nominal diameters: The rubber bellows ends are moulded into flat flanges and backed with steel flanges. On both connection types, moulded beads or welded-on support collars (brims) are included for stabilising.



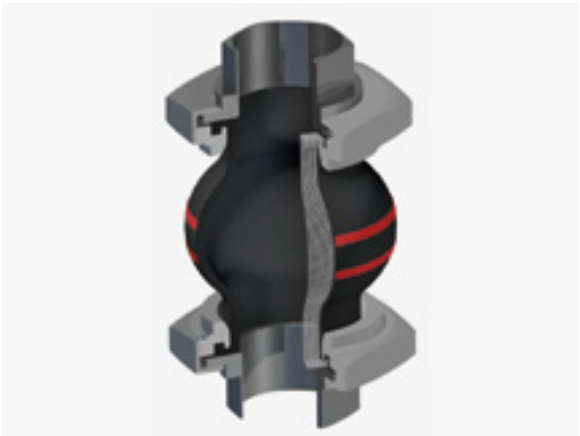
Design of a type 1 model GS

Inner layer:	NBR (nitrile butadiene rubber)
Pressure support liner:	Galvanised steel wire cord
Outer layer:	CR (chloroprene rubber)
Flange:	Rotating flange with rubber sealing collar
Identification:	2 yellow rings, ERV DN.., PN.., date of manufacture
Accessories:	vacuum support ring



Design of a type 2 model R

Inner layer:	EPDM
Pressure support liner:	Nylon cord
Outer layer:	EPDM
Flange:	Backing flange with solid rubber flat flange
Identification:	1 red ring, DN.., PN.., date of manufacture



Design of a type 3 model HZR

Inner layer:	EPDM
Pressure support liner:	Aramid cord
Outer layer:	EPDM
Screw fitting:	PR internal thread (right), cylindrical
Identification:	2 red rings, DN.., PN.., date of manufacture

Flanges

Flanges for rubber expansion joints of type 1 and type 2 can be manufactured to all common international standards such as DIN, EN, ANSI, AWWA, BS, JIS or special dimensions. Flange holes can be produced as through holes or threaded holes. As a standard, flanges are made of unalloyed steel, galvanised or coated with a corrosion protection primer. To meet higher corrosion protection requirements, high-alloy stainless CrNi steel is used. Special materials such as aluminium or special surface coatings (two pack epoxy, two component PUR) in line with customer specifications are also possible.

Material group	Material designation
Standard (unalloyed steel)	1.0038 (S235JR)
Stainless steel	1.4301 (X5CrNi18-10) 1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2)
Aluminium	3.3535 (AlMg3) 3.3547 (AlMg4.5Mn)

Flange versions for type 1 rubber expansion joints

Universal expansion joint
Standard flange with groove and support collar

Lateral expansion joint
Oval flange with tabs for 2 tension rods (small Nominal diameter)

Lateral expansion joint
Flange with additional pitch circle for tension rods

Angular expansion joint
Flange with tabs for joint connections

Flange versions for type 2 rubber expansion joints

Universal expansion joint
Backing flange with support collar

Lateral expansion joint
Flange with several tabs or additional pitch circle for tension rods

Angular expansion joint
Flange with tabs for joint connections

Tie rods

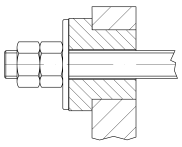
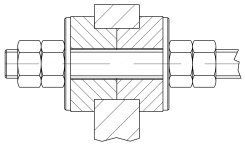
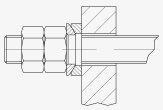
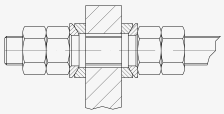
Rubber expansion joints under pressure (operating or test conditions) develop an axial reaction force across the effective bellows cross section area which acts on adyescent plain and fixed bearings. This bearing stress in the pipe system is drastically reduced by using lateral and/or angular expansion joints with tie rods. Only the adjustment forces and moments from the lateral or angular movement are introduced into the pipe system and absorbed by lightweight fixed points.

External tie rods

External and internal tie rods

Tension rods

This type of tensioning is used for lateral expansion joints or can be used to limit the element length on universal expansion joints. Threaded rods are placed symmetrically around the circumference and supported either with rubber bushes or with spherical washers, conical washers and nuts. Using rubber bushes creates a noise absorbing connection to the flange; this is done up to a Nominal diameter of maximum DN 300. For absorbing excess pressure (internal pressure), only external tensioning is required and additional internal tensioning for negative pressure (vacuum). All metal components such as threaded rod, nut, spherical washer and conical washer are galvanised as a standard. Versions mode from corrosion resistant materials or with hot galvanising are available on customer request.

Bearing type	External Tensioning	External and internal Tensioning
Rubber bush		
Spherical and conical washers		

Material group	Material designation		
	Moulded parts/tabs	Spherical/conical washers	Tension rods/nuts
Standard (unalloyed steel)	1.0038 (S235JR)	1.0401 (C15)	5.6, 8.8 / 5, 8
Stainless steel	1.4301 (X5CrNi18-10) 1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2)	1.4305 (X8CrNiS18-9)	A2, A4

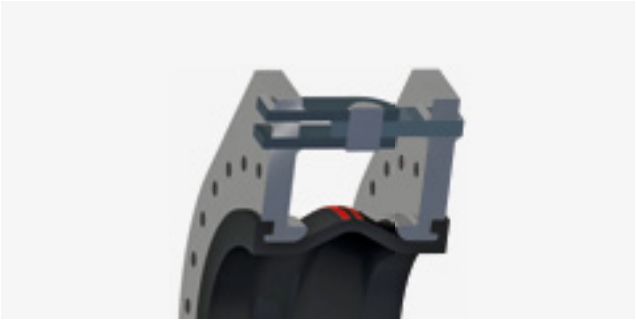
Single joint tensioners

Cardan joint tensioners with ring

Cardan joint tensioners with frame

Hinged tensioners

Single joint or cardan joint tensioners are installed on angular rubber expansion joints for transferring axial reaction forces. The link joints are placed at the centre of the bellows axis in pairs and can absorb unilateral or all-around rotations. Single joint tensioners use an oval flange with connected tabs and bolts to form a two-shear connection which allows angular rotation only around the centre bolt axis. On cardan joint tensioners, the oval flanges are placed with tabs offset by 90° and connected with a gimbal ring or box. This allows an angular rotation around the bellows centre point in all directions. All metal, unalloyed components are galvanised or treated with a corrosion protection primer. Versions mode from corrosion resistant materials or with special coatings are available on customer request.



Detail of single joint tensioner

Detail of cardan joint tensioner

Material group	Material designation	
	Moulded parts/tabs	Bolts
Standard (unalloyed steel)	1.0038 (S235JR)	1.0038 (S235JR) 1.0401 (C15)
Stainless steel	1.4301 (X5CrNi18-10) 1.4541 (X6CrNiTi18-10) 1.4571 (X6CrNiMoTi17-12-2)	

Vacuum support rings

Rubber bellows resist small to medium levels of negative pressure, depending on Nominal diameter, design and application. For higher levels of negative pressure or full vacuum it is usually necessary to install vacuum support rings. These support the inner surface of the bellows curve and are made of stainless steel as a standard. Different designs are available, from a single open support ring and support rings with lock to a ring which is vulcanised into the bellows during production. The latter design is only available for type 2 rubber expansion joints. As a rule, the permitted movement absorption is reduced by approx. 50 % Precise data for vacuum stability can be found in the tables or supplied on request.

VSD – vacuum support ring

VSD+S – vacuum support ring with lock

Vacuum support ring
(type 2 only)

PTFE lining

If no resistant rubber compound is available due to aggressive media or combination of chemical media components, a seamless inner PTFE lining can be installed to increase the chemical resistance. This lining is approx. 1 mm thick, protects the inside of the rubber bellows against media contact and can be used for almost all media without limitations. A PTFE lining can only be installed at the factory, retrofitting is not possible. Heat resistance usually depends on the rubber bellows material. The permitted pressure load is usually reduced to approx. 6 bar and the permitted movement absorption is decreased by approx. 50 %. For use with vacuum, the PTFE lining is only suitable in connection with a PTFE support ring.

PTFE lining

PTFE lining with vacuum support ring

Inner sleeves

Rubber expansion joints feature a flow-optimised convolution geometry on the inside to reduce flow-related resistance (pressure loss) and turbulences. They can normally be used without an inner sleeve. An inner sleeve or guide pipe is required for abrasive media or high flow rates. The rubber bellows is not in direct contact with the flowing medium. It is therefore protected and sediment in the bellows convolution is reduced. The straight shape of the inner sleeve lets the medium flow with more direction, developing less turbulence. As a standard, inner sleeves are made from stainless steel and consist of a cylindrical or conical pipe with a collar which is welded or moulded on. An additional seal has to be used between inner sleeve collar and counter flange.

Cylindrical inner sleeve
(axial movement absorption)

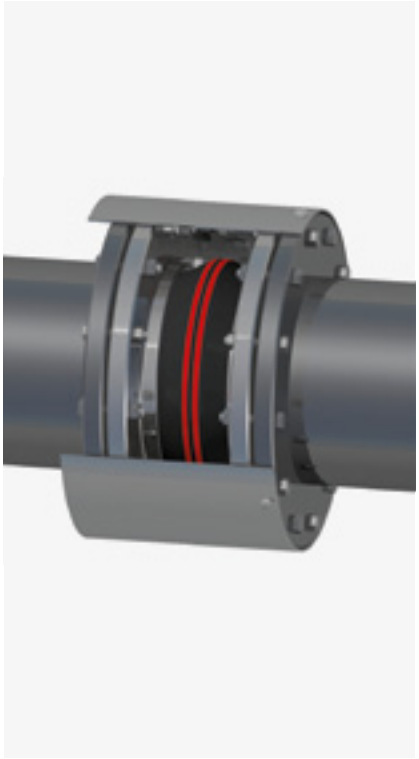
Conical inner sleeve
(lateral and angular movement absorption)

Telescopic inner sleeve (large axial movement absorption and full bellows protection)

External protection systems

Extremely rough operating conditions, weather influence such as strong UV radiation or risk of damage from external mechanical influence require protection of the rubber expansion joint. Suitable products are available, starting with a simple flame protection cover made of a glass fabric with an insulating insert for flame impact up to 800 °C to robust protection for placement in the ground.

Flame protection cover



External tube

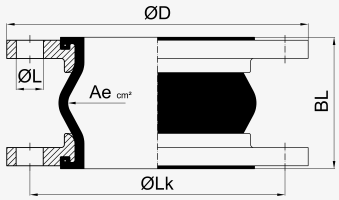
Soil protection cover

RUBBER EXPANSION JOINTS

Type 1 MODEL CR

TYPE 1 MODEL CR

TYPE 1 MODEL CR



Version

The HKS rubber expansion joint of **type 1 model CR** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	Chloroprene CR, seamless, abrasion-resistant
Pressure support:	PA textile cord
Outer layer:	Chloroprene CR
Identification:	White „CR“ print, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint **type 1 model CR** is suitable for cold and warm water, swimming pool water, seawater, wastewater (lightly acidic or alkaline), also with low oil content, cooling water with corrosion protection agents containing oil, lubricant, grease, air and compressed air. Electrically dissipative.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction
- Water supply and building technology
- Wastewater technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Subject to technical modifications

Nominal diameter		Length	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Borehole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30	max. -1000	max. -1000	max. -1000	115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
40	1 1/2“	130	16	20	-30	+20	±30	±30				150	40	110	4	18	4.0
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
100	4“	130	16	125	-30	+20	±30	±20	-400			220	16	180	8	18	8.0
125	5“	130	16	185	-30	+20	±30	±20	-300			250	16	210	8	18	9.9
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
200	8“	130	16	400	-25	+30	±30	±10	-300			340	10	295	8	22	16.5
250	10“	130	16	600	-10	+30	±15	±5	-200			395	10	350	12	22	21.6
300	12“	130	16	800	-10	+30	±15	±5	-100			445	10	400	12	22	29.3
350	14“	200	16	1000	-40	+35	±30	±8	-			505	10	460	16	22	43.0
400	16“	200	16	1375	-40	+35	±30	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-40	+35	±35	±10	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+35	±30	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+35	±30	±8	-	-700		780	10	725	20	30	70.0
700	28“	260	10	4800	-40	+30	±30	±5	-	-		895	10	840	24	30	117.0
800	32“	250	10	5440	-40	+35	±35	±5	-	-	-700	1015	10	950	24	33	129.5
900	36“	300	10	7100	-40	+40	±40	±5	-	-	-700	1115	10	1050	28	33	184.0
1000	40“	300	10	8700	-40	+40	±40	±5	-	-	-700	1230	10	1160	28	36	245.0

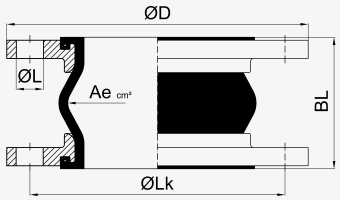
1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 1 MODEL G

TYPE 1 MODEL G

TYPE 1 MODEL G



Version

The HKS rubber expansion joint of **type 1 model G** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	NBR (nitrile), seamless, abrasion-resistant
Pressure support:	PA textile cord
Outer layer:	Chloroprene CR
Identification:	Yellow ring, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint **type 1 model G** is suitable for mineral oil products, fuel-ethanol mixtures and EN fuels, municipal and natural gas except liquid gas. Electrically conductive.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction and ship building
- Gas supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Subject to technical modifications

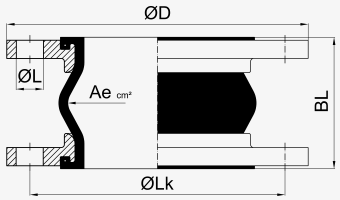
Nominal diameter		Length	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Borehole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30				115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
32	1 1/4“	160	16	15	-30	+35	±35	±15				140	40	100	4	18	3.6
40	1 1/2“	130	16	20	-30	+20	±30	±30	max. -1000			150	40	110	4	18	4.0
40	1 1/2“	160	16	20	-30	+35	±35	±15				150	40	110	4	18	4.2
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
50	2“	150	16	30	-35	+30	±30	±15				165	16	125	4	18	4.7
50	2“	160	16	30	-30	+35	±35	±15				165	16	125	4	18	4.8
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
65	2 1/2“	150	16	50	-35	+30	±30	±15	-700			185	16	145	4	18	5.4
65	2 1/2“	160	16	50	-30	+35	±35	±15	-700			185	16	145	4	18	5.5
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
80	3“	150	16	85	-35	+30	±30	±15	-600			200	16	160	8	18	7.0
80	3“	160	16	85	-30	+35	±35	±15	-600			200	16	160	8	18	7.1
100	4“	130	16	125	-30	+20	±30	±20	-400	max. -1000		220	16	180	8	18	8.0
100	4“	150	16	125	-35	+30	±30	±15	-400			220	16	180	8	18	8.1
100	4“	160	16	125	-30	+35	±35	±15	-400			220	16	180	8	18	8.2
125	5“	130	16	185	-30	+20	±30	±20	-300		max. -1000	250	16	210	8	18	9.9
125	5“	150	16	185	-35	+30	±30	±15	-300			250	16	210	8	18	10.1
125	5“	160	16	185	-30	+35	±35	±15	-300			250	16	210	8	18	10.2
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
150	6“	150	16	250	-35	+30	±30	±15	-300			285	16	240	8	22	12.4
150	6“	160	16	250	-30	+35	±35	±15	-300			285	16	240	8	22	12.5
200	8“	130	16	400	-25	+30	±30	±10	-300			340	10	295	8	22	16.5
200	8“	150	16	400	-35	+30	±30	±15	-300			340	10	295	8	22	16.6
200	8“	160	16	400	-30	+35	±35	±15	-300			340	10	295	8	22	16.7
200	8“	175	16	400	-15	+35	±10	±5	-300			340	10	295	8	22	16.8
250	10“	130	16	600	-10	+30	±15	±5	-200			395	10	350	12	22	21.6
250	10“	175	16	600	-15	+35	±10	±5	-200			395	10	350	12	22	21.9
250	10“	200	10	600	-40	+35	±30	±10	-200			395	10	350	12	22	22.1
300	12“	130	16	800	-10	+30	±15	±5	-100			445	10	400	12	22	29.3
300	12“	200	10	800	-40	+35	±30	±10	-100			445	10	400	12	22	29.8
350	14“	200	16	1000	-40	+35	±30	±8	-			505	10	460	16	22	43.0
400	16“	200	16	1375	-40	+35	±30	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+35	±30	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+35	±30	±8	-	-700		780	10	725	20	30	70.0
700	28“	260	10	4800	-40	+30	±30	±5	-	-		895	10	840	24	30	117.0
800	32“	250	10	5440	-40	+35	±35	±5	-	-	-700	1015	10	950	24	33	129.5
900	36“	300	10	7100	-40	+40	±40	±5	-	-	-700	1115	10	1050	28	33	184.0
1000	40“	300	10	8700	-40	+40	±40	±5	-	-	-700	1230	10	1160	28	36	245.0

RUBBER EXPANSION JOINTS

Type 1 MODEL GR

TYPE 1 MODEL GR

TYPE 1 MODEL GR



Version

The HKS rubber expansion joint **type 1 model GR** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	Hypalon® (CSM), seamless, highly abrasion-resistant
Pressure support:	PA textile cord
Outer layer:	Hypalon® (CSM)
Identification:	Green ring, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint type 1 model GR is suitable for chemicals, acids, lyes and aggressive chemical wastewater. For compressor air containing oil, it is suitable up to a temperature of +90 °C. Electrically dissipative.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction
- Gas supply
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Subject to technical modifications

Nominal diameter		Length	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal	Effective diameter	Axial		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Borehole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30	max. -1000	max. -1000	max. -1000	115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
40	1 1/2“	130	16	20	-30	+20	±30	±30				150	40	110	4	18	4.0
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
100	4“	130	16	125	-30	+20	±30	±20	-400			220	16	180	8	18	8.0
125	5“	130	16	185	-30	+20	±30	±20	-300			250	16	210	8	18	9.9
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
200	8“	130	16	400	-25	+30	±30	±10	-300			340	10	295	8	22	16.5
250	10“	130	16	600	-10	+30	±15	±5	-200			395	10	350	12	22	21.6
300	12“	130	16	800	-10	+30	±15	±5	-100			445	10	400	12	22	29.3
350	14“	200	16	1000	-40	+35	±30	±8	-			505	10	460	16	22	43.0
400	16“	200	16	1375	-40	+35	±30	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-45	+35	±35	±10	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+35	±30	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+35	±30	±8	-	-700		780	10	725	20	30	70.0
700	28“	260	10	4800	-40	+30	±30	±5	-	-		895	10	840	24	30	117.0

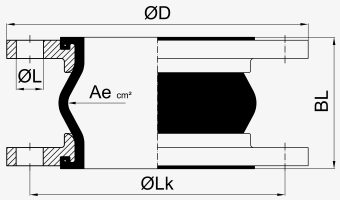
1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 1 MODEL GS

TYPE 1 MODEL GS

TYPE 1 MODEL GS



Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction and ship building
- Energy and offshore technology

Version

The HKS rubber expansion joint **type 1 model GS** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	NBR (nitrile), seamless, abrasion-resistant
Pressure support:	Galvanised steel wire cord
Outer layer:	Chloroprene CR
Identification:	2 yellow rings, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Properties and areas of application:

The HKS rubber expansion joint **type 1 model GS** is suitable for mineral oil products, DIN fuels, cooling water with corrosion protection containing oil, lubricating oils, hydraulic oils and seawater. Electrically conductive.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
60 °C	100 %	10 bar	16 bar
100 °C	60 %	6 bar	10 bar

Subject to technical modifications

Nominal diameter		Length	Bellows		Permitted movement absorption nominal [5]				Permitted negative (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Borehole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	10	-30	+15	±15	±20	max. -1000	max. -1000	max. -1000	115	40	85	4	14	2.0
32	1 1/4“	130	16	15	-30	+15	±15	±20				140	40	100	4	18	3.5
40	1 1/2“	130	16	20	-30	+15	±15	±20				150	40	110	4	18	4.0
50	2“	130	16	30	-30	+15	±15	±20				165	16	125	4	18	5.0
65	2 1/2“	130	16	50	-30	+15	±15	±20				185	16	145	4	18	5.5
80	3“	130	16	85	-30	+15	±15	±20				200	16	160	8	18	7.1
80	3“	150	16	85	-35	+20	±15	±15				200	16	160	8	18	7.2
100	4“	130	16	125	-30	+15	±15	±15	-800			220	16	180	8	18	8.3
100	4“	150	16	125	-35	+20	±15	±15	-800			220	16	180	8	18	8.4
125	5“	130	16	185	-30	+15	±15	±15	-700			250	16	210	8	18	10.1
125	5“	150	16	185	-35	+20	±15	±15	-700			250	16	210	8	18	10.2
150	6“	130	16	250	-30	+15	±15	±15	-700			285	16	240	8	22	12.6
150	6“	150	16	250	-35	+20	±15	±15	-700			285	16	240	8	22	12.7
200	8“	130	16	400	-15	+20	±10	±5	-700			340	10	295	8	22	16.9
200	8“	175	16	400	-25	+20	±15	±5	-700			340	10	295	8	22	17.2
250	10“	130	16	600	-15	+20	±10	±5	-700			395	10	350	12	22	22.3
250	10“	175	16	600	-25	+20	±15	±5	-700			395	10	350	12	22	22.6
300	12“	130	16	800	-15	+20	±10	±5	-600			445	10	400	12	22	29.9
300	12“	200	16	800	-40	+30	±25	±10	-600			445	10	400	12	22	30.4
350	14“	200	16	1000	-40	+30	±25	±10	-400			505	10	460	16	22	44.0
400	16“	200	16	1375	-40	+30	±25	±5	-400			565	10	515	16	26	47.5
450	18“	200	10	1780	-40	+30	±25	±5	-300	-800		615	10	565	20	26	51.0
450	18“	250	10	1780	-40	+30	±30	±5	-300	-800		615	10	565	20	26	54.0
500	20“	200	10	2185	-40	+30	±25	±5	-300	-800		670	10	620	20	26	57.5
600	24“	200	10	3080	-40	+30	±25	±5	-200	-700		780	10	725	20	30	70.0

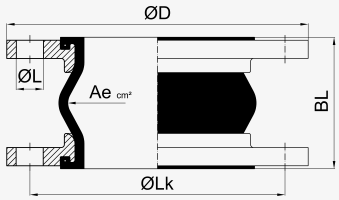
1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 1 MODEL R

TYPE 1 MODEL R

TYPE 1 MODEL R



Version

The HKS rubber expansion joint **type 1 model R** consists of a rubber bellows and two rotating flanges.

Design Gummibalg:

Inner layer:	Butyl (IIR) / EPDM, seamless, low diffusion
Pressure support:	PA textile cord, butyl rubber coating
Outer layer:	EPDM, ozone-resistant, heat-resistant
Identification:	Red ring, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint type 1 model R is suitable for water, drinking water (certifications DVGW W 270 as well as ACS), cold and hot wastewater, seawater, cooling water (also with chemical additives for water processing), weak acids and lyes, saline solutions, technical alcohol, ester and ketones. It can be used in a temperature range (depending on media) from -40 °C to +100 °C (briefly up to +120) and is electrically dissipative.

Areas of application in industry and trade:

- Absorbing axial, lateral and angular movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction and ship building
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

Subject to technical modifications

1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

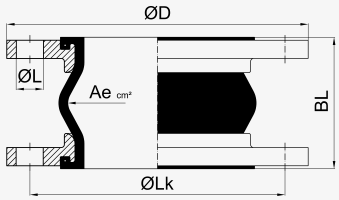
Nominal diameter		LGTH	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Bore-hole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30				115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
32	1 1/4“	160	16	15	-30	+35	±35	±15				140	40	100	4	18	3.6
40	1 1/2“	130	16	20	-30	+20	±30	±30	max. -1000			150	40	110	4	18	4.0
40	1 1/2“	160	16	20	-30	+35	±35	±15				150	40	110	4	18	4.2
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
50	2“	150	16	30	-35	+30	±30	±15				165	16	125	4	18	4.7
50	2“	160	16	30	-30	+35	±35	±15				165	16	125	4	18	4.8
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
65	2 1/2“	150	16	50	-35	+30	±30	±15	-700			185	16	145	4	18	5.4
65	2 1/2“	160	16	50	-30	+35	±35	±15	-700			185	16	145	4	18	5.5
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
80	3“	150	16	85	-35	+30	±30	±15	-600			200	16	160	8	18	7.0
80	3“	160	16	85	-30	+35	±35	±15	-600			200	16	160	8	18	7.1
100	4“	130	16	125	-30	+20	±30	±20	-400	max. -1000		220	16	180	8	18	8.0
100	4“	150	16	125	-35	+30	±30	±15	-400			220	16	180	8	18	8.1
100	4“	160	16	125	-30	+35	±35	±15	-400			220	16	180	8	18	8.2
125	5“	130	16	185	-30	+20	±30	±20	-300		max. -1000	250	16	210	8	18	9.9
125	5“	150	16	185	-35	+30	±30	±15	-300			250	16	210	8	18	10.1
125	5“	160	16	185	-30	+35	±35	±15	-300			250	16	210	8	18	10.2
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
150	6“	150	16	250	-35	+30	±30	±15	-300			285	16	240	8	22	12.4
150	6“	160	16	250	-30	+35	±35	±15	-300			285	16	240	8	22	12.5
200	8“	130	16	400	-25	+30	±30	±10	-300			340	10	295	8	22	16.5
200	8“	150	16	400	-35	+30	±30	±15	-300			340	10	295	8	22	16.6
200	8“	160	16	400	-30	+35	±35	±5	-300			340	10	295	8	22	16.7
200	8“	175	16	400	-15	+35	±15	±5	-300			340	10	295	8	22	16.8
250	10“	130	16	600	-10	+30	±15	±5	-200			395	10	350	12	22	21.6
250	10“	175	16	600	-15	+35	±10	±5	-200			395	10	350	12	22	21.9
250	10“	200	10	600	-40	+35	±30	±10	-200			395	10	350	12	22	22.1
300	12“	130	16	800	-10	+30	±15	±5	-100			445	10	400	12	22	29.3
300	12“	200	10	800	-40	+35	±30	±10	-100			445	10	400	12	22	29.8
350	14“	200	16	1000	-40	+35	±30	±8	-			505	10	460	16	22	43.0
400	16“	200	16	1375	-40	+35	±30	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-40	+35	±35	±10	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+35	±30	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+35	±30	±8	-	-700		780	10	725	20	30	70.0
700	28“	260	10	4800	-40	+30	±30	±5	-	-		895	10	840	24	30	117.0
800	32“	250	10	5440	-40	+35	±35	±5	-	-	-700	1015	10	950	24	33	129.5
900	36“	300	10	7100	-40	+40	±40	±5	-	-	-700	1115	10	1050	28	33	184.0
1000	40“	300	10	8700	-40	+40	±40	±5	-	-	-700	1230	10	1160	28	36	245.0

RUBBER EXPANSION JOINTS

Type 1 MODEL RS

TYPE 1 MODEL RS

TYPE 1 MODEL RS



Version

The HKS rubber expansion joint **type 1 model RS** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	EPDM, resistant to hot water, seamless, highly abrasion-resistant
Pressure support:	Polymer textile cord, resistant to hot water and hydrolysis
Outer layer:	EPDM, ozone-resistant, heat-resistant
Identification:	2 red rings, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint **type 1 model RS** is suitable for continuous duty with hot heating and cooling water as well as hot air. It is DIN certified up to 100 °C at 10 bar and up to 110 °C at 6 bar pressure. Electrically dissipative.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
70 °C	100 %	10 bar	16 bar
100 °C	75 %	7.5 bar	12 bar
130 °C	50 %	5 bar	8 bar

1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Subject to technical modifications

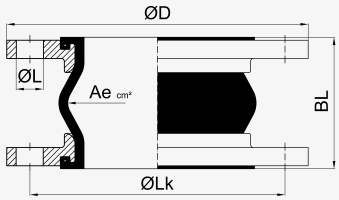
Nominal diameter		LGTH	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Bore-hole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30	max. -1000	max. -1000	max. -1000	115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
32	1 1/4“	160	16	15	-30	+25	±25	±15				140	40	100	4	18	3.6
40	1 1/2“	130	16	20	-30	+20	±30	±30				150	40	110	4	18	4.0
40	1 1/2“	160	16	20	-30	+25	±25	±15				150	40	110	4	18	4.2
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
50	2“	160	16	30	-30	+25	±25	±15				165	16	125	4	18	4.8
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
65	2 1/2“	160	16	50	-30	+25	±25	±15	-700			185	16	145	4	18	5.5
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
80	3“	150	16	85	-30	+20	±30	±15	-600			200	16	160	8	18	7.0
80	3“	160	16	85	-30	+25	±25	±15	-600			200	16	160	8	18	7.1
100	4“	130	16	125	-30	+20	±30	±20	-400			220	16	180	8	18	8.0
100	4“	150	16	125	-30	+20	±30	±15	-400			220	16	180	8	18	8.1
100	4“	160	16	125	-30	+25	±25	±15	-400			220	16	180	8	18	8.2
125	5“	130	16	185	-30	+20	±30	±20	-300			250	16	210	8	18	9.8
125	5“	150	16	185	-30	+20	±30	±15	-300			250	16	210	8	18	9.9
125	5“	160	16	185	-30	+25	±25	±15	-300			250	16	210	8	18	10.0
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
150	6“	150	16	250	-30	+20	±30	±15	-300			285	16	240	8	22	12.4
150	6“	160	16	250	-30	+25	±25	±15	-300			285	16	240	8	22	12.5
200	8“	130	16	400	-25	+30	±25	±10	-300			340	10	295	8	22	16.5
200	8“	150	16	400	-30	+20	±30	±15	-300			340	10	295	8	22	16.6
200	8“	160	16	400	-30	+25	±25	±15	-300			340	10	295	8	22	16.7
200	8“	175	16	400	-30	+30	±30	±10	-300			340	10	295	8	22	16.8
250	10“	130	16	600	-15	+30	±25	±5	-200			395	10	350	12	22	21.6
250	10“	175	16	600	-30	+30	±30	±10	-200			395	10	350	12	22	21.9
250	10“	200	10	600	-30	+25	±25	±10	-200			395	10	350	12	22	22.1
300	12“	130	16	800	-15	+30	±25	±5	-100			445	10	400	12	22	29.3
300	12“	200	10	800	-30	+25	±25	±10	-100			445	10	400	12	22	29.7
350	14“	200	10	1000	-40	+25	±25	±8	-			505	10	460	16	22	43.0
400	16“	200	10	1375	-40	+25	±25	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+25	±25	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-40	+30	±25	±10	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+25	±25	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+25	±25	±8	-	-700		780	10	725	20	30	70.0
700	28“	260	10	4800	-40	+30	±25	±5	-	-		895	10	840	24	30	117.0
800	32“	250	10	5440	-40	+30	±25	±5	-	-	-700	1015	10	950	24	33	129.5
900	36“	300	10	7100	-40	+35	±30	±5	-	-	-700	1115	10	1050	28	33	184.0
1000	40“	300	10	8700	-40	+35	±30	±5	-	-	-700	1230	10	1160	28	36	245.0

RUBBER EXPANSION JOINTS

Type 1 MODEL V

TYPE 1 MODEL V

TYPE 1 MODEL V



Version

The HKS rubber expansion joint **type 1 model V** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	FPM, seamless, diffusion-proof, electrically insulating
Pressure support:	PA textile cord, special rubber coating
Outer layer:	ECO, electrically conductive
Identification:	White-green-white rings, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint type 1 model V with seamless FPM lining is suitable for petrochemical plants, motors, power plants and flue gas desulphurisation plants with a high resistance to hot oils, benzene, xylene, fuels with an aromatics content over 50 %, bio diesel, aromatic/chlorinated hydrocarbons and mineral acids.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

Subject to technical modifications

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Nominal diameter		LGTH	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Bore-hole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30	max. -1000	max. -1000	max. -1000	115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
40	1 1/2“	130	16	20	-30	+20	±30	±30				150	40	110	4	18	4.0
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
100	4“	130	16	125	-30	+20	±30	±20	-400			220	16	180	8	18	8.0
125	5“	130	16	185	-30	+20	±30	±20	-300			250	16	210	8	18	9.9
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
200	8“	130	16	400	-25	+30	±30	±10	-300	-600		340	10	295	8	22	16.5

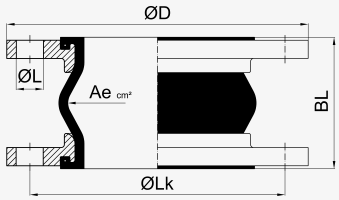
1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100%.

RUBBER EXPANSION JOINTS

Type 1 MODEL W

TYPE 1 MODEL W

TYPE 1 MODEL W



Version

The HKS rubber expansion joint **type 1 model W** consists of a rubber bellows and two rotating flanges.

Design of rubber bellows:

Inner layer:	NBR light, seamless, abrasion-resistant
Pressure support:	PA textile cord
Outer layer:	Chloroprene (CR)
Identification:	White ring, DN.., PN.., date of manufacture

Flange design:

Rotating steel flanges made of material S235JR, galvanised, DIN PN 10, with integrated rubber bead (self-sealing), additional seals are not required.

Properties and areas of application:

The HKS rubber expansion joint **type 1 model W** is suitable for food, including food containing oil and fat. It is not approved for drinking water. The inner rubber complies with the German Food Safety Act. Electrically dissipative.

Temperature-dependent pressure and movement ranges

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows	
		PN 10	PN 16
50 °C	100 %	10 bar	16 bar
70 °C	80 %	8 bar	12 bar
100 °C	60 %	6 bar	10 bar

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Food processing industry

Additional equipment:

- PTFE linings
- Vacuum support rings
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves
- Flame protection covers
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, ASA, JIS, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables. DN 32 bellows are used for DN 25 rubber expansion joints.

Subject to technical modifications

Nominal diameter		LGTH	Bellows		Permitted movement absorption nominal [5]				Permitted negative pressure (vacuum stability)			Flange					Weight
			Nominal pressure	Effective diameter	Axial [4]		Lateral	Angular	Without VSD	With VSD [2]	With VSD+S [3]	Outside diameter	Borehole pattern acc. to EN 1092	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	PN	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$				D	PN	Lk	n	L	G
mm	in	mm	bar	cm²	mm	mm	mm	Degrees	mbar	mbar	mbar	mm	-	mm	-	mm	kg
25 [1]	1“	130	16	15	-30	+20	±30	±30	max. -1000	max. -1000	max. -1000	115	40	85	4	14	1.9
32	1 1/4“	130	16	15	-30	+20	±30	±30				140	40	100	4	18	3.4
40	1 1/2“	130	16	20	-30	+20	±30	±30				150	40	110	4	18	4.0
50	2“	130	16	30	-30	+20	±30	±30				165	16	125	4	18	4.6
65	2 1/2“	130	16	50	-30	+20	±30	±30	-700			185	16	145	4	18	5.3
80	3“	130	16	85	-30	+20	±30	±30	-600			200	16	160	8	18	6.9
100	4“	130	16	125	-30	+20	±30	±20	-400			220	16	180	8	18	8.0
125	5“	130	16	185	-30	+20	±30	±20	-300			250	16	210	8	18	9.9
150	6“	130	16	250	-30	+20	±30	±20	-300			285	16	240	8	22	12.3
200	8“	130	16	400	-25	+30	±30	±10	-300			340	10	295	8	22	16.5
250	10“	130	16	600	-10	+30	±15	±5	-200			395	10	350	12	22	21.6
300	12“	130	16	800	-10	+30	±15	±5	-100			445	10	400	12	22	29.3
350	14“	200	16	1000	-40	+35	±30	±8	-			505	10	460	16	22	43.0
400	16“	200	16	1375	-40	+35	±30	±8	-			565	10	515	16	26	46.0
450	18“	200	10	1780	-40	+35	±30	±8	-	-700		615	10	565	20	26	50.0
450	18“	250	10	1780	-45	+35	±35	±10	-	-700		615	10	565	20	26	53.0
500	20“	200	10	2185	-40	+35	±30	±8	-	-700		670	10	620	20	26	57.0
600	24“	200	10	3080	-40	+35	±30	±8	-	-700		780	10	725	20	30	70.0

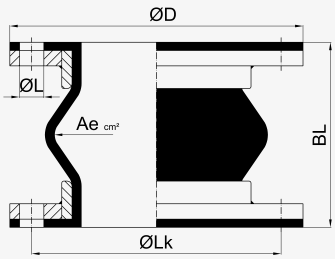
1) DN 32 bellows are used for DN 25 rubber expansion joints.
2) VSD … vacuum support ring made of material 1.4571
3) VSD+S ... vacuum support ring with lock (screw fitting) made of 1.4571
4) Axial movement absorption Δx_c … compression and Δx_e … extension
5) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 2 MODEL R

TYPE 2 MODEL R

TYPE 2 MODEL R



Version

The HKS rubber expansion joint **type 2 model R** is individually tailored based on customer requirements. It consists of a rubber bellows with pressure-reinforced solid rubber flanges attached to both sides and backing steel flanges made from material S235JR.

Design of rubber bellows:

Inner layer:	EPDM, seamless, low diffusion
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	EPDM, resistant to ageing, ozone and weather
Pressure:	Max. 18 bar [1]
Temperature:	Max. 100 °C
Identification:	Red ring, DN.., PN.., date of manufacture

Flange design:

The backing steel flanges are manufactured with or without a support collar depending on operating pressure. As a standard they consist of material S235JR, are hot galvanised and feature a standard hole pattern (standard PN10). The connections are self-sealing so no additional seals are required.

Properties and areas of application:

The HKS rubber expansion joint **type 2 model R** is suitable for water, cold and hot wastewater, seawater, cooling water (also with chemical additives for water processing), weak acids and lyes, saline solutions, technical alcohol, ester and ketones.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings [2]
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves, protective pipes
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, EN, ASA, AWWA, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Temperature-dependent pressure and movement absorption

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows		
		PN 6	PN 10	PN 16
50 °C	100 %	6 bar	10 bar	16 bar
70 °C	80 %	5 bar	8 bar	12 bar
100 °C	60 %	2.5 bar	4 bar	7 bar

1) The value stated is the maximum value and depends on length, Nominal diameter and operating temperature. The table values were determined for an ambient temperature of 20 °C. Pressure derating has to be taken into account for deviating operating temperatures.

2) Vacuum support rings can be vulcanised into the rubber bellows on customer request to achieve improved media resistance.

Subject to technical modifications

Nominal diameter		LGTH	Rubber bellows with nominal pressure PN6			Permitted movement absorption nominal [3]				Permitted negative pressure (vacuum stability)		Flange with hole pattern PN10 acc. to EN 1092-1					Weight
			Rubber flange thickness	Inner diameter of convolution	Effective diameter	Axial [2]		Lateral	Angular	Without VSD	With VSD [1]	Outside diameter	Sheet thickness	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	F	A	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$			D	C_1	L_k	n	L	G
mm	in	mm	mm	mm	cm²	mm	mm	mm	Degrees	mbar	mbar	mm	mm	mm	-	mm	kg
450	18“	250	13	532	1978	-44	+20	±27	±5.1			615	15	565	20	26	51.0
500	20“	250	13	585	2418	-44	+20	±27	±4.6			670	15	620	20	26	57.5
600	24“	250	13	685	3368	-44	+20	±27	±3.8			780	15	725	20	30	72.5
700	28“	250	13	786	4487	-44	+20	±26	±3.3			895	15	840	24	30	88.5
800	32“	300	13	917	6176	-53	+31	±34	±4.4			1015	15	950	24	33	115
900	36“	300	13	1017	7647	-53	+31	±33	±3.9			1115	15	1050	28	33	128
1000	40“	300	13	1117	9275	-53	+31	±33	±3.5			1230	15	1160	28	36	146
1100	44“	300	13	1217	11060	-53	+31	±33	±3.2			1345	15	1270	32	36	168
1200	48“	300	13	1317	13003	-43	+41	±32	±3.9			1455	15	1380	32	39	196
1300	52“	300	13	1417	15102	-53	+31	±32	±2.7			1565	15	1485	32	42	219
1400	56“	300	13	1517	17358	-53	+31	±31	±2.5			1675	15	1590	36	42	241
1500	60“	300	13	1617	19771	-53	+31	±31	±2.4	max. -200	max. -950	1795	15	1705	36	48	261
1600	64“	300	13	1717	22341	-53	+31	±31	±2.2			1915	15	1820	40	48	291
1700	68“	300	13	1817	24788	-53	+31	±30	±2.1			2015	20	1920	44	48	380
1800	72“	300	13	1917	27657	-53	+31	±30	±2.0			2115	20	2020	44	48	401
1900	76“	300	13	2017	30682	-53	+31	±29	±1.9			2220	20	2125	48	48	428
2000	80“	300	13	2117	33864	-53	+31	±29	±1.8			2325	20	2230	48	48	455
2100	84“	350	13	2255	38514	-69	+43	±38	±2.3			2440	20	2335	48	56	505
2200	88“	350	13	2355	42070	-69	+43	±37	±2.2			2550	20	2440	52	56	539
2400	96“	350	13	2555	49653	-69	+43	±36	±2.1			2760	20	2650	56	56	600
2500	100“	350	13	2655	53680	-69	+43	±36	±2.0			2860	20	2750	56	56	624
2600	104“	350	13	2755	57864	-69	+43	±35	±1.9			2960	20	2850	60	56	646
2800	112“	350	13	2955	66703	-69	+43	±34	±1.8			3180	20	3070	64	56	726
3000	120“	350	13	3155	76170	-69	+43	±33	±1.6			3405	20	3290	68	62	807

1) VSD … vacuum support ring made of material 1.4571, placed internally or vulcanised in

2) Axial movement absorption Δx_c … compression and Δx_e **…** extension

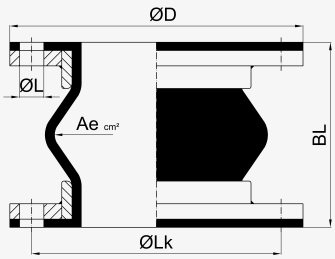
3) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 2 MODEL RS

TYPE 2 MODEL RS

TYPE 2 MODEL RS



Version

The HKS rubber expansion joint **type 2 model RS** is individually tailored based on customer requirements. It consists of a rubber bellows with pressure-reinforced solid rubber flanges attached to both sides and backing steel flanges made from material S235JR.

Design of rubber bellows:

Inner layer:	EPDM, seamless, low diffusion
Pressure support:	Aramid cord (AR) Nomex®, Kevlar®
Outer layer:	EPDM, resistant to ageing, ozone and weather
Pressure:	max. 27 bar [1]
Temperature:	max. 100 °C
Identification:	2 red rings, DN.., PN.., date of manufacture

Flange design:

The backing steel flanges are manufactured with or without a support collar depending on operating pressure. As a standard they consist of material S235JR, are hot galvanised and feature a standard hole pattern (standard PN10). The connections are self-sealing so no additional seals are required.

Properties and areas of application:

The HKS rubber expansion joint **type 2 model RS** is suitable for water, cold and hot wastewater, seawater, cooling water (also with chemical additives for water processing), weak acids and lyes, saline solutions, technical alcohol, ester and ketones.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings [2]
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves, protective pipes
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, EN, ASA, AWWA, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Temperature-dependent pressure and movement absorption

Max. operating temperature	Max. movement range	Temperature-dependent operating pressure for bellows		
		PN 6	PN 10	PN 16
50 °C	100 %	6 bar	10 bar	16 bar
70 °C	80 %	5 bar	8 bar	12 bar
100 °C	60 %	2.5 bar	4 bar	7 bar

Subject to technical modifications

1) The value stated is the maximum value and depends on length, Nominal diameter and operating temperature. The table values were determined for an ambient temperature of 20 °C. Pressure derating has to be taken into account for deviating operating temperatures.

2) Vacuum support rings can be vulcanised into the rubber bellows on customer request to achieve improved media resistance.

Nominal diameter		LGTH	Rubber bellows with nominal pressure PN6			Permitted movement absorption nominal [3]				Permitted negative pressure (vacuum stability)		Flange with hole pattern PN10 acc. to EN 1092-1					Weight
			Rubber flange thickness	Inner diameter of convolution	Effective diameter	Axial [2]		Lateral	Angular	Without VSD	With VSD [1]	Outside diameter	Sheet thickness	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	F	A	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$			D	C_1	L_k	n	L	G
mm	in	mm	mm	mm	cm²	mm	mm	mm	Degrees	mbar	mbar	mm	mm	mm	-	mm	kg
450	18“	250	13	532	1978	-44	+20	±27	±5.1			615	15	565	20	26	51.0
500	20“	250	13	585	2418	-44	+20	±27	±4.6			670	15	620	20	26	57.5
600	24“	250	13	685	3368	-44	+20	±27	±3.8			780	15	725	20	30	72.5
700	28“	250	13	786	4487	-44	+20	±26	±3.3			895	15	840	24	30	88.5
800	32“	300	13	917	6176	-53	+31	±34	±4.4			1015	15	950	24	33	115
900	36“	300	13	1017	7647	-53	+31	±33	±3.9			1115	15	1050	28	33	128
1000	40“	300	13	1117	9275	-53	+31	±33	±3.5			1230	15	1160	28	36	146
1100	44“	300	13	1217	11060	-53	+31	±33	±3.2			1345	15	1270	32	36	168
1200	48“	300	13	1317	13003	-43	+41	±32	±3.9			1455	15	1380	32	39	196
1300	52“	300	13	1417	15102	-53	+31	±32	±2.7			1565	15	1485	32	42	219
1400	56“	300	13	1517	17358	-53	+31	±31	±2.5			1675	15	1590	36	42	241
1500	60“	300	13	1617	19771	-53	+31	±31	±2.4	max. -200	max. -950	1795	15	1705	36	48	261
1600	64“	300	13	1717	22341	-53	+31	±31	±2.2			1915	15	1820	40	48	291
1700	68“	300	13	1817	24788	-53	+31	±30	±2.1			2015	20	1920	44	48	380
1800	72“	300	13	1917	27657	-53	+31	±30	±2.0			2115	20	2020	44	48	401
1900	76“	300	13	2017	30682	-53	+31	±29	±1.9			2220	20	2125	48	48	428
2000	80“	300	13	2117	33864	-53	+31	±29	±1.8			2325	20	2230	48	48	455
2100	84“	350	13	2255	38514	-69	+43	±38	±2.3			2440	20	2335	48	56	505
2200	88“	350	13	2355	42070	-69	+43	±37	±2.2			2550	20	2440	52	56	539
2400	96“	350	13	2555	49653	-69	+43	±36	±2.1			2760	20	2650	56	56	600
2500	100“	350	13	2655	53680	-69	+43	±36	±2.0			2860	20	2750	56	56	624
2600	104“	350	13	2755	57864	-69	+43	±35	±1.9			2960	20	2850	60	56	646
2800	112“	350	13	2955	66703	-69	+43	±34	±1.8			3180	20	3070	64	56	726
3000	120“	350	13	3155	76170	-69	+43	±33	±1.6			3405	20	3290	68	62	807

1) VSD … vacuum support ring made of material 1.4571, placed internally or vulcanised in

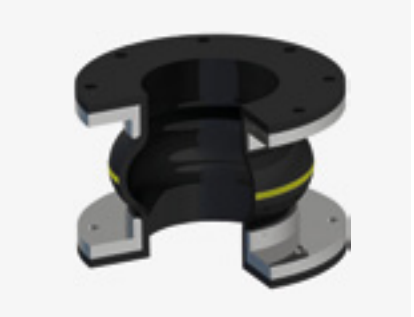
2) Axial movement absorption Δx_c … compression and Δx_e **…** extension

3) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

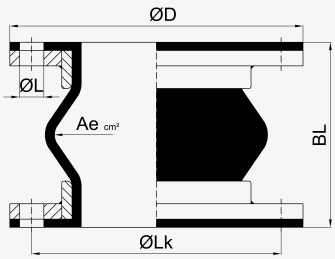
RUBBER EXPANSION JOINTS

Type 2 MODEL G

TYPE 2 MODEL G



TYPE 2 MODEL G



Version

The HKS rubber expansion joint **type 2 model G** is individually tailored based on customer requirements. It consists of a rubber bellows with pressure-reinforced solid rubber flanges attached to both sides and backing steel flanges made from material S235JR.

Design of rubber bellows:

Inner layer:	NBR, seamless, abrasion-resistant
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	NBR
Pressure:	max. 18 bar [1)]
Temperature:	max. 100 °C
Identification:	Yellow ring, DN.., PN.., date of manufacture

Flange design:

The backing steel flanges are manufactured with or without a support collar depending on operating pressure. As a standard they consist of material S235JR, are hot galvanised and feature a standard hole pattern (standard PN10). The connections are self-sealing so no additional seals are required.

Properties and areas of application:

The HKS rubber expansion joint **type 2 model G** is suitable for mineral oil products, fuel-ethanol mixtures and EN fuels, municipal and natural gas except liquid gas.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings [2)]
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves, protective pipes
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, EN, ASA, AWWA, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Temperature-dependent pressure and movement absorption

Max. operating temperature	Movement absorption max.	Temperature-dependent operating pressure of the rubber bellows		
		PN 6	PN 10	PN 16
50 °C	100 %	6 bar	10 bar	16 bar
70 °C	80 %	5 bar	8 bar	12 bar
100 °C	60 %	2.5 bar	4 bar	7 bar

1) The value stated is the maximum value and depends on length, Nominal diameter and operating temperature. The table values were determined for an ambient temperature of 20 °C. Pressure derating has to be taken into account for deviating operating temperatures.

2 Vacuum support rings can be vulcanised into the rubber bellows on customer request to achieve improved media resistance.

Subject to technical modifications

Nominal diameter		LGTH	Rubber bellows with nominal pressure PN6			Permitted movement absorption nominal [3]				Permitted negative pressure (vacuum stability)		Flange with hole pattern PN10 acc. to EN 1092-1					Weight
			Rubber flange thickness	Inner diameter of convolution	Effective diameter	Axial [2]		Lateral	Angular	Without VSD	With VSD [1]	Outside diameter	Sheet thickness	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	F	A	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$			D	C_1	L_k	n	L	G
mm	in	mm	mm	mm	cm²	mm	mm	mm	Degrees	mbar	mbar	mm	mm	mm	-	mm	kg
450	18“	250	13	532	1978	-44	+20	±27	±5.1			615	15	565	20	26	51.0
500	20“	250	13	585	2418	-44	+20	±27	±4.6			670	15	620	20	26	57.5
600	24“	250	13	685	3368	-44	+20	±27	±3.8			780	15	725	20	30	72.5
700	28“	250	13	786	4487	-44	+20	±26	±3.3			895	15	840	24	30	88.5
800	32“	300	13	917	6176	-53	+31	±34	±4.4			1015	15	950	24	33	115
900	36“	300	13	1017	7647	-53	+31	±33	±3.9			1115	15	1050	28	33	128
1000	40“	300	13	1117	9275	-53	+31	±33	±3.5			1230	15	1160	28	36	146
1100	44“	300	13	1217	11060	-53	+31	±33	±3.2			1345	15	1270	32	36	168
1200	48“	300	13	1317	13003	-43	+41	±32	±3.9			1455	15	1380	32	39	196
1300	52“	300	13	1417	15102	-53	+31	±32	±2.7			1565	15	1485	32	42	219
1400	56“	300	13	1517	17358	-53	+31	±31	±2.5			1675	15	1590	36	42	241
1500	60“	300	13	1617	19771	-53	+31	±31	±2.4	max. -200	max. -950	1795	15	1705	36	48	261
1600	64“	300	13	1717	22341	-53	+31	±31	±2.2			1915	15	1820	40	48	291
1700	68“	300	13	1817	24788	-53	+31	±30	±2.1			2015	20	1920	44	48	380
1800	72“	300	13	1917	27657	-53	+31	±30	±2.0			2115	20	2020	44	48	401
1900	76“	300	13	2017	30682	-53	+31	±29	±1.9			2220	20	2125	48	48	428
2000	80“	300	13	2117	33864	-53	+31	±29	±1.8			2325	20	2230	48	48	455
2100	84“	350	13	2255	38514	-69	+43	±38	±2.3			2440	20	2335	48	56	505
2200	88“	350	13	2355	42070	-69	+43	±37	±2.2			2550	20	2440	52	56	539
2400	96“	350	13	2555	49653	-69	+43	±36	±2.1			2760	20	2650	56	56	600
2500	100“	350	13	2655	53680	-69	+43	±36	±2.0			2860	20	2750	56	56	624
2600	104“	350	13	2755	57864	-69	+43	±35	±1.9			2960	20	2850	60	56	646
2800	112“	350	13	2955	66703	-69	+43	±34	±1.8			3180	20	3070	64	56	726
3000	120“	350	13	3155	76170	-69	+43	±33	±1.6			3405	20	3290	68	62	807

1) VSD … vacuum support ring made of material 1.4571, placed internally or vulcanised in

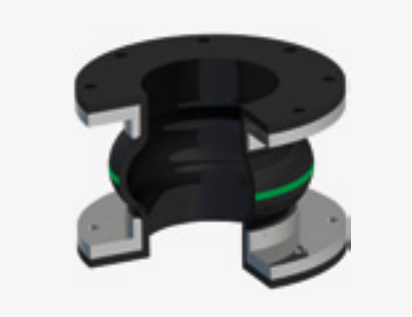
2) Axial movement absorption Δx_c … compression and Δx_e **…** extension

3) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

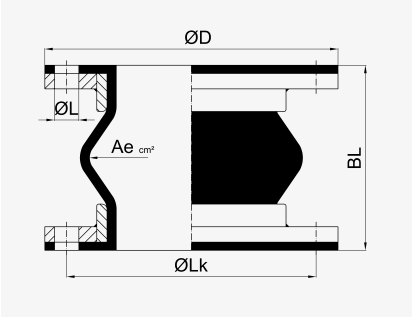
RUBBER EXPANSION JOINTS

Type 2 MODEL GR

TYPE 2 MODEL GR



TYPE 2 MODEL GR



Version

The HKS rubber expansion joint **type 2 model GR** is individually tailored based on customer requirements. It consists of a rubber bellows with pressure-reinforced solid rubber flanges attached to both sides and backing steel flanges made from material S235JR.

Design of rubber bellows:

Inner layer:	CSM (Hypalon®), seamless, highly abrasion-resistant
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	CSM (Hypalon®)
Pressure:	max. 18 bar [1)]
Temperature:	max. 100 °C
Identification:	Green ring, DN.., PN.., date of manufacture

Flange design:

The backing steel flanges are manufactured with or without a support collar depending on operating pressure. As a standard they consist of material S235JR, are hot galvanised and feature a standard hole pattern (standard PN10). The connections are self-sealing so no additional seals are required.

Properties and areas of application:

The HKS rubber expansion joint **type 2 model GR** is suitable for chemicals, acids, lyes and aggressive chemical wastewater as well as compressed air containing oil up to +90 °C.

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings [2)]
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves, protective pipes
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, EN, ASA, AWWA, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

Temperature-dependent pressure and movement absorption

Max. operating temperature	Movement absorption max.	Temperature-dependent operating pressure of the rubber bellows		
		PN 6	PN 10	PN 16
50 °C	100 %	6 bar	10 bar	16 bar
70 °C	80 %	5 bar	8 bar	12 bar
100 °C	60 %	2.5 bar	4 bar	7 bar

Subject to technical modifications

1) The value stated is the maximum value and depends on length, Nominal diameter and operating temperature. The table values were determined for an ambient temperature of 20 °C. Pressure derating has to be taken into account for deviating operating temperatures.

2) Vacuum support rings can be vulcanised into the rubber bellows on customer request to achieve improved media resistance.

Nominal diameter		LGTH	Rubber bellows with nominal pressure PN6			Permitted movement absorption nominal [3]				Permitted negative pressure (vacuum stability)		Flange with hole pattern PN10 acc. to EN 1092-1					Weight
			Rubber flange thickness	Inner diameter of convolution	Effective diameter	Axial [2]		Lateral	Angular	Without VSD	With VSD [1]	Outside diameter	Sheet thickness	Pitch circle diameter	No. of holes	Hole diameter	
DN		BL	F	A	Ae	Δx_c	Δx_e	Δy	$\Delta \alpha$			D	C_1	L_k	n	L	G
mm	in	mm	mm	mm	cm²	mm	mm	mm	Degrees	mbar	mbar	mm	mm	mm	-	mm	kg
450	18“	250	13	532	1978	-44	+20	±27	±5.1			615	15	565	20	26	51.0
500	20“	250	13	585	2418	-44	+20	±27	±4.6			670	15	620	20	26	57.5
600	24“	250	13	685	3368	-44	+20	±27	±3.8			780	15	725	20	30	72.5
700	28“	250	13	786	4487	-44	+20	±26	±3.3			895	15	840	24	30	88.5
800	32“	300	13	917	6176	-53	+31	±34	±4.4			1015	15	950	24	33	115
900	36“	300	13	1017	7647	-53	+31	±33	±3.9			1115	15	1050	28	33	128
1000	40“	300	13	1117	9275	-53	+31	±33	±3.5			1230	15	1160	28	36	146
1100	44“	300	13	1217	11060	-53	+31	±33	±3.2			1345	15	1270	32	36	168
1200	48“	300	13	1317	13003	-43	+41	±32	±3.9			1455	15	1380	32	39	196
1300	52“	300	13	1417	15102	-53	+31	±32	±2.7			1565	15	1485	32	42	219
1400	56“	300	13	1517	17358	-53	+31	±31	±2.5			1675	15	1590	36	42	241
1500	60“	300	13	1617	19771	-53	+31	±31	±2.4	max. -200	max. -950	1795	15	1705	36	48	261
1600	64“	300	13	1717	22341	-53	+31	±31	±2.2			1915	15	1820	40	48	291
1700	68“	300	13	1817	24788	-53	+31	±30	±2.1			2015	20	1920	44	48	380
1800	72“	300	13	1917	27657	-53	+31	±30	±2.0			2115	20	2020	44	48	401
1900	76“	300	13	2017	30682	-53	+31	±29	±1.9			2220	20	2125	48	48	428
2000	80“	300	13	2117	33864	-53	+31	±29	±1.8			2325	20	2230	48	48	455
2100	84“	350	13	2255	38514	-69	+43	±38	±2.3			2440	20	2335	48	56	505
2200	88“	350	13	2355	42070	-69	+43	±37	±2.2			2550	20	2440	52	56	539
2400	96“	350	13	2555	49653	-69	+43	±36	±2.1			2760	20	2650	56	56	600
2500	100“	350	13	2655	53680	-69	+43	±36	±2.0			2860	20	2750	56	56	624
2600	104“	350	13	2755	57864	-69	+43	±35	±1.9			2960	20	2850	60	56	646
2800	112“	350	13	2955	66703	-69	+43	±34	±1.8			3180	20	3070	64	56	726
3000	120“	350	13	3155	76170	-69	+43	±33	±1.6			3405	20	3290	68	62	807

1) VSD … vacuum support ring made of material 1.4571, placed internally or vulcanised in

2) Axial movement absorption Δx_c … compression and Δx_e **…** extension

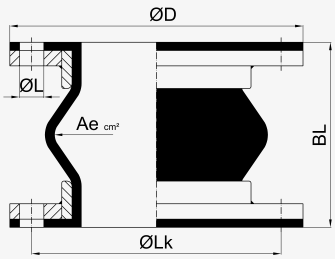
3) $\Delta x_c/\Delta x_e$, Δy and $\Delta \alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 2 MODEL CR

TYPE 2 MODEL CR

TYPE 2 MODEL CR



Version

The HKS rubber expansion joint **type 2 model CR** is individually tailored based on customer requirements. It consists of a rubber bellows with pressure-reinforced solid rubber flanges attached to both sides and backing steel flanges made from material S235JR.

Design of rubber bellows:

Inner layer:	CR (Neoprene®), seamless, abrasion-resistant
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	CR (Neoprene®)
Pressure:	max. 18 bar 1)
Temperature:	max. 70 °C
Identification:	Grey ring, DN.., PN.., date of manufacture

Flange design:

The backing steel flanges are manufactured with or without a support collar depending on operating pressure. As a standard they consist of material S235JR, are hot galvanised and feature a standard hole pattern (standard PN10). The connections are self-sealing so no additional seals are required.

Properties and areas of application:

The HKS rubber expansion joint **type 2 model CR** is suitable for cold and warm water, swimming pool water, seawater, wastewater (lightly acidic or alkaline), also with low oil content, cooling water with corrosion protection agents containing oil, lubricant, grease, air and compressed air.

Temperature-dependent pressure and movement absorption

Max. operating temperature	Movement absorption max.	Temperature-dependent operating pressure of the rubber bellows		
		PN 6	PN 10	PN 16
50 °C	100 %	6 bar	10 bar	16 bar
70 °C	80 %	5 bar	8 bar	12 bar

Subject to technical modifications

Areas of application in industry and trade:

- Absorbing axial movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Reducing noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Water supply and building technology
- Energy and offshore technology
- Steel, printing, paper and chemical industry

Additional equipment:

- PTFE linings
- Vacuum support rings [2)]
- Tensioning/tension rod length limiters
- Hinged tensioners
- Inner sleeves, protective pipes
- Soil protection covers

Special versions:

- Flanges: Other materials, flange standards and dimensions according to DIN, EN, ASA, AWWA, etc. are possible.
- Rubber bellows: On request, other expansion joints are available with Nominal diameters, pressure stages and lengths which exceed the standard listed in the tables.

1) The value stated is the maximum value and depends on length, Nominal diameter and operating temperature. The table values were determined for an ambient temperature of 20 °C. Pressure derating has to be taken into account for deviating operating temperatures.

2) Vacuum support rings can be vulcanised into the rubber bellows on customer request to achieve improved media resistance.

Nominal diameter		LGTH	Rubber bellows with nominal pressure PN6			Permitted movement absorption nominal [3]				Permitted negative pressure (vacuum stability)		Flange with hole pattern PN10 acc. to EN 1092-1					Weight
			Rubber flange thick-ness	Inner diame-ter of convo-lution	Effec-tive diame-ter	Axial [2]		La-teral	Angu-lar	Wit-hout VSD	With VSD [1]	Outside diameter	Sheet thick-ness	Pitch circle diame-ter	No. of holes	Hole diame-ter	
DN		BL	F	A	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$			D	C_1	L_k	n	L	G
mm	in	mm	mm	mm	cm²	mm	mm	mm	De-grees	mbar	mbar	mm	mm	mm	-	mm	kg
450	18“	250	13	532	1978	-44	+20	±27	±5.1			615	15	565	20	26	51.0
500	20“	250	13	585	2418	-44	+20	±27	±4.6			670	15	620	20	26	57.5
600	24“	250	13	685	3368	-44	+20	±27	±3.8			780	15	725	20	30	72.5
700	28“	250	13	786	4487	-44	+20	±26	±3.3			895	15	840	24	30	88.5
800	32“	300	13	917	6176	-53	+31	±34	±4.4			1015	15	950	24	33	115
900	36“	300	13	1017	7647	-53	+31	±33	±3.9			1115	15	1050	28	33	128
1000	40“	300	13	1117	9275	-53	+31	±33	±3.5			1230	15	1160	28	36	146
1100	44“	300	13	1217	11060	-53	+31	±33	±3.2			1345	15	1270	32	36	168
1200	48“	300	13	1317	13003	-43	+41	±32	±3.9			1455	15	1380	32	39	196
1300	52“	300	13	1417	15102	-53	+31	±32	±2.7			1565	15	1485	32	42	219
1400	56“	300	13	1517	17358	-53	+31	±31	±2.5			1675	15	1590	36	42	241
1500	60“	300	13	1617	19771	-53	+31	±31	±2.4	max. -200	max. -950	1795	15	1705	36	48	261
1600	64“	300	13	1717	22341	-53	+31	±31	±2.2			1915	15	1820	40	48	291
1700	68“	300	13	1817	24788	-53	+31	±30	±2.1			2015	20	1920	44	48	380
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2200	88“	350	13	2355	42070	-69	+43	±37	±2.2			2550	20	2440	52	56	539
2400	96“	350	13	2555	49653	-69	+43	±36	±2.1			2760	20	2650	56	56	600
2500	100“	350	13	2655	53680	-69	+43	±36	±2.0			2860	20	2750	56	56	624
2600	104“	350	13	2755	57864	-69	+43	±35	±1.9			2960	20	2850	60	56	646
2800	112“	350	13	2955	66703	-69	+43	±34	±1.8			3180	20	3070	64	56	726
3000	120“	350	13	3155	76170	-69	+43	±33	±1.6			3405	20	3290	68	62	807

1) VSD … vacuum support ring made of material 1.4571, placed internally or vulcanised in

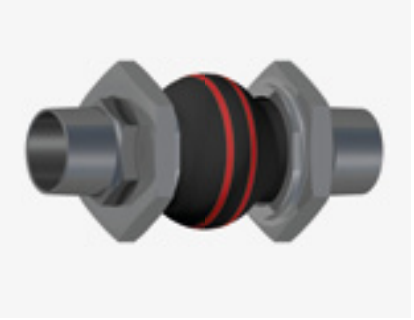
2) Axial movement absorption Δx_c … compression and Δx_e **…** extension

3) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 3 MODEL HZR

TYPE 3 MODEL HZR AG/AG



TYPE 3 MODEL HZR IG/IG

Version

The HKS rubber expansion joint **type 3 model HZR** consists of a rubber bellows with flat convolution with support lining and two threaded screw fittings. Version 1 with external thread (AG) and version 2 with internal thread (IG).

Flange design:

Inner layer:	EPDM, seamless, low diffusion
Pressure support:	Aramid cord (AR) Nomex®, Kevlar®
Outer layer:	EPDM, resistant to ageing, ozone and weather
Perm. pressure:	16 bar at 50 °C, 10 bar at 100 °C, 6 bar at 110 °C
Perm. negative pressure:	Vacuum-resistant to 0.5 bar abs.
Identification:	2 red rings, DN.., PN.., date of manufacture

Flange design:

The screw fittings are made of malleable cast iron (EN-GJMW-400-5), are galvanised and include an integrated rubber bead. Internal and external thread connections are standardised pipe threads for conically or metallically sealing connections in the thread according to ISO 7-1 (EN 10226-1, previously DIN 2999).

Version 1:	R external thread (right), conical
Version 2:	Rp internal thread (right), cylindrical

Properties and areas of application:

The HKS rubber expansion joint **type 3 model HZR** is suitable for heating systems according to DIN 48091), for continuous duty in warm and hot water heating systems up to 100 °C at 10 bar and 110 °C at 6 bar operating pressure for a duty time of 10 years. Not suitable for media containing oil.

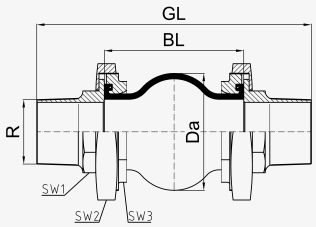
Areas of application in industry and trade:

- Absorbing axial, lateral and angular movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Sound absorption and reduction of noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Plant engineering, pipeline construction and heating systems
- Water supply and building technology (TGA)

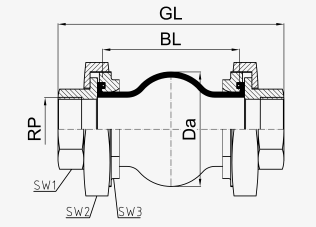
Special versions:

- Screw fitting: Where increased corrosion protection is required, the connecting parts are also available in stainless steel or brass.
- Rubber bellows: On request, other rubber qualities for drinking water, chemical plants, gas, oil and fuel are also available.

External thread AG/AG



Internal thread IG/IG



1) TÜV approvals are available for heating systems according to DIN 4809 and PED 97/23/EC.

Nominal diameter		Length		Bellows			Permitted movement absorption nominal [2]				Permitted negative pressure (vacuum stability)	Screw fitting				Weight
		Without screw fitting	With screw fitting	Nominal pressure	Outside diameter	Effective diameter	Axial [1]		Lateral	Angular		Thread connection acc. to ISO7-1	Spanner size			
DN		BL	GL	PN	Da	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$	-	-	SW1	SW2	SW3	G
mm	in	mm	mm	bar	mm	cm²	mm	mm	mm	Degrees	mbar	inches	mm	mm	mm	kg
RUBBER EXPANSION JOINT with external thread AG/AG · **type 3 MODEL HZR** version 1																
20	3/4“	130	228	16	65	12	-30	+15	±10	±30	-500	R 3/4“	36	80	48	0.65
25	1“	130	236	16	65	12	-30	+15	±10	±30	-500	R 1“	40	80	54	0.85
32	1 1/4“	130	246	16	78	18	-30	+15	±10	±30	-500	R 1 1/4“	48	80	66	1.30
40	1 1/2“	130	250	16	90	27	-30	+15	±10	±30	-500	R 1 1/2“	53	90	74	1.50
50	2“	130	256	16	109	42	-30	+15	±10	±30	-500	R 2“	66	110	90	2.25
RUBBER EXPANSION JOINT with internal thread IG/IG · **type 3 MODEL HZR** version 2																
20	3/4“	130	186	16	65	12	-30	+15	±10	±30	-500	Rp 3/4“	36	80	48	0.60
25	1“	130	192	16	65	12	-30	+15	±10	±30	-500	Rp 1“	40	80	54	0.70
32	1 1/4“	130	196	16	78	18	-30	+15	±10	±30	-500	Rp 1 1/4“	48	80	66	1.10
40	1 1/2“	130	202	16	90	27	-30	+15	±10	±30	-500	Rp 1 1/2“	53	90	74	1.30
50	2“	130	215	16	109	42	-30	+15	±10	±30	-500	Rp 2“	66	110	90	1.50

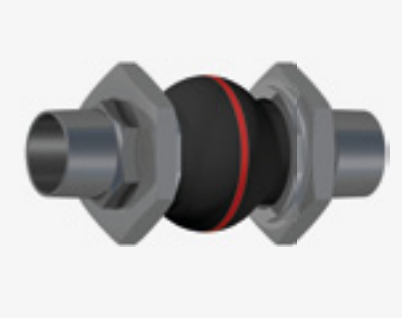
1) Axial movement absorption Δx_c … compression and Δx_e … extension

2) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 3 MODEL HZB

TYPE 3 MODEL HZB AG/AG



TYPE 3 MODEL HZB IG/IG

Areas of application in industry and trade:

- Absorbing axial, lateral and angular movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Sound absorption and reduction of noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Plant engineering, pipeline construction and heating systems
- Water supply and building technology (TGA)

Version

The HKS rubber expansion joint **type 3 model HZB** consists of a rubber bellows with flat convolution with support lining and two threaded screw fittings. Version 1 with external thread (AG) and version 2 with internal thread (IG).

Special versions:

- Screw fitting: Where increased corrosion protection is required, the connecting parts are also available in stainless steel or brass.
- Rubber bellows: On request, other rubber qualities for drinking water, chemical plants, gas, oil and fuel are also available.

Design of rubber bellows:

Inner layer:	EPDM, seamless, low diffusion
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	EPDM, resistant to ageing, ozone and weather
Perm. pressure:	16 bar at 50 °C, 12 bar at 70 °C, 10 bar at 90 °C
Perm. negative pressure:	Vacuum-resistant to 0.5 bar abs.
Identification:	Red ring, DN.., PN.., date of manufacture

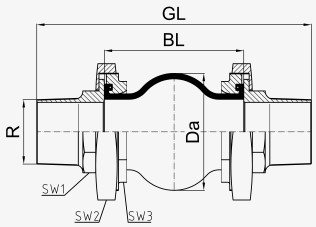
Flange design:

The screw fittings are made of malleable cast iron (EN-GJMW-400-5), are galvanised and include an integrated rubber bead. Internal and external thread connections are standardised pipe threads for conically or metallically sealing connections in the thread according to ISO 7-1 (EN 10226-1, previously DIN 2999).

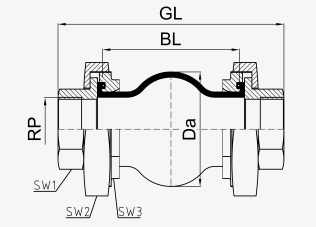
Version 1: R external thread (right), conical

Version 2: Rp internal thread (right), cylindrical

External thread AG/AG



Internal thread IG/IG



Properties and areas of application:

The HKS rubber expansion joint **type 3 model HZB** is suitable for cold and hot water (up to 90 °C), also with added chemicals for water processing, wastewater, acids, lyes, alcohols, ester and ketones. Not suitable for media containing oil.

Subject to technical modifications

Nominal diameter		Length		Bellows			Permitted movement absorption nominal [2]				Permitted negative pressure (vacuum stability)	Screw fitting				Weight
		Without screw fitting	With screw fitting	Nominal pressure	Outside diameter	Effective diameter	Axial [1]		Lateral	Angular		Thread connection acc. to ISO7-1	Spanner size			
DN		BL	GL	PN	Da	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$	-	-	SW1	SW2	SW3	G
mm	in	mm	mm	bar	mm	cm²	mm	mm	mm	Degrees	mbar	inches	mm	mm	mm	kg
RUBBER EXPANSION JOINT with external thread AG/AG · **type 3 MODEL HZB** version 1																
20	3/4“	130	228	16	65	12	-30	+15	±10	±30	-500	R 3/4“	36	80	48	0.65
25	1“	130	236	16	65	12	-30	+15	±10	±30	-500	R 1“	40	80	54	0.85
32	1 1/4“	130	246	16	78	18	-30	+15	±10	±30	-500	R 1 1/4“	48	80	66	1.30
40	1 1/2“	130	250	16	90	27	-30	+15	±10	±30	-500	R 1 1/2“	53	90	74	1.50
50	2“	130	256	16	109	42	-30	+15	±10	±30	-500	R 2“	66	110	90	2.25
RUBBER EXPANSION JOINT with internal thread IG/IG · **type 3 MODEL HZB** version 2																
20	3/4“	130	186	16	65	12	-30	+15	±10	±30	-500	Rp 3/4“	36	80	48	0.60
25	1“	130	192	16	65	12	-30	+15	±10	±30	-500	Rp 1“	40	80	54	0.70
32	1 1/4“	130	196	16	78	18	-30	+15	±10	±30	-500	Rp 1 1/4“	48	80	66	1.10
40	1 1/2“	130	202	16	90	27	-30	+15	±10	±30	-500	Rp 1 1/2“	53	90	74	1.30
50	2“	130	215	16	109	42	-30	+15	±10	±30	-500	Rp 2“	66	110	90	1.50

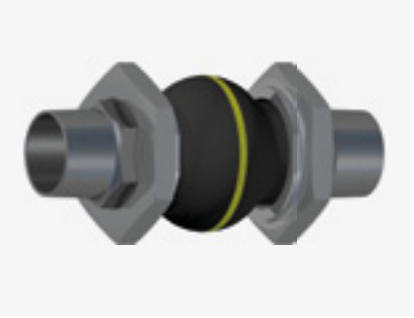
1) Axial movement absorption Δx_c … compression and Δx_e … extension

2) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

RUBBER EXPANSION JOINTS

Type 3 MODEL HZG

TYPE 3 MODEL HZG AG/AG



TYPE 3 MODEL HZG IG/IG

Version

The HKS rubber expansion joint **type 3 model HZG** consists of a rubber bellows with flat convolution with support lining and two threaded screw fittings. Version 1 with external thread (AG) and version 2 with internal thread (IG).

Design of rubber bellows:

Inner layer:	NBR, seamless, abrasion-resistant
Pressure support:	Nylon cord (polyamide cord PA6)
Outer layer:	CR (Neoprene®)
Perm. pressure:	16 bar at 50 °C, 12 bar at 70 °C, 10 bar at 90 °C
Perm. negative pressure:	Vacuum-resistant to 0.5 bar abs.
Identification:	Yellow ring, DN.., PN.., date of manufacture

Flange design:

The screw fittings are made of malleable cast iron (EN-GJMW-400-5), are galvanised and include an integrated rubber bead. Internal and external thread connections are standardised pipe threads for conically or metallically sealing connections in the thread according to ISO 7-1 (EN 10226-1, previously DIN 2999).

Version 1: R external thread (right), conical

Version 2: Rp internal thread (right), cylindrical

Properties and areas of application:

The HKS rubber expansion joint **type 3 model HZG** is suitable for oil, fuel and gas. Areas of application are municipal gas and natural gas, fuel, lubricating oil and heating oil, cooling water emulsions as well as seawater with oil residue.

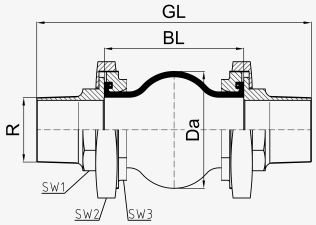
Areas of application in industry and trade:

- Absorbing axial, lateral and angular movements and (heat/cold) expansions
- Vibration-reducing connection of machines and units
- Sound absorption and reduction of noise transfer
- Compensation of installation inaccuracies
- Reduction of forces and moments in connections
- Mechanical engineering, plant engineering, pipeline construction, ship building and heating systems
- Gas and water supply and building technology (TGA)
- Energy and offshore technology

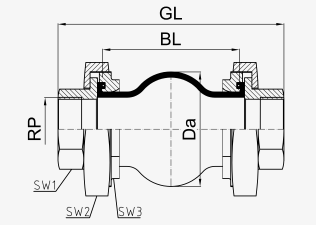
Special versions:

- Screw fitting: Where increased corrosion protection is required, the connecting parts are also available in stainless steel or brass.
- Rubber bellows: On request, other rubber qualities for drinking water, chemical plants, gas, oil and fuel are also available.

External thread AG/AG



Internal thread IG/IG



Subject to technical modifications

Nominal diameter		Length		Bellows			Permitted movement absorption nominal [2]				Permitted negative pressure (vacuum stability)	Screw fitting				Weight
		Without screw fitting	With screw fitting	Nominal pressure	Outside diameter	Effective diameter	Axial [1]		Lateral	Angular		Thread connection acc. to ISO7-1	Spanner size			
DN		BL	GL	PN	Da	Ae	Δx_c	Δx_e	Δy	$\Delta\alpha$	-	-	SW1	SW2	SW3	G
mm	in	mm	mm	bar	mm	cm²	mm	mm	mm	Degrees	mbar	inches	mm	mm	mm	kg
RUBBER EXPANSION JOINT with external thread AG/AG · **type 3 MODEL HZG** version 1																
20	3/4“	130	228	16	65	12	-30	+15	±10	±30	-500	R 3/4“	36	80	48	0.65
25	1“	130	236	16	65	12	-30	+15	±10	±30	-500	R 1“	40	80	54	0.85
32	1 1/4“	130	246	16	78	18	-30	+15	±10	±30	-500	R 1 1/4“	48	80	66	1.30
40	1 1/2“	130	250	16	90	27	-30	+15	±10	±30	-500	R 1 1/2“	53	90	74	1.50
50	2“	130	256	16	109	42	-30	+15	±10	±30	-500	R 2“	66	110	90	2.25
RUBBER EXPANSION JOINT with internal thread IG/IG · **type 3 MODEL HZG** version 2																
20	3/4“	130	186	16	65	12	-30	+15	±10	±30	-500	Rp 3/4“	36	80	48	0.60
25	1“	130	192	16	65	12	-30	+15	±10	±30	-500	Rp 1“	40	80	54	0.70
32	1 1/4“	130	196	16	78	18	-30	+15	±10	±30	-500	Rp 1 1/4“	48	80	66	1.10
40	1 1/2“	130	202	16	90	27	-30	+15	±10	±30	-500	Rp 1 1/2“	53	90	74	1.30
50	2“	130	215	16	109	42	-30	+15	±10	±30	-500	Rp 2“	66	110	90	1.50

1) Axial movement absorption Δx_c ... compression and Δx_e ... extension

2) $\Delta x_c/\Delta x_e$, Δy and $\Delta\alpha$ have to be reduced proportionately for simultaneous movement absorption. The sum of all parts must not exceed 100 %.

Fabric expansion joints

HKS fabric expansion joints are manufactured from high-quality materials and have proven their suitability in decades of practical application. The continuous new and further development of our fabric expansion joints ensures the targeted adaptation to the current requirements of our customers. This results in powerful, reliable fabric expansion joints with a long service life. Our development and design department is available for technical consultation for our customers, engineering and solutions for project-oriented challenges.

Areas of application

HKS fabric expansion joints are suitable for gaseous media such as air, flue gas, exhaust gas and solvent fumes. In addition, they can be used for processes below the dewpoint (even where substances with a certain acid content are present) and for gases containing abrasive substances (e.g. coal dust or cement dust).

In piping, apparatuses and machines they are primarily used for:

- Compensation of expansions and movement
- Reducing the transfer of noise, vibration and oscillations
- Compensation of installation inaccuracies

HKS fabric expansion joints are primarily used in the following industries:

- Plant engineering
- Chemical plants
- Energy suppliers/power plants
- Waste incineration plants
- Cement works
- Steel industry
- Conveyor technology
- Refineries
- Offshore industry

Model variants

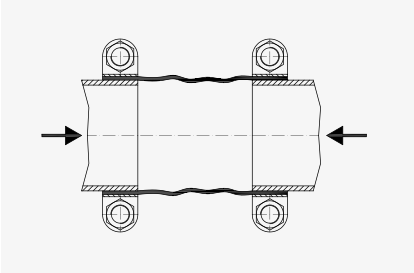
Our fabric expansion joints differ in the following properties:

- Bellows shape (single convolution or cylindrical fabric expansion joints)
- Bellows cross section (circular, oval or rectangular)
- Wall structure (single-ply, multi-layered, multi-layered with insulation)
- Structure of the support layers (adapted to pressure and temperature resistance)
- Quality of the materials and coating of the fabric bellows (depending on the media used)
- Connection type of the piping (backing flanges, band clamps, etc.)

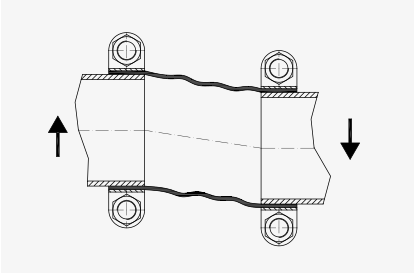
In addition to the standard fabric expansion joints listed here, we also develop and manufacture our fabric expansion joints completely on the basis of individual customer requirements. Connecting parts are available to DIN, ISO, ANSI, BS, ventilation standards or customer requirements.

Movement absorption

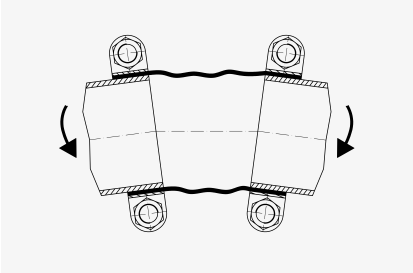
Axial, lateral, angular and a combination of different types of movement absorption are possible.



Axial movement absorption



Lateral movement absorption



Angular movement absorption

Fixpoints

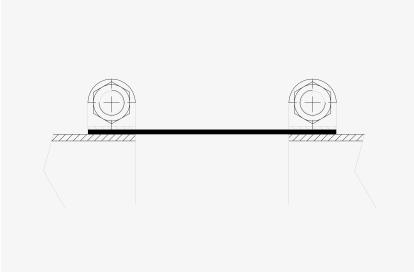
Stable piping fixpoints are required for absorbing axial forces and for professional pipeline installation.

Design of the fabric bellows

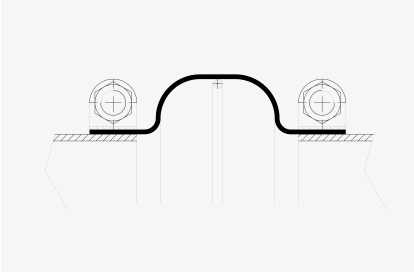
HKS fabric bellows are often manufactured from a variety of high-quality materials to ensure optimised and flexible fabric bellows for any application.

Three bellows shapes are available as a standard, depending on the required movement absorption:

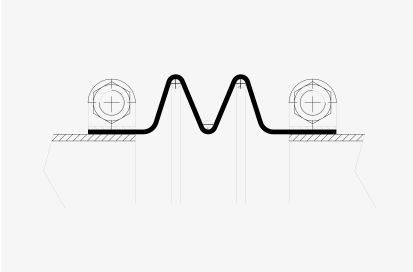
- Cylindrical fabric bellows (circular, oval or rectangular)
- Single convolution fabric bellows (circular, oval or rectangular)
- Multi convolution fabric bellows (circular, oval or rectangular)



Cylindrical



Single convolution



Two convolutions

HKS fabric bellows usually have a multi-layered design. The different layers have different functions.

Temperature reduction: Corrosionresistant and temperature-resistant insulating fabric

Sealing layer: Gas-tight films, foils or composite materials made from materials such as Teflon® (PTFE), silicone, Hypalon®, Inconel or aluminium

Weather protection: UV-resistant and water-resistant materials

Pressure absorption: Support layers such as glass, polyester or aramid fabrics

Abrasion protection: Wire mesh as mechanically stable layers

The following lists the material properties and areas of application for the material qualities most often used by us:

Materials for sealing and coating layers	Material properties	Areas of application
CSM Chlorosulfonated polyethylene (rubber) (Hypalon®)	› CSM has a high resistance to acids › Temperature in continuous operation: -25 °C to +100 °C	Acids
CR Polychloroprene (Neoprene®, Baypren®)	› CR has good resistance to oil, weather and flames, very good ageing resistance › In addition it is resistant to different inorganic and organic chemicals › Impermeable to gas for hydrocarbons Temperature in continuous operation: -30 °C to +90 °C › Resistance to hot water up to +70 °C	Faeces, cooling water, coking plant gas, lyes, air, acids and seawater
Stainless steel foil 1.4435 2.4816	› Stainless steel foil has a high temperature resistance › 1.4435: Temperature in continuous operation up to +500 °C › 2.4816: Temperature in continuous operation +800 °C	Lyes and solvents
EPDM Ethylene propylene diene monomer rubber (Buna AP®, Keltan®, Vistalon®)	› EPDM has good resistance to heat and weather › EPDM is particularly resistant to highly oxidising media and a great number of chemicals (but not oil-resistant) › Temperature in continuous operation: -40 °C to +100 °C	Pickling solutions, steam, hot water, hypochlorite solutions, lyes, acids and water
FPM Fluoro rubber (Viton®)	› FPM has very high resistance to acids › Temperature in continuous operation: -40 °C to +200 °C	Acids
PTFE Polytetrafluorethylene (Teflon®, Hostaflon®, Fluon®, Polyfluron®)	› PTFE has good resistance to heat and weather › PTFE has excellent chemical resistance to aggressive media › Very good electrical insulation properties › Temperature in continuous operation: -50 °C to +210 °C	Bleaching agents, chlorides, gases, halogens, hydraulic oil, lyes, solvents, mineral oil, organic and inorganic acids, peroxides, sulphates and fuels
VMQ Silicone rubber (Silopren®, Elastosil®)	› Good resistance to weather, ageing, ozone and radiation › Temperature in continuous operation: -45 °C to +180 °C	Alkalines, hot water, weak acids and water
Materials for support layers	**Material properties**	**Areas of application**
Aramid fabric	› Aramid fabrics have high tensile strength, abrasion resistance and vibration resistance › Temperature in continuous operation up to +150 °C	Gases (incl. air)
GF, GM Glass fabric	› Glass fabrics have good tensile strength, good chemical resistance and good insulating properties › Temperature in continuous operation up to +600 °C	Gases (incl. air), lyes, acids
PEBA Polyester fabrics	› PEBA has high tensile strength, abrasion resistance and vibration resistance › Temperature in continuous operation up to +150 °C	Gases (incl. air)
Silicate fabric	› Silicate fabrics have very high resistance to acids › Temperature in continuous operation up to +1000 °C	Gases (incl. air), lyes, acids
Materials for insulation	**Material properties**	**Areas of application**
Rock wool	› Rock wool has good temperature resistance and good insulation properties › Temperature in continuous operation up to +500 °C	Gases (incl. air)
Ceramic wool	› Ceramic wool has very high temperature resistance and good insulation properties › Temperature in continuous operation up to +1100 °C	Gases (incl. air)

Connection types

As a rule, HKS fabric expansion joints are connected to pipes, ducts etc. using flanges, band clamps or clamping strips. The fabric expansion joint connections are standardised and fit commercial pipes and flanges. The band clamps are made of unalloyed steel S235JR (1.0038) and are galvanised. Where increased corrosion protection is required, stainless steel is used. Flanges or band clamps consist of unalloyed steel S235JR (1.0038) and are finished with a corrosion protection primer. Other corrosion protection (e.g. special paint, hot galvanising, coating, etc.), other materials or special connections are available on customer request.

Band clamps

Band clamps are used to fix HKS fabric expansion joints to round or oval pipes which are only subject to low internal pressure levels.

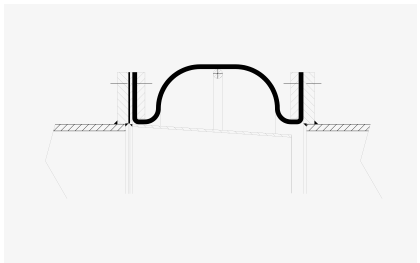
Clamping strips

Clamping strips are used to fix HKS fabric expansion joints to round, oval or rectangular pipes and ducts which are only subject to low internal pressure levels.

Flanges

For higher internal pressures up to 2 bar, HKS fabric expansion joints are equipped with backing clamping flanges. All common standards are supported with regard to holes and pitch circles in the flanges: e.g. EN 1092, ANSI (ASA) or BS.

Fabric expansion joint with rectangular flanges



Single convolution with inner sleeve, vacuum support ring and flanges

Combination of connection types

On customer request, different connection types (e.g. band clamp on one side and flange on the other) can be combined.

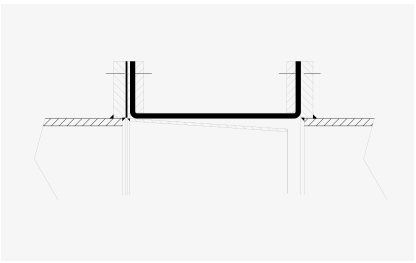
Accessories

The following accessories (optional) are available for HKS fabric expansion joints

- Inner sleeves
- Vacuum support rings for inner sleeves

Inner sleeves

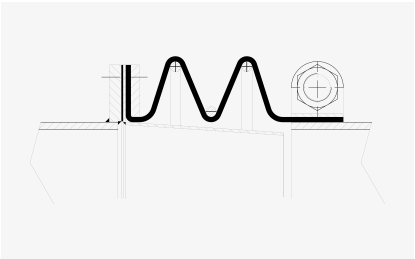
Inner sleeves are used for high flow rates (> 10 m/s) to avoid pulsating or fluttering or for abrasive solids to avoid mechanical abrasion on the bellows which results in a prolonged service life of the fabric expansion joint. Bearing this in mind, we recommend the use of inner sleeves as a rule. The inner sleeves provided by HKS are usually made of unalloyed or stainless steel. For exclusively axial movements, cylindrical inner sleeves are used and conical inner sleeves for lateral and/or angular movements.



Cylindrical with inner sleeve

Vacuum support rings

If HKS fabric expansion joints are operated with negative pressure, vacuum support rings have to be inserted on the inner bellows wall. Support rings are usually made of stainless steel.

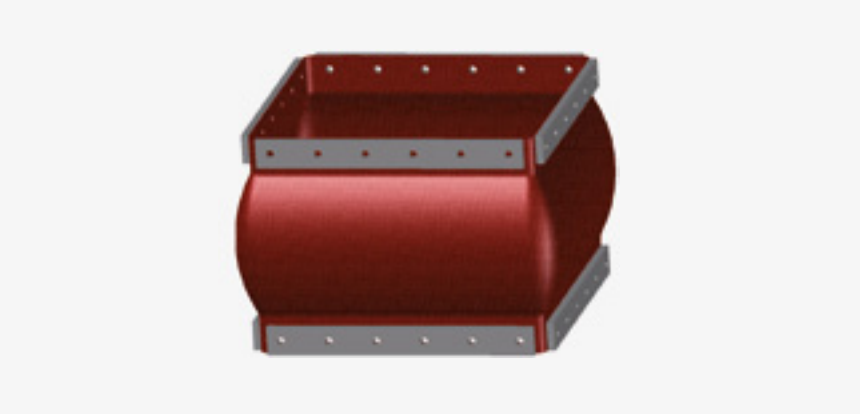


Two convolutions with vacuum support rings and inner sleeve

FABRIC EXPANSION JOINT

Type GW-1

FABRIC EXPANSION JOINT single convolution, rectangular DN 100 - DN 5000



Movement absorption

The permitted axial, lateral and/or angular movement absorption depends on the wall structure of the fabric bellows and the installation length (pipe spacing).

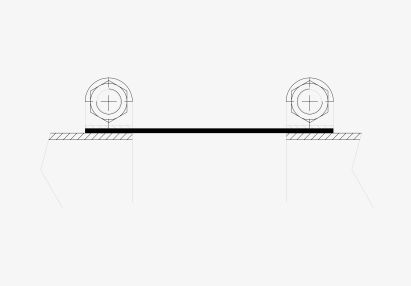
Special versions and ancillary equipment

- Guide sleeve, vacuum support rings
- Conical version: different connection diameters
- Different connection cross sections: rectangular connection on one side and circular connection on the other

Version

Self-sealing HKS fabric expansion joint; **cross section variants:** circular, oval or rectangular; **longitudinal section variants:** cylindrical, single convolution or multiple convolutions; **wall structure:** The material selection and the design stipulations for the wall structure (sealing and coating layers, pressure support layers and possibly insulation) depend on customer requirements for operating pressure, medium, operating temperature and movement absorption.

Operating (nominal) **pressures**	bis PN 0.2
Operating temperature	bis 700 °C



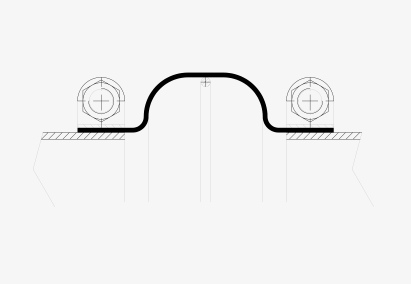
Cylindrical with band clamps

Areas of application

Suitable for gaseous media. If other media are to be used, design changes in the clamping area are necessary.

Reduction of thermal and mechanical tensions, vibration and noise reduction, absorption of axial, lateral and angular movements, compensation of installation inaccuracies.

Plant engineering, dust removal and filter technology, ceramics industry, waste incineration plants, steel industry, drying technology, cement works

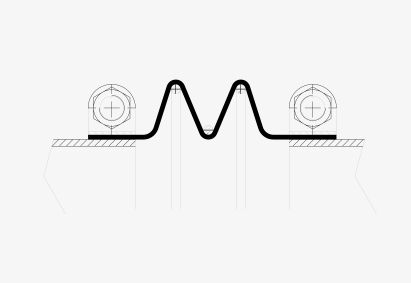


Single convolution with vacuum support ring and band clamps

Connection types

On one side band clamp made of material S235JR (1.0038), galvanised, or of stainless steel or band clamp made of material S235JR (1.0038), primed, or of stainless steel. As a custom version, clamping strips are also available hot galvanised, with special paint or special coating.

On the other side flange made of material S235JR (1.0038), galvanised, or of stainless steel. As a custom version, flanges are also available hot galvanised, with special paint or special coating.

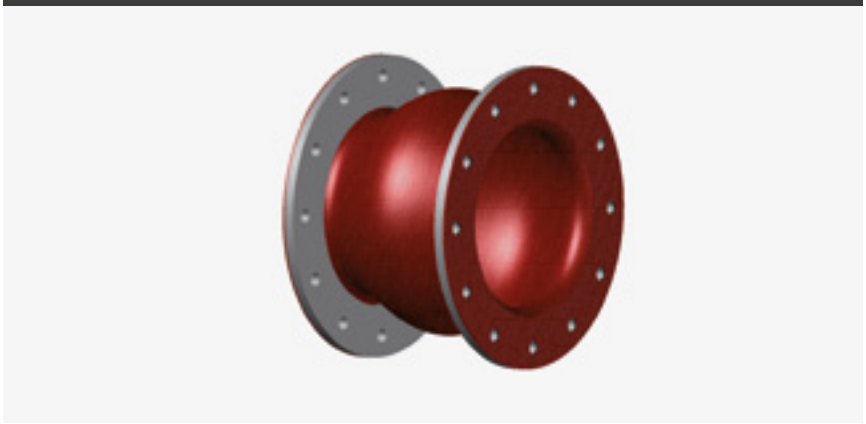


Double convolution with vacuum support rings and band clamps

FABRIC EXPANSION JOINT

Type GW-2

FABRIC EXPANSION JOINT single convolution, round DN 100 - DN 5000



Movement absorption

The permitted axial, lateral and/or angular movement absorption depends on the wall structure of the fabric bellows and the installation length (pipe spacing).

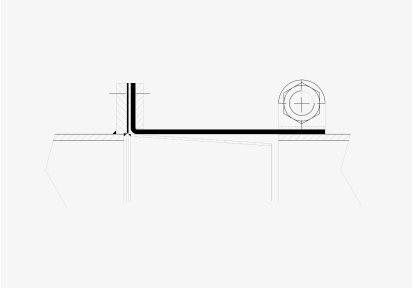
Special versions and ancillary equipment

- Guide sleeve, vacuum support rings
- Conical version: different connection diameters
- Different connection cross sections: rectangular connection on one side and circular connection on the other

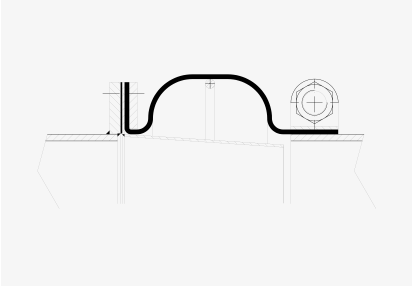
Version

Self-sealing HKS fabric expansion joint; **cross section variants:** circular, oval or rectangular; **longitudinal section variants:** cylindrical, single convolution or multiple convolutions; **wall structure:** The material selection and the design stipulations for the wall structure (sealing and coating layers, pressure support layers and possibly insulation) depend on customer requirements for operating pressure, medium, operating temperature and movement absorption.

Operating (nominal) **pressures**	bis PN 0.2
Operating temperature	bis 700 °C



Cylindrical with inner sleeve, flange on one side, band clamp on other side



Single convolution with inner sleeve and vacuum support ring, flange on one side, band clamp on other side

Areas of application

Suitable for gaseous media. If other media are to be used, design changes in the clamping area are necessary.

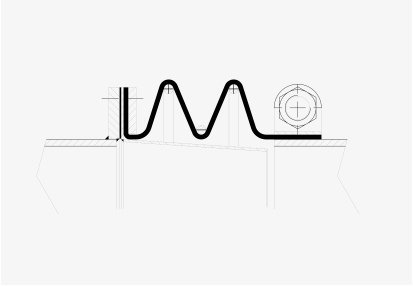
Reduction of thermal and mechanical tensions, vibration and noise reduction, absorption of axial, lateral and angular movements, compensation of installation inaccuracies.

Plant engineering, dust removal and filter technology, ceramics industry, waste incineration plants, steel industry, drying technology, cement works

Connection types

On one side band clamp made of material S235JR (1.0038), galvanised, or of stainless steel or band clamp made of material S235JR (1.0038), primed, or of stainless steel. As a custom version, clamping strips are also available hot galvanised, with special paint or special coating.

On the other side flange made of material S235JR (1.0038), galvanised, or of stainless steel. As a custom version, flanges are also available hot galvanised, with special paint or special coating.

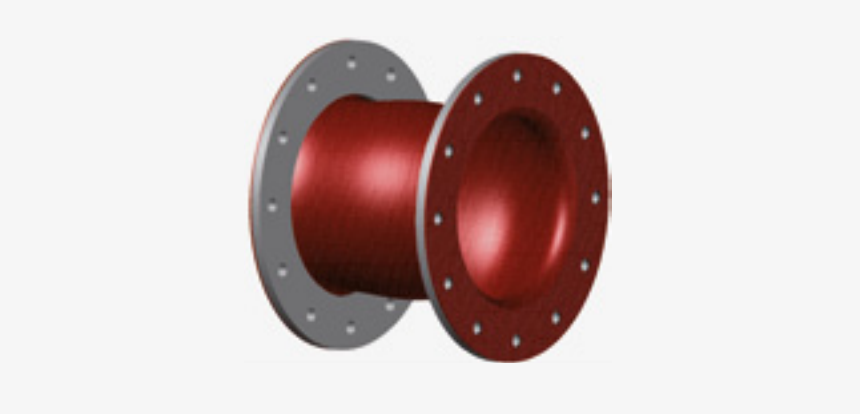


Double convolution with inner sleeve and vacuum support rings, flange on one side, band clamp on other side

FABRIC EXPANSION JOINT

Type GW-3

FABRIC EXPANSION JOINT cylindrical, round DN 100 - DN 5000



Movement absorption

The permitted axial, lateral and/or angular movement absorption depends on the wall structure of the fabric bellows and the installation length (pipe spacing).

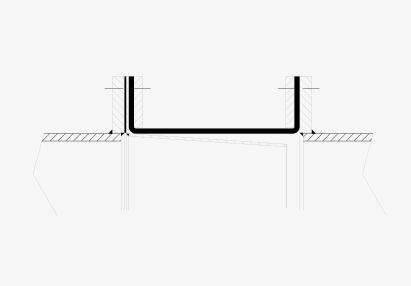
Special versions and ancillary equipment

- Guide sleeve, vacuum support rings
- Conical version: different connection diameters
- Different connection cross sections: rectangular connection on one side and circular connection on the other

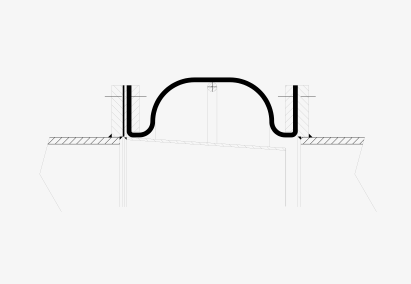
Version

Self-sealing HKS fabric expansion joint; **cross section variants:** circular, oval or rectangular; **longitudinal section variants:** cylindrical, single convolution or multiple convolutions; **wall structure:** The material selection and the design stipulations for the wall structure (sealing and coating layers, pressure support layers and possibly insulation) depend on customer requirements for operating pressure, medium, operating temperature and movement absorption.

Operating (nominal) **pressures**	bis PN 2
Operating temperature	bis 500 °C



Cylindrical with inner sleeve and flanges



Single convolution with inner sleeve, vacuum support ring and flanges

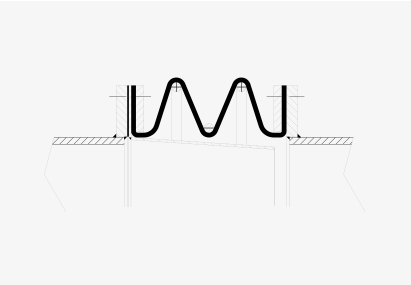
Areas of application

Suitable for almost all media. Reduction of thermal and mechanical tensions, vibration and noise reduction, absorption of axial, lateral and angular movements, compensation of installation inaccuracies.

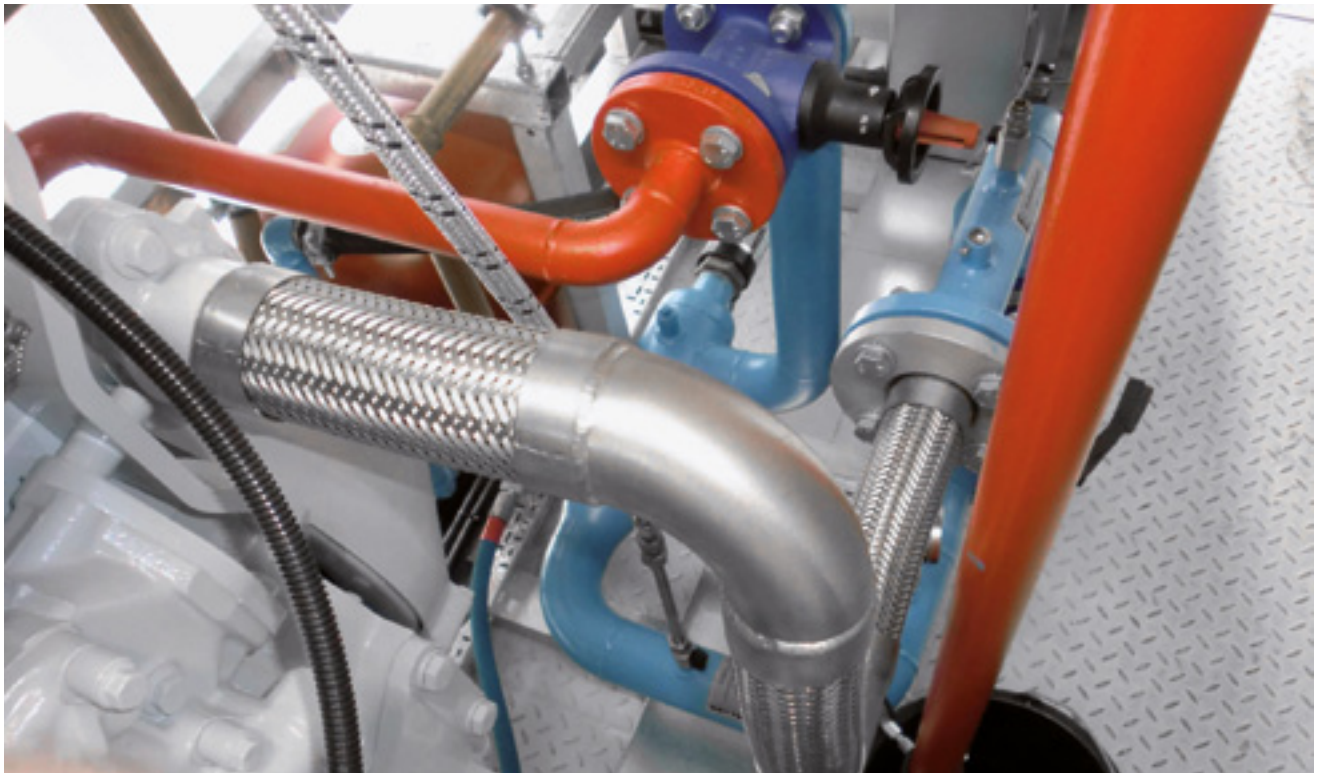
Plant engineering, chemical industry, dust removal and filter technology, energy technology, conveyor technology, ceramics industry, waste incineration plants, steel industry, drying technology, cement works.

Connection types

On both sides flanges made of material S235JR (1.0038), galvanised, or of stainless steel. As a custom version, flanges are also available hot galvanised, with special paint or special coating.



Double convolution with inner sleeve, vacuum support rings and flanges



Hoses

HKS offers a wide range of hoses made of a variety of materials and connecting parts. HKS hoses can be used in a variety of areas, e.g. for bottling, filling or conveying various media (e.g. compressed air, steam, water, aggressive media, etc.) or as vibration dampers for cooling and air conditioning systems. HKS also develops special solutions and offers hoses with special connectors.

Areas of application for hoses

- Connection between stationary and moving units
- Absorption of lifting movements
- Absorption of heat expansions
- Compensation of parallel pipe offset

Hose types

- Stainless steel hoses (1.4541/1.4404 with braid made of 1.4301/1.4404)
- Fuel hoses made of corrugated Teflon® with braid and fire protection hose
- Hydraulic hoses
- Elastomer hoses (NBR, CR, EPDM)
- PTFE hoses

Connection parts

- Flanges
- Welding ends
- Screwed pipe connections
- Threaded nipples
- Pipe nuts
- Couplings
- Special connectors on request

Nominal diameters: DN 6 bis DN 300
Operating temperature: up to 600 °C
Pressure stage: PN 1 to PN 250

Corrugated metal hoses

Design and function

Stainless steel hoses are made from thin-walled stainless steel pipes with lengthwise welds. Special tools are used to mould hydraulics convolutions into the pipes which achieves the desired moveability and pressure resistance of the hoses. Steel hoses are used for conveying liquids and gases as flexible connecting elements in pressure and vacuum lines, absorbing movement, vibrations and heat expansions.

Metal hoses have single-layer walls and can be equipped with single or double braid to increase pressure resistance: The braid prevents the hose from expanding, absorbs tensile forces and also serves as a protective hose.

Braid and hose can be made from different **materials**. Depending on the application and the media, the hose can be made of the materials 1.4541 or 1.4404 and the braid made of material 1.4301 or 1.4404 and, depending on the pressure load, can be used at an operating temperature from -270 °C to max. 600 °C (see table for derating factors). The materials have a very high resistance to water, steam and thermo oil. A detailed resistance table can be found in the general technical appendix.

As a standard, the hoses are available in **Nominal diameters** from 6 mm to 300 mm, where the Nominal diameter of a hose is the same as the internal diameter. The permitted operating pressure is between 0.25 bar and 250 bar depending on operating temperature and Nominal diameter.

The **length** can be freely selected by the customer. The hose ends can be welded with all standardised connections. Custom connections are also available.

Application options for interlocked metal hoses

HKS hoses are used in the following areas, among others: Cooling and air conditioning systems, exhaust plants, vacuum and high pressure technology, heat exchanger devices, food and drink industry, heat exchanger installations, landfill operations, chemistry plants, pharma industry, cleaning technology, vehicle technology. medical technology, solar engineering, air/space travel, research and development.

Stainless steel hose in a combined heat and power plant with 90° bend and swivel flanges

Stainless steel hose in a combined heat and power plant with 90° bend with swivel flanges on one side and welding ends at the other side.

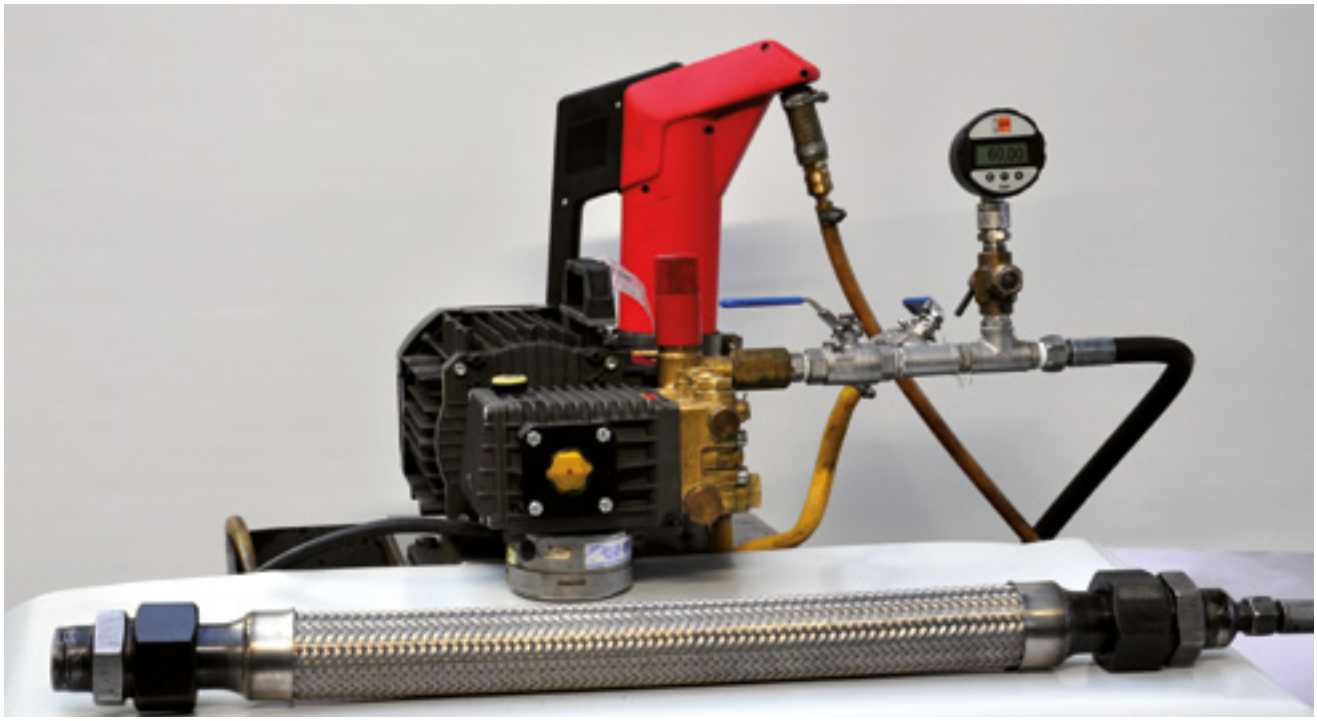
Stainless steel hose in a combined heat and power plant with swivel flanges

Stainless steel hose for starter air for installation in ship motors

Stainless steel hose with DILO connection for installation in ships motors.

Test certifications and documentation

As a rule, all hoses are subjected to a pressure and leakage test before shipping. Hoses which are not subject to the Pressure Equipment Directive are tested with a test pressure PT = 1.5 x PN. On request, test certificates to EN 10204:2005 – 01 can be issued.



Interlocked metal hoses

Derating factors: to determine the permitted operating pressure at increased operating temperatures

Temperatures	Temperature derating factor C_t			
in °C	1.4301	1.4541	1.4571	1.4404
20	1.00	1.00	1.00	1.00
50	0.88	0.92	0.90	0.88
100	0.73	0.83	0.81	0.74
150	0.66	0.78	0.76	0.67
200	0.60	0.74	0.73	0.62
250	0.56	0.71	0.69	0.58
300	0.52	0.67	0.65	0.54
350	0.50	0.64	0.63	0.52
400	0.48	0.62	0.61	0.50
450	0.47	0.61	0.59	0.48
500	0.46	0.60	0.59	0.47
550	0.42	0.59	0.58	0.47
600	only for depressurised use			

Diameter: see table DN 6 to DN 250
Operating pressure: UH vacuum to PN 100
Operating temperature: max. 550 °C

Materials:

Steel hose
Mat.no. 1.4541
Mat.no. 1.4404
Mat.no. 1.4571 on request

Braid
Mat.no. 1.4301
Mat.no. 1.4404

$$P(T) = PN \times C_t$$

Example: DN40, operating temperature 300 °C, derating factors C_t (take into account lowest value of hose or braid) for 1.4301 = 0.52, nominal pressure PN 25

P(T) = 25 x 0.52 = 13.00 bar

INTERLOCKED METAL HOSE normal corrugation **Type B**

Nominal diameter		Nominal pressure stage	Permitted static operating pressure at 20 °C		Permitted test pressure at 20 °C		Bursting pressure at 20 °C		Minimum bending radius				External diameter		Weight	
									Dynamic load		Static load					
DN		PN	PS		PT		-		$R_{min,dyn}$		$R_{min,stat}$		D_a		G	
mm	in	bar	bar	psig	bar	psig	bar	psig	mm	in	mm	in	mm	in	kg/m	lbs/ft
Interlocked METAL HOSE type B · SO without braid																
6	1/4	10	10	145	15	220	40	580	100	4	15	0.6	13	0.5	0.17	0.11
10	3/8	10	10	145	15	220	40	580	125	5	25	1	16.5	0.7	0.24	0.16
12	1/2	2.5	5	75	7.5	110	20	290	125	5	30	1.2	21	0.9	0.31	0.21
16	5/8	2.5	5	75	7	105	20	290	150	6	40	1.6	26.5	1.0	0.35	0.23
20	3/4	2.5	4	60	6	90	16	230	150	6	50	2	28.5	1.1	0.37	0.25
25	1	2.5	4	60	6	90	16	230	175	7	63	2.5	36	1.4	0.48	0.32
32	1 1/4	2.5	3	43	4.5	65	12	170	200	8	80	3.2	43.5	1.7	0.65	0.45
40	1 1/2	1	2	29	3	43	8	120	250	10	100	4	53	2.1	0.85	0.57
50	2	1	1	14	1.5	22	4	60	350	14	125	5	67.5	2.7	1.25	0.84
65	2 1/2	1	1	14	1.5	22	4	60	500	20	163	6.5	81.5	3.2	1.55	1.0
80	3	1	1	14	1.5	22	4	60	525	21	200	7.9	96	3.8	1.8	1.2
100	4	0.5	0.7	10	1.1	16	3	43	625	25	250	9.9	124	4.9	2.4	1.6
125	5	0.5	0.7	10	1.1	16	3	43	750	30	313	12.4	154	6.1	3.9	2.6
150	6	0.5	0.5	7	0.75	11	2	29	900	36	375	14.8	178	7.0	4.5	3.1
200	8	-	0.3	4	0.45	6	1.2	17	1020	40	500	19.7	234	9.2	6.0	4.0
250	10	-	0.25	3	0.36	5	1	14	1220	48	625	24.7	286	11.3	7.5	5.0
Interlocked METAL HOSE type B · SE with single braid																
6	1/4	100	140	2030	210	3045	560	8120	100	4	18	0.8	15	0.6	0.28	0.19
10	3/8	100	100	1450	150	2175	400	5800	125	5	30	1.2	18	0.7	0.39	0.26
12	1/2	63	90	1305	135	1960	360	5220	125	5	36	1.5	23	0.9	0.50	0.34
16	5/8	63	65	940	97	1410	260	3770	150	6	48	1.9	28	1.1	0.55	0.37
20	3/4	50	55	800	83	1200	220	3200	150	6	60	2.4	31.5	1.2	0.62	0.42
25	1	40	48	700	72	1050	192	2780	175	7	75	3	37.5	1.5	0.80	0.53
32	1 1/4	25	38	550	57	825	152	2200	200	8	96	3.8	47	1.9	1.2	0.78
40	1 1/2	25	34	490	51	740	136	1970	250	10	120	4.8	56.5	2.2	1.5	1.1
50	2	25	31	450	46	670	124	1800	350	14	150	6	71	2.8	2.1	1.4
65	2 1/2	20	27	387	40	581	107	1548	508	20	203	8	84.6	3.3	2.8	1.9
80	3	20	22	316	33	474	87	1264	559	22	229	9	98.6	3.9	3.0	2.0
90	3 1/2	20	20	297	31	445	82	1188	610	24	254	10	113	4.5	3.9	2.6
100	4	16	16	232	24	348	64	927	686	27	330	13	127	5.0	4.0	2.7
125	5	10	13	191	20	286	53	764	787	31	457	18	153	6.0	5.6	3.8
150	6	10	11	165	17	247	46	660	914	36	483	19	180	7.1	7.1	4.8
200	8	16	16	234	24	350	64	934	1016	40	508	20	233	9.2	14.1	9.4
250	10	16	16	230	24	344	63	918	1270	50	635	25	288	11.3	19.2	12.9
300	12	10	11	161	17	241	44	643	1524	60	762	30	340	13.4	22.1	14.8
Interlocked METAL HOSE type B · SZ with double braid																
6	1/4	250	250	3625	375	5440	1000	14500	100	4	21	0.9	17.5	0.7	0.40	0.27
10	3/8	160	180	2610	270	3915	720	10440	125	5	35	1.4	20.5	0.8	0.56	0.38
12	1/2	160	160	2320	240	3480	640	9280	125	5	42	1.7	25.5	1.0	0.71	0.48
16	5/8	100	120	1740	180	2610	480	6960	150	6	56	2.3	30	1.2	0.75	0.50
20	3/4	63	93	1350	140	2030	372	5400	150	6	70	2.8	34.5	1.4	0.90	0.60

INTERLOCKED METAL HOSE normal corrugation **Type B**

Nominal diameter		Nominal pressure stage	Permitted static operating pressure at 20 °C		Permitted test pressure at 20 °C		Bursting pressure at 20 °C		Minimum bending radius				External diameter		Weight	
									Dynamic load		Static load					
DN		PN	PS		PT		-		$R_{min,dyn}$		$R_{min,stat}$		D_a		G	
mm	in	bar	bar	psig	bar	psig	bar	psig	mm	in	mm	in	mm	in	kg/m	lbs/ft
25	1	63	77	1120	115	1670	308	4470	175	7	88	3.5	40.5	1.6	1.1	0.75
32	1 1/4	50	62	900	93	1350	248	3600	200	8	112	4.5	51	2.0	1.7	1.2
40	1 1/2	40	46	670	69	1000	184	2670	250	10	140	5.6	60	2.4	2.2	1.5
50	2	40	43	625	64	930	172	2500	350	14	175	6.9	75	3.0	3.1	2.1
65	2 1/2	40	43	619	64	929	171	2477	508	20	203	8	87	3.4	3.8	2.6
80	3	25	35	506	52	758	139	2022	559	22	229	9	101	4.0	4.2	2.8
90	3 1/2	25	33	475	49	712	131	1900	610	24	254	10	116	4.6	5.4	3.6
100	4	25	26	371	38	557	102	1485	686	27	330	13	130	5.1	5.5	3.7
125	5	16	21	306	32	458	84	1222	787	31	457	18	156	6.2	7.4	5.0
150	6	16	18	264	27	396	73	1056	914	36	483	19	186	7.3	9.0	6.0
200	8	25	26	374	39	561	103	1495	1016	40	508	20	236	9.3	19.9	13.4
250	10	25	25	367	38	551	101	1469	1270	50	635	25	291	11.5	28.3	19.0
300	12	16	18	257	27	386	71	1029	1524	60	762	30	343	13.5	30.7	20.6

Example type B:

SE 100 / 010 / B / B - 1000

Type | DN | PN | Connections | Length

Hose connection types:

B	Swivel flange	**S**	Custom-made flange	**DAGA**	Rotating external thread
F	Fixed flange	**K**	Customer part	**DIGA**	Rotating internal thread
V	Welding neck flange	**AGA**	Fixed external thread	**ÜFD**	Pipe nut, flat seal
R	Weld end	**IGA**	Fixed internal thread	**ÜKD**	Pipe nut, conical seal

DN	Nominal diameter (inner diameter)
PN	Nominal pressure stage acc. to EN 1333
PS	Permitted operating pressure at 20 °C (SF4 with 4-fold bursting pressure resistance)
PT	Permitted test pressure at 20 °C
$R_{min,dyn}$	Minimum bending radius for cyclic loading (If the installation instructions according to ISO 10380 are observed, an average service life of $5 \cdot 10^4$ load exchanges, but at least $4 \cdot 10^4$ load exchanges can be expected. Higher operating temperatures and corrosion influences decrease the service life and/or increase the minimum bending radius.)
$R_{min,stat}$	Minimum bending radius for static load (e.g. compensating pipe offset)
D_a	External diameter of the hose
G	Hose weight per meter with/without braid (deviation +/-10 %)

Design: The table values shown refer to 20 °C design temperature with a standard Material combination 1.4541/1.4301 (hose/braid material).
For other materials and operating temperatures, operating pressure and movement absorption have to be adapted with factors or requested separately.

INTERLOCKED METAL HOSE tight corrugation/highly flexible **Type C**

Nominal diameter		Nominal pressure stage	Permitted static operating pressure at 20 °C		Permitted test pressure at 20 °C		Bursting pressure at 20 °C		Minimum bending radius				External diameter		Weight	
									Dynamic load		Static load					
DN		PN	PS		PT		-		$R_{min,dyn}$		$R_{min,stat}$		D_a		G	
mm	in	bar	bar	psig	bar	psig	bar	psig	mm	in	mm	in	mm	in	kg/m	lbs/ft
Interlocked METAL HOSE type C · SO without braid																
6	1/4	10	10	145	15	220	40	580	75	3	15	0.6	13	0.50	0.22	0.15
10	3/8	10	10	145	15	220	40	580	90	3.5	25	1.0	16.5	0.65	0.33	0.22
12	1/2	2.5	5	75	7.5	110	20	290	100	4	30	1.2	21	0.85	0.40	0.27
20	3/4	2.5	4	60	6	90	16	230	115	4.5	50	2.0	28.5	1.1	0.50	0.34
25	1	2.5	4	60	6	90	16	230	125	5	63	2.5	36	1.4	0.65	0.44
32	1 1/4	2.5	3	43	4.5	65	12	170	150	6	80	3.2	43.5	1.7	0.90	0.60
40	1 1/2	1	2	29	3	43	8	120	200	8	100	4.0	53	2.1	1.1	0.74
50	2	1	1	14	1.5	22	4	60	275	11	125	5.0	67.5	2.7	1.6	1.1
65	2 1/2	1	1	14	1.5	22	4	60	350	14	163	6.5	81.5	3.2	1.9	1.3
80	3	1	1	14	1.5	22	4	60	400	16	200	7.9	96	3.8	2.3	1.5
100	4	0.5	0.7	10	1.1	16	3	43	500	20	250	9.9	124	4.9	3.1	2.1
125	5	0.5	0.7	10	1.1	16	3	43	660	26	313	12.4	154	6.1	5.0	3.4
150	6	0.5	0.5	7	0.75	11	2	29	760	30	375	14.8	178	7.0	5.8	3.9
Interlocked METAL HOSE type C · SE with single braid																
6	1/4	160	160	2320	240	3080	640	9280	75	3	17	0.7	15	0.60	0.33	0.22
10	3/8	100	138	2000	207	3000	552	8000	90	3.5	28	1.2	18	0.71	0.48	0.32
12	1/2	100	103	1500	154	2230	412	5980	100	4	33	1.3	23	0.90	0.60	0.40
20	3/4	50	62	900	93	1350	248	3600	115	4.5	55	2.2	31.5	1.2	0.75	0.50
25	1	50	52	750	78	1130	208	3020	125	5	69	2.8	37.5	1.5	0.95	0.65
32	1 1/4	40	42	610	63	910	168	2400	150	6	88	3.5	47	1.9	1.4	0.94
40	1 1/2	25	38	550	57	830	152	2200	200	8	110	4.4	56.5	2.2	1.8	1.2
50	2	25	34	490	51	740	136	1970	275	11	125	5.0	71	2.8	2.5	1.6
65	2 1/2	25	31	450	46	670	124	1800	350	14	163	6.5	86.5	3.4	3.0	2.0
80	3	25	27	390	40	580	108	1570	400	16	200	7.9	100	4.0	3.6	2.4
100	4	16	17	250	25	360	68	990	500	20	250	9.9	130	5.1	4.8	3.2
125	5	16	16	230	24	350	64	920	660	26	313	12.4	159	6.3	7.5	5.0
150	6	10	10	145	15	220	40	580	760	30	375	14.8	183	7.2	9.1	6.1
Interlocked METAL HOSE type C · SZ with double braid																
6	1/4	250	275	3990	412	5970	1100	15950	75	3	18	0.8	17.5	0.68	0.45	0.30
10	3/8	160	220	3190	330	4790	880	12760	90	3.5	30	1.2	20.5	0.81	0.65	0.44
12	1/2	160	176	2550	264	3830	704	10200	100	4	36	1.5	25.5	1.0	0.80	0.54
20	3/4	100	110	1600	165	2400	440	6400	115	4.5	60	2.4	34.5	1.4	1.0	0.67
25	1	63	90	1350	135	1960	360	5220	125	5	75	3.0	40.5	1.6	1.3	0.84
32	1 1/4	63	69	1000	103	1500	276	4000	150	6	96	3.8	51	2.0	2.0	1.3
40	1 1/2	50	52	750	78	1130	208	3000	200	8	120	4.8	60	2.4	2.5	1.6
50	2	40	48	700	72	1050	192	2780	275	11	138	5.5	75	3.0	3.4	2.3
65	2 1/2	40	41	595	61	890	164	2380	350	14	179	7.1	91	3.6	4.2	2.8
80	3	25	38	550	57	830	152	2200	400	16	200	7.9	105	4.1	5.0	3.4
100	4	20	20	290	30	440	80	1160	500	20	250	9.9	136	5.4	6.7	4.5
125	5	16	19	280	28	410	76	1100	660	26	313	12.4	165	6.5	10.2	6.8
150	6	10	15	220	22	320	60	870	760	30	375	14.8	188	7.4	12.7	8.5

Example type C:

SE 0050 / 016 / B / DAGA - 500

Type | DN | PN | Connections | Length

Hose connection types:

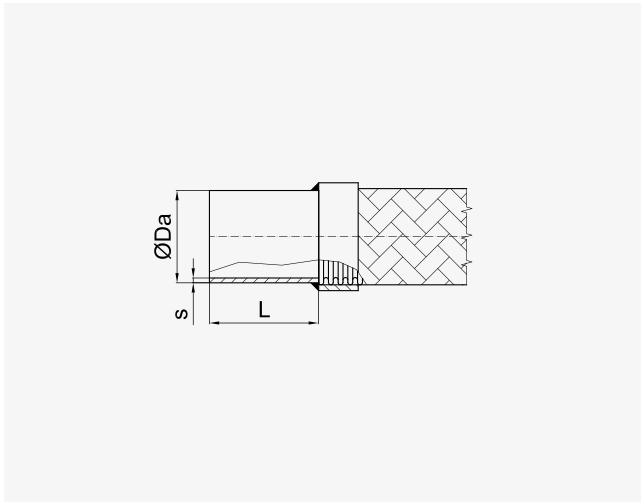
B	Swivel flange	**S**	Custom-made flange	**DAGA**	Rotating external thread
F	Fixed flange	**K**	Customer part	**DIGA**	Rotating internal thread
V	Welding neck flange	**AGA**	Fixed external thread	**ÜFD**	Pipe nut, flat seal
R	Weld end	**IGA**	Fixed internal thread	**ÜKD**	Pipe nut, conical seal

DN	Nominal diameter (inner diameter)
PN	Nominal pressure stage acc. to EN 1333
PS	Permitted operating pressure at 20 °C (SF4 with 4-fold bursting pressure resistance)
PT	Permitted test pressure at 20 °C
$\mathbf{R}_{min,dyn}$	Minimum bending radius for cyclic loading (If the installation instructions according to ISO 10380 are observed, an average service life of $5 \cdot 10^4$ load exchanges, but at least $4 \cdot 10^4$ load exchanges can be expected. Higher operating temperatures and corrosion influences decrease the service life and/or increase the minimum bending radius.)
$\mathbf{R}_{min,stat}$	Minimum bending radius for static load (e.g. compensating pipe offset)
$\mathbf{D}_a$	External diameter of the hose
G	Hose weight per meter with/without braid (deviation +/-10 %)

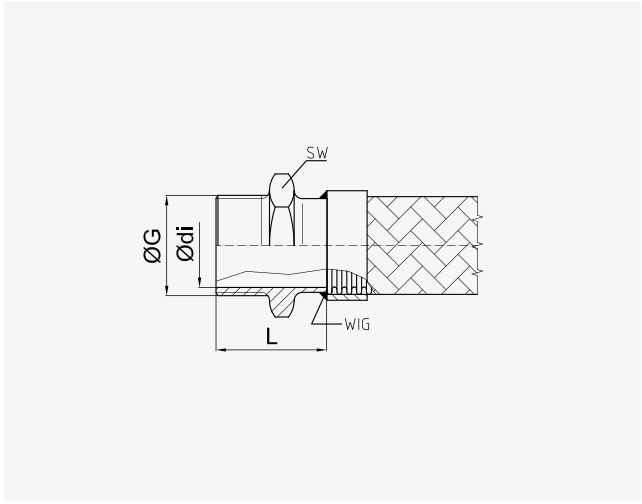
Design: The table values shown refer to 20 °C design temperature with a standard Material combination 1.4541/1.4301 (hose/braid material).
For other materials and operating temperatures, operating pressure and movement absorption have to be adapted with factors or requested separately.

Hose connection types: Hose and thread nipples

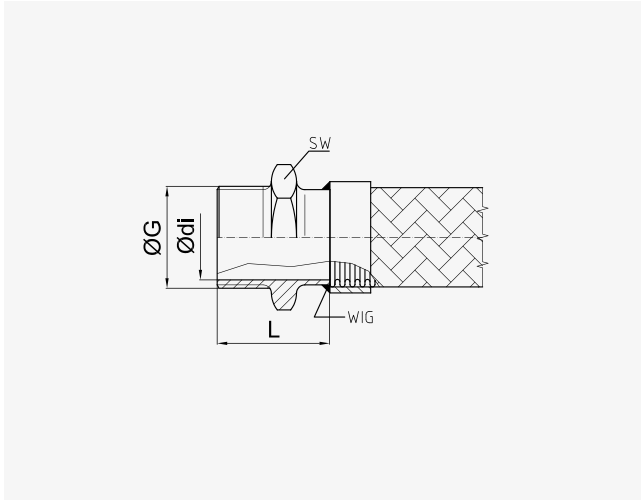
Welding end **R**



Threaded nipple with hexagon DIN 2990 **AGA**

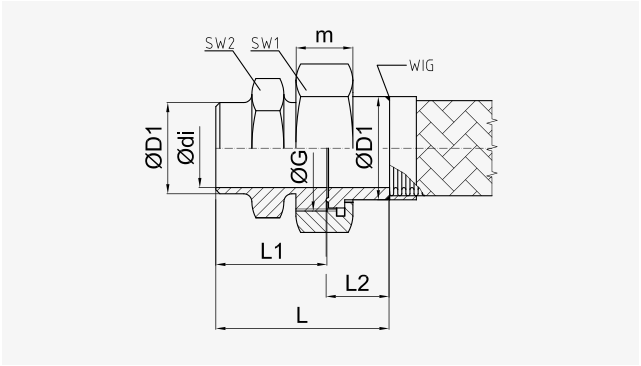


Threaded nipple with hexagon DIN 2950-280 (N8) **AGA**

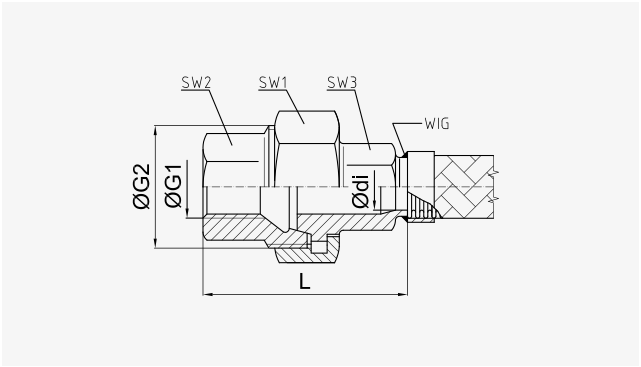


Hose connection types: Screw fittings

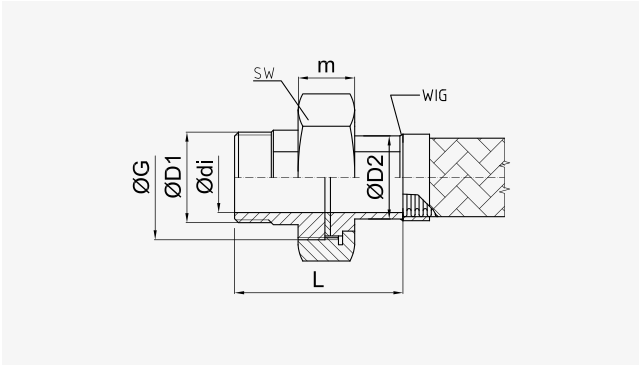
Welding pipe joint from supplier **DILO**



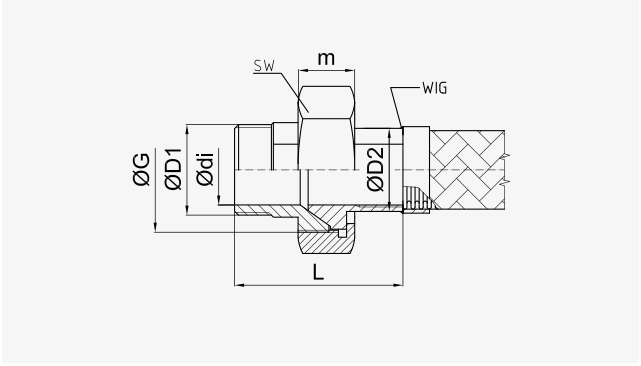
Pipe joint conical sealing **DIGA**



Pipe joint with flat seal **DAGA**

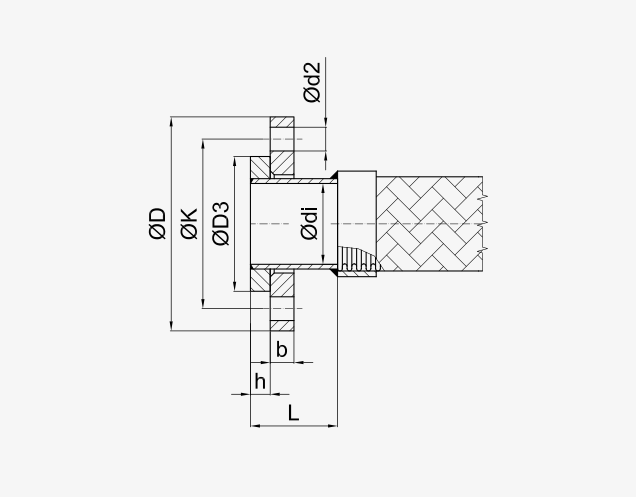


Pipe joint with conical seal **DAGA**

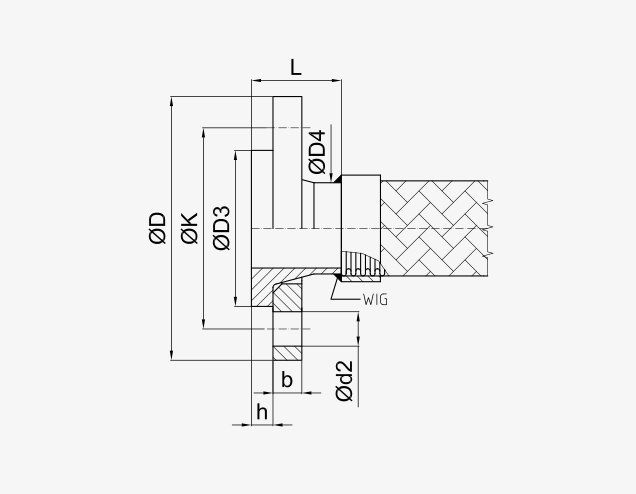


Hose connection types: Flanges

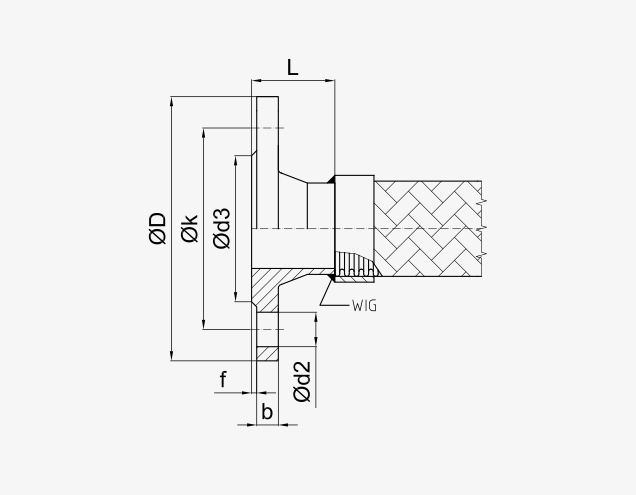
Swivel flange PN 40 with flange **B**



Swivel flange PN 10 with collar or flange **B**

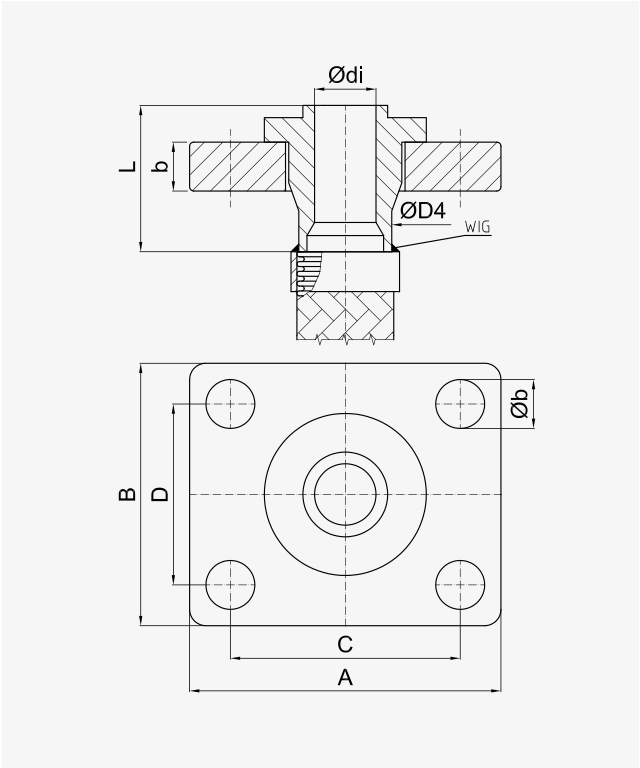


Welding neck flange PN 16 **V**



Hose connection types: Flanges

Hose connection with rectangular flange **S**



SI base units

Size	Name	Symbol
Length	metre	m
Mass	kilogramme	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

Unit conversion tables

Force				
	N	**kN**	**lbf**	**kp**
N	1	1000	4.448	9.806
kN	0.1	1	0.004448	0.00981
lbf	0.225	224.81	1	2.2046
kp	0.1019	101.97	0.4536	1

Mass				
	kg	**g**	**t**	**lb**
kg	1	0.001	1000	0.4536
g	1000	1	1000000	453.592
t	0.001	0.000001	1	0.000454
lb	2.2046	0.002205	2204.62	1

Thermodynamic temperature			
	K	**°C**	**°F**
K	1	$T_C + 273.15$	$(T_F + 459.67) \cdot 5/9$
°C	$T_K - 273.15$	1	$(T_F - 32) \cdot 5/9$
°F	$T_K \cdot 1.8 - 459.67$	$T_C \cdot 1.8 + 32$	1

Time					
	s	**min**	**h**	**d**	**a**
s	1	60	3600	86400	$3.154 \cdot 10^{7}$
min	0.017	1	60	1440	525600
h	0.00028	0.017	1	24	8760
d	0.0000116	0.000694	0.0412	1	365
a	$3.171 \cdot 10^{-8}$	$1.903 \cdot 10^{-6}$	0.000114	0.00274	1

Pressure						
	N/m² = Pa	**N/mm² = MPa**	**bar**	**Torr**	**psi = lbf/in²**	**psf = lbf/ft²**
N/m² = Pa	1	1000000	100000	133.32	6894.76	47.88
N/mm² = MPa	$1 \cdot 10^{-6}$	1	0.1	0.00013	0.00689	$4.788 \cdot 10^{-5}$
bar	0.00001	10	1	0.00133	0.06895	0.0004788
Torr	0.0075	7500.6	750.06	1	51.715	0.3591
psi = lbf/in²	0.000145	145.04	14.504	0.0193	1	0.00694
psf = lbf/ft²	0.02089	20885	2088.5	2.784	144	1

Length							
	m	**dm**	**cm**	**mm**	**in**	**ft**	**yd**
m	1	0.1	0.01	0.001	0.0254	0.3048	0.9144
dm	10	1	0.1	0.01	0.254	3.048	9.144
cm	100	10	1	0.1	2.54	30.48	91.44
mm	1000	100	10	1	25.4	304.8	914.4
in	39.37	3.937	0.3937	0.03937	1	12	36
ft	3.2808	0.3281	0.0328	0.0033	0.0833	1	3
yd	1.0936	0.1094	0.0109	0.0011	0.0278	0.3333	1

Area					
	m²	**dm²**	**cm²**	**mm²**	**in²**
m²	1	0.01	0.0001	0.000001	0.000645
dm²	100	1	0.01	0.0001	0.064516
cm²	10000	100	1	0.01	6.4516
mm²	1000000	10000	100	1	645.16
in²	1549.997	15.5	0.155	0.00155	1

Coefficients of thermal expansion

Material	Length expansion coefficient α ×10^{-6} [1/K] between 20 °C and				
	100 °C	200 °C	300 °C	400 °C	500 °C
Ferritic steel	12.5	13.0	13.6	14.1	14.3
X6CrNiTi18-10 (1.4541)	16.0	16.5	17.0	17.5	18.0
X6CrNiMoTi17-12-2 (1.4571)	16.5	17.5	18.0	18.5	19.0
X2CrNiMo17-12-2 (1.4404)	16.0	16.5	17.0	17.5	18.0
Copper	15.5	16.0	16.5	17.0	17.5
Aluminium (AlMg3)	23.7	24.5	25.3	26.3	27.2
PE	200.0	-	-	-	-
PP	180.0	-	-	-	-
PVC	80.0	-	-	-	-

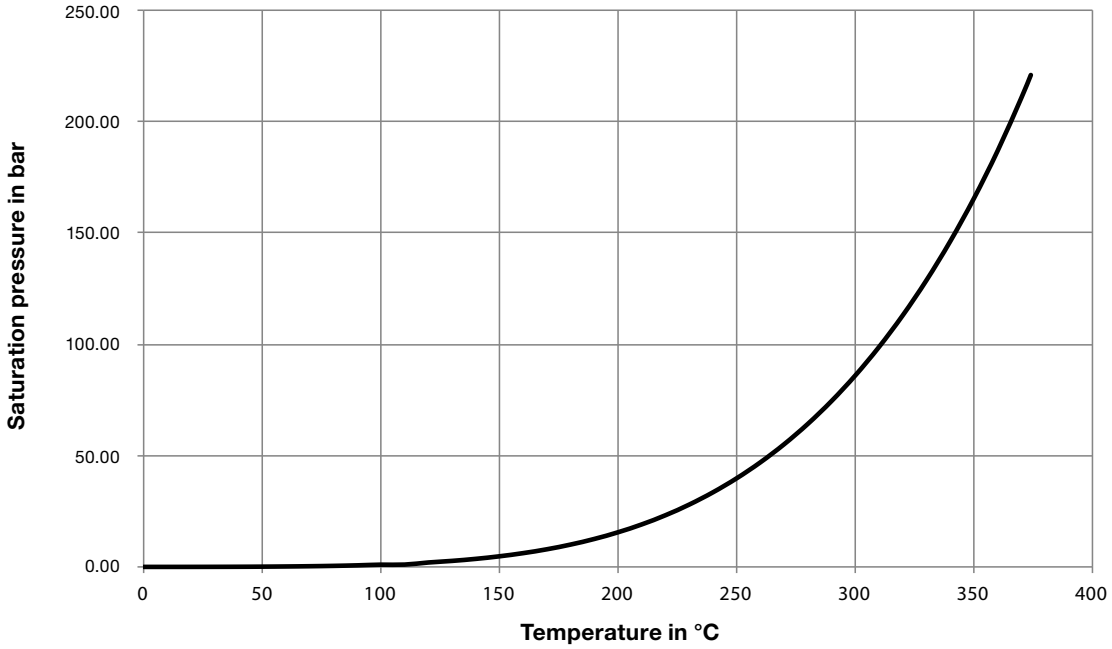
Steam table

Thermodynamic temperature	Pressure	Pressure Specific volume		Enthalpy		
T	p_{abs}	v‘ [1]	v‘‘ [2]	h‘ [1]	h‘‘ [2]	r [3]
°C	bar	dm³/kg	m³/kg	kJ/kg	kJ/kg	kJ/kg
0.01	0.01	1.0002	205.990	0	2501	2501
10	0.01	1.0003	106.320	42	2519	2477
20	0.02	1.0018	57.779	84	2537	2453
30	0.04	1.0044	32.996	126	2555	2430
40	0.07	1.0079	19.528	168	2573	2406
50	0.12	1.0122	12.037	209	2591	2382
60	0.20	1.0171	7.674	251	2609	2358
70	0.31	1.0228	5.045	293	2626	2333
80	0.47	1.0290	3.409	335	2643	2308
90	0.70	1.0359	2.362	377	2660	2283
100	1.01	1.0434	1.674	419	2676	2257
110	1.04	1.0515	1.211	461	2691	2230
120	1.98	1.0603	0.892	504	2706	2202
130	2.70	1.0697	0.669	546	2720	2174
140	3.61	1.0797	0.510	589	2734	2145
150	4.76	1.0904	0.393	632	2746	2114
160	6.18	1.1019	0.307	676	2758	2082
170	7.91	1.1142	0.243	719	2769	2049
180	10.02	1.1273	0.194	763	2778	2015
190	12.54	1.1414	0.157	808	2786	1978
200	15.54	1.1564	0.127	852	2793	1940
210	19.06	1.1726	0.104	898	2798	1900

Thermodynamic temperature	Pressure	Pressure Specific volume		Enthalpy		
T	p_{abs}	v‘ [1]	v“ [2]	h‘ [1]	h“ [2]	r [3]
°C	bar	dm³/kg	m³/kg	kJ/kg	kJ/kg	kJ/kg
220	23.18	1.1900	0.086	944	2801	1858
230	27.95	1.2088	0.072	990	2803	1813
240	33.45	1.2292	0.060	1037	2803	1766
250	39.74	1.2515	0.050	1085	2801	1715
260	46.90	1.2758	0.042	1134	2796	1662
270	55.00	1.3026	0.036	1185	2789	1605
280	64.13	1.3324	0.030	1236	2779	1543
290	74.38	1.3658	0.026	1289	2766	1477
300	85.84	1.4037	0.022	1344	2749	1405
310	98.61	1.4473	0.018	1401	2727	1326
320	112.79	1.4984	0.016	1461	2700	1239
330	128.52	1.5601	0.013	1520	2665	1145
340	145.94	1.6373	0.011	1594	2621	1028
350	165.21	1.7401	0.009	1670	2564	893
360	186.55	1.8936	0.007	1761	2482	721
370	210.30	2.2068	0.005	1890	2340	450
374	220.55	3.1100	0.003	2086	2086	0

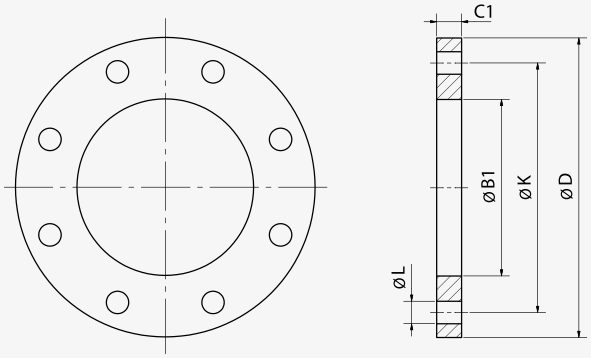
1) Values with x´ indicate liquid state
2) Values with x´´ indicate gaseous state
3) Vaporisation heat

Saturation pressure – temperature diagram



Flanges

Plain fixed flange acc. to EN 1092 - 1 TYPE 01



Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_1	C_1
-	mm	mm	mm	-	-	mm	mm
Plain fixed flange · nominal pressure PN 2,5							
10 - 1000	Dimensions according to PN 6						
1200	1375	1320	30	32	M27	[a]	60
Plain fixed flange · nominal pressure PN 6							
10	75	50	11	4	M10	18	12
15	80	55	11	4	M10	22	12
20	90	65	11	4	M10	27.5	14
25	100	75	11	4	M10	34.5	14
32	120	90	14	4	M12	43.5	16
40	130	100	14	4	M12	49.5	16
50	140	110	14	4	M12	61.5	16
65	160	130	14	4	M12	77.5	16
80	190	150	18	4	M16	90.5	18
100	210	170	18	4	M16	116	18
125	240	200	18	8	M16	141.5	20
150	265	225	18	8	M16	170.5	20
200	320	280	18	8	M16	221.5	22
250	375	335	18	12	M16	276.5	24
300	440	395	22	12	M20	327.5	24
350	490	445	22	12	M20	359.5	26
400	540	495	22	16	M20	411	28
450	595	550	22	16	M20	462	30
500	645	600	22	20	M20	513.5	30

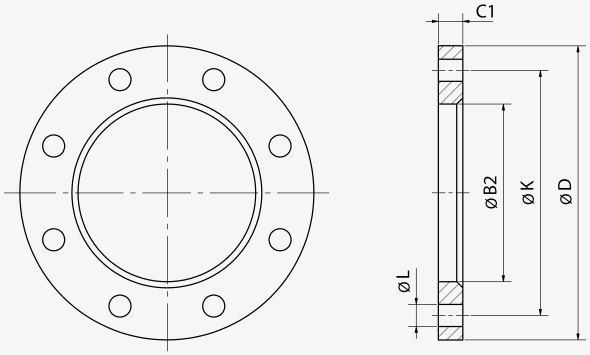
Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_1	C_1
-	mm	mm	mm	-	-	mm	mm
600	755	705	26	20	M24	616.5	32
700	860	810	26	24	M24	[a]	40
800	975	920	30	24	M27	[a]	44
900	1075	1020	30	24	M27	[a]	48
1000	1175	1120	30	28	M27	[a]	52
1200	1405	1340	33	32	M30	[a]	60
1400	1630	1560	36	36	M33	[a]	72
1600	1830	1760	36	40	M33	[a]	80
1800	2045	1970	39	44	M36	[a]	88
2000	2265	2180	42	48	M39	[a]	96
Plain fixed flange · nominal pressure PN 10							
10 - 40	Dimensions according to PN 40						
50 - 150	Dimensions according to PN 16						
200	340	295	22	8	M20	221.5	24
250	395	350	22	12	M20	276.5	26
300	445	400	22	12	M20	327.5	26
350	505	460	22	16	M20	359.5	30
400	565	515	26	16	M24	411	32
450	615	565	26	20	M24	462	36
500	670	620	26	20	M24	513.5	38
600	780	725	30	20	M27	616.5	42
700	895	840	30	24	M27	[a]	50
800	1015	950	33	24	M30	[a]	56
900	1115	1050	33	28	M30	[a]	62
1000	1230	1160	36	28	M33	[a]	70
1200	1455	1380	39	32	M36	[a]	83
Plain fixed flange · nominal pressure PN 16							
10 - 40	Dimensions according to PN 40						
50	165	125	18	4	M16	60.3	20
65	185	145	18	8 [b]	M16	76.1	20
80	200	160	18	8	M16	88.9	20
100	220	180	18	8	M16	114.3	22
125	250	210	18	8	M16	139.7	22
150	285	240	22	8	M20	168.3	24
200	340	295	22	12	M20	219.1	26

Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_1	C_1
-	mm	mm	mm	-	-	mm	mm
250	405	355	26	12	M24	273	29
300	460	410	26	12	M24	323.9	32
350	520	470	26	16	M24	355.6	35
400	580	525	30	16	M27	406.4	38
450	640	585	30	20	M27	457	42
500	715	650	33	20	M30	508	46
600	840	770	36	20	M33	610	55
700	910	840	36	24	M33	711	63
800	1025	950	39	24	M36	813	74
900	1125	1050	39	28	M36	914	82
1000	1255	1170	42	28	M39	1016	90
Plain fixed flange · nominal pressure PN 25							
10 - 150	Dimensions according to PN 40						
200	360	310	26	12	M24	221.5	32
250	425	370	30	12	M27	276.5	35
300	485	430	30	16	M27	327.5	38
350	555	490	33	16	M30	359.5	42
400	620	550	36	16	M33	411	48
450	670	600	36	20	M33	462	54
500	730	660	36	20	M33	513.5	58
600	845	770	39	20	M36	616.5	68
700	960	875	42	24	M39	[a]	85
800	1085	990	48	24	M45	[a]	95
Plain fixed flange · nominal pressure PN 40							
10	90	60	14	4	M12	18	14
15	95	65	14	4	M12	22	14
20	105	75	14	4	M12	27.5	16
25	115	85	14	4	M12	34.5	16
32	140	100	18	4	M16	43.5	18
40	150	110	18	4	M16	49.5	18
50	165	125	18	4	M16	61.5	20
65	185	145	18	8	M16	77.5	22
80	200	160	18	8	M16	90.5	24
100	235	190	22	8	M20	116	26

Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_1	C_1
-	mm	mm	mm	-	-	mm	mm
125	270	220	26	8	M24	141.5	28
150	300	250	26	8	M24	170.5	30
200	375	320	30	12	M27	221.5	36
250	450	385	33	12	M30	276.5	42
300	515	450	33	16	M30	327.5	52
350	580	510	36	16	M33	359.5	58
400	660	585	39	16	M36	411	65

a) To be defined by the customer
b) Steel flanges with 4 holes are permitted upon agreement between manufacturer and customer.

Swivel flange acc. to EN 1092-1 TYPE 02



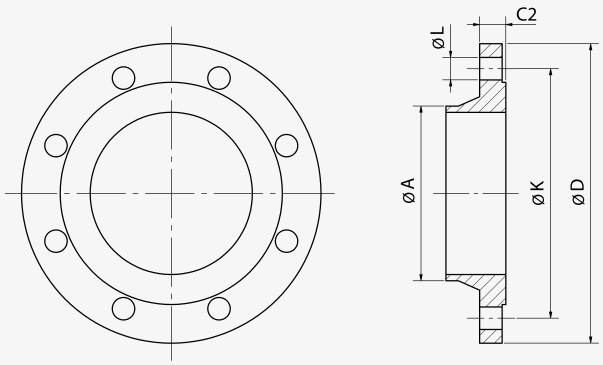
Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_2	C_1
-	mm	mm	mm	-	-	mm	mm
swivel flange · nominal pressure PN 2.5							
10 - 1000	Dimensions according to PN 6						
swivel flange · nominal pressure PN 6							
10	75	50	11	4	M10	21	12
15	80	55	11	4	M10	25	12
20	90	65	11	4	M10	31	14
25	100	75	11	4	M10	38	14
32	120	90	14	4	M12	46	16
40	130	100	14	4	M12	53	16
50	140	110	14	4	M12	65	16
65	160	130	14	4	M12	81	16
80	190	150	18	4	M16	94	18
100	210	170	18	4	M16	120	18
125	240	200	18	8	M16	145	20
150	265	225	18	8	M16	174	20
200	320	280	18	8	M16	226	22
250	375	335	18	12	M16	281	24
300	440	395	22	12	M20	333	24
350	490	445	22	12	M20	365	26
400	540	495	22	16	M20	416	28
450	595	550	22	16	M20	467	30
500	645	600	22	20	M20	519	30

Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_2	C_1
-	mm	mm	mm	-	-	mm	mm
600	755	705	26	20	M24	622	32
700	860	810	26	24	M24	721	40
800	975	920	30	24	M27	824	44
900	1075	1020	30	24	M27	926	48
1000	1175	1120	30	28	M27	1028	52
1200	1405	1340	33	32	M30	1234	60
swivel flange · nominal pressure PN 10							
10 - 40	Dimensions according to PN 40						
50 - 150	Dimensions according to PN 16						
200	340	295	22	8	M20	226	24
250	395	350	22	12	M20	281	26
300	445	400	22	12	M20	333	26
350	505	460	22	16	M20	365	30
400	565	515	26	16	M24	416	32
450	615	565	26	20	M24	467	36
500	670	620	26	20	M24	519	38
600	780	725	30	20	M27	622	42
700	895	840	30	24	M27	721	50
800	1015	950	33	24	M30	824	56
900	1115	1050	33	28	M30	926	62
1000	1230	1160	36	28	M33	1028	70
1200	1455	1380	39	32	M36	1234	83
swivel flange · nominal pressure PN 16							
10 - 40	Dimensions according to PN 40						
50	165	125	18	4	M16	65	20
65	185	145	18	8 [b]	M16	81	20
80	200	160	18	8	M16	94	20
100	220	180	18	8	M16	120	22
125	250	210	18	8	M16	145	22
150	285	240	22	8	M20	174	24
200	340	295	22	12	M20	226	26
250	405	355	26	12	M24	281	29
300	460	410	26	12	M24	333	32
350	520	470	26	16	M24	365	35
400	580	525	30	16	M27	416	38
450	640	585	30	20	M27	467	42

Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	B_2	C_1
-	mm	mm	mm	-	-	mm	mm
500	715	650	33	20	M30	519	46
600	840	770	36	20	M33	622	55
700	910	840	36	24	M33	721	63
800	1025	950	39	24	M36	824	74
900	1125	1050	39	28	M36	926	82
1000	1255	1170	42	28	M39	1030	90
swivel flange · nominal pressure PN 25							
10 - 125	Dimensions according to PN 40						
150	300	250	26	8	M24	174	30
200	360	310	26	12	M24	226	32
250	425	370	30	12	M27	281	35
300	485	430	30	16	M27	333	38
350	555	490	33	16	M30	365	42
400	620	550	36	16	M33	416	48
450	670	600	36	20	M33	467	54
500	730	660	36	20	M33	519	58
600	845	770	39	20	M36	622	68
700	960	875	42	24	M39	721	85
800	1085	990	48	24	M45	824	95
swivel flange · nominal pressure PN 40							
10	90	60	14	4	M12	21	14
15	95	65	14	4	M12	25	14
20	105	75	14	4	M12	31	16
25	115	85	14	4	M12	38	16
32	140	100	18	4	M16	47	18
40	150	110	18	4	M16	53	18
50	165	125	18	4	M16	65	20
65	185	145	18	8	M16	81	22
80	200	160	18	8	M16	94	24
100	235	190	22	8	M20	120	26
125	270	220	26	8	M24	145	28
150	300	250	26	8	M24	174	30
200	375	320	30	12	M27	226	36
250	450	385	33	12	M30	281	42
300	515	450	33	16	M30	333	52
350	580	510	36	16	M33	365	58
400	660	585	39	16	M36	416	65

b) Steel flanges with 4 holes are permitted upon agreement between manufacturer and customer.

Welding neck flange acc. to EN 1092 - 1 TYPE 11



Nominal diameter	Connection dimensions					Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	A	C_2
-	mm	mm	mm	-	-	mm	mm
Welding neck flange · nominal pressure PN 2.5							
10 - 1000	Dimensions according to PN 6						
1200	1375	1320	30	32	M27	1219	32
1400	1575	1520	30	36	M27	1422	38
1600	1790	1730	30	40	M27	1626	46
1800	1990	1930	30	44	M27	1829	46
2000	2190	2130	30	48	M27	2032	50
2200	2405	2340	33	52	M30	2235	56
2400	2605	2540	33	56	M30	2438	62
2600	2805	2740	33	60	M30	2620	64
2800	3030	2960	36	64	M33	2820	74
3000	3230	3160	36	68	M33	3020	80
3200	3430	3360	36	72	M33	3220	84
3400	3630	3560	36	76	M33	3420	90
3600	3840	3770	36	80	M33	3620	96
3800	4045	3970	39	80	M36	3820	102
4000	4245	4170	39	84	M36	4020	106
Welding neck flange · nominal pressure PN 6							
10	75	50	11	4	M10	17.2	12
15	80	55	11	4	M10	21.3	12
20	90	65	11	4	M10	26.9	14
25	100	75	11	4	M10	33.7	14

Nominal diameter	Connection dimensions					Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	A	C_2
-	mm	mm	mm	-	-	mm	mm
32	120	90	14	4	M12	42.4	14
40	130	100	14	4	M12	48.3	14
50	140	110	14	4	M12	60.3	14
65	160	130	14	4	M12	76.1	14
80	190	150	18	4	M16	88.9	16
100	210	170	18	4	M16	114.3	16
125	240	200	18	8	M16	139.7	18
150	265	225	18	8	M16	168.3	18
200	320	280	18	8	M16	219.1	20
250	375	335	18	12	M16	273	22
300	440	395	22	12	M20	323.9	22
350	490	445	22	12	M20	355.6	22
400	540	495	22	16	M20	406.4	22
450	595	550	22	16	M20	457	22
500	645	600	22	20	M20	508	24
600	755	705	26	20	M24	610	30
700	860	810	26	24	M24	711	30
800	975	920	30	24	M27	813	30
900	1075	1020	30	24	M27	914	34
1000	1175	1120	30	28	M27	1016	38
1200	1405	1340	33	32	M30	1219	42
1400	1630	1560	36	36	M33	1422	56
1600	1830	1760	36	40	M33	1626	63
1800	2045	1970	39	44	M36	1829	69
2000	2265	2180	42	48	M39	2032	74
2200	2475	2390	42	52	M39	2235	81
2400	2685	2600	42	56	M39	2438	87
2600	2905	2810	48	60	M45	2620	91
2800	3115	3020	48	64	M45	2820	101
3000	3315	3220	48	68	M45	3020	102
3200	3525	3430	48	72	M45	3220	106
3400	3735	3640	48	76	M45	3420	110
3600	3970	3860	56	80	M52	3620	124

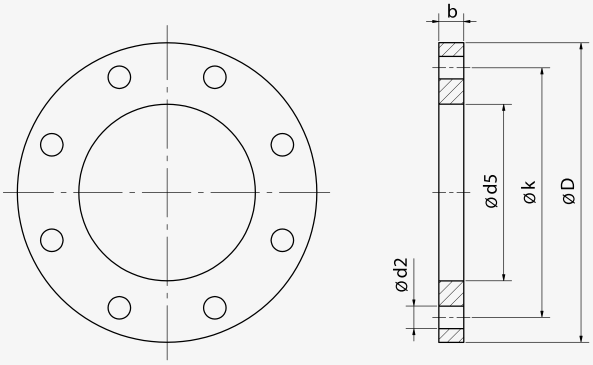
Nominal diameter	Connection dimensions					Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	A	C_2
-	mm	mm	mm	-	-	mm	mm
Welding neck flange · nominal pressure PN 10							
10 - 40	Dimensions according to PN 40						
50 - 150	Dimensions according to PN 16						
200	340	295	22	8	M20	219.1	24
250	395	350	22	12	M20	273	26
300	445	400	22	12	M20	323.9	26
350	505	460	22	16	M20	355.6	26
400	565	515	26	16	M24	406.4	26
450	615	565	26	20	M24	457	28
500	670	620	26	20	M24	508	28
600	780	725	30	20	M27	610	30
700	895	840	30	24	M27	711	35
800	1015	950	33	24	M30	813	38
900	1115	1050	33	28	M30	914	38
1000	1230	1160	36	28	M33	1016	44
1200	1455	1380	39	32	M36	1219	55
1400	1675	1590	42	36	M39	1422	65
1600	1915	1820	48	40	M45	1626	75
1800	2115	2020	48	44	M45	1829	85
2000	2325	2230	48	48	M45	2032	90
2200	2550	2440	56	52	M52	2235	100
2400	2760	2650	56	56	M52	2438	110
2600	2960	2850	56	60	M52	2620	110
2800	3180	3070	56	64	M52	2820	124
3000	3405	3290	62	68	M56	3020	132
Welding neck flange · nominal pressure PN 16							
10 - 40	Dimensions according to PN 40						
50	165	125	18	4	M16	60.3	18
65	185	145	18	8 [b]	M16	76.1	18
80	200	160	18	8	M16	88.9	20
100	220	180	18	8	M16	114.3	20
125	250	210	18	8	M16	139.7	22
150	285	240	22	8	M20	168.3	22
200	340	295	22	12	M20	219.1	24

Nominal diameter	Connection dimensions					Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	A	C_2
-	mm	mm	mm	-	-	mm	mm
250	405	355	26	12	M24	273	26
300	460	410	26	12	M24	323.9	28
350	520	470	26	16	M24	355.6	30
400	580	525	30	16	M27	406.4	32
450	640	585	30	20	M27	457	34
500	715	650	33	20	M30	508	36
600	840	770	36	20	M33	610	40
700	910	840	36	24	M33	711	40
800	1025	950	39	24	M36	813	41
900	1125	1050	39	28	M36	914	48
1000	1255	1170	42	28	M39	1016	59
1200	1485	1390	48	32	M45	1219	78
1400	1685	1590	48	36	M45	1422	84
1600	1930	1820	56	40	M52	1626	102
1800	2130	2020	56	44	M52	1829	110
2000	2345	2230	62	48	M56	2032	124
Welding neck flange · nominal pressure PN 25							
10 - 150	Dimensions according to PN 40						
200	360	310	26	12	M24	219.1	30
250	425	370	30	12	M27	273	32
300	485	430	30	16	M27	323.9	34
350	555	490	33	16	M30	355.6	38
400	620	550	36	16	M33	406.4	40
450	670	600	36	20	M33	457	46
500	730	660	36	20	M33	508	48
600	845	770	39	20	M36	610	48
700	960	875	42	24	M39	711	50
800	1085	990	48	24	M45	813	53
900	1185	1090	48	28	M45	914	57
1000	1320	1210	56	28	M52	1016	63
Welding neck flange · nominal pressure PN 40							
10	90	60	14	4	M12	17.2	16
15	95	65	14	4	M12	21.3	16
20	105	75	14	4	M12	26.9	18

Nominal diameter	Connection dimensions					Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	K	L	-	-	A	C_2
-	mm	mm	mm	-	-	mm	mm
25	115	85	14	4	M12	33.7	18
32	140	100	18	4	M16	42.4	18
40	150	110	18	4	M16	48.3	18
50	165	125	18	4	M16	60.3	20
65	185	145	18	8	M16	76.1	22
80	200	160	18	8	M16	88.9	24
100	235	190	22	8	M20	114.3	24
125	270	220	26	8	M24	139.7	26
150	300	250	26	8	M24	168.3	28
200	375	320	30	12	M27	219.1	34
250	450	385	33	12	M30	273	38
300	515	450	33	16	M30	323.9	42
350	580	510	36	16	M33	355.6	46
400	660	585	39	16	M36	406.4	50
450	685	610	39	20	M36	457	57
500	755	670	42	20	M39	508	57
600	890	795	48	20	M45	610	72

b) Steel flanges with 4 holes are permitted upon agreement between manufacturer and customer.

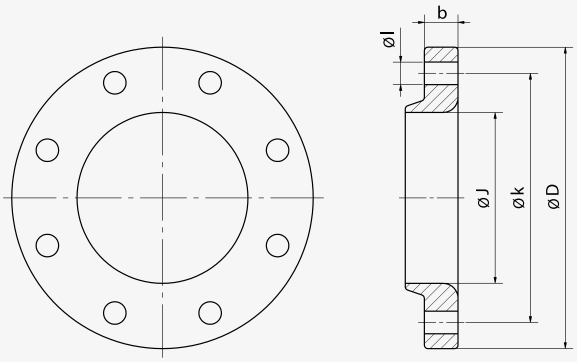
Flat flange acc. to DIN 86044



Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	k	d_2	-	-	d_5	b
-	mm	mm	mm	-	-	mm	mm
200	320	280	18	8	M16	222	16
250	375	335	18	12	M16	276	16
300	440	395	22	12	M20	327	16
350	490	445	22	12	M20	359	16
400	540	495	22	16	M20	410	16
450	595	550	22	16	M20	461	16
500	645	600	22	20	M20	512	16
550	703	650	22	20	M20	563	20
600	754	700	22	20	M20	614	20
650	805	750	22	20	M20	665	20
700	856	800	22	24	M20	716	20
750	907	850	22	24	M20	767	20
800	958	900	22	24	M20	818	20
850	1010	950	22	28	M20	870	20
900	1060	1010	22	28	M20	920	20
950	1110	1060	22	28	M20	970	20
1000	1162	1110	22	32	M20	1022	20
1100	1266	1210	22	32	M20	1126	20
1200	1366	1310	22	36	M20	1226	20
1300	1466	1410	22	40	M20	1326	20
1400	1566	1510	22	40	M20	1426	20
1500	1666	1610	22	44	M20	1526	20

Nominal diameter	Connection dimensions					Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws			
				Qty.	Size		
DN	D	k	d_2	-	-	d_5	b
-	mm	mm	mm	-	-	mm	mm
1600	1766	1710	22	48	M20	1626	20
1700	1866	1810	22	48	M20	1726	20
1800	1966	1910	22	52	M20	1826	20
1900	2066	2010	22	56	M20	1926	20
2000	2166	2110	22	56	M20	2026	20
2100	2266	2210	22	60	M20	2126	20
2200	2366	2310	22	64	M20	2226	20
2300	2466	2410	22	64	M20	2326	20
2400	2566	2510	22	68	M20	2426	20
2500	2666	2610	22	72	M20	2526	20
2600	2766	2710	22	72	M20	2626	20
2700	2866	2810	22	76	M20	2726	20
2800	2966	2910	22	80	M20	2826	20
2900	3066	3010	22	80	M20	2926	20
3000	3166	3110	22	84	M20	3026	20

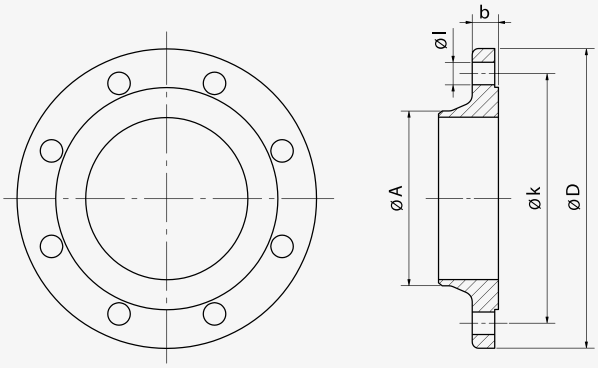
Lap joint flanges acc. to ASME B16.5



Nominal diameter	Connection dimensions				Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws Qty.		
DN	D	k	I	-	J	b
˝	mm	mm	mm	-	mm	mm
Lap joint flanges · ANSI 150 lbs						
1/2	88.9	60.5	15.7	4	22.9	11.2
3/4	98.6	69.9	15.7	4	28.2	12.7
1	108	79.2	15.7	4	35.1	14.2
1 1/4	117.3	88.9	15.7	4	43.7	15.7
1 1/2	127	98.6	15.7	4	50	17.5
2	152.4	120.7	19.1	4	62.5	19.1
2 1/2	177.8	139.7	19.1	4	75.4	22.4
3	190.5	152.4	19.1	4	91.4	23.9
3 1/2	215.9	177.8	19.1	8	104.1	23.9
4	228.6	190.5	19.1	8	116.8	23.9
5	254	215.9	22.4	8	144.5	23.9
6	279.4	241.3	22.4	8	171.5	25.4
8	342.9	298.5	22.4	8	222.3	28.4
10	406.4	362	25.4	12	277.4	30.2
12	482.6	431.8	25.4	12	328.2	31.8
14	533.4	476.3	28.4	12	360.2	35.1
16	596.9	539.8	28.4	16	411.2	36.6
18	635	577.9	31.8	16	462.3	39.6
20	698.5	635	31.8	20	514.4	42.9
24	812.8	749.3	35.1	20	616	47.8

Nominal diameter	Connection dimensions				Hole diameter	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws		
				Qty.		
DN	D	k	l	-	J	b
˝	mm	mm	mm	-	mm	mm
Lap joint flanges · ANSI 300 lbs						
1/2	95.3	66.6	15.7	4	22.9	14.2
3/4	117.3	82.6	19.1	4	28.2	15.7
1	124	88.9	19.1	4	35.1	17.5
1 1/4	133.4	98.6	19.1	4	43.7	19.1
1 1/2	155.4	114.3	22.4	4	50	20.6
2	165.1	127	19.1	8	62.5	22.4
2 1/2	190.5	149.4	22.4	8	75.4	25.4
3	209.6	168.1	22.4	8	91.4	28.4
3 1/2	228.6	184.2	22.4	8	104.1	30.2
4	254	200.2	22.4	8	116.8	31.8
5	279.4	235	22.4	8	144.5	35.1
6	317.5	269.7	22.4	12	171.5	36.6
8	381	330.2	25.4	12	222.3	41.1
10	444.5	387.4	28.4	16	277.4	47.8
12	520.7	450.9	31.8	16	328.2	50.8
14	584.2	514.3	31.8	20	360.2	53.8
16	647.7	571.5	35.1	20	411.2	57.2
18	711.2	628.7	35.1	24	462.3	60.5
20	774.7	685.8	35.1	24	514.4	63.5
24	914.4	812.8	41.1	24	616	69.9

Welding neck flanges acc. to ASME B16.5



Nominal diameter	Connection dimensions				Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws		
				Qty.		
DN	D	k	l	-	A	b
´´	mm	mm	mm	-	mm	mm
Welding neck flanges · ANSI 150 lbs						
1/2	88.9	60.5	15.7	4	21.3	11.2
3/4	98.6	69.9	15.7	4	26.7	12.7
1	108	79.2	15.7	4	33.4	14.2
1 1/4	117.3	88.9	15.7	4	42.2	15.7
1 1/2	127	98.6	15.7	4	48.3	17.5
2	152.4	120.7	19.1	4	60.3	19.1
2 1/2	177.8	139.7	19.1	4	73	22.4
3	190.5	152.4	19.1	4	88.9	23.9
3 1/2	215.9	177.8	19.1	8	101.6	23.9
4	228.6	190.5	19.1	8	114.3	23.9
5	254	215.9	22.4	8	141.3	23.9
6	279.4	241.3	22.4	8	168.3	25.4
8	342.9	298.5	22.4	8	219.1	28.4
10	406.4	362	25.4	12	273	30.2
12	482.6	431.8	25.4	12	323.8	31.8
14	533.4	476.3	28.4	12	355.6	35.1
16	596.9	539.8	28.4	16	406.4	36.6
18	635	577.9	31.8	16	457.2	39.6
20	698.5	635	31.8	20	508	42.9
24	812.8	749.3	35.1	20	609.6	47.8

Nominal diameter	Connection dimensions				Outer diameter of the neck	Flange thickness
	External diameter	Pitch circle diameter	Hole diameter	Screws		
				Qty.		
DN	D	k	l	-	A	b
˝	mm	mm	mm	-	mm	mm
Welding neck flanges · ANSI 300 lbs						
1/2	95.3	66.5	15.7	4	21.3	14.2
3/4	117.3	82.6	19.1	4	26.7	15.7
1	124	88.9	19.1	4	33.4	17.5
1 1/4	133.4	98.6	19.1	4	42.2	19.1
1 1/2	155.4	114.3	22.4	4	48.3	20.6
2	165.1	127	19.1	8	60.3	22.4
2 1/2	190.5	149.4	22.4	8	73	25.4
3	209.6	168.1	22.4	8	88.9	28.4
3 1/2	228.6	184.2	22.4	8	101.6	30.2
4	254	200.2	22.4	8	114.3	31.8
5	279.4	235	22.4	8	141.3	35.1
6	317.5	269.7	22.4	12	168.3	36.6
8	381	330.2	25.4	12	219.1	41.1
10	444.5	387.4	28.4	16	273	47.8
12	520.7	450.9	31.8	16	323.8	50.8
14	584.2	514.4	31.8	20	355.6	53.8
16	647.7	571.5	35.1	20	406.4	57.2
18	711.2	628.7	35.1	24	457.2	60.5
20	774.7	685.8	35.1	24	508	63.5
24	914.4	812.8	41.1	24	609.6	69.8

Material designation

Material group	Steel designation		
	Material no.	ID	USA AISI (UNS)
General structural steel	1.0038	S235JR (RSt 37-2)	(K03000)
	1.0050	E295 (St 50-2)	-
	1.0060	E335 (St 60-2)	-
High-temperature steel	1.0345	P235GH (HI)	(K02201)
	1.0425	P265GH (HII)	(K02505)
	1.0481	P295GH (17 Mn 4)	(K02704)
	1.5415	16Mo3 (15 Mo 3)	(K12320)
	1.7335	13CrMo4-5 (13 CrMo 4 4)	(K11789)
Fine-grained structural steel	1.1104	P275NL2 (EStE 285)	-
	1.0565	P355NH (WStE 355)	(K12037)
	1.1106	P355NL2 (EStE 355)	(K12510)
	1.8918	P460NL2 (EStE 460)	-
Stainless austenitic steel	1.4301	X5CrNi18-10	304 (S30400)
	1.4306	X2CrNi19-11	304 L (S30403)
	1.4401	X5CrNiMo17-12-2	316 (S31600)
	1.4404	X2CrNiMo17-12-2	316 L (S31603)
	1.4429	X2CrNiMoN17-13-3	316 LN (S31653)
	1.4541	X6CrNiTi18-10	321 (S32100)
	1.4571	X6CrNiMoTi17-12-2	316 Ti (S31635)
Austenitic high-temperature steel	1.4948	X6CrNi18-10	304 H (S30409)
	1.4951	X6CrNi25-20	316 F
	1.4958	X5NiCrAlTi31-20	(N08810)
Heat resistant steel	1.4828	X15CrNiSi20-12	309 (S30900)
Nickel-base alloys	2.4856	NiCr22Mo9Nb (Incoly 625)	(N06625)
	2.4858	NiCr21Mo (Incoloy 825)	(N08825)

Materials – mechanical properties

Material group	Steel designation	Yield point		Tensile strength	Flexural strength	Notched bar impact work, lateral	Application temperature in °C	
	Material no.	$R_{p0,2}$ N/mm²	$R_{p1,0}$ N/mm²	R_m N/mm²	A %	A_{KV} in J at 20°C		
						J	T_{min}	T_{max}
General structural steel	1.0038	235	-	340 - 470	21 - 24	27	-20	300
	1.0050	295	-	470-610	14 - 18	27	-20	300
	1.0060	335	-	570-710	10 - 14	27	-20	300
High-temperature steel	1.0345	235	-	360 - 480	24	40	-	450
	1.0425	265	-	410 - 530	22	40	-	450
	1.0481	295	-	460 - 580	21	40	-	450
	1.5415	275	-	450 - 490	22	31	-	500
	1.7335	300	-	450 - 600	19	31	-	500
Fine-grained structural steel	1.1104	275	-	390 - 510	24	70	-20	400
	1.0565	355	-	490 - 630	22	70	-20	400
	1.1106	355	-	490 - 630	22	70	-20	400
	1.8918	460	-	570 - 730	17	70	-20	400
Stainless austenitic steel	1.4301	230	260	540 - 750	45	60	-196	550
	1.4306	220	250	520 - 700	45	60	-270	550
	1.4401	240	270	530 - 680	40	60	-196	550
	1.4404	240	270	530 - 680	40	60	-270	550
	1.4429	300	330	580 - 780	35	60	-270	550
	1.4541	220	250	520 - 720	40	60	-270	550
	1.4571	240	270	540 - 690	40	60	-270	550
Austenitic high-temperature steel	1.4948	230	260	530 - 740	45	60	-	600
	1.4951	220	250	530 - 730	35	60	-	600
	1.4958	170	200	500 - 750	30	80	-	600
Heat resistant steel	1.4828	230	270	500 - 750	30	-	-	900
Nickel-base alloys	2.4856	380	-	760 - 1000	30	100	-270	900
	2.4858	240	270	550 - 750	30	80	-270	450

HKS | Enquiry form for corrugated expansion joints

Customer data

Company name: ..... Enquiry no.: .....
Responsible: ..... Project: .....
Department: ..... Tel.: .....
Street/post box: ..... Fax: .....
Post code/town: ..... Email: .....

Geometry

Designation/type: ..... Nominal diameter DN: .....
Quantity: ..... Length L: .....

Medium

Designation: ..... Flow rate: ..... m/s
Additives: ..... Condensates: .....
Fluid group: ☐ Group 1 – hazardous ☐ Group 2 – others Other: ☐ toxic ☐ flammable ☐ caustic
Physical state: ☐ liquid when pD ≤ 0.5 bar ☐ gaseous or liquid when pD > 0.5 bar ☐ inside ☐ outside

Operating and test conditions

Design pressure: ..... bar Operating pressure: ..... bar Test pressure: ..... bar
Design temperature: ..... °C Operating temperature: ..... °C Vacuum/negative pressure: ..... bar
Axial movement: +/- ..... mm Pressure surges: ☐ yes ☐ no Vibrations: ☐ yes ☐ no
Lateral movement: +/- ..... mm Number of stress cycles: ..... Frequency: ..... Hz
Angular movement: +/- ..... Degrees Safety factor: ..... Amplitude: ..... mm

Metal bellows and connections

Metal bellows material: ..... No. of layers: ☐ single-ply ☐ multi-ply

☐ Flanges ☐ Welding ends ☐ Custom flange
Material: ..... Material: ..... Material: .....
Flange standard: ..... Outside diameter: ..... mm Outside diameter: ..... mm
Rotating: ☐ yes ☐ no Wall thickness: ..... mm Pitch circle diameter: ..... mm
Pressure stage: ..... Groove: ☐ yes ☐ no No./diameter of holes: ..... × ..... mm
Corrosion protection: ..... Corrosion protection: ..... Inside diameter: ..... mm
☐ Other: .....
.....

Tie rods

☐ Length limitation (threaded rods) ☐ Single hinged tensioner (single axis movements)
☐ Tension rods (threaded rods) ☐ Cardan joint tensioner (all-around movements)
Material: ☐ 8.8 ☐ Stainless steel ..... Material: ☐ same as flange ☐ Stainless steel .....

Accessories

Inner sleeve: ☐ yes ☐ no External tube: ☐ yes ☐ no
Wall thickness: ..... mm Wall thickness: ..... mm
Material: ..... Material: .....
☐ Cylindrical inner sleeve ☐ Telescopic inner sleeve ☐ Conical inner sleeve ☐ Detachable protective sleeve ☐ Telescopic protective sleeve

Documentation and tests

Scope of application: Pressure Equipment Directive 97/23/EC ☐ Piping ☐ Container
Other: .....
Design regulations: ☐ AD2000/EJMA ☐ EN13445 ☐ EN13480 ☐ EN14917 ☐ ASME Sec. VIII/App.26
Inspection certificates: ☐ WZ 2.2 in line with EN10204 ☐ APZ 3.1 in line with EN10204 ☐ APZ 3.2 in line with EN10204 (TÜV)
Non-destructive tests: ☐ VT 100% (visual test) ☐ PT ..... % (dye penetration test) ☐ RT ..... % (X-ray test)
Documentation: ☐ Declaration of Conformity with CE mark (module A, A1 or H)
☐ Certification of Conformity (TÜV) with CE mark module B1 + F or G
☐ Manufacturer's Declaration with operating instructions

HKS | Enquiry form for lens expansion joints

Customer data

Company name: ..... Enquiry no.: .....
Responsible: ..... Project: .....
Department: ..... Tel.: .....
Street/post box: ..... Fax: .....
Post code/town: ..... Email: .....

Geometry

Designation/type: ..... Nominal diameter DN: .....
Quantity: ..... Length L: .....

Medium

Designation: ..... Flow rate: ..... m/s
Additives: ..... Condensates: .....
Fluid group: ☐ Group 1 – hazardous ☐ Group 2 – others Other: ☐ toxic ☐ flammable ☐ caustic
Physical state: ☐ liquid when pD ≤ 0.5 bar ☐ gaseous or liquid when pD > 0.5 bar ☐ inside ☐ outside

Operating and test conditions

Design pressure: ..... bar Operating pressure: ..... bar Test pressure: ..... bar
Design temperature: ..... °C Operating temperature: ..... °C Vacuum/negative pressure: ..... bar
Axial movement: +/- ..... mm Pressure surges: ☐ yes ☐ no Vibrations: ☐ yes ☐ no
Lateral movement: +/- ..... mm Number of stress cycles: ..... Frequency: ..... Hz
Angular movement: +/- ..... Degrees Safety factor: ..... Amplitude: ..... mm

Metal bellows and connections

Metal bellows material: ..... Design: ☐ round ☐ oval ☐ rectangular ☐ other .....
☐ Flanges ☐ Welding ends ☐ Custom flange
Material: ..... Material: ..... Material: .....
Flange standard: ..... Outside diameter: ..... mm Outside diameter: ..... mm
Rotating: ☐ yes ☐ no Wall thickness: ..... mm Pitch circle diameter: ..... mm
Pressure stage: ..... Groove: ☐ yes ☐ no No./diameter of holes: ..... × ..... mm
Corrosion protection: ..... Corrosion protection: ..... Inside diameter: ..... mm
☐ Other: .....
.....

Tie rods

☐ Length limitation (threaded rods) ☐ Single hinged tensioner (single axis movements)
☐ Tension rods (threaded rods) ☐ Cardan joint tensioner (all-around movements)
Material: ☐ 8.8 ☐ Stainless steel ..... Material: ☐ same as flange ☐ Stainless steel .....

Accessories

Inner sleeve: ☐ yes ☐ no External tube: ☐ yes ☐ no
Wall thickness: ..... mm Wall thickness: ..... mm
Material: ..... Material: .....
☐ Cylindrical inner sleeve ☐ Telescopic inner sleeve ☐ Conical inner sleeve ☐ Detachable protective sleeve ☐ Telescopic protective sleeve

Documentation and tests

Scope of application: Pressure Equipment Directive 97/23/EC ☐ Piping ☐ Container
Other: .....
Design regulations: ☐ AD2000/EJMA ☐ EN13445 ☐ EN13480 ☐ EN14917 ☐ ASME Sec. VIII
Inspection certificates: ☐ WZ 2.2 in line with EN10204 ☐ APZ 3.1 in line with EN10204 ☐ APZ 3.2 in line with EN10204 (TÜV)
Non-destructive tests: ☐ VT 100 % (visual test) ☐ PT ..... % (dye penetration test) ☐ RT ..... % (X-ray test)
Documentation: ☐ Declaration of Conformity with CE mark (module A, A1 or H)
☐ Certification of Conformity (TÜV) with CE mark module B1 + F or G
☐ Manufacturer's Declaration with operating instructions

HKS | Enquiry form for rubber expansion joints

Customer data

Company name: ..... Enquiry no.: .....
Responsible: ..... Project: .....
Department: ..... Tel.: .....
Street/post box: ..... Fax: .....
Post code/town: ..... Email: .....

Geometry

Designation/type: ..... Nominal diameter DN: .....
Quantity: ..... Length L: .....

Medium

Designation: ..... Flow rate: ..... m/s
Additives: ..... Condensates: .....
Fluid group: ☐ Group 1 – hazardous ☐ Group 2 – others Other: ☐ toxic ☐ flammable ☐ caustic
Physical state: ☐ liquid when pD ≤ 0.5 bar ☐ gaseous or liquid when pD > 0.5 bar ☐ inside ☐ outside

Operating and test conditions

Design pressure: ..... bar Operating pressure: ..... bar Test pressure: ..... bar
Design temperature: ..... °C Operating temperature: ..... °C Vacuum/negative pressure: ..... bar
Axial movement: +/- ..... mm Lateral movement: +/- ..... mm Angular movement: +/- ..... Degrees
Pressure surges: ☐ yes ☐ no Vibrations: ☐ yes ☐ no

Connections

☐ Flanges ☐ Rohrverschraubung ☐ Other:
Material: ..... Type: ☐ External thread .....
Flange standard: ..... ☐ Internal thread .....
Rotating: ☐ yes ☐ no Thread: ....
Pressure stage: ..... Material: ....
Corrosion protection: .....

Tie rods

☐ Length limitation (threaded rods)
☐ Tension rods (threaded rods)
Material: ☐ 8.8 ☐ Stainless steel .....
Support: ☐ Spherical/conical washers
☐ Rubber bushes

☐ Single hinged tensioner (single axis movements)
☐ Cardan joint tensioner (all-around movements)
Material: ☐ same as flange ☐ Stainless steel .....

Accessories

Inner sleeve: ☐ yes ☐ no
Wall thickness: ..... mm
Material: .....
☐ Cylindrical inner sleeve ☐ Telescopic inner sleeve
☐ Conical inner sleeve

External tube: ☐ yes ☐ no
Wall thickness: ..... mm
Material: .....
☐ Detachable protective sleeve
☐ Telescopic protective sleeve
☐ Soil protection cover

Other: ☐ Vacuum support ring ☐ Flame protection cover
☐ PTFE lining

Documentation and tests

Acceptance: Δ☐ Pressure Equipment Directive 97/23/EC Δ☐ DVGW Δ ☐ Drinking water W270
Δ☐ ABS Δ ☐ GL Δ ☐ DNV Δ ☐ LRS Δ ☐ BV Δ ☐ Other: .....
Inspection certificates: Δ☐ WZ 2.2 in line with EN10204 ☐ APZ 3.1 in line with EN10204
Tests: Δ☐ Leakage test 0.5 bar Δ ☐ Pressure test ☐ Helium leakage test
Documentation: Δ☐ Declaration of Conformity with CE mark
☐ Manufacturer's Declaration with operating instructions

HKS | Enquiry form for fabric expansion joints

Customer data

Company name: ..... Enquiry no.: .....
Responsible: ..... Project: .....
Department: ..... Tel.: .....
Street/post box: ..... Fax: .....
Post code/town: ..... Email: .....

Geometry

Designation/type: ..... Clear width: ..... mm
Quantity: ..... Installation length: ..... mm
Construction/Style: ☐ round ☐ oval ☐ angular ☐ conic ☐ other Production length: ..... mm

Medium

Designation: ..... velocity: ..... m/s
Gas composition: ☐ Flue gas ☐ Air ☐ exhaust gas discharge: ..... m³/h
☐ Other: .....
☐ dry ☐ damp
Dust: ☐ no ☐ yes: ..... content: ..... mg/m³
Solid contents: ☐ no ☐ yes: ..... content: ..... mg/m³ grain size: ..... µm
Flow direction: ☐ horizontally ☐ upwards in vertical direction ☐ vertically down
☐ upwards diagonally ☐ downwards diagonally
Below the dewpoint: ☐ no ☐ yes Dewpoint: ..... °C
Condensate: ☐ strongly acidic ☐ slightly acidic ☐ neutral ☐ slightly alkaline ☐ strongly alkaline

Operating and test conditions

Operating pressure: ..... mbar Design pressure: ..... mbar
Pressure variations: ☐ no ☐ yes, from ..... mbar to ..... mbar Frequency: .....
Shock pressure loading: ☐ no ☐ yes, from ..... mbar to ..... mbar Frequency: .....
Medium temperature: ..... °C Design temperature: ..... °C Ambient temperature: ..... °C
Axial compression: ..... mm Axial expansion: ..... mm
Lateral Offset x: ..... mm Lateral Offset y: ..... mm
Vibration: ..... Hz Amplitude: ..... mm Angular Movement: ..... Degree
Torsion: ..... Degree

Design/Connections

Connection type: ☐ ribbon connection ☐ flange connection
Delivery mode: ☐ open ☐ closed
baffle: ☐ no ☐ yes ☐ welded in ☐ screwed on
Insulation between expansion joint and baffle: ☐ yes ☐ no
Channel inside Dimension: ..... mm Wall thickness: ..... mm tube inside dimension: ..... mm
wall thickness: ..... mm
Channel flange Height a: ..... mm Thickness b: ..... mm Distance both ends: ..... mm
swivel flange outer diameter: ..... mm pitch circle diameter: ..... mm
inner diameter: ..... mm hole spacing: ..... mm
thickness: ..... mm hole diameter: ..... mm number of holes: ..... mm

Scope of delivery

expansion joint ☐ inner insulation ☐ counter flanges/lightening straps ☐ channel flanges
screw connection ☐ baffle ☐ baffle sealing
assembly loose ☐ assembly pre-assembled

Tightness requirements

Tightness requirements: ☐ without ☐ flue gas tight ☐ nekal-tight

HKS | Enquiry form for hoses

Customer data

Company name: ..... Enquiry no.: .....
Responsible: ..... Project: .....
Department: ..... Tel.: .....
Street/post box: ..... Fax: .....
Post code/town: ..... Email: .....

Geometry

Designation/type: ..... Nominal diameter DN: .....
Quantity: ..... Length L: .....

Medium

Designation: ..... Flow rate: ..... m/s
Additives: ..... Condensates: .....
Fluid group: ☐ Group 1 – hazardous ☐ Group 2 – others Other: ☐ toxic ☐ flammable ☐ caustic
Physical state: ☐ liquid when pD ≤ 0.5 bar ☐ gaseous or liquid when pD > 0.5 bar ☐ inside ☐ outside

Operating and test conditions

Design pressure: ..... bar Operating pressure: ..... bar Test pressure: ..... bar
Design temperature: ..... °C Operating temperature: ..... °C Vacuum/negative pressure: ..... bar
Min. bending radius (stat.): ..... mm Min. bending radius (dyn.): ..... mm Pressure surges: ☐ yes ☐ no
Installation type: ☐ 90° Bend ☐ 180° Bend ☐ straight
Type of movement: ☐ static ☐ dynamic ☐ oscillating
Size: ..... Direction: .....
Amplitude: ..... mm Frequency: ..... Hz

Hose and connections

Hose material: ..... Number of braids:
Braid material: ..... ☐ without (SO) ☐ 1-fold (SE) ☐ 2-fold (SZ)
Connections (abbreviations see chapter Hoses):

☐ Flanges ☐ B ☐ V ☐ S ☐ Welding ends R ☐ Screw fittings
Material: ..... Material: ..... ☐ AGA ☐ DIGA ☐ DAGA ☐ DILO
Flange standard: ..... Outside diameter: ..... mm Material: .....
Rotating: ☐ yes ☐ no Wall thickness: ..... mm Thread: .....
Pressure stage: ..... Groove: ☐ yes ☐ no
Corrosion protection: ..... Corrosion protection: .....
☐ Other: .....
.....

Other requirements

☐ Free from oil and grease ☐ Free from gaps and burrs ☐ Bend protection one side ☐ Bend protection both sides
☐ External protective hose ☐ Heat insulation ☐ other .....

Documentation and tests

Scope of application: Δ☐ Pressure Equipment Directive 97/23/EC Δ☐ DVGW Δ ☐ Drinking water W270
Δ☐ ABS Δ ☐ GL Δ ☐ DNV Δ ☐ LRS Δ ☐ BV Δ ☐ Other: .....
Inspection certificates: Δ☐ WZ 2.2 in line with EN10204 ☐ APZ 3.1 in line with EN10204
Tests: Δ☐ Leakage test 0.5 bar Δ ☐ Pressure test ☐ Helium leakage test
Documentation: Δ☐ Declaration of Conformity with CE mark
☐ ☐ Manufacturer's Declaration with operating instructions

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