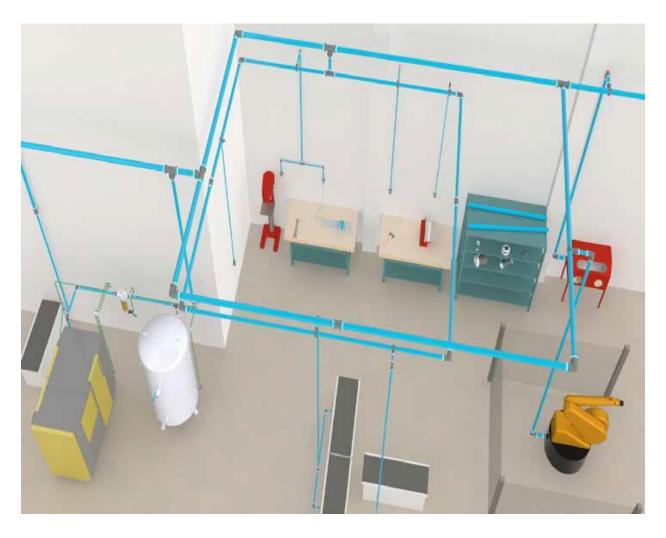


Installation Manual

USE

Kaeser SmartPipe+ ANSMARTPIPEPLUS_09 USE

Installation and Assembly Instructions



Manufacturer: KAESER COMPRESSORS, Inc. P.O. Box 946 • Fredericksburg, Virginia 22404 • Tel. +1 540-898-5500 • Fax. +1 540-898-5520 https://www.us.kaeser.com



Table of Contents

Section Title

Section	Title	Page
1	Safety Regulations	4
1.1	Explanation of Symbols and Instructions	4
1.2	General Safety Instructions	4
1.3	Warning	5
1.3.1	Product Compatibility	
1.3.2	Emergency Shut-off	5
1.3.3	Explosive Atmospheres	5 5 5
1.3.4	Air Quality	5
1.3.5	Temperature	6
1.3.6	Operation	6
1.3.7	Service and Maintenance	6
1.4	Caution	6
1.4.1	Pneumatic Connection	6
1.5	User Responsibilities	6
1.6	Environmental Protection	7
1.7	Personal Protective Equipment	7
2	General	7
2.1	Correct Use	7
2.2	Incorrect Use	8
2.3	Copyright	8
3	Items Required for Installation	9
4	Technical Specifications	10
4.1	Installation Conditions	10
4.2	Pressure and Temperature Ranges	10
4.3	Aluminum Piping Specifications	10
4.4	Aluminum Fitting Specifications	10
4.5	Flexible Hose Specifications	10
4.6	Pipe Sizes	11
4.7	Certifications	11
5	DN 20 – DN 63 Fittings	12
5.1	Fitting Components	12
6	Pipe Preparation	13
7	DN 20 – DN 63 Fitting Assembly	14
7.1	General Fitting Assembly	14
7.2	Sliding Coupling Assembly	16
7.3	Reducer Assembly	17
7.4	Male and Female Connectors	17
7.5	Vented End Cap Assembly	18
7.6	Mini Bracket Assembly	19
7.6.1	Fitting Components	19
7.6.2	Preparation	19
7.6.3	Assembly	20
7.7	Quick Reducing Bracket Assembly	21
7.7.1	Fitting Components	21
7.7.2	Preparation	22
7.7.3	Assembly	22
8	Manifold Assembly	22
8 .1	Fitting Components	23
8.2	Assembly	23
o.z 8.2.1	Examples and Assembly Solutions	24 24
9.2.1	45° Wall Bracket Assembly	24 25

39

KAESER Compressors

9.1	Fitting Components	25
9.1.1	Examples and Assembly Solutions	25
9.2	Assembly	26
9.3	Assembling to the Wall	27
10	Flexible Hose Assembly	28
11	Examples of Assembly Solutions	29
12	Fixing Clips Example Installations	30
12.1	Fixing to the Ceiling	30
12.2	Fixed Directly to the Wall	30
12.3	Fixed with Steel Shelf	30
13	Pipe Hanger Assembly	31
14	Examples of Rigid Piping Supports	32
15	System Check Prior to Pressurization	34
16	General Piping Practices for Startup	35
17	Pressure Loss Chart	36
18	Maintenance	38

<u>Annex</u>

Lists of Tables

Table 1.	Pipe Depth Insertion Requirement	13
Table 2.	Bolt Torque Requirement	20, 22
Table 3.	Flexible Hose Specifications	28
Table 4.	Branch and Linear Distribution Network	36
Table 5.	Looped or Ring Distribution Network	37



1. Safety Regulations

This manual should be read and the instructions it contains followed before initial startup, troubleshooting, changing any settings, or carrying out any maintenance work.

1.1. Explanation of Symbols and Instructions

This symbol is placed before all references to safety where danger to life and limb can occur during work. It is important in such cases that these instructions are observed and that extreme care is taken. For their own protection, all other users must be informed about these safety rules laid down in this installation manual.

Attention!

This symbol is placed by text where considerable attention must be paid so that directives, regulations, references, and correct sequence of work are adhered to and that damage and/or destruction is prevented.



A

This symbol identifies environmental protection measures.

1.2. General Safety Instructions

Work on power-driven or pressure-driven systems may only be carried out by trained, supervised, or specialized personnel.

Attention!

Any modifications not described in this manual and not authorized by KAESER will result in the invalidation of all warranties.

No welding, heat treatment, or mechanical work may be carried out on pressure retaining components, e.g. pipes, air main system, receiver, etc.

National and Local Directives must be observed during installation, operation, maintenance, and repair. Users of compressors located outside the jurisdiction of European Standards are obliged to comply with the safety and accident prevention regulations valid in the country of use. If necessary, corresponding measures must be taken to ensure compliance with these national regulations before initial startup. Allow no open flames or sparks at the place of installation.

The SmartPipe+ may only be mounted, started up, and serviced by fully trained and qualified personnel, observing the accepted industry codes and practices. Make sure employees or third persons are not exposed to any danger. All safety instructions and warning in these mounting and operating instructions, particularly those concerning assembly, startup and maintenance assembly must be observed.

For appropriate operation, make sure that the SmartPipe+ is only used where the operating pressure and temperatures do not exceed the maximum operating values.



The manufacturer does not assume any responsibility for damage caused by external forces and any other external influence! Any hazards which could be caused in the SmartPipe+ by the process medium, operating pressure, operating temperature, or by moving parts are to be prevented by means of the appropriate measures.

For installation and maintenance work on the SmartPipe+, make sure the relevant section of the pipeline is depressurized and isolated with the system locked out and tagged out appropriately. Allow the SmartPipe+ to cool down or warm up to reach ambient temperature prior to starting any work on the SmartPipe+.

Prior to performing any work on the SmartPipe+, make sure the supply air is removed and the compressed air system shutdown, and isolated with the system locked out and tagged out appropriately if required, to prevent any hazards that could be caused by a live system.

1.3. Warning

1.3.1. Product Compatibility

Kaeser Compressors, Inc. products and accessories are for use in industrial pneumatic applications with compressed air media only. The compatibility of the equipment is the responsibility of the end user. Product performance and safety are the responsibility of the person who determined the compatibility of the system. Also, this person is responsible for continuously reviewing the suitability of the products specified for the system, referencing the latest catalog, installation manual safety precautions, and all materials related to the product. It is prohibited to use SmartPipe+ fittings with any piping other than SmartPipe+, and SmartPipe+ piping with any fittings other than SmartPipe+. Doing so will void the warranty and could present safety issues. Should the need arise to adapt SmartPipe+ to another piping network, appropriate NPT adapters and unions or similar must be used to link the two networks. Improper operation could result in injury to persons or damage to equipment. Note that galvanic corrosion must be avoided (connection directly between brass or copper and aluminum), and good plumbing practices must be instituted so that no standing water is present within the pipe network.

1.3.2. Emergency Shut-off

The Kaeser SmartPipe+ product includes isolation ball valves. However, safety precautions must be in place to safely shutdown the compressed air station to prevent serious injury or loss of life.

1.3.3. Explosive Atmospheres

Products and equipment should not be used where harmful, corrosive, or explosive materials or gases are present. Kaeser Compressors, Inc. products cannot be used in the aforementioned hazardous environments.

1.3.4. Air Quality

Clean, dry air is recommended for the Kaeser SmartPipe+ products. SmartPipe+ pipe and fittings are compatible with Nitrogen, Argon, and CO2.



1.3.5. Temperature

Products should be used with a media (operating temperature) and ambient environment (storage temperature) inside of the specified temperature range. Operating temperature between -22°F to 248°F, storage temperature between -40°F to 212°F.

1.3.6. Operation

Only trained and qualified personnel should operate electronic and pneumatic machinery and equipment. Electronics and pneumatics are very dangerous when handled incorrectly. All industry standard safety guidelines should be observed.

1.3.7. Service and Maintenance

Service and maintenance of machinery and equipment should only be handled by trained and experienced operators. Inspection should only be performed after safety has been confirmed. Ensure all supply pressure has been exhausted and residual energy (compressed gas, springs, gravity, etc.) has been released in the entire system prior to removing equipment for service or maintenance. The SmartPipe+ product line does not have serviceable parts.

1.4. Caution

Attentiont Improper operation could result in injury to persons or damage to equipment!

1.4.1. Pneumatic Connection

All pipes, pneumatic hose, and tubing should be free of all contamination, debris, and chips prior to installation. Flush pipes with compressed air to remove any loose particles.

To prevent product contamination, thread tape is not recommended. Instead, an anaerobic pipe sealant is recommended for installation. Apply sealant a couple threads from the end of the pipe thread to prevent contamination.

Note that SmartPipe+ is a compression style aluminum piping system and does not need any thread sealant. There are several fittings that include NPT threads. Whether thread sealant is required must be determined onsite and the affect this might have on the air quality of the installation should be considered.

1.5. User Responsibilities

٨

Compliance with all federal, state, and/or local regulations regarding workplace health and safety is the responsibility of the owner/operator.

Qualified personnel are people who, by virtue of their training, knowledge, and experience, as well as their knowledge of relevant regulations can assess the work to be done and recognize the possible dangers involved.

KAESER COMPRESSORS

Authorized operators possess the following qualifications:

- Are of legal age,
- Have read, are conversant with and adhere to the safety instructions and sections of the operator manual applicable to installations and maintenance,
- Are fully conversant with the safety concepts and regulations of electrical and compressed air systems,
- Are able to recognize the possible dangers of electrical and compressed air devices and take appropriate measures to safeguard persons and property,
- Have received adequate training and authorization for the safe installation and maintenance on this equipment,
- Ensure that operating, installation, and maintenance personnel are qualified and authorized to carry out their tasks.
- First hand trainings are available on demand for a fee.
- Online assembly videos are available 24 hours / 7 days a week for reference: www.us.kaeser.com/smartpipeplusinstall

1.6. Environmental Protection



Ensure that all lubricants, consumable materials, and replacement parts accumulating during operation and servicing of the compressed air system are disposed of according to environmental regulations. All batteries should be recycled according to national and/or local recycling policies.

1.7. Personal Protection

Attention!

A

SmartPipe+ installation 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 for SmartPipe+ installations:

- Hard hat
- Safety glasses
- Hearing protection
- Gloves
- Safety shoes
- Fall protection equipment (when working from heights)

2. General

2.1. Correct Use

Attention!

Kaeser SmartPipe+ is a compression style aluminum piping system. It is designed to convey compressed air within the pressure and temperature parameters set forth herein. While SmartPipe+ is an aluminum piping system, SmartPipe+ piping cannot be used with another brand of aluminum network fittings or the SmartPipe+ fittings with another brand of aluminum piping. Doing so will void the warranty and could present safety issues. Improper operation could result in injury to persons or damage to equipment.



A

Any other use is considered incorrect. The manufacturer cannot accept liability for any consequential damage caused by such incorrect use; the user alone is liable for any risks incurred. Correct use also means adherence to the manufacturer's conditions for installation. Recommended ambient temperature of -40°F to 212°F, recommended operating temperature -22°F to 248°F.

2.2. Incorrect Use

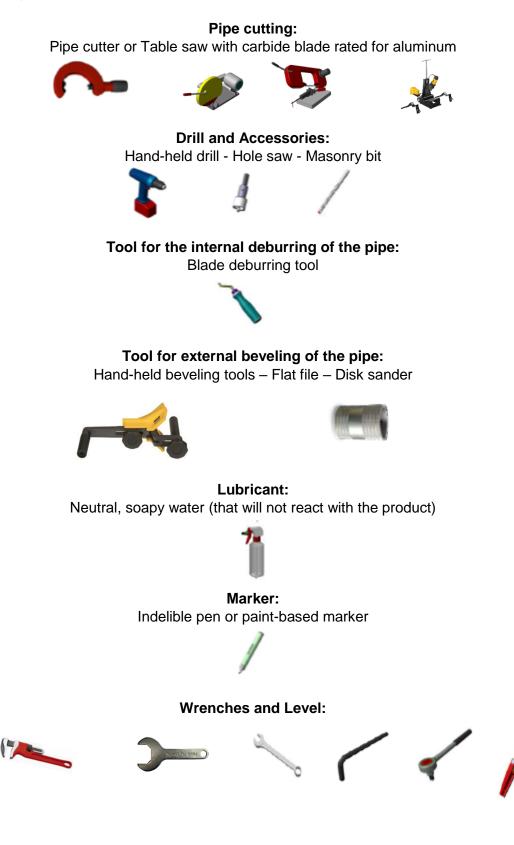
Never direct compressed air toward any persons. Compressed air is contained energy. Uncontrolled release of this energy can cause serious injury or death.

2.3. Copyright

The copyright of this installation manual is the property of Kaeser Compressors, Inc. This installation manual is intended for use only by installation, operating, setting, maintenance, and supervisory personnel. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, with prior authorization.



3. Items Required for Installation





4. Technical Specifications

Kaeser SmartPipe+ is a compression style aluminum piping system. It is designed to convey compressed air within the pressure and temperature parameters set forth herein. It can be used in a compressor room, as a distribution network, or at the point of use. Note that vibration isolation, in the form of flexible hose, **must** be used at the discharge of each compressor, between high vibration equipment, in any areas with fluctuating temperature, and any long piping runs.

Any other use is considered incorrect. The manufacturer cannot accept liability for any consequential damage caused by such incorrect use; the user alone is liable for any risks incurred. Correct use also means adherence to the manufacturer's conditions for installation.

4.1. Installation Conditions

If SmartPipe+ is installed outdoors, the equipment must be protected from frost. It should be protected from direct sunlight, dust and rain. The temperature requirements must be adhered to.

4.2. Pressure and Temperature Ranges

- Maximum working pressure and temperature range: 232 psig, -22°F to 248°F
- Storage temperature: -40°F to 212°F
- Max vacuum: 98.3% (29.5" Hg)
- Consult factory for higher pressure or temperatures

4.3. Aluminum Piping Specification

- 6063-T5 aluminum grade
- Extruded pipe conforms to standards EN755.2 and EN755.8
- Smooth bore ID for optimal flow rate performance
- Powder coat in BLUE (RAL5012) and QUALICOAT CERTIFIED lacquer finish exterior

4.4. Aluminum Fitting Specification

- Connector bodies manufactured in aluminum alloy ASTM B26-356.0
- Nuts are aluminum alloy per ASTM B241-6061 and anodized
- Fitting threads meet ANSI B1.20.1 standard
- Fitting bodies are black cataphoresis coated with minimum thickness of 10 μ m

4.5. Flexible Hose Specification

- Resistant to mineral and synthetic oils
- Maximum working pressure for flexible hose: varies depending on size
- Fire resistant, conforms to ISO 8030 standards for compressed air flexible hose



4.6. Pipe Sizes

Nominal Ø	Outside Ø	Nominal Outside Ø	Inside Ø	Inside Ø	Wall Thickness	Wall Thickness
(in.)	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
3/4	3/4	20.1	11/16	18	3/64	1.0
1	1	25.1	7/8	22.8	3/64	1.1
1-1/4	1-1/4	32.1	1-3/16	29.6	3/64	1.2
1-1/2	1-9/16	40.1	1-1/2	37.4	3/64	1.3
2	2	50.1	1-7/8	47	1/16	1.5
2-1/2	2-1/2	63.1	2-5/16	59.4	5/64	1.8

4.7. Certifications

SmartPipe+ meets the requirement of ASME B31.1 which stipulates the minimum requirements for the design, materials, fabrication, installation, test, and inspection of power and auxiliary piping systems for industrial plants.

SmartPipe+ components also meet ASME B31.3 and B31.9 requirements.

SmartPipe+ also conforms to European standard 2014/68/EU regarding equipment under pressure.

SmartPipe+ also conforms to CRN standards in Canada under pressure. Ask for CRN numbers before purchase.

Kaeser warrants its SmartPipe+ products to be free of defects in material and workmanship for a period of ten (10) years from the date of purchase.

QUALICOAT certification is a guarantee of the quality of the lacquer finish applied to the SmartPipe+ aluminum pipe.





5. DN20 - DN63 Fittings 5.1. Fitting Components



1-5 Come Pre-assembled

- 1. Nut
- 2. Identification ring
- 3. O-ring
- Clamping ring
 Body

6. Pipe Preparation

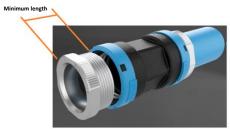
Refer to Section 1 for all safety relevant information. Adhere to PPE, Section 1.7, when completing the Pipe Preparation steps.

Failure to comply with the steps outline below can result in system leaks or an Attention! uncontrolled release of pressure which can cause damage to the facility as well as serious injury or death.

Verify the integrity of the pipe section to be inserted in the fitting.

Any scratches on the paint, if not deep, can be eliminated using sand paper with a range between 300 and 600 grit. This only affects the pipe ends that will be inserted into the fittings. If there are deep dents or scratches these can be removed by cutting the pipe before that area, or by replacing the affected pipe.

When necessary, cut the pipe using a pipe cutter or saw with carbide blade rated for aluminum. The cuts must be straight. The minimum distance between each fitting must be the length of the nut itself that way it can be loosened if the fitting must be disassembled.



Carefully deburr the internal pipe ends and chamfer the external pipe ends. Make an external bevel of 1/16" to 3/16" (or 1 - 4 mm) length x 15° to 45° tapered. The aim is to avoid all deformation of the pipe edge from the pipe cutting step, as this deformation could damage the O-ring and can cause a leak.

Note that original lengths of pipe should also be deburred

and chamfered unless received from the factory in that condition.



Mark the pipe to have a reference for its correct insertion into the fitting. This will ensure that the pipe exceeds the O-ring. The following table shows the correct reference lengths.

*Tolerance +/- 1 mm.

Diameter (DN)	20	25	32	40	50	63
Length (in.)	1-3/8	1-1/2	1-7/8	2-3/8	3	3-3/4
Length						
(mm)	35	38	49	60	76	96

Lubricate the pipe with Vaseline, water, or neutral, soapy water.





7. Fitting Assembly

7.1. General Fitting Assembly

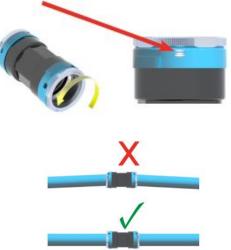


Refer to Section 1 for all safety relevant information. Adhere to PPE Section 1.7, when completing fitting assembly.

Adhere to Section 1.2, ensure supply air is removed prior to completing this section.



- **7.1.1.** Ensure that gloves are worn at all times when working with SmartPipe+
- **7.1.2.** Loosen the nut. Ensure that the fitting is free from debris and the body and O-ring are lubricated.



- Attention! 7.1.3. Pay attention: pipes and fitting have to be in the same axis.
 - **7.1.4.** Ensure that the clamping ring is in the correct orientation in the nut and is not potentially obstructing the pipe. It is recommended to mount and support the pipe prior to assembly. This will require that all support clips are three-dimensionally leveled (preferably with a laser level).
 - **7.1.5.** Insert the pipe into the fitting, aligning the pipe depth insertion mark (see Table 1 on page 13) with the external nut surface. Make sure that the depth mark is aligned to the Nut. Do not pull the pipe to insert into the fitting otherwise this can compromise the previous joint.
 - **7.1.6.** Tighten the nut by hand until it cannot move any further.







Attention! 7.1.7. Use a wrench to tighten the nut no more than ¼ turn from the hand tighten marks, only tighten with a wrench after completing the hand tightening step. Mark the pipe and fitting perpendicular to the nut.



Mark the Pipe and Fitting

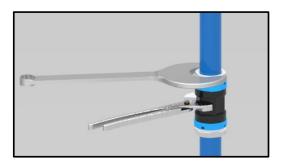


Do not mark the Identification Ring

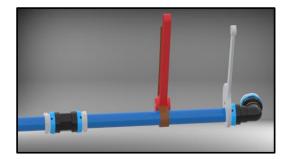
- Attention! 7.1.8. The installation process proceeds in two major repetitive steps.
 - 1) <u>Attaching a pipe to an already installed fitting</u>: Secure fitting with an adjustable wrench or by hand. Tighten nut with wrench.
 - 2) <u>Attaching a fitting to an already installed pipe</u>: Secure pipe with a strap wrench. Tighten new fitting nut with wrench.

<u>Important</u>: the purpose of the strap wrench is to avoid pipe turning, which could lead to loosening the previously tightened upstream fitting.

1) Attaching a pipe to installed fitting



2) Attaching a fitting to installed pipe



Attention!

7.1.9 Check all nut tightness with a wrench prior to the pressurization step. Do not overtighten. Overtightening can lead to deformation of the nuts which will lead to leaks and/or blowouts.

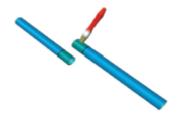


7.2. Sliding Coupling Assembly

First consult the Pipe Preparation (Section 6) and Fitting Assembly instructions (Section 7). Follow steps 7.1.1-7.1.4.



Insert the slide coupling on the pipe. Mark the location (2 marks) where the slide coupling will be installed. Remove the slide coupling. Measure and mark the center line. Follow all steps in Section 6, page 13, and cut the pipe at the center line mark. Debur the pipe internally and chamfer the pipe externally.



Lubricate the cut pipe ends with Vaseline, water, or neutral, soapy water.



Insert one of the two pipes into the fitting, until it comes out from the other end. Do not pull the pipe to insert into the fitting otherwise this can compromise the previous joint.



Align the two pipes and slide the fitting until the reference marks are visible on both sides.

Tighten the nuts following the procedure on page 14 (7.1.6-7.1.9).

7.3. Reducer Assembly



Remove the nut, clamping ring and identification ring where the reducer will be inserted.

All of the threads from the Reducer Assembly must be fully inserted into the adapter fitting. Tighten the Reducer Assembly in the Fitting by hand. Snug tight with a wrench. Do not over tighten with a wrench. No additional pipe sealant is required.



Proceed with assembly of the fitting as indicated on page 14 (Section 7.1).

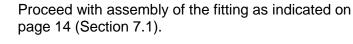
7.4. Male and Female Connectors



Remove the nut, clamping ring and identification ring where the reducer will be inserted.



All of the threads from the Connector must be fully inserted into the adapter fitting. Tighten the Connector in the Fitting by hand. Snug tight with a wrench. Do not over tighten with a wrench. No additional pipe sealant is required.





7.5. Vented End Cap Assembly

Attention!

The following section is for the Vented End Cap. Note that an additional fitting is required. In the examples at right, an elbow is used.

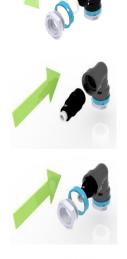
Vented End Cap

Remove the nut, clamping ring and identification ring where the plug will be inserted.

Insert the plug into the fitting until it bottoms out.

Remove the clamping ring from the nut.

Insert the nut into the fitting until it is firmly placed. Tighten the nut in the fitting according to Section 7.1. Do not overtighten with a wrench. Ensure Plug in Vented End Cap is tightened completely.

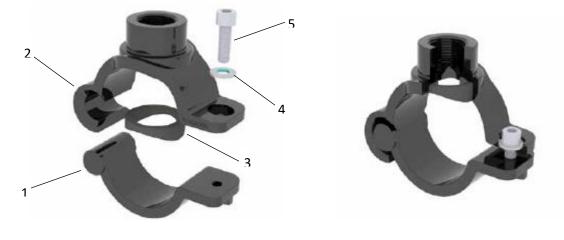




Plugs (end caps) can be used with any fitting.



7.6. Mini Bracket Assembly 7.6.1. Fitting Components



- 1 Bottom piece
- 2 Off-take piece
- 3 Gasket
- 4 Washer
- 5 Socket bolt

All parts come pre-assembled.

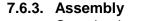
7.6.2. Preparation

Verify the integrity of the pipe section where the gasket is going to be positioned. Any scratches on the paint, if not deep, can be eliminated using sand paper with a range between 300 and 600 grit. If there are deep dents or deep scratches it is recommended to cut off the pipe prior to this section or replace the pipe.

Verify the correct positioning of the components inside the fitting. Fittings are supplied assembled and they have to be disassembled only for the installation. In case of accidental disassembly, check the correct assembly sequence and the position of all components which has to match the assembled figure above.



Adhere to Section 1.2, ensure supply air is off to the system before completing this step, and Section 1.7, proper PPE.



Completely unscrew the screw.

Separate the bottom part from the off-take part by sliding it axially until it is free.

Position the off-take part on the pipe, close to its final position and insert the bottom part pushing it axially until the screw holes are aligned.

Screw the bolt without tightening completely to place the Mini Bracket in its final position. It is recommended to use a level to ensure correct location.

Tighten the bolt per Table 2. Mark the Mini Bracket location with a marker.

Table 2. Bolt Torque Requirement

Torque Force with Hex Key								
Diameter	Bolt	N-m	Ft-lbs					
25	M8	15	11					
32 M8		15	11					
40	M8	15	11					
50	M8	15	11					
63 M8		15	11					

Drill the pipe by using a hole saw bit based on the off-take diameter below. Ensure drill is level and the Mini Bracket is not damaged.

1/2" = Ø14 mm 3/4" = Ø19 mm 1" = Ø24 mm

Eliminate the burr after drilling and carefully clean out all residues due to this operation. To clean and debur the hole the Mini Bracket can be removed, though it is not necessary. If so, ensure the Mini Bracket position has been marked with a pen before removal. Clean and debur, and replace according to the steps above. Connect desired item to the female NPT threads.





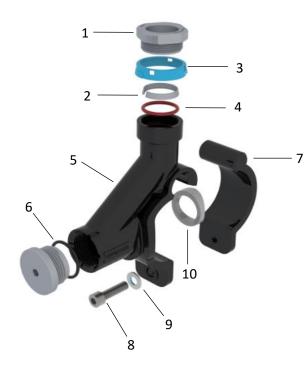






7.7. Quick Reducing Bracket Assembly

7.7.1. Fitting Components





1-3 Come Pre-assembled

- 1 Nut
- 2 Clamping ring
- 3 Identification ring

4-10 Come Pre-assembled and Pre-Lubricated

- 4 O-ring
- 5 Off-take piece
- 6 Plug and O-ring
- 7 Bottom piece
- 8 Socket bolt
- 9 Washer
- 10 Gasket

7.7.2. Preparation

Verify the integrity of the pipe section where the gasket is going to be positioned. Any scratches on the paint, if not deep, can be eliminated using sand paper with a range between 300 and 600 grit. Deep dents or scratches can be eliminated only by changing the bracket position or by replacing the affected pipe section interested.

Verify the correct positioning of the components inside the fitting. Fittings are supplied assembled and they have to be disassembled only for the installation. In case of accidental disassembly, check the correct assembly sequence and the position of all components which has to match the assembled figure above only.

Adhere to Section 1.2, ensure supply air is off to the system before completing this step, and Section 1.7, proper PPE.

7.7.3. Assembly

Completely unscrew the bolt and separate the bottom part from the off-take part by sliding it axially until it is free.

Position the off-take part on the pipe, close to its final position and insert the bottom part pushing it axially until the screw holes are aligned.

Screw the bolt without tightening completely to place the Bracket in its final position. It is recommended to use a level to ensure correct location.

Tighten the bolt per Table 2. Mark the Quick Reducing Bracket location with a marker.

Remove the plug.

ANSMARTPIPEPLUS 09 USE

Table 2. Bolt Torque Requirement

То	Torque Force with Hex Key									
Diameter	Bolt	N-m	Ft-lbs							
25	M8	15	11							
32	M8	15	11							
40	M8	15	11							
50	M8	15	11							
63	M8	15	11							

SmartPipe+ Installation Manual







22







Drill the pipe by using a hole saw bit based on the off-take diameter below. Ensure drill is level and the Bracket is not damaged.

D25 – D32 or 1/2" NPT = Ø14 mm

D40 - D50 - D63 or ³/₄" NPT = Ø19 mm

Eliminate the burr after drilling and carefully clean out all residues due to this operation. To clean and debur the hole the Bracket can be removed, though it is not necessary. If so, ensure the Bracket position has been marked with a pen before removal. Clean and debur, and replace according to the steps above.







Screw and tighten the plug. Ensure that the O-ring seats properly or the fitting will leak at this location.

Insert the prepared pipe in the new drop and tighten the nut following the DN20 - DN63 fitting assembly instructions. See Sections 6 and 7 for further details.

8. Manifold Assembly 8.1. Fitting Components



1 – Manifold 2 – Holder





Adhere to Section 1.2, ensure supply air is off to the system before completing this step, and Section 1.7, proper PPE.



8.2. Assembly

Assemble the Manifold (with all the fittings and/or other components connected to it) to the incoming pipe, leaving the inlet fitting nut loose. In the example, a ball valve with NPT connection is used. The pipe should be inserted completely to the fitting. Pipe and Manifold must be level. Mark the position around the Manifold keeping it assembled.

Completely detach the assembly from the incoming pipe.

Completely slip the support off the Manifold by forcing it axially. To avoid any hand injury it is advisable to put the Manifold on a plane and use a rubber or plastic ends mallet.

Place the holder support on the previously drawn mark for the Manifold and mark the position of the holes. Note, an additional spacer may be required off the wall to ensure that the pipe is perpendicular to the header.

Drill the support holes and install the anchors (not furnished with the Manifold). Mount the holder to the wall (mounting hardware not furnished with the Manifold).

Vertical Assembly 1: Completely insert inlet fitting into pipe, tighten the nut and insert the Manifold into the holder as shown. See Section 7 for further details.

Vertical Assembly 2: Insert Manifold partially into the holder, as shown previously. Then assemble it to the pipe, sliding it axially with the help of a soft end mallet, if needed. Tighten the inlet fitting nut. See Section 7 for further details.

Horizontal Assembly: Completely insert inlet fitting into pipe, tighten the nut and insert the Manifold into the holder as shown. See Section 7 for further details.

8.2.1. Examples and Assembly Solutions























2

3



- 9. 45° Wall Bracket Assembly 9.1. Fitting Components
 - 1 45° Wall Bracket 2 – Identification ring

 - 3 Purge valve

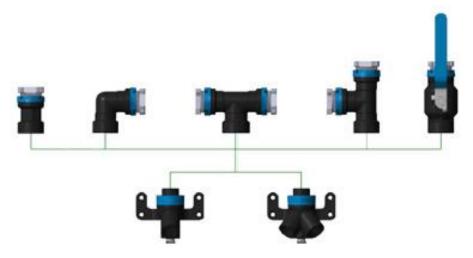
Attention! Wall Bracket requires an additional fitting or ball valve in order to connect to the pipe. See examples in 9.1.1. The Identification Ring (Item 3) is not included with the Wall Bracket but with the additional fitting or ball valve required.

Additionally, 1/2" NPT plugs can be added to the Wall Bracket should a customer connection not be made at the time of installation. Ensure that the Purge Valve (Item 2) is tight prior to pressurization of the compressed air system.



Adhere to Section 1.2, ensure supply air is off to the system before completing this step, and Section 1.7, proper PPE.

9.1.1. Examples and Assembly Solutions





9.2. Assembly

Remove the nut, clamping ring, and identification ring from the fitting where the Wall Bracket will be inserted. Note that the Wall Brackets are only 25 mm. However, 25 mm fittings can be transitioned to 20 mm either via the 25 mm x 20 mm Ball Valve or the 25 mm x 20 mm Reducer.

Push the Wall Bracket into the fitting until the threads from the Wall Bracket thread into the fitting. The Wall Bracket must push past the O-ring on the fitting. No additional pipe sealant is required.

Loosen the socket allen screw at the back of the Wall Bracket, if necessary. Screw the Wall Bracket into the fitting completely.

Align valve or fitting and Wall Bracket.

Tighten the socket allen screw.















9.3. Assembling to the Wall

Assemble the Wall Bracket, with all the fittings and/or other components connected to it, to the outlet pipe, leaving the inlet fitting nut loose. Prepare the pipe according to Section 6. The pipe should be fully inserted into the fitting. The pipe and bracket must be level.

Mark the positioning of the mounting holes keeping the elements assembled. Note, an additional spacer may be required off the wall to ensure that the pipe is perpendicular to the header.

Completely detach the assembly from the outlet pipe.

Drill the support holes and install the anchors (not furnished with the Wall Bracket).

Completely insert inlet fitting into pipe, fix the Wall Bracket with bolts (not furnished with the Wall Bracket). Hand tighten bolts in a cross or an X pattern. Tighten bolts per bolt specifications.

Tighten the nut following the DN20 – DN63 fitting assembly instructions. See Section 7 for further details.





10. Flexible Hose Assembly

⚠

Adhere to Section 1.2, ensure supply air is off to the system before completing this step, and Section 1.7, proper PPE.

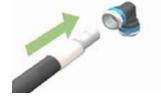
Loosen the nut until the end surface of the fitting body is no longer visible through the two inspection slots. Ensure clamping ring is inserted in the correct orientation.

Mark the end of the flexible hose according to Table 1 on page 13.

Insert the male end of the hose into the fitting. It may be required to screw the nut slightly onto the fitting in order to push the male end of the hose completely to the depth mark.

Tighten the nut by hand until it cannot move any further. Align the reference mark with the external nut surface. Tighten with a wrench until just before the hose turns. In this case, the tightness and axial clamping are ensured as the clamping ring will bite into the grooves on the male end of the hose. See Section 7 for further details. Prepare the opposite end of the hose in the same way.







Hose shall be in the same plane or with an appropriate bend. Hose must include antiwhiplash strap mounted to rigid support, not piping. "S" bends are not acceptable. Hose should not have any twist or axial movement.



			Table 3	. Flexible	e Hose Spe	ecification	IS		
nal	Outside	Outside	Inside	Inside	Min. Bend	Min. Bend	MAWP	MAWP	

Nominal Size	Nominal Size	Outside	Outside	Inside	Inside	Min. Bend Radius	Min. Bend Radius	MAWP	MAWP	Min. Burst	Min. Burst
ø	ø	Ø	Ø	ø	ø					Pressure	Pressure
in.	mm	in.	mm	in.	mm	in.	mm	psig	bar	psig	bar
3/4	20	1	25.4	3/4	19	9-7/16	240	1520	105	6091	420
1	25	1-5/16	33.3	1	25.4	11-13/16	300	1270	88	5076	350
1-1/4	32	1-3/4	44.3	1-1/4	31.8	16-1/2	420	910	63	3625	250
1-1/2	40	1-13/16	46.8	1-1/2	38.1	19-11/16	500	720	50	2900	200
2	50	2-9/16	64.6	2	50.8	24-13/16	630	580	40	2320	160
2-1/2	63	3	75.8	2-1/2	63.1	29-15/16	760	1015	70	5511	380

Attention!

The same flexible hoses can be used for vacuum applications. Consult factory for specification details.



A hose connection is required at the discharge of each compressor, any time there is a potential change in temperature between areas, and straight lengths of pipe 150 feet or longer. A hose can also be used on any drop from the main header or at any change in direction of the piping (particularly the corners of a building).

11. Examples of Assembly Solutions



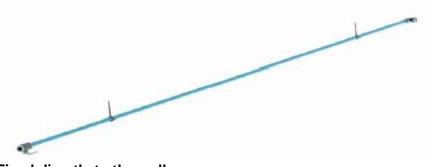
Attention! Required piping supports (fixing clips or other) are not shown herein.



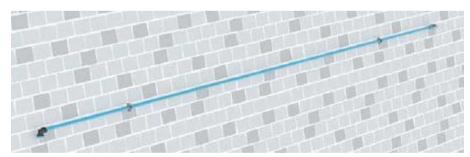
12. Fixing Clips Example Installations

12.1. Fixed to the ceiling

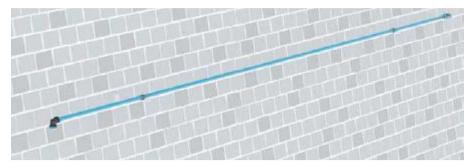
While fixing the pipe to the ceiling is acceptable, a free-floating pipe network is not. The pipe must be supported either from the floor, or directly from a support beam in various locations to avoid free swinging of the pipe network.



12.2. Fixed directly to the wall



12.3. Fixed with steel shelf



All pipes have to be fixed with a minimum of two clips, each one no more than 3 feet from the fitting. Additional fixing clips may be required depending on pipe runs, elbows, etc. Highly dynamic systems will need additional supports, bracing, and hoses in addition to the minimum required two clips. All pipe must be three-dimensionally leveled (preferably using a laser level). It is recommended to install fixing clips closer than 3 feet from either end of a valve to ensure there is no pipe movement when the valve is opened and closed. Supporting the valve itself separately would be recommended. Any drops from a main header should have a support clip 3 feet from the main header. To avoid expansion on a Tee, you can fix the pipe 3 feet from the main header.



If there is any axial movement of the piping, this can cause the pipes to slide out of the fittings causing a failure. Rigid supports must be placed on the piping to ensure the piping network will not axially move with the introduction or removal of compressed air. Follow all applicable National, State, and Local piping codes.

13. Pipe Hanger Assembly

Fix firmly the bottom part of the rubber lined bracket. The resistance of it will depend of the surface where it will be fixed.

Place the pipe and the top part of the bracket in their position.

Screw and tighten the bolts of the bracket.

Two hangers must be installed on every pipe and no more than a 3 foot maximum gap between a hanger and a fitting. Additional hangers may be required depending on pipe runs, elbows, etc. Highly dynamic systems will need additional supports, bracing, and hoses in addition to the minimum required two hangers. All pipe must be three-dimensionally leveled (preferably with a laser level). It is recommended to install pipe hangers within 3 feet from either end of a valve to ensure there is no pipe movement when the valve is opened and closed. Supporting the valve itself separately would be recommended. Any drops from a main header should have a support clip 3 feet from the main header. To avoid expansion on a Tee, you can fix the pipe 3 feet from the main header.

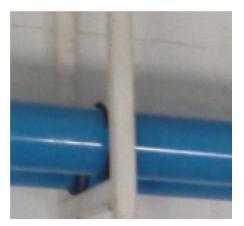
If there is any axial movement of the piping, this can cause the pipes to slide out of the fittings causing a failure. Rigid supports must be placed on the piping to ensure the piping network will not axially move with the introduction or removal of compressed air. Follow all applicable National, State, and Local piping codes.



14. 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







Air Main Charging Valve and Filter supports



15. System Check Prior to Pressurization \Lambda

If a new SmartPipe+ 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 piping insertion marks indicate proper insertion depth inside fitting.
- Verify all compression fittings have been tightened appropriately per Section 7.
- Verify all brackets are assembled properly and screws / bolts are fully tightened.
- Verify any openings are plugged closed prior to pressurization. Including but not limited to: wall brackets are plugged and ball valves are closed.
- Verify all piping is installed via good piping practices. All piping shall be level or within the tolerances specified in the SmartPipe+ manual and catalog.
- Verify that all piping is properly secured using SmartPipe+ fixing clips or equivalent and otherwise adheres to all safety and design standards indicated in Section 4.7.
- 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 SmartPipe+ header.
- Verify that SmartPipe+ piping is not used to support other equipment.



16. General Piping Practices for Startup 🥂

Pipelines of compressed air 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. 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. Nuts not tightened properly or overtightened causing deformations in the pipe or fitting
- e. Missing or damaged O-ring
- f. Debris obstructing the O-ring
- 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. Rubber hose connections are required in case of large ambient temperature changes in extensive pipelines.

The ASME code B31.1 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 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 the nuts and bolts for those applicable 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 value, if there are leaks, immediately depressurize the section, fix the leaks, and begin the test again. Increase the pressure by minimum steps of 10 psig. 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 value 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. Recheck that all fittings still maintain the correct tightness based on the installation instructions.
- 12. Increase the pressure again to the needed value and check for any possible leaks.
- 13. Repeat the process for each subsequent section of the facility until stabilization has been reached.
- 14. It is a good practice to pressurize and depressurize the system several times prior to handing the system over to the customer. As well operating all possible compressed air users, especially those high demand users.

Attention!

The connections can be guaranteed only if SmartPipe+ fittings are connected to SmartPipe+ pipes. See Section 2.1.

17. Pressure Loss Chart

Pipe size recommended based on 100 psi and less than 5.5 psi pressure drop.



Branch or Linear Distribution

	Equivalent										
Flow (cfm)	50	150	300	400	500	1000	2000	3000	4000	5000	
10	20	20	20	20	20	20	20	25	25	25	
25	20	20	20	20	25	25	32	32	32	40	
50	25	25	25	32	32	32	40	40	40	50	
75	25	25	32	32	32	40	40	50	50	50	
100	32	32	32	40	40	40	50	63	63	63	
150	40	40	40	40	40	50	63	05	05	05	
250	50	50	50	50	50	63	05				
500			63	63	63						
750	62	62	05								
900	63	63									
1000											

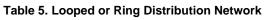
Table 4. Branch or Linear Distribution Network

Attention!

For flows above the range shown, see SmartPipeXL.



Equivalent						
Flow (cfm)	500	1000	2000	3000	4000	5000
10	20	20	20	20	20	20
25	20	25	25	25	32	32
50	25	32	32	40	40	41
75	32		40	40		50
100	32	40	40	50	50	
150	40		50			63
250	40	50	62	(2)	63	
350	50	63	63	63		
500	(2)					
750	63					





Looped or Ring Distribution

Attention!

For flows above the range shown, see SmartPipeXL.

KAESER COMPRESSORS

18. Maintenance

The systems made with SmartPipe+ products guarantee tight installations per the instructions provided herein. However, even after a completely leak-free installation, some events over time could occur, for example, but not limited to:

- Lines that lose alignment
- Failure to compensate, where necessary, for linear expansion / contraction
- Impact or casual stress
- Extreme environmental conditions outside the allowed limits (which could occur randomly)
- Changes, new connections or extensions made in stages subsequent to the original installation
- Badly threaded connections
- Defective accessories

It is therefore advisable to check for leaks annually, preferably during shutdown periods where the compressed air is operational but not required for production.



Refer to Section 1 for all safety relevant information while conducting leak detection.

The systems available for carrying out a leak test are various; the most common are listed below:

- Listening in conditions of relative silence
- Soapy liquids
- Ultrasound leak detection

It is advisable to search for leaks at low-pressure, such as 14.5 psig or 1 bar, as higher pressures can induce the "dynamic" seal of some gaskets.

Remember that the loss "0" is highly unlikely, and it would be impossible to be measured. Checking the leak load can be as simple as utilizing the same test outlined in Section 16, steps 7 through 10. However, to identify individual leaks the operator must use the most common methods listed above.

Also note that decreases or increases in pressure can result from changes in room temperature. It is therefore advisable not to limit the control by simply detecting the absolute manometric value (except to consider these possible variations in temperature).



When fixing leaks within the piping network, ensure that the operator is adhering to all safety relevant information outlined in Section 1; that the system is properly depressurized per Section 1.3.7 before any work is done, and that the proper PPE, per Section 1.7, is worn. Should any replacement joints or pipe be required, adhere to the pertinent steps outlined in Section 6 regarding the piping preparation and various sections throughout the manual regarding preparation and connections of the fittings and supports.



Annex

Warranty





SmartPipe+[™] 3/4" to 2-1/2"

Model: _____ Serial No: _____ Start-up Date: _____

Kaeser Compressors, Inc. herein referred to as "Kaeser," warrants the Kaeser SmartPipe+™ delivered hereunder will be free of defects in material and workmanship for a period of ten (10) years from the date of purchase of the products.

Kaeser does not warranty the design, assembly or installation of the system, but only the components as stated herein. Kaeser is not responsible for improper design, assembly or installation, or for any modifications of the Kaeser products.

Should any failure to conform with the above warranties occur during the specified period under normal use, and the components have been proven to Kaeser's satisfaction to have been properly stored, installed and maintained, and purchaser has complied with all procedures outlined in the service manual or installation instructions then Kaeser shall, with prompt notice correct the non-conformities at its option either by replacement or by refund of the purchase price of the non-conforming equipment. Return of such component to such delivery point as Kaeser may direct pursuant to this paragraph shall be at the purchaser's risk and expense. Kaeser warrants any components replaced pursuant to the above warranty, under normal use, to be free from defects in workmanship and material for a period of ninety (90) days after the shipment of such replaced components or for a period ending on the expiration of the original component warranty, whichever is longer. Unless otherwise expressly agreed, Kaeser shall not be responsible for labor charges, loss or damage resulting from improper operation, maintenance or repairs made by personnel other than those authorized in writing by Kaeser, or damage to equipment caused by the use of non-authorized replacement parts.

Replacement or refund (whichever Kaeser determines, in its sole discretion, to provide) shall be Kaeser's sole obligation and purchaser's exclusive remedy for any nonconformity, noncompliance, defect or deficiency in components furnished hereunder, and shall be conditioned upon purchaser's return of the defective components to Kaeser (DAP Kaeser's directed delivery point) if Kaeser requires such return. This exclusive remedy will not be deemed to have failed of its essential purpose so long as Kaeser is willing to provide replacement or refund. THE EXPRESS WARRANTY CONTAINED HEREIN IS EXCLUSIVE AND IN LIEU OF ALL OTHER REPRESENTATIONS AND WARRANTIES, EXPRESSED OR IMPLIED, AND KAESER EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE.

AUTHORIZATION FROM THE SERVICE DEPARTMENT IS NECESSARY BEFORE MATERIAL IS RETURNED TO THE FACTORY OR IN-WARRANTY REPAIRS ARE MADE.

Product Warranty Registration

In order for Kaeser Compressors, Inc. to properly handle warranty or other service requests, please register online at <u>us.kaeser.com/warranty.</u>

us.kaeser.com/warranty

LIMITATION OF LIABILITY

THE REMEDIES OF THE PURCHASER SET FORTH HEREIN ARE EXCLUSIVE, AND KAESER COMPRESSORS' LIABILITY WITH RESPECT TO EQUIPMENT SOLD HEREUNDER SHALL BE LIMITED TO THE WARRANTY PROVIDED HEREIN AND, WITH RESPECT TO ANY BREACH OF ITS CONTRACT WITH PURCHASER, SHALL BE LIMITED TO THE CONTRACT PRICE OF EQUIPMENT THAT IS THE SUBJECT OF THE BREACH; PROVIDED, HOWEVER, THAT THE FOREGOING SHALL NOT APPLY IN THE EVENT OF ANY ACT THAT CONSTITUTES GROSS NEGLIGENCE OR WILLFUL MISCONDUCT BY THE PARTY SUBJECT TO THE CLAIM FOR SUCH DAMAGES. PRIOR TO PURCHASER HAVING ANY RIGHT TO RECOVER DAMAGES (SUBJECT TO THE LIMITATIONS SET FORTH BELOW), KAESER COMPRESSORS SHALL HAVE THE RIGHT TO CORRECT ANY DEFECT OR NON-CONFORMITY OF ANY EQUIPMENT SOLD HEREUNDER IN A REASONABLE TIME FRAME. AND IF KAESER COMPRESSORS DETERMINES THAT IT IS UNABLE OR UNWILLING TO CORRECT ANY SUCH DEFECT OR NON-CONFORMITY, THEREAFTER, PURCHASER MAY PURSUE THE ALTERNATIVE REMEDIES SET FORTH HEREIN. NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY, IN NO EVENT SHALL EITHER PARTY BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, OR EXPENSES INCURRED BY THE OTHER PARTY, THE OTHER PARTY'S CUSTOMERS OR ANY THIRD PARTY, WHETHER ARISING FROM BREACH OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHER THEORIES OF LAW OR EQUITY, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OR REVENUE. LOSS OF USE OF EQUIPMENT OR ANY ASSOCIATED EQUIPMENT, COST OF CAPITAL, COST OF SUBSTITUTE FACILITIES OR SERVICES, DOWNTIME COSTS OR CLAIMS OF CUSTOMERS OR SUCH OTHER PARTY FOR SERVICE INTERRUPTION, OR ANY OTHER TYPES OF ECONOMIC LOSS WHETHER OR NOT SUCH LOSS OR DAMAGE IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE.



Built for a lifetime.







Kaeser Compressors, Inc. 511 Sigma Drive Fredericksburg, VA 22408 USA Telephone: 540-898-5500 Toll Free: 800-777-7873 Info.usa@kaeser.com

us.kaeser.com