

## WILLBRANDT Length Limiters / Tie Rods

Rubber expansion joints should be considered as elastic elements in the pipelines Design A (without tie rods), the rubber expansion joint creates reaction forces in the direction of expansion when subject to pressure (effective area x operating pressure), and reaction forces in the direction of compression when subject to negative pressure. These forces must be absorbed by the closest fixed points, radial plain bearings or the valve flange.

If this is not possible, there are a number of different length limiters that absorb the corresponding reaction forces but do not limit the expansion joint's freedom of movement (with the exception of axial movement absorption). In the case of a design with tie rods, only the stiffness rates from the rubber bellow and the frictional force from the bearings need to be taken into account for the fixed points.

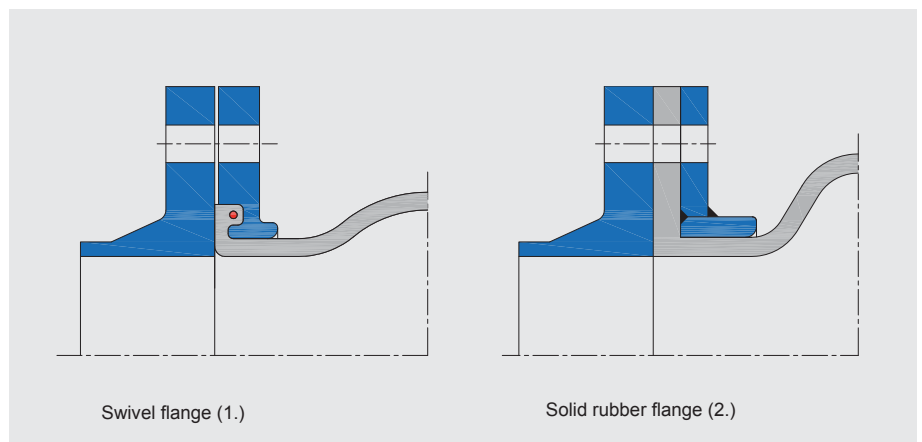
Please refer the following rod examples:

### Design A

Rubber expansion joints without tie rods, with swivel flanges or solid rubber flanges, suitable for movement absorption in any direction.

**Fixed point load:** Reaction force plus stiffness rates

**Production:**  
1. DN 20 - DN 1000  
2. DN 50 - DN 5000



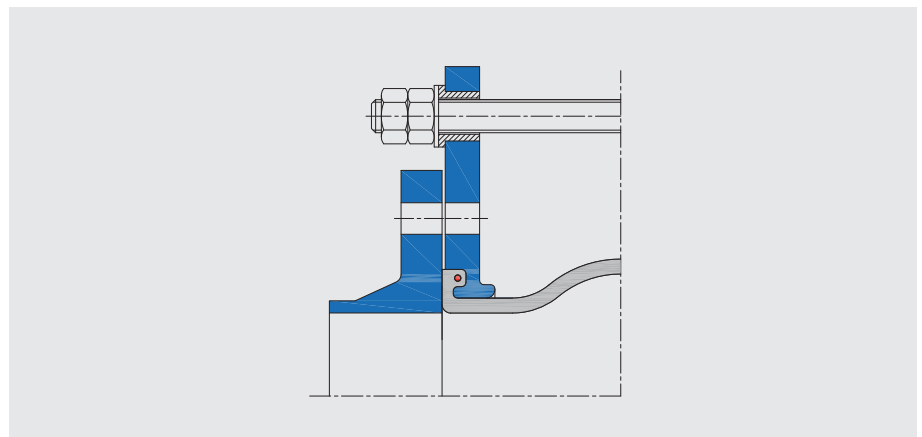
### Design B

Rubber expansion joint with length limiter to absorb reaction force. Tie rods in rubber bushings, suitable for sound and vibration absorption and for lateral movement absorption.

**Fixed point load:** Lateral stiffness rate plus bearing stiffness rate

**Production:** DN 20 - DN 200

**Permissible pressure:** DN 20 - DN 150: 16 bar  
DN 200: 10 bar



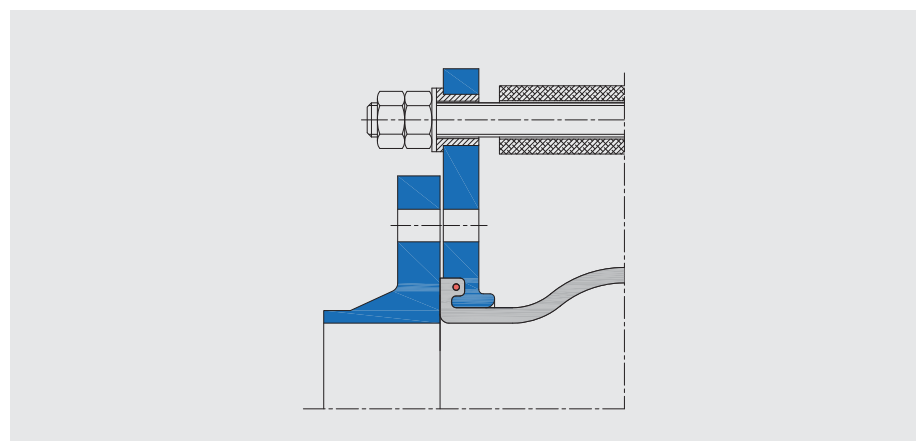
### Design C

Rubber expansion joint with length limiter for absorbing reaction force, tie rods in rubber bushings, includes thrust limiters for securing bellow. Suitable for sound and vibration absorption and for lateral movement absorption.

**Fixed point load:** Lateral stiffness rate plus bearing stiffness rate

**Production:** DN 20 - DN 200

**Permissible pressure:** DN 20 - DN 150: 16 bar  
DN 200: 10 bar



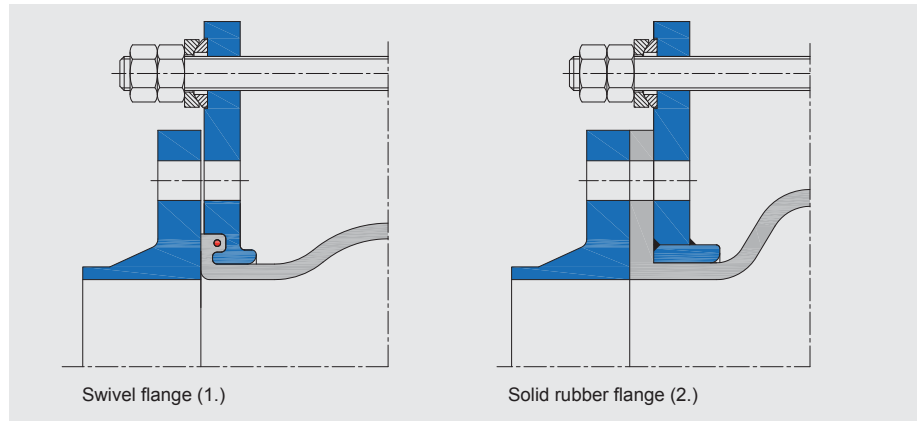
## WILLBRANDT Length Limiters / Tie Rods

### Design E

Rubber expansion joint with length limiter for absorbing reaction force, tie rods in PTFE-coated spherical washers and conical sockets, for reduction of frictional force, external. Suitable for lateral movement absorption.

**Fixed point load:** Lateral stiffness rate plus bearing stiffness rate

**Production:**  
 1. DN 200 - DN 1000  
 2. DN 50 - DN 5000

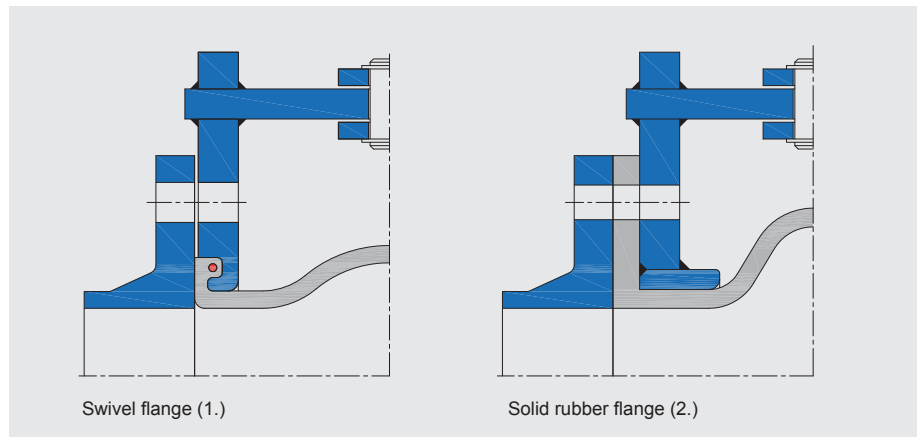


### Design F

Rubber expansion joint with hinge for absorbing reaction force, suitable for angular movement absorption in a single plane. Two hinge expansion joints with an intermediate pipe can absorb a large amount of lateral movement. A combination of three (see fitting examples) can create soft corners in order to absorb movement in two planes.

**Fixed point load:** Angular stiffness torque and frictional torque from bearings

**Production:**  
 1. DN 32 - DN 1000  
 2. DN 200 - DN 5000

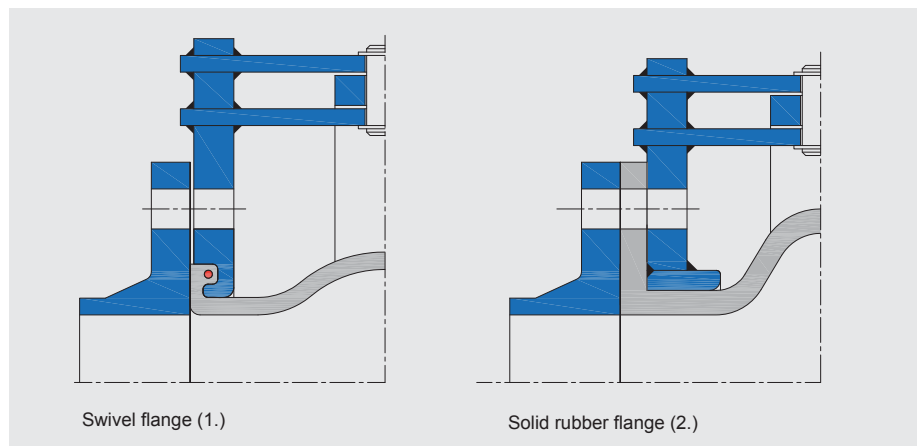


### Design G

Rubber expansion joint with cardan shaft for absorbing reaction force, suitable for angular movement absorption in a circular plane. Two cardan shaft expansion joints with an intermediate pipe can absorb high lateral movement in two level. A combination of three (see fitting examples) can create soft corners in order to absorb movement in three planes.

**Fixed point load:** Angular stiffness torque and frictional torque from bearings

**Production:**  
 1. DN 32 - DN 1000  
 2. DN 200 - DN 5000

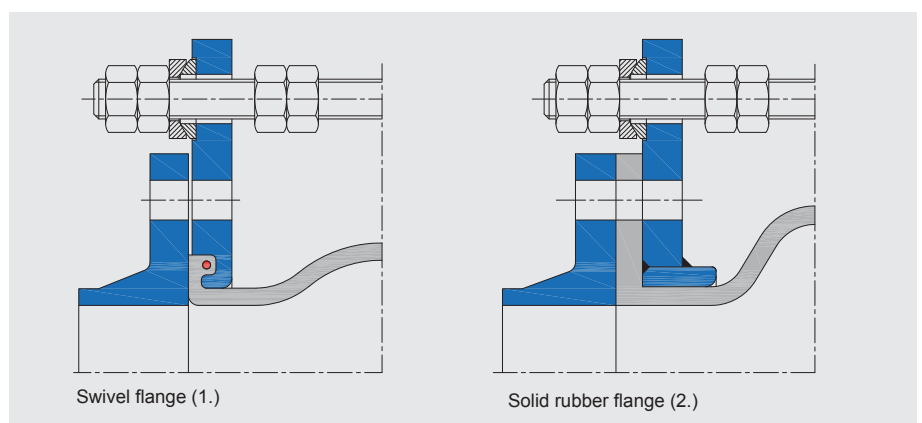


### Design H

Rubber expansion joint with tie rods for absorbing reaction force, tie rods in PTFE-coated spherical washers and conical sockets, for reduction of frictional force. External, with additional adjustable inner end stop (lock nuts) as thrust limiter. Suitable for high lateral movement absorption.

**Fixed point load:** Lateral stiffness rates plus bearing stiffness rates

**Production:**  
 1. DN 200 - DN 1000  
 2. DN 50 - DN 5000

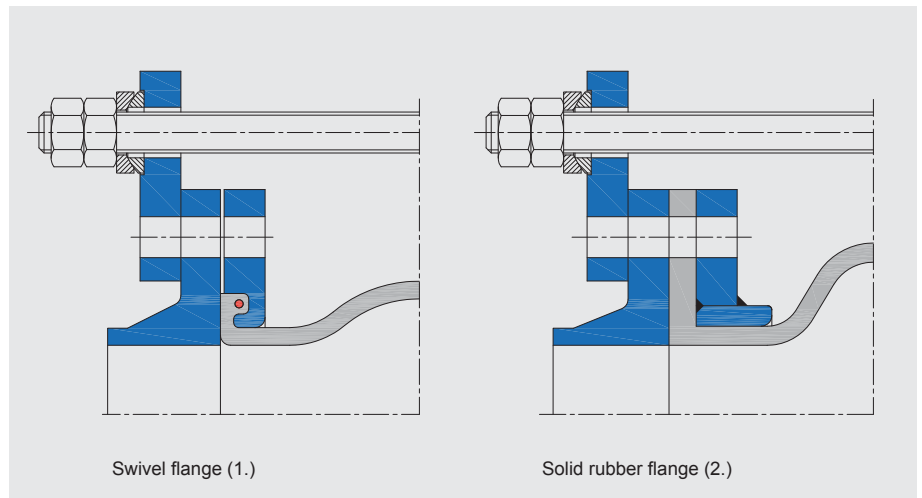


## WILLBRANDT Length Limiters / Tie Rods

### Design K

Segment bracing with tie rods from counter flanges to counter flange, as length limiter for absorbing reaction force of expansion joint, tie rods in PTFE-coated spherical washers and conical sockets, for reduction of frictional force, external. Suitable for lateral movement absorption.

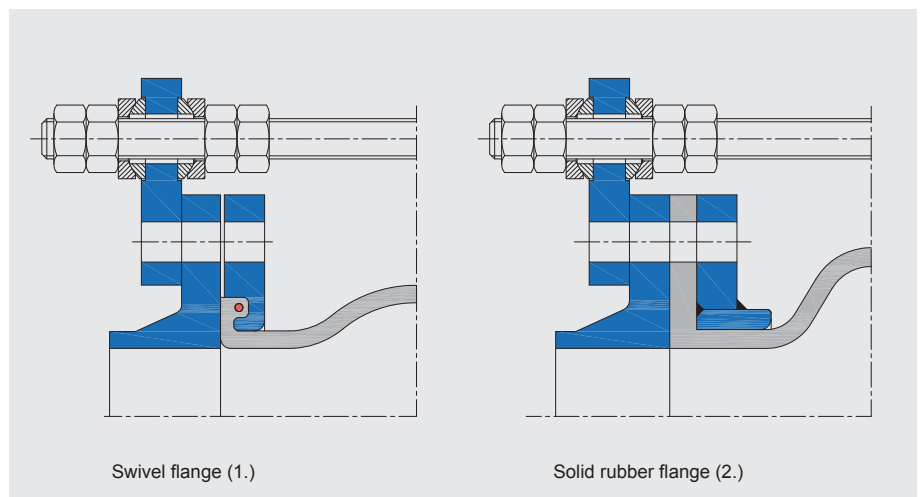
- Fixed point load:** Lateral stiffness rates plus bearing stiffness rates
- Production:**
1. DN 200 - DN 1000
  2. DN 50 - DN 5000
- Note:** In the case of large expansion joints and high pressure, the undulating load on the rubber flange must be taken into account.



### Design L

Segment bracing tie rods from counter flange to counter flange, PTFE-coated spherical washers and conical sockets, internal and external, for absorbing thrust and tensile force. Suitable for high lateral movement absorption in pressure and vacuum areas.

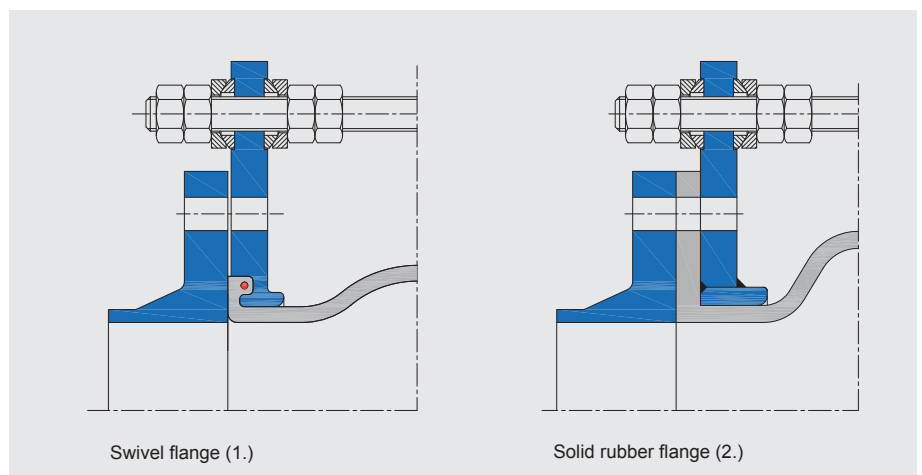
- Fixed point load:** Lateral stiffness rates plus bearing stiffness rates
- Production:**
1. DN 200 - DN 300
  2. DN 50 - DN 5000
- Note:** In the case of large expansion joints and high pressure, the undulating load on the rubber flange must be taken into account.



### Design M

Rubber expansion joint, with tie rods, PTFE-coated spherical washers and conical sockets, internal and external, for absorbing thrust and tensile force. Suitable for high lateral movement absorption in pressure and vacuum areas.

- Fixed point load:** Lateral stiffness rate plus bearing stiffness rate
- Production:**
1. DN 200 - DN 1000
  2. DN 50 - DN 5000



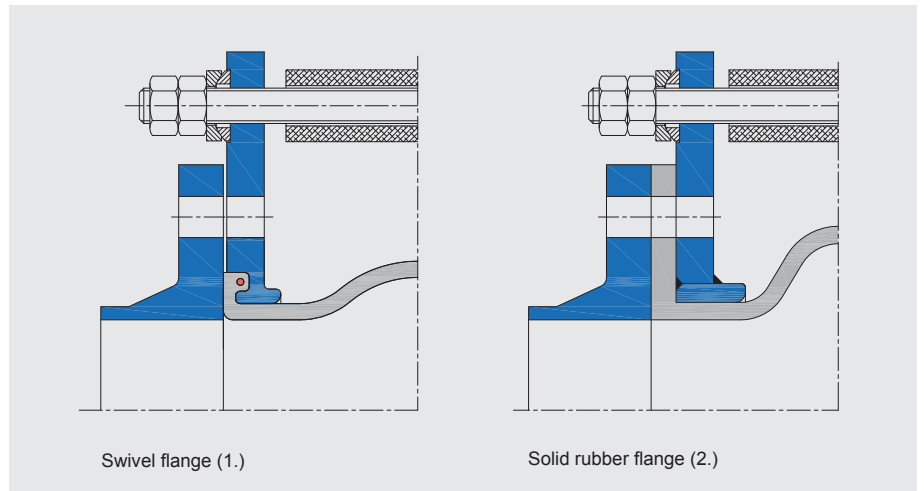
## WILLBRANDT Length Limiters / Tie Rods

### Design S

Rubber expansion joint with tie rods to absorb reaction force. Tie rods in PTFE-coated spherical washers and conical sockets, for reducing frictional force, external, includes thrust limiter for securing bellow. Suitable for high lateral movement absorption.

**Fixed point load:** For external end stops, lateral stiffness rates and bearing stiffness rates, full reaction force and axial stiffness rates in the case of compression.

**Production:**  
 1. DN 200 - DN 500  
 2. DN 50 - DN 500



### Design R

Segment bracing with tie rods from counter flanges to counter flange, as length limiter for absorbing reaction force. Tie rods in rubber bushings, suitable for sound and vibration absorption and for lateral movement absorption.

**Production:**  
 DN 20 - DN 200  
 Max. operating pressure:  
 10 bar

