# Pipe supports

# Finding the type and settings in CAEPIPE for support from

# Lisega

# SSG-standard

# Contents



# 1. Disclaimer

The objective of this document is to provide guidelines on how to model various supports including information on settings in CAEPIPE.

The user of CAEPIPE piping software is responsible for model setup, selection of pipe supports and to check the validity of calculated results.

The information in this document may be obsolete or change at any time without notice and it is up to the user of the CAEPIPE piping software to carefully read the update notes coming with each program update or revision.

# 2. Trademarks

Lisega is the trademark of Lisega SE, Gerhard-Liesegang-Straße 1, 27404 Zeven, Germany (www.lisega.de)

SSG is the trademark of the SSG Standard Solutions Group, Skönsbergsvägen 3, 856 41 Sundsvall, Sweden (www.ssgsolutions.com)

Rörklammerfabriken is a manufacturer of pipe supports following the SSG standard.

Address:

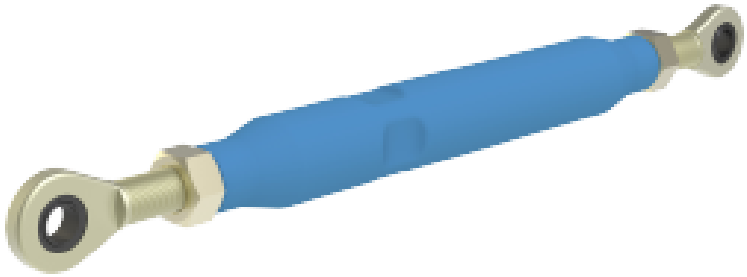
Rörklammerfabriken AB, Box 31, 241 21 Eslöv, Sweden, www.rorklammerfabriken.se

# 3. Figures used in this document

Pictures showing Lisega components taken from the Lisega product catalogue and are shown with courtesy of Lisega SE.

Pictures showing SSG components are taken from the webpage of Rörklammerfabriken AB with courtesy of SSG Standard Solutions Group and Rörklammerfabriken AB.

# 4. Lisega rigid link

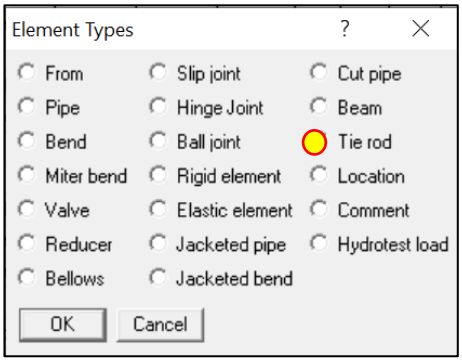


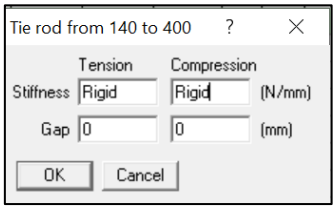
## Rigid Link, Tie Rod

- Carries load in both tension and compression
- “Axial stiffness may be given and play in joints can be modelled
- Bending moments and torques are <u>not</u> restrained.
    - PX, PY and PZ= free

- This support is built as a component

- Menu items and sample input:



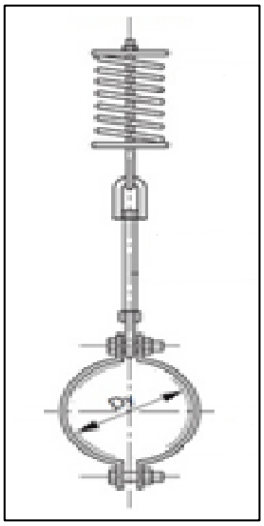




| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Lisega rigid link | | | | | | | | |
| 140 | From | | | | | | | |
| 400 | Tie rod | 700 | | | | | | Anchor |

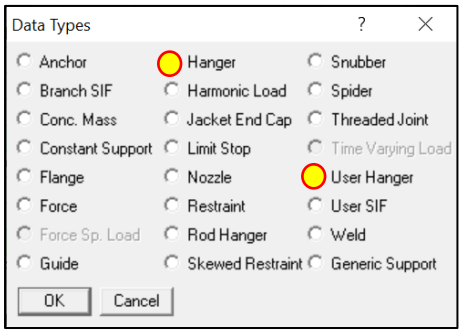
# 5. Spring hanger, Lisega and SSG type 4

Lisega spring hanger

Spring hanger SSG type 4



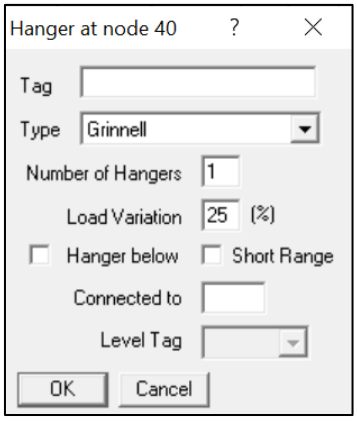
CAEPIPE menus:

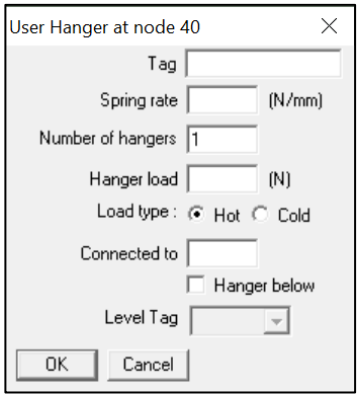



## Hanger, User Hanger

- Is working in vertical direction only.
- "Number of Hangers" specifies number of parallel supports installed at this location.
- "Connected to" option allows connection to other existing beam or pipe structures in model
- Bending moments and torques are not restrained.
  - PX, PY and PZ= free
- Automatic design according to spring manufacturers design rules is default.

- Data type "User Hanger" allows for specification of an existing spring hanger with known data



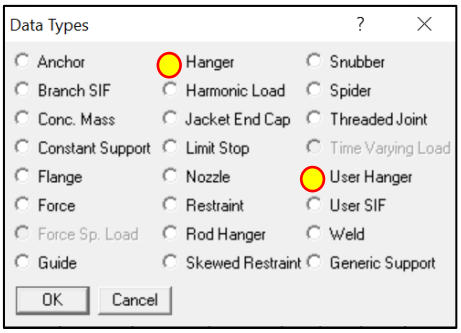

Notes:

- Check the horizontal movement of the spring hangers to calculate the angulation of the hanger.
- Allowable angulation according to EN 13480 is 4°.

# 6. Spring Support, Lisega

Lisega spring support:

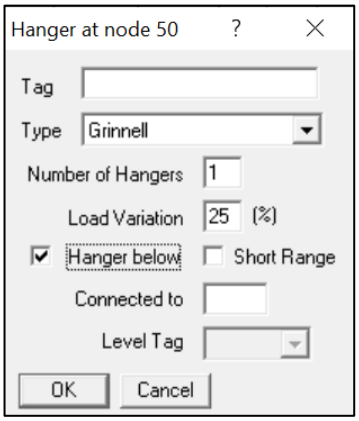
CAEPIPE menus:

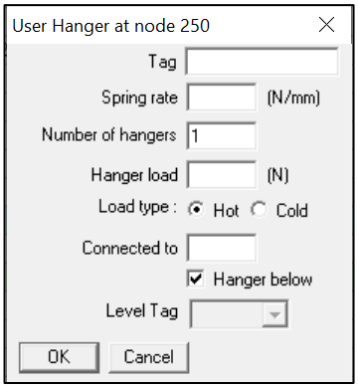



## Hanger, User Hanger

- Is working in vertical direction only
- "Number of Hangers" specifies number of parallel supports installed at this location.
- Option "Hanger below" relates to spring support
- "Connected to" option allows connection to other existing beam or pipe structures in model
- Bending moments and torques are <u>not</u> restrained.
    - PX, PY and PZ= free

- Data type "User Hanger" allows for specification of an existing spring hanger with known data



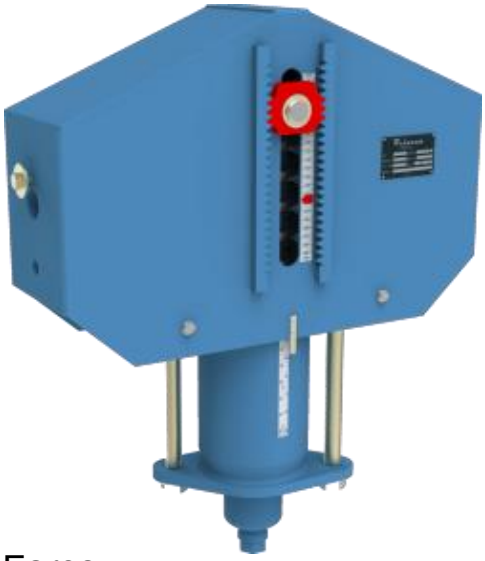

Notes:

- The spring support normally acts as a sliding support having friction and can restrain lateral movement.

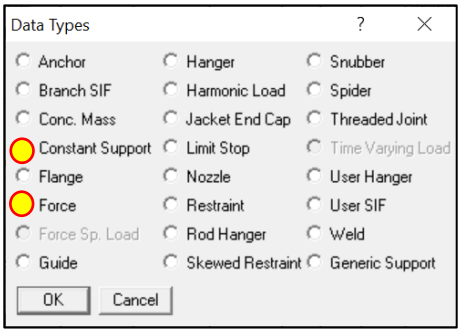
- Skios can provide information on how to model the spring support in detail including friction and lateral restraints.

# 7. Constant hanger, Lisega

Lisega constant hanger

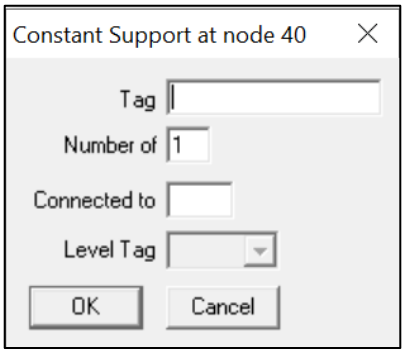


CAEPIPE menus:



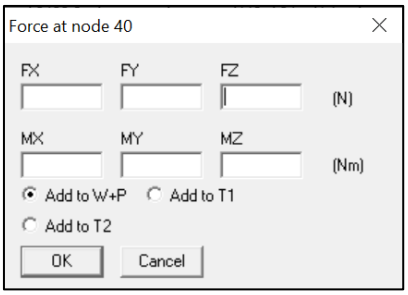

## Constant Support, Force

- Is working in vertical direction only providing a constant lifting force independent of the vertical movement.
- "Number of Hangers" specifies the number of parallel supports installed at this location
- "Connected to" option allows connection to other existing beam or pipe structures in the model




- Bending moments and torques are <u>not</u> restrained.
  - PX, PY and PZ= free
  - Caepipe calculates the vertical force required to carry the mass of the piping

- Use data type "Force" for an existing constant hanger with known lifting force

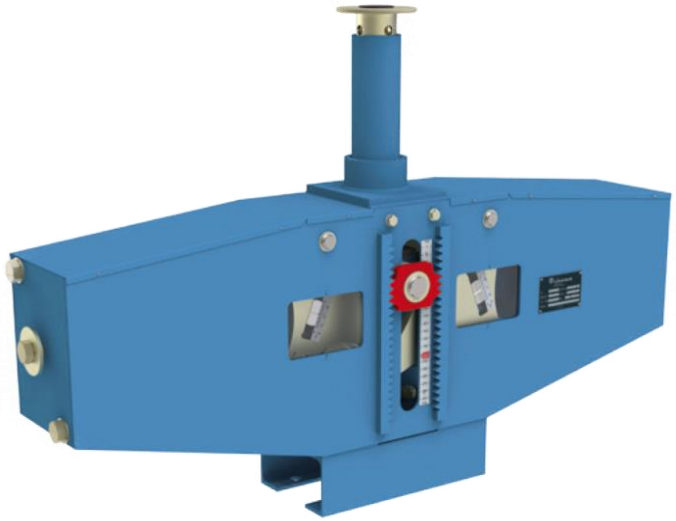



Notes:

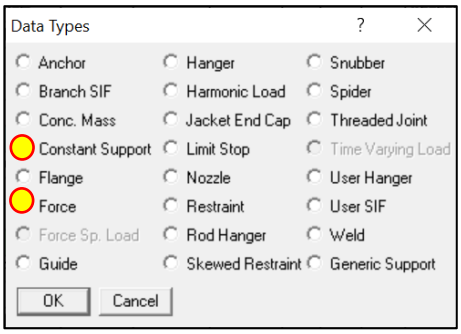
- Check the horizontal movement of the constant hangers to calculate the angulation of the hanger.
- Allowable angulation according to EN 13480 is 4°.

# 8. Constant Support, Lisega

Lisega constant support:



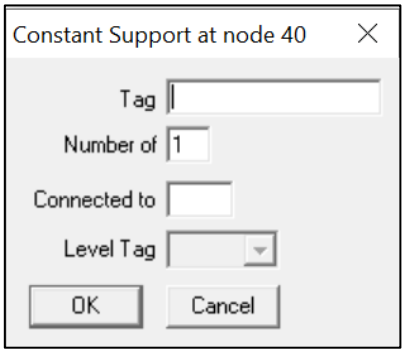
CAEPIPE menus:

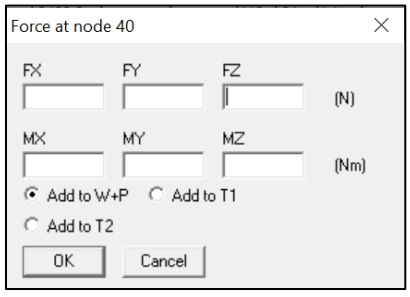



## Constant support, Force

- Is working in vertical direction only
- "Number of Hangers" specifies number of parallel supports installed at this location.
- "Connected to" option allow connection to other existing beam or pipe structures in model
- Bending moments and torques are <u>not</u> restrained.
    - PX, PY and PZ= free

- Use data type "Force" for an existing constant support with known lifting force.




Notes:

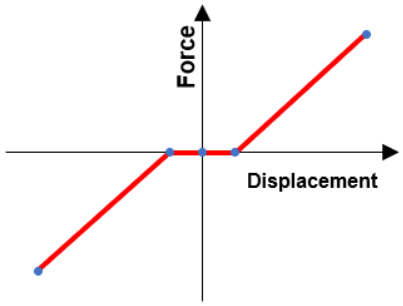
- The spring support normally acts as a sliding support having friction and can restrain lateral movement.

- Skios can provide input how to model the spring support in detail including friction and lateral restraints.

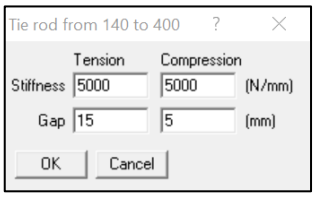
# 9. Lisega Shock absorber

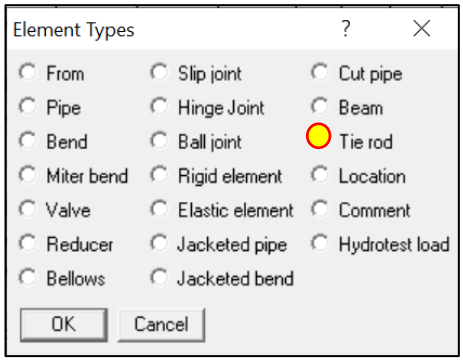
## Shock absorber

- Component is active in dynamic analysis only. The shock absorber allows slow thermal movements within a specified range but restricts fast movements due to fast dynamic events.
    - Eigenfrequency analysis: Only the stiffnesses for both system and spring rate are considered.
    - Linear dynamics: Same as for eigenfrequency analysis.
    - The force displacement characteristics for the real-life component is shown below




- Carries load in both tension and compression.
- Bending moments and torques are <u>not</u> restrained.
    - PX, PY and PZ= free.
- The shock absorber has no mass.
- Viscous effect is not considered This support is built as a component
- Menu items and sample input:

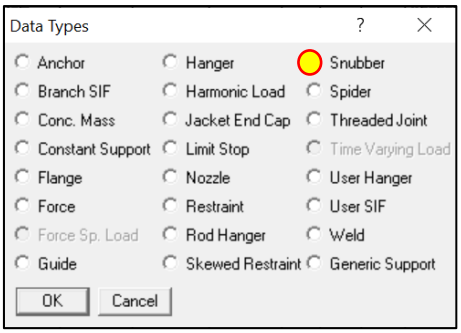



| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Lisega shock absorber | | | | | | | | |
| 140 | From | | | | | | | |
| 400 | Tie rod | 700 | | | | | | Anchor |

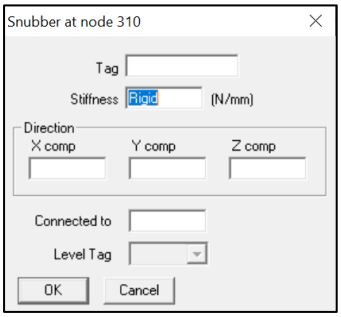
# 10. Lisega Damper

CAEPIPE menus:




## Snubber

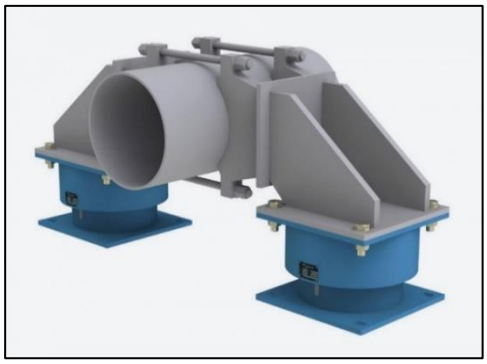
- Component is active in dynamic analysis only. The damper allows slow thermal movements but restricts fast movements due to fast dynamic events.
    - Eigenfrequency analysis: Only the stiffnesses for spring rates are considered.
    - Linear dynamics: Same as for eigenfrequency analysis.
- Carries load in both positive and negative direction.
- The damper has no mass.
- Viscous effects are not considered in dynamic analysis
- “Connected to” option allows connection to other existing beam or pipe structures in model



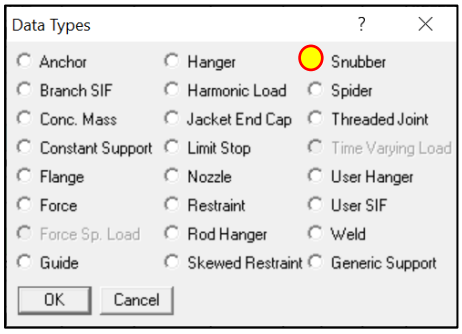

**Comment:**

The damper is a viscous damper with very small or virtually no backlash effect.

# 11. Lisega Visco Damper



CAEPIPE menus:

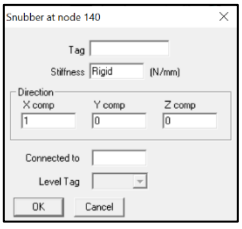



## Snubber

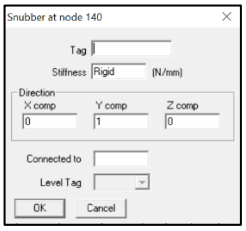
- Component is active in dynamic analysis only. The damper allows slow thermal movements but restricts fast movements due to fast dynamic events.
    - Eigenfrequency analysis: Only the stiffnesses for spring rates are considered.
    - Linear dynamics: Same as for eigenfrequency analysis.
- Bending moments and torques are <u>not</u> restrained.
    - PX, PY and PZ= free.
- Carries load in both positive and negative direction simultaneously.
- The main advantage of the visco damper is, that there is no play/gap in the connection to the piping. This means that the visco damper also prevents small movements.
- Sample CAEPIPE input:

| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Lisega visco damper | | | | | | | | |
| 140 | Location | | | | | | | Snubber |
| 140 | Location | | | | | | | Snubber |
| 140 | Location | | | | | | | Snubber |

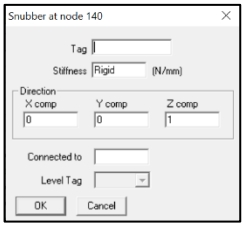
X-direction



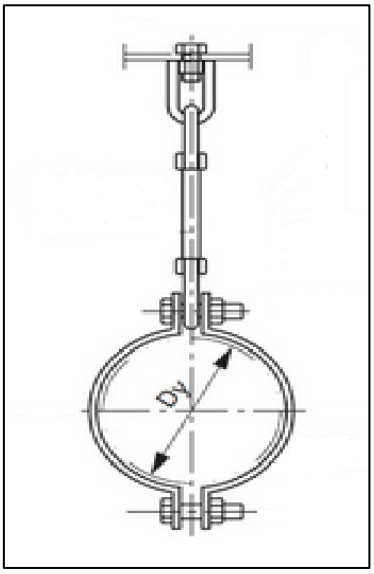

Y-direction



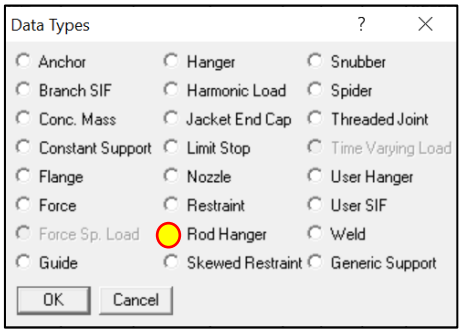

Z-direction



# 12. Lisega Rod support, SSG type 1, 2 & 3



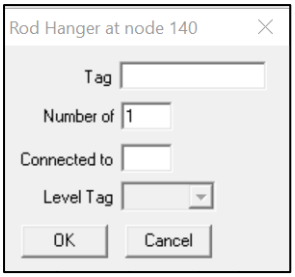
CAEPIPE menu:




## Rod Hanger

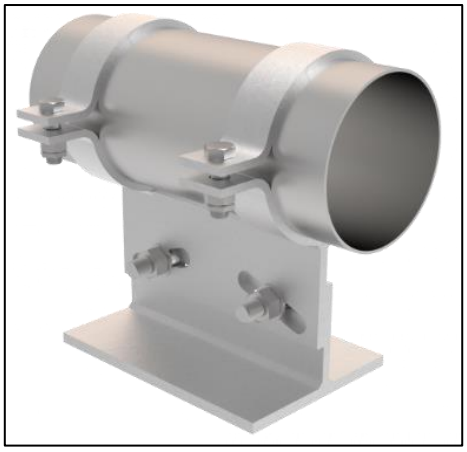
- Rod Hanger
- The support can carry downward acting loads only, behaves like a chain or a rope.

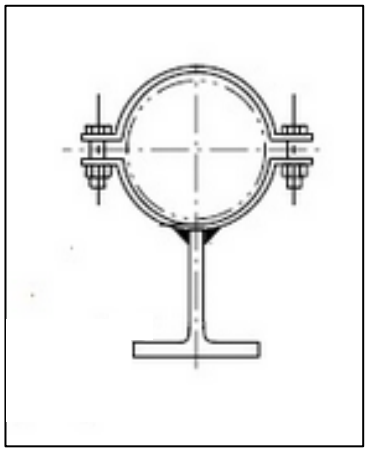
Notes:



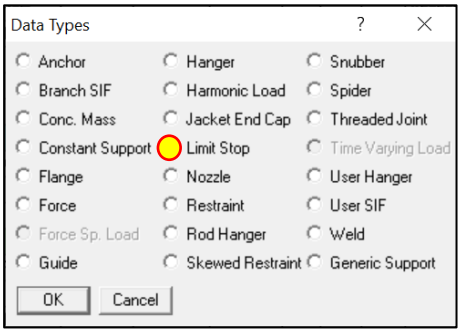

- “Connected to” option allows connection to other existing beam or pipe structures in model
- Check the horizontal movement of the rod hangers to calculate the angulation of the hanger.
- Allowable angulation according to EN 13480 is 4°.

# 13. Lisega Sliding shoe, SSG type 11





CAEPIPE menu:



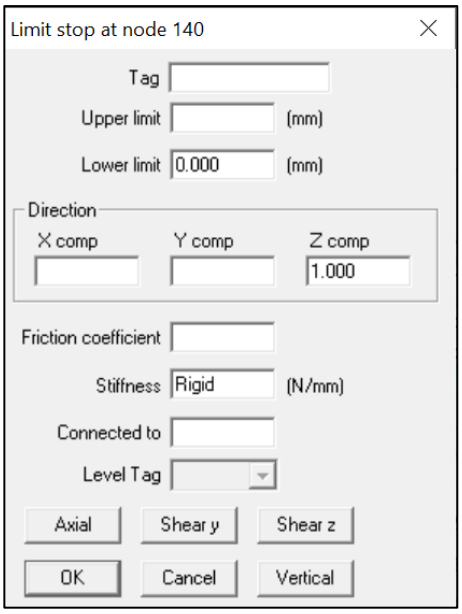

## Limit Stop

- Limit Stop.
  - Active in vertical direction only, all other translations and rotations are free (PX, PY and PZ= free).

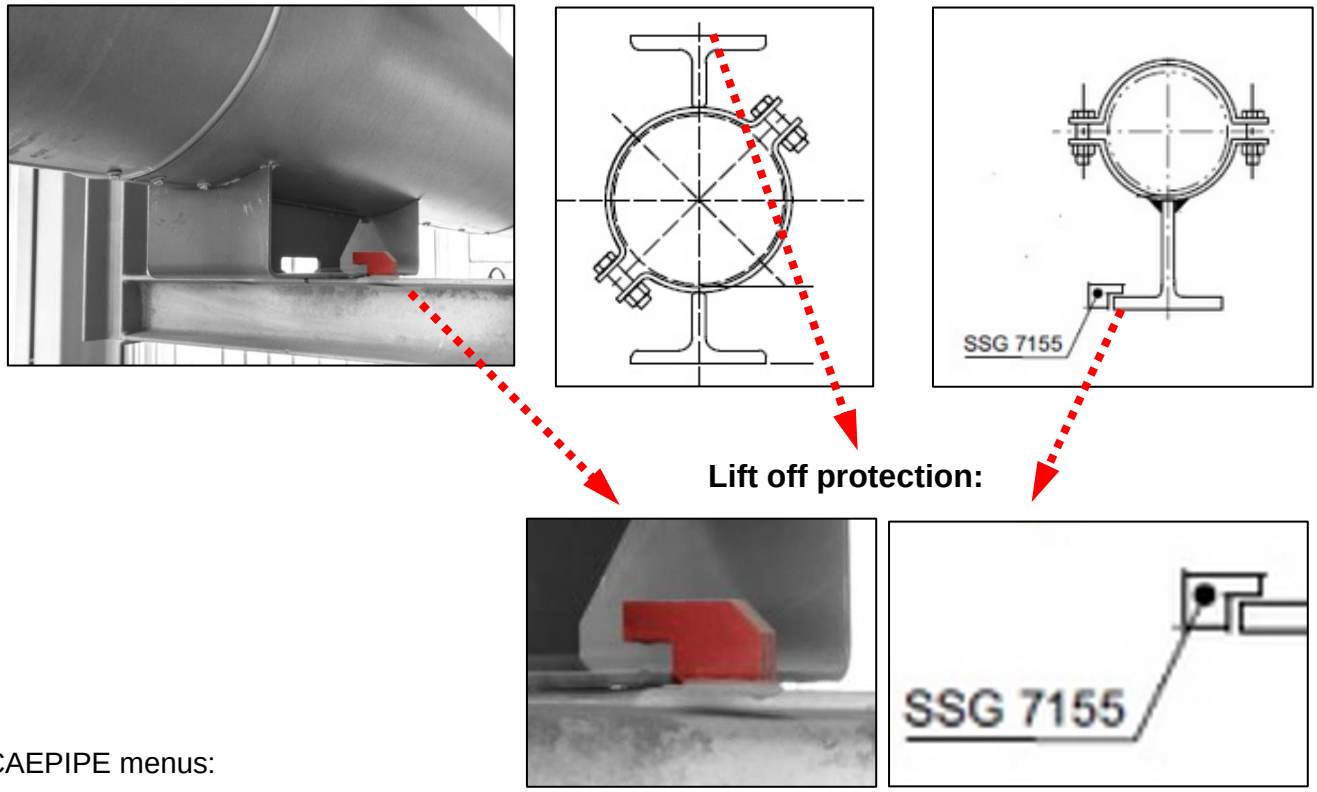
- "Connected to" option allows connection to other existing beam or pipe structures in model

- Coefficient of friction steel – steel shall be μ=0.3 according to EN 13480 chapter 13.7.

- Stiffness is the stiffness of secondary steel and pipe fittings.



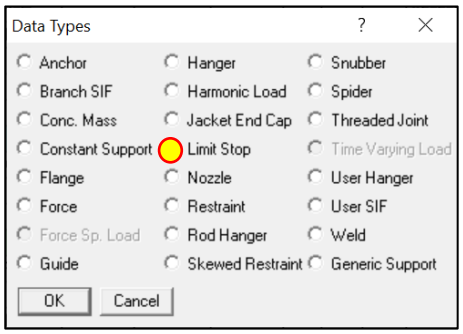
# 14. Lisega Sliding shoe, SSG type 12 &13

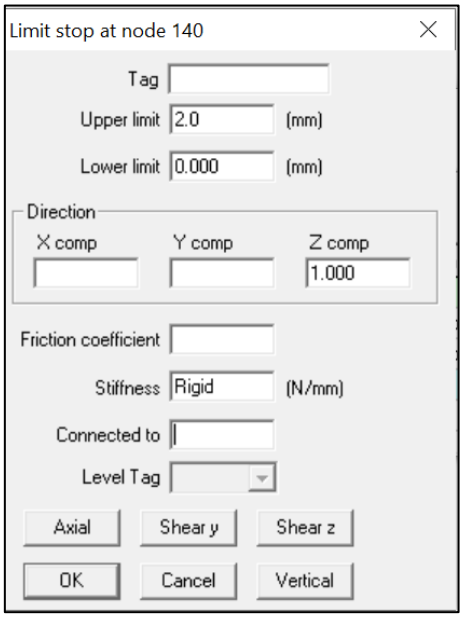



CAEPIPE menus:

## Limit Stop

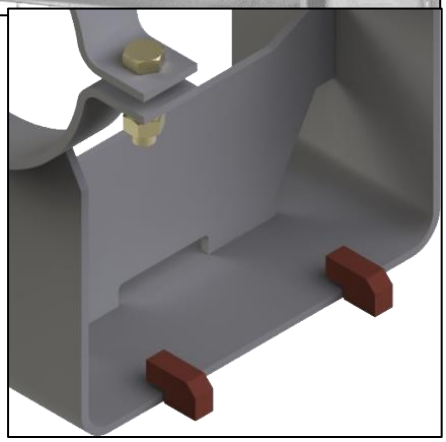
- Limit Stop.
  - Active in vertical direction only, all other translations and rotations are free (PX, PY and PZ= free).
  - Specifying a value for “Upper limit” will restrain upward movement.
    In figures below a gap of 2 mm is defined for upward movement of the piping.
  - Note that the “hook” and SSG 7155 vertical restraint can restrain lateral movement if the lateral movements are large.
- “Connected to” option allows connection to other existing beam or pipe structures in model
- Coefficient of friction steel – steel shall be μ=0.3 according to EN 13480 chapter 13.7.
- Stiffness is the stiffness of secondary steel and pipe fittings.

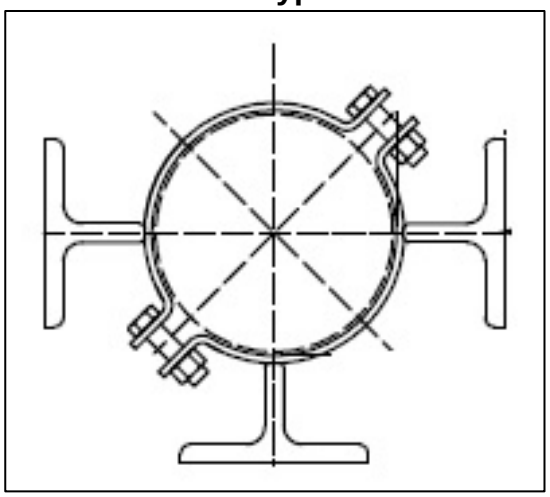


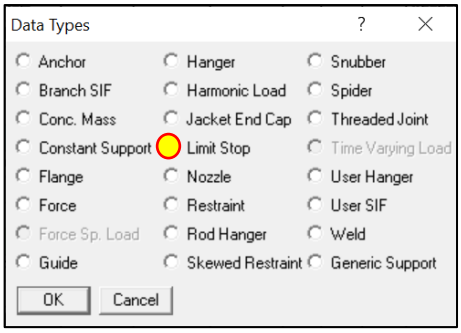
# 15. Lisega Sliding shoe w. guide, SSG type 14

**SSG type 14**





CAEPIPE menus:



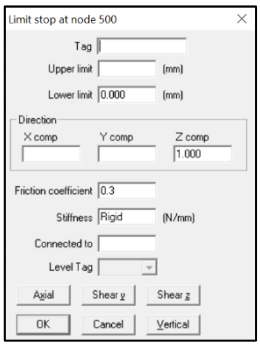

## Limit Stop

- This support is built up by using Limit Stops
  - First limit stop is acting in vertical direction
  - Second limit stop is acting in horizontal direction

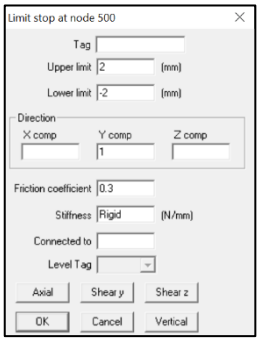
- Sample input is shown below for a pipe moving in X-direction, having a gap of 2 mm in lateral direction on both sides of pipe:

| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Sliding shoe & lateral support, SSG type 14 | | | | | | | | |
| 500 | | 5000 | | | M2 | S1 | L4 | Limit stop |
| 500 | Location | | | | | | | Limit stop |

First limit stop acting in vertical direction:

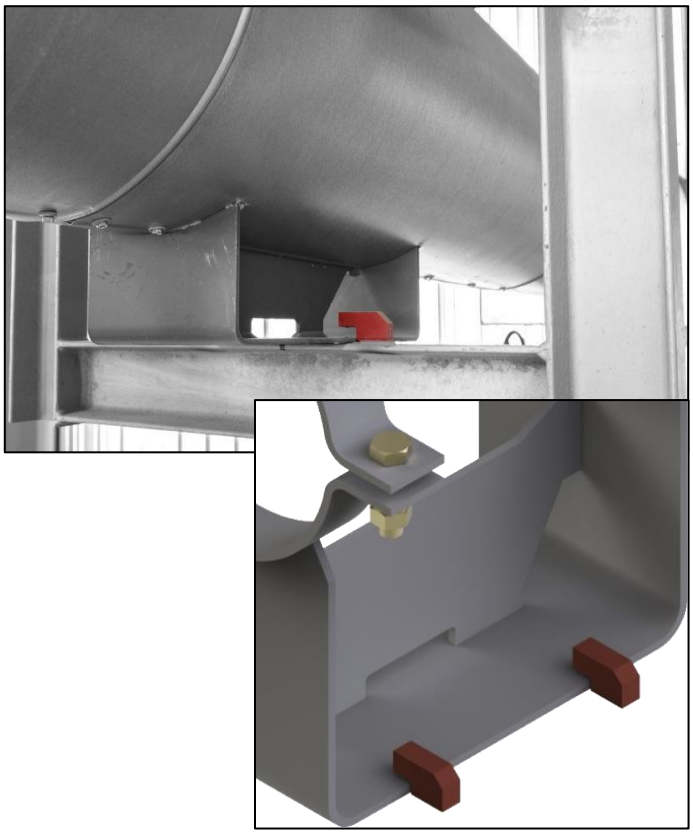


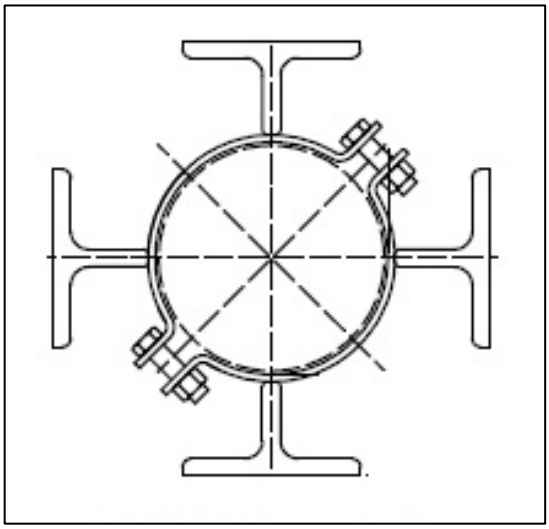

Second limit stop acting in horizontal direction:

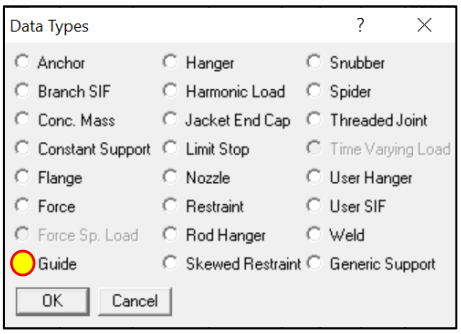


# 16. Lisega Sliding shoe w. guide, SSG type 15

**SSG type 15**

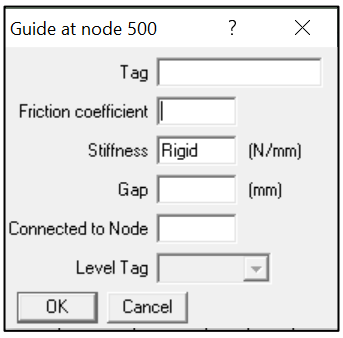







CAEPIPE menus:

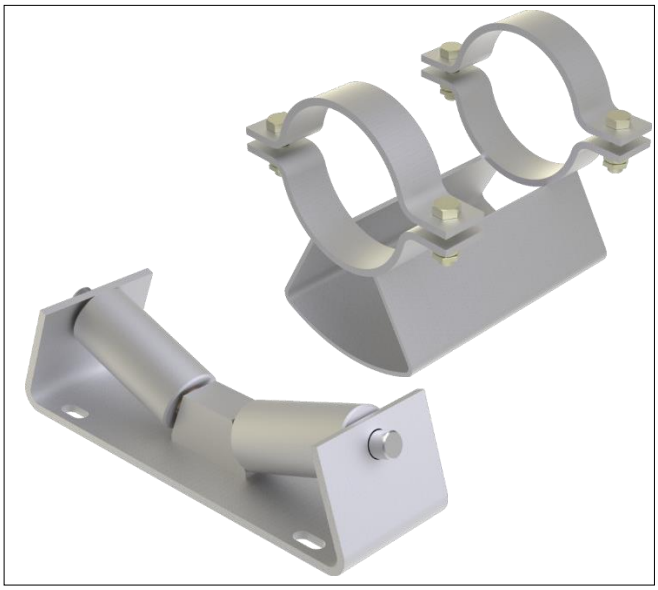
## Guide



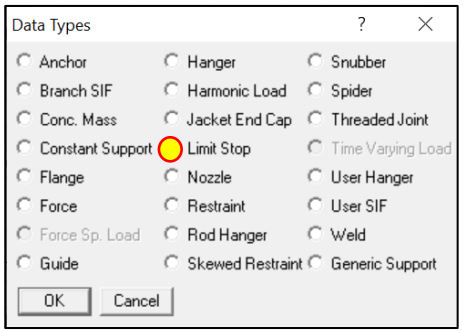

- Active in lateral directions only,
  axial translation and all rotations are free
  (PX, PY and PZ= free).

- Coefficient of friction steel – steel shall be μ=0.3 according to EN 13480 chapter 13.7.
- Stiffness is the stiffness of secondary steel and pipe fittings
- Gap: this is a uniform radial gap around the circumference of the pipe.
  - Specifying a gap makes sense only for a vertical run.
  - For a horizontal run use modelling scheme according to SSG type 14 applying an upper limit on vertical limit stop.
- “Connected to” option allows connection to other existing beam or pipe structures in model

# 17. Lisega roller bearing support

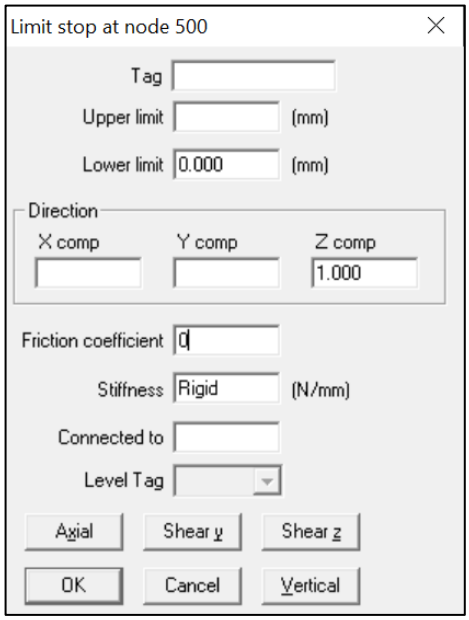


CAEPIPE menus:

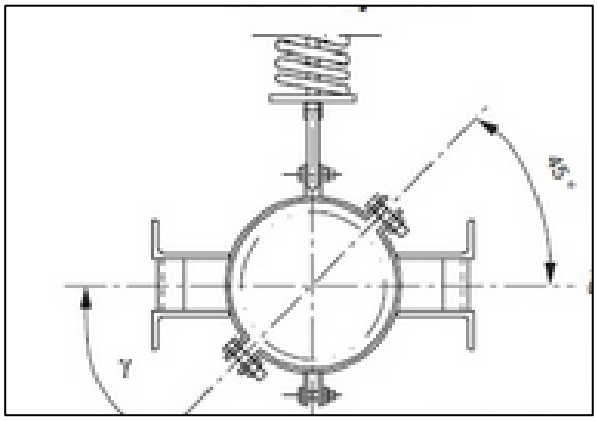



## Limit stop

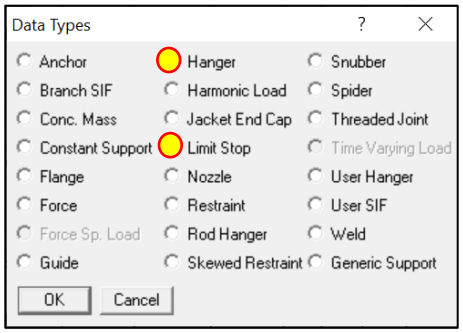
- Active in vertical direction only. Axial translation and all rotations are free (PX, PY and PZ= free).
- Coefficient of friction must be set to zero:
- Use Limit Stop to restrain lateral movements, see SSG type 14 above.



# 18. Lateral support & spring, SSG type 17 & 18



CAEPIPE menus:




## Spring hanger with guide (optional)

This support is a combination of a spring hanger and limit stop acting in the lateral direction.

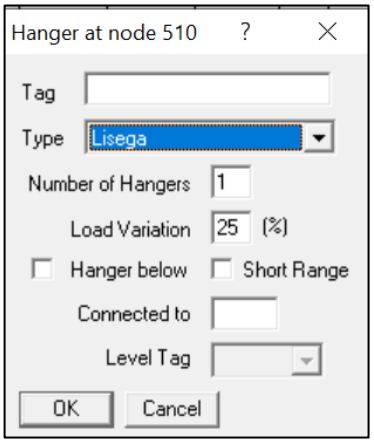
The pipe support in the top right picture, SSG type 17 – 18 is modelled as follows:

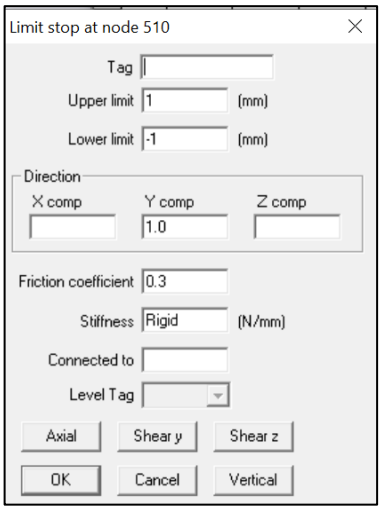
1. Create a spring hanger.

2. Use “Location” command and add a limit stop at the same node point.

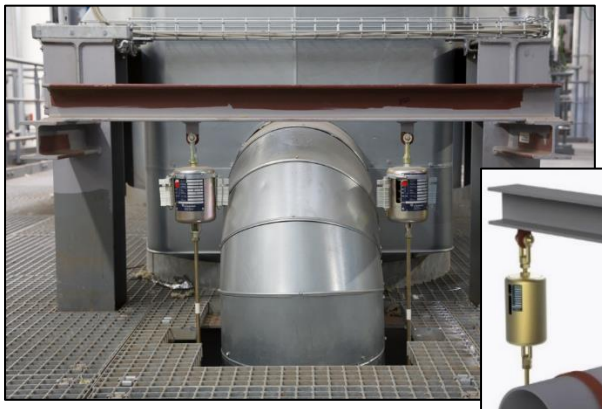
Sample input is shown for a pipe run moving in the X-direction:

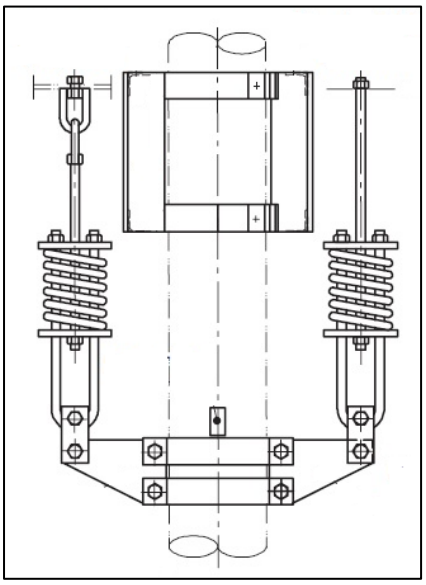
| SSG support type 17 & 18 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 510 | | 4000 | | | M2 | S1 | L4 | Hanger |
| 510 | Location | | | | | | | Limit stop |



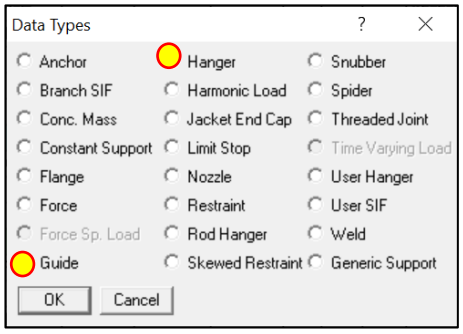
# 19. Lisega spring support vert. pipe, SSG type 27 - 30





CAEPIPE menus:

+ Spring hanger with guide (optional)




This support is a combination of a spring hanger guide or a limit stop acting in lateral direction.

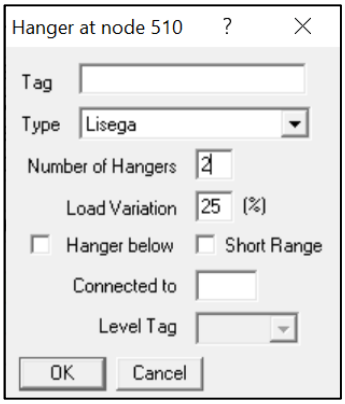
The pipe support in the top right picture, SSG type 27 – 30 is modelled as follows:

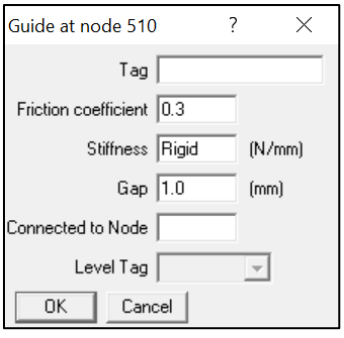
1. Create a spring hanger with option using two (2) spring hangers.

2. Use the “Location” command and add a guide or a limit stop at the same node point depending on which directions are to be restrained.

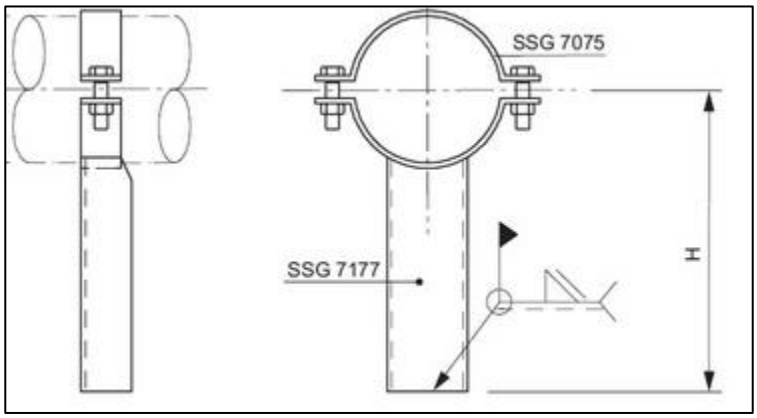
Sample input is shown for a pipe run going in Z-direction:

| SSG support type 27 - 30 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 510 | | | | 5000 | M2 | S1 | L4 | Hanger |
| 510 | Location | | | | | | | Guide |



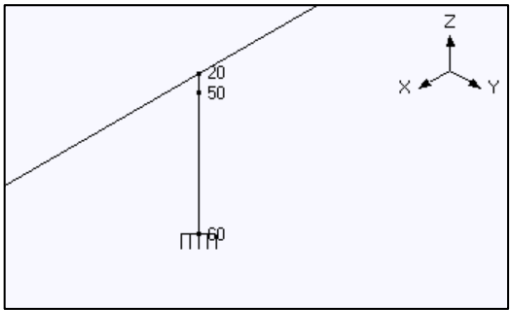
# 20. Pipe – beam connection, SSG type 31

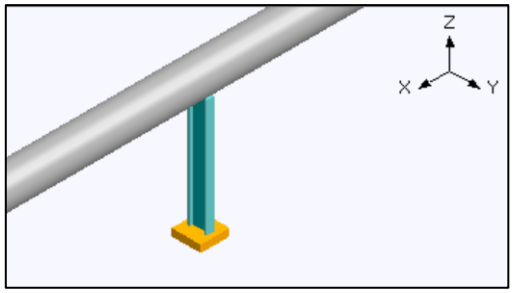



This pipe support is built as a structural beam connecting to the pipe:

Consider the following using this support:

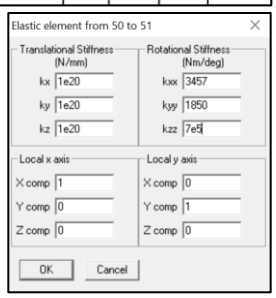
- This support is not intended for large axial forces or displacements. Sliding between pipe clamp is not desired.
- The angulation of pipe must be small. Angle between beam – pipe should be 90°.
- Create a rigid element within the pipe (between node 20 and node 50 in figure) to get a more correct stiffness of the beam-pipe connection. Otherwise, the support will be too flexible.
- Additional flexibility between pipe and beam can be defined using an “Elastic Element”
    a. Stiffness values must be obtained by other means, for example by FE-analysis



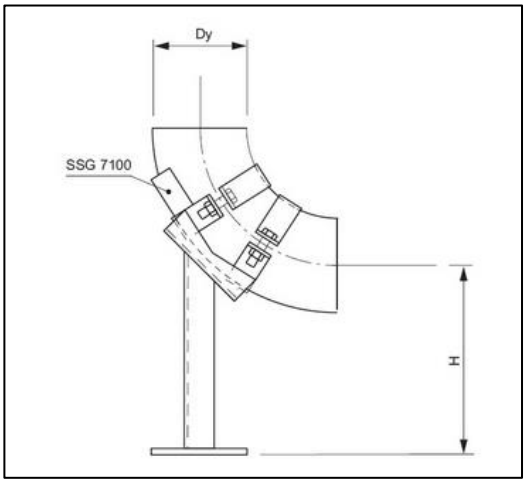




| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | | | 5500 | | M1 | 350 | L1 | Anchor |
| 20 | From | | | | | | | |
| 50 | Rigid | | | -175 | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | C200 | BL1 | Anchor |

| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | | | 5500 | | M1 | 350 | L1 | Anchor |
| 20 | From | | | | | | | |
| 50 | Rigid | | | -175 | M1 | 350 | L1 | |
| 51 | Elastic | | | | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | C200 | BL1 | Anchor |



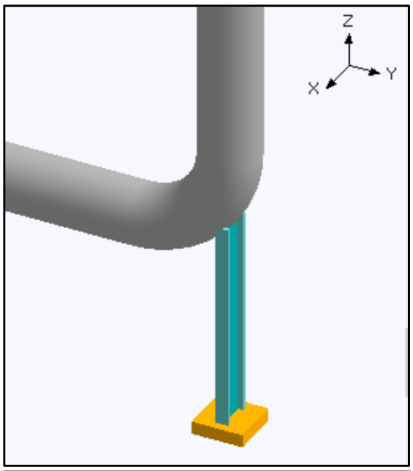
# 21. Trunnion support, SSG type 32

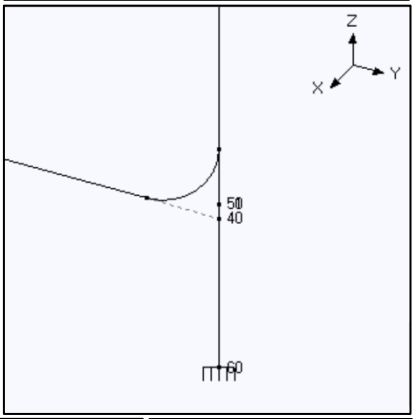



This pipe support is built as a structural beam connected to the pipe bend:

Consider the following using this support:

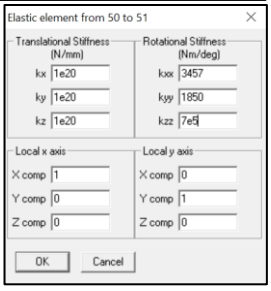
- This support is not intended for large horizontal forces or displacements. Sliding between pipe and clamp is not allowed.
- The angulation of pipe must be small.
- Create a rigid element within the bend (between node 40B and node 50 in figure) to get a more correct stiffness of the beam-pipe connection. Otherwise, the support will be too flexible.
- Additional flexibility between pipe and beam can be defined by using “Coupling”
    a. Stiffness values must be obtained by other means, for example by FE-analysis



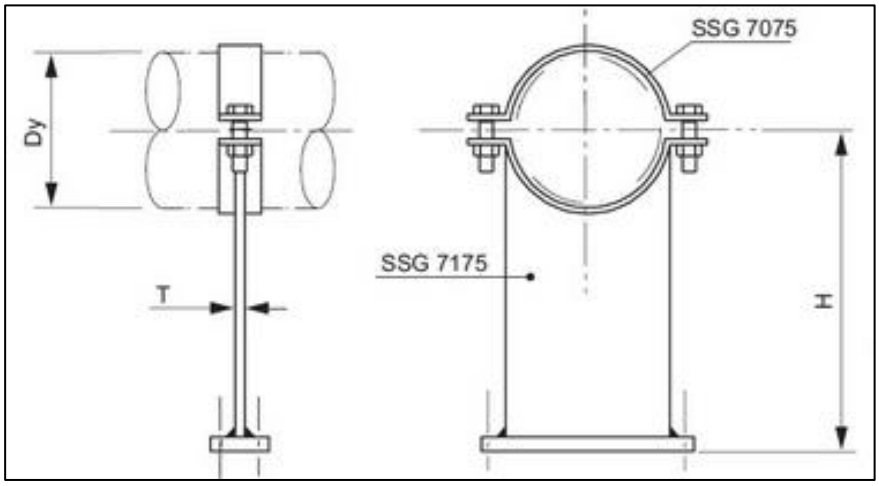




| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | Bend | | 5500 | | M1 | 350 | L1 | |
| 45 | | | | 3500 | M1 | 350 | L1 | Anchor |
| 40B | From | | | | | | | |
| 50 | Rigid | | | -425 | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | C200 | BL1 | Anchor |

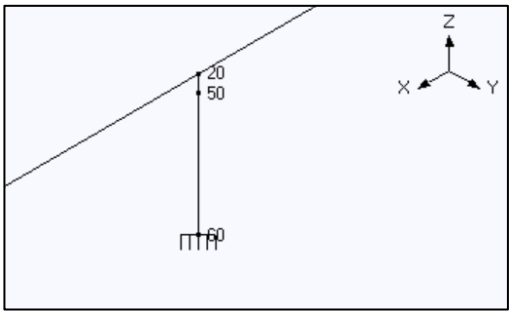
| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | Bend | | 5500 | | M1 | 350 | L1 | |
| 45 | | | | 3500 | M1 | 350 | L1 | Anchor |
| 40B | From | | | | | | | |
| 50 | Rigid | | | -425 | M1 | 350 | L1 | |
| 51 | Elastic | | | | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | C200 | BL1 | Anchor |



# 22. Axial flex plate support, SSG type 33 & 34

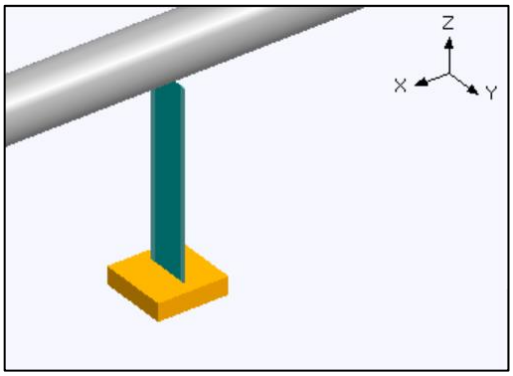



This pipe support is built as a structural beam connected to the pipe:



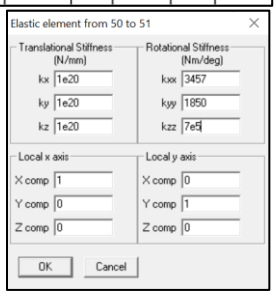

Consider the following using this support:

- This support is flexible in the axial direction and is stiff in the lateral and vertical directions.
- Create a rigid element within the pipe (between node 20 and node 50 in figure) to get a more correct stiffness of the beam-pipe connection. Otherwise, the support will be too flexible
- Additional flexibility between pipe and beam can be defined using “Coupling”
    a. Stiffness values must be obtained by other means, for example by FE-analysis

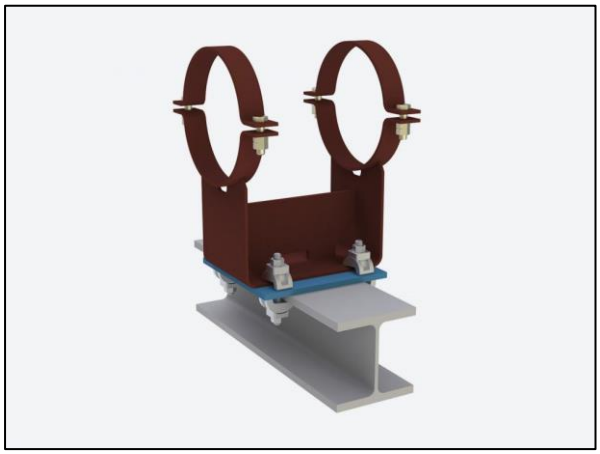


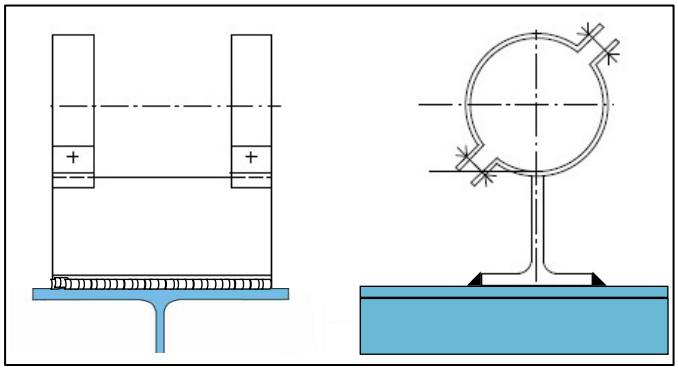

| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | Bend | | 5500 | | M1 | 350 | L1 | |
| 45 | | | | 1500 | M1 | 350 | L1 | Anchor |
| 20 | From | | | | | | | |
| 50 | Rigid | | | -175 | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | PLATE | BL1 | Anchor |

| Node | Type | DX (mm) | DY (mm) | DZ (mm) | Matl | Sect | Load | Data |
|---|---|---|---|---|---|---|---|---|
| Title = pipe supports | | | | | | | | |
| 10 | From | | | | | | | Anchor |
| 20 | | 6000 | | | M1 | 350 | L1 | |
| 30 | Bend | 5000 | | | M1 | 350 | L1 | |
| 40 | Bend | | 5500 | | M1 | 350 | L1 | |
| 45 | | | | 1500 | M1 | 350 | L1 | Anchor |
| 20 | From | | | | | | | |
| 50 | Rigid | | | -175 | M1 | 350 | L1 | |
| 51 | Elastic | | | | M1 | 350 | L1 | |
| 60 | Beam | | | -1250 | BM1 | PLATE | BL1 | Anchor |

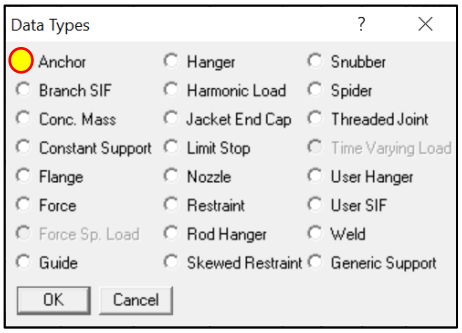


# 23. Lisega anchor support, SSG type 35 & 36





CAEPIPE menus:




## Lisega anchor support, SSG type 35 & 36

Rigid support, Anchor

1. All translations and rotations are restrained
2. Stiffness values can be specified for all degrees of freedom
3. It is not possible to specify any gaps for any direction or rotation