TEEKAY COUPLINGS INSTALLATION GUIDE

- Guide to Coupling types
- Key to label details
- How the products work
- Design considerations
- Installation considerations
- Tools and accessories

Subjects covered include:

- Misalignment
- Angular deflection
- Pipe ovality
- Pipe OD tolerances
- Distance between pipe ends
- Expansion and contraction
- Guides, anchors and supports
- Corrosion protection
- Temperature
- Electrical conductivity

COUPLING IDENTIFICATION

TEEKAY

ANCHORED

AXILOCK AXILOCK-S

These models are used on metal pipes where the coupling provides axial restraint of the pipe against system pressures.

For use on certain plastic and GRP pipes, please contact us for guidance and references.

AXILOCK FP

This model is used for connecting metal pipes where fire protection is required and provides axial restraint against system pressures.

For use on fireproof GRP pipes, please contact us for guidance and references.

NON-ANCHORED

AXIFLEX

This model is used for connecting pipes of virtually any material with the same outside diameter which do not require the coupling to provide any axial restraint of the pipe against system pressures.

STEPPED

This model is used for connecting pipes of virtually any material or combinations of materials of the same nominal bore but with different outside diameters. It does not provide any axial restraint against system pressures.

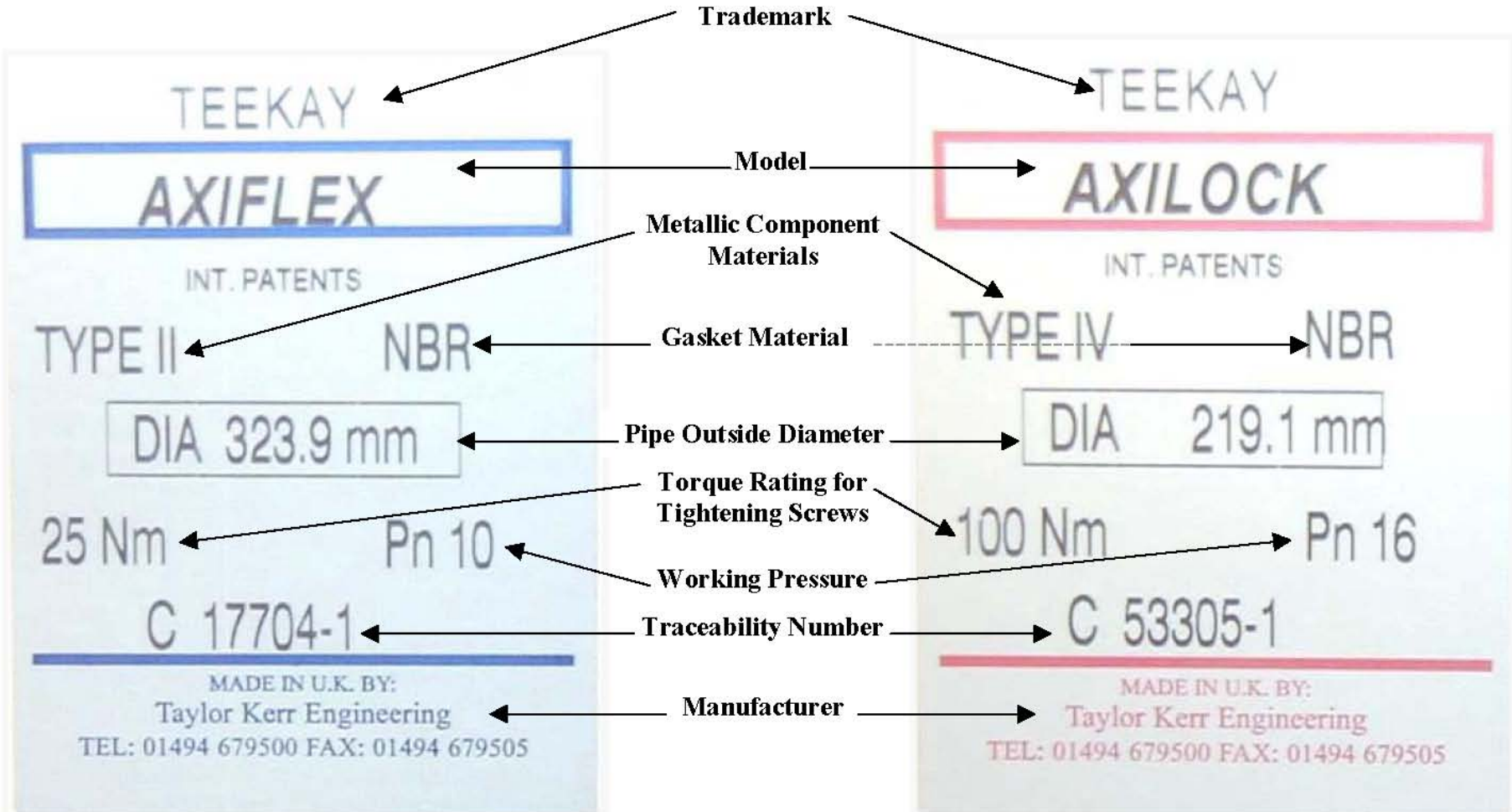
AXIFLEX HC REPAIR

These models are hinged and open fully to wrap around the pipes. They are used to connect pipes in areas of limited access or to repair holes or cracks. They do not provide any axial restraint against system pressures.

FLANGE ADAPTOR

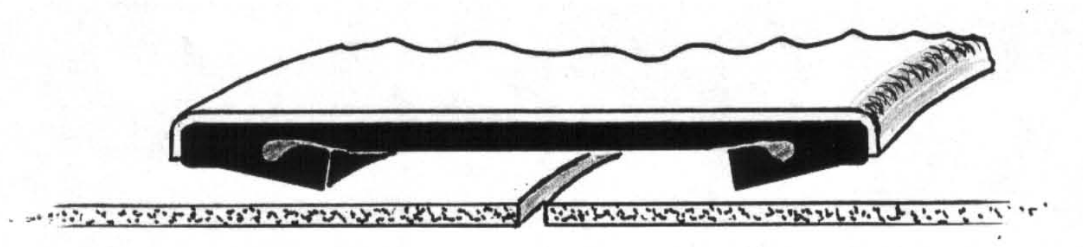
This model is used for connecting flanges to plain end pipes. Flanges of virtually any drilling can be combined with plain end pipes of virtually any outside diameter or material.

LABEL DETAILS

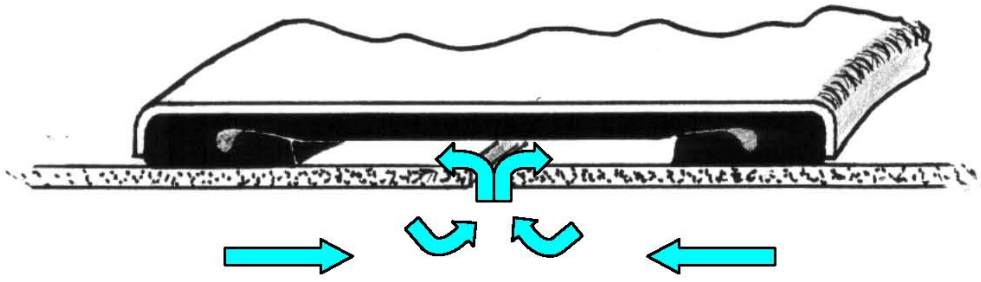


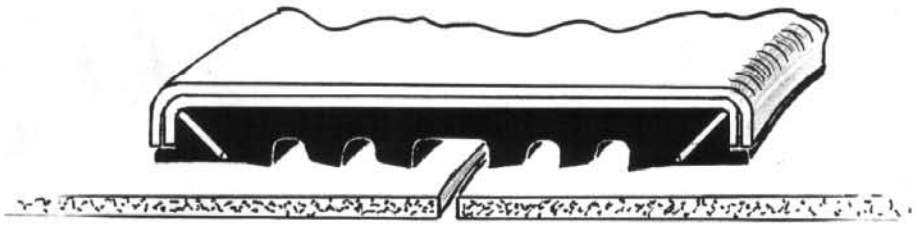
HOW TEEKAY COUPLINGS WORK

Each coupling consists of a casing, a gasket and a lockpart. The purpose of the casing is to house the gasket and to press it onto the pipe surface when the lockpart is closed. The lockpart is designed to pull the two ends of the casing together circumferentially around the pipe. In order to achieve this, the coupling is labelled clearly with a torque figure which should ensure that the gasket is compressed sufficiently against the pipe surface.

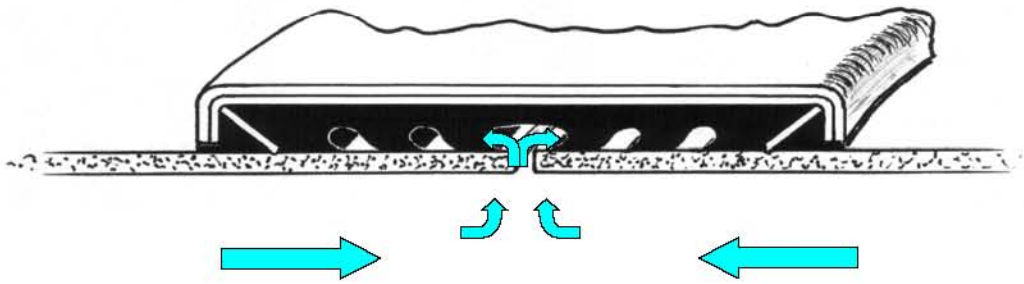


The gasket itself has sealing lips which press against the pipe surface and forms lip seals. The lip seals are designed to resist the internal pressure in the pipes. As the pressure increases, the coupling is designed to seal more tightly against the pipe surface.

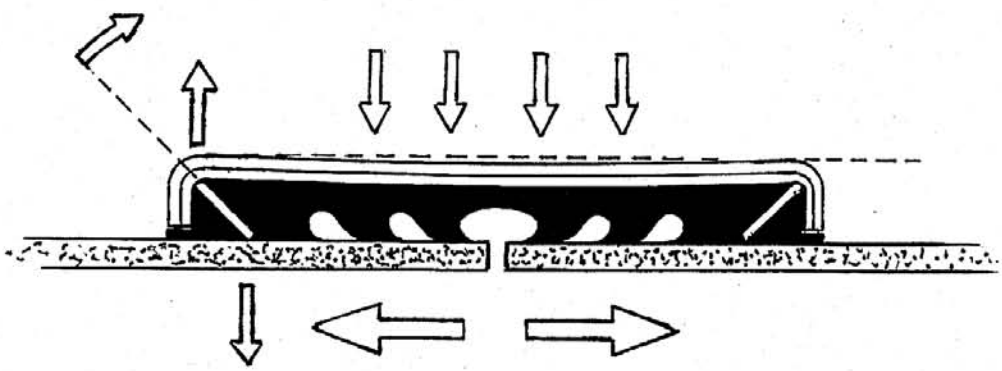




In the case of anchored couplings, such as the Axilock, two anchor rings are placed adjacent to, but separate from, the sealing mechanism. As the lockpart is tightened the sealing lips are pressed against the pipe surface to form a seal. At the same time the two anchor rings penetrate the rubber, bite into the two pipes and prevent them from pulling apart, whether by external loading or internal pressure. The end seal is also pressed against the pipe surface, which protects both the anchor ring and the section of the pipe where the anchor rings have bitten from any possible external corrosion.



Under pressure, or external load, as the pipes try to pull apart, the anchor rings rotate, which pushes the outer edges of the casing upwards. Under the ensuing beam effect the central cross section of the casing bows inwards which further compresses the rubber to form a yet tighter seal against the pipe.



DESIGN CONSIDERATIONS

PIPE MATERIALS

Teekay **Axilock** Pipe Couplings are primarily designed to join metallic pipes.

Other pipe materials, such as rigid plastics and GRP, can be joined under certain circumstances. Soft plastic materials, such as PE, must be fitted with internal stiffeners (these should be specifically requested at time of order) but will not resist pull out forces generated by cold creep. Please contact us prior to joining non-metallic pipe materials.

Teekay **Axiflex** Pipe Couplings are suitable for use with the following piping materials:

i) Carbon Steel (seamless, longitudinally or spirally welded)
ii) Stainless Steel (seamless or longitudinally welded), metric thin wall or standard schedule sizes
iii) Cast or Ductile Iron
iv) Concrete
v) Asbestos Cement
vi) Glass Reinforced Plastic (GRP) / Fibre Reinforced Polyester (FRP) centrifugally cast or spirally wound
vii) PVC and uPVC
viii) High Density Polyethylene (HDPE) and MDPE
ix) Polybutylene, Polypropylene and ABS

OVALITY

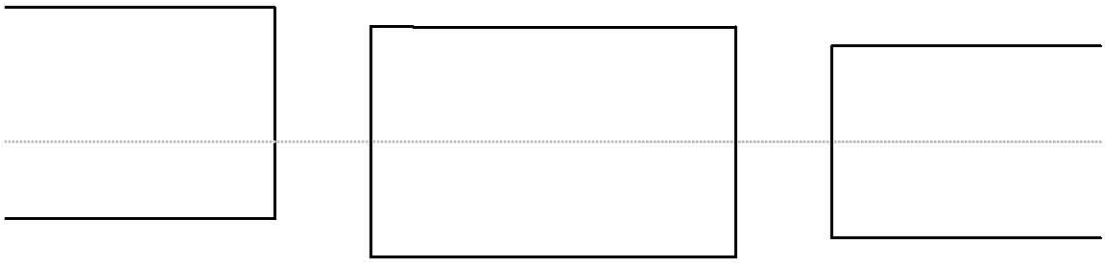
Teekay **Axiflex** Pipe Couplings are sufficiently flexible to accept a misshape within the pipe cross section provided the out-of-roundness is fairly evenly distributed around the circumference (oval rather than D shaped). Depending on application and pipe material, up to 8% ovality may be accommodated.

PIPE ALIGNMENT

The distance between pipe ends is caused by several factors. These include axial distance between pipe ends, parallel misalignment, angular misalignment and tolerances on pipe diameters. There are individual limits for each of these parameters if they occur separately but there is also a maximum limit on the maximum distance between the pipe ends when a combination of these misalignments occur.

PARALLEL MISALIGNMENT

The maximum permissible parallel or concentric misalignment for a Teekay coupling is 1% of the pipe OD or 3mm which ever is less.



ANGULAR MISALIGNMENT

Angle of Deflection for **Axilock** Type Couplings

Pipe OD mm	**Maximum Angle of Deflection**
38 - 60.3	5°
60.3 - 219.1	4°
219.1 - 429	2°

Angle of Deflection for **Axiflex** Type Couplings

Pipe ND mm	**Coupling Width mm**	**Maximum Angle of Deflection**
40 - 100	85	5°
80 - 300	110	5°
150 - 500	140	5°
600 - 700	140	3½°
800 - 1200	140	2°
200 - 700	210	5°
800 - 1200	210	3°
1300 - 1800	210	2°
1900 - 3000	210	1°
2 00 - 800	310	5°
900 - 1300	310	3°
1400 - 2300	310	2°
2400 - 3000	310	1°

Note:
Maximum angle of deflection assumes that the coupling spans the angle evenly.

ALLOWABLE PIPE DIAMETER TOLERANCES

Type of Teekay Coupling	Pipe OD mm	Coupling Width mm	OD Tolerance mm
AXILOCK (including Axilock FP)	38 - 57 60.3 - 429		-1 / +1 -1 / +2
AXIFLEX (including Stepped and Axiflex HC)	38 - 44.5 48.3 - 76.1 82.5 - 125 88.9 - 149.9 153 - 193.7 200 - 326 153 - 193.7 200 - 635 168.3 - 170 291.1 - 345.4 355 - 1255 219.1 - 345.4 355 - 1255 1256 - 2350 2351 - 3050 315 - 326 333.8 - 821 822 - 1631 1632 - 2350 2351 - 3050	65 85 85 110 110 110 140L 140L 140 140 140 210 210 210 210 310 310 310 310 310	+ / - 1 + / - 1.5 + / - 2 + / - 2 + / - 2.5 + / - 3 + / - 2.5 + / - 3 + / - 2.5 + / - 4 + / - 4 + / - 4 + / - 4 + / - 8 + / - 16 + / - 4 + / - 4 + / - 8 + / - 16 + / - 16 See also Parallel Misalignment Page 7

DISTANCE BETWEEN PIPE ENDS

For **Axilock** Couplings the optimum distance between pipe ends is 0 - 5mm. This allows for expansion and contraction, suction and vacuum, pipe deflection and a reasonable cutting tolerance.

For **Axiflex, Stepped** and **Axiflex HC** Couplings the recommended gap between pipe ends depends on the width of the coupling and whether or not a vacuum ring is fitted. When this gap is exceeded (or in all vacuum applications) a vacuum insert must be fitted.

The table gives the maximum pipe gaps for the **Axiflex** type of coupling.

Axiflex Pipe Gap

Coupling Width mm	Maximum Pipe Gap	
	Without Vacuum Ring mm	With Vacuum Ring mm
85	5	20
110	5	30
140	10	40
210	20	50
310	30	110

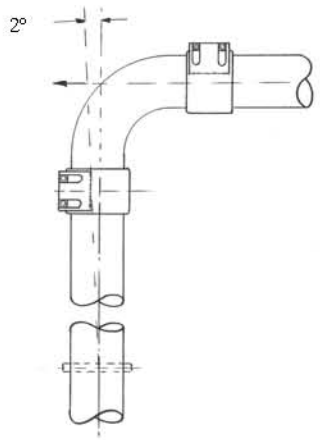
Notes:

1 Maximum pipe gap without vacuum ring can be doubled on applications where intrusion of the rubber gasket into the pipe gap is not a problem

2 Maximum pipe gap with vacuum ring is limited by the maximum angle of deflection. If the angle of deflection is less than the maximum allowable angle of deflection, the maximum pipe gap (with vacuum ring) can be increased accordingly.

EXPANSION AND CONTRACTION

Teekay **Axilock** Pipe Couplings can accommodate up to 6mm expansion / contraction in a straight line. At changes of direction make sure that any resultant angular deflection is restricted to a maximum of 2°.



Teekay **Axiflex** Couplings can accept thermal expansion or contraction of the pipeline by axial movement through the coupling or by the angulation of two couplings. In either case the pipeline should be adequately restrained.

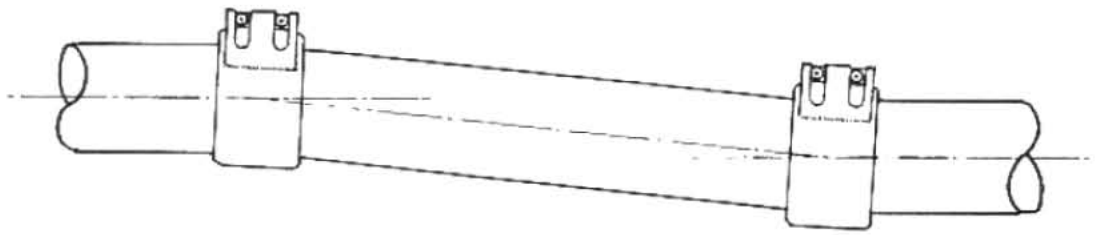
If it is not possible to place intermediate anchors between couplings, the Teekay **Axiflex** Coupling can be supplied with an integral central register, (see Page 14), to locate the coupling.

The recommended maximum pipe axial expansion or contraction which can be accepted by one coupling is as follows:

Coupling Width mm	**Pipe Expansion / Contraction mm**
85	2.5
110	7.5
140	14.5
210	25
310	35

LATERAL DISPLACEMENT

Lateral displacement may be accommodated by the use of two Teekay Couplings with an intermediate length of pipe. Lateral displacement between two pipes then becomes simple angular deflection at each coupling. Hence, the amount of displacement which can be accommodated in a given configuration is related to the permissible angular deflection. (See above.)



SHOCK, VIBRATION, WATER HAMMER

Due to the design of the gasket Teekay Couplings dampen sound, vibration and water hammer. Shock levels to military requirements can also be accommodated.

In the case of Teekay **Axiflex** Couplings for applications where excessive vibration might occur it is recommended that the couplings are supplied with central registers to locate the coupling in position.

TEMPERATURE

The operating temperature of the coupling is limited by the choice of gasket material.

EPDM: -40°C to +100°C
NBR: -30°C to + 80°C
VITON: -20°C to +250°C

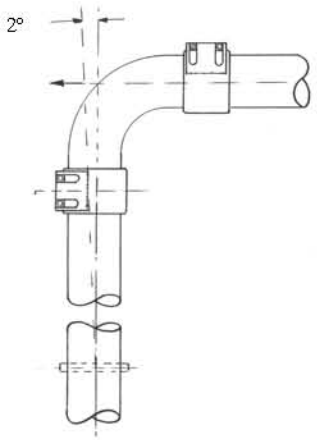
ELECTRICAL CONDUCTIVITY

In Teekay **Axilock** Pipe Couplings electrical conductivity is conveyed through the coupling casing by the anchor rings.

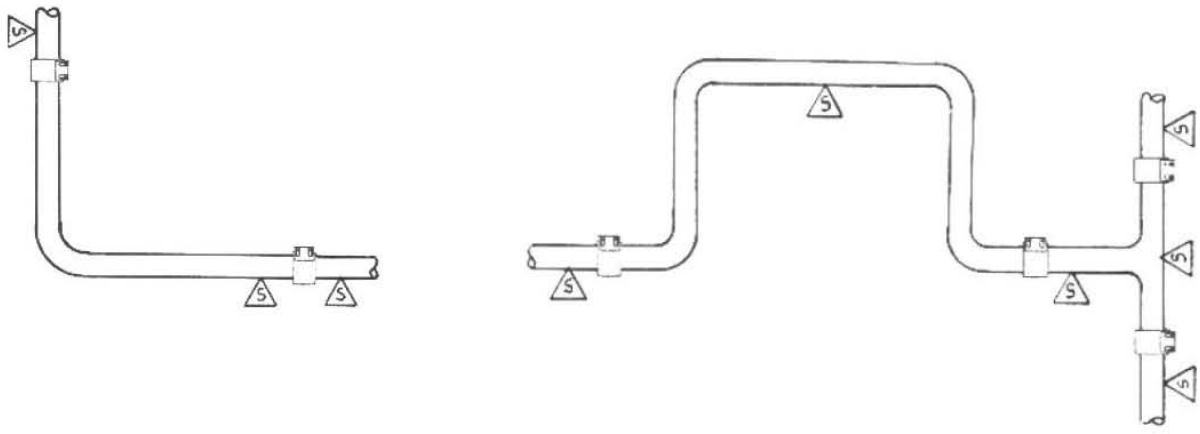
In Teekay **Axiflex** Pipe Couplings stainless steel continuity strips are fitted to prevent the build up of static electricity (these should be specifically requested at time of order).

SUPPORT AND RESTRAINT

Teekay **Axilock** Pipe Couplings are designed to restrain the pipes axially. However, they are also flexible, allowing some axial and angular movement. Therefore the pipes should be guided to ensure that they remain within 2° angular deflection, especially where a long run of pipes suddenly changes direction.

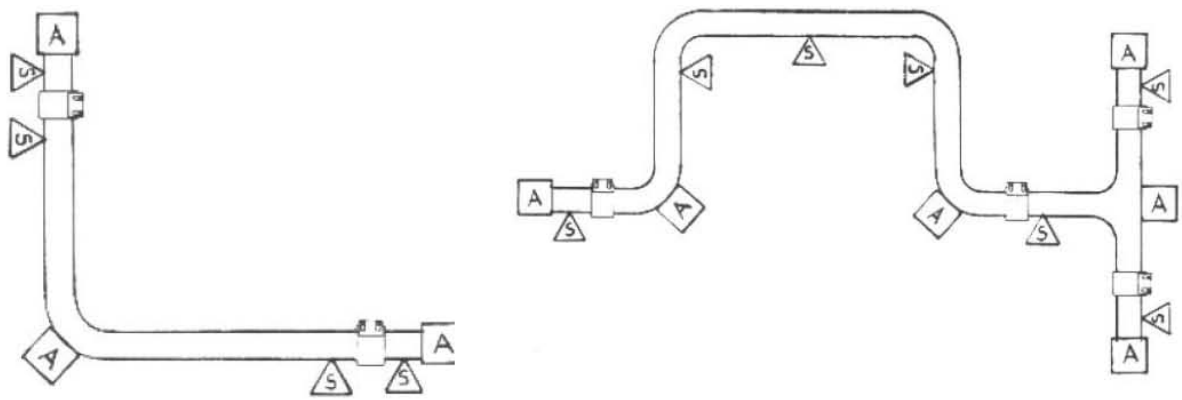


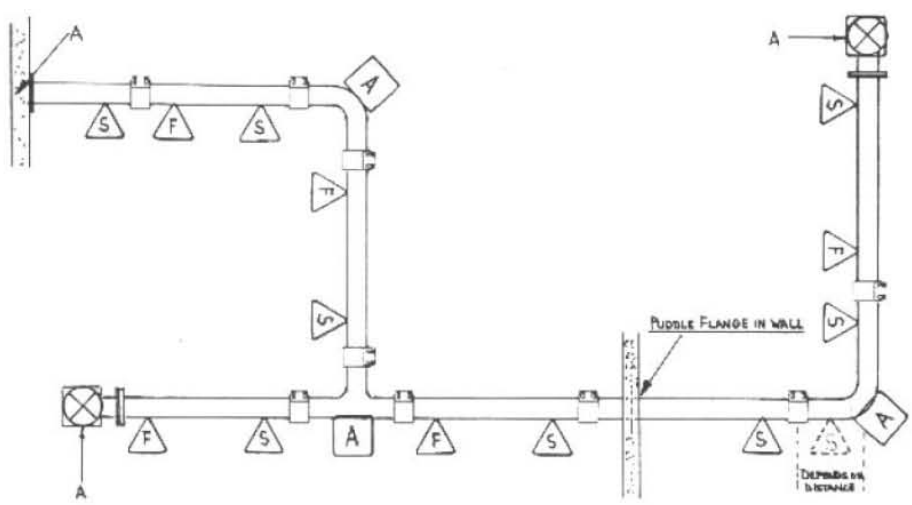
Teekay **Axilock** Pipe Couplings should always be installed in accordance with good piping practice, conforming to the relevant industry standards. For example:



Standard Teekay **Axiflex** Pipe Couplings are not designed to accept end load pressures. As a result, pipes must generally be anchored against internal pressure at changes in direction, branches, valves and at pipe ends. For example:

A = Anchor or thrust block F = Fixed support. S = Sliding support or Guide

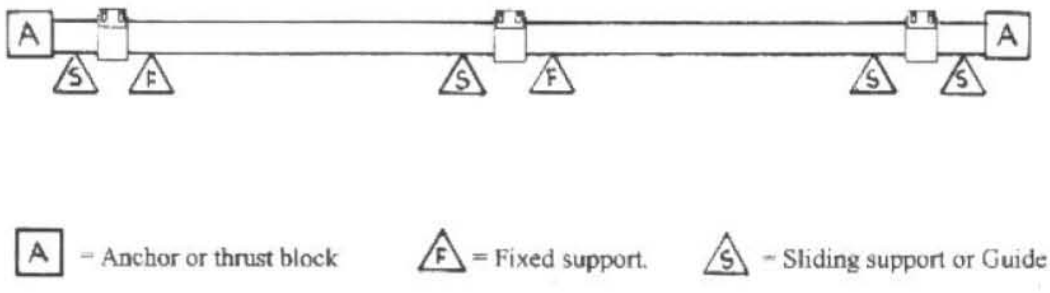




Buried pipelines can generally be restrained by means of thrust blocks at major changes in direction. Straight runs and minor curves are usually restrained by soil friction.

The same is largely true of gravity or very low pressure pipelines running along the ground, although with certain thermoplastic piping materials special attention should be given to restraining the forces generated by excessive expansion, contraction and creep.

For above ground applications it is recommended that pipelines should be anchored as shown in the following diagram:



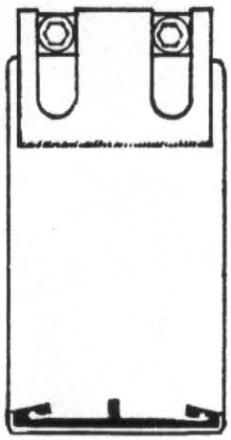
Intermediate anchors should be designed to withstand the forces and movements transferred and imposed upon them by each of the pipe sections to which they are attached, taking into account such forces as friction, wind load, self weight, and changes in fluid momentum.

Above ground pipelines subject to side thrusts, or required to be used to absorb angular deflections or lateral displacements, must be adequately restrained and supported.

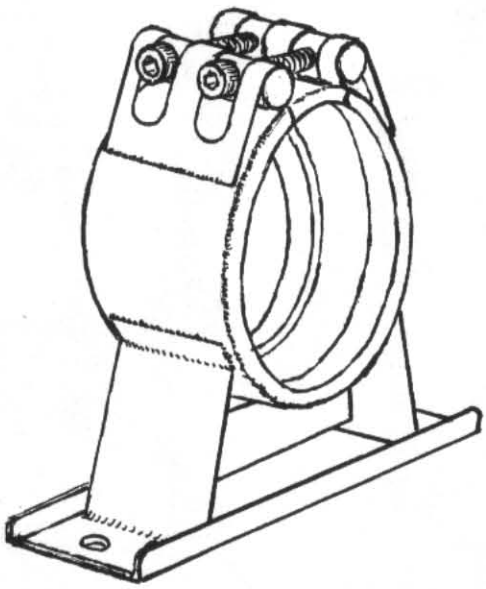
Supporting of the pipeline for shear deadweight must be carried out to ensure that no excessive sagging occurs beyond the limits of angular deflection of the coupling. Support pitching will depend on pipe material, diameter, wall thickness and operating temperature.

A simple method of harnessing pipelines is by welding lugs to the pipe and connecting them with tie rods.

For above ground applications where there is a possibility that the coupling may move along the pipe due to excessive vibration, expansion and contraction etc. the Teekay **Axiflex** Pipe Coupling can be supplied with a central register. The central register is a circumferential ridge integral to the gasket and serves to locate the coupling on the pipeline, thereby preventing its movement. (This should be specifically requested at time of order.)



Teekay **Bracketed** Pipe Couplings can be provided with brackets of various designs welded to the coupling casing which can then be bolted to any convenient support.



CORROSION PROTECTION

Teekay Couplings have been installed successfully in some of the worst corrosive conditions in the world, including the North Sea, the Dead Sea and Middle East coastal areas. They are used both above and below ground and, depending on materials of construction, can be partially or fully immersed in clean, dirty or even seawater.

Teekay Couplings have an excellent build quality and use only the best raw materials and components in their design, all of which are fully certificated. To avoid galvanic corrosion, Teekay couplings do not combine dissimilar materials. In addition, all couplings are completely rubber lined. The anchor rings of the Axilock Couplings are also protected from external corrosion by the rubber end seals. Axiflex Couplings can also be supplied with a non-corroding central register built into the sealing sleeve. All welding is by the TIG process and the welds are fully cleaned and passivated.

Every Teekay Coupling has a one piece rubber sealing sleeve which fully contains the pipeline media and thus the metallic components of the coupling i.e. the casing and the fasteners, are isolated from the potential internal corrosive effects of the media.

Sealing sleeves in three different materials - EPDM, NBR and Viton - can be provided to suit most applications. Bolt relaxation tests have shown that, at ambient temperatures, the sealing sleeves can function successfully for more than 100 years.

The Teekay Coupling casing and fasteners can be supplied in a variety of coated alloy and stainless steels to meet many environmental conditions. In addition to the standard range of materials listed in the respective brochures, special materials such as duplex or super duplex stainless can be provided for even the most saline conditions.

For some buried applications or for use on pipelines in aggressive atmospheres Teekay Couplings can be further protected after installation by any of the following established methods:

1 Protective Tapes e.g. Denso Tape
2 Shrink Sleeves e.g. Raychem
3 Cathodic Protection

Due to the streamlined design of Teekay Couplings, these methods can be incorporated cheaply and effectively.

INSTALLATION CONSIDERATIONS

Teekay products are simple and easy to install and offer generous tolerances and flexibility when they are installed correctly and in accordance with good piping practice.

A general torque recommendation is stated on the coupling label. While this should be generally adhered to, it may be necessary to increase or decrease the torque rating for certain applications in consultation with the Teekay Technical Department.

Fitting instructions are supplied with each delivery or are available from us. These should be read prior to installation and the procedures should be followed. Advice on applications or installation of Teekay Pipe Couplings is readily available from the Teekay Technical Department.

Since Teekay **Axiflex** Pipe Couplings can accept large tolerances on pipe outside diameter, pipes may be cut on site and the ends need not be machined to exact size. Due to the design of the Teekay **Axiflex** Coupling gasket, pipes need not be specially prepared prior to installation. It is recommended that when pipes are cut, any burrs or surface scale should be removed. Lubrication of the gasket or pipe is also strongly advised (NB this does **not** apply to **Axilock** products).

On longitudinally or spirally wound steel pipe, weld beads should be removed for a distance of one coupling width back from the end of the pipe.

Since the rubber gasket in a Teekay Pipe Coupling responds to changes in pipeline pressure it is not necessary to over tighten the screws to achieve a seal.

Torque ratings are printed on each Teekay Coupling label which indicate a torque suitable for most pipe materials and applications. However, with thin wall, soft or flexible pipe materials, it may be necessary to reduce the torque setting. This will decrease the radial load and allow an effective seal without deforming or damaging the pipe.

Conversely, on rigid pipes with rough surfaces, on oval pipes or to overcome certain site conditions, it may be necessary to increase the torque to allow the coupling to adopt the shape of the pipe to effect a seal. Before changing torques contact the Teekay Technical Department.

INSTALLATION

The pipe ends should be cut square and all sharp edges and burrs must be removed.

The pipe surface must be clean and smooth with no loose material in the region of the sealing lips.

There must be no dents in the pipe in the region of the sealing lips.

The alignment of the pipe ends must be within the limits specified for the coupling.

Mark half the width of the pipe coupling on both pipe ends as a fitting guide. This will enable the coupling to be centred over the pipe ends when fitted.

Check that the coupling is of the right type and that a vacuum insert is fitted if required.

Remove the plastic packing from the coupling.

Do not dismantle the pipe coupling.

Do not drop the pipe coupling.

Move one pipe end out of the way and slide the coupling over one pipe end. Re-position the other pipe and slide the coupling over the joint into the correct position as shown by the fitting marks already drawn on the pipes.

Tighten clamping bolts partially until the coupling is "nipped up" against the pipe. Do not rotate the coupling on the pipe once the coupling is engaged.

Tighten the locking bolts evenly with a torque wrench to the final prescribed torque on the coupling label. Ensure that both bolts have reached torque by moving from one to the other until both click off without further rotation.

Do not over tighten the coupling bolts. Do not re-tighten the bolts once set.

REMOVAL

Ensure that there is no pressure in the pipes at the joint to be removed.

Drain the pipes at the joint as far as is practicable.

Protect yourself against spilling liquid.

Protect any surrounding equipment from spilled liquid.

Make sure the pipe coupling is not supporting the pipe ends.

Loosen locking bolts alternately but do not remove completely.

Do not rotate pipe coupling on pipe as long as anchoring teeth are engaged (**Axilock** only).

Loosen anchoring teeth engagement, if necessary, by gently rocking or tapping the loosened coupling up and down the pipe (**Axilock** only).

Slide the coupling off the pipe.

Clean coupling and pipes ends and check the condition of the gasket before re-use.

TOOLS AND ACCESSORIES

Available separately or as a kit

Pipeline lubricant for easier installation of large diameter couplings (suitable for potable water)

Speed brace for taking up the slack on the fasteners prior to tightening the coupling with a torque wrench

Socket adaptors

	6mm	8mm	10mm	14mm AF
for	M8	M10	M12	M16 screws

Torque wrenches

Model SL1	Range 10 - 54 N/m
Model SL2	Range 30 - 150 N/m

Mallets
Available in 2 sizes: 35mm and 50mm
Use for improved seating on pipe surface of larger diameter pipes