General

- This installation guide should be read and the instructions it contains followed before initial startup, troubleshooting, changing any settings, or carrying out any maintenance work.
- Any modifications not described herein and not authorized by Kaeser will result in all applicable warranties being rendered null and void.
- National and Local Directives must be observed during installation, operation, maintenance, and repair. Appropriate measures must be taken to ensure compliance with these regulations before each applicable phase.
- Follow all applicable safety codes when installing SmartPipeXL™.
- SmartPipeXL may only be mounted, started up and serviced by fully trained and qualified personnel, observing the accepted industry codes and practices.
- For appropriate operating, make sure that SmartPipeXL is only used where the operating pressure and temperatures do not exceed the maximum operating values.
- For installation and maintenance work on the SmartPipeXL, make sure that the relevant section of the pipeline is depressurized and isolated with the system locked out and tagged out appropriately, to prevent any hazards that could be caused by a live system. Allow the SmartPipeXL to cool down or warm up to reach ambient temperature prior to starting any work on the SmartPipeXL.
- SmartPipeXL requires the use of Personal Protective Equipment (PPE) as noted below. Worksites may have additional PPE requirements. Therefore, installers are required to evaluate each site, then select and use the proper PPE required to complete the installation. Minimum PPE required:
    - Hard hat
    - Safety glasses
    - Hearing protection
    - Gloves
    - Safety shoes
    - Fall protection equipment (when working from heights)
- Flexible SmartPipeXL hose should be installed at the start of the system in order to eliminate any sources of vibration and to facilitate maintenance operations. Installers should use only SmartPipeXL components and accessories, including SmartPipeXL pipe clips and fixture clamps. The technical properties of the SmartPipeXL components, as described in the SmartPipeXL catalog and herein, must be respected.
- SmartPipeXL aluminum pipe is supplied ready for use. No particular preparation (cutting, deburring, chamfering, etc.) is required unless cutting to length.
- Thanks to the rigidity of SmartPipeXL aluminum pipe, temperature-related expansion / contraction is reduced to a minimum. The SmartPipeXL system retains its straightness, and hence its performance, over time.

- SmartPipeXL aluminum pipe is calibrated and fits perfectly with all SmartPipeXL components. It is prohibited to use SmartPipeXL fittings with any piping other than SmartPipeXL, and SmartPipeXL piping with any fittings other than SmartPipeXL. Should the need arise to connect another piping network, appropriate NPT adapters, unions, flanges, or similar must be used between the two networks. Doing so will void the warranty and could present safety issues. Improper operation could result in injury to persons or damage to equipment.

Component assembly

- SmartPipeXL components are provided with assembly instructions for their correct use. Simply follow the methods and recommendations stated in this document.

Expansion / contraction

- Expansion and contraction of the system should be calculated prior to installation. The system designer and installer should calculate the elongation or retraction of each SmartPipeXL line according to the recommendations in this installation guide.

Situations to avoid

- SmartPipeXL pipe should be protected from mechanical impact, particularly if exposed to collision with fork-lift trucks or in an environment with moving overhead loads.
- Rotation of the pipe and pipe supports should be avoided.
- SmartPipeXL pipe must not be welded.
- Flexible SmartPipeXL hoses should be used in accordance with the recommendations of the installation guidelines.
- Installation within a solid mass (concrete, foam, etc.) should be avoided.
- The hanging of any external equipment to SmartPipeXL pipe should be avoided.
- The use of SmartPipeXL for grounding, or as a support for electrical equipment should be avoided.
- Exposure to chemicals that are incompatible with SmartPipeXL components (please contact Kaeser for further details) should be avoided.
- SmartPipeXL should not support other items.
- SmartPipeXL should not be bent or modified in anyway outside of what is shown within this document.

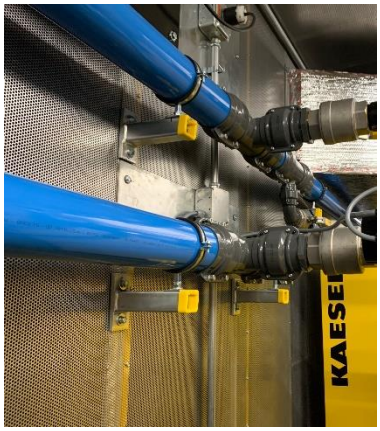
Installation and Maintenance Best Practices for an Optimized SmartPipeXL System

Follow Best Practices

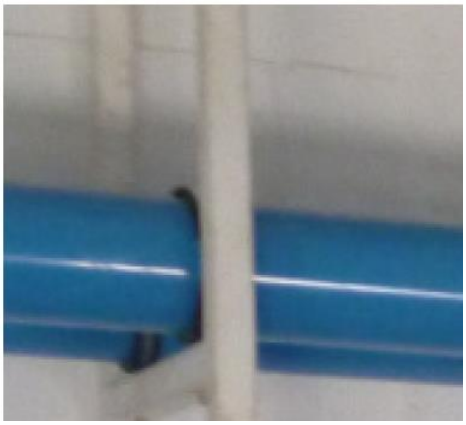
- Design, installation, and maintenance should be performed in accordance with accepted engineering knowledge and practice involving piping systems.
- Maintain high-quality air levels within your system.
- To avoid pressure drops within your system, minimize pipe diameter reductions.
- Properly size your system to allow for optimal flow and efficiency.
- All aluminum piping to be installed in strict accordance with SmartPipeXL installation instructions and specifications.
- Allowing the corners to expand and contract by placing pipe clips an appropriate distance from each corner. Avoid placing a pipe clip directly in a corner.
- Install piping adjacent to equipment and machines to allow service and maintenance.
- Install air and drain piping with 1 percent slope downward in direction of flow.
- Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.
- Install branch connections to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.
- Install piping to permit valve servicing (i.e. valves should have sufficient space around).
- Install piping free of sags and bends.
- Install unions, adjacent to each valve and at final connection to each piece of equipment and machine.
- Install sleeves and escutcheons for piping penetrations of walls, ceilings, and floors as necessary.
- The fixing clips shall allow axial movement of the pipe to compensate for system expansion and contraction.
- Horizontal and vertical SmartPipeXL piping shall be supported by SmartPipeXL pipe clips. Hanger rods to be solid with only enough thread for the connection ends. Hangers to be spaced at intervals as described herein, as required to avoid sag, prevent vibration, and allow accurate leveling or grading.
- Rigid support must be placed on the piping to ensure the piping network will not axially move with the introduction or removal of compressed air.
- All hoses should include an anti-whiplash strap mounted to a fixed structure.
- Follow all applicable state, local, and national codes when installing the piping network.

Examples of Rigid Piping Supports

Rigid Pipe Supports with Flexible Connection at Discharge



Rigid Pipe Supports from Wall



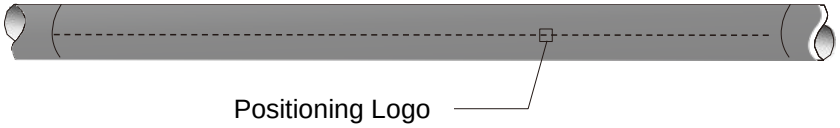
Rigid Pipe Supports from Ceiling

Filter supports

AMCS and Filter supports

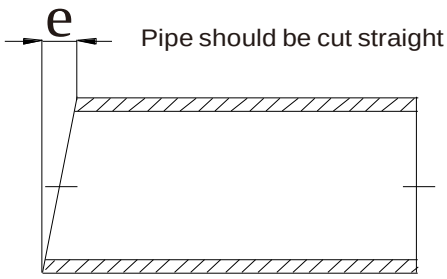
Drilling Indicator

- An identifying dashed line is imprinted on each length of pipe that may be used as an alignment guide when installing quick drop connections.



Cutting the Pipe

- Rotate the corresponding pipe cutter around the pipe while gently tightening the wheel.



- Use part number ANK0040 for pipe diameters ¾” to 2 ½”
- Use part number ANK0140 for pipe diameters 1 ½” to 4”
- For larger sizes use the electric pipe cutter, part number ANK0344

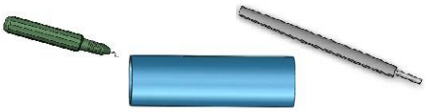
Nominal Diameter	(e) Cutting slope of pipe and allowable deviation (mm / in)
80	1.0 / 3/64
100-150	1.4 / 1/16
200	2.0 / 5/64

Sizing Chart for Quick Drops

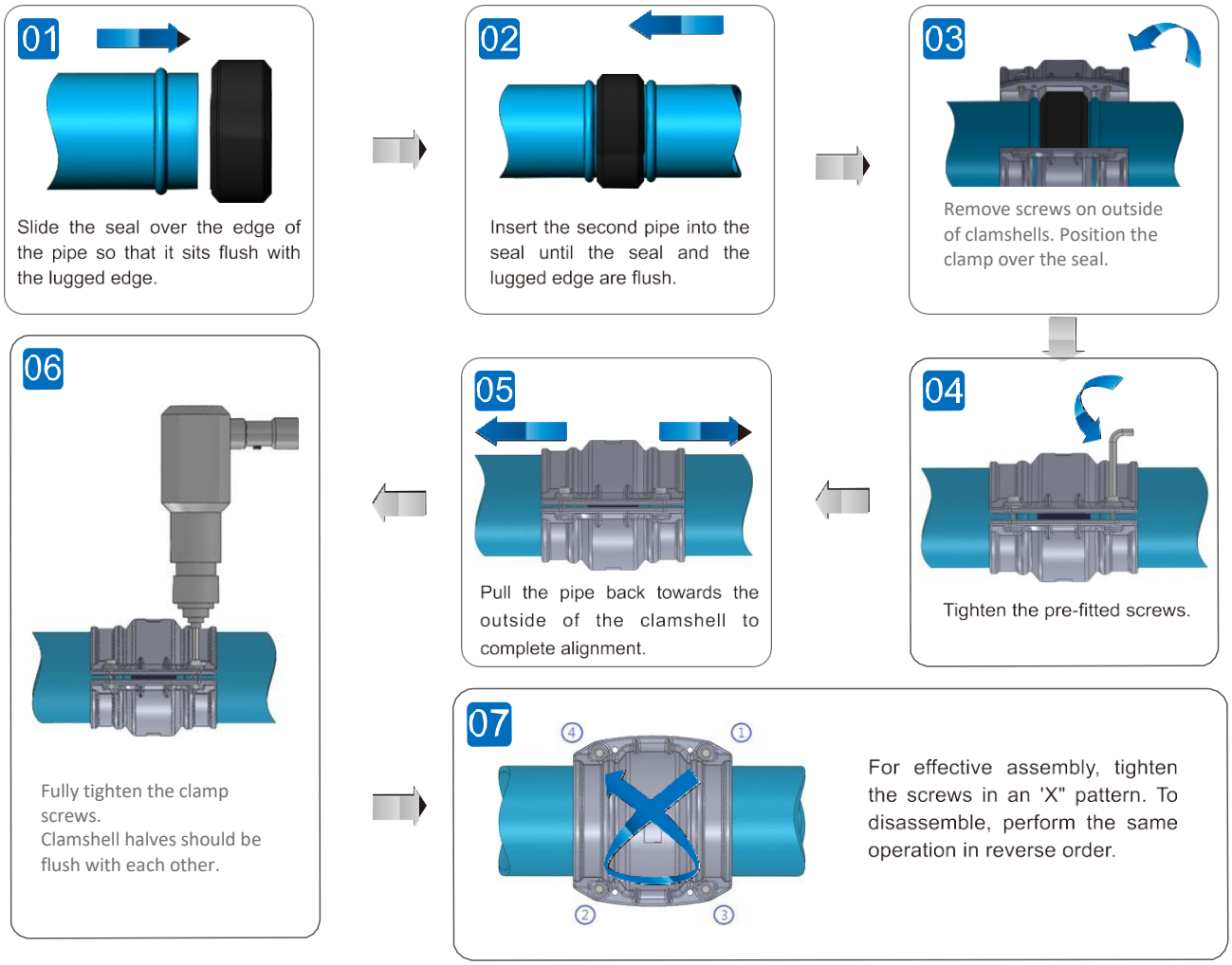
Pilot Bit	Hole Saw	DN(M/M)	Quick drops (PN)				
ANK0243	ANK0343	Φ25	ANK7110	ANK7210			
			ANK8110	ANK8210	ANK9110	ANK9210	ANKA210
			ANK7011	ANK7111			
			ANK8011	ANK9011			
ANK0643	ANK0443	Φ38	ANK8410				
ANK0643	ANK0543	Φ51	ANK9410	ANK9510	ANKA410	ANKA510	

Deburr & Chamfer the Outer and Inner Edges before Installation

- Use a hand file for DN80-DN200 to chamfer the outer edges; make use of a deburring tool to deburr the inside of the pipe end.
- All factory lengths will be chamfered and deburred.

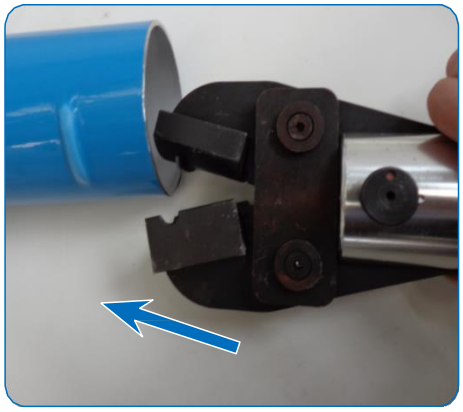


Installation Guide for DN80~DN200

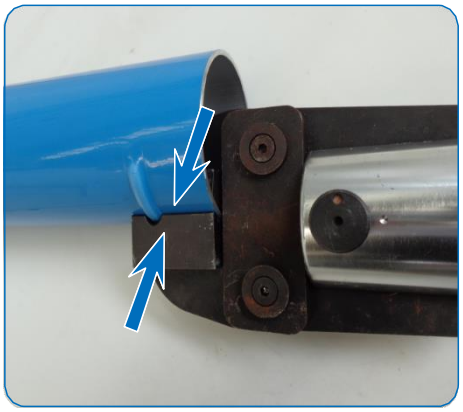


Hand-held Hydraulic Lugging Machine Operation Requirements

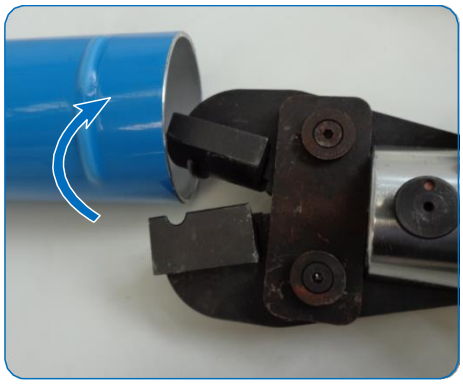
Use portable lugging machine, part number ANK0844 (includes tool and jaw kit). A jaw kit (part number ANK1844) can be used with similar lugging machine to lug SmartPipeXL.



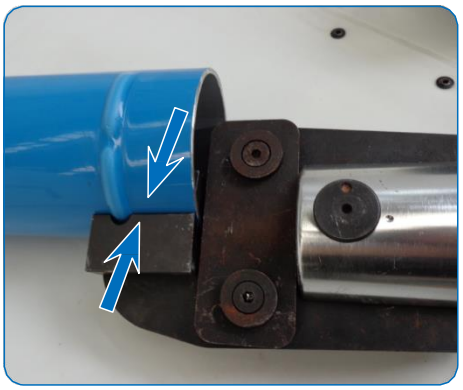
Manually open the jaws of the clamp and insert the aluminum pipe into the clamp as far as possible.



Release the jaws and press the button until the cylinder completes the lugging cycle.



Re-open the two jaws to remove the pipe.



Repeat the lugging cycle until the required number of lugs are applied to the pipe.

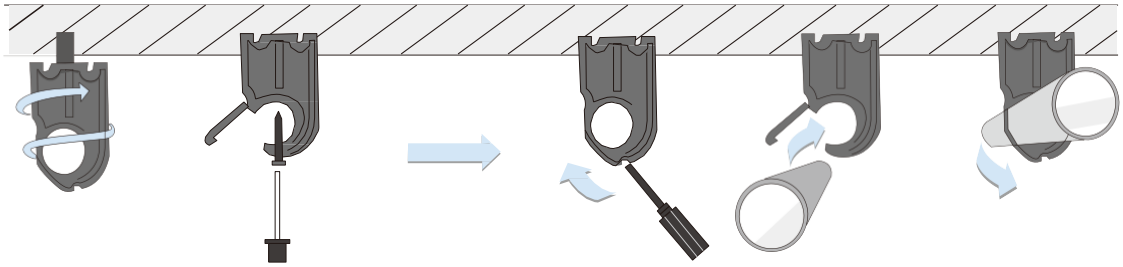
Note that Jaws include an alignment mark. Align the edge of the jaw with the alignment mark for each lug after the first.

Lug Size for DN80~DN200

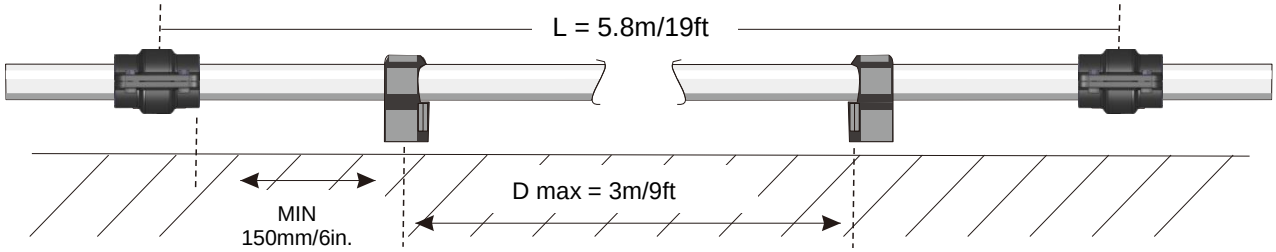
Min. number of lugs	DN80	DN 100	DN150	DN200
	6	6	9	12

Pipe Clip

3/8” - 16



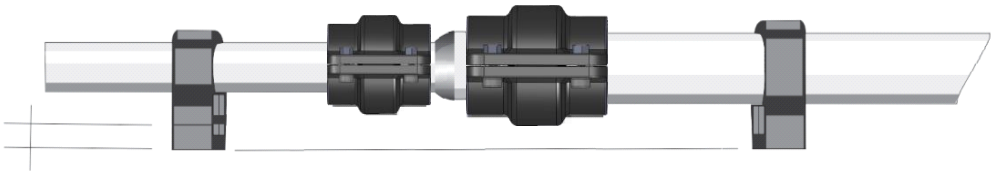
SmartPipeXL’s pipe clips (ANK7022 and ANK8022) are designed for versatility. They can be secured via all-thread rod through the clips internal 3/8” - 16 nut, or mounted directly with wall anchors.

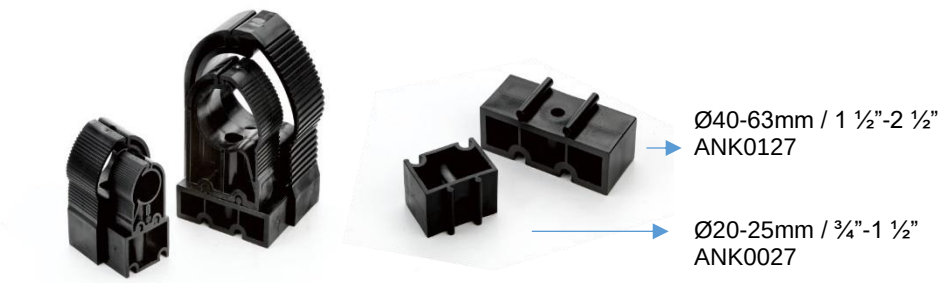


- The bolt size 3/8”-16 is suitable for all fixing clips.
- This clip allows expansion and contraction of the pipe to occur freely. The fixing clip should be fixed at the minimum distance of 6 inch (150mm), but no longer than 4 feet, from the connector in order to allow for the expansion and contraction effect.
- The below data is the distances of the two clips to be fixed for SmartPipeXL.

Φ	L (Meter)	D max (meter)
80-200	5.8	3

Spacers for Pipe Clips





Spacer clip ANK0027 is used to create a level plane for 3/4” or 1” diameters transitioning to 1 ½”, 2”, or 2 ½”.
Spacer clip ANK0127 is used to create a level plane for 1 ½”, 2”, or 2 ½” diameters transitioning to 3” or 4”.

Installing Quick Drop Connectors

01

Mark the pipe where the hole for the quick drop connector will be installed.

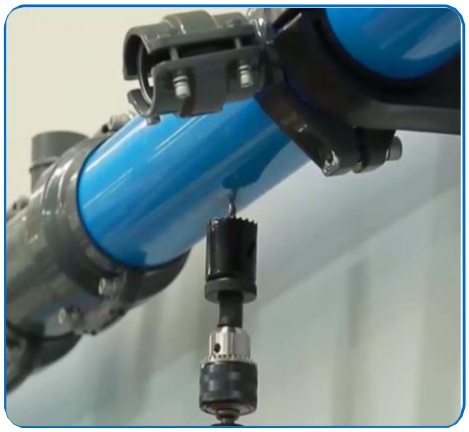
02

Identify the drill arbor & hole saw bit required by locating the quick drop part number on the Sizing Chart for Quick Drops (page 2).
Note: the quick drop part number is located on the connector, add ANK in front of part number.

03

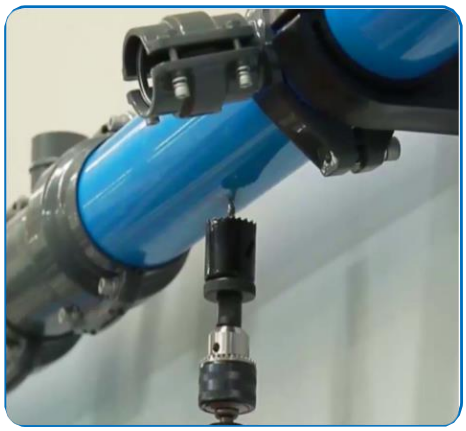
Identify the drill arbor & hole saw bit required by locating the quick drop part number on the Sizing Chart for Quick Drops (page 2).
Note: the quick drop part number is located on the connector, add ANK in front of part number.

04



Hold the drill perpendicular to the pipe with the drill bit in the center of the mark placed on the pipe.

05



Apply steady pressure until the hole saw bit has completely entered the pipe. The hole saw bit and drill bit should have the main portion of the drilled aluminum.

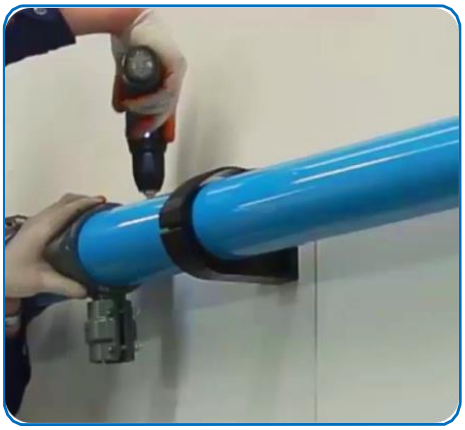
06

Remove debris and deburr cut edges.

07

The quick drop connector easily aligns into the drilled hole.

08



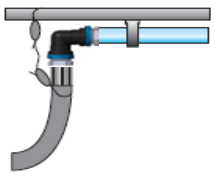
Tighten the bolt to complete assembly per torque specification.

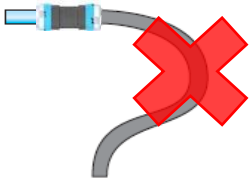
Compensating for the effect of expansion and contraction due to temperature variations

Consequences of not properly accounting for thermal variations:

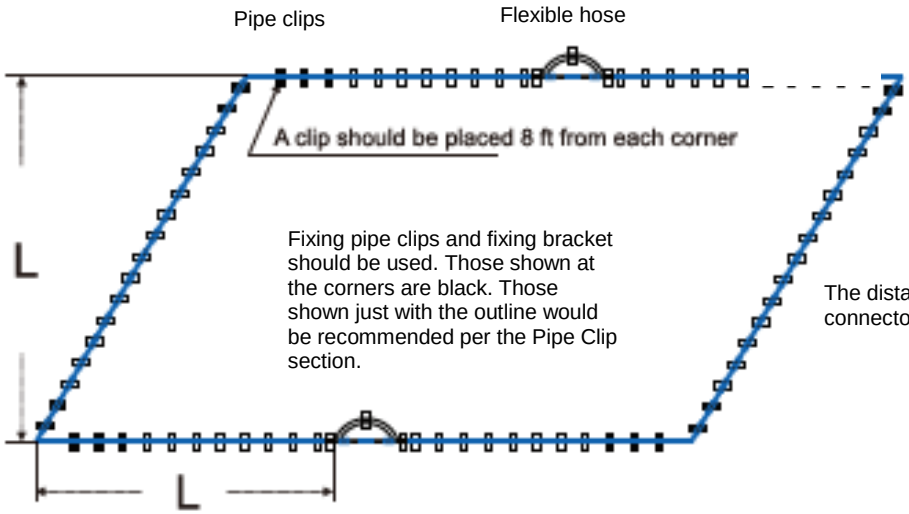
- Leakage and system deformation, which in extreme situations, could result in a connection separation.
- Pipe system movement could create an obstruction.
- Quick drop connections could become compromised.
- Hoses must be used in aluminum piping systems per recommendations below.

1. In order to compensate for the effects of expansion and contraction due to temperature variations, system lengths should be appropriately evaluated and expansion joints or flexible hoses must be installed where needed.
    - Anytime there is a change in temperature between areas
    - If there is a temperature differential of 30°F or more possible in the system
    - For significant lengths of piping
2. Flexible hose or expansion loop locations, including but not limited to:
    - The discharge of the compressor
    - The middle of a long run of pipe
    - Corners of a piping network
    - In a multiple pipeline loop at the beginning of a parallel line internal to the pipeline loop
    - Any location where point of use equipment may transfer vibration back to the main header
3. When installing flexible hoses:
    - The hose shall be in the same plane or with an appropriate bend
    - The hose should be straight for twice the O.D. from each fitting end before bending
    - Use the natural curvature of the hose when considering bends
    - Consider the expansion and contraction of the hose for straight connections. The hose must not be pulled tight, it must have enough slack for expansion and contraction and this may exhibit a slight sag of the hose.
    - The hose must include anti-whiplash straps mounted to rigid support, not piping.
    - "S" bends are not acceptable.
    - The hose should not have any twist of axial movement.
    - The hose must not support the weight of the pipe, fittings, or other items. Appropriate piping supports on either end of the piping prior to the hose must be installed.
4. The bend radius to follow for SmartPipeXL flexible hoses:
    - 12” for 3”
    - 16” for 4”
    - 48” for 6”
    - 72” for 8”





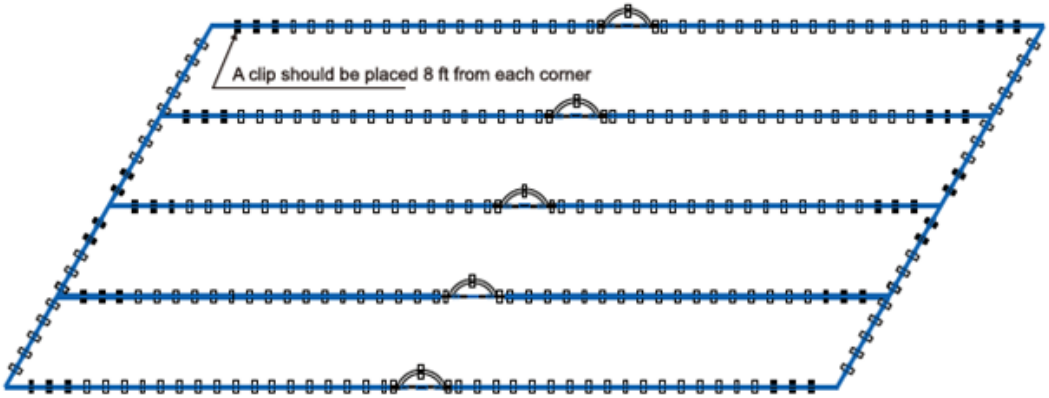
5. Single loop pipeline for DN40-DN100
    - Using a 30° flexible hose in the middle of the pipeline



Fixing pipe clips and fixing bracket should be used. Those shown at the corners are black. Those shown just with the outline would be recommended per the Pipe Clip section.

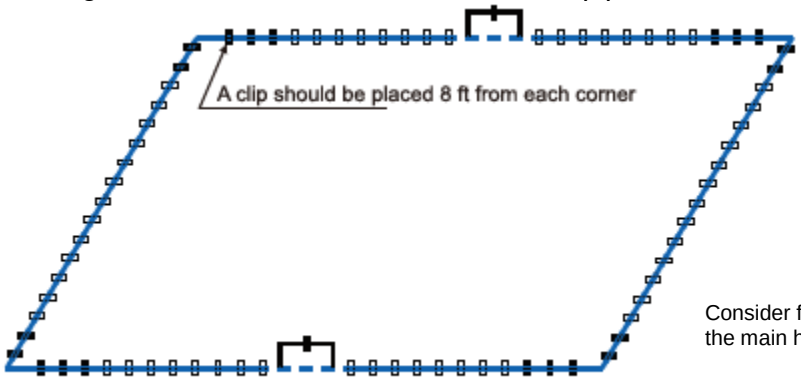
The distance between pipe clip and the connector should be appropriately sized

6. Multiloop pipeline for DN40-DN100
    - Using a 30° flexible hose in the middle of the pipeline



Compensating for the effects of thermal variation

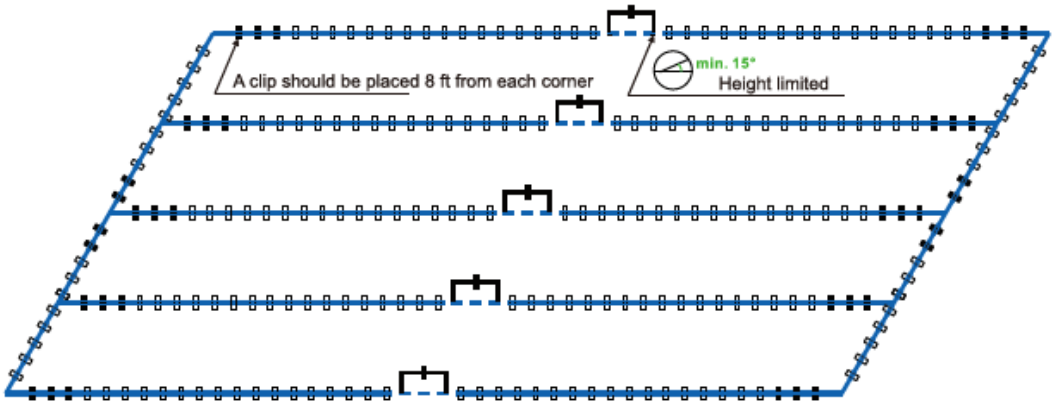
7. Single loop pipeline for DN150-DN200
    - Using two metal hoses in the middle of the pipeline



Consider flexibility for drops from the main header as well

Compensating for the effects of expansion or contraction

8. Multiloop pipeline for DN150-DN200
    - Using two metal hoses in the middle of the pipeline



System Check Prior to Pressurization

If a new SmartPipeXL system has been installed, or an existing system is modified or serviced, technicians are required to check the following, prior to pressurizing the system:

- Verify all fittings have been tightened appropriately per the Installation Guide.
- Verify all brackets, hangers, and clips are assembled properly and screws / bolts are fully tightened.
- Verify any openings are plugged closed prior to pressurization.
- Verify all piping is installed per instructions. All piping shall be level or within the tolerances specified in this manual or the SmartPipeXL catalog.
- Verify all installation issues noted during inspection are corrected prior to pressurizing the system.
- Verify that hoses and drops are supported properly and that they cannot move the SmartPipeXL header.
- Verify that SmartPipeXL piping is not used to support other equipment.

General Piping Practices for Startup

Pipelines of compressed air, vacuum, and inert gases only.

Before starting a plant conveying compressed air, the potential danger of high-speed expansion of such fluids must be taken into account. There is the potential for piping to separate from the fitting, or the fittings to move.

These incidents are extremely dangerous for the safety of people in or in close proximity to the plant and may cause serious damages to the facility, the equipment, or the people. The effect caused by a breakage or slipping of the piping or fitting is comparable to a violent explosion, with a projection of the involved materials and any related system's component. The reason of such incidents can be related to: a faulty joint, incorrect evaluation of the working conditions, incorrect installation practices, incorrect starting operations, choice of incorrect material.

More specific examples, but not limited to:

a. Where applicable, incorrect position of the clamping ring in the fitting or missing the clamping ring entirely
b. Mistakes in machining or assembling the fitting
c. A pipe out of the allowed tolerance, undersized or incorrect pipe used
d. Fittings not tightened properly or overtightened causing deformations in the pipe or fitting
e. Missing or damaged Seals
f. Debris obstructing the Seals
g. Improper assembly of the pipe and fittings

The following Pressure Test directions can avoid the danger of the above-mentioned incidents. The plant design must include enough valves to gradually pressurize the entire pipeline. It helps to gradually increase the pressurized volume.

The ASME code B31.3 advises to use water during the pressure test, however, that is not always possible. Most installations obtain the needed pressure using an air compressor.
At the initial pressurization of piping it is recommended to apply the following procedure; it is recommended to reach the station operating pressure value gradually and slowly:

1. Verify that all the people are far from the installation area, or entirely out of the facility.
2. In a large facility, it is recommended to use a small separate compressor (air quality required must be considered) and isolate each section of the system rather than pressurizing the entire system at once. Start with the compressor room prior to the distribution network. Then move to each subsequent area of the facility.
3. Check the correct tightening of all fittings.
4. Ensure that all open fittings are closed and isolation valves for each section are locked out and tagged out.
5. Start the compressor. Raise the pressure to no more than 20 psig to start.
6. At every pressure step, listen and check for leaks, and ensure there is no axial movement of the piping network. Wait at least one minute before going on to the next pressure test value, if there are leaks, immediately depressurize the section, fix the leaks, and begin the test again. Increase the pressure in steps by a minimum of 10 psi. If there is any axial movement of the piping, immediately depressurize the section, correct the issue, and begin the test again.
7. After reaching the maximum pressure, wait for pressure stabilization.
8. Isolate the system by turning off the compressor, and closing the discharge ball valve from the compressor.
9. Maintain this maximum pressure for at least 10 minutes.
10. Depressurize the system completely.
11. Repeat Steps 1 through 10 for each subsequent section of the facility.
12. It is a good practice to pressurize and depressurize the system several times prior to handing the system over to the customer, as well as operating all possible compressed air users, especially those high demand users.

Attention! The connections can be guaranteed only if SmartPipeXL fittings are connected to SmartPipeXL pipes. See Installation Guidelines for further information.

For further information on installation, please visit www.kaeser.com/smartpipexlinstall.

INSTALLATION VIDEO