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Stainless Steel  
Water Application



# Stainless Steel

Water Application Installation and Assembly Guide

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# AIRnet Installation Instructions

## **Notice A: Certified Installer**

At AIRnet, we take pride in the quality and safety of our products. That's why we require that all installations are carried out by a certified installer, who is highly trained and equipped to handle all aspects of the installation process.

## **Notice B: Complete Comprehension**

This comprehensive manual must be thoroughly read in its entirety in order to have a complete understanding of the AIRnet assembly process.

# Operating Conditions

## Operating Conditions

AIRnet stainless steel pipes and fittings are designed for industrial water cooling and heating applications in a closed loop system. AIRnet stainless steel systems must only be used as per the specifications mentioned in this AIRnet document.



AIRnet stainless steel systems must be appropriately protected against violent impacts and wind gusts.

Ensure accessibility of the AIRnet system for possible future system expansion or maintenance.



AIRnet stainless steel pipes and fittings should not be used as support for electrical equipment or earth conductors.



AIRnet stainless steel pipes should never be directly connected to a source of vibrations (use hoses instead).



When using water as a medium through the AIRnet stainless steel pipes and fittings, the system must be in closed circuit as regards to corrosion and the water used for heating or cooling must meet the quality criteria indicated in the table “Water Quality Parameters.”



AIRnet pipes and fittings are not suitable for direct contact with soil. A watertight PVC pipe suited for underground or outside installations can be used to install around the AIRnet pipe.

## AIRnet Installations in Explosive Environments

Cutting, deburring and assembly of AIRnet stainless steel pipes can create sparks. Necessary precautions in explosive atmospheres must be taken.



AIRnet stainless steel installations in explosive environments must always be earthed. Bonding and earthing must be checked at frequent intervals to secure that the system cannot be electrically charged.

## Purity Remarks

AIRnet stainless steel cannot be allowed to convey any end products (food, beverage, pharmaceuticals, etc.)

# Safety Instructions

## Safety Instructions



AIRnet is not meant to bear weight beside its own weight. Heavier accessories incorporated into the AIRnet system (like filters or valves) need proper supporting.



Do not use any other brand fittings or pipes in combination with AIRnet stainless steel products.



Installation, adjustments and repair work of an AIRnet system must be performed by authorized trained personnel.

Installers must use the necessary protection means (PPMs). When working at heights, use a harness for personal protection, and ensure that tools are securely fastened to prevent them from falling.



Installers must comply to all local safety requirements related to the application(s) in scope. Special care must always be taken to prevent suffocation risks when working with gases other than air.

Please consider the potential galvanic corrosion when combining parts with different material.

Before any installation, adjustment, repair work or other non-routine checks, relieve the AIRnet system of pressure and effectively isolate the system from all sources of pressure.

Avoid routing pipes across electrical circuits or operating machinery to prevent potential damage in case of leaks.



Only genuine AIRnet parts and tools should be used when installing, adjusting or repairing an AIRnet stainless steel system.

All plugs and caps must be removed before installing the AIRnet pipes.



Check the surface of the AIRnet pipes before installing. There should be no relevant scratches, abrasions, dents etc.



Use only solvents or chemicals which do not damage the materials of AIRnet.

Please conduct an LMRA (last minute risk assessment) before commencing an AIRnet installation.



Before using the AIRnet stainless steel system, installers must ensure that all necessary test controls and applicable rules for the specific installation are complied with.

At initial startup of the AIRnet system, apply a test pressure of 1.5 bar to identify leakage or imperfect joints. After performing an inspection, increase the pressure gradually and constantly (max 1 bar every 5 minutes) and perform a second inspection for leakages or imperfect joints at the final pressure.

Never use damaged AIRnet fittings or tools.



AIRnet  
stainless steel  
water application  
**Product  
Information**

AIRnet stainless steel is a piping system designed to deliver a fast, easy, reliable and clean distribution network for industrial water application as per specification mentioned below.

## Pipes

<b>Product Range</b>	Pipes SS304L: D15 (1/2"), D22 (3/4"), D28 (1"), D35 (1 1/4"), D42 (1 1/2"), D54 (2"), D76 (2 3/4"), D89 (3 1/2"), D108 (4") Pipes SS316L: D15 (1/2"), D28 (1"), D42 (1 1/2")
<b>Material</b>	Stainless Steel AISI 316L 1.4404 EN10088 Stainless Steel AISI 304L 1.4301 ASTM A666
<b>Treatment</b>	304L - Unannealing 316L - Annealing

## Fittings

<b>Fittings</b>	D15 (1/2"), D22 (3/4"), D28 (1"), D35 (1 1/4"), D42 (1 1/2"), D54 (2"), D76 (2 3/4"), D89 (3 1/2"), D108 (4")
<b>Connection</b>	Press fit system
<b>Seal fittings</b>	FKM (fluoroelastomer)
<b>Material</b>	Stainless Steel AISI 316L 1.4404
<b>Treatment</b>	316L - Annealing

## General specifications

<b>Applications</b>	Water in closed system
<b>Safety factor</b>	4, Burst pressure > 64 Bar (>928 PSI)
<b>Working pressure</b>	16 Bar (232 PSI)
<b>Working temperature (*)</b> <i>(Range for hot water and cold water)</i>	-20°C to +120°C (-34°F to 248°F)



(\*) -20 °C to 0°C range considering glycols as additives.

# Water Quality Parameters

Parameter	Unit	Closed loop	
		T < 90°	90° < T ≤ 120°
pH		7,5 - 9,3	7,5 - 9,3
Conductivity	µs/cm	< 4000	50-600
Total Dissolved Solids (TDS)	mg/L	TDS required to calculate RSI	
Ca-hardness	ppm CaCO <sub>3</sub>	< 250	< 50
Total alkalinity	ppm CaCO <sub>3</sub>	Required to calculate CCI	
Ryznar Stability Index (RSI)		5,6 - 7,5	5,6 - 7,5
Chlorine	ppm	Not allowed	Not allowed
Chlorides (304L/316L)	ppm (**)	< 200 / (< 400)	< 50 / (< 100)
Nitrates	ppm	Required to calculate CCI	
Sulphates	ppm	< 250	< 150
Chemical Corrosion Index (CCI)	(***)	< 1	< 1
Copper	ppm	< 1	< 0,2
Ammonium	ppm	< 0,5	< 0,5
Suspended Solids (maximum 10 µ)	ppm	< 10	< 1
Biology	CFU/mL	< 10 <sup>3</sup>	< 10 <sup>3</sup>

(\*\*) Limit is function of RSI

(\*\*\*) Chemical Corrosion Index =  $([SO_4^{2-}] + [Cl^-] + [NO_3^-]) / [Total\ Alkalinity]$  all in meq/l

# Water Quality Parameters

$$RSI = 2 * pHs - pH$$

Where:

- pH = measured pH (at room temp) of water sample
- pHs = pH at saturation

The pHs is calculated by using:

$$pHs = (9,3 + A + B) - (C + D)$$

- RSI < 6: scale formation
- RSI 6 - 7: neutral water
- RSI > 7: corrosive water

Generally, the values from A, B, C and D are calculated as follows:

- A = (Log10 [TDS] - 1)10
- B = -13,12 x Log10 (°C + 273) + 34,55
- C = Log10 [Ca<sup>2+</sup> + as CaCO<sub>3</sub>] - 0,4
- D = Log10 [alkalinity as CaCO<sub>3</sub>]

Approximate values:

Total Dissolved Solids (ppm)	A	Temperature (°C)	B	Ca-hardness (ppm CaCO <sub>3</sub> )	C	M-alkalinity (ppm CaCO <sub>3</sub> )	D
< 30	0,1	0 - 1	2,3	9 - 11	0,6	10 - 11	1,0
30 - 320	0,2	2 - 6	2,2	12 - 14	0,7	12 - 14	1,1
>320	0,3	7 - 9	2,1	15 - 17	0,8	15 - 17	1,2
		12 - 16	2,0	18 - 22	0,9	18 - 22	1,3
		17 - 22	1,9	23 - 28	1,0	23 - 28	1,4
		23 - 27	1,8	29 - 35	1,1	29 - 35	1,5
		28 - 32	1,7	36 - 44	1,2	36 - 44	1,6
		33 - 38	1,6	45 - 56	1,3	45 - 56	1,7
		39 - 43	1,5	57 - 70	1,4	57 - 70	1,8
		44 - 49	1,4	71 - 89	1,5	71 - 89	1,9
		50 - 55	1,3	90 - 112	1,6	90 - 112	2,0
		56 - 61	1,2	113 - 141	1,7	113 - 141	2,1
		62 - 65	1,1	142 - 177	1,8	142 - 177	2,2
				178 - 223	1,9	178 - 223	2,3
				224 - 281	2,0	224 - 281	2,4
				282 - 355	2,1	282 - 355	2,5
				356 - 446	2,2	356 - 446	2,6
				447 - 563	2,3	447 - 563	2,7
				564 - 707	2,4	564 - 707	2,8
				708 - 892	2,5	708 - 892	2,9
				893 - 1000	2,6	893 - 1000	3,0



# Compatible Glycols for Installation

The use of antifreeze should be limited to cases that necessitate it (such as systems with combined heating and cooling and systems combined with solar systems). The glycols listed in table below are fully compatible with the AIRnet stainless steel piping system with the given glycol-water ratio specified. Any glycol not listed in this table should be inquired about to the AIRnet technical support.

In the case that the installation intends to have a permanent mixture of water and antifreeze components, system dimensioning should be adapted to that as it will influence pressure losses and reduce heat output.

GLICOLE	Manufacturer	Areas of use
GLYKOSOL N	Pro Kühlsole GmbH	Heating, Cooling cycles
PEKASOL L	Pro Kühlsole GmbH	Heating, Cooling cycles
TYFOCOR	Tyforop Chemie GmbH	Heating, Cooling cycles
TYFOCOR L	Tyforop Chemie GmbH	Heating, Cooling cycles
Antifrogen N	Clariant	Heating, Cooling cycles
Antifrogen L	Clariant	Heating, Cooling cycles
CosmoSOL	Tyforop Chemie GmbH	Heating, Cooling cycles
DOWNCAL 100	DOW	Heating, Cooling cycles
DOWNCAL 200	DOW	Heating, Cooling cycles
STAUBCO® COOL N	STAUB & CO. – SILBERMANN GmbH	Heating, Cooling cycles
STAUBCO® COOL L	STAUB & CO. – SILBERMANN GmbH	Heating, Cooling cycles
Glysofor N	WITTIG Umweltchemie GmbH	Heating, Cooling cycles
Glysofor L	WITTIG Umweltchemie GmbH	Heating, Cooling cycles

- You will need to increase the flow with 11% if you use 40% glycol in the water in order to get the same energy transfer.
- OR you can transfer 11% less energy if you use the same flow but add 40% glycol to the water.

Antifreeze / glycol (%)	Protection (°C / °F)	Correction factor
20%	-10°C / 14°F	1,05
30%	-16°C / 3,2°F	1,08
40%	-25°C / -13°F	1,11

# LMRA (Last Minute Risk Assessment)

This checklist is a risk assessment to be performed on-site at the customer and must be preceded by a detailed risk assessment.

**General**

**STEP 1: EVALUATION BEFORE THE START OF WORK**

	YES	NO	N/A
Do I know what to do and how?			
Am I trained to do this kind of work?			
Is my work equipment suitable and in good condition / inspected?			
Do I have the necessary PPE, and do they offer appropriate protection?			
Do I have a work permit that allows me to start?			
Is my working environment free of slipping, tripping and/or falling hazards?			
Is my work environment sufficiently enlightened?			
Have I identified all energy sources and followed the Lock Out – Tag Out procedure?			
Do I know the regulations for using and handling dangerous goods I am going to use?			
Is the atmosphere in and around my work environment safe? (confined space, explosion)			
Is the danger of falling objects excluded?			
Am I sufficiently protected against falls from height?			
Are the weather conditions good?			
Can I lift loads manually in an ergonomic way?			
Is my work environment defined?			
Is there regular supervision when I work in isolation?			
Am I aware of the risks of other activities in my work environment?			
Do I know the locations of first aid equipment (e.g. emergency shower, eyewash bottle)			
Do I know the locations of firefighting equipment (e.g.; extinguisher, reel)			
Do I know the alarm procedure and numbers in the event of a fire or accident?			
Do I know my escape route and evacuation site?			
Have I taken all measures to prevent environmental pollution?			

# LMRA (Last Minute Risk Assessment)

**AIRnet  
specific**

	YES	NO	N/A
Did I read and understand the installation manual for AIRnet - <a href="http://www.airnet-system.com">www.airnet-system.com</a>			
Is scaffolding and/or lifting equipment inspected and in good condition?			
Will the AIRnet system be installed within the limits of the product in terms of environment, pressure and temperature?			
Will the AIRnet system be used for the gasses mentioned in the technical datasheet OR has a written confirmation from the manufacturer been obtained that claims AIRnet can be used for this type of gas?			
Will the AIRnet system be properly earthed (electrically?)			
Did I check for any damage to the AIRnet material due to transport?			
Did I check if the tools used are in good condition and have been maintained as per requirement?			
Did I check if the right tools are available for carrying out the AIRnet installation?			
Did I check that the piping route does not pose a risk of electrical short circuits or damage to the operating machinery in case of water leakage?			

## STEP 2: MEASURES TO ELIMINATE OR REDUCE EXISTING RISKS TO AN ACCEPTABLE LEVEL


## STEP 3: PRESENT WHEN FORMATTING THIS LMRA

Name	Date	Signature

# Commissioning Report

All AIRnet commissioning has to be registered in the F3 app!

Go to <https://airnetinstructions.com/> to register your installation and get up-to-date information about AIRnet.

Commissioning data to be collected and submitted in the F3 app as shown below:

Certified installer:	Responsible AIRnet champion:
Customer:	Commissioning date (dd/mm/yyyy):
Customer address:	
<input type="checkbox"/> Expansion of existing installation	<input type="checkbox"/> New installation

## Before installation

### SAFETY

- All safety instructions at customer site have been acknowledged and applied.
- The AIRnet installation manual (latest version is available on the website: <https://www.airnet-system.com/en>) has been read and understood. The installation is carried out in accordance with the instructions in this manual.

### MEDIUM

- Water

	T <sub>MAX</sub> _____ °C / °F
	T <sub>AVG</sub> _____ °C / °F
	T <sub>MIN</sub> _____ °C / °F
	Working pressure _____ bar(g) / psi

### AMBIENT CONDITIONS

The installation is installed:

- Indoor
- Outdoor
- The piping is protected against violent impacts and wind gusts

### NETWORK LAYOUT

- Ensure that pressure vessels are bolted to the floor, and that vibrations may not be transmitted to the AIRnet piping.

- Expansion loops

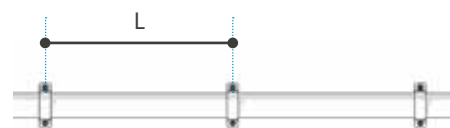
Number of expansion loops or compensators:

Longest straight line: \_\_\_\_\_ m/ft

## Installation

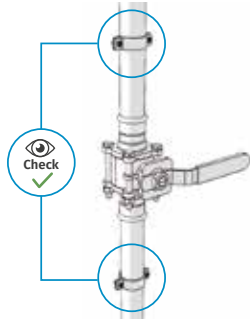
- Check if enough supporting is used based on the table on the right. The table shows the maximum allowed distance L between two pipe clips.

Pipe outside diameter (mm / inch)	Horizontal spacing (recommended) (m / ft)	Vertical spacing (recommended) (m / ft)
15 / 1/2	1,2 / 3,94	1,8 / 5,91
22 / 3/4	1,8 / 5,91	2,4 / 7,87
28 / 1	1,8 / 5,91	2,4 / 7,87
35 / 1 1/4	2,4 / 7,87	3,0 / 9,84
42 / 1 1/2	2,4 / 7,87	3,0 / 9,84
54 / 2	2,7 / 8,86	3,6 / 11,81
76 / 2 3/4	3,0 / 9,84	3,6 / 11,81
89 / 3 1/2	3,0 / 9,84	3,6 / 11,81
108 / 4	3,0 / 9,84	3,6 / 11,81

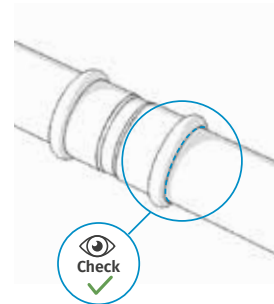


# Commissioning Report

All valves and flanges are supported by a pipe clip on both sides



Insertion depth markers have been checked on at least 10% of fittings



## Commissioning

Commissioning an AIRnet stainless steel piping system with water as a medium consists of the following steps:

**1. Flushing**

Drinking water can be used for flushing.

**2. Filling**

Check the quality of the filling water (it must meet the water specifications as mentioned in the water quality standard section). If the local drinking water meets the requirements, it can be used. If the flushing water meets the requirements it can remain in the system. If the flushing water contains antifreeze agent not intended for permanent use, it should be drained. Demineralized and/or softened water can also be used as filling or make-up water (provided it meets the water specifications required).

**3. De-aeration (venting gas)**

The system must be completely vented to prevent the presence of gas bubbles and gas cushions.

**4. Pressurizing**

At initial startup of the AIRnet system, apply a test pressure of 1.5 bar to identify leakage or imperfect joints. After performing an inspection, increase the pressure gradually and constantly (max 1 bar every 5 minutes) and perform a second inspection for leakages or imperfect joints at the final pressure.

**5. Checking/documentation**

Check for any leaks, malfunctions and noises and repair as needed. Document the filling water quality and the appearance of the water. A system book must be kept for the installation and in it should be logged the quality of the filling water and of the make-up water each time that it is added. If a periodic (not longer than 1 year) water inspection occurs, this must be added in this system book. In this case the quality of the make-up water does not need to be written down provided that the make-up water is directly linked to the inspected water without any added impurities. The quality of the previous inspection will be assumed in this case.

If system needs to be drained during commissioning or later during maintenance, refilling must be carried out immediately. A time delay should not be more than three days. If antifreeze mixtures are used, they should be added in the right ration in the make-up water too. It is not permissible to add make-up water containing no antifreeze in this case.

# Commissioning Report

System book: Data to be captured during commissioning as well as every time a maintenance is done.

The system book should contain the following information:

Name of the planner: \_\_\_\_\_

Name of the installer: \_\_\_\_\_

Name of the operator: \_\_\_\_\_

System location area name: \_\_\_\_\_

System water volume (liters/gallons): \_\_\_\_\_

Maximum filling and make-up water volume (liters/gallons): \_\_\_\_\_

Materials on the heating-water side i.e. at end point of water piping connection, for example: stainless steel, copper, etc.  
\_\_\_\_\_

Drinking water quality (from for e.g. the water supply company)

- Total quantity of alkaline earths (=total hardness): \_\_\_\_\_

- pH value: \_\_\_\_\_

- Electrical conductivity: \_\_\_\_\_

Sampling point for heating water:  Yes /  No - Location description details: \_\_\_\_\_

Name and ratio of antifreeze or anticorrosion agent used: \_\_\_\_\_

Maintenance plan for checking the heating water quality, expected value in terms of time added: \_\_\_\_\_

Additionally, the following parameters should also be listed in that book:

- System pressure: \_\_\_\_\_

- System temperature: \_\_\_\_\_

- The water appearance: \_\_\_\_\_

## Maintenance

At least once a year the installation should be maintained. This includes inspection and if necessary, repairs. The customer is responsible for this regular check.

- The system pressure should be checked to avoid underpressure conditions which can imply oxygen entry in the system. After repair, the system should be vented, and make-up water should be added afterwards. During the annual repair or any repair, the system characteristics (appearance, electrical conductivity, pH and total dissolved solids) should be measured and documented in the system book. If the system uses antifreeze agents, it should be added in the make-up water also with the specified ratio. If the loss of water between 2 maintenance checks is less than 1%, the measurements of the total dissolved solids can be omitted. In the case that the electrical conductivity levels measured exceed the allowed value, steps need to be taken to reduce it. A possible step is to do a partial-flow demineralization of the heating water.

- In the case that the make-up water exceeds more than three times the nominal volume of the initial filling water, there must be a switch to softening and/or demineralization of the make-up water. During repair or expansion, the system should not be completely emptied, restrict the repair work (emptying if necessary) to the impacted section. In the case of Microbiologically Influenced Corrosion (MIC) as the primary driver of corrosion, a specialist company that deals with MIC must be contacted.

## Signatures

AIRnet installer	AIRnet champion	Customer representative

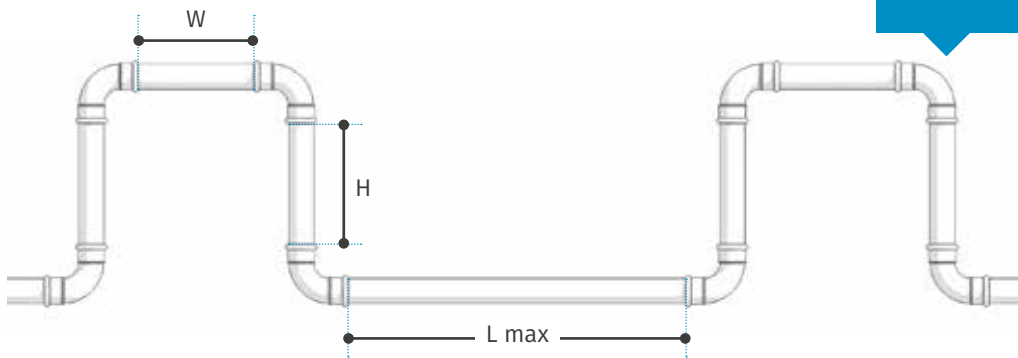
# External Cleaning Products

Product	Usage in the field	Stainless steel 304L	Stainless steel 316L	O-rings in SS fittings
<b>Disinfection/sterilization</b>				
Ethyl Alcohol (ethanol) (60-90%)	Seldom, used on small external surfaces	Good	Good	Good
Isopropyl alcohol (isopropanol)	Seldom, used on small external surfaces	Good	Good	Good
Amphoterics		Good	Good	Unknown
Quaternary ammonium compounds (QAC)	environmental sanitation of noncritical surfaces	Good	Good	Unknown
Gluteraldehyde	high-level disinfectant for medical equipment, not for non-critical surfaces	Good	Good	Unknown
Formaldehyde	Seldom, produces carcinogenic fumes	Good	Good	Good (at concentration of 40% or less)
<b>Whole Room disinfection/sterilization</b>				
QAC fogging		Unknown	Unknown	Unknown
<b>Cleaning (components)</b>				
surfactants (detergents in general)		Good	Good	Good
Ethylene diamine tetracetic acid (EDTA)		Good	Good	Not resistant

# Expansion Loops and Compensators

Long straight pipes will expand or contract due to temperature variations. To compensate for this effect, expansion loops or compensators are required. An expansion loop is a U-shaped construction that compensates the variation in length. Compensators are straight fittings specifically designed to allow axial movement. The number of expansion loops / compensators depends on the total length of the straight line and the maximum temperature variation.

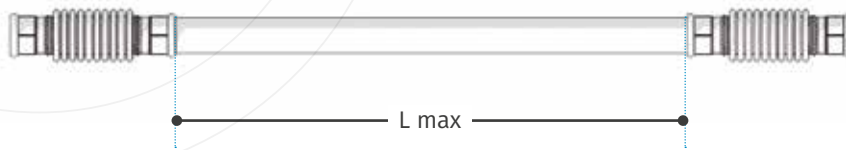
The below table gives the maximum possible straight distance between two expansion loops with fixed piping vs. the temperature variation:



	Ø15 mm / 1/2"	Ø22 mm / 3/4"	Ø28 mm / 1"	Ø35 mm / 1 1/4"	Ø42 mm / 1 1/2"	Ø54 mm / 2"	Ø76 mm / 2 3/4"	Ø89 mm / 3 1/2"	Ø108 mm / 4"
<b>H</b>	1 m / 3,3 ft	1 m / 3,3 ft	1,25 m / 4,1 ft	2 m / 4,9 ft	1,5 m / 4,9 ft	1,75m / 5,7 ft	2 m / 6,6 ft	2 m / 6,6 ft	2,5 m / 8,2 ft
<b>W</b>	0,5 m / 1,6 ft	0,5 m / 1,6 ft	0,63 m / 2,1 ft	1 m / 2,5 ft	0,75 m / 2,5 ft	0,88m / 2,9 ft	1 m / 3,3 ft	1 m / 3,3 ft	1,25 m / 4,1 ft
<b>Δt</b>	Maximum distance between two expansion joints								
5°C / 41°F	698 m / 2291 ft	476 m / 1563 ft	584 m / 1917 ft	673 m / 2209 ft	561 m / 1841 ft	436 m / 1432 ft	551 m / 1808 ft	471 m / 1544 ft	536 m / 1757 ft
10°C / 50°F	349 m / 1145 ft	238 m / 781 ft	292 m / 959 ft	337 m / 1104 ft	281 m / 920 ft	218 m / 716 ft	276 m / 904 ft	235 m / 772 ft	268 m / 878 ft
20°C / 68°F	175 m / 573 ft	119 m / 390 ft	146 m / 479 ft	168 m / 552 ft	140 m / 460 ft	109 m / 358 ft	138 m / 452 ft	118 m / 386 ft	134 m / 439 ft
30°C / 86°F	116 m / 386 ft	79 m / 260 ft	97 m / 320 ft	112 m / 368 ft	94 m / 307 ft	73 m / 239 ft	92 m / 301 ft	78 m / 257 ft	89 m / 293 ft
40°C / 104°F	87 m / 286 ft	60 m / 195 ft	73 m / 240 ft	84 m / 276 ft	70 m / 230 ft	55 m / 179 ft	69 m / 226 ft	59 m / 193 ft	67 m / 220 ft
50°C / 122°F	70 m / 229 ft	48 m / 156 ft	58 m / 192 ft	67 m / 221 ft	56 m / 184 ft	44 m / 143 ft	55 m / 181 ft	47 m / 154 ft	54 m / 176 ft
60°C / 140°F	58 m / 191 ft	40 m / 130 ft	49 m / 160 ft	56 m / 184 ft	47 m / 153 ft	36 m / 119 ft	46 m / 151 ft	39 m / 129 ft	45 m / 146 ft
70°C / 158°F	50 m / 164 ft	34 m / 112 ft	42 m / 137 ft	48 m / 158 ft	40 m / 131 ft	31 m / 102 ft	39 m / 129 ft	34 m / 110 ft	38 m / 125 ft
80°C / 176°F	44 m / 143 ft	30 m / 98 ft	37 m / 120 ft	42 m / 138 ft	35 m / 115 ft	27 m / 89 ft	34 m / 113 ft	29 m / 97 ft	33 m / 110 ft
90°C / 194°F	39 m / 127 ft	26 m / 87 ft	32 m / 107 ft	37 m / 123 ft	31 m / 102 ft	24 m / 80 ft	31 m / 100 ft	26 m / 86 ft	30 m / 98 ft
100°C / 212°F	35 m / 115 ft	24 m / 78 ft	29 m / 96 ft	34 m / 110 ft	28 m / 92 ft	22 m / 72 ft	28 m / 90 ft	24 m / 77 ft	27 m / 88 ft



# Expansion Loops and Compensators



The table below gives the maximum possible straight distance between two compensators vs. the temperature variation:

	Ø15 mm / 1/2"	Ø22 mm / 3/4"	Ø28 mm / 1"	Ø35 mm / 1 1/4"	Ø42 mm / 1 1/2"	Ø54 mm / 2"
<b>Δt</b>	<b>Maximim distance between two compensators (800 cycles max.)</b>					
5°C / 41°F	194 m / 636 ft	242 m / 795 ft	267 m / 875 ft	315 m / 1034 ft	388 m / 1273 ft	436 m / 1432 ft
10°C / 50°F	97 m / 318 ft	121 m / 398 ft	133 m / 437 ft	158 m / 517 ft	194 m / 636 ft	218 m / 716 ft
20°C / 68°F	48 m / 159 ft	61 m / 199 ft	67 m / 219 ft	79 m / 258 ft	97 m / 318 ft	109 m / 358 ft
30°C / 86°F	32 m / 106 ft	40 m / 133 ft	44 m / 146 ft	53 m / 172 ft	65 m / 212 ft	73 m / 239 ft
40°C / 104°F	24 m / 80 ft	30 m / 99 ft	33 m / 109 ft	39 m / 129 ft	48 m / 159 ft	55 m / 179 ft
50°C / 122°F	19 m / 64 ft	24 m / 80 ft	27 m / 87 ft	32 m / 103 ft	39 m / 127 ft	44 m / 143 ft
60°C / 140°F	16 m / 53 ft	20 m / 66 ft	22 m / 73 ft	26 m / 86 ft	32 m / 106 ft	36 m / 119 ft
70°C / 158°F	14 m / 45 ft	17 m / 57 ft	19 m / 62 ft	23 m / 74 ft	28 m / 91 ft	31 m / 102 ft
80°C / 176°F	12 m / 40 ft	15 m / 50 ft	17 m / 55 ft	20 m / 65 ft	24 m / 80 ft	27 m / 89 ft
90°C / 194°F	11 m / 35 ft	13 m / 44 ft	15 m / 49 ft	18 m / 57 ft	22 m / 71 ft	24 m / 80 ft
100°C / 212°F	10 m / 32 ft	12 m / 40 ft	13 m / 44 ft	16 m / 52 ft	19 m / 64 ft	22 m / 72 ft

**Example:**

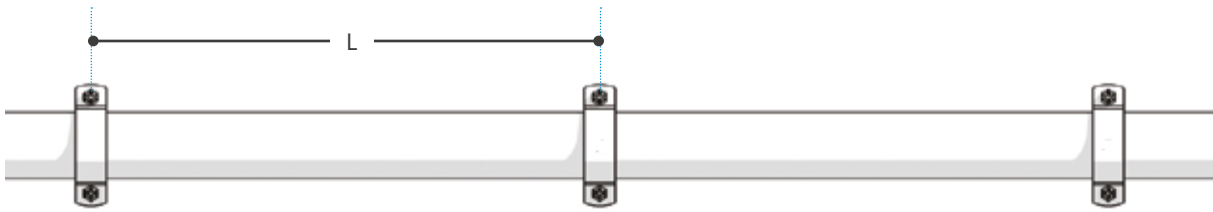
Consider an installation with a 100m / 328 ft straight line in 15mm / 1/2" pipe. The minimum temperature of the system is -20°C / -4°F in the winter, and the maximum temperature is 50°C / 122°F due to hot compressed air when the system is in use. The Δt is then 70°C / 126°F.

For this 100m / 328 ft straight line, this means that 2 expansions loop is required. This means that for this straight line, 7 compensators are required.

# Pipe Support

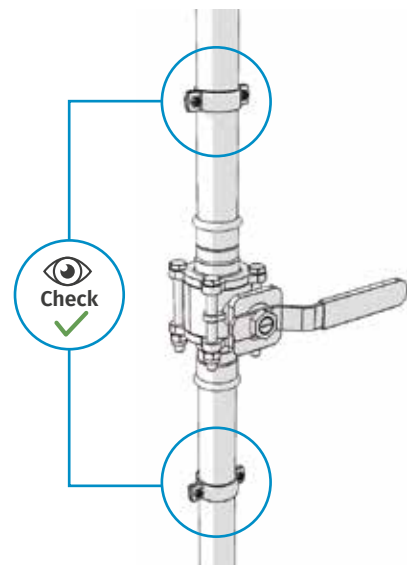
The maximum distance L between two pipe clips is given by the table below:

Make sure the piping system is rigidly supported to the structure of the building so that movement due to external forces (e.g. wind) of the piping is prevented.



Pipe outside diameter (mm / inch)	Horizontal spacing (recommended) (m / ft)	Vertical spacing (recommended) (m / ft)
15 / 1/2	1,2 / 3,94	1,8 / 5,91
22 / 3/4	1,8 / 5,91	2,4 / 7,87
28 / 1	1,8 / 5,91	2,4 / 7,87
35 / 1 1/4	2,4 / 7,87	3,0 / 9,84
42 / 1 1/2	2,4 / 7,87	3,0 / 9,84
54 / 2	2,7 / 8,86	3,6 / 11,81
76 / 2 3/4	3,0 / 9,84	3,6 / 11,81
89 / 3 1/2	3,0 / 9,84	3,6 / 11,81
108 / 4	3,0 / 9,84	3,6 / 11,81

Valves must be supported by a pipe clip on both sides, with a maximum distance of 0.5m (20") between the valve and the pipe clips.



# Insulation

Thermal insulation can prevent the formation of water condensate outer layer of the pipe. The type of insulation depends on the national regulations of the installation. All care must be taken to prevent humidity from penetrating the insulation as this would aggravate a localized corrosion.

Only insulation materials containing less than 0.05% water-soluble chloride ions are permitted for the insulation of AIRnet stainless steel piping system.

Recommended insulation material thickness.

Note: The installer is responsible for the correct insulation of AIRnet stainless steel.

Cold water		Hot water	
Type of installation	Insulation material thickness in mm $\lambda = 0,040 \text{ W/ (m x } ^\circ\text{K)}$	OD in mm	Insulation material thickness in mm $\lambda = 0,040 \text{ W/ (m x } ^\circ\text{K)}$
Piping uncovered, not heated (i.e. cellar)	4	15	20
Piping uncovered without hot water lines	9	22	20
Piping in channel, no hot water lines	4	28	30
Piping in channel, along with hot water	13	35	40
Piping in wall slit, risers	4	42	40
Piping in wall gap, along with hot water	13	54	50
Piping on concrete floor	4	76,1	65
		88,9	80
		108	100

## Pressure Relief

Add expansion vessel and pressure relief valve in the circuit. Sizing and location to be decided based on system requirements. Consult experts if necessary.

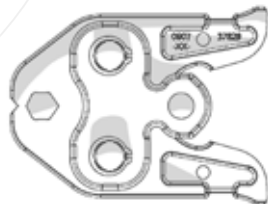
## Galvanic Corrosion

In a closed system AIRnet stainless steel is compatible with all non-ferrous metals, including copper, brass, and red brass, in a mixed installation without the requirement to follow flow rules. When combining the AIRnet stainless steel with zinc-coated materials, bimetal corrosion can occur. To avoid this, spacing material made of non-ferrous material should be used. The thickness of this spacing material or component should at least be 80mm. An example of a spacing component can be a valve.

# Tools - Overview

## D15 - D35

1/2" - 1 1/4"



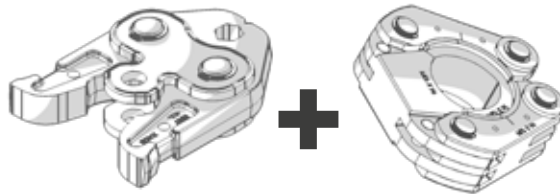
D15 / 1/2" = 2812 1030 00  
 D22 / 3/4" = 2812 1030 22  
 D28 / 1" = 2812 2030 00  
 D35 / 1 1/4" = 2812 3030 00



230V: 2812 0030 00  
 110V: 2812 0030 01  
 Including protective case,  
 battery charger, charger cable

## D42 - D54

1 1/2" - 2"



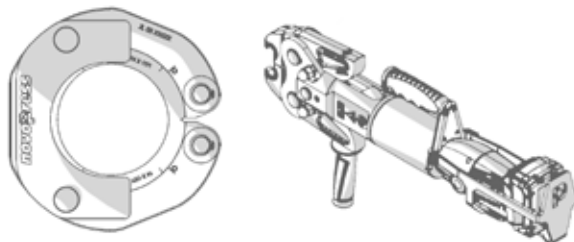
2812 4530 00

D42 / 1 1/2" = 2812 4030 00  
 D54 / 2" = 2812 5030 00

**Spare parts:**  
 Charger: 230V: 2812 0430 00  
 110V: 2812 0430 01  
 Battery: 2812 0230 00  
 Cable to work on grid power:  
 2812 0428 01 (110V)  
 2812 0428 00 (220V)

## D76 - D108

2 3/4" - 4"



D76 / 2 3/4" = 2812 6030 00  
 D89 / 3 1/2" = 2812 7030 00  
 D108 / 4" = 2812 8030 00

230V: 2812 0130 00  
 110V: 2812 0130 01  
 Including protective case,  
 battery charger, charger cable,  
 cable to work on power grid

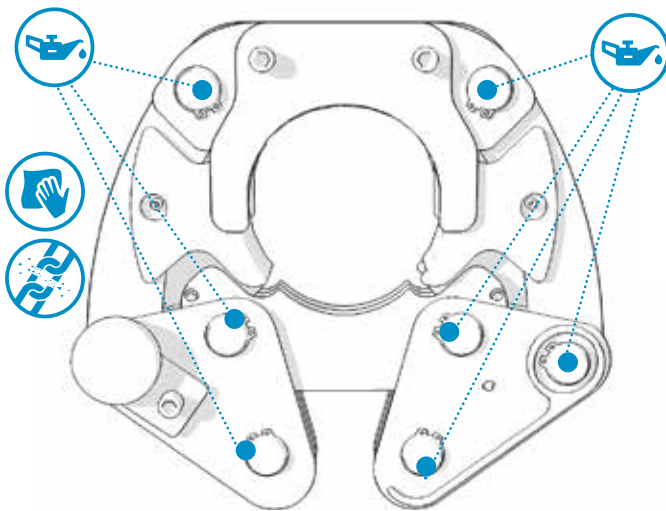
**Spare parts:**  
 Charger: 230V: 2812 0430 00  
 110V: 2812 0430 01  
 Battery: 2812 0230 00  
 Cable to work on grid power:  
 2812 0428 01 (110V)  
 2812 0428 00 (220V)

Note: the AIRnet Stainless Steel System will only attain the designed pressure when installed using the tools in the table above. Using other tools is not recommend, as this may lower the pressure rating.

# Tools - Inspection and Maintenance

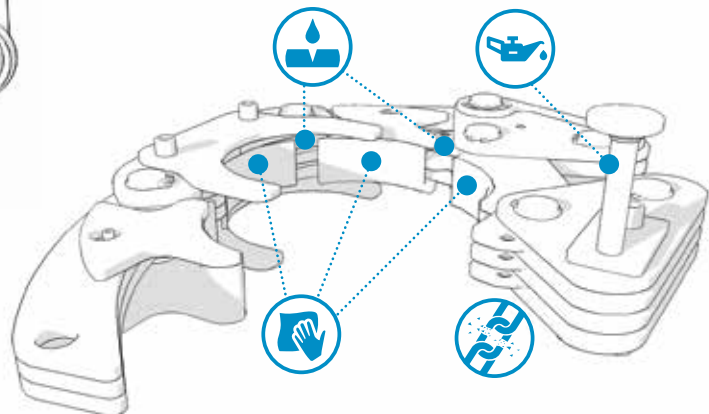
To guarantee correct installation, the pressing tools must be checked regularly by an official authorized repairer according to the manufacturer specifications. All moving parts and pressing surfaces must be cleaned and lubricated daily. Before starting installation, make sure to inspect the tools thoroughly. Any possible oxidation, paint or dirt will affect the reliability, possibly resulting in sliding issues on the fittings during pressing.

		Klauke D15 - D54									Klauke D76 - D108				
		15	18	22	28	35	42	54	Chain + collar 42	Chain + collar 54	Battery/charger	76	89	108	Battery/charger
Novopress ACO 203 BT	15	YES													
	18		YES												
	22			YES											
	28				YES										
	35					YES									
	42						NO								
	54							NO							
	Chain + collar 42								YES						
	Chain + collar 54									YES					
Battery/charger										NO					
Novopress ACO 403 BT	76										NO				
	89											NO			
	108												NO		
	Battery/charger														NO



New "Novopress" tool compatibility with old "Klauke" tool:

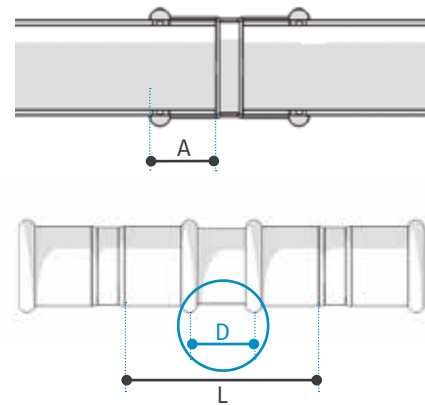
- D15 - D35 jaws are interchangeable
- D42 - D54 the chain of Klauke is not compatible with collar of Novopress and vice versa
- D42 - D54 the combination of chain and collars is interchangeable with both tools
- D76 - D108 collars are not interchangeable



# Installation - Pipe Preparation

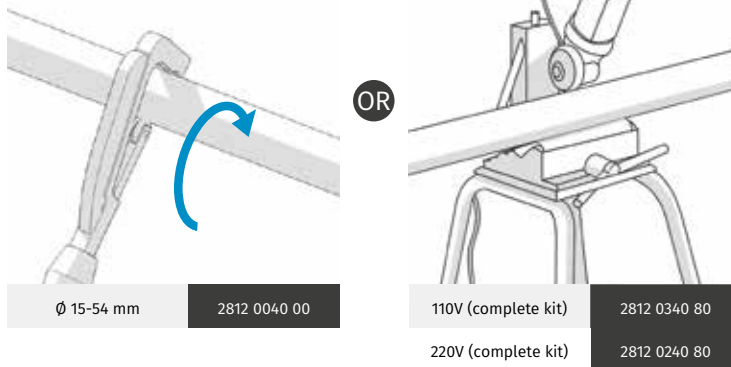
## 1 Measure

Pipe Outside Diameter (mm/inch)	A (mm/inch)	D (mm/inch)	L (mm/inch)
15 / 1/2"	20 / 13/16"	20 / 13/16"	60 / 2 3/8"
22 / 3/4"	21 / 1 1/4"	20 / 13/16"	62 / 2 1/2"
28 / 1"	23 / 15/16"	20 / 13/16"	66 / 2 5/8"
35 / 1 1/4"	26 / 1"	20 / 13/16"	72 / 2 13/16"
42 / 1 1/2"	30 / 1 3/8"	40 / 1 9/16"	100 / 5 1/2"
54 / 2"	35 / 1 3/8"	40 / 1 9/16"	110 / 4 5/8"
76 / 2 3/4"	55 / 2 3/8"	60 / 2 3/8"	170 / 6 1/4"
89 / 3 1/2"	60 / 2 3/8"	60 / 2 3/8"	180 / 7 1/8"
108 / 4"	75 / 2 13/16"	60 / 2 3/8"	210 / 8 1/4"



A = Insertion Depth  
D = Minimum Distance  
L = Minimum Pipe Length Tube

## 2 Cut

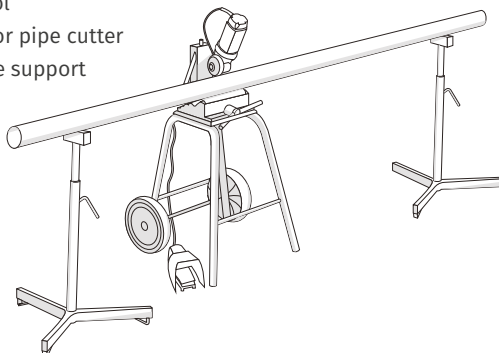


Ø 15-54 mm      2812 0040 00

110V (complete kit)      2812 0340 80  
220V (complete kit)      2812 0240 80

### The 'complete kit' contains:

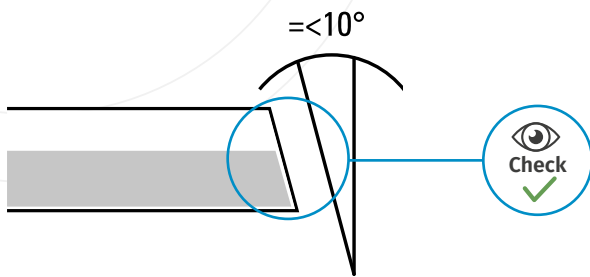
- 1 x Pipe cutter tool
- 1 x Wheel stand for pipe cutter
- 2 x Tripod for pipe support
- 1 x Cutting wheel



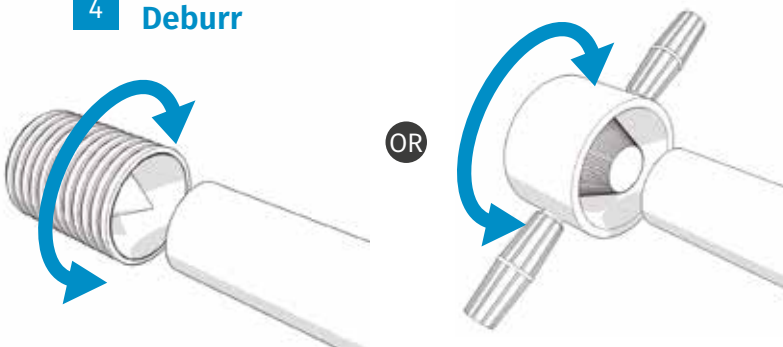
Pipe cutter tool – 110V (1 pc)	2812 0340 81
Pipe cutter tool – 220V (1 pc)	2812 0240 81
Wheel stand (1 pc)	2812 0740 00
Tripod (1 pc)	2812 0840 00
Spare cutting wheel for pipe cutter (1 pc)	2812 0640 00
Spare pipe rollers for pipe cutter (set of 4pcs)	2812 0940 00

# Installation - Pipe Preparation

## 3 Check



## 4 Deburr



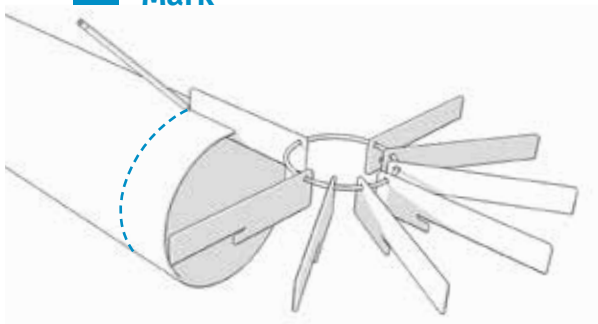
Ø 15-54 mm

2810 0141 00

Ø 76 - 108 mm

2810 0641 00

## 5 Mark



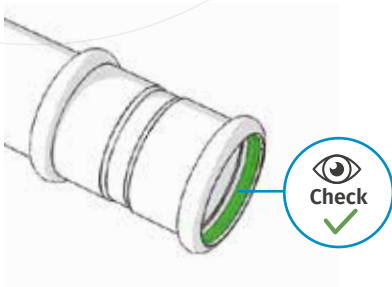
Pipe Marker

2812 0029 80

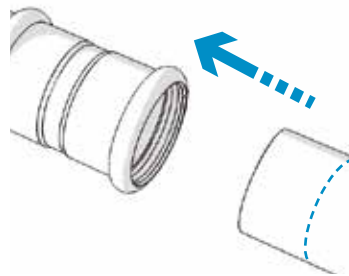
# Installation - Press Fitting

Diameters 15 - 35 mm / 1/2" - 1 1/4"

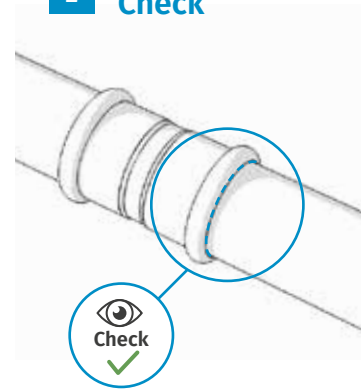
**0** Check O-ring  
for damage



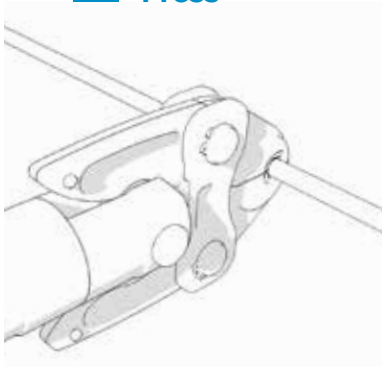
**1** Insert



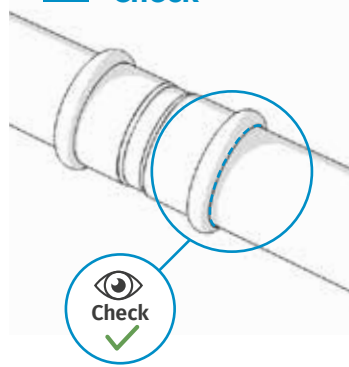
**2** Check



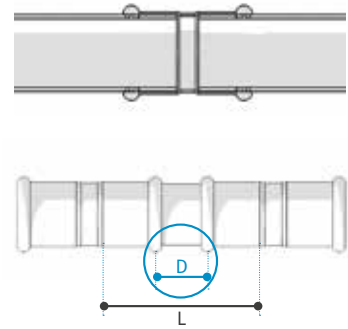
**3** Press



**4** Check



**5** Check distance



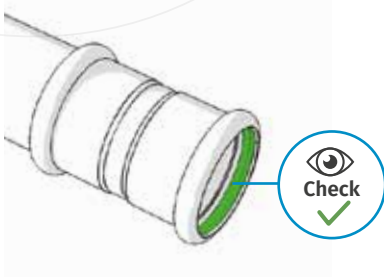
A = Insertion Depth  
D = Minimum Distance  
L = Minimum Pipe Length Tube



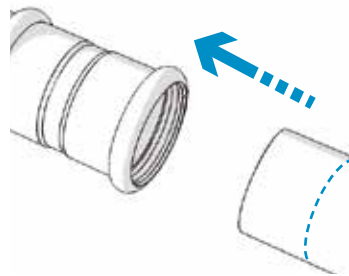
# Installation - Press Fitting

Diameters 42 - 54 mm / 1 1/2" - 2"

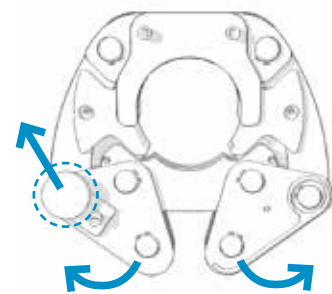
**0** Check O-ring for damage



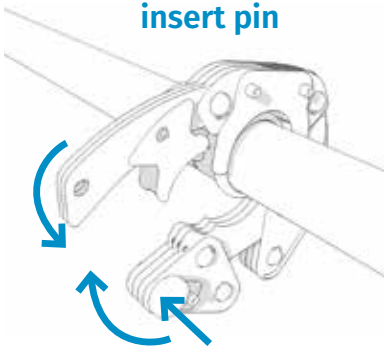
**1** Insert



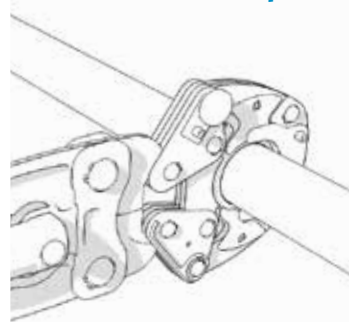
**2** Retract pin and open chain



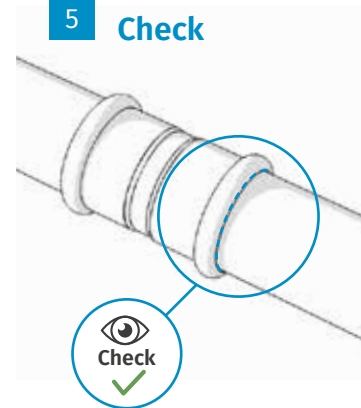
**3** Close chain and insert pin



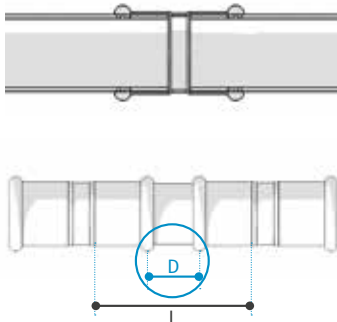
**4** Mount adapter



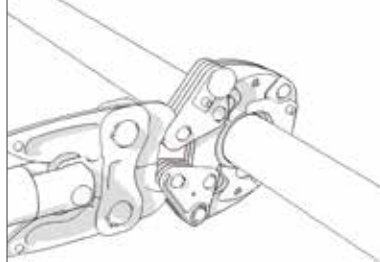
**5** Check



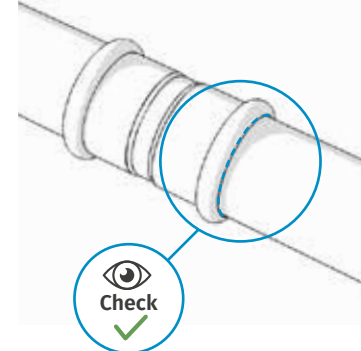
**6** Check distance



**7** Press



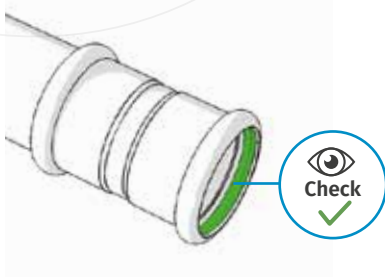
**8** Check



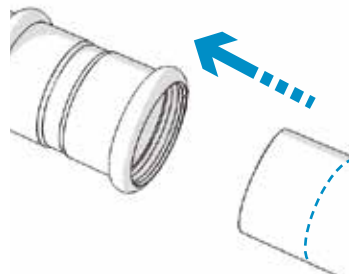
# Installation - Press Fitting

Diameters 76 - 108 mm / 2 ¾" - 4"

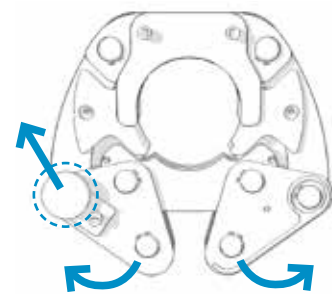
**0** Check O-ring  
for damage



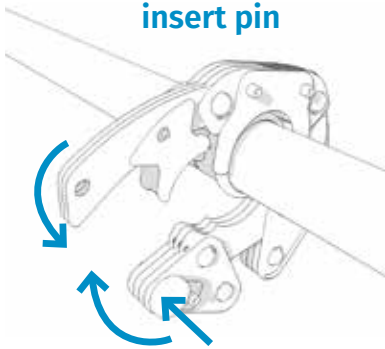
**1** Insert



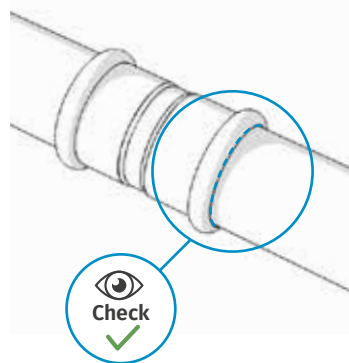
**2** Retract pin and  
open chain



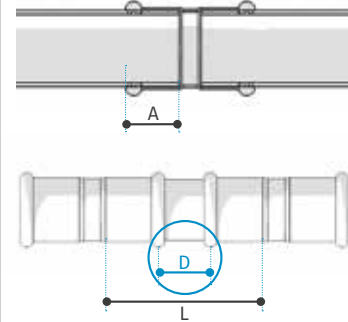
**3** Close chain and  
insert pin



**4** Check



**5** Check distance

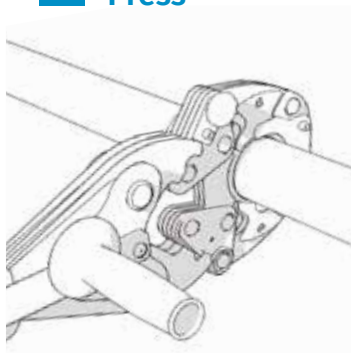


A = Insertion Depth

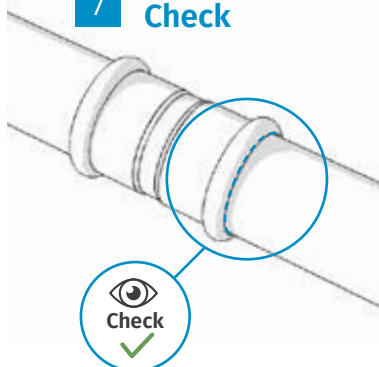
D = Minimum Distance

L = Minimum Pipe Length Tube

**6** Press



**7** Check



# Installation - Press Fitting

To carry out pressing correctly, there must be a minimum distance between the pipe and the building, and from pipe to pipe as shown in the tables below.

## Minimum distances and space requirement 15 - 35 mm

Pipe $\varnothing$	Figure 1		Figure 2			Figure 3			Figure 4		
	A	D	A	D	D1	A	C	D	D1	D	E
15	56	30	75	30	35	85	155	30	35	40	60
22	75	40	80	40	40	85	165	40	40	40	61
28	82	40	90	40	45	90	180	40	45	40	63
35	85	40	90	40	45	90	180	40	45	40	66

## Minimum distances 42 - 108 mm

Pipe $\varnothing$	Figure 4		Figure 5		
$\varnothing$	D	E	A	B	C
42	50	80	150	150	110
54	50	85	150	150	110
76	60	115	170	210	170
89	60	120	190	260	190
108	60	135	200	320	280

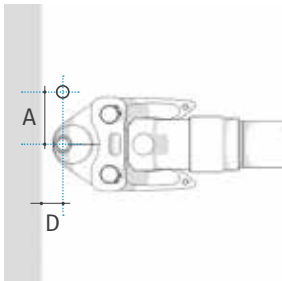


Figure 1 - Minimum distances and space requirements

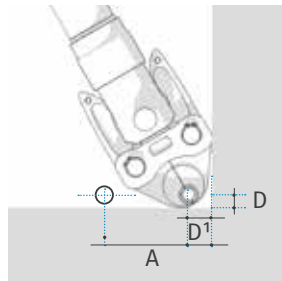


Figure 2 - Minimum distances and space requirements

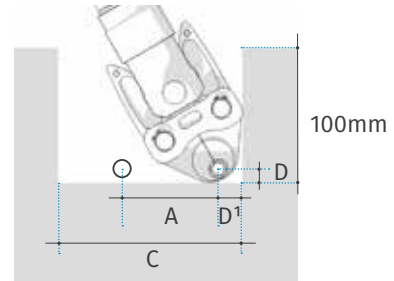


Figure 3 - Minimum distances and space requirements

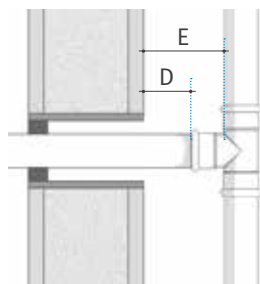


Figure 4 - Minimum distances and space requirements

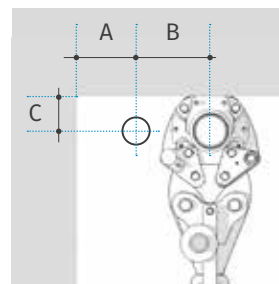


Figure 5 - Minimum distances for chains / collars



Preserving the power of air

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