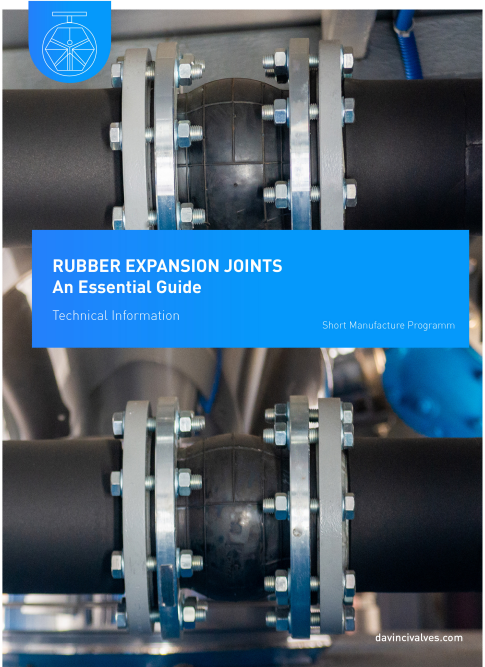


RUBBER EXPANSION JOINTS
An Essential Guide

Technical Information

Short Manufacture Programm

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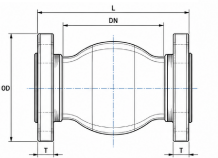
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What is RUBBER EXPANSION JOINT?

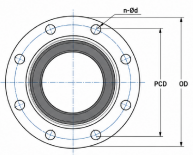
A rubber expansion joint is a flexible piping component designed to accommodate movement, isolate vibration and reduce the transmission of mechanical forces and noise between sections of a piping system.
Its flexible body is generally manufactured from natural or synthetic elastomers combined with textile reinforcement and, where required by the design, metallic reinforcement. This composite construction provides flexibility while maintaining the mechanical strength required for the intended pressure, temperature and service conditions.

DAVINCI RUBBER EXPANSION JOINTS are commonly installed in piping systems connected to pumps, compressors, chillers, heat exchangers, cooling towers and other mechanical equipment, as well as in pipelines where thermal expansion, structural movement or vibration must be accommodated. Depending on their construction, rubber expansion joints can accommodate axial compression, axial extension, lateral movement and angular movement.

A rubber expansion joint is not simply a flexible length of pipe. Its performance depends on the interaction between medium + temperature + pressure + vacuum + movement + nominal size + elastomer + reinforcement + flange standard + piping arrangement. These parameters should always be evaluated together.



SIDE ELEVATION



FRONT FLANGE VIEW

DIMENSIONS (mm)	
ITEM	SYMBOL
Nominal Diameter	DN
Overall Length (Face to Face)	L
Outer Diameter (Flange)	OD
Pitch Circle Diameter	PCD
Number of Bolt Holes x Hole Diameter	n-Ød
Flange Thickness	T

1. Drawing shows typical DAVINCI single sphere RUBBER EXPANSION JOINT, flanged type.
2. Dimensions are for reference only. Actual dimensions may vary by pressure rating and standard (e.g. EN, ANSI, JIS)
3. Internal structure and reinforcement shown schematically.
4. Material of flanges: Carbon Steel, Stainless Steel or as specified.
5. Other standards, sizes and materials available on request


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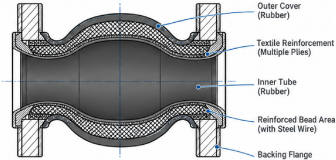
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Which is the construction of A RUBBER EXPANSION JOINT?

A rubber expansion joint is a composite flexible pressure-containing component. Its performance depends not only on the elastomer visible from the outside, but on the interaction between the inner lining, structural reinforcement, outer protection and flange connection.
Each layer performs a different function and must work together as a single engineered structure.

A STANDARD DAVINCI RUBBER EXPANSION JOINT include:

1. **Inner Tube** Isolates the process medium from the carcass
2. **Reinforcement System**
   - 2.1 **Textile Reinforcement** Provides flexible tensile strength
   - 2.2 **Metallic Reinforcement** Adds structural stability where required
3. **Outer Cover** Protects against the external environment
4. **Reinforced Bead / Flange Area** Transfers loads into the flange connection
5. **Backing / Retaining Flanges** Connect and distribute bolting forces
6. **Control Unit Assemblies — when required** Limit or control movement when required



SECTIONAL VIEW

1 - INNER TUBE (Rubber)

The inner tube is the primary elastomeric layer in direct contact with the process medium. **Its main function is to provide a continuous barrier between the fluid and the internal reinforcement structure of the expansion joint.** By preventing the process medium from reaching the textile or metallic reinforcement, the inner tube helps preserve the mechanical integrity, pressure capability and service life of the joint.

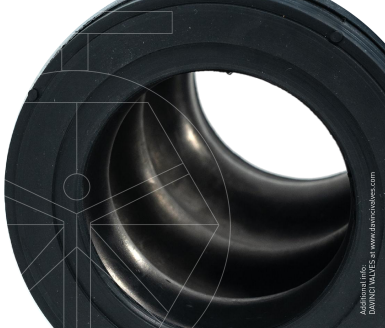
Depending on the product design, the inner tube may extend through the bore and into the flange sealing area, creating a continuous elastomeric wetted surface.

The inner-tube compound must be selected according to the actual service conditions, including:
Fluid composition - Concentration - Temperature - Pressure - Abrasiveness - Cleaning media
Suitable compounds can be formulated for applications involving water, wastewater, chemicals, hydrocarbons, gases and abrasive media, provided that compatibility is confirmed for the specific elastomer and operating conditions

The inner tube and the outer cover do not necessarily need to be made from the same elastomer.
The inner tube is selected primarily for compatibility with the process medium, while the outer cover can be selected to resist the external environment, such as ozone, UV exposure, weathering, oil splash or chemical atmosphere. This allows the expansion joint to be engineered for two different environments at the same time: inside and outside.

A small defect in the inner tube can be more critical than visible surface ageing on the outer cover. If the process medium penetrates the inner lining and reaches the reinforcement plies, it may progressively weaken the carcass from the inside, even before significant external damage becomes visible.

Primary Barrier to the Process Medium
Protects the internal reinforcement
Inner Tube and Outer Cover may use diferent elastomers



2 - REINFORCEMENT SYSTEM

The reinforcement system forms the structural load-bearing core of the rubber expansion joint. It is designed to provide the strength required to withstand internal pressure, maintain dimensional stability and control the deformation of the flexible body. Depending on the product design and service conditions, the reinforcement system may combine textile plies and metallic elements. These elements perform complementary functions and should be considered as part of the complete engineered carcass.

2.1 - Textile Reinforcement (Multiple Plies)

The body contains one or more textile reinforcement layers designed to carry pressure loads while maintaining flexibility. The material, number and orientation of these layers depend on nominal diameter, pressure rating, required movement, bellows geometry and manufacturer design.

The textile reinforcement provides flexible mechanical strength while allowing the bellows to deform under axial, lateral and angular movement.
One or several reinforcement plies may be incorporated into the carcass, depending on:

Nominal Diameter
Operating Pressure
Temperature
Required Movement
Bellows Geometry
Service Conditions



High-strength synthetic fabrics
are commonly used because they combine
tensile strength, flexibility and dimensional stability.

The reinforcement plies are embedded within the elastomeric
structure so that the fabric and rubber work together
as a composite material.
Under internal pressure, the textile reinforcement
helps control radial expansion of the flexible body and carry tensile loads generated within the carcass.

2.2. - Metallic Reinforcement (Reinforced Bead Area with Steel Wire)

Some constructions incorporate steel wire, rings or other metallic reinforcement to increase mechanical stability. These elements can be particularly important for pressure resistance, dimensional stability and vacuum service. Some expansion-joint constructions also incorporate steel wire, wire cords, rings or other metallic reinforcing elements. Their function is to provide additional structural support
where the design requires higher resistance to:
Internal Pressure - Vacuum - Radial Deformation - Bead Separation - Dimensional Instability
Metallic reinforcement may be concentrated in specific areas, such as the bead or flange region,
or incorporated into the body of the joint depending on the construction.

In vacuum service, metallic reinforcement can be especially important because it helps
prevent the flexible body from collapsing inward under external atmospheric pressure.

HOW THE TEXTILE AND METALLIC REINFORCEMENT WORK TOGETHER

The textile and metallic reinforcements do not perform exactly the same function.
Textile reinforcement primarily provides flexible tensile strength,
while metallic reinforcement provides additional rigidity, shape retention
or local reinforcement where required.

The final construction must BALANCE always.

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More reinforcement is not always better. Increasing reinforcement can improve pressure or vacuum capability, but it can also make the joint stiffer and increase the forces transmitted to the piping system.
For this reason, **the reinforcement system must be engineered as part of the complete joint design, rather than specified only by the number of fabric plies or steel rings**

A rubber expansion joint works as a composite structure.
The elastomer provides sealing and flexibility, the textile plies carry much of the tensile load generated by pressure, and metallic elements can help control shape and local stresses.
In that sense, its construction is closer to an engineered composite pressure component than to a simple molded rubber part.

ENGINEERING PRINCIPLE:

The Elastomer Seals and Flexes
The Textile Reinforcement carries tensile load
The Metallic Reinforcement controls stability where required.

3 - OUTER COVER

The outer cover is the protective elastomeric layer surrounding the structural carcass.
Unlike the inner tube, which is selected primarily according to the process medium, the outer cover is designed to protect the reinforcement system from the external operating environment.

PROTECTS THE STRUCTURAL CARCASS FROM THE EXTERNAL ENVIRONMENT

Depending on the elastomer and formulation, the cover may provide resistance to:
Weathering · Ozone · UV Exposure · Oils · Chemicals · Abrasion · Acid Fumes · Ambient Heat
Its primary purpose is to prevent external conditions from damaging the textile and metallic reinforcement underneath.

In certain applications, additional protective coatings or specialised cover compounds may be used where the environment is especially aggressive.

The external appearance of the joint does not always indicate the condition of the internal carcass.
However, changes such as cracking, cuts, blistering, swelling or exposed reinforcement should always be investigated because they may indicate deterioration of the protective cover or deeper structural damage.

The elastomer best suited to the process medium may not be the best material for the surrounding environment.
For example, a joint may require one compound internally for fluid compatibility and another externally for ozone, UV or weather resistance. This is one reason why rubber expansion joints should be considered multi-material engineered components rather than homogeneous rubber products.

4 - BEAD / REINFORCED FLANGE AREA



The bead or flange area is the transition zone between the flexible bellows and the mechanical flange connection.
It is one of the most highly loaded regions of the expansion joint because forces generated within the flexible body must be transferred safely into the flange assembly.

TRANSFERS LOADS BETWEEN THE FLEXIBLE CARCASS AND THE FLANGE CONNECTION

Depending on the construction, this area may contain:
Steel Wire · Reinforcing Rings · Additional Fabric Plies · Locally Increased Elastomer Thickness
The reinforced bead helps maintain the geometry of the rubber flange and prevents the flexible carcass from being pulled away from the flange connection under pressure and movement.
It also provides structural continuity between the pressure-containing body and the mechanical connection to the piping system.

The bead area must accommodate two very different requirements:
It must be flexible enough to remain integrated with the elastomeric body, yet strong enough to transfer substantial mechanical loads into the flange assembly.

A pressure failure does not necessarily begin at the centre of the bellows.
The transition between the flexible carcass and the flange can experience significant local stress concentrations, which is why reinforcement geometry in this area is particularly important.

5 - BACKING / RETAINING FLANGES

The metallic flange system provides the mechanical connection between the rubber expansion joint and the adjoining piping.

CONNECTS, CLAMPS AND DISTRIBUTES BOLTING LOAD WITHOUT DAMAGING THE FLEXIBLE BODY

Its main functions are to:
- **connect the joint to the mating pipe flange;**
- **distribute bolting loads around the elastomeric sealing surface;**
- **support the reinforced bead area;**
- **help maintain a uniform and pressure-tight flange connection.**

Depending on the product design, the expansion joint may use:
Backing flanges, retaining rings or split retaining rings.

Rotatable Flanges
Rotatable or loose backing flanges are particularly useful because they allow the bolt holes to be aligned with the mating flange without twisting the rubber body. This is especially important for international projects where different drilling patterns may be required.Ask for yours during the first project stage with DAVINCI.

Retaining Rings
In designs using rubber flanges, retaining rings distribute the bolting load over the elastomeric flange and help prevent excessive local compression. The edge of the metallic ring in contact with the rubber should be appropriately finished so that sharp edges cannot cut or damage the elastomer. Washers may also be required under bolt heads or nuts depending on the flange arrangement and manufacturer's installation instructions.

Typical materials include: Carbon Steel - Zinc-Plated Steel - Hot-Dip Galvanised Steel - Stainless Steel
The material and protective coating should be selected according to the external environment and project requirements.

Important advice:
The flange pressure designation does not automatically define the pressure rating of the complete expansion joint. For example, fitting PN16 or Class 150 flanges to a rubber body does not by itself make the complete assembly suitable for the full pressure capability associated with those metallic flange systems.
The allowable pressure is determined by the complete expansion-joint construction.

The backing flange is not normally the pressure barrier itself.
The rubber flange face provides the sealing interface, while the metallic backing flange distributes the mechanical clamping force generated by the bolts.This combination allows the flexible rubber body and the rigid metallic piping flange to work together.

6. - CONTROL UNIT ASSEMBLIES

Control units are external mechanical restraint assemblies installed across the expansion joint when the piping system requires additional control of movement or pressure thrust.
CONTROLS MOVEMENT AND, WHEN SPECIFICALLY ENGINEERED, HELPS MANAGE PRESSURE-THRUST FORCES

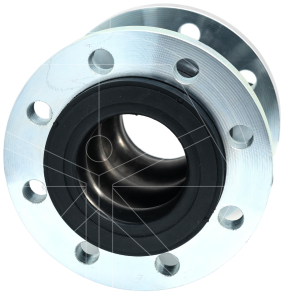
They normally consist of:
Control Rods or Limit Rods - Nuts - Washers - Gusset Plates / Lugs
depending on the design.

Their purpose may include:
- limiting axial extension;
- limiting compression;
- restraining pressure thrust;
- preventing excessive movement;
- protecting connected equipment;
- providing additional restraint when adequate external anchoring cannot be provided.

IMPORTANT DISTINCTION
Control units are not part of the internal carcass of the rubber expansion joint.
They interact mechanically with the joint and piping system but should be treated as a separate engineered restraint system. Their configuration and adjustment must correspond to the actual movement and force requirements of the installation.

A control rod should not simply be tightened until it becomes rigid.
Depending on the intended function, specific clearances may be required to permit the designed compression, extension or lateral movement. Incorrect adjustment can either prevent the joint from moving correctly or allow excessive movement before the restraint becomes effective

Control rods can fundamentally change the way forces are transferred through a piping system. An unrestrained joint transfers pressure thrust to the external anchors. A properly engineered restrained arrangement can transfer some of these forces through the control-unit structure itself. For that reason, control rods are not merely accessories; they can become part of the load path of the piping system.



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Which are the main FUNCTIONS of DAVINCI RUBBER EXPANSION JOINT?

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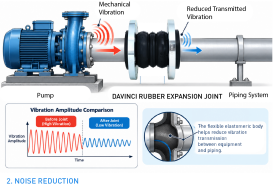
Rubber expansion joints are used to introduce controlled flexibility into piping systems. When correctly selected and installed, they can help manage movement, reduce the transmission of vibration and noise, and limit certain mechanical loads transferred between piping and connected equipment.
Their main functions include:

Vibration Isolation
Noise Reduction
Movement Compensation
- Axial Compression
- Axial Elongation
- Lateral Movement
- Angular Movement
- Combined Movements
Shock and Hydraulic Disturbance Attenuation
Accommodation of Controlled Misalignment
Compact Movement Control

The actual performance of the joint depends on its construction, elastomer, reinforcement, size, operating pressure, temperature, movement requirements and piping arrangement. Always remember that DAVINCI RUBBER EXPANSION JOINT does not eliminate piping forces. It provides a controlled flexible element that helps manage movement, vibration and certain dynamic loads within a correctly designed piping system.

1. VIBRATION ISOLATION

Rubber expansion joints can help reduce the transmission of mechanical vibration generated by pumps, compressors, fans and other rotating or reciprocating equipment.
The flexible elastomeric body acts as a mechanical discontinuity between connected components, reducing the amount of vibration that is transmitted through rigid pipework.
Reciprocating equipment can generate significant cyclic and unbalanced forces, while centrifugal pumps and fans may produce vibration associated with rotational speed, blade-pass frequency or hydraulic conditions.
A properly selected rubber expansion joint can help attenuate part of these disturbances before they propagate through the piping system.



2. NOISE REDUCTION

Mechanical vibration travelling through rigid pipework can also generate structure-borne noise.
Davinci rubber expansion joints can help reduce this transmission because the elastomeric body interrupts the direct metallic path between connected components.This is particularly useful in systems connected to:
Pumps · Compressors · Fans · Chillers · HVAC Equipment · Mechanical Rooms
Noise may originate from the equipment itself or develop progressively during operation as a result of wear, hydraulic disturbance, cavitation or changes in rotating components. The flexible joint can help dampen the transmission path, reducing the amount of vibrational energy transferred into adjacent piping and structural supports.

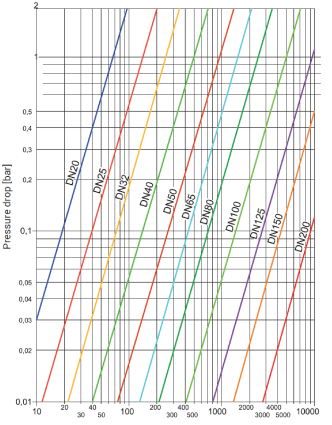
In addition to reducing vibration and structure-borne noise, rubber expansion joints provide several complementary functions that contribute to the overall reliability and performance of piping systems.

Their flexibility allows them to accommodate minor assembly tolerances and installation misalignments, while also helping to absorb movements and mechanical stresses transmitted through the pipeline. They can also provide flexible sealing connections where pipes pass through walls and help electrically isolate dissimilar metals, reducing the risk of galvanic corrosion.

Beyond these mechanical benefits, the hydraulic performance of rubber expansion joints must also be considered during system design. As fluid flows through the joint, a pressure drop occurs, which varies depending on the flow rate and the nominal diameter (DN) of the connection. Generally, higher flow rates result in greater pressure losses, while larger nominal diameters allow higher flow rates with lower pressure drops.

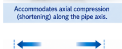
The following graph illustrates the relationship between flow rate and pressure drop for rubber expansion joints ranging from DN20 to DN200, providing a reference for evaluating their hydraulic behaviour and selecting an appropriate joint size.

PRESSURE DROP VS. FLOW RATE FOR RUBBER EXPANSION JOINTS (DN20–DN200)



3. MOVEMENT COMPENSATION

Davinci rubber expansion joints are designed to accommodate controlled movement within piping systems while helping reduce the mechanical loads transmitted to connected equipment, supports and pipework.
Depending on the joint design, movement may occur in four principal forms:
Axial Compression - Axial Elongation - Lateral Movement - Angular Movement
The permissible movement in each direction depends on the joint geometry, nominal size, reinforcement, operating pressure, temperature and product design.



Accommodates axial compression (shortening) along the pipe axis.

AXIAL COMPRESSION

ACCOMMODATES SHORTENING ALONG THE PIPE AXIS
Axial compression occurs when the face-to-face length of the expansion joint decrease. This is typically caused by thermal growth of the connected piping, where both sides of the system move towards the joint. A correctly selected expansion joint can absorb this shortening within its specified movement limits, helping reduce the stresses that would otherwise develop in rigid piping.



Accommodates axial elongation (lengthening) along the pipe axis.

AXIAL ELONGATION

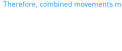
ACCOMMODATES LENGTHENING ALONG THE PIPE AXIS
Axial elongation occurs when the distance between the two connecting faces increases. This may result from thermal contraction, structural movement or other controlled changes in the piping geometry. The allowable elongation is not necessarily equal to the allowable compression and must therefore be checked independently.



Allows controlled transverse displacement between connected piping sections.

LATERAL MOVEMENT

ALLOWS CONTROLLED TRANSVERSE DISPLACEMENT BETWEEN CONNECTED PIPING SECTIONS
Lateral movement occurs when the two ends of the expansion joint remain approximately parallel while their centre lines become offset. **Typical causes include:**
- thermal expansion in perpendicular piping runs; - structural displacement;
- equipment movement; - controlled changes in piping geometry.
Rubber expansion joints are particularly effective at accommodating lateral displacement because the flexible bellows can deform transversely without requiring a long installation length.The joint should not be used to correct severe installation misalignment. Designed operational movement and incorrect installation alignment are not the same condition.



Permits limited angular deflection between flange faces.

ANGULAR MOVEMENT

PERMITS CONTROLLED ANGULAR DEFLECTION BETWEEN FLANGE FACES
Angular movement occurs when the two flange faces rotate relative to one another. The flexible body deforms to accommodate a limited angular displacement between the connected piping sections.
This type of movement may occur as a result of:
- structural movement;
- thermal expansion;
- equipment displacement;
- changes in piping alignment during operation.
The maximum allowable angular movement must always be verified against the specific product data

COMBINED MOVEMENTS

In real installations, more than one type of movement may occur at the same time.
For example, a joint may be subjected simultaneously to:
Axial Compression + Lateral Movement or Axial Elongation + Angular Movement
A fundamental design principle is: Maximum movement values in different directions must not automatically be added together.
Using part of the available movement capacity in one direction normally reduces the remaining capacity available in another.
Therefore, combined movements must always be evaluated according to the manufacturer's allowable movement limits.

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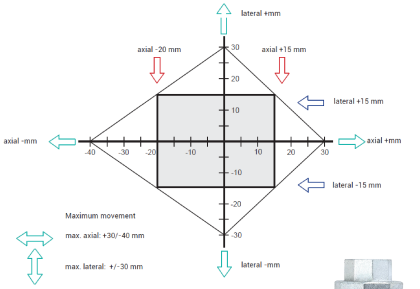
Movement Diagram for Combined Movement Absorption (Axial and Lateral) for DAVINCI RUBBER EXPANSION JOINTS

The rhombus below illustrates how a permissible combination of movement absorption can be represented for expansion joints.

The combination of lateral and axial movement may result in a maximum of 100% utilisation for the expansion joint as a whole.

The combination movements must fit into the rhombus as a rectangle.

Example:
For movement of - 20 mm and +15 mm axially, the expansion joint can absorb another +/- 15 mm laterally. This rhombus can be used for all nominal diameters and sizes if the corresponding permissible maximum values for the expansion joint are plottered in the rhombus.



Any combination of movements can be found in this diagram.

The combined current movements must fit into the rhombus as a rectangle.

Example: axial -20 mm
axial +15 mm

lateral max. +/-15 mm



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4. SHOCK AND HYDRAULIC DISTURBANCE ATTENUATION

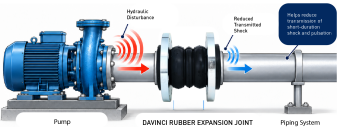
Davinci rubber expansion joints can help attenuate certain short-duration mechanical and hydraulic disturbances within a piping system. Because the elastomeric body is flexible, it can deform under rapidly changing loads and help reduce the transmission of some transient forces to adjacent piping, supports and connected equipment.
Typical disturbances may include:
Pressure Pulsations · Pump Start/Stop Events · Hydraulic Shock · Flow-Induced Transients

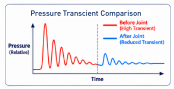
In these conditions, the joint can provide a degree of compliance within the system, helping to absorb part of the mechanical energy associated with sudden load changes.

A rubber expansion joint should not be considered a dedicated surge-protection device.
Severe water hammer or pressure surge must be addressed through appropriate system design, which may include:
- surge vessels;
- air chambers;
- controlled valve-closing times;
- pressure-relief devices;
- pump control systems;
- non-return valve selection.

The expansion joint may help reduce the transmission of transient forces, but it must still be selected for the maximum pressure and dynamic conditions expected in service

A pressure transient can act in two ways at the same time:
it can create a temporary pressure peak inside the joint while also generating a rapid mechanical load through the piping system. The joint's flexibility can help moderate the transmitted motion, but the transient pressure itself may increase the load on the carcass and reinforcement.
This is why surge conditions should always be considered during product selection.







5. ACCOMMODATION OF CONTROLLED MISALIGNMENT

Rubber expansion joints can accommodate limited, controlled positional offset between connected piping sections, provided that the displacement remains within the allowable movement limits of the selected joint. This capability can be useful where relative movement occurs as a result of:
Structural Settlement · Equipment Movement · Thermal Growth · Controlled Piping Displacement
The flexible elastomeric body can deform to accommodate small changes in alignment without creating the same level of stress that would occur in a fully rigid connection.
However, this function must be clearly distinguished from incorrect installation practice.
A rubber expansion joint is designed to accommodate anticipated operational movement, not to correct severely misaligned pipework.

Installation misalignment and operational misalignment are not the same condition.
If two pipe flanges are significantly out of alignment before installation, forcing the expansion joint into position can introduce permanent deformation into the carcass and consume part of its available movement capacity before the system is even commissioned.

This may result in:
- reduced movement capability;
- uneven stress in the reinforcement;
- abnormal loading of the flange area;
- shortened service life.
The piping should therefore be properly aligned and supported before the joint is installed.

A rubber expansion joint has a limited movement budget.
If part of this capacity is already being used to compensate for installation offset, less movement remains available to absorb thermal expansion, equipment displacement or other operational movements.
For example, a joint installed with a permanent lateral offset may have substantially less lateral capacity available during operation.

1. Designed Relative Displacement	2. Causes in Service	3. Important Limitation



Accomodates limited, controlled positional offset between connected piping sections.





Not intended to correct severe installation misalignment.

Designed movement may be accomodated, poor installation alignment should be always corrected, not absorbed.



Using part of the joint 's movement capacity to absorb permanent offset reduces the movement available during operation.

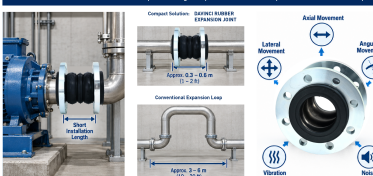
6. COMPACT MOVEMENT CONTROL

One of the practical advantages of a rubber expansion joint **is its ability to accommodate significant movement within a relatively short face-to-face length.**
This makes it especially useful in piping systems where installation space is limited or where a conventional expansion loop, offset or long flexible arrangement would be impractical.
This can simplify piping layouts and reduce the amount of space required for movement compensation.

Compact movement control can be particularly useful in:
- pump connections;
- HVAC systems;
- mechanical rooms;
- skid-mounted equipment;
- confined plant areas;
- marine installations;
- retrofit projects where available space is restricted.

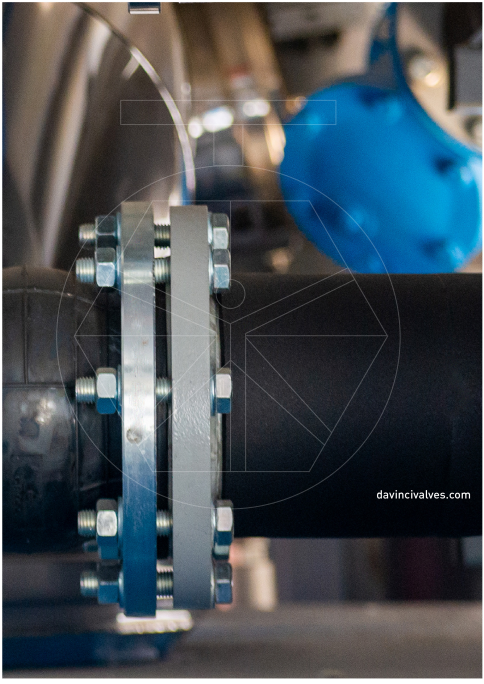
Compact does not mean self-supporting.
The expansion joint still requires a correctly designed piping system with suitable:
Anchors · Guides · Supports · Restraint
The short face-to-face length of the joint does not eliminate pressure thrust or the need to control pipe movement.

A conventional pipe expansion loop absorbs thermal movement by flexing a relatively long length of pipe. A rubber expansion joint achieves the same general objective in a much shorter space by concentrating the required flexibility into an engineered elastomeric element.
This is one of the reasons rubber expansion joints are widely used where space efficiency and flexibility must be combined.



Compact flexibility saves space - but the piping system must still be properly anchored, guided and supported!

Disclaimer: Although care has been taken to ensure the accuracy of this information, users must verify product suitability for their specific application. Dimensions are nominal and should be confirmed if critical. No warranty, express or implied, is given unless stated in a formal agreement. Check more information at dayncirubbers.com or contact us at: valves@dayncirubbers.com


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Which are the main MATERIALS used in DAVINCI RUBBER EXPANSION JOINT?

ELASTOMER AND MATERIAL SELECTION

Choosing the correct elastomer is one of the most important steps in expansion-joint selection. Temperature alone is not sufficient to determine compatibility.
The following conditions should be evaluated together: fluid + concentration + temperature + pressure + exposure time + cleaning media + external environment.
Different formulations of the same generic elastomer can have different properties. Final compatibility must therefore be confirmed against the specific compound and product data supplied by the manufacturer

DAVINCI Rubber Expansion Joints are available in a wide range of materials selected to suit the application, commonly used elastomers with their identification colours are listed below. Please feel fee to discuss the application and material choice with DAVINCI engineers.

EPDM (Ethylene-propylene-terpolymerisat)
Good heat resistance and suitable for alkaline waste water, compressed air (oil free) and chemicals, weather-resistant, good gas tightness. Not suitable for use with hydrocarbons.
Temperature range: -25°C up to +130° C
Not suitable for oils or fatty media.

NBR (Acrylnitrile-butadiene-rubber)
Oil and fuel quality, also suitable for gasses, solvents and fats. High abrasion resistance.
Temperature Range: -25°C up to +90°C (120° C)
Not suitable for steam of hot water.

NBR Oil Fuel (Acrylnite-butadiene-rubber)
Oil and fuel quality, also suitable for gasses, solvents and fats acc. DIN5622. High abrasion resistance. Temperature Range: -20°C up to +90°C. Not suitable for steam of hot water.

YNBRH (Acrylnite-butadiene-rubber)
Oil and fuel quality, also suitable for gasses, solvents, fats, cooling water and sea water. High abrasion resistance.
Temperature Range: -20°C up to +90°C (120° C)

White, Perbunan NBR (Acrylnitrile-butadiene-rubber)
Foodstuff quality in acc. with RAL guidelines, good for pulps, fats, flours, juices, wines.
Temperature range: -20°C up to +80°C

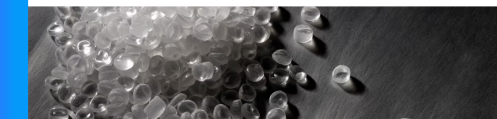
CR Neoprene (Chloroprene Rubber)
Water quality. Weather resistant.
Suitable for some small groups of lyes equal as compressed air and lightly oil-related media.
Temperature range: -20°C up to +70°C

Buty R (Butyl Rubber)
Good heat resistance, suitable for alkaline waste water, compressed air (oil free) Chemicals and special hydraulic oils, weather-resistant.
Temperature range: -25°C up to +90°C. Drinking water quality.

Viton FPM (Fluorine Polymer)
Particularly suited for high temperatures. Good resistance to chemicals and oils, combustibles and solvents.
Temperature range: -10°C up to +150°C
Not suitable for ketones and chlorine.

PTFE (Polytetrafluorine-ethylene)
Total resistance to all media.
Temperature resistance: -50°C up to +230°C
Suitable for alkali metals in molten state and reaction formed amides.

The choice of material plays a key role in determining the joint's resistance to temperature, pressure, chemicals and mechanical stresses. Commonly used elastomers include EPDM, NBR, CR, CSM and FPM, among others, with different reinforcement materials such as aramid, polyamide, polyester and steel cord contributing to the joint's overall performance.



Particular attention must be paid to the maximum operating temperature, as the permissible pressure and service life of the expansion joint may be affected by temperature variations. Material compatibility with the conveyed fluid must also be considered to ensure reliable and long-lasting operation.

The following chart provides an overview of the temperature resistance of different elastomer and reinforcement combinations, helping to identify suitable materials according to the operating conditions. For specific applications or material selection guidance, DAVINCI engineering team is available to provide technical assistance.

OPERATING TEMPERATURE RANGES FOR RUBBER EXPANSION JOINT MATERIALS AND REINFORCEMENTS

Core	Rein-forcement	Temperature 80 °C	90 °C	100 °C	110 °C	130 °C	150 °C	200 °C	230 °C
EPDM ht	Aramid								
EPDM	Aramid								
EPDM	Polyamide								
NBR	Polyamide								
CSM	Polyamide								
FPM	Aramid								
CR	Polyamide								
NBR (beige)	Polyamide								
SI	Glass fabric								
EPDM	Polyamide								
EPDM	Aramid								
IIR	Polyamide								
NBR	Polyamide								
NBR	Polyamide								
CSM	Polyamide								
NBR	Polyamide								
EPDM	Aramid								
IIR	Polyamide								
NBR	Polyamide								
NBR	Polyamide								
NBR	Polyamide								
CSM	Polyamide								
FPM	Polyamide								
NBR	Steel cord								
NBR	Steel cord								
HNBR	Steel cord								
CR	Polyamide								
IIR	Aramid								
NBR	Aramid								
CSM	Aramid								
FPM	Aramid								
EPDM ht	Aramid								
EPDM	Aramid								
EPDM	Polyamide								
NBR	Polyamide								
CSM	Polyamide								
FPM	Aramid								
CR	Polyamide								
NBR	Polyamide								
SI	Glass fabric								
EPDM	-								
CR	Polyamide								
EPDM	Polyamide								
FPM	Gaebanic								
NBR	Polyamide								
CR	Polyamide								
PTFE	-								
PTFE	-								



Which are the main ADVANTAGES of DAVINCI RUBBER EXPANSION JOINT?

5

ENGINEERED FOR PERFORMANCE, BUILT FOR RELIABILITY

The rubber expansion joint industry has developed in close collaboration with engineers, designers, architects, contractors and installation specialists to deliver flexible piping solutions capable of meeting the demanding requirements of modern industrial applications.

Continuous advances in elastomer technology, rubber compounding and high-performance reinforcement fabrics have made it possible to manufacture rubber expansion joints combining flexibility, mechanical strength, chemical resistance and long-term operational reliability.

Beyond their primary function of accommodating movement and vibration, rubber expansion joints provide a wide range of technical and economic advantages. Their performance, however, depends not only on their design but also on the careful selection of materials, the quality of internal reinforcements and the precision of manufacturing processes.

1. MINIMAL FACE-TO-FACE DIMENSIONS

Davinci rubber expansion joints offer compact face-to-face dimensions, providing significant space and cost savings compared with conventional expansion bends or piping loops.

Although the initial cost of additional pipework may appear competitive, the overall installation expenses associated with increased space requirements, additional supports, installation labour and potential pressure losses can be considerably higher.

Their compact construction also reduces the number of components required, simplifying system design and helping improve overall installation efficiency.

2. LIGHTWEIGHT CONSTRUCTION

Davinci rubber expansion joints are relatively lightweight compared with metallic alternatives and conventional piping arrangements, allowing easier handling, positioning and installation.

This characteristic can reduce installation time, labour requirements and the need for specialized lifting equipment, particularly in confined spaces or complex piping systems.

Despite their reduced weight, **properly engineered expansion joints incorporate carefully selected reinforcement materials and retaining components designed to provide the structural strength required** for their intended operating conditions.

3. LOW MOVEMENT FORCES REQUIRED

The inherent flexibility of rubber expansion joints enables them to accommodate axial, lateral and angular movements while generating relatively low reaction forces.

This flexibility helps reduce mechanical stresses transmitted to connected equipment, including pumps, compressors, valves and adjacent piping components.

The combination of suitable elastomer compounds and appropriately designed internal reinforcements is essential to maintaining this flexibility without compromising the joint's pressure resistance or structural integrity.

4. REDUCED FATIGUE FACTOR

Natural and synthetic elastomers provide excellent elastic recovery properties, allowing rubber expansion joints to withstand repeated movements and operational vibrations when correctly selected and operated within their design limits. Their flexible construction helps absorb cyclic stresses that could otherwise contribute to fatigue in rigid piping systems. The durability of the joint depends significantly on the quality of the rubber compounds, the arrangement of reinforcement layers and the strength of the connection between the elastomeric body and its retaining elements.

By providing a non-metallic separation between connected components, rubber expansion joints can also help reduce galvanic corrosion caused by direct contact between dissimilar metals.

5. REDUCED HEAT LOSS

Davinci rubber expansion joints can contribute to reduced heat losses when compared with conventional expansion loops requiring additional lengths of piping.Their compact dimensions minimize the exposed surface area of the installation, potentially improving thermal efficiency and reducing operating costs. Proper elastomer selection is essential to ensuring reliable performance under the specified temperature conditions, as temperature resistance varies according to the rubber compound and reinforcement materials used.

6. CORROSION AND EROSION RESISTANCE

A wide range of natural, synthetic and specialized elastomers is available to meet different chemical, thermal and mechanical operating requirements.

Materials such as EPDM, NBR, CR, CSM and FPM offer different levels of resistance to chemicals, oils, temperature and environmental exposure, allowing the expansion joint to be adapted to the characteristics of the conveyed fluid. For particularly aggressive applications, specialized internal linings such as PTFE or FEP can provide additional chemical protection. The correct selection and quality of the elastomeric compound are fundamental to ensuring compatibility with the conveyed medium and minimizing premature deterioration, swelling, abrasion or chemical attack.

Equally important is the use of suitable reinforcement fabrics, whose mechanical properties contribute directly to the joint's pressure resistance and durability.

7. NO GASKETS REQUIRED

Rubber expansion joints with integral elastomeric sealing faces can provide reliable fluid- and gas-tight connections without requiring separate gaskets in suitable flange configurations. The flexible sealing surfaces can accommodate minor irregularities in mating flange faces, helping achieve effective sealing while simplifying installation and maintenance. The quality of the elastomeric sealing surfaces, the dimensional accuracy of the flanges and the strength of the retaining elements are critical to maintaining connection integrity during operation.

Particular attention must be paid to flange compatibility, bolt tightening procedures and the specified operating pressure to prevent leakage or mechanical damage. For certain flange arrangements, including some raised-face configurations, additional sealing provisions may be necessary.

8. ACOUSTICAL IMPEDANCE

The elastomeric composition of rubber expansion joints provides effective damping of mechanical vibrations and helps reduce noise transmission through piping systems. By interrupting the rigid metallic transmission path between connected components, rubber expansion joints can limit the propagation of structure-borne noise generated by pumps, compressors and other rotating equipment. Their vibration isolation performance depends on the joint's geometry, elastomer properties, reinforcement configuration and operating conditions.

Carefully engineered construction helps maintain the balance between flexibility, vibration damping and mechanical resistance, contributing to quieter and more reliable system operation.

9. GREATER SHOCK RESISTANCE

Davinci rubber expansion joints provide a degree of flexibility and energy absorption that helps piping systems accommodate transient mechanical stresses associated with hydraulic surges, water hammer and pump cavitation. Their elastomeric construction can reduce the transmission of sudden dynamic loads to adjacent piping and equipment, helping protect sensitive components from excessive mechanical stress.

However, reliable performance under these conditions requires more than a flexible rubber body. Properly specified reinforcement layers, robust retaining elements and suitable flange construction are essential to maintaining the joint's integrity when exposed to pressure fluctuations and dynamic loading. The combination of high-quality materials, appropriate reinforcement and controlled manufacturing processes contributes to improved resistance against premature failure and supports long-term operational reliability.



QUALITY BEYOND THE VISIBLE COMPONENTS

While rubber expansion joints may appear similar in their external design, their long-term performance is strongly influenced by factors that are not immediately visible.

The formulation of the elastomeric compounds, the type and arrangement of reinforcement fabrics, the thickness and mechanical strength of the flanges, and the integrity of the retaining elements all contribute to the overall safety and reliability of the installation.

Carefully selected materials and controlled manufacturing processes help ensure consistent performance under pressure, temperature variations and repeated mechanical movements.

For this reason, choosing a rubber expansion joint should involve more than comparing dimensions and initial purchase prices. Construction quality, material compatibility, mechanical resistance and compliance with applicable standards are essential considerations when evaluating its suitability for demanding industrial applications.

"The true value of a rubber expansion joint lies not only in its ability to accommodate movement, but in the confidence that its design, materials and construction will deliver reliable performance throughout its intended service life."

DAVINCI SHORT STANDARD MANUFACTURING RUBBER EXPANSION JOINTS PROGRAMM

1. Interior Rubber Structure Layers are three:

> Inner Layer Glue = protection effect
> Middle Skeleton Layer = pressure effect
> Outer Layer Glue = antiaging effect

All in High quality materials: Virgin rubber with EPDM





2. Steel Wire

The reinforcing steel wire at both ends of the rubber pipe body avoids the rubber plate from pulling out of the flange slot and also strength, just as prevention of any kind of removing.
Strong fabric reinforcement and rings until min 50 bars for break point.

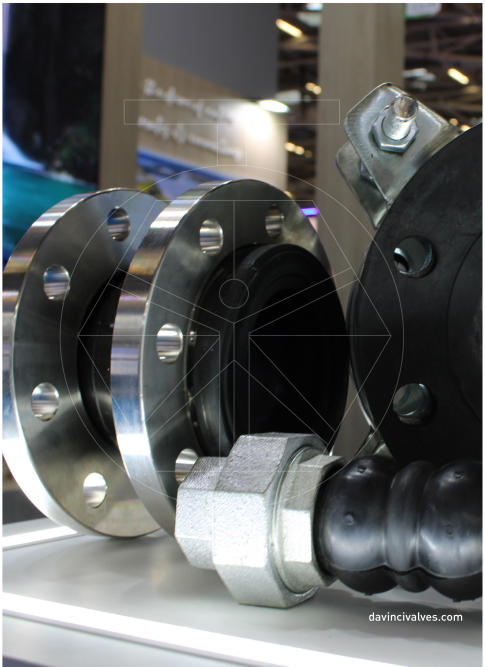
Possibility to supply all types of tie rods.

3. Galvanized flanged

The galvanized flanged rubber joint is cold galvanized by forging flanges then combined with rubber pipes.
Galvanized flange has a certain corrosion resistance.

Flanges according DIN standard.




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How are manufactured DAVINCI RUBBER EXPANSION JOINTS?

DAVINCI RUBBER EXPANSION JOINT MANUFACTURING PROCESS

The manufacturing of Davinci rubber expansion joints involves a carefully controlled sequence of material selection, rubber processing, reinforcement, moulding, vulcanization and quality inspection. Each stage contributes to the mechanical strength, flexibility, pressure resistance and long-term reliability of the finished product.

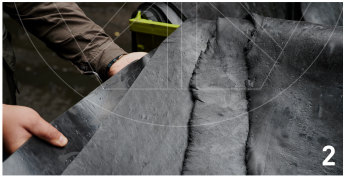
1. RAW MATERIAL SELECTION

The manufacturing process begins with the selection of suitable elastomers, reinforcement fabrics and metallic components. Materials are chosen according to the intended operating conditions, including fluid compatibility, temperature, pressure and mechanical requirements.



2. RUBBER COMPOUND PREPARATION

Natural or synthetic rubber is mixed with carefully proportioned additives, such as reinforcing fillers, processing agents and vulcanizing chemicals. The resulting compound is processed into uniform rubber sheets suitable for forming the inner lining and outer cover of the expansion joint.



3. FABRIC REINFORCEMENT PREPARATION

High-strength textile materials, such as nylon, polyester or aramid, are prepared and, where required, coated or impregnated with rubber compounds to promote adhesion. These reinforcement layers provide mechanical strength and help the joint withstand internal pressure while maintaining flexibility.



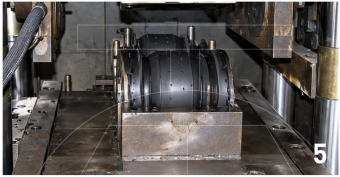
4. JOINT CONSTRUCTION AND LAYERING

The expansion joint body is formed by arranging successive layers of uncured rubber and reinforcing fabric around a mandrel or within a mould. Depending on the design, metallic reinforcing rings may also be incorporated, particularly around the sealing ends. The layers are positioned to achieve the required geometry, wall thickness and structural resistance.



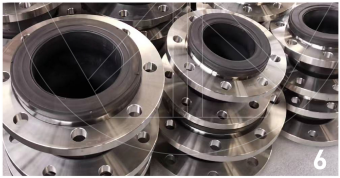
5. MOULDING AND VULCANIZATION

The assembled rubber body undergoes vulcanization under controlled temperature and pressure conditions. This process creates cross-links within the rubber compounds and promotes bonding between the elastomeric layers and reinforcement materials, giving the joint its final elastic and mechanical properties.



6. FINISHING AND ASSEMBLY

After vulcanization, the joint is removed from the mould or mandrel, inspected and trimmed to remove excess material. Depending on the connection design, metallic flanges or retaining rings are fitted to complete the assembly and ensure compatibility with the piping system.



7. QUALITY CONTROL AND TESTING

The finished expansion joint undergoes dimensional and visual inspections to verify manufacturing quality. Depending on the product specification and applicable requirements, additional tests may include hydrostatic pressure testing, leakage verification, rubber hardness measurements and other mechanical performance assessments.



8. PACKAGING AND DISPATCH

Following final inspection and approval, the expansion joints are carefully packed to protect the elastomeric surfaces, sealing faces and metallic components during handling, storage and transportation.
The finished products are then prepared for delivery and installation.




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How are tested DAVINCI RUBBER EXPANSION JOINTS?

DAVINCI TESTING & QUALITY ASSURANCE

Quality, safety and reliability are essential throughout the manufacturing process of our rubber expansion joints.
To ensure consistent performance under demanding operating conditions, our products are subject to rigorous quality control procedures and different types of testing, depending on their design, materials and application requirements.

Our testing and inspection procedures may include:

1. HYDROSTATIC PRESSURE TEST
Verifies the structural integrity and pressure resistance of the expansion joint under controlled internal pressure conditions.

2. LEAKAGE TEST
Checks the tightness of the rubber body and sealing connections to detect possible leaks and ensure reliable operation.

3. BURST PRESSURE TEST
Evaluates the ultimate pressure resistance of representative expansion joint designs, helping validate their structural safety margins.

4. MOVEMENT AND FLEXIBILITY TEST
Assesses the ability of the expansion joint to accommodate specified axial, lateral, angular or combined movements without compromising its mechanical integrity.

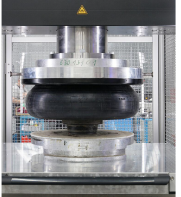
5. RUBBER HARDNESS TEST
Measures the hardness of the elastomeric compounds to verify material consistency and conformity with the required specifications.

6. TENSILE STRENGTH AND ELONGATION TEST
Evaluates the mechanical properties of the rubber compounds, including their resistance to tensile forces and their ability to withstand deformation.

7. ADHESION TEST
Assesses the bonding strength between rubber layers and reinforcement materials, helping ensure the structural integrity of the joint.

8. DIMENSIONAL AND VISUAL INSPECTION
Verifies dimensions, flange compatibility, surface finish and overall manufacturing quality before final approval.





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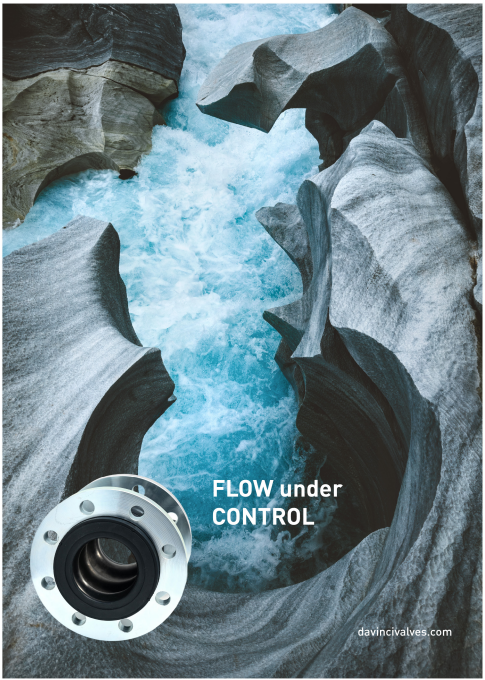


WRAS APPROVED

WRAS APPROVED DAVINCI RUBBER EXPANSION JOINTS

As part of our commitment to quality and regulatory compliance, selected rubber expansion joints are available with WRAS-approved materials or product configurations, suitable for applications involving contact with drinking water within the scope and conditions of their approval.

WRAS approval provides additional assurance that the relevant materials or products meet applicable requirements for use in contact with wholesome water. By combining carefully selected materials, controlled manufacturing processes and appropriate testing procedures, we aim to deliver rubber expansion joints that offer reliable performance, durability and confidence throughout their intended service life.


FLOW under
CONTROL
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Recommended applications for DAVINCI RUBBER EXPANSION JOINTS?

Davinci rubber expansion joints are widely used across industrial, commercial and infrastructure applications where piping systems are exposed to mechanical vibrations, thermal movements, pressure fluctuations and operational stresses.
Thanks to their flexibility, compact design and availability in different elastomeric materials, they provide an effective solution for protecting connected equipment, reducing noise transmission and accommodating movement in a wide variety of operating environments.

Their main fields of application include:

1. WATER SUPPLY AND DRINKING WATER SYSTEMS

Rubber expansion joints are extensively used in municipal water distribution networks, pumping stations, water treatment facilities and building water supply installations.
They help absorb vibrations generated by pumps, accommodate minor movements and reduce mechanical stresses transmitted to pipes, valves and associated equipment. Remember: For drinking water applications, selected rubber expansion joints are available with WRAS-approved materials or product configurations, providing additional assurance of their suitability for
contact with potable water within the specified approval conditions.

2. WASTEWATER AND SEWAGE TREATMENT

In wastewater treatment plants, sewage pumping stations and drainage systems, rubber expansion joints help accommodate pipeline movements and dampen vibrations generated by pumps and other mechanical equipment.
Depending on the conveyed medium, suitable elastomer compounds can be selected to provide resistance to wastewater constituents, chemicals and operating conditions commonly encountered in these installations.

3. HVAC AND BUILDING SERVICES

Heating, ventilation and air-conditioning systems frequently incorporate rubber expansion joints to reduce vibration and structure-borne noise from chillers, circulation pumps, cooling towers, air-handling equipment and other mechanical installations. Their flexibility helps protect piping connections and supports while contributing to quieter operation in commercial buildings, hospitals, hotels, industrial facilities and mechanical rooms.

4.. POWER GENERATION AND ENERGY INDUSTRY

Rubber expansion joints are used in power generation facilities, cooling water circuits, auxiliary pumping systems and other energy-related applications. They help accommodate thermal movements, absorb mechanical vibrations and reduce stresses caused by operational changes in connected equipment. Material selection is particularly important in these environments, where temperature, pressure and fluid characteristics can vary considerably.

5. CHEMICAL AND PROCESS INDUSTRIES

Chemical processing plants and industrial production facilities require piping components capable of operating with different chemical substances and process fluids. Rubber expansion joints manufactured from appropriately selected elastomers, such as EPDM, NBR, CR or FPM, can provide resistance to specific chemicals and operating conditions.
For particularly aggressive media, specialized internal linings may be considered, subject to compatibility verification.

6. MARINE, SHIPBUILDING AND OFFSHORE APPLICATIONS

In marine and offshore installations, rubber expansion joints are commonly incorporated into seawater cooling systems, ballast water circuits, bilge systems and auxiliary piping networks. Their flexibility helps reduce the transmission of vibration from pumps and mechanical equipment while accommodating limited movements associated with vessel operation and structural deflection. Suitable materials must be selected according to seawater exposure, operating pressure and environmental conditions.

7. INDUSTRIAL PUMPING AND MECHANICAL EQUIPMENT

Davinci rubber expansion joints are frequently installed near pumps, compressors and other vibrating equipment to reduce the transmission of mechanical vibrations and noise into connected pipework.They also help accommodate minor installation tolerances and movements, reducing the transfer of mechanical stresses between equipment and piping systems. Correct installation, pipe anchoring and appropriate pressure-thrust restraint are essential to achieving reliable operation.

8. PAPER, PULP AND GENERAL MANUFACTURING

In paper mills, pulp processing facilities and general manufacturing plants, rubber expansion joints are used in process water systems, cooling circuits, pumping installations and other industrial pipework. They contribute to vibration isolation, movement accommodation and the protection of connected equipment in demanding operating environments.
The availability of different elastomeric compounds and reinforcement configurations allows their construction to be adapted to specific process requirements.

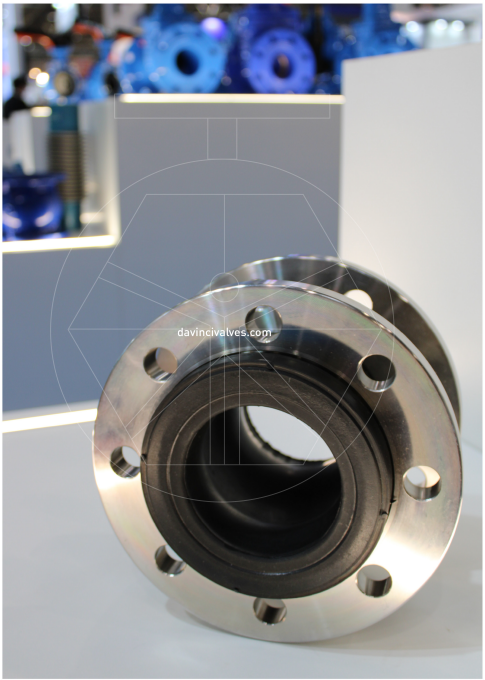
ENGINEERED FOR EVERY APPLICATION

Selecting the appropriate **Davinci rubber expansion joint** requires careful consideration of the conveyed fluid, operating pressure, temperature, nominal diameter, expected movements and installation conditions. Our engineering team provides technical guidance to help identify suitable elastomeric materials, reinforcement configurations and connection arrangements according to each application's requirements.

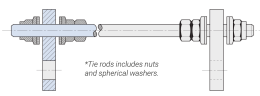
With a wide range of standard solutions and application-specific configurations, our rubber expansion joints are designed to support reliable, efficient and long-lasting piping system performance.

Ask for your specific one at: zuzana@davincivalves.com and check more information at our website.



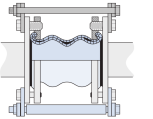

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Tie Rods and Control units for DAVINCI RUBBER EXPANSION JOINTS?



**Tie rods includes nuts and spherical washers.*





TIE RODS AND CONTROL UNITS FOR DAVINCI RUBBER EXPANSION JOINTS

Tie rods and control units are mechanical restraint devices designed to enhance the safety, stability and reliability of rubber expansion joints installed in pressurized piping systems.

A typical control unit consists of two or more steel rods, together with retaining plates, nuts, washers and, where required, compression sleeves. These components are installed between the flanges of the expansion joint to control axial displacement and prevent excessive movements that could compromise the integrity of the joint or adjacent equipment.

Control units can be adjusted to limit the maximum permissible axial extension and, when appropriately equipped, compression of the rubber expansion joint. In this way, they provide an additional safety measure against unexpected pipeline movements and excessive mechanical stresses.

1. MOVEMENT CONTROL AND PROTECTION

Davinci rubber expansion joints are designed to accommodate specified axial, lateral and angular movements within their allowable operating limits.

Control units help prevent excessive extension or compression by mechanically restricting displacement beyond predetermined limits. This protection is particularly important in systems exposed to pressure fluctuations, thermal variations or unexpected operating conditions.

The adjustment of the control rods must correspond to the maximum permissible movements specified for the expansion joint, ensuring that its flexibility and operational performance are not unnecessarily restricted.

2. PRESSURE THRUST RESTRAINT

Internal pressure generates axial thrust forces that tend to separate the ends of a rubber expansion joint. These forces increase with the operating pressure and the effective cross-sectional area of the joint.

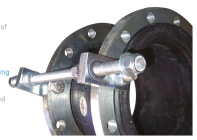
Under normal installation conditions, rubber expansion joints should be installed between two properly designed fixed anchoring points capable of resisting the pressure thrust generated within the piping system.

The pipework must be adequately anchored and guided on both sides of the expansion joint to control movements and withstand the forces produced by internal pressure, temperature variations and other operating loads.

Where adequate main anchoring cannot be provided, properly engineered tie rods or pressure-thrust restraint assemblies are required to prevent uncontrolled axial separation.

ND	Nº OF TIE RODS NP10	NP16
40	-	2
50	-	2
65	-	2
80	-	2
100	-	2
125	-	2
150	-	2
200	4	2
250	4	4
300	4	4
350	4	4
400	4	4
450	4	4
500	4	4
600	4	4

**Tie rods necessary for correct assembly.*



3. TYPES OF CONTROL ROD CONFIGURATIONS

Different restraint configurations are available depending on the required movement limitations and operating conditions.

A. LIMIT RODS

Limit rods are designed to allow the rubber expansion joint to extend up to a predetermined maximum axial extension.

The retaining nuts are positioned to restrict further extension once the specified movement limit has been reached. Their adjustment must never permit movement beyond the maximum allowable extension of the expansion joint.

This configuration is primarily intended to prevent excessive axial elongation and does not inherently provide compression limitation or continuous pressure-thrust restraint throughout the permitted movement range.

B. CONTROL RODS

Control rod configurations can be designed to limit both axial extension and compression, allowing the expansion joint to operate within a predetermined movement range.

External and internal nuts are adjusted according to the allowable extension and compression of the joint. Where appropriate, compression sleeves or mechanical stops may also be incorporated.

In applications where axial restraint is required, suitably engineered configurations can restrict axial separation and manage pressure-thrust forces. Their use may, however, limit the available axial flexibility and affect the forces transmitted to connected equipment.

Spherical washers may be incorporated beneath the nuts or retaining plates to accommodate small angular variations and reduce the risk of uneven loading or binding during movement.

The position and adjustment of all retaining nuts and restraint components must be verified by a qualified engineer before the piping system is placed into operation.

4. ENHANCED OPERATIONAL SAFETY

Control units provide an additional level of protection by limiting excessive movements that could otherwise damage the elastomeric body, reinforcement layers or flange connections.

When correctly designed and installed, they can help minimize the risk of overextension, mechanical failure and damage to connected equipment.

Their use is particularly recommended in installations subject to hydraulic transients, pressure variations or conditions where unexpected pipeline displacement may occur.

5. INSTALLATION AND ANCHORING REQUIREMENTS

Rubber expansion joints must be incorporated into piping systems with suitable anchoring, alignment and support arrangements.

Pipe anchors must be capable of withstanding the forces generated by internal pressure and temperature fluctuations, while guides and supports help maintain correct pipeline alignment.

When proper anchoring cannot be provided, **CONTROL UNITS OR SUITABLY ENGINEERED PRESSURE-THRUST RESTRAINT SYSTEMS ARE REQUIRED** to ensure that axial forces are safely controlled.

It is important to distinguish between control rods designed primarily to limit movement and tie-rod assemblies specifically designed to resist pressure thrust. Only suitably rated restraint systems can perform the latter function.



6. DESIGN AND ADJUSTMENT CONSIDERATIONS

The selection of tie rods and control units depends on the nominal diameter, operating pressure, expected movements, flange arrangement and overall piping configuration. The retaining nuts must be correctly adjusted to ensure that the expansion joint does not exceed its maximum allowable axial extension or compression.

Where compression-limiting sleeves are incorporated, their dimensions must correspond to the allowable compression of the joint.Particular attention must be paid to maintaining suitable clearances, preventing rod binding and ensuring that the selected restraint arrangement remains compatible with the required axial, lateral and angular movements.

A qualified system engineer should always verify the restraint configuration, load capacity and final nut settings before commissioning.

RELIABLE PROTECTION FOR CRITICAL INSTALLATIONS

Properly designed tie rods and control units contribute to the safe operation of rubber expansion joints by controlling excessive displacement, managing pressure thrust where specifically engineered for that purpose, and protecting adjacent piping components.Correct anchoring, suitable restraint selection and precise adjustment are essential to ensuring the long-term reliability and safety of the entire piping system.



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