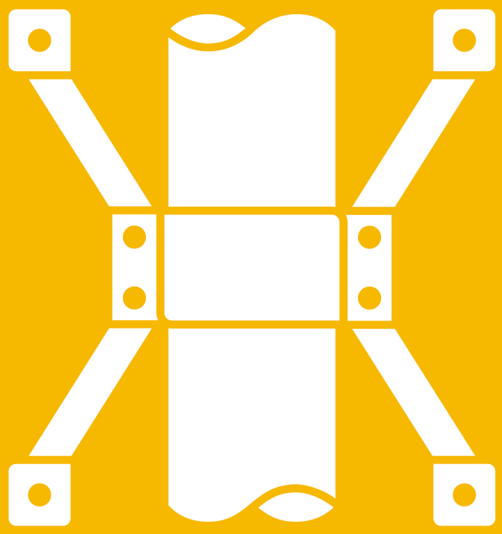
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Fixed point Guidelines

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07/2022

This "Fixed Point Brochure" allows the user to easily select pipe supports for industrial piping and plant engineering.

The documentation is intended only for the use of the recipient and is in all parts the property of Sikla.
The technical illustrations and all information are given to the best of our knowledge. Illustrations and drawings are not binding. Liability for printing errors or defects is excluded.

We reserve the right to make changes and design improvements, in particular in the interest of technical progress.

Conformity of products, calculation modelling and dimensioning are recommendations based on current technical standards rules and guidelines. They do not replace individual verification by a structural engineer.

Impacts

Permissible loads F_{zul} in kN (e.g. shear forces) are specified as maximum values of the characteristic action and take into account a partial safety factor $\gamma_F = 1.35$.

Boundary Conditions

All loads act as predominantly static loads at room temperature.
Technical information in the respective product data sheets on application and field of use must be observed.

Influence Of Fixed Point Forces On The Building Structure

When arranging fixed points, always take into account the load on the supporting structure.
If necessary, the structural engineer responsible for the supporting structure must be informed about the fixed point force to be applied.

Pipe supports are used in installations, whether in the heating, ventilation or sanitary sector. When selecting and arranging the supports, the expansion of the pipes must be taken into account in addition to the fastening placement.

In all areas of industry, and especially in mechanical engineering, project and assembly engineers are faced with the joint task of taking these expansions into account and controlling them.

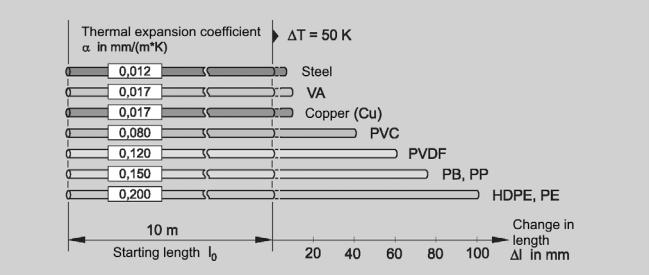


Figure 1.1: Material coefficient of linear expansion

Pipes for heating, air conditioning and process technology in particular are often subject to considerable temperature fluctuations and consequently show significant changes in length. The pipes shrink when they cool down and expand when they heat up. Depending on the material, pipelines expand very differently at the same temperature difference; polyethylene (PE), for example, expands 17 times more than structural steel. Therefore, the given coefficient of linear expansion must be taken into account during the planning phase due to the choice of material (Figure 1.1).

The fundamental fact that these pipelines transport thermal energy over long distances increases the importance of the design quality.

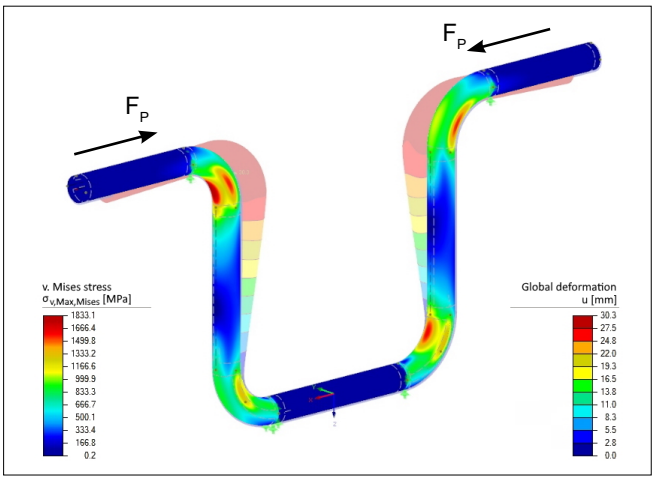


Figure 1.2: v. Mises stress distribution / deformation for U-bend

Whether a change in length is significant depends less on the absolute magnitude than on whether the pipeline has the possibility to yield to the change in length. Pipelines for natural expansion compensation should therefore be designed in such a way that the expansion can be absorbed by elastic bending.

In principle, the legs created by the change of direction are suitable for absorption. If these are not long enough to absorb the expansion elastically, even with well-considered pipe routing, expansion bends or compensators must be added. If these physical laws are not observed, the pipeline itself can be damaged or cause serious damage to components or supports.

Elongation reaction according to support types

Direction of expansion and reaction forces from expansion depend on the clamping placement on the pipeline:

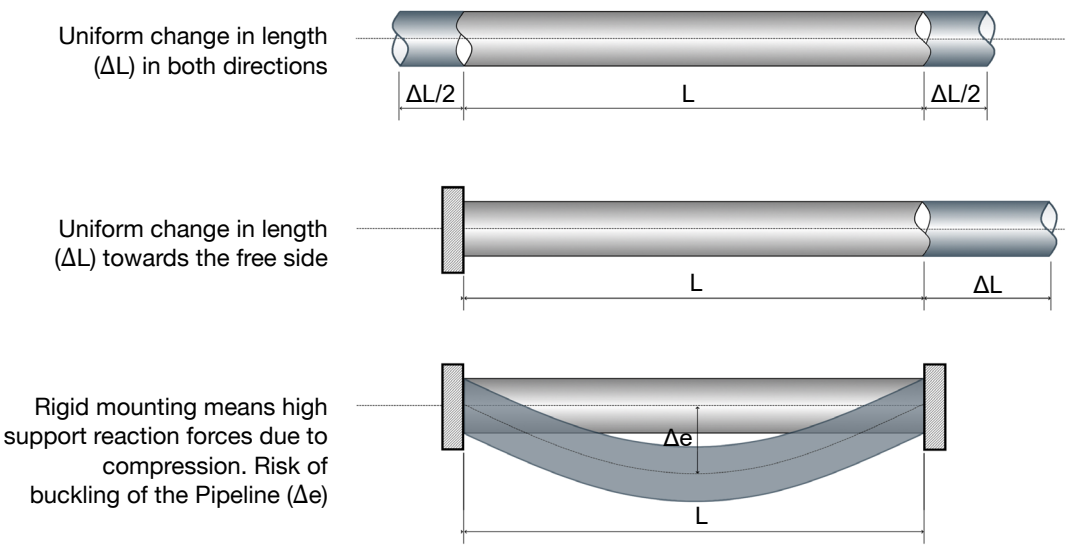


Figure 1.3: Behaviour of the deformation of the pipe with temperature change.

A change in length caused by a change in temperature requires different fixings in order to direct the movement in a targeted manner. This is necessary to prevent damage and to achieve high operational safety even under alternating loads. Correct planning and execution allow the pipeline to have freedom of movement at defined positions or to specifically prevent movement. Often the supports also have the task of absorbing weight forces of the pipeline.

In planning, the positions for absorbing the weight forces are determined first. These already consider the support options on the structure, the spans based on the pipeline dimensions and the static dimensioning by pure weight force. Subsequently, fixed points and guides are determined based on the expansion concept. Otherwise, fixed points or guides at positions that cannot be realised on the structure entail further planning and design.

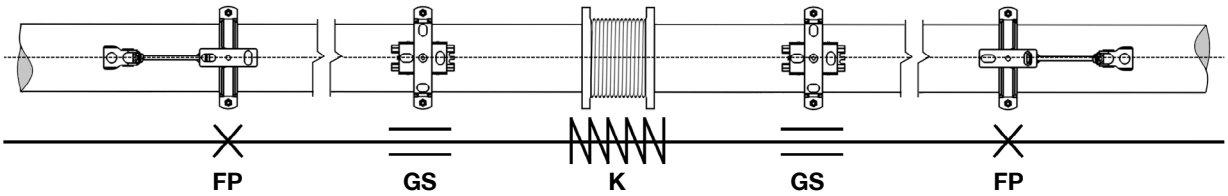


Figure 1.4: Fastenings in pipeline.

FP - Anchor points connect the pipe to the building structure, which is usually assumed to be rigid. They can absorb forces and moments in all directions. Partial fixed points are intended to limit the degrees of freedom of pipelines in 1-5 directions. Since FP forces need to be taken into account, the design challenge is always high when the pipeline is planned with a large distance to the building structure. This ceiling or wall distance decisively determines the FP design.

GS - Guide supports allow the pipeline to move in a predetermined direction but hinder it in another direction. They are usually equally spaced along the entire pipeline. The function is to prevent deflection of the pipe axis, while allowing the pipe to move in the axial direction. Cross sliders are a FL variant. These allow displacements in the two horizontal planes but enable the absorption of lifting forces and of support forces.

LS - Non-locating support ist to support vertically acting loads, but not to significantly hinder displacements in the horizontal plane. These supports are often found in the area of directional changes and allow the desired deflection movement in expansion bends.

K - Expansion joints serve as flexible elements that absorb movement in the pipe system. They are used to compensate for changes in length, vibration decoupling or for pipe misalignments. Absorption of the movement takes place mechanically via an elastic bellows. Depending on the medium, pressure, temperature and service life requirements, they are made from different materials.

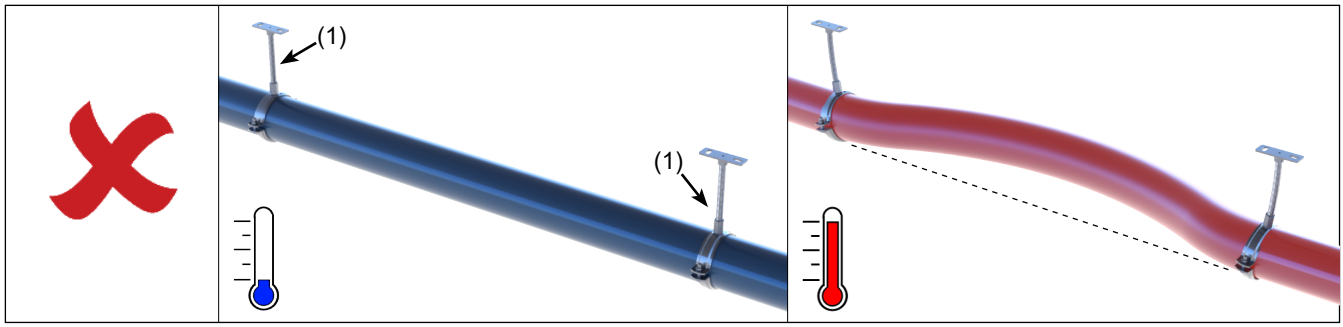


Figure 1.5: Pipe with two fixed points (1) deforms during a temperature change.

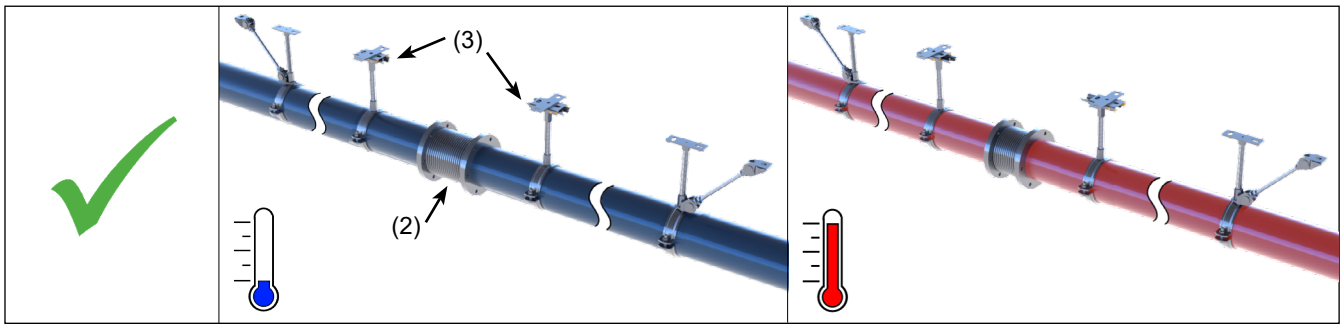


Figure 1.6: Deformation stopped by expansion joint (2) and steering by guide support (3) with temperature change.

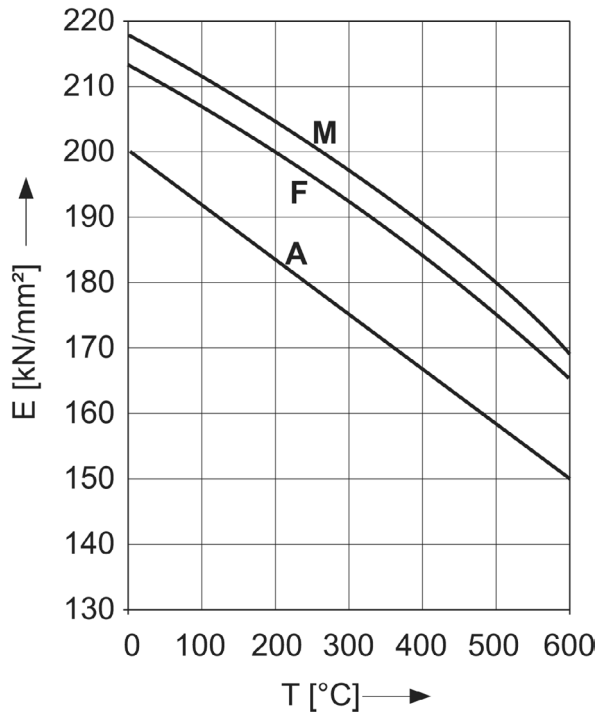
Material properties and restrictions for static loading

Since the strength properties of steel decrease significantly at higher temperatures, the reduced values must be taken into account in calculations. Intermediate values are to be inserted linearly.

Material properties

Material	Yield strength R_e [N/mm²] at					Temperature [°C]		
	50	200	250	300	350	400	450	500
S235JR (St 37)	235	161	143	122	-	-	-	-
1.4301	177	127	118	110	104	98	95	92
1.4401	196	147	137	127	120	115	112	110
1.4571	202	167	157	145	140	135	131	129

The yield strength for S235JR apply to wall thicknesses up to 16 mm, lt. AD 2000 MB W1.



M = martensitic

F = ferritic

A = austenitic

The values given for R_e are characteristic material values. Safety factors must also be taken into account.

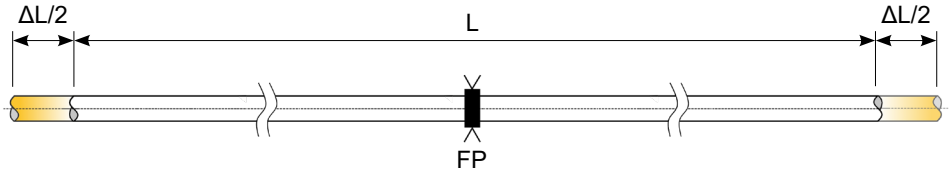
For hot-dip galvanised products, the upper temperature limit is 250 °C. S235JR (St 37) should not be used above 300 °C. For particularly high temperatures, the creep strength must be taken into account when selecting the material.

Determining the axial force of a Pipeline

Pipes that expand due to temperature changes and where movement is inhibited generate reaction forces at the supports. The tension increases in the pipe itself. Enormous forces quickly arise in pipes that are firmly clamped on both sides.

As a result, stresses or moments can occur that damage equipment, devices or the pipeline itself.

The primary task is to identify favourable pipe sections and quantify their absolute elongation. The arrangement of guide supports, floating supports and clamped fixed points is then used to guide the movement and influence the reaction force.



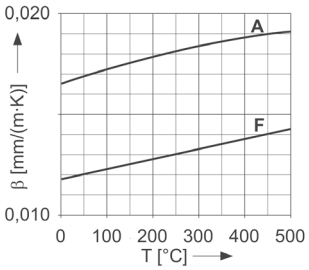
The pipeline expands during commissioning. Compared to the situation during installation or standstill, there are always different conditions. The temperature difference and the thermal expansion coefficient of the material are decisive for the absolute change in length.

$$\Delta L = L * \beta L * \Delta T$$

whereby:
ΔL = length change
L = pipeline length
βL [1] = coefficient of thermal expansion (1/K)
ΔT = temperature difference = $T_{Operational} - T_{Installation}$

[1] As the temperature rises, the coefficient of linear expansion continues to increase. For calculations above 200°C, therefore, the mathematical solution with integral coefficient of linear expansion must be used.

Coefficient of linear expansion	
material	β [mm/(mK)]
HDPE, PE	0.200
PB, PP	0.150
PVDF	0.12 ... 0.18
PVC	0.080
A = Steel (VA), Cu	0.017
F = Steel (ferr.)	0.012



With a pipe clamped on both sides, the following axial force occurs at the clamping points, and the following compressive stress in the pipe cross-section. The assumption here is that the pipe does not buckle beforehand.

$$f = E * (\Delta L/L) \qquad F = f * A$$

whereby:
F = axial force (N)
f = compressive stress (N/mm²)
A = cross-section of the pipe wall (mm²)
E = modulus of elasticity (N/mm²)

Load transfer

Fixed points must absorb forces in pipe axis consisting of several components:

1. Frictional force from elongation.
2. Bending force from elongation.
3. Spring force on the expansion joint.
4. Hydrostatic force at **K**.

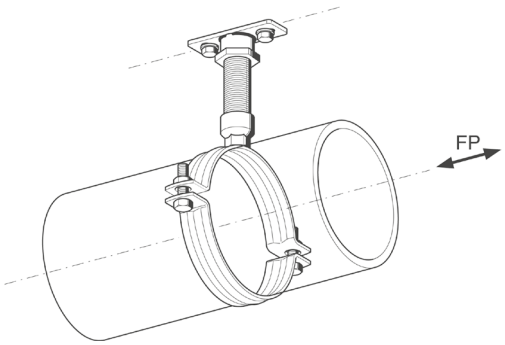


Figure 2.1: Pipe single fastening.

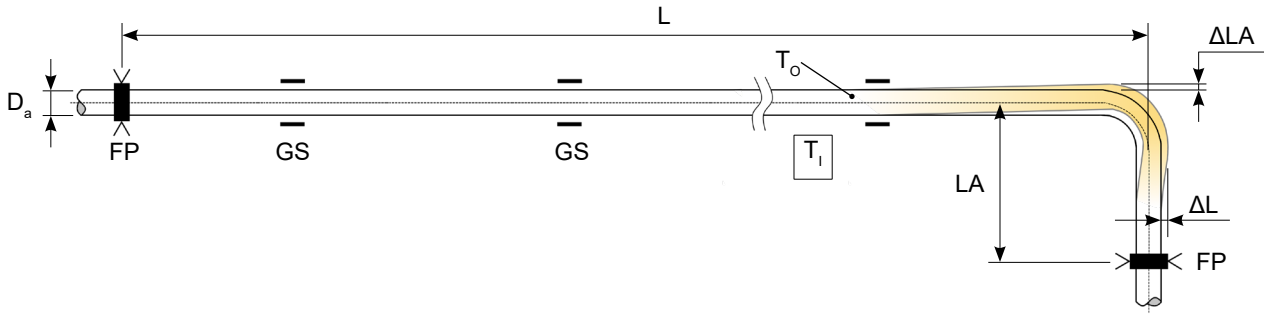
$$FP_{(1)} = FR + FB \qquad FP_{(2)} = FR + FH + FF$$

whereby:
FP = fixed point force
FR = frictional force
FB = bending force (bending leg)
FH = force resulting from hydrostat. Pressure
FF = spring force (expansion joint)

In order to safely avoid the pipes from slipping in the pipe clamps, stoppers have to be installed. At the fixed point the max. dislocation of a pipe should not exceed 3 mm.

Single angle bend (L-bend)

It is effective to use existing 90° directional changes in the pipe run as expansion compensation. This pipe section is clamped at both ends by FP. The guide supports allow free expansion in the axial direction and prevent undesired lateral deflection. By arranging LS or cross-slide combinations in the area of the 90° bend, the bending leg is extended and the fixed point forces are reduced enormously. This arrangement is shown schematically in the following figure. If one fixed point is determined by construction (e.g. wall opening), the position of the other fixed point and, if necessary, the FL must be calculated according to the following expressions.



Minimum length for bending leg LA

- Steel pipe (ferritic, austenitic)

$$LA_{min} = \sqrt{\frac{3 * E}{2 * f_{perm.}}} * \sqrt{\Delta L * D_a}$$

whereby:
LA_{min} = minimum bending leg length
E = E-modulus (N/mm²)
ΔL = length change (mm)
D_a = pipe outer diameter (mm)
$f_{perm.}$ = permissible stress (N/mm²)

- Plastic pipe

$$LA_{min} = C * \sqrt{\Delta L * D_a}$$

whereby:
LA_{min} = minimum bending leg length
ΔL = length change (mm)
D_a = pipe outer diameter (mm)
C: HDPE=26; MEPLA=33; PP=30; PVC=33.5; PVDF=21.6

Fixed point force

The fixed point force F_P is greater than bending force F_B, because friction force F_R of the guide support must be added.

$$F_P = F_R + F_B$$

$$F_R = \text{Frictional force} = \mu_r * M * L$$

whereby:
μ_r = coefficient of friction
M = pipe weight (kg/m) (water filled pipe)
L = pipe length (effective)

$$F_B = \text{Bending force} = E * I * (\Delta L^3/LA^3)$$

whereby:
E = E-modulus (N/mm²)
I = pipe moment of inertia (mm⁴)
ΔL = length change (mm)
LA = bending leg length (mm)

Practical Example

Parameters:

Steel pipe DIN 2448 ; Ø = 48.3mm
Wall thickness = 2.6 mm ; Weight (insulated) = 9.42 kg/m
Material: St (Ferrit) ; E-Modulus = 205,000 N/mm²
Coefficient βL [20...100°] = 12.2 * 10^{-6}/K ; $f_{perm.}$ = 152 N/mm²
Coefficient of friction (Sikla slide support) μ_r = 0.18
Pipe length L = 10.0 m / Bending leg length LA = 3.0 m
Temperature operational (T_O)= 80 °C
Temperature installation (T_I)= 20°C

Result:

$\Delta L = L * \beta L * \Delta T = 7.32$ mm
$\Delta LA = LA * \beta L * \Delta T = 2.20$ mm

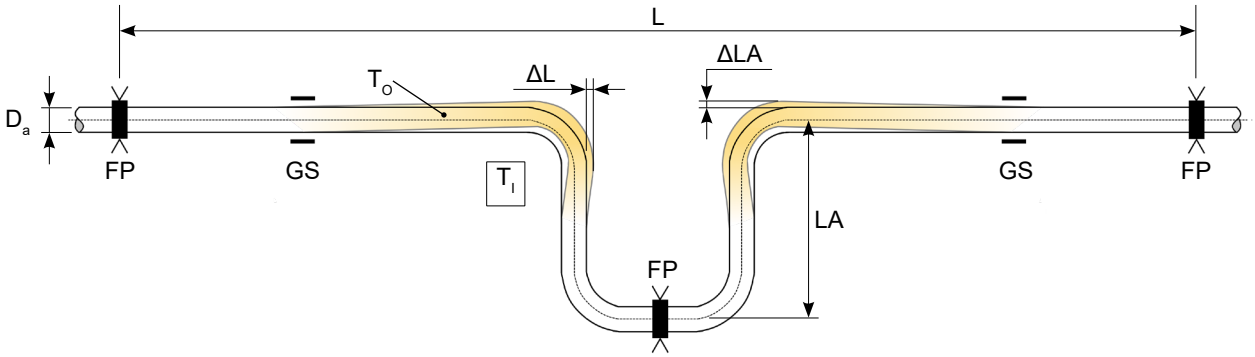
$LA_{min} = \sqrt{(3*E/(2*f_{zul}))} * \sqrt{(\Delta L*Da)} = 0.85m < LA$

F_R = Frictional force = $\mu_r * M * L = 0.17$ kN
F_B = Bending force = $E * I * (\Delta L^3/LA^3) = 0.02$ kN
F_P = Fixed point force = $F_R + F_B = 0.19$ kN

U-Bend

If there are no suitable changes of direction in the pipeline for natural expansion compensation, a U-bend can also be arranged to compensate for the linear deformation.

In addition to the length of the LA bending arm, its width must also be taken into account when placing the bend. Since the change in length of the U-bend is compensated by two bends, the necessary leg length is smaller than for the L-bend.



Minimum length for bending leg LA

Steel pipe (ferritic, austenitic)

$$LA_{min} = \sqrt{\frac{3 * E}{2 * f_{perm.}}} * \sqrt{\Delta L * D_a}$$

$$\Delta L = (L^* \beta L * \Delta T)/2$$

whereby:
LA_{min} = minimum bending leg length
E = E-modulus (N/mm²)
ΔL = length change (mm)
D_a = pipe outer diameter (mm)
$f_{perm.}$ = permissible stress (N/mm²)
L = pipeline length (m)
βL = coefficient of thermal expansion (1/K)
ΔT = temperature difference = T_O - T_I
T_O = operational temperature (°C)
T_I = installation temperature (°C)

Fixed point force

The fixed point force F_P is greater than bending force F_B, because friction force F_R of the guide support must be added.

$$F_P = F_R + F_B$$

$$F_R = \text{Frictional force} = \mu_r * M * L$$

whereby:
μ_r = coefficient of friction
M = pipe weight (kg/m) (water filled pipe)
L = pipe length (effective)

$$F_B = \text{Bending force} = E * I * (\Delta L^*3/LA^3)$$

whereby:
E = E-Modulus (N/mm²)
I = pipe moment of inertia (mm⁴)
ΔL = length change (mm)
LA = bending leg length (mm)

Practical Example

Parameters:

Steel pipe DIN 2448 ; Ø = 114.3mm
Wall thickness = 3.6 mm ; Weight (insulated) = 33.3 kg/m
Material: St (Ferrit) ; E-Modulus = 205,000 N/mm²
Coefficient βL [20...100°] = 12.6 * 10^{-6}/K ; $f_{perm.}$ = 132 N/mm²
Coefficient of friction (Sikla slide support) μ_r = 0,18
Pipe length L = 15.0 m ; Leg length LA (mm) = 2.5 m
Temperature operational (T_O) = 160°C
Temperature installation (T_I) = 20°C

Result:

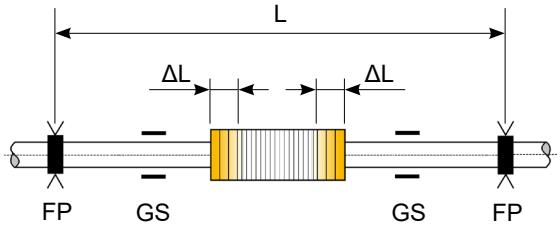
$\Delta L = (L * \beta L^* \Delta T) / 2 = 13.23$ mm
$\Delta LA = LA * \beta L * \Delta T = 4.41$ mm

$LA_{min} = \sqrt{(3*E/(2*f_{perm.}))} * \sqrt{(\Delta L*Da)} = 1.88$ m < LA

F_R = Frictional force = μ_r * M * L = 0.45 kN
F_B = Bending force = E * I * (ΔL*3 / LA^3) = 1.00 kN
F_P = Fixed point force = F_R+F_B= 1.45 kN

Expansion Joint

If natural expansion compensation is not feasible due to spatial conditions, artificial expansion compensation can be used. Expansion joints have the task of absorbing relative movements and displacements or decoupling forces, moments and vibrations from connections. Displacements can occur, for example, due to temperature differences, installation tolerances or foundation subsidence. The core component of a metal expansion joint is the bellows, which acts as a spring element due to its corrugated geometry and low wall thickness.



$$F_P = F_H + F_F + F_R$$

The pressure-induced axial force (F_H) usually forms the main part of the absolute fixed point force. However, the total fixed point force (F_P) is greater because the spring force of the expansion joint (F_F) and the frictional forces of the slide supports (F_R) are also included.

The following figure illustrate the expansion behaviour of the pipe. The longer the distance between the sliding support and the fixed point, the greater the sliding distance. Therefore, the installation position (off-centre position) of the slide plate relative to the holder has to be determined to allow for the full sliding distance to be accommodated by the sliding support. The location and the expected sliding distance and direction of movement must be taken into consideration.

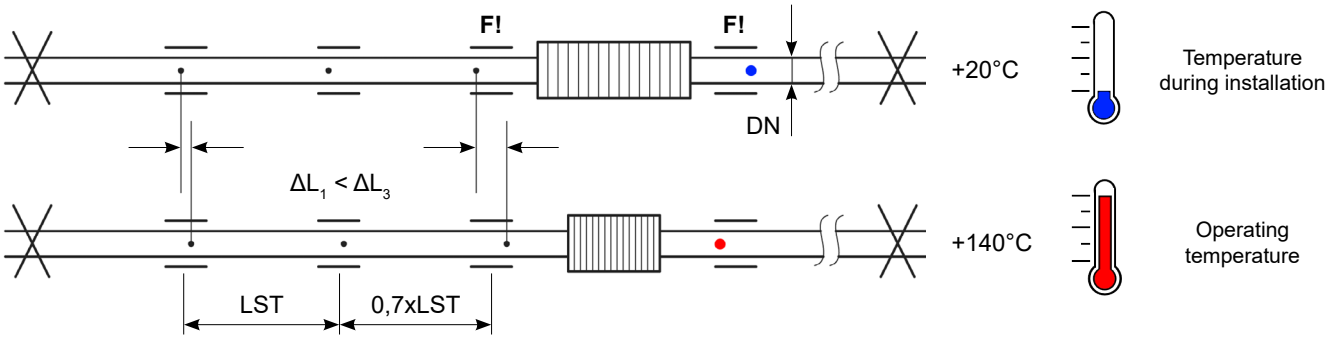


Figure 2.2: Directly before and after the expansion joint, in a distance of 2x pipe diam., two guided supports are required. Normally, the subsequent slide support should be installed with a shorter distance (0.7xLST). LST = pipe support distance.

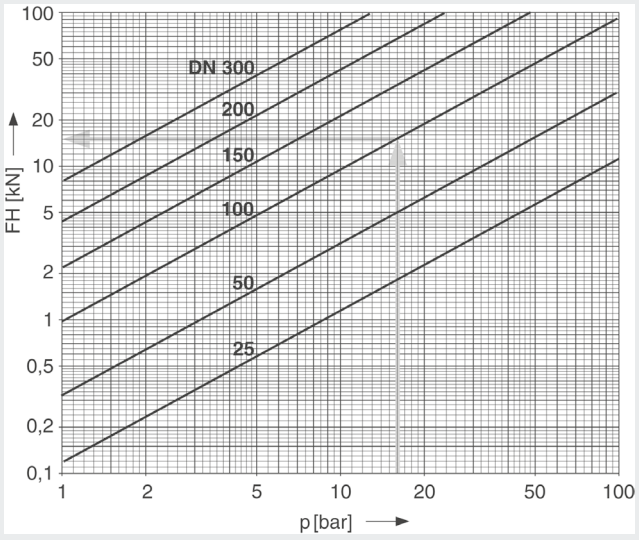
Practical Example

Parameters:

Steel pipe DIN 2448 ; DN 100
Wall thickness = 3.6 mm ; Weight (insulated) = 33.3 kg/m
Material: St (Ferrit) / E-Modulus = 205,000 N/mm²
Linear coeff. of therm.exp. (mm/m*K) = 0.012
$f_{perm.}$ = 147.0 N/mm²
Coefficient of friction (Sikla slide support) μ_r = 0,18
Pipe length L = 5.0 m
Temperature operational (T_O) = 100 °C
Temperature installation (T_I) = 25°C
E. Joint spring rate = 5 N/mm
E. Joint cross sectional area = 11,000 mm²
Test operational-pressure= 16.0 bar

Result:

Length change ΔL= (L * βL * ΔT) / 2 = 2.25 mm
F_R = Frictional force = μ_r * M * L = 0.29 kN
F_F = Spring force = 2 * ΔL * E. Joint spring rate = 0.02 kN
(1) F_H = Hydrostatic force ≈ 17.0 kN



$$F_P = F_H + F_R + F_F \approx 17{,}31 \text{ kN}$$

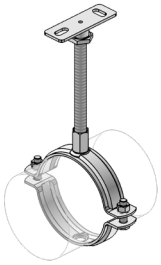
(1) For exact calculation of hydrostatic force F_H, the axial compensator (pipe expansion joint) has to be considered. On the basis of the nominal diameter DN, approximate values can be derived from the diagram.

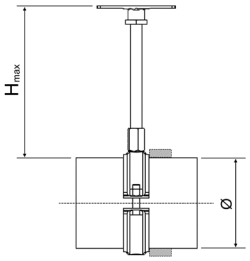
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With Siconnect fixed points, FP forces of up to approx. 35 kN can be transferred. Higher loads are also possible by connecting the same fixed points in series. The extensive combination options of pipe clamp, threaded rod or threaded tube and the base element allow technical and economic optimisation. Assemblies can be installed with or without bracing. The variant with struts is particularly favoured for large distances from the structure.

Mounting without bracing

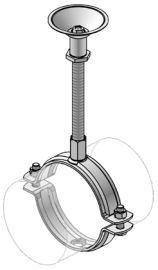
Single mounting with Mounting Plate GPL ss

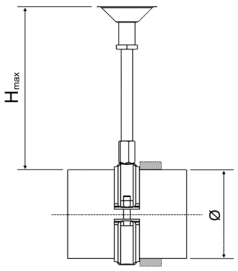




H_{max} = 500mm $F_{max.axial} \approx$ 2.5 kN

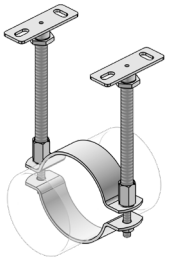
Single mounting with Support Cone SMD 1

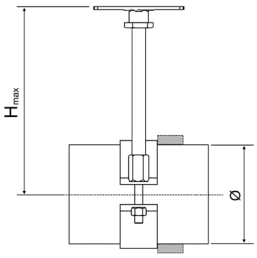




H_{max} = 500mm $F_{max.axial} \approx$ 2.5 kN

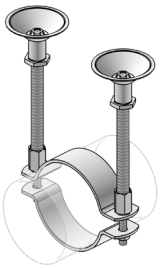
Double attachment with Mounting Plate GPL ss

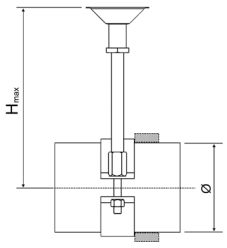




H_{max} = 500mm $F_{max.axial} \approx$ 3.5 kN

Double attachment with Support Cone SMD 1

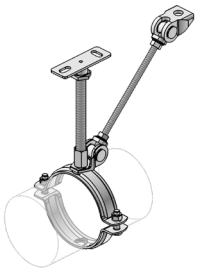


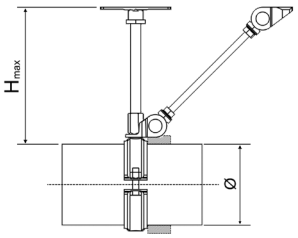


H_{max} = 500mm $F_{max.axial} \approx$ 3.5 kN

Mounting with bracing

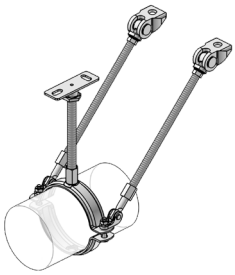
Single attachment + 1 Brace

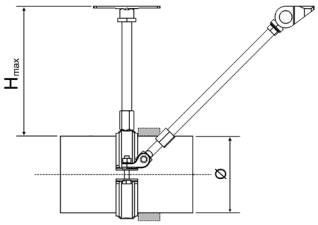




H_{max} = 1100mm $F_{max.axial} \approx$ 4.0 kN

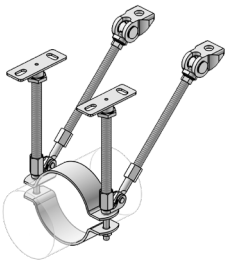
Single attachment + 2 Bracing

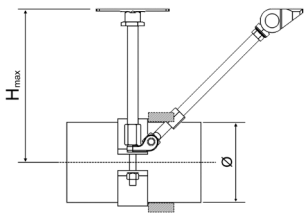




H_{max} = 1100mm $F_{max.axial} \approx$ 6.0 kN

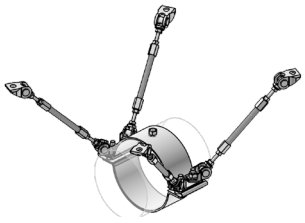
Double attachment + 2 Bracing

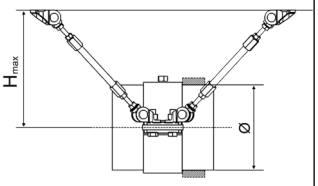




H_{max} = 1100mm $F_{max.axial} \approx$ 8.0 kN

Trestle Arrangement

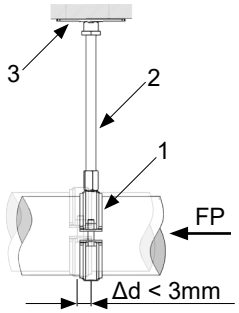




H_{max} = 1500mm $F_{max.axial} \approx$ 35 kN

All the constructions shown can be mounted on the wall, floor or ceiling.
To avoid movement of the pipe in the pipe clamp, stoppers are required.

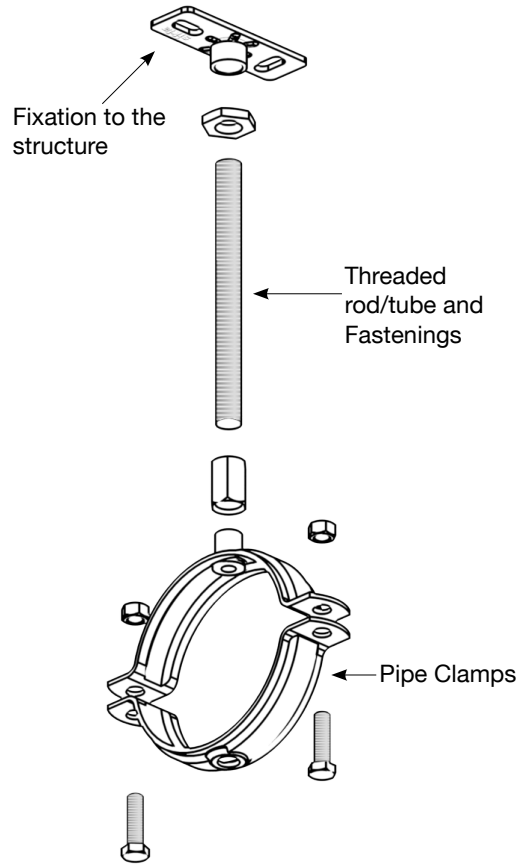
Mounting without bracing (up to 3.5 kN)



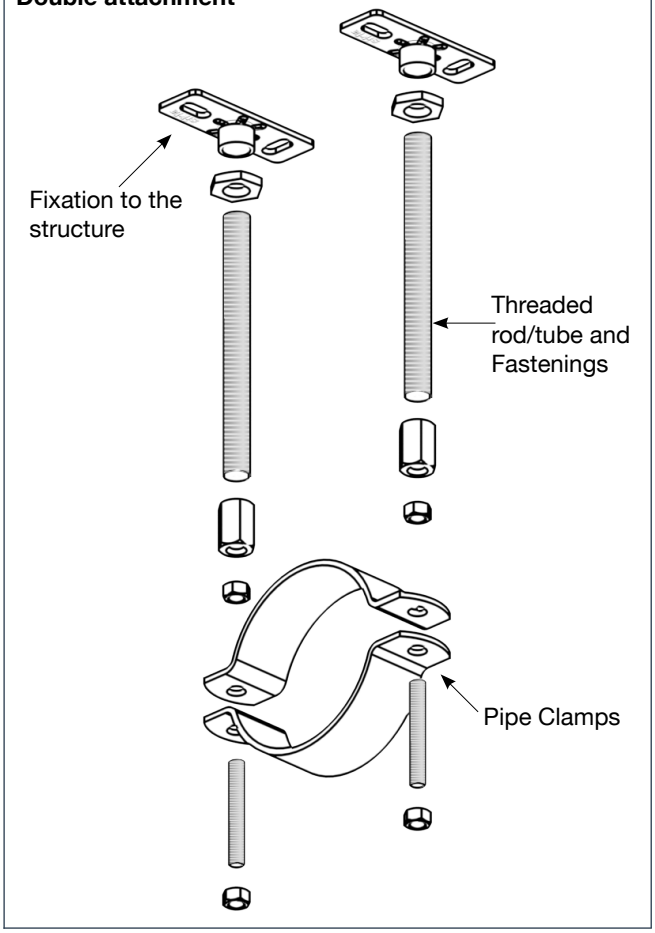
This FP design is installed by simply attaching a threaded rod or threaded tube between the pipe clamp (Pos.1) and the structure. The fixed point load generates a maximum bending moment on the rod (Pos.2) or base element (Pos.3).

The GPL Stabil Mounting Plate as a basic element which enables wall, ceiling and floor mounting. Thread adapters allow variation for ideal connection of all pipe clamps. This can be done either via the Triple-Thread Connector NT 3G or for double mounting on the two lateral clamp tabs.

Single mounting



Double attachment



Components | **Pipe Clamps** | **Threaded rod - Fastenings** | **Fixation to the structure**

1. Pipe Clamps



Stabil D-3G
Versatile connection with welded in 3G triple thread nut and Adapter.



Stabil RB-A
For particularly high static requirements in plant construction. Design similar to DIN 3567.



Stabil D-M16
With welded M16 nut; clamping bolts and nuts included in loose form.

2. Threaded Rod and Fastenings



GST GR
M8 1/2“
M10 3/4“
M12 1“
M16



Hexagon Nut NT
Satisfies: DIN 934
M8 M10 M12 M16



Locking Nut NT G
1/2“
3/4“
1“



Adapter AD f/f
Additional connection options for all Sikla Pipe Clamps equipped with 3G triple thread nut.

3. Fixation To The Structure



Mounting Plate GPL
For wall, ceiling and floor installation for mounting elements in M&E services.



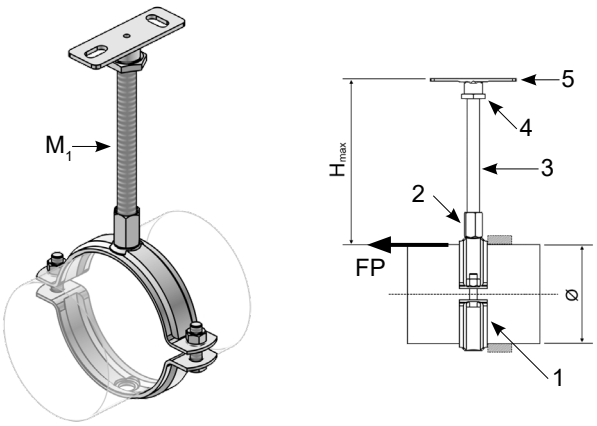
Support Cone SMD 1
Single-point mounting element for use with an anchor for floor, wall and ceiling.



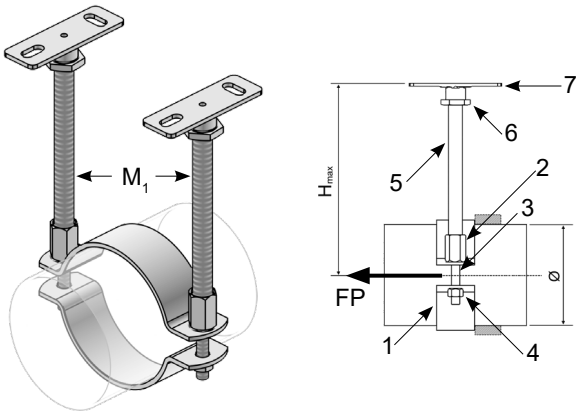
Mounting Plate GPL F 80 Stabil
Adapter plate for installing pipe clamps to Beam Section TP F80 or Channel System.

Permissible fixed point force

Single mounting with Mounting Plate GPL ss



Double attachment with Mounting Plate GPL ss



Parts list

Pos.	Product Description	Qty
1	Pipe Clamp Stabil D-3G / Stabil D M16	1
2	Adapter AD f/f	1
3	Threaded Rod GST - Threaded Tube GR [M_1]	1
4	Locking Nut NT G [M_1]	1
5	Mounting Plate GPL ss [M_1]	1

Thread M_1	H_{max} [mm]	Perm. Axial Force FP [kN]
M12	100	0.27
	150	0.18
	200	0.13
	250	0.08
	300	0.05
M16	100	0.67
	150	0.45
	200	0.34
	250	0.27
	300	0.16
1/2“	100	0.59
	200	0.29
	300	0.20
	400	0.11
	500	0.05
3/4“	100	1.28
	200	0.64
	300	0.43
	400	0.30
	500	0.15
1“	100	2.78
	200	1.39
	300	0.93
	400	0.69
	500	0.42

Parts list

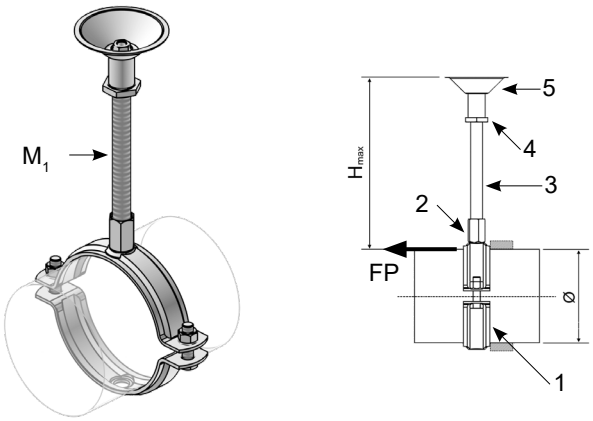
Pos.	Product Description	Qty
1	Pipe Clamp Stabil RB-A / Stabil D	1
2	Adapter AD f/f	2
3	Threaded Stud GST	2
4	Hexagon Nut NT	2
5	Threaded Rod GST - Threaded Tube GR [M_1]	2
6	Locking Nut NT G [M_1]	2
7	Mounting Plate GPL ss [M_1]	2

Thread M_1	H_{max} [mm]	Perm. Axial Force FP [kN]
M12	100	0.54
	150	0.36
	200	0.27
	250	0.16
	300	0.09
M16	100	1.34
	150	0.89
	200	0.67
	250	0.54
	300	0.32
1/2“	150	0.78
	200	0.59
	300	0.39
	400	0.21
	500	0.11
3/4“	150	1.71
	200	1.28
	300	0.85
	400	0.60
	500	0.31
1“	150	3.70
	200	2.78
	300	1.85
	400	1.39
	500	0.83

Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 1" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

Permissible fixed point force

Single mounting with Support Cone SMD 1

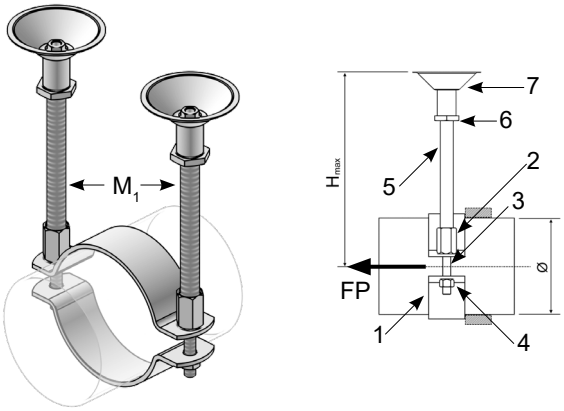


Parts list

Pos.	Product Description	Qty
1	Pipe Clamp Stabil D-3G / Stabil D M16	1
2	Adapter AD f/f	1
3	Threaded Rod GST - Threaded Tube GR [M_1]	1
4	Locking Nut NT G [M_1]	1
5	Support Cone SMD 1 [M_1]	1

Thread M_1	H_{max} [mm]	Perm. Axial Force FP [kN]
M12	100	0.36
	150	0.21
	200	0.15
	250	0.11
	300	0.06
M16	100	0.91
	150	0.54
	200	0.39
	250	0.30
	300	0.21
1/2“	100	1.29
	150	0.77
	200	0.55
	300	0.33
	400	0.13
	500	0.06
3/4“	100	2.74
	150	1.65
	200	1.18
	300	0.75
	400	0.36
	500	0.18

[1] Double attachment with Support Cone SMD 1



Parts list

Pos.	Product Description	Qty
1	Pipe Clamp Stabil RB-A / Stabil D	1
2	Adapter AD f/f	2
3	Threaded Stud GST	2
4	Hexagon Nut NT	2
5	Threaded Rod GST - Threaded Tube GR [M_1]	2
6	Locking Nut NT G	2
7	Support Cone SMD 1 [M_1]	2

Thread M_1	H_{max} [mm]	Perm. Axial Force FP [kN]
M12	100	0.72
	150	0.43
	200	0.31
	250	0.22
	300	0.12
M16	100	1.81
	150	1.08
	200	0.77
	250	0.60
	300	0.42
1/2“	100	1.54
	150	1.09
	200	0.67
	300	0.26
	400	0.13
	500	0.07
3/4“	100	3.31
	150	2.37
	200	1.51
	300	0.72
	400	0.36
	500	0.20

[1] Realisable from DN50 (2")

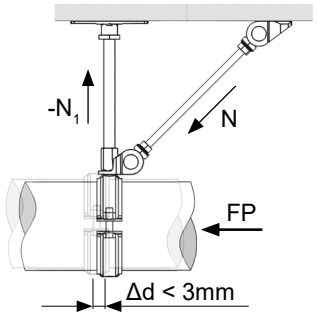
Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 1" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

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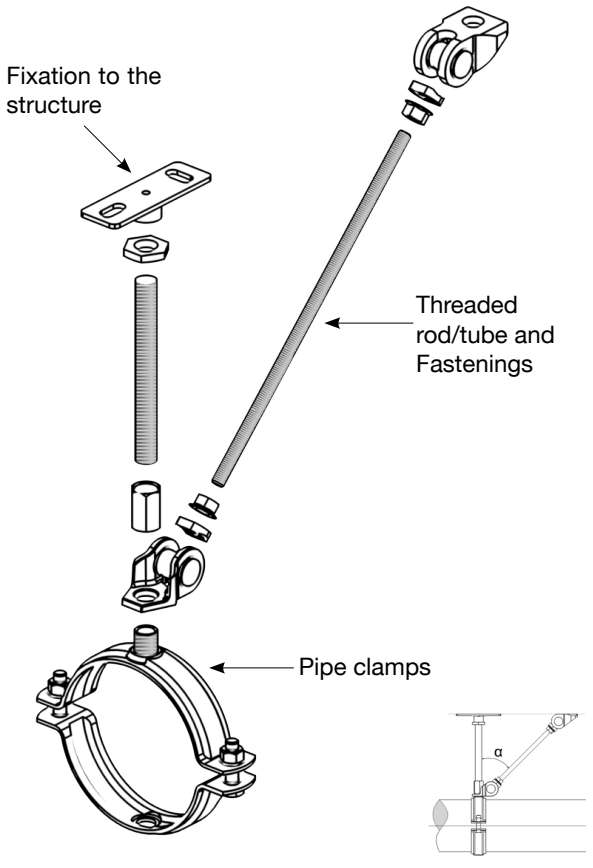
Mounting with bracing (up to 8.0 kN)

The maximum permissible fixed point force of the construction groups can be significantly increased by using brace supports. Inclined tie rod in the form of threaded rods or threaded tubes enable a precise construction optimized to the load requirement.

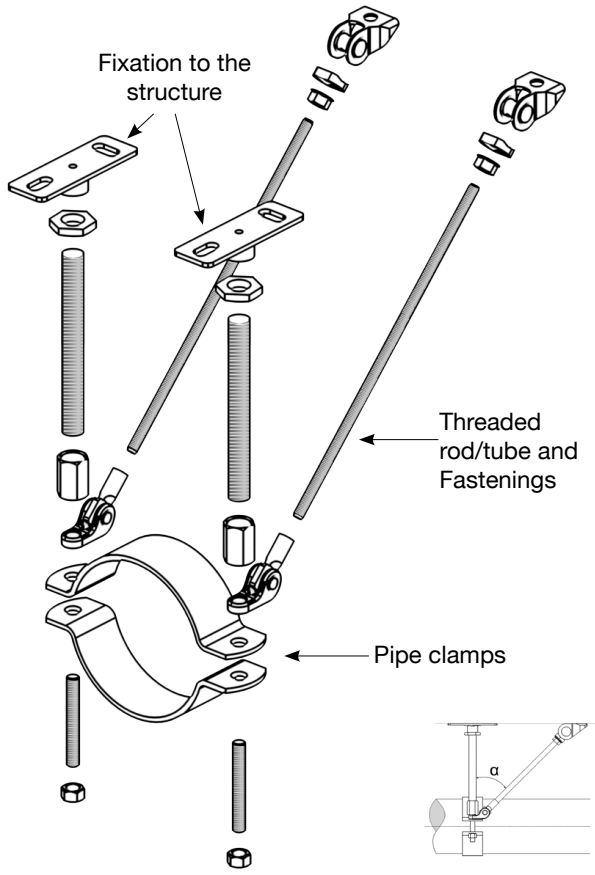
Universal joints (UG) and Support joints (SG) allow a brace angle adjustment for adaptation to structural conditions and can be adapted to 3G Nut or directly on pipe clamp flanges.



Sloped supports on centric clamp nut (with UG FP Joint)



Sloped supports on Clamp flanges (with SG Joint)



Components | **Pipe Clamps** | **Threaded rod - Fastenings** | **Fixation to the structure**

1. Pipe Clamps

Stabil D-3G
Versatile connection with welded in 3G triple thread nut and Adapter.

Stabil RB-A
For particularly high static requirements in plant construction. Design similar to DIN 3567.

Stabil D-A
Two parts pipe clamp without clamping bolts and nuts.

Stabil D M-16
With welded M16 nut; clamping bolts and nuts included in loose form.

2. Threaded Rod and Fastenings

GST	GR
M8	1/2“
M10	3/4“
M12	1“
M16	

Support Joint SG
Fixed directly to the flanges of the pipe clamp with adjustable brace angle.

Universal Joint UG
Universal connection for attachment to non-horiz. components. Infinitely variable angle adjustment.

Adapter AD f/f
Additional connection options for all Sikla Pipe Clamps equipped with 3G triple thread nut.

3. Fixation To The Structure

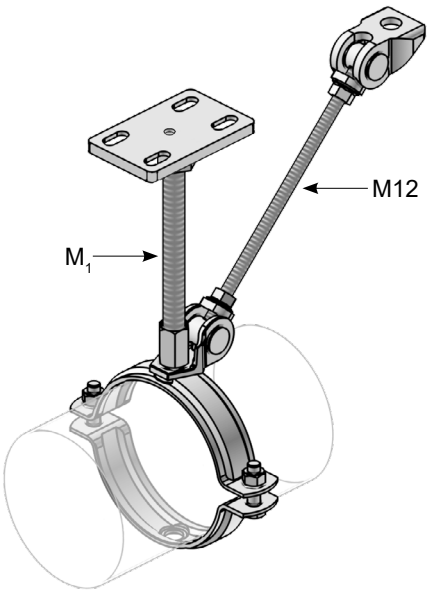
Mounting Plate GPL
For wall, ceiling and floor installation for mounting elements in M&E services.

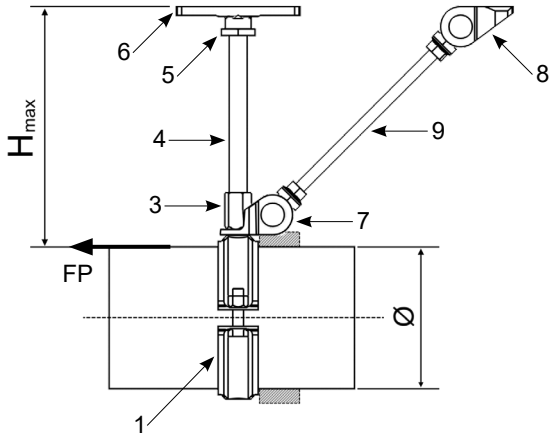
Support Cone SMD 1
Single-point mounting element for use with an anchor for floor, wall and ceiling.

Mounting Plate GPL F 80 Stabil
Adapter plate for installing pipe clamps to Beam Section TP F80 or Channel System.

Permissible fixed point force

Single attachment + 1 Brace M12 on centric clamp nut



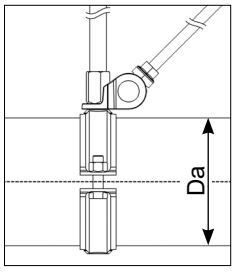


Perm. Axial Force FP [kN]		
Thread M_1	H_{max} [mm]	FP [kN]
GST M16	200	2.85
	300	2.44
	500	2.20
	700	2.11
	900	1.48
	1100	0.99
GR 1/2“	200	3.12
	300	2.63
	500	2.24
	700	2.12
	900	2.06
	1100	1.56
GR 3/4“	200	3.65
	300	3.60
	500	2.44
	700	2.19
	900	2.09
	1100	2.02
GR 1“	200	4.24
	300	3.99
	500	2.79
	700	2.32
	900	2.15
	1100	2.06

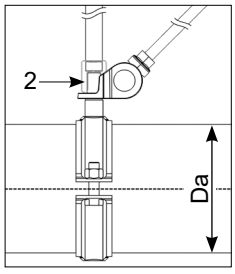
Parts list

Pos.	Product Description	Qty
1	Stabil D-3G / Stabil D M16	1
2*	Threaded Stud GST M16x50	1
3	Adapter AD f/f	1
4	Threaded Rod GST - Threaded Tube GR [M_1]	1
5	Locking Nut NT G [M_1]	1
6	Mounting Plate GPL F 80 Stabil [M_1]	1
7	Universal Joint UG FP M12	1
8	Universal Joint UG M12	1
9	Threaded Rod GST M12	1

(*) Position 2



15mm < Da < 129mm



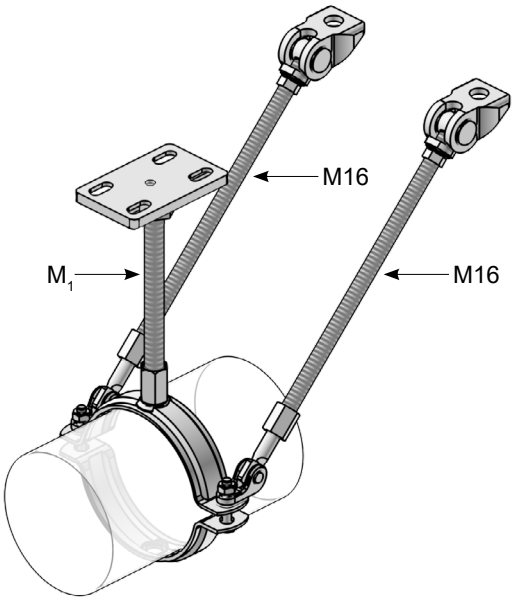
133mm < Da < 521mm

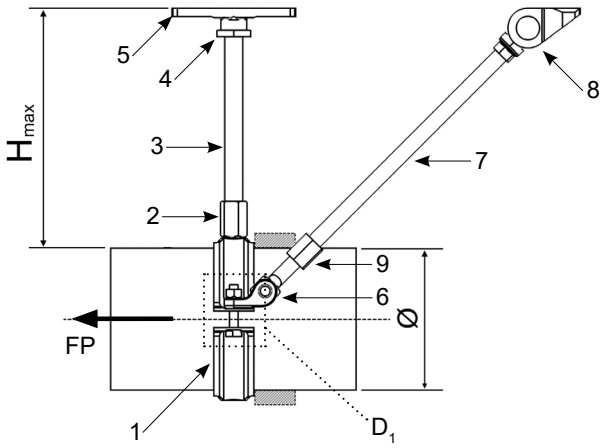
Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 1" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

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Permissible fixed point force

Single attachment + 2 Bracing M16 on clamp flanges





Perm. Axial Force FP [kN]		
Thread M_1	H_{max} [mm]	FP [kN]
GST M16	200	4.36
	300	4.14
	500	3.74
	700	2.44
	900	1.47
	1100	0.98
GR 1/2“	200	4.50
	300	4.32
	500	3.78
	700	3.57
	900	2.33
	1100	1.56
GR 3/4“	200	5.61
	300	5.23
	500	3.97
	700	3.64
	900	3.46
	1100	3.31
GR 1“	200	6.35
	300	4.91
	500	4.41
	700	3.80
	900	3.53
	1100	3.35

Parts list

Pos.	Product Description	Qty
1	Stabil D-3G / Stabil D M16	1
2	Adapter AD f/f	1
3	Threaded Rod GST - Threaded Tube GR [M_1]	1
4	Locking Nut NT G [M_1]	1
5	Mounting Plate GPL F 80 Stabil [M_1]	1
6	Support Joint SG	2
7	Threaded Rod GST M16	2
8	Universal Joint UG M16	2
9	Reducer AD f/m 16/10	2

(D_1) For the assembly of the Support joint SG, a longer screw must be used, according to the following table:

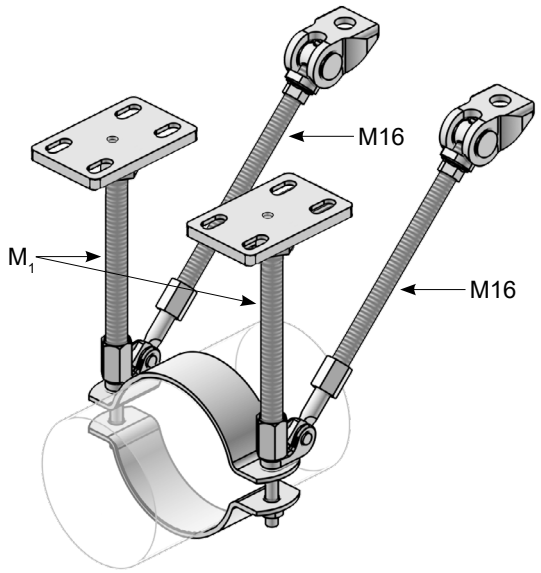
Pipe Clamp	Size range [mm]	Hexagon Bolt SKT	
		Type	Part Nr.
Stabil D-3G	(1) 76 to 129	SKT M8/60	114705
	133 to 173	SKT M10/60	138635
	176 to 316	SKT M12/60	138680
Stabil D-M16	218 to 277	SKT M12/60	138680
	316 to 521	SKT M16/80	138750

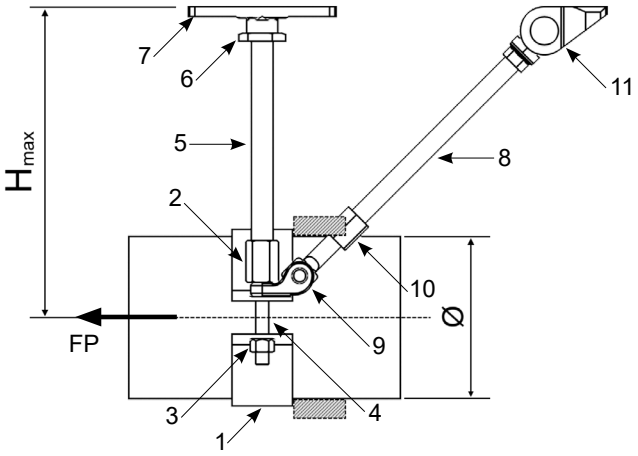
(1) Hexagon Nut NT M8 + Washer US 8/125 necessary.

Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 2 1/2" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

Permissible fixed point force

Double attachment + 2 Bracing M16 on clamp flanges





Perm. Axial Force FP [kN]		
Thread M_1	H_{max} [mm]	FP [kN]
GST M16	200	5.39
	300	4.58
	500	3.99
	700	3.83
	900	2.95
	1100	1.97
GR 1/2“	200	6.21
	300	5.27
	500	4.38
	700	4.15
	900	4.02
	1100	3.12
GR 3/4“	200	7.25
	300	7.09
	500	4.78
	700	4.30
	900	4.09
	1100	3.96
GR 1“	200	8.29
	300	7.54
	500	5.66
	700	4.62
	900	4.24
	1100	4.04

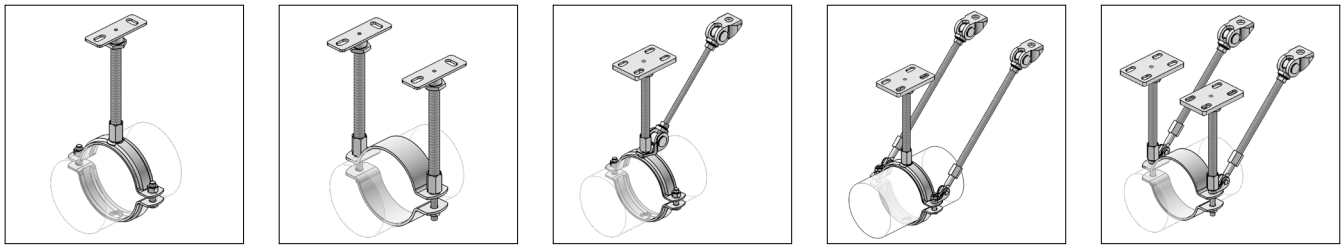
Parts list

Pos.	Product Description	Qty
1	Stabil RB-A / Stabil D	1
2	Adapter AD f/f	2
3	Hexagon Nut NT	2
4	Threaded Stud GST	2
5	Threaded Rod GST - Threaded Tube GR [M_1]	2
6	Locking Nut NT G [M_1]	2
7	Mounting Plate GPL F 80 Stabil [M_1]	2
8	Threaded Rod GST M16	2
9	Support Joint SG	2
10	Reducer AD f/m 16/10	2
11	Universal Joint M16	2

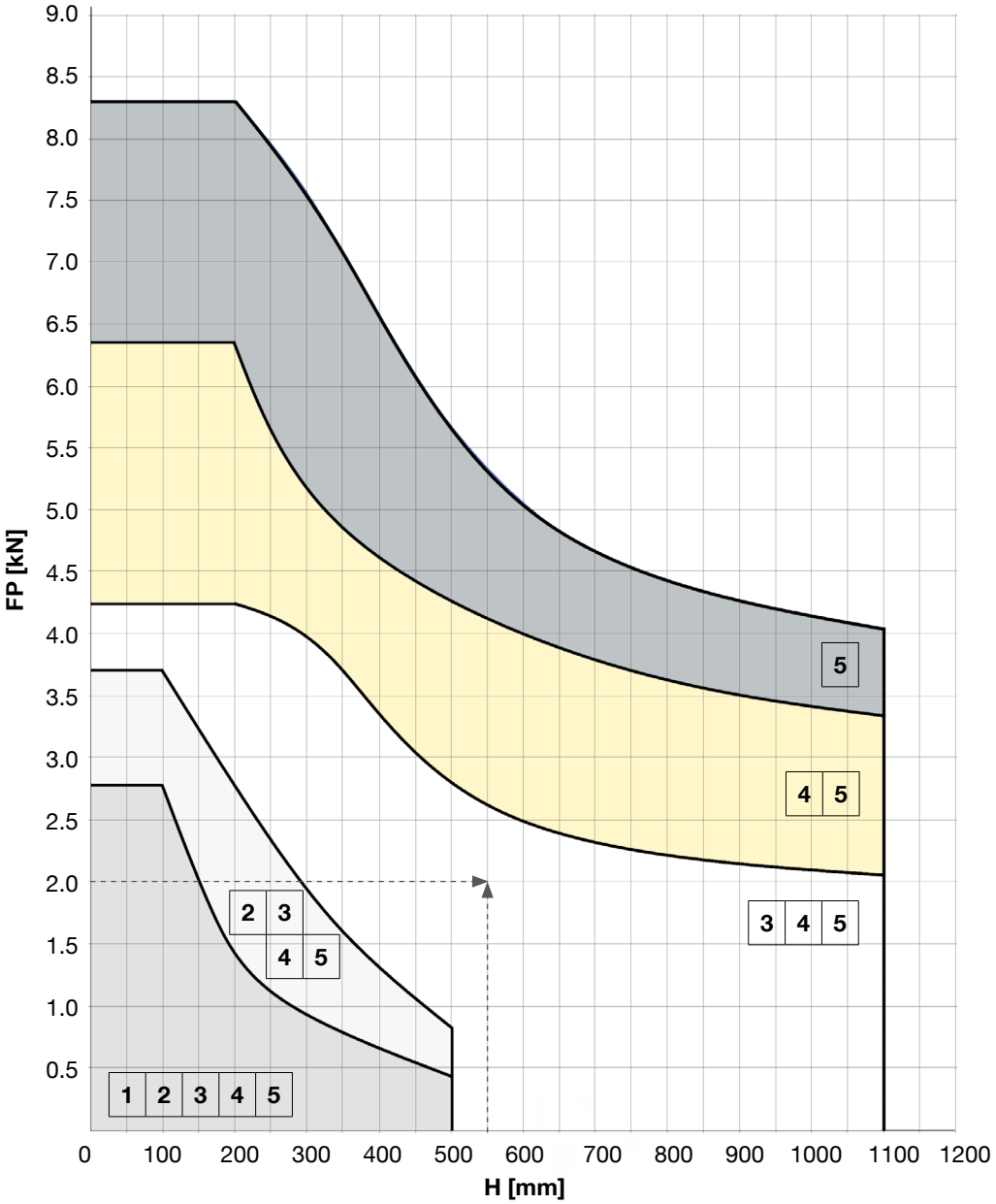
Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 1" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

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Selection of the fixed point type



Type 1 | Type 2 | Type 3 | Type 4 | Type 5



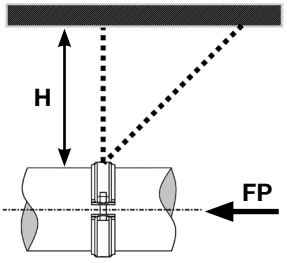


Figure 3.1: Siconnect assembly by height and fixed point force

Example

Parameters: H = 550mm ; FP = 2.0 kN
Result: possible mounting types: **Type 3, Type 4 and Type 5**

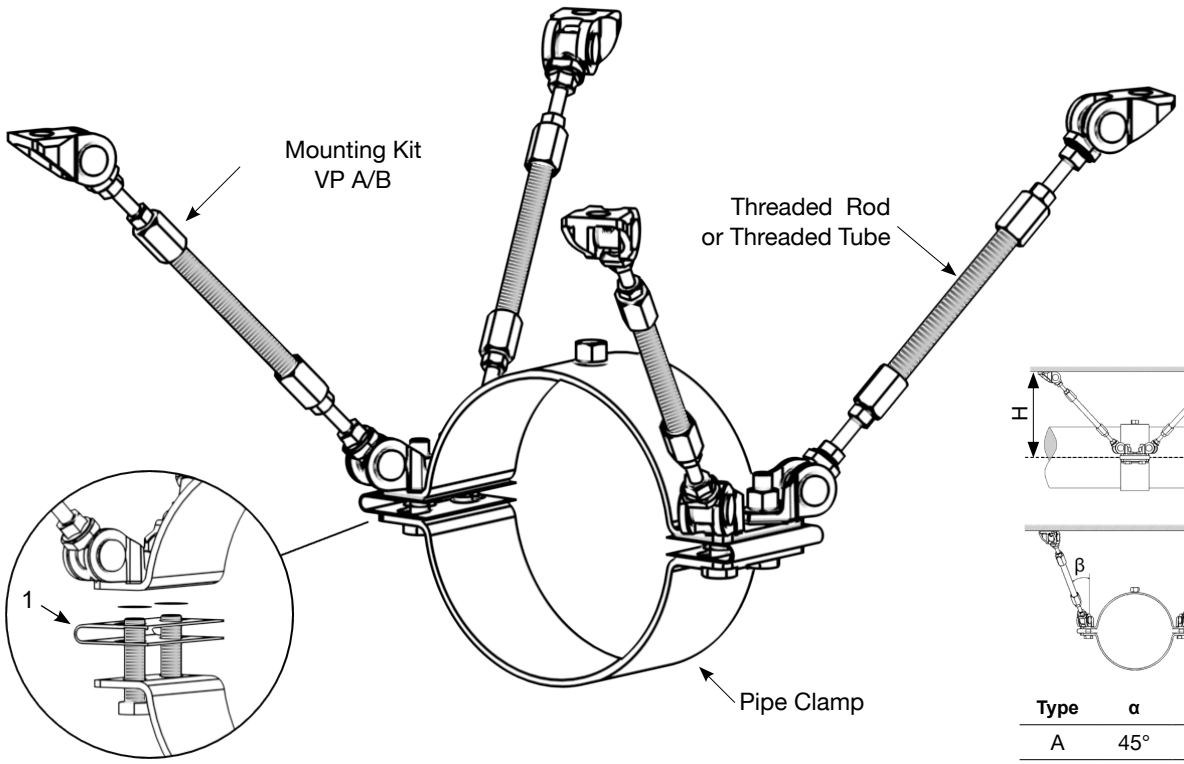
Valid only for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel casing in normal wall thickness (DN from 1" to 10").
All constructions shown can also be used upright. The load capacity of the anchors must be taken into account according to local conditions.
In order to safely avoid the pipes from slipping in the pipe clamps,stoppers have to be installed.

Trestle Arrangement (up to 35 kN)

The symmetrical FP design enables the absorption of both axial shear forces and resulting shear forces. Forces and moments in all directions are safely transferred into the structure via this clamping fixed point. The fixed point clamp with patented support element (Pos.1) generates high and defined clamping forces when the clamping screws are tightened. In the case of steel pipes with large walls, it is usually possible to dispense with the attachment of cleats. Connection package (with or without sound insulation) and 4 individually adjustable supports (Sikla threaded pipes or rods) complete the fixed point.

To design a fixed point in a trestle arrangement, the pipe diameter, fixed point force and structure distance to the pipe axis must be available.

Trestle Arrangement without sound insulation / Mounting Kit



Type	α	β
A	45°	22,5°
B	30°	13,4°

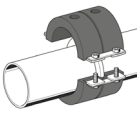
Components	Pipe Clamp	Threaded Rod/Threaded Tube	Mounting Kit VP A/B

1. Pipe Clamp



Fixed Point Clamp FS

To be used for Fixed Point installations in combination with Mounting Kits. Clamping bolts and spring inserts are fixed and retained to the lower part of the clamp.



Chilled Water Fixed Point Clamp FKS

Chilled Water clamp for the absorption of axial forces. The contraction forces are transferred to the pipe clamp by a pressure ring welded to the perimeter of the pipe.

2. Mounting Kit VP A/B



Mounting Kit VP A/B

Assembly of sloped supports for Fixed Points. With the beveled Universal Joint UG FP, the sloped supports could be mounted directly to the Fixed Point Clamp.



GST	GR
M12	1/2“
M16	3/4“
	1“

Procedure for the design of trestle constructions

Input values D, H, FP, G

↓

FG = FP + G (in kN)

↓

Type static
Set type A or type B and
determine support dimension
from diagram

↓

Calculation of
- **Hole pattern** on the structure **LB**, **LL**
- Saw length for one prop **LAB**

↓

Anchor selection incl. check for
compliance with centre distances

↓

Order
Package 1 **Fixed point clamp** (complete)
Package 2 **Mounting Kit**
Package 3 **Threaded Rod or Threaded Tube** (for supports)

↓

Follow the installation instructions, if necessary,
attach anti-slip devices (Stoppers)

The following input values are required:

D = Outer diameter
H = Distance from pipe centre to building structure
FP = Fixed point force
G = weight share of the pipeline at the fixing point

Determination of the total force **FG**

valid for:
- Ceiling mounting
- Floor mounting
- Wall mounting (as downpipe)

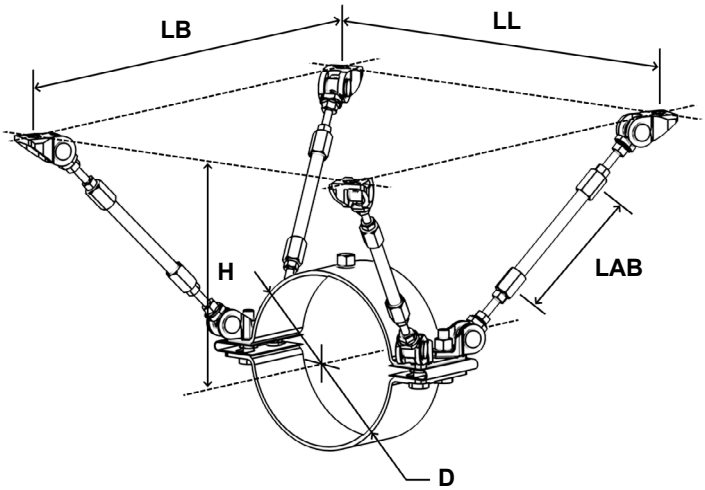
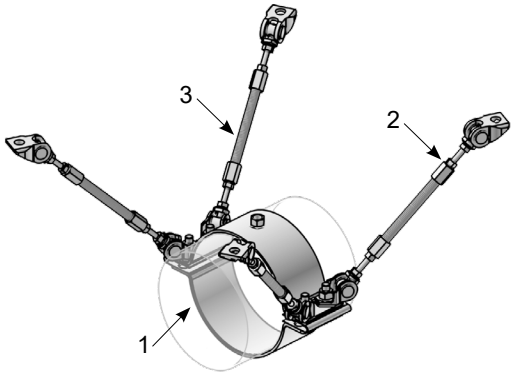
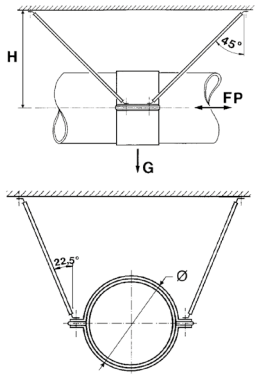


Figure 3.2: Trestle arrangement mounting dimensions

Permissible fixed point force

Type static for trestle construction type A (45°)





Parts list

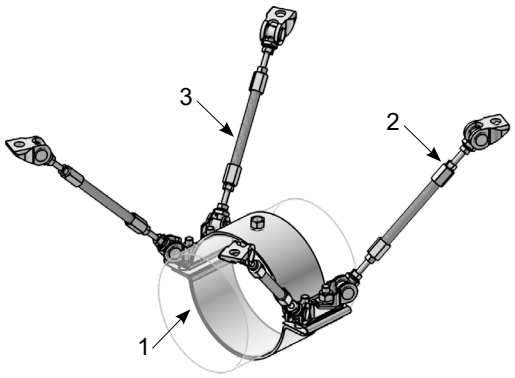
Pos.	Product description	Qty
1	Fixed point clamp FS	1
2	Mounting Kit VP A/B	1
3	Threaded rod / Threaded tube	4

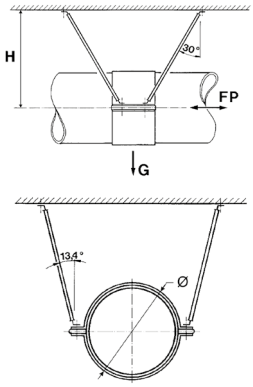
Max. Permissible fixed point force FG [kN]						
Ø [mm]	Mounting Kit A/B	H_{max} [mm]				
		250	500	750	1000	1500
21.3 < Ø < 33.7	M12	9.3	2.9	-	-	-
	M16	15.6	8.7	-	-	-
	1/2"	21.3	15.0	6.5	-	-
	3/4"	27.8	34.4	19.7	11.0	-
	1"	35.2	35.2	35.2	27.8	12.3
42.4 < Ø < 60.3	M12	9.1	2.6	-	-	-
	M16	15.9	8.5	-	-	-
	1/2"	21.6	14.7	6.3	-	-
	3/4"	28.1	34.9	19.4	10.7	-
	1"	34.9	34.9	34.9	27.5	12
76.1 < Ø < 114	M12	7.9	1.5	-	-	-
	M16	14.8	7.4	-	-	-
	1/2"	22.4	13.6	5.2	-	-
	3/4"	29.2	33.8	18.3	9.6	-
	1"	33.8	33.8	33.8	26.4	10.9
133 < Ø < 168	M12	6.4	-	-	-	-
	M16	13.2	5.8	-	-	-
	1/2"	21.3	12.0	3.6	-	-
	3/4"	28.7	32.2	16.7	8.00	-
	1"	32.2	32.2	32.2	24.8	9.3
219 < Ø < 274	M12	2.5	-	-	-	-
	M16	9.3	2.0	-	-	-
	1/2"	17.5	8.2	-	-	-
	3/4"	28.4	28.4	12.9	4.20	-
	1"	28.4	28.4	28.4	21	5.4
324 < Ø < 356	1/2"	-	4.1	-	-	-
	3/4"	-	24.3	8.8	-	-
	1"	-	24.3	24.3	16.9	1.4
407 < Ø < 508	3/4"	-	14.3	-	-	-
	1"	-	14.3	14.3	7.0	-

Valid for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel jacket for pipes in normal wall thickness.
For the version with sound insulation, the load limit is 25 kN.

Permissible fixed point force

Type static for trestle construction type B (30°)





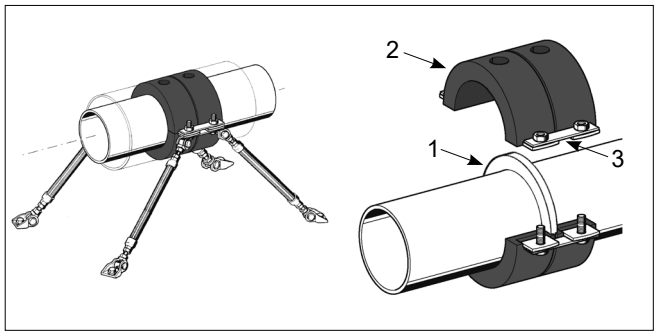
Parts list

Pos.	Product description	Qty
1	Fixed point clamp FS	1
2	Mounting Kit VP A/B	1
3	Threaded rod / Threaded tube	4

Max. Permissible fixed point force FG [kN]						
Ø [mm]	Mounting Kit A/B	H_{max} [mm]				
		250	500	750	1000	1500
21.3 < Ø < 33.7	M12	6.5	3.2	-	-	-
	M16	9.6	9.8	4.2	-	-
	1/2"	13.5	16.3	7.3	4.0	-
	3/4"	17.8	21.0	22.1	12.3	5.4
	1"	25.3	25.3	23.7	23.7	13.7
42.4 < Ø < 60.3	M12	6.4	2.9	-	-	-
	M16	10.3	9.5	4.0	-	-
	1/2"	14.2	16.5	7.1	3.8	-
	3/4"	18.7	21.7	21.8	12.0	5.1
	1"	25.0	25.0	25.0	25.0	13.5
76.1 < Ø < 114	M12	5.3	1.8	-	-	-
	M16	9.8	8.4	2.9	-	-
	1/2"	13.9	15.4	6.0	2.7	-
	3/4"	18.6	21.4	20.7	10.9	4.0
	1"	23.9	23.9	23.9	23.9	12.3
133 < Ø < 168	M12	3.7	-		-	-
	M16	8.6	6.8	1.3	-	-
	1/2"	13.7	13.8	4.4	1.1	-
	3/4"	18.6	21.3	19.1	9.4	2.4
	1"	22.3	22.3	22.3	22.3	10.8
219 < Ø < 274	M16	4.8	3.0	-	-	-
	1/2"	10.6	9.9	-	-	-
	3/4"	16.9	18.5	15.2	5.5	-
	1"	18.5	18.5	18.5	18.5	6.9
324 < Ø < 356	1/2"	-	5.9	-	-	-
	3/4"	-	14.4	11.2	1.4	-
	1"	-	14.4	14.4	14.4	2.9
407 < Ø < 508	3/4"	-	4.4	1.2	-	-
	1"	-	4.4	4.4	4.4	-

Valid for steel pipes 100% - insulation with 100 kg/m³ and 1 mm sheet steel jacket for pipes in normal wall thickness.
For the version with sound insulation, the load limit is 18 kN.

Chilled Water Fixed Point Clamp FKS



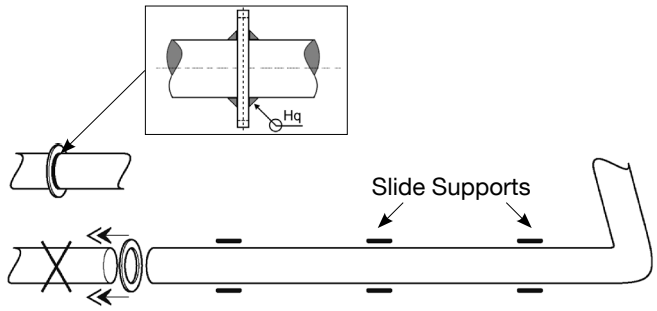
Chilled Water Fixed point clamp for absorbing loads in axial direction. The axial forces are transmitted via a thrust ring welded onto the pipe (Pos.1). The fixed point forces are transmitted to the fixing points via the clamp body (Pos.2).

Fixed point clamp consisting of:
4 half shells
2 splice plates (Pos.3)
1 pressure ring
as well as bolts and nuts.

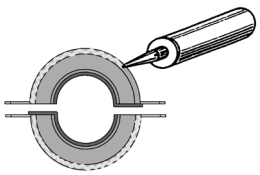
Installation to the pipe

① Preparation

Push the pressure ring onto the pipe, weld and conserve.



Apply sealant to the edge faces of the clamps such that the pressure ring will be fully sealed when the pipe clamp half-shells are pushed together onto the pressure ring.



Note:

The pressure ring must be fixed to the pipe at right angles to the pipe axis without tilting in order to ensure perfect power transmission.

Welding on the pipe is done with a weld seam on both sides of the thrust collar.

Dimensioning of the weld seams:

Shear stress for structural steel (at least 70 N/mm²).
Assumed seam height H_q = 3 mm.

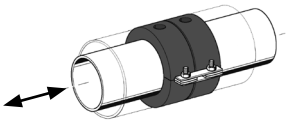
The **permissible relative weld load capacity** **$FSN_{perm.}$** is 210 N/mm. (70 N/mm² * 3 mm).

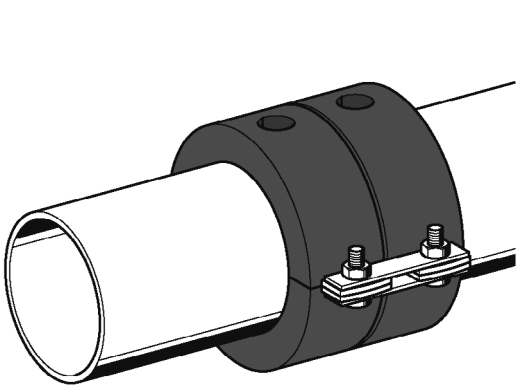
Weld length LN = Fx / FSN_{zul}
each pipe outside diameter.

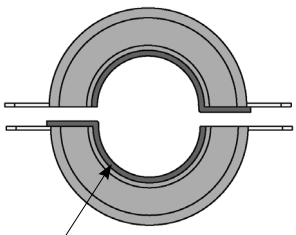
Ex: LN (D_a = 76.1 mm) = 2,000 N / (210 N/mm) = 9.5 mm

② Installation insulation parts

Position the half-shells and the connecting bracket on the pipe. Pre-assemble the connecting elements. After assembly, check that the joint between the clamps is exactly sealed with sealing paste.







Between the cut edges of the pipe shells and the inner surface of the shell bores, a rubber insert has been integrated which allows a diffusionfree sealed connection to the chilled water or refrigeration pipe.

Type [DN]	Insulating thickness [mm]	Max. Fixed point load (shear) [kN]
78.1	30	2.0
88.9	30	2.0
108	30	2.5
114.3	40	3.0
133	40	3.5
139.7	40	5.0
168.3	40	5.5
219.1	60	9.5
273	60	13.0
323.9	60	14.5

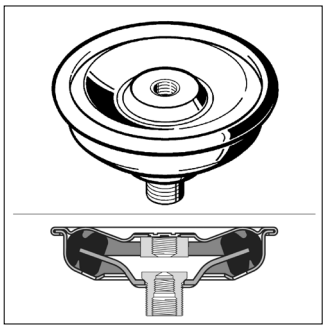
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Sound absorption fixed points

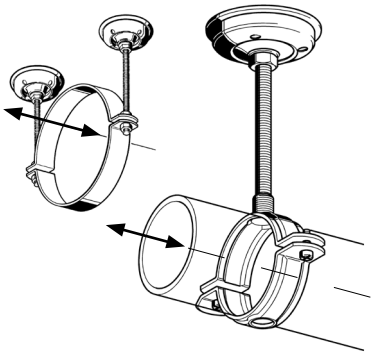
Sound-absorbing elements are suitable for sound-decoupled fixings for sound insulation requirements according to DIN 4109. Pipe clamps with inserts are only suitable as sound-absorbing fixed points for low fixed point forces. For higher requirements, sound insulation elements should be used in the substructure. In this case, the pipe is installed with a clamp without an insert. The decoupling to the building structure is then done by sound insulation elements.

All solutions shown in this chapter are suitable for both hanging and standing arrangements. For wall installations, the weight of the pipe must be supported by separate brackets. To avoid movement of the pipe in the pipe clamp, shear restraints are required (see chapter 5.2). The load capacity of the anchors must be taken into account according to local conditions.

Sound Absorber
SDE 1

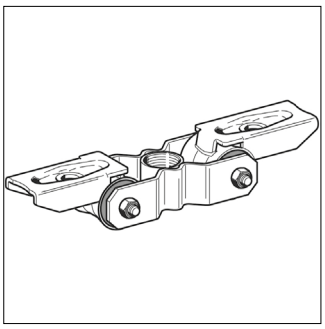


Various applicable sound absorption element according to DIN 4109.

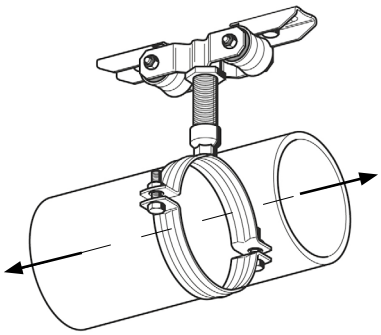


Max. Fixed point force up to 0,5 kN

Sound Absorber
SDE 2 - FP 1

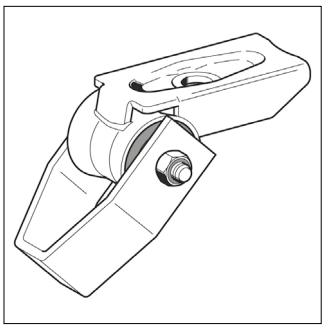


single point connections to GR tubes up to 1" as a base for soundproof fixed points.

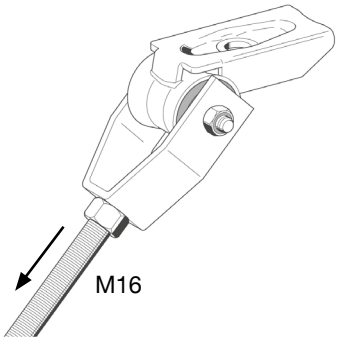


For fixed points up to 3 kN

Sound Absorber
SDE 2 - UG 16



Suitable for installation of soundproof inclined supports.



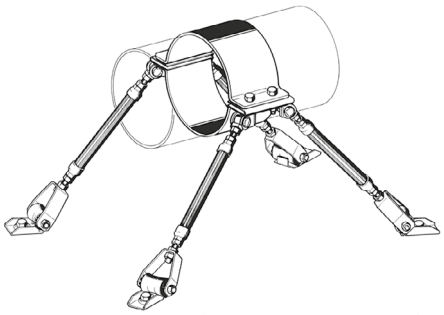
Additional inclined support

Alternative variants of pipe fastening for systems with sound insulation requirements according to DIN 4109.

Mounting Kit VP SDE 2



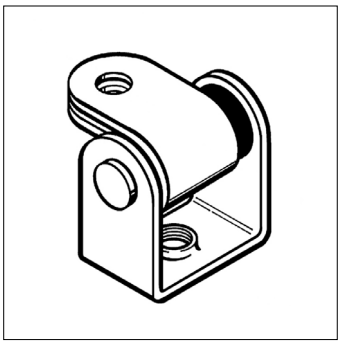
The Universal Joint UG FP and Sound Absorber SDE 2 are already pre-assembled as Mounting Kits, containing Threaded Stud, Hexagon Nut and Rod Coupling.



Trestle arrangement with 4 SDE 2 - UG 16 for sound absortion fixed points up to 25 kN (Type A, 45°)

Sound-insulated fixed point with low load requirements

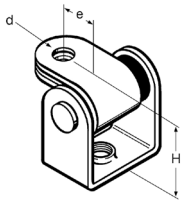
Sound Absorber SDE 0



The Sound Absorber SDE 0 is a versatile element for installations with sound insulation requirements in accordance with DIN 4109. Suitable for all technical supply systems.

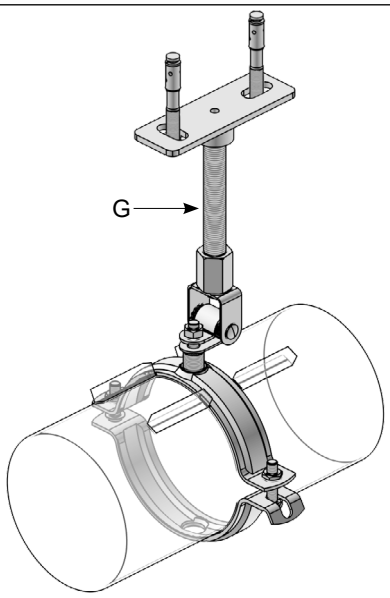
The SDE 0 element is used mainly for direct ceiling attachment. Can be combined with other support components such as Ducting Angles, Pipe Clamps, Channels or special structures.
Working load: 1,0 kN

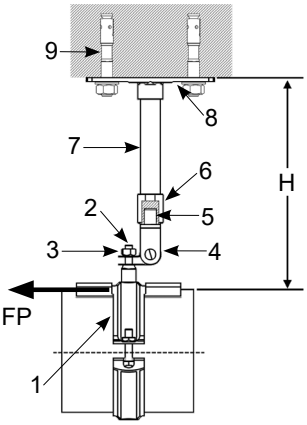
d	Ø9 mm
e	20 mm
H	38 mm



Sound-insulated fixed point without bracing

Single mounting with Mounting plate



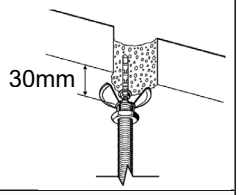


G	H_{max} [mm]	FP_{max} [kN]
M16	125	0,7
	200	0,4
3/4"	125	1,0
	200	0,7

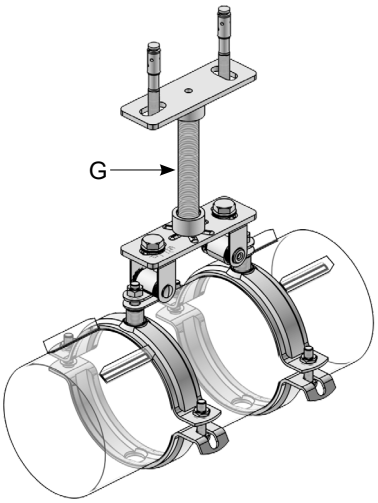
Parts list

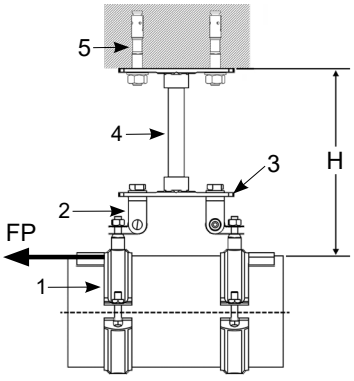
Pos.	Product Description	Qty
1	Stabil D-3G DN ≤ 4“	1
2	Threaded Stud GST M8/40	1
3	Hexagon Nut NT M8	1
4	Sound Absorber SDE 0 - M10	1
5	Threaded Stud GST M10/25	1
6	Adapter AD (M16/M10) (G 3/4"/M10)	1
7	Threaded Rod GST (M16) (G 3/4“)	1
8 [1)]	Mounting Plate Stabil (M16) (G 3/4")	1
9	Bolt Anchor AN BZ plus	2

[1)] Alternative:
Support Cone SMD 1 for heights H_{max} from 150 mm to 200 mm.



Single mounting (2x Pipe Clamps) with Mounting plate

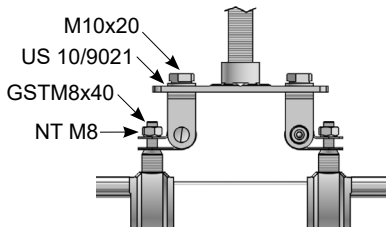




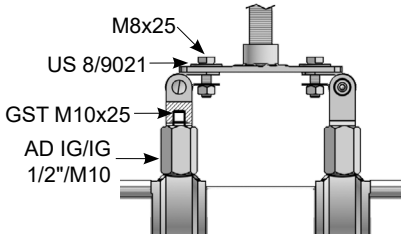
G	H_{max} [mm]	FP_{max} [kN]
3/4"	125	1,4
	200	0,7
1"	125	2,0
	200	1,6

Parts list

Pos.	Product Description	Qty
1	Stabil D-3G DN ≤ 6“	2
2	Sound Absorber SDE 0 M10	2
3	Mounting Plate Stabil (G 3/4") (G1")	2
4	Threaded Rod GST (G 3/4") (G1“)	1
5	Bolt Anchor AN BZ plus	2



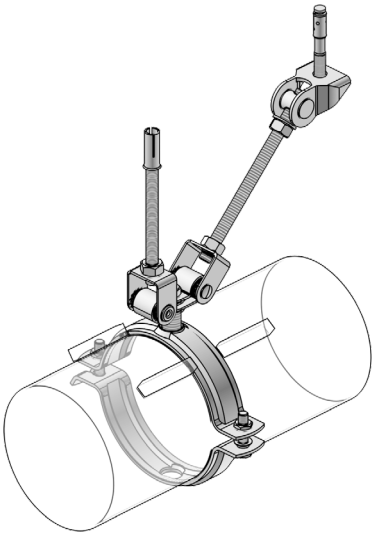
DN ≤ 4"

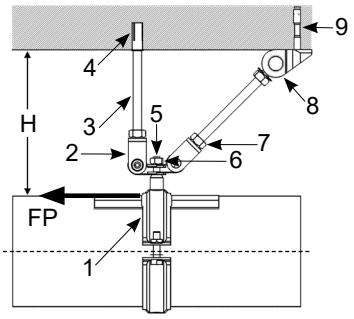


4" < DN ≤ 6"

Sound-insulated fixed point with bracing

Single attachment + 1 Brace



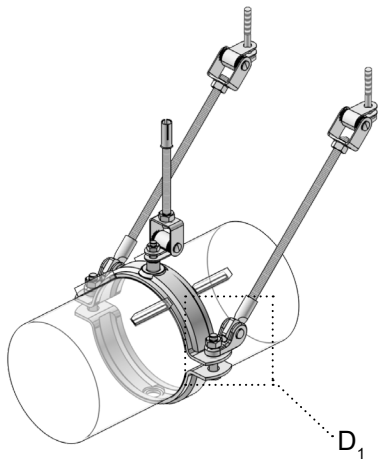


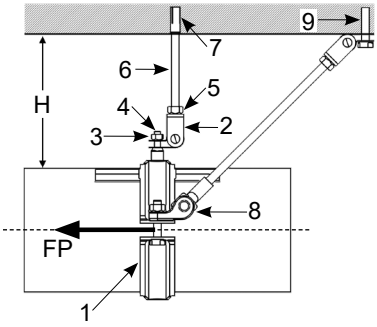
H_{max} [mm]	FP_{max} [kN]
150	2,0
200	1,6
250	1,4
300	1,3

Parts list

Pos.	Product Description	Qty
1	Stabil D-3G DN ≤ 4“	1
2	Sound Absorber SDE 0 M10	2
3	Threaded Rod GST M10	2
4	Drop-In Anchor AN ES M10x40	1
5	Threaded Stud GST M8x40	1
6	Hexagon Nut NT M8	1
7	Hexagon Nut NT M10	2
8	Universal Joint UG M10	1
9	Bolt Anchor AN BZ plus	1

Single attachment + 2 Brace





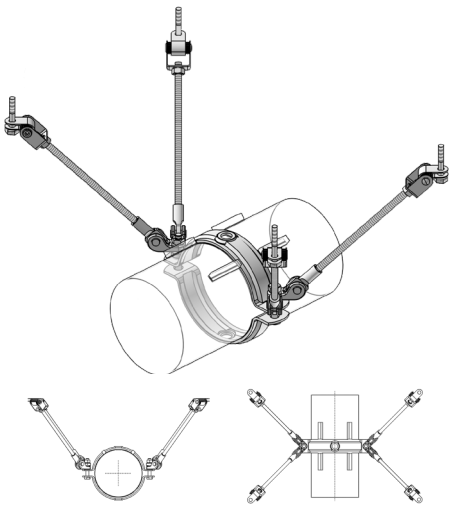
H_{max} [mm]	FP_{max} [kN]
150	3,0
200	2,8
250	2,7
300	2,6

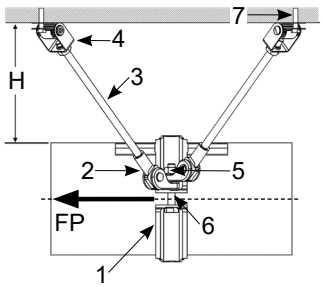
Parts list

Pos.	Product Description	Qty
1	Stabil D-A DN 4"< DN ≤ 6"	1
2	Sound Absorber SDE 0 M10	3
3	Hexagon Nut NT M8	1
4	Threaded Stud GST M8x40	1
5	Hexagon Nut NT M10	3
6	Threaded Rod GST M10	3
7	Drop-In Anchor AN ES M10x40	1
8	Support Joint SG	2
9	Screwbolt TSM-S 6x50	2

[D1)] Combination with screw and Support joint see page 18 Paragraph "D1".

4x Brace





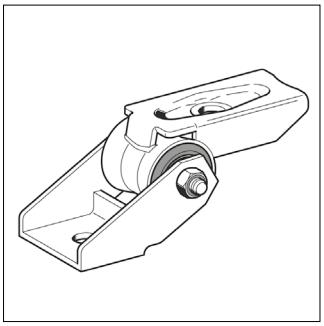
H_{max} [mm]	FP_{max} [kN]
350 mm	4,0 kN

Parts list

Pos.	Product Description	Qty
1	Stabil D-A DN 2"< DN ≤ 6"	1
2	Support Joint SG	4
3	Threaded Rod GST M10	4
4	Sound Absorber SDE 0 - M10	4
5	Hexagon Nut NT	2
6	Hexagon Bolt SKT	2
7	Screwbolt TSM-S 6x50	4

Sound-insulated fixed point for high load requirements

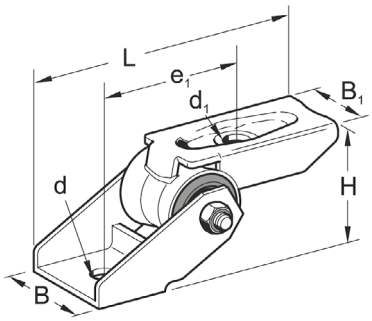
Sound Absorber SDE 2 - SBZ



Universal sound absorption element for heavy loads. Particularly suitable for soundproof installation. It is also possible to mount the Sound Absorber onto Sikla Channels of sound-insulated fixed points.

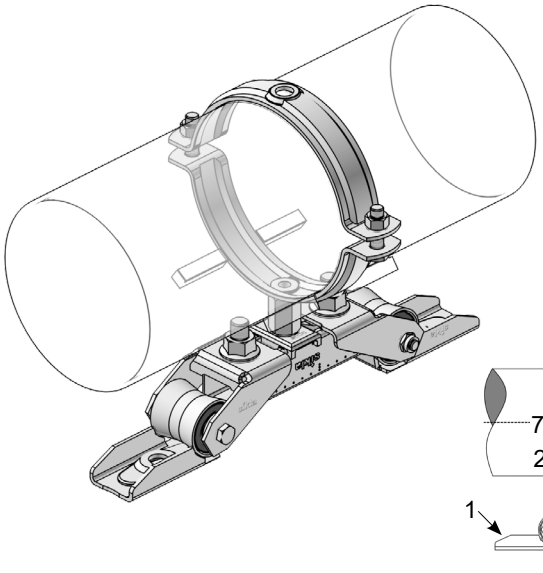
Working load (under tension or pressure for all directions in the planeof rotation): **max. 10 kN**

L	133 mm
e_1	94 mm
d_1	16,5 mm
B_1	50 mm
H	73 mm
d	17 mm
B	70 mm



Sound-insulated fixed point with Sound Absorber SDE 2 - SBZ

Direct mounting (single clamp)

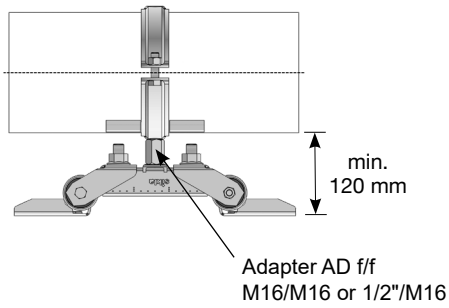


Parts list

Pos.	Product Description	Qty
1	Sound Absorber SDE 2 - SBZ	2
2	T-Head Bolt TBO HZ 41 M16x25	2
3	Pipe Clamp Stabil D-3G / D-M16	1
4	T-Head Bolt TBO HZ 41 M16x35	1
5	Holding Bracket HK 41/16	1
6	Channel MS 41/41 x 150mm	1
7	Adapter AD lf/f see type table	1

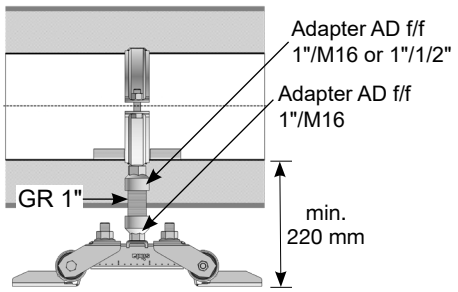
Type table: Position 7

Without Rohr insulation



FP_{max} = 3,0 kN

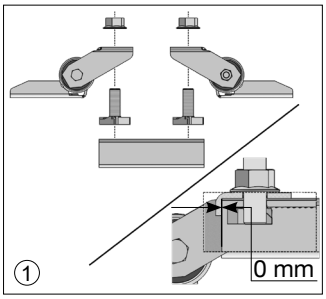
Rohr Isolated



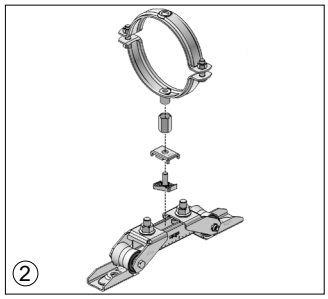
FP_{max} = 3,0 kN

Installation

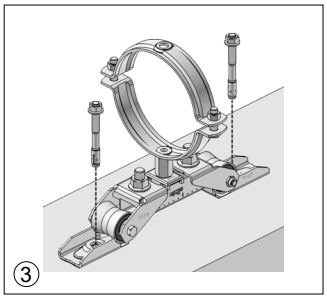
Fasten Channel with T-Bolts to Sound Absorber element.



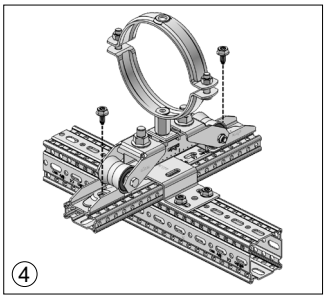
Fasten Pipe clamp with adapter in in the Channel.



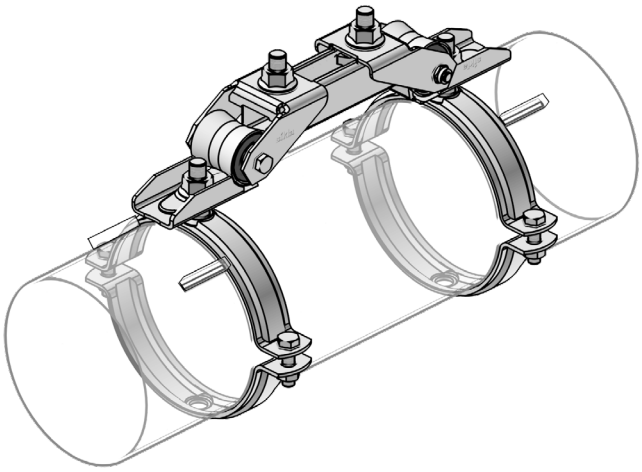
Mount to the building structure with Bolt anchors.

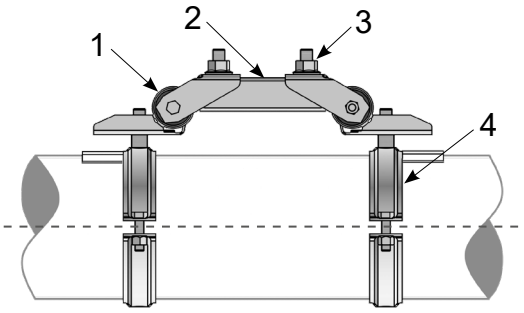


Mount to the siFramo profile with FLS screw. Depending on the alignment, use Beam Section Holders.



Mounting on centric nut (double clamp)

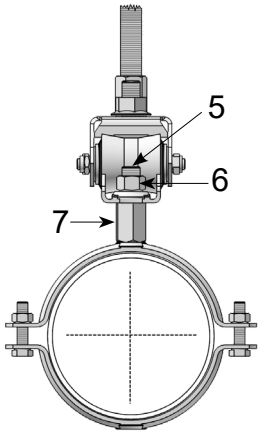




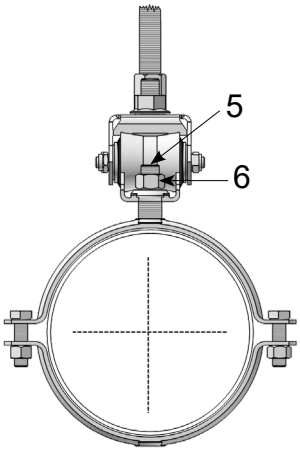
Parts list

Pos.	Product Description	Qty
1	Sound Absorber SDE 2 - SBZ	2
2	Channel MS 41/41/2,0 x 150mm	1
3	T-Head Bolt TBO HZ 41 M16x25	2
4	Pipe Clamp Stabil D-3G	2
5	Threaded Stud GST M16x35	2
6	Hexagon Nut NT M16	2
7 (1)	Adapter AD f/f M16/M16	2

(1) only required for clamps with diameters from 15mm to 129mm



Stabil D-3G
15mm ≤ Ø ≤ 129mm



Stabil D-3G
133mm ≤ Ø ≤ 316mm

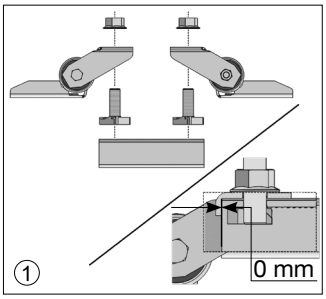
Installation

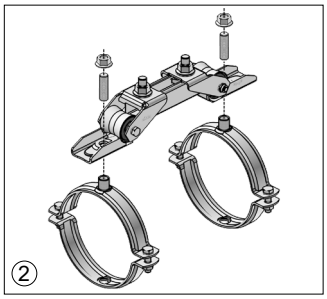
Pre-assemble the TBO on the SDE2-SBZ. Mounting the TBO into the channel and push against the bend of the SDE. Tighten the nut.

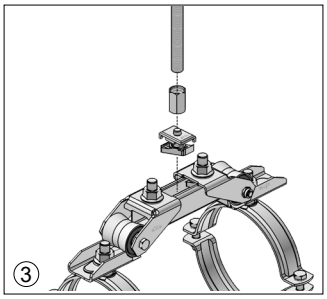
Screw the Threaded Stud into the nut of the pipe clamp. Align the clamp with the GST on the SDE and tighten with nut.

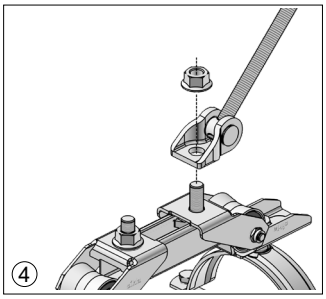
The installation of a single-point fastening without braces takes place directly in the centre of the channel opening.

The universal joint for the inclined brace is fixed directly on the SDE and TBO HZ 41 M16x75.





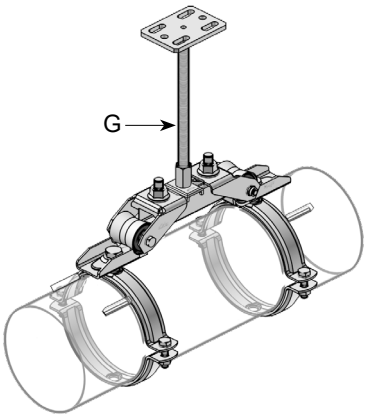


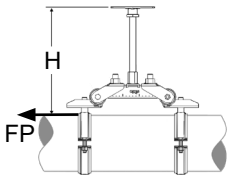


Sound-insulated fixed point types with SDE 2

Mounting without bracing

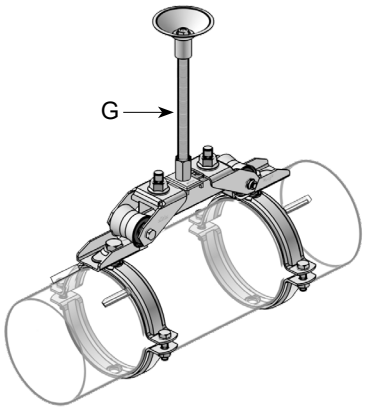
Single mounting with Mounting plate GPL

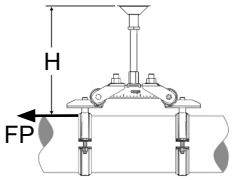




G	H_{max} [mm]	FP_{max} [kN]
M16	200	0,8
	250	0,5
	300	0,3
1"	200	3,2
	250	1,9
	300	1,9

Single mounting with Support Cone SMD 1

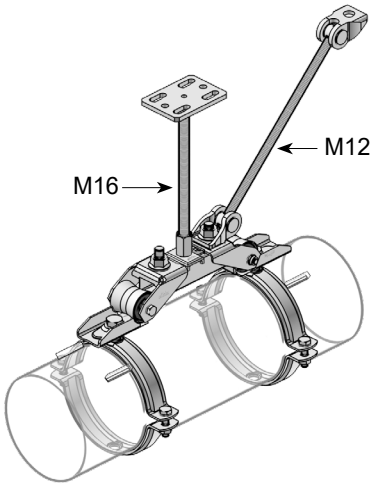


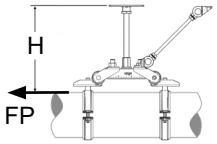


G	H_{max} [mm]	FP_{max} [kN]
1/2"	200	1,1
	250	0,5
	300	0,4
3/4"	200	2,3
	250	1,2
	300	0,8

Mounting with bracing

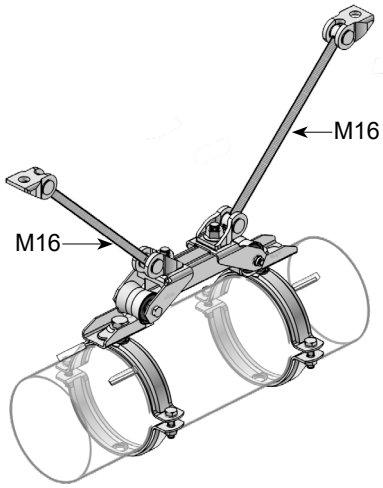
Single attachment + 1 Brace

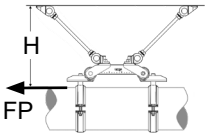




H_{max} [mm]	FP_{max} [kN]
300	3,8
400	3,7
500	3,2

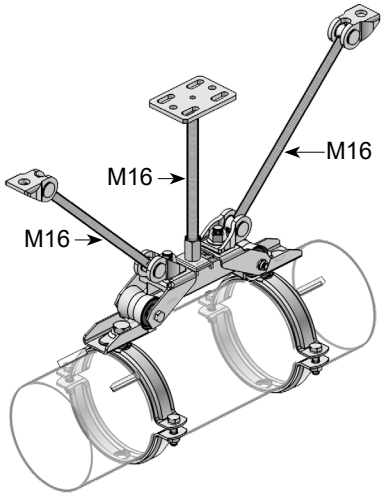
Double attachment with 2 Bracing

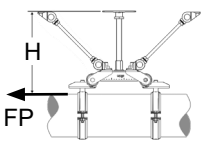




H_{max} [mm]	FP_{max} [kN]
300	5,0

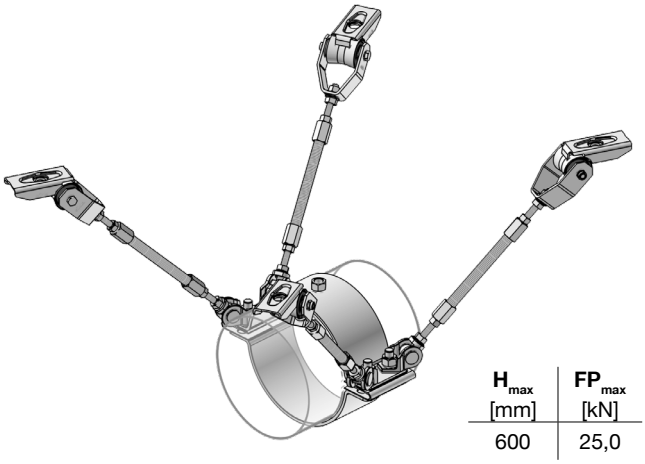
Single attachment + 2 Bracing





H_{max} [mm]	FP_{max} [kN]
300	6,1
400	4,7
500	4,2

Sound-insulated fixed point as trestle arrangement



H_{max} [mm]	FP_{max} [kN]
600	25,0

Fixed Point Goalpost Ms Channel

Sikla offers elements for mounting and supporting frames and L-constructions with a freely selectable, infinitely variable angle adjustment up to 180°. This type of bracing is required for shear stress due to pipe expansion during temperature changes. We recommend these solutions for large distances from the structure.

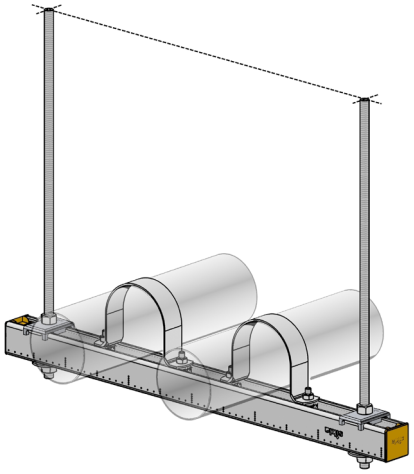


Figure 3.3: Goalpost Ms Channel
fastened with two vertical Threaded rods.

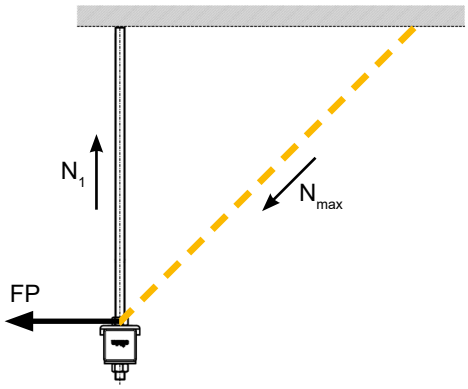
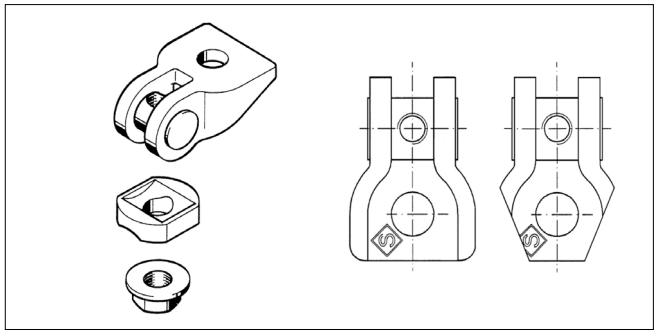


Figure 3.4: The shear forces or fixed point forces „FP“ in the longitudinal direction of the pipe must be supported by brace-struts (N_{max}) taken up safely at the Goalpost. There is otherwise an acute danger that the vertical bars will deform excessively.

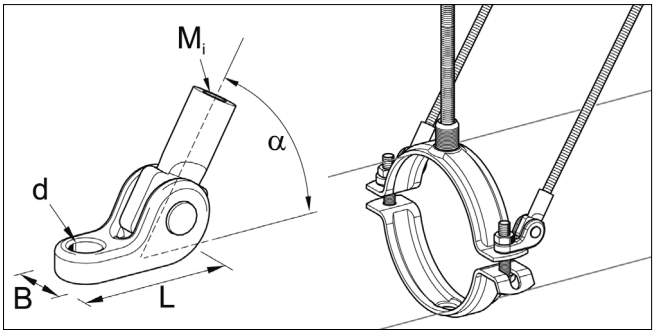
Bracing with Threaded Rod through Universal Joint.

Universal joint UG



Universal connection to inclined components due to step-loose angle adjustment . Nominal load N_{max} = 13 kN.

Support joint SG



SG M10-11	α_{max} = 90°	Ød = 11mm	B = 20mm	L = 52mm
SG M10-13	α_{max} = 90°	Ød = 13mm	B = 22mm	L = 54mm
SG M10-17	α_{max} = 90°	Ød = 17mm	B = 27mm	L = 60mm

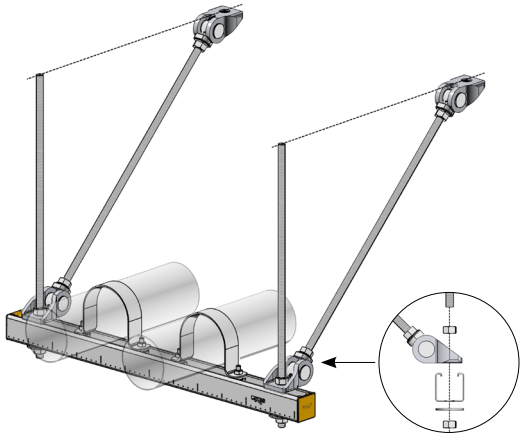


Figure 3.5: MS/GST Goalpost with 2x brace GST

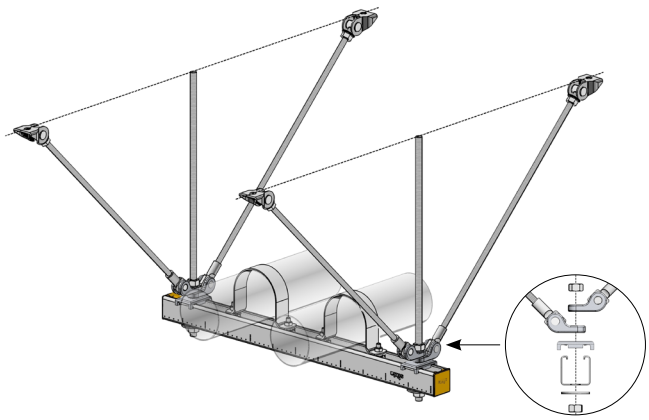
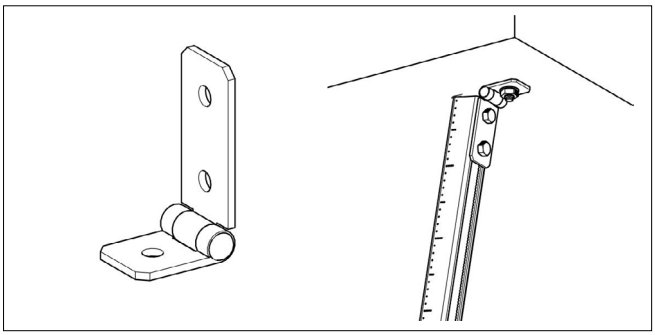


Figure 3.6: MS/GST Goalpost with 4x Bracing GST

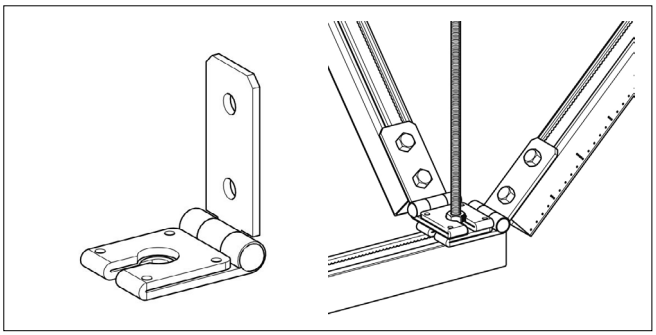
Bracing With MS Channel 41 by Joint JOI

Joint JOI S



To connect Channels 41 to the building structure if an arbitrary, continuous angle adjustment up to 180° is necessary. The Joint JOI S is especially used for the connection to the structure. Nominal load N_{max} = 2.0 kN.

Joint JOI R



The Joint JOI R is used for bracing of channel installations which are of central importance to seismic support of services. Due to its keyhole shaped design the joint can be retrofitted. Nominal load N_{max} = 2.0 kN.

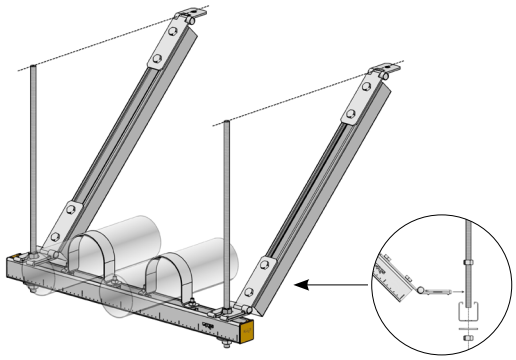


Figure 3.7: GST Goalpost with 2x Brace MS 41

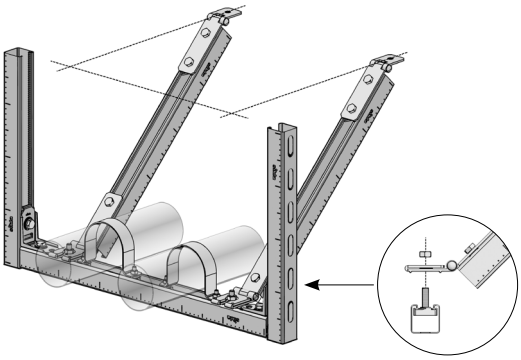


Figure 3.9: MS Goalpost with 2x Brace MS 41

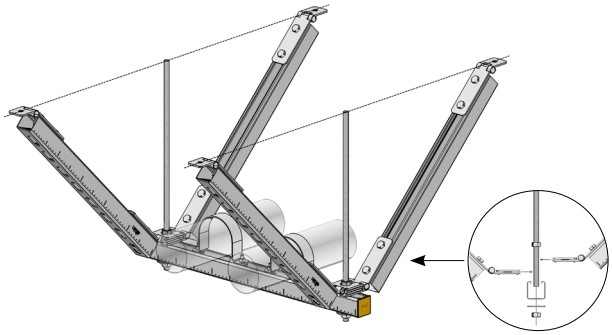


Figure: 3.8: GST Goalpost with 4x Brace MS 41

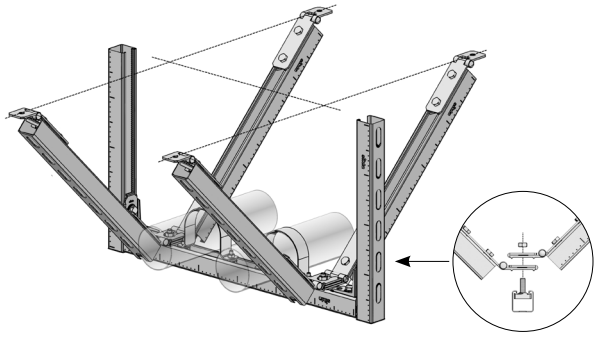
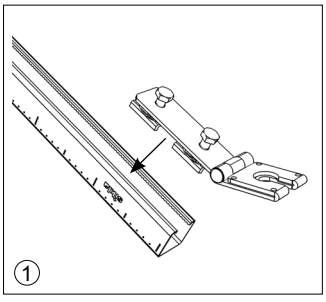


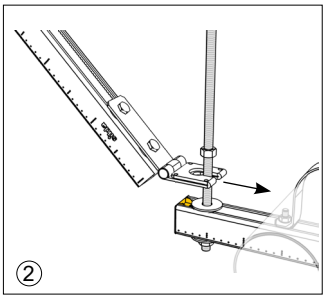
Figure 3.10: Goalpost with 4x Brace MS 41

Installation

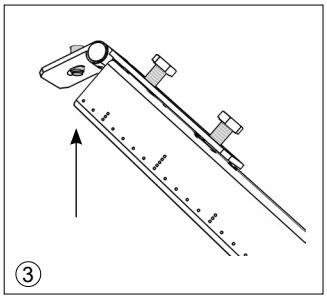
Fasten the JOI R joint to the Channel for the brace using 2x Speed Nut NT M10.



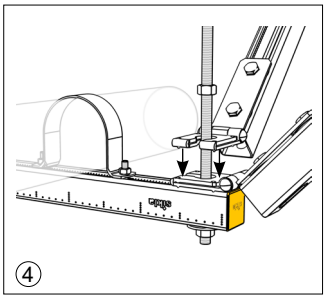
Mount the JOI R joint on the Goalpost to be braced setting the joint through the keyhole.



Attach the JOI S joint to the other end of the Brace using 2x Speed Nut NT M10 and fix it to the structure.

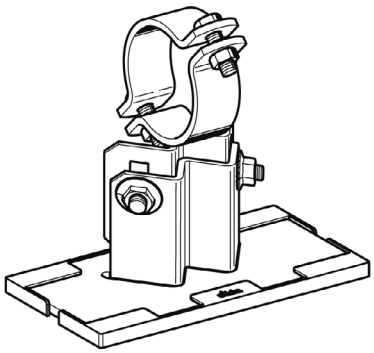
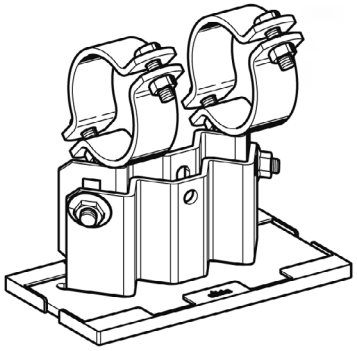
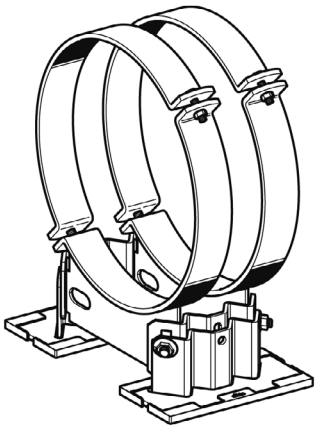


The coupling of several JOI R joints for bracing in different directions is possible through the four pins located under the base of the joint.



Simotec Pipe Shoes: Types and Installation

The Sikla height- adjustable Supports (Pipe Shoes; HV 90, HV 150, HV 200) can be used as a Skid, a Guide or as a Fixed Point. The testing process of the individual Support types and the determination of the direction dependent permissible loads was carried out by the independent testing house TÜV Rheinland.

		
Pipe shoe LA - HV (Single Clamp, Single Base)	**Pipe shoe LC - HV** (Double Clamp, Single Base)	**Pipe shoe LD - HV** (Double Clamp, Dual Base)

The upper and lower parts are height-adjustable by a screwed. The sliding plate is already mounted on the lower part. With LD supports, the lower parts must be mounted in the same height setting to ensure correct support of the sliding plates on both sides. By adapting the guide or fixed point set, the pipe shoe becomes a guide support or fixed point.

(Observe recommended maximum distances between guide supports according to EN 13480-3, Annex C.)

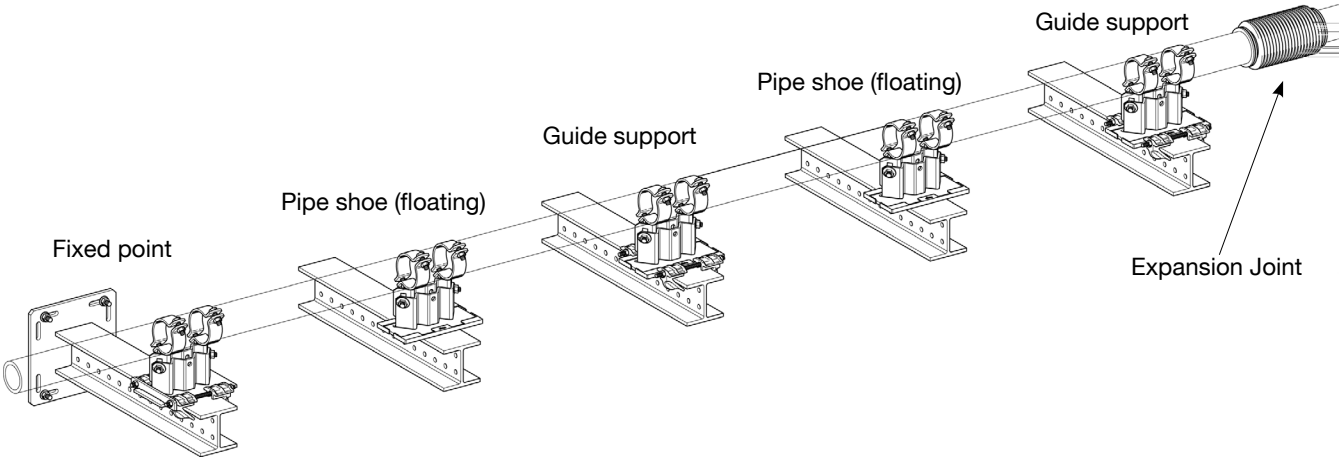


Figure 4.1: Example for pipe installation: 1 fixed point, 2 Pipe shoe and 2 guide supports are used for pipe support.

An expansion joint has to be used to adjust the linear expansion of the pipe due to a change in temperature.
Guiding Sets have to be installed directly before and after an axial compensator is attached. Observe the installation instructions of the expansion joint manufacturer.

The coefficient of static friction μ_0 depends on the consistence of the installation surface.

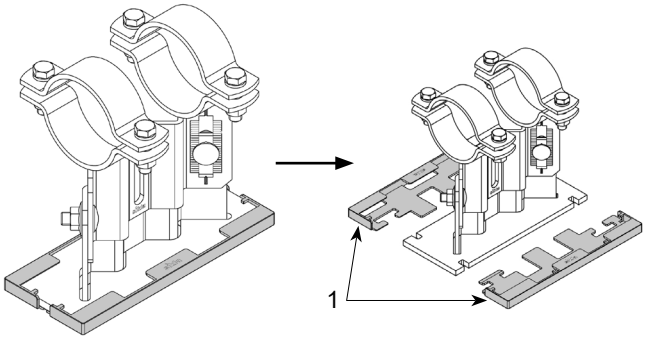
Installation Fixed Point Supports

1. Assembly Preparation

Support surface: The support surface of the pipe support must be clean, grease-free and undamaged.

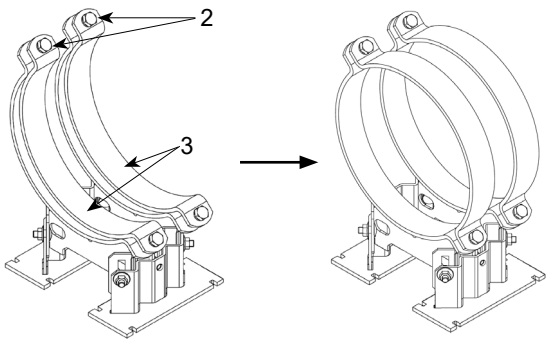
2. Assembly of the Pipe shoe

2.1. Removing the sliding plates



For fixed points FP it is mandatory to remove the sliding plates (Pos.1)!

2.2. Pipe Clamps



The clamping bolts (Pos.2) must be loosened and the upper clamp part (Pos.3) removed and reassembled with the specified torque after inserting the pipe.

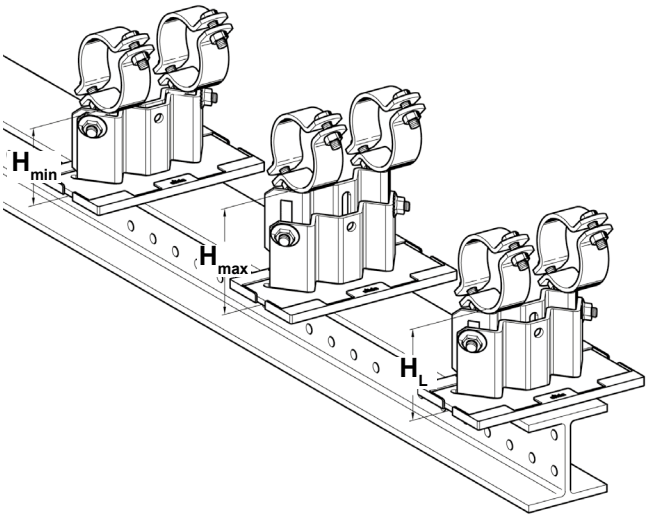
The pipe shoe should be centred on the supporting beam in the operating state (for fixed points FP, the position of the base body results from the clamping set).

Tightening torques:

Clamping bolts (Pos.2)	Tightening torque [Nm]
M10	40
M12	50
M16	60

3. Height Adjustment

The pipe shoes are height-adjustable and can be adjusted to the required height before mounting.
After adjusting the height, the bolts (Pos.4) must be tightened with a torque of 80 Nm!



The height **H** is always measured from the top edge of the beam to the bottom edge of the pipe.

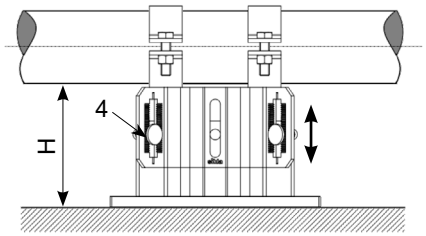


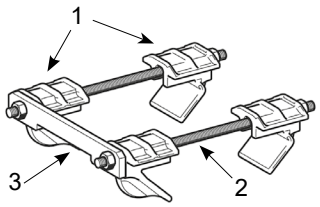
Figure 4.2: Pipe shoe LC HV

Type	Minimum height H_{min} [mm]	Height as delivered H_L [mm]	Maximum height H_{max} [mm]
HV 90	89	90	113
HV 150	116	150	168
HV 200	171	200	223

4. Mounting the Clamping set

4.1. 4.1. Mounting on steel beams with Fixed Point Set XS

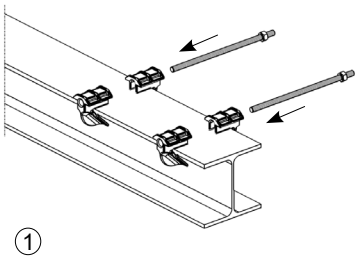
Fixed Point Set XS

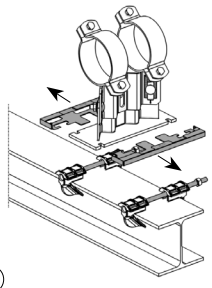


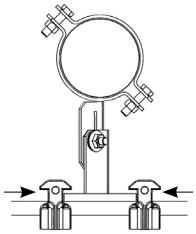
Pre-assembled Fixed Point Set containing:

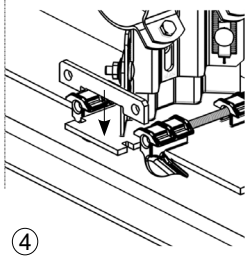
4 Clamping hooks (Pos. 1)
2 Threaded Stud (Pos. 2)
1 Cross bar (Pos. 3)
2 Lift-off preventions (XS 280/300)

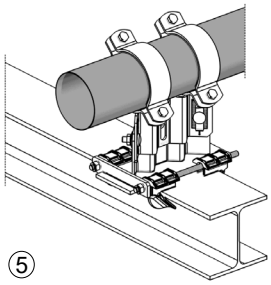
Hexagon nuts:
4x for XS 80/120 and XS 140/160
6x for XS 180/220 and XS 240/260
10x for XS 280/300







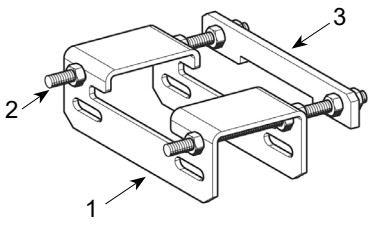




Assembly Video

4.2. Mounting on siFramo beam section with Fixed Point Bracket XW F

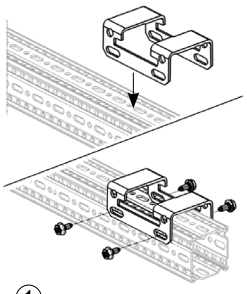
Fixed Point Bracket XW F

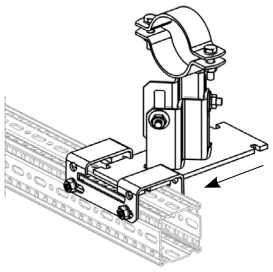


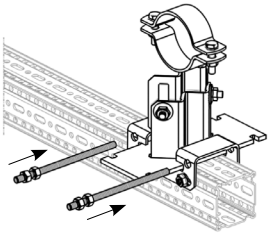
Fixed Point Bracket XW F containing:

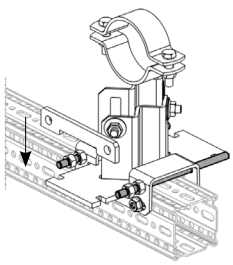
1 Guiding Bracket FW F (Pos. 1)
2 Threaded Stud M12 (Pos. 2)
1 Cross bar (Pos. 3)
8 Hexagon nut M12

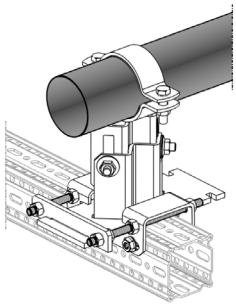
Conection to siFramo beam section with 4 Self Forming Screw FLS F.











Assembly Video

5. Mounting the stoppers

5.1. Assembly of clamp Inlay

Cut one insert from the Glas Fabric Tape (GSK) for each clamp half (2x) according to the table below.



Einlage

NB	Type	Outer D. Ø [mm]	Length [1] [mm]
1“	25	33,7	43
1 1/4“	32	42,4	57
1 1/2“	40	48,3	66
2“	50	60,3	85
2 1/2“	65	76,1	110
3“	80	88,9	130
4“	100	114,3	170
5“	125	139,7	209
6“	150	168,3	254
7“	175	193,7	294
8“	200	219,1	334
9“	225	236,0	361
10“	250	273,0	419
12“	300	323,9	499
14“	350	355,6	549
16“	400	406,4	628
18“	450	457,0	708
20“	500	508,0	788
24“	600	610,0	948

[1] Dimension for 1x clamp half

5.2. Mounting the stoppers

These must be welded on offset by an angle α [°] from the centre of the pipe.

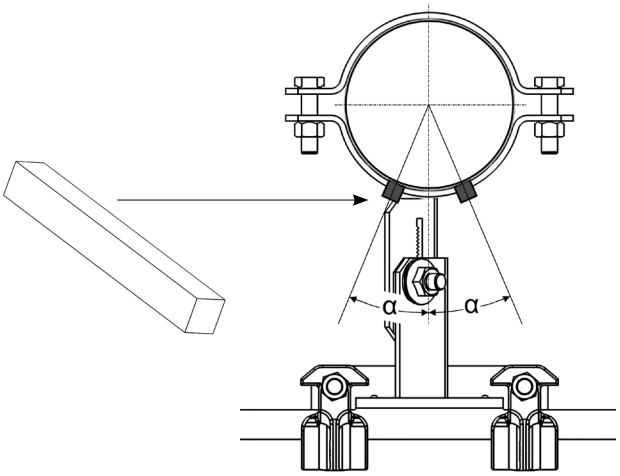


Figure 4.3: Assembly of the stoppers

The stoppers must be as close as possible to the bar on both sides and must not have any play.

For the fixed point FP, the position of the Glass Fabric Tape (GSK) is flush with the left edge of the left clamp and the right edge of the right clamp. This allows the cleats to fit snugly against the clamp.

During installation, the PE peel-off foil is removed, and the tape is glued into the pipe clamp halves and the pipe is inserted. Then the upper half of the clamp is screwed to the lower half.

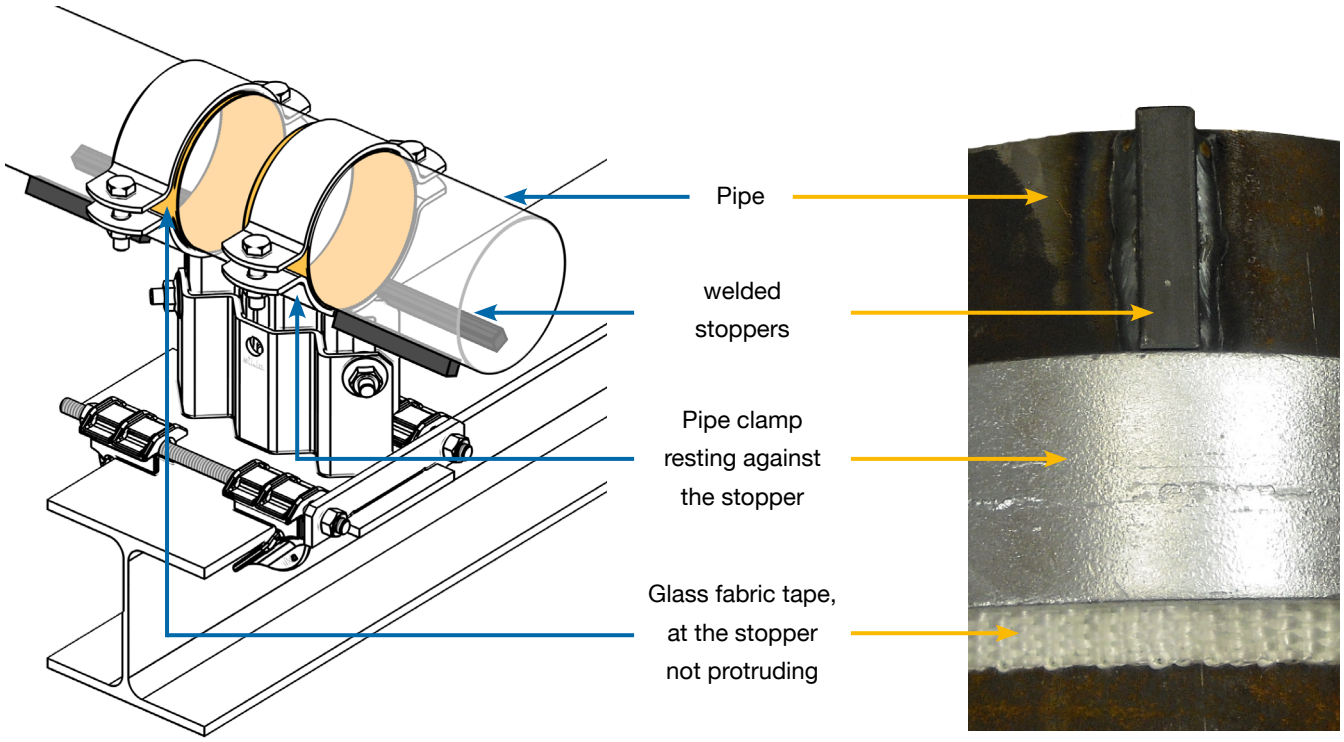
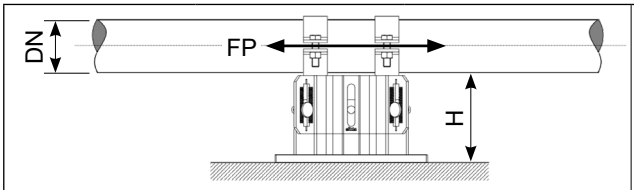
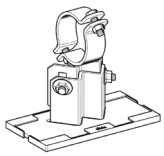
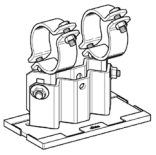


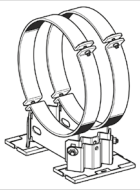
Figure 4.4: Positioning of Glass Fabric Tape (GSK) and stoppers

6. Max. permissible Fixed Point Force FP [1)]









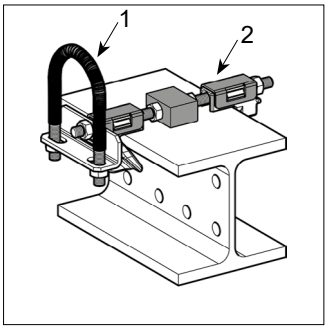
Type	Height H adjustment range [mm]	NB	Pipe shoe LA - HV $FP_{perm.}$ [kN]	Pipe shoe LC - HV $FP_{perm.}$ [kN]	Pipe shoe LD - HV $FP_{perm.}$ [kN]
HV 90	88,5 < H < 113,5	≤ 25	9,1	14,3	-
		32	8,8	14,1	-
		40	8,6	14,0	-
		50	8,2	13,9	-
		65	7,7	13,6	-
		80	7,3	13,5	-
		100	6,5	13,1	-
		125	5,7	12,7	-
		150	4,7	12,3	-
		200	-	11,6	-
		250	-	10,8	-
		300	-	10,1	-
		350	-	-	25,0
		400	-	-	22,5
		500	-	-	20,8
		600	-	-	10,3
HV 150	116 < H < 168,5	≤ 25	8,0	8,5	-
		32	7,9	8,5	-
		40	7,8	8,5	-
		50	7,6	8,4	-
		65	7,4	8,4	-
		80	7,2	8,4	-
		100	6,9	8,3	-
		125	6,5	8,3	-
		150	6,1	8,2	-
		200	-	8,1	-
		250	-	8,0	-
		300	-	7,9	-
		350	-	-	25,0
		400	-	-	22,5
		500	-	-	17,3
		600	-	-	8,7
HV 200	171 < H < 223,5	≤ 25	6,3	7,3	-
		32	6,2	7,2	-
		40	6,2	7,2	-
		50	6,0	7,1	-
		65	5,9	7,0	-
		80	5,7	6,9	-
		100	5,5	6,7	-
		125	5,2	6,5	-
		150	4,9	6,3	-
		200	-	5,9	-
		250	-	5,5	-
		300	-	5,1	-
		350	-	-	25,0
		400	-	-	20,5
		500	-	-	15,7
		600	-	-	7,5

[1)] Valid only for installation on steel beams using Fixed Point set XS and on siFramo Beam Section F80/F100 using Fixed Point Bracket XW F. Fixed point forces in the axial direction can only be achieved if anti-slip devices (e.g. stoppers) are used properly. These must be provided when designing the pipeline and are the responsibility of the pipeline manufacturer. Further static product performance data on request.

Fixed Point XR - H 20 (U Bolt)

Fixed Point for attachment of steel or stainless steel pipes of DN 15 up to DN 300 on steel beams with width of 80 up to 300 mm and max. flange thickness of 20 mm. The U-bolt sheath and the PA slide bearing blocks reliably prevent bimetal corrosion.

H 20 (DN 15 - 50)



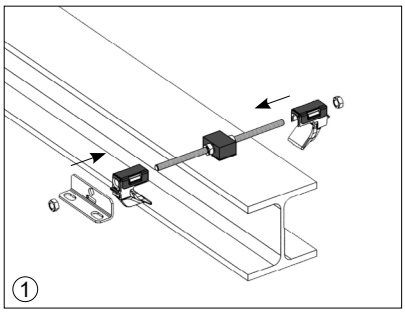
Fixed point set consisting of Preassembled Fixed Point including contact corrosion protection by means of a U-bolt sheath (Pos.1) PA slide bearing blocks (Pos.2).

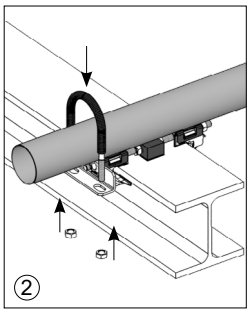
Accessories per clamping:
2x Clamping hooks with slide bearers, 1x slide bar, 1x threaded rod M10, 1x U-Bolt fixing plate and 4x Nuts M10.

Installation

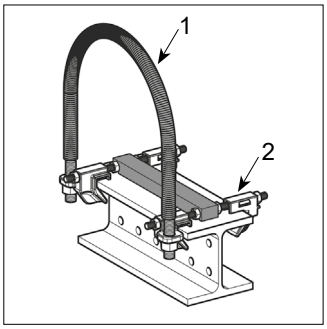
Position the clamping hooks onto the beam flange and tighten the nuts (to 10 Nm). For beam width < 100mm both nuts of the PA bearing block have to be removed.

Fasten U-bolt to U-Bolt fixing plate (to 30 Nm). The pipe is pressed against the PA bearing blocks.





H 20 (DN 65 - 300)



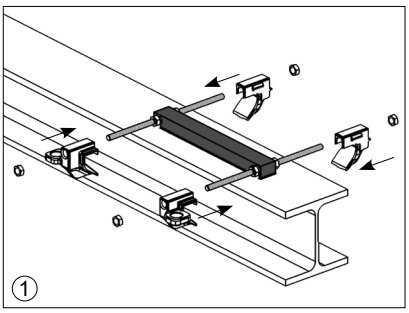
Fixed point set consisting of Preassembled Fixed Point including contact corrosion protection by means of a U-bolt sheath (Pos.1) PA slide bearing blocks (Pos.2).

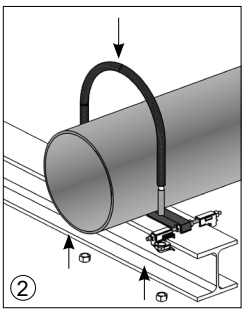
Accessories per clamping:
4x Clamping hooks,
1x slide bar,
2x threaded rod M10 and
8x nuts M10.

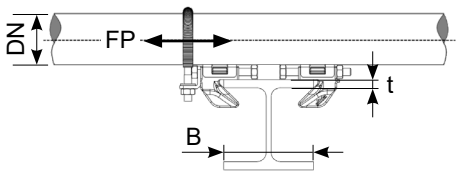
Installation

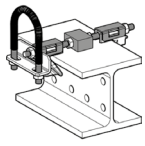
Position the clamping hooks onto the beam flange and tighten the nuts (to 10 Nm). For beam width < 100mm the 4 nuts of the PA bearing block have to be removed.

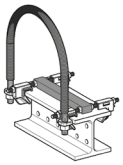
Fasten U-bolt to the clamping hooks with the nuts included (to 50 Nm).









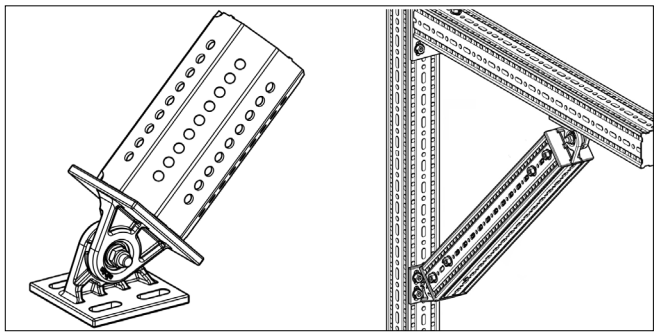


B [mm]	t [mm]	DN	H 20 (DN 15 - 50) $FP_{perm.}$ [kN]	H 20 (DN 65 - 300) $FP_{perm.}$ [kN]
80 < B < 300	max. 20mm	15	0.50	-
		20	0.50	-
		25	0.50	-
		32	0.50	-
		40	0.50	-
		50	0.50	-
		65	-	0.30
		80	-	0.30
		100	-	0.30
		125	-	0.30
		150	-	0.30
		175	-	0.30
		200	-	0.30
		225	-	0.30
		250	-	0.30
		300	-	0.30

Assembly Video

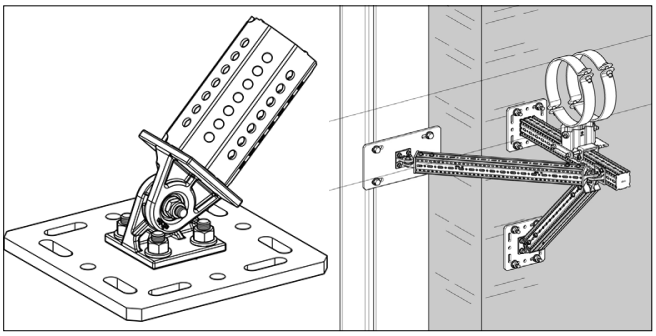
Fixed Point Goalpost with siFramo

Pivot Joint GE F



Applicable as a bracing element for single-arm cantilevers in conjunction with siFramo section, and for the knee-brace reinforcing of siFramo frame constructions. The pivot can be installed with angles from 25° to 155°.

Pivot Joint GE F - ST F



Applicable as a bracing element for single-arm cantilevers supported from primary steelwork or concrete surfaces, also for the knee-brace reinforcing of all siFramo frame constructions. The pivot can be installed with angles from 25° to 155°.

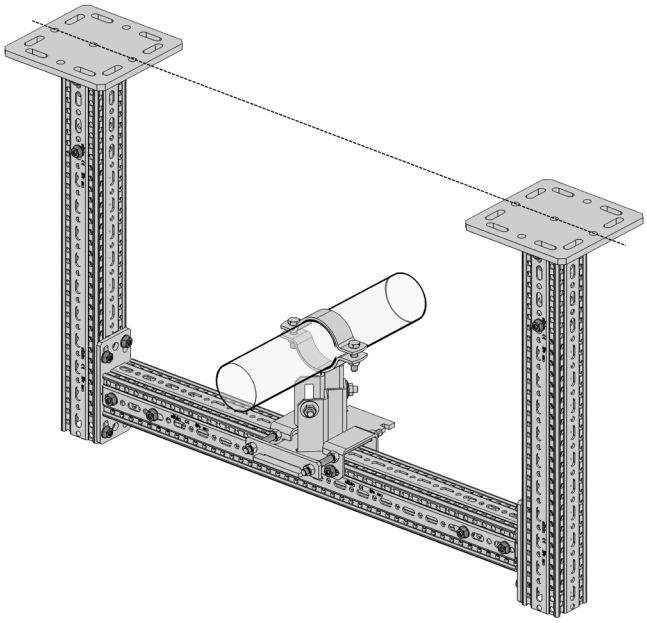


Figure 4.5: Goalpost with siFramo

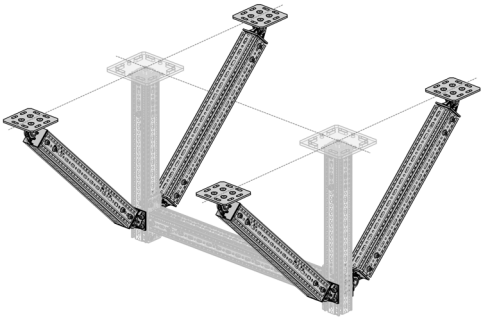


Figure 4.6: siFramo Goalpost with 4x Bracing

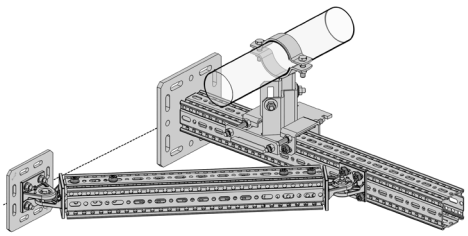


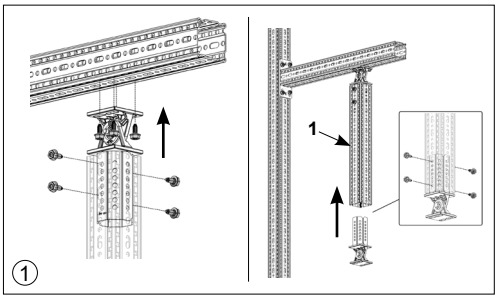
Figure 4.7: siFramo Beam Bracket TKO

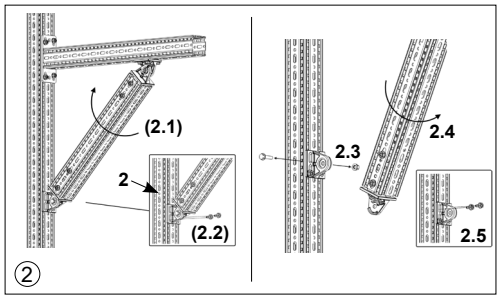
Installation

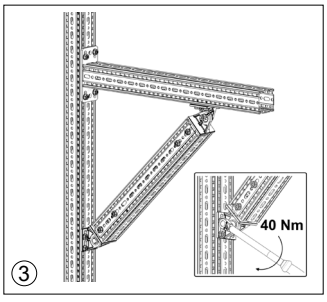
The joints are fixed to the support profiles with 4x Self Forming Screws each and 4x Self Forming Screws at the base plate.
First attach both joints to the siFramo Tie Beam section (Pos.1)

Position the joint on the main support (Pos.2) and tighten the two lower Self Forming screws FLS (2.2). Disassemble the joint screw set (2.3) and fastening the two upper FLS F (2.5).

After mounting at the desired angle, place the two parts of the joint correctly and tighten the screw set in the with 40 Nm.







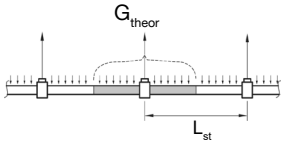
Support distances in building services for pipes made of steel, copper, plastic (standard values)

Nominal Diameter	Nominal Diameter	Outside-Ø	SIKLA - Recommandation [m] Pipes filled with water with insulation[1)]			DIN 1988-2 [m] Pipes filled with water			
			Steel Pipe EN 10220 DIN 2448 DIN 2458	Steel Pipe EN 10255 DIN 2440	Cu-Pipe EN 1057 DIN 1786	Steel Pipe EN 10255 DIN 2440	Cu-Pipe EN 1057 DIN 1786	PVC-Pipe	
[DN]	[In]	[mm]						at 20°C	at 40°C
		12.0			1.00		1.25		
10		13.5	1.00						
		15.0			1.10		1.25		
		16.0						0.80	0.50
10	3/8“	17.2		1.20		2.25			
		18.0			1.20		1.50		
15		20.0	1.20					0.90	0.60
15	1/2“	21.3		1.50		2.75			
		22.0			1.30		2.00		
20		25.0	1.40					0.95	0.65
20	3/4“	26.9		2.00		3.00			
		28.0			1.50		2.25		
25		30.0	1.80						
		32.0						1.05	0.70
25	1“	33.7		2.50		3.50			
		35.0			1.60		2.75		
32		38.0	2.20						
		40.0						1.05	0.70
		42.0			1.80		3.00		
32	1 1/4“	42.4		2.90		3.75			
40		44.5	2.40						
40	1 1/2“	48.3		3.30		4.25			
		50.0						1.40	1.10
		54.0			2.00		3.50		
50		57.0	3.10						
50	2“	60.3		4.00		4.75			
		63.0						1.50	1.20
		64.0					4.00		
		75.0						1.65	1.35
65		76.1	3.30				4.25		
65	2 1/2“	76.1		4.75		5.50			
80		88.9	4.20				4.75		
80	3“	88.9		5.25		6.00			
		90.0						1.80	1.50
100		108.0	4.50				5.00		
100	4“	114.3		5.80		6.00			
		110.0						2.00	1.70
125		133.0	5.10				5.00		
125	5“	139.7		6.50		6.00			
		140.0						2.25	1.95
150		159.0	5.80				5.00		
		160.0						2.40	2.10
150	6“	168.3		7.20					
200	8“	219.1	7.80						

[1)] 100% - Insulation with 100 kg/m³ and 1 mm steel sheat for pipes with normal thickness.

Example

For the static dimensioning of a pipe support, the weight which has to be carried by the clamp has to be calculated. The length of pipe sections, assigned hypothetically, correspond with the support distance L_{st}.



$$G_{theor} = G' * L_{st}$$

In practice a security coefficient S should be taken into consideration. Based on the simulation approach, S will be rated 1.5... 2.5 depending on the application case.

$$G_{pract} = G' * L_{st} * S$$

D_a = 168.3mm; Lst = 5.8m; m' = 38 kg/m; G' ≈ 0.38 kN/m; S = 2.0
G_{theor} = 0.38 kN/m * 5.8 m = 2.20 kN
G_{pract} = 0.38 kN/m * 5.8 m * 2.0 = 4.41 kN

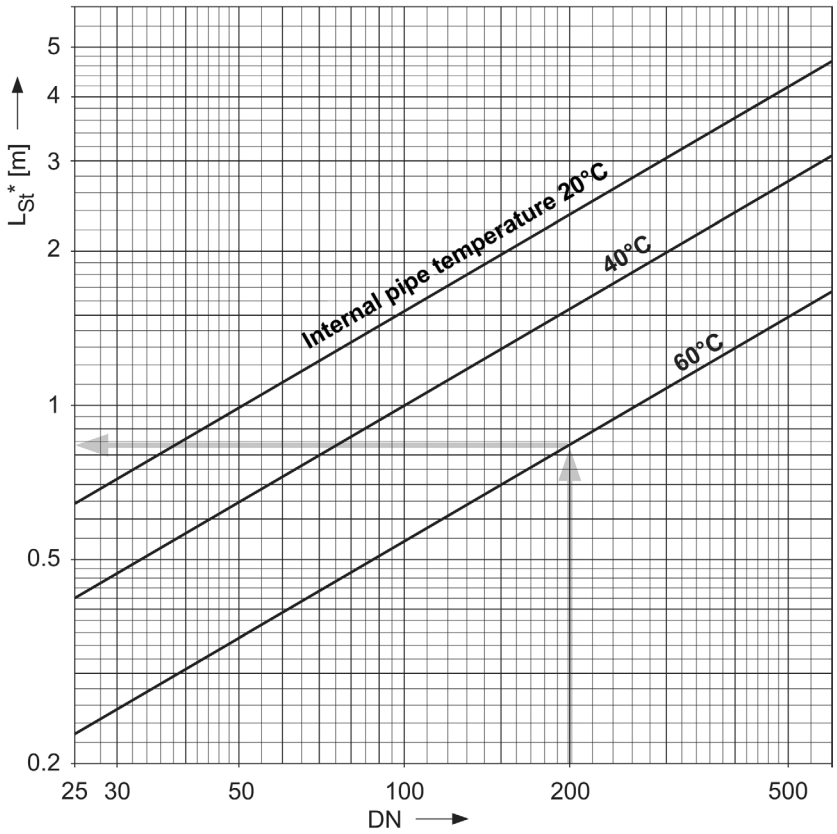
Support distances for plastic pipes (standard values according to producer)

Pipes made of PVC - hard

$$L_{St} = L_{St}^{*} \text{ KM * KR}$$

Medium	KM
gas	1.3
1< density [g/cm³] ≤ 1.8	0.8

Pipe raw DIN 8062	KR
1	1.0
2	1.3
3	1.6
4	1.8
5	2.0
6	2.3



Example

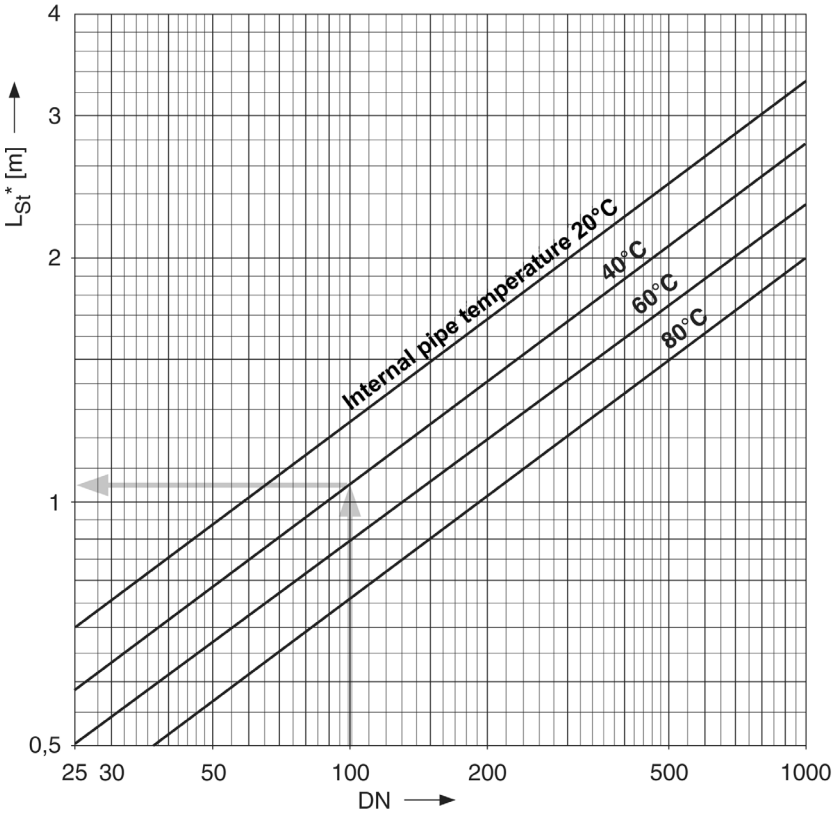
DN 200; T = 60°C; GAS; Pipe raw 5
L_{St}= 0.83 m * 1.3 * 2.0 ≈ 2.16 m

Pipes made of HDPE or PP

$$L_{St} = L_{St}^{*} \text{ KM * KR}$$

Medium	KM
gas	1.3
1< density [g/cm³] ≤ 1.8	0.8

Pipe raw	KR	
	HDPE	PP
1 and 2	1.0	1.1
3	1.1	1.45
4	1.25	1.65
5	1.45	



Example

HDPE; DN 100; T = 40°C; bulk material;
Pipe raw 3
L_{St}= 1.05 m * 0.8 * 1.1 ≈ 0.92 m

Sikla Fixed point calculation tools

Sikla offers several tools to optimise the Fixed point calculation. According to the parameters (Fixed point force, pipe axis height, pipe diameter and Type), the most suitable assembly for the installation is found.

SiPlan: Fixed point module

In the module of Siplan software"Fixed point", the fixed point force FP is determined at the L-bend and U-bend or when using an axial expansion joint and can be used for dimensioning the Trestle arrangement.

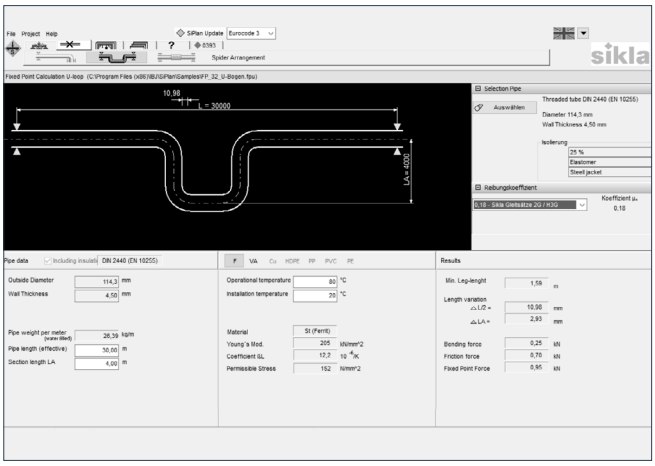


Figure A2.1: Siplan - Fixed point module

Excel Fixed point Tool

With the Excel Calculation tool the ideal construction Type can be easily determined by selecting the installation parameters and maximum axial fixed point force.

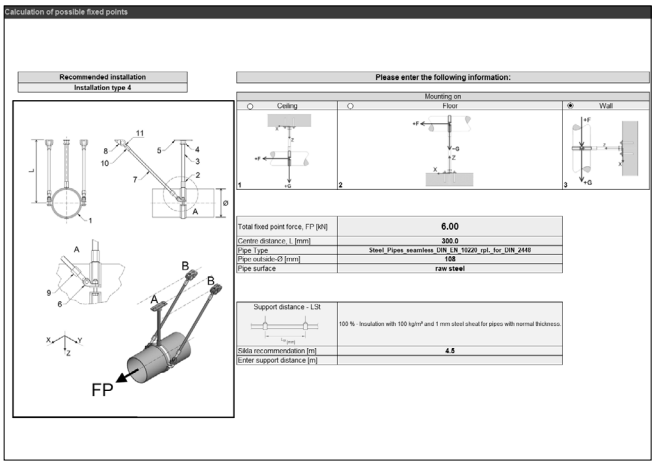


Figure A2.2: Excel Fixed point Tool

Sikla CAD-Library

The Sikla CAD library provides the Sikla entire product range from the Siconnect and Simotec catalogues as 3D or 2D geometry in common formats.

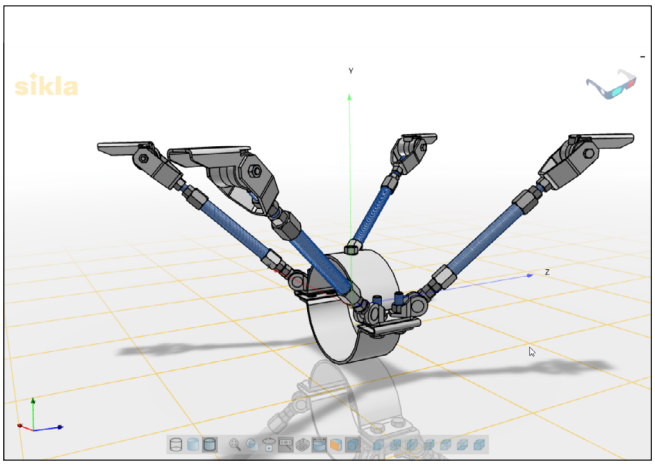


Figure A2.3: Sikla CAD library

Sikla - Anchor Design Program

The anchor design program provides evidence for the usability of possible anchors according to the concrete load situation.

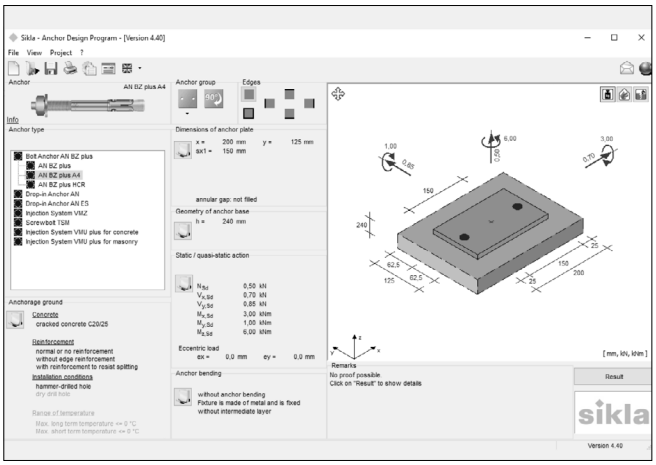
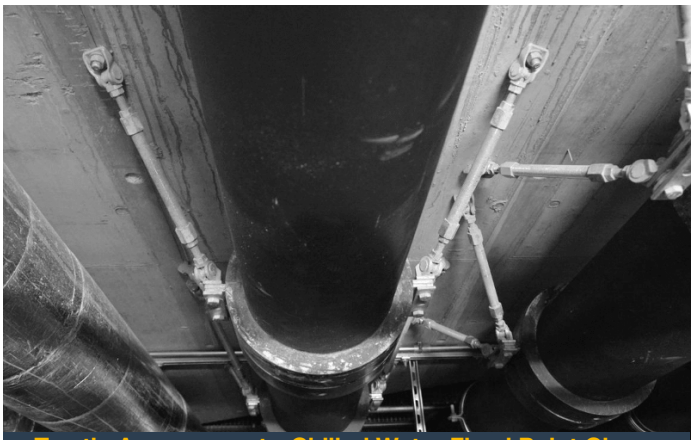
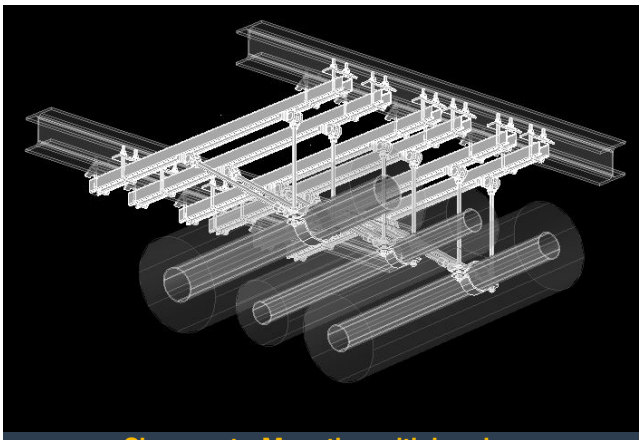
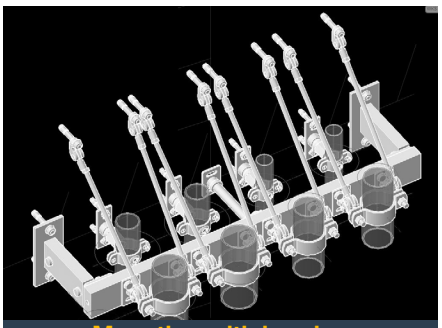


Figure A2.4: Sikla - Anchor Design Program

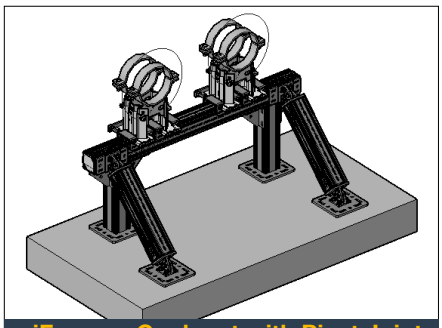
Application examples


Trestle Arrangement - Chilled Water Fixed Point Clamp


Siconnect - Mounting with bracing


Mounting with bracing

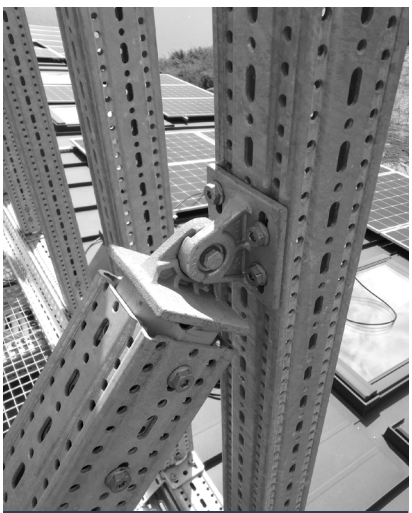

Simotec - Goalpost with Pivot Joint

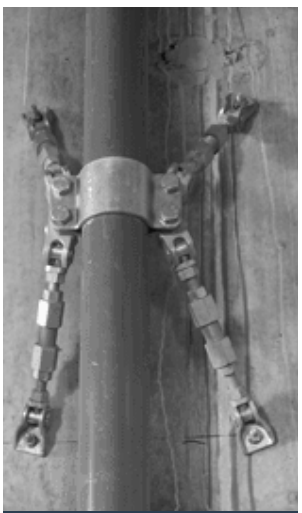

siFramo - Goalpost with Pivot Joint

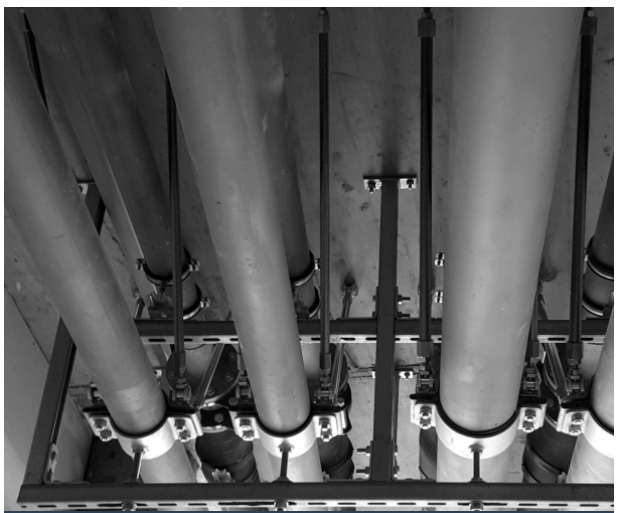

Mounting without bracing


Support Cone SMD 1


Simotec - Pipe shoe with Fixed Point Set


siFramo - Pivot Joint GE F


Trestle Arrangement


Siconnect - Mounting with 2x bracing

Fixed point product range

Siconnect

Pipe Clamps

- Stabil D-3G
- Stabil RB-A
- Fixed Point Clamp FKS
- Chilled Water Fixed Point Clamp FKS

Fastenings

- Threaded Rod GST
- Threaded Tube GR
- Adapter AD f/f
- Hexagon Nut NT
- Locking Nut NT G
- Mounting Kit VP A/B

Brackets and Mounting plates

- Mounting Plate GPL
- Support Cone SMD 1
- Mounting Plate GPL F Stabil

Joints

- Universal Joint UG
- Support Joint SG
- Joint JOI S
- Joint JOI R

Simotec

Pipe shoes

- Pipe shoe LA - HV
- Pipe shoe LC – HV
- Pipe shoe LD – HV

Fixed point Sets

- Fixed Point Set XS
- Fixed Point Bracket XW F
- Fixed Point FR – H 20

Joints

- Pivot Joint GE F
- Pivot Joint GE F – ST F

07/2022